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LETTER OF TRANSMISSION

To His Honour W. D. Ross,

Lieutenant-Governor of the Province of Ontario.

Sir,—I have the honour to transmit to you herewith, for presentation to the Legislative Assembly of the Province of Ontario, the Thirty-sixth Annual Report of the Department over which I have the honour to preside.

I have the honour to be, Sir,

Your obedient servant,

Chas. McCrea,

Minister of Mines.

Department of Mines,
Toronto, 1927.

INTRODUCTORY LETTER

TO THE HONOURABLE CHAS. MCCREA,

Minister of Mines.

SIR,—I beg to submit to you herewith the Thirty-sixth Annual Report of the Department of Mines, published in four parts, as follows:—

PART 1	PAGE
Introductory Letter, by Thos. W. Gibson	ii
Statistical Review of Ontario's Mineral Industry in 1926, by W. R. Rogers and H. C. Young	1-68
Classes for Prospectors, 1926-27, by W. L. Goodwin	69-70
Mining Accidents in 1926, by T. F. Sutherland, G. E. Cole, D. G. Sinclair, J. G. McMillan, and A. R. Webster	71-74
Mines of Ontario in 1926, by T. F. Sutherland, J. G. McMillan, D. G. Sinclair, G. E. Cole, and A. R. Webster	75-178
PART 2	
Michipicoten Gold Area, District of Algoma, by T. L. Gledhill	1-49
Goudreau-Lochalsh Gold Area, District of Algoma, by T. L. Gledhill	50-86
Shiningtree Silver Area, District of Timiskaming, by Geo. B. Langford	87-99
Wasapika Section, West Shiningtree Area, District of Sudbury, by Geo. B. Langford	100-104
PART 3	
Geology of the Basin of Red Lake, District of Kenora (Patricia Portion), by E. L. Bruce and J. E. Hawley	1-72
Gammon River Area and Rickaby Lake Schist Belt, District of Kenora (Patricia Portion), by Geoffrey Gilbert	73-84
Woman and Narrow Lakes Area, District of Kenora (Patricia Portion), by J. W. Greig	85-110
PART 4	
Natural Gas in 1926, by R. B. Harkness	1-27
Petroleum in 1926, by R. B. Harkness	28-34

Only Part 1 is bound with the Sessional Papers of the Legislature. All parts are available on application to the Department.

I have the honour to be, Sir,

Your obedient servant,

THOS. W. GIBSON,

Deputy Minister of Mines.

DEPARTMENT OF MINES,
Toronto, 1927.

ONTARIO

PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. CHAS. MCCREA, *Minister of Mines* THOS. W. GIBSON, *Deputy Minister*

THIRTY-SIXTH ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. XXXVI, PART I, 1927

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STATISTICAL REVIEW OF ONTARIO'S MINERAL INDUSTRY IN 1926

By W. R. Rogers and A. C. Young

Introduction

The total value of the mineral output of Ontario for the year 1926 was $85,098,706, being a decrease of $2,484,600, or 2.8 per cent. from the total of $87,583,306 in 1925. While production showed a small decline, there was great activity and keen interest displayed throughout the period and the momentary pause may be explained partly to the greatly decreased price of silver, which accounted for more than one million dollars of the decrease, and also to a drop in the value of cobalt and the output of nickel.

As shown in Table I, the mineral production is divided into four main groups comprising thirty-two different mineral substances: Metallics worth $59,218,297; Non-Metallics $7,842,632; Structural Materials $12,681,308, and Clay Products valued at $5,356,469. All groups, except metallics, showed slight increases in value over the year 1925.

As above noted, the most important group of minerals is that of Metallics. Gold mining on the whole continued to expand, and although the largest field, that of Porcupine, showed a slight falling off in output, the decrease was more than offset by the rapid expansion at Kirkland Lake. Despite a drop of almost seven cents per ounce in the price of silver the more important mines of Cobalt, South Lorrain and Gowganda continued to operate and closely approached the output of the previous year in quantity. There were slight reductions in the quantity of silver bullion sold as well as the silver contents of exported material. In the nickel-copper industry production in 1926 was less than in 1925. This is explained in the annual report of the International Nickel Company, the decrease being in part due to the consumption of large quantities of nickel-steel armour and deck-plate scrap resulting from the disarmament of war vessels and sold to the alloy steel makers at low prices. This substitution made inroads into the company sales of nickel for alloy steel making.

Among the Non-Metallics the most important items were natural gas with a total value of $4,415,918 and salt $1,388,672. Other items such as arsenic, feldspar, graphite, gypsum and talc all showed slight increases.

Structural Materials and Clay Products more than maintained the values of the previous year and were indicative of the active conditions prevailing in the building industry during the period. The values, however, were still below those of 1922 and 1923, when higher prices prevailed in building and construction materials. The index numbers of wholesale prices of building commodities has steadily declined from 214.9 in 1920 to 149.4 in 1926, based on 100.0 in 1913, while wages which stood at 180.9 in 1920 dropped to 162.5 in 1922 and has gradually increased to 172.1 for 1926. The index numbers of employment in Ontario on the basis of 100 in January, 1920, stood at 134.8 in 1926.

Table I which follows summarizes production and employment statistics for the year 1926:—

TABLE I.—SUMMARY OF MINERAL STATISTICS OF ONTARIO FOR 1926

Product (tons of 2,000 lbs.)	Quantity	Value	Employees	Wages
		$		$
METALLIC:				
Gold.....oz.	1,497,215	30,950,753	5,778	8,891,068
Silver..... "	9,382,316	5,781,706	1,405	2,223,601
Copper in matte (*a*).....tons	11,596	2,319,164	(*b*) 2,642	3,565,667
Nickel in matte (*a*)..... "	16,988	6,115,540		
Copper (metallic).....lb.	18,121,226	2,509,800		
Nickel, metallic and contained in speiss exported..... "	25,680,593	6,432,939	(*c*) 490	793,399
Nickel oxide and salts..... "	7,862,624	1,825,684		
Platinum metals.....oz.	19,495	1,559,527		
Bismuth.....lb.	6,440	6,440		
Cobalt, metallic and in residues exported..... "			316	329,449
Cobalt oxide (metal content)..... "	664,778	1,136,014		
Cobalt in salts and unseparated oxides..... "				
Lead, pig and in concentrates exported..... "	7,398,796	580,730	163	270,044
Total.....	.....	59,218,297	10,794	16,073,228
NON-METALLIC:				
Abrasives.....tons	64	576	2	243
Actinolite..... "	80	1,000	11	445
Arsenic, white.....lb.	4,055,477	135,549	(*d*)	(*d*)
Asbestos.....tons	14	3,935	.....	.....
Feldspar, crude and ground..... "	22,783	199,102	240	123,416
Graphite, crude and refined..... "	2,266	158,994	38	30,091
Gypsum..... "	89,987	496,059	188	245,663
Iron pyrites..... "	371	4,912	.....	.....
Mica..... "	881	59,085	42	25,371
Mineral water.....Imp. gals.	208,400	27,277	14	5,030
Natural gas.....M. cu. ft.	7,776,496	4,415,918	1,008	720,556
Petroleum, crude.....bbls.	136,971	376,822	2,241	2,876,150
Quartzite and quartz.....tons	192,733	339,304	123	102,230
Silica brick.....no.	1,306,773	56,441	.....	.....
Salt.....tons	252,345	1,388,672	466	614,790
Talc and soapstone..... "	14,882	178,986	50	47,083
Total.....	.....	7,842,632	4,423	4,791,068
STRUCTURAL MATERIALS:				
Cement, Portland.....bbls.	3,398,860	4,792,857	764	997,089
Hydrated lime.....tons	39,217	457,978	414	397,988
Quicklime.....bush.	5,402,261	1,593,468		
Sand and gravel.....tons	4,899,580	2,117,461	435	421,887
Sand-lime brick.....M	46,869	461,376	178	171,747
Stone, building, trap, granite, etc.....tons	3,627,971	3,258,168	1,400	990,008
Total.....	.....	12,681,308	3,191	2,978,719
CLAY PRODUCTS:				
Brick, face.....M.	122,929	2,436,848		
" common..... "	50,638	768,734		
" fancy and ornamental..... "	374	20,047	1,842	1,564,594
" sewer..... "	6,397	111,620		
Tile, drain..... "	12,788	340,403		
" structural.....	.....	756,011		
Sewer pipe, copings, flue-linings, etc.....tons	48,176	835,206	294	337,710
Pottery.....M.	5,910	87,600	29	35,997
Total.....	.....	5,356,469	2,165	1,938,301
GRAND TOTAL.....	.....	**85,098,706**	**20,573**	**25,781,316**

(*a*) Copper and nickel in matte valued at 10 and 18 cents per pound, respectively.
(*b*) Employees and wages for nickel-copper mines and smelters.
(*c*) Employees and wages for nickel-copper refineries.
(*d*) Employees and wages included with silver-cobalt smelters and refineries.

The following comparative statement shows the course of the mining industry during the five-year period, 1922 to 1926 inclusive, as indicated by the value of the total production:

TABLE II.—VALUE OF MINERAL PRODUCTION, 1922 TO 1926

Product	1922	1923	1924	1925	1926
METALLIC:	$	$	$	$	$
Gold	20,579,569	20,136,287	25,669,303	30,206,432	30,950,753
Silver	7,800,029	6,843,364	7,233,078	6,964,325	5,781,706
Platinum metals	924,712	1,418,633	1,891,497	1,676,446	1,559,527
Cobalt (*a*)	1,080,873	1,456,583	1,662,526	2,328,517	1,136,014
Nickel (*b*)	7,038,202	9,572,662	11,309,326	15,946,673	14,374,163
Other nickel and cobalt compounds	255,034	347,289	.....	.....	.....
Copper, metallic and in matte	2,069,824	3,456,067	3,825,294	4,739,124	4,828,964
Iron ore (*c*)	25,261	26,452	110	.....	.....
Pig iron (*d*)	340,730	423,298	91,862	.....	.....
Lead (pig)	173,742	347,886	419,405	601,704	580,730
Zinc	2,181	.....	.....	13,685	.....
Bismuth	.....	48,139	27,913	18,566	6,440
Total	40,290,157	44,076,660	52,130,314	62,495,472	59,218,297
NON-METALLIC					
Abrasives (*e*)	.....	100,000	9,272	945	576
Actinolite	575	583	1,225	500	1,000
Arsenic, white	299,940	582,785	309,108	113,325	135,549
Asbestos	.....	2,600	91,900	901	3,935
Barite	.....	4,180	.....	.....	.....
Feldspar, crude and ground	120,576	134,822	216,791	141,059	199,102
Fluorspar	3,905	597	1,343	200	.....
Graphite, crude and refined	34,124	65,557	72,842	134,213	158,994
Gypsum	621,668	542,317	467,097	491,833	496,059
Iron pyrites	39,763	99,716	44,542	8,799	4,912
Mica	56,480	110,290	172,252	82,661	59,085
Mineral water	10,528	14,047	13,133	25,452	27,277
Natural gas	4,024,767	4,066,244	4,076,014	4,083,341	4,415,918
Peat fuel	14,500	.....	.....	8,394	.....
Petroleum, crude	466,587	478,149	390,424	396,154	376,822
Quartzite and quartz	(*f*) 146,446	(*f*) 510,410	(*f*) 221,452	(*f*) 359,691	339,304
Silica brick	.....	.....	.....	.....	56,441
Salt	1,573,657	1,674,365	1,337,311	1,466,450	1,388,672
Talc and soapstone	178,397	125,124	130,577	174,116	178,986
Total	7,591,913	8,511,786	7,555,283	7,488,034	7,842,632
STRUCTURAL MATERIALS:					
Cement, Portland	6,235,370	5,855,589	5,668,671	5,253,911	4,792,857
Lime, hydrated and quicklime	1,767,543	1,893,663	1,840,152	2,044,125	2,051,446
Sand and gravel	1,816,320	1,623,317	1,587,913	1,658,700	2,117,461
Sand-lime brick	851,007	897,960	512,361	677,103	461,376
Stone, building, trap, granite, etc	2,969,926	2,869,228	2,789,368	2,817,335	3,258,168
Total	13,640,166	13,139,757	12,398,465	12,451,174	12,681,308
CLAY PRODUCTS:					
Brick, face	4,793,224	4,191,145	2,203,617	2,403,832	2,436,848
" common			944,892	733,793	768,734
" fancy and ornamental			88,857	21,728	20,047
" sewer			40,922	37,082	111,620
Tile, drain	368,180	283,662	373,980	360,710	340,403
Tile, structural	720,101	790,475	550,170	612,138	756,011
Sewer pipe, copings, flue-linings, etc.	973,824	925,858	851,327	893,443	835,206
Pottery	88,889	78,000	84,100	86,000	87,600
Total	6,944,218	6,269,140	5,137,865	5,148,626	5,356,469
Grand Total	**68,466,454**	**71,997,343**	**77,221,927**	**87,583,306**	**85,098,706**

(*a*) Cobalt, oxide, metallic cobalt, and cobalt content of residues marketed.
(*b*) Nickel in matte, oxide and metallic nickel.
(*c*) Exports and shipments to points other than Ontario blast furnaces.
(*d*) Product from Ontario ore only.
(*e*) Includes corundum, garnets, quartz pebbles.
(*f*) Includes value of silica brick.

In Table III is given the aggregate value of the metals and metallic products from the time production began in Ontario down to the end of 1926. As regards pig iron it should be pointed out that since 1914 the statistics of annual production credit the Province only with the value of the product made from Ontario ore. This is but a small part of the total output, since the great bulk of the iron ore charged into the blast furnaces of the Province is "lake" ore from the mines of Minnesota, Michigan and Wisconsin. In the production tables credit is taken only for the ore exported or shipped to points other than Ontario blast furnaces, since to include the value of the domestic ore converted into pig iron in Ontario furnaces would involve a duplication of this item.

TABLE III.—TOTAL MINERAL PRODUCTION OF ONTARIO

Year	Value of Mineral Production				
	Metallic (a)	Non-Metallic	Structural Materials	Clay Products	Total
	$	$	$	$	$
Before 1891..	9,520,269		(a)		9,520,269
1891.....	388,715		4,316,958		4,705,673
1892.....	864,382		4,509,757		5,374,139
1893.....	614,762		5,505,991		6,120,753
1894.....	842,750		5,244,008		6,086,758
1895.....	616,055		4,554,083		5,170,138
1896.....	963,288		4,271,715		5,235,003
1897.....	1,038,089		(b) 4,480,452		(b) 5,518,541
1898.....	1,689,002		5,546,875		7,235,877
1899.....	2,055,592		6,361,081		8,416,673
1900.....	2,565,286		6,733,338		9,298,624
1901.....	5,016,734		6,814,352		11,831,086
1902.....	6,257,499		7,134,135		13,391,634
1903.....	5,242,575		7,628,018		12,870,593
1904.....	4,906,677		6,665,970		11,572,647
1905.....	10,201,010		7,653,286		17,854,296
1906.....	13,353,080		9,035,303		22,388,383
1907.....	14,550,835	3,020,537	3,876,275	3,571,726	25,019,373
1908.....	16,754,986	2,629,749	3,396,406	2,856,476	25,637,617
1909.....	22,928,496	2,825,751	4,028,206	3,198,922	32,981,375
1910.....	28,161,678	3,141,658	4,380,000	3,630,559	39,313,895
1911.....	29,102,867	3,674,926	4,935,609	4,263,395	41,976,797
1912.....	34,799,734	4,009,643	4,701,170	4,831,056	48,341,603
1913.....	37,507,935	4,296,450	5,866,775	5,561,151	53,232,311
1914.....	33,345,291	4,339,703	4,505,368	4,105,597	46,295,959
1915.....	44,109,679	4,655,250	3,609,371	1,871,379	54,245,679
1916.....	55,002,918	4,982,140	3,734,065	1,584,699	65,303,822
1917.....	56,831,857	7,702,942	4,962,284	2,596,749	72,093,832
1918.....	66,178,059	7,815,062	4,297,401	2,018,450	80,308,972
1919.....	41,590,759	6,308,182	7,208,413	3,776,562	58,883,916
1920.....	48,281,553	8,141,796	11,921,019	4,735,154	73,079,522
1921.....	28,777,581	6,636,217	13,967,386	(c) 5,183,125	54,564,309
1922.....	40,290,157	7,591,913	13,640,166	6,944,218	68,466,454
1923.....	44,076,660	8,511,786	13,139,757	6,269,140	71,997,343
1924.....	52,130,314	7,555,283	12,398,465	5,137,865	77,221,927
1925.....	62,495,472	7,488,034	12,451,174	5,148,626	87,583,306
1926.....	59,218,297	7,842,632	12,681,308	5,356,469	85,098,706
Total...	882,270,893	.....	441,966,912	.....	1,324,237,805

(a) Prior to 1891, when the Ontario Bureau (now Department) of Mines was established, it is estimated that metals to the value of $9,520,269 were produced. No estimate has been made of the output of non-metallics up to 1891.
(b) Estimated on basis of preceding year ($1,618,720 for stone, lime, and clay products).
(c) Includes $88,429 valuation of fire clay and products not listed.

The total production of metals in Ontario is noted hereunder:—

Metal or Product	Production to December 31, 1925	Production, 1926	Production to December 31, 1926
	$	$	$
Silver	228,184,421	5,781,706	233,966,127
Nickel, including nickel oxide	312,542,357	14,374,163	227,916,520
Gold	184,492,033	30,950,753	215,442,786
Pig iron	84,775,556	.....	84,775,556
Copper (*a*)	72,819,550	4,828,964	77,648,514
Cobalt (*b*)	16,574,011	1,136,014	17,710,025
Platinum metals	10,269,857	1,559,527	11,829,384
Iron ore	9,463,516	.....	9,463,516
Lead	2,518,666	580,730	3,099,396
Molybdenite	209,735	.....	209,735
Zinc ore	108,276	.....	108,276
Bismuth	94,618	6,440	101,058
Total	823,052,596	59,218,297	882,270,893

(*a*) Includes small quantities of copper sulphate.
(*b*) Includes cobalt metal, cobalt oxide, cobalt salts, and cobalt content of residues exported

Gold

The total gold produced during 1926 from all sources in Ontario amounted to 1,497,214.93 fine ounces, valued at $30,950,753, as against 1,461,039.37 fine ounces worth $30,206,432 in 1925. These figures include the gold won from the refining of nickel-copper matte.

The crude bullion recovered from the gold mines also contains a certain percentage of silver. The total value of the crude bullion from Porcupine was $23,810,700 in 1926 as against $24,886,615 during the previous year, while the corresponding figures for the Kirkland Lake camp were $7,193,411 and $5,403,289 respectively, a total gain of $714,207 for the gold mines of these two areas. From other points a few small properties produced crude bullion worth $4,992 in 1926, while gold recovered from the refining of nickel-copper matte was valued at $91,367. Ore milled increased from 3,399,544 tons in 1925 to 3,696,605 tons in 1926. In these years, respectively, the figures for Porcupine were 3,016,178 and 3,180,943 tons milled and for Kirkland Lake 383,235 and 515,124.

With the exception of the Ankerite, March, Paymaster and Kirkland Gold, the producing mines were operated at practically full time during the period. On the average 5,778 wage-earners were employed and $8,891,068 was paid in wages.

In addition to the producing mines many others carried on development operations during 1926, while the usual assessment work on mining claims as prescribed by the Mining Act was performed by claim holders in the several Mining Divisions. Returns were received from 18 companies shown below, most of which were active throughout the entire period, or were developing under contract. The number of days' work done per mine during 1926 averaged around 242, while the average number of wage-earners was 480, to whom $682,949 was paid in wages. The total number of wage-earners and wages paid by the active mines, therefore, amounted to an average of 6,258 with a total pay roll of $9,574,017.

If complete statistics were available from all individuals doing assessment work on which day labour was engaged the gold mining industry of Ontario, exclusive of salaried officials, would approximate 10 million dollars in wages alone and supply employment to more than 6,000 men.

The Porcupine area was represented by nine producing mines, of which the Hollinger, Dome and McIntyre produced the major portion. In Kirkland Lake there were seven producing mines of which Lake Shore, Wright-Hargreaves and Teck-Hughes were the leaders. Details of production are given separately in the following table:—

TABLE IV.—ONTARIO'S GOLD PRODUCTION, 1926

Source	Ore Milled, tons	Bullion shipped				Total Value of Bullion (a)
		Gold		Silver		
		Fine ounces	Value	Fine ounces	Value	
PORCUPINE			$		$	$
Ankerite	23,060	6,785.07	140,260	588	328	140,588
Dome	555,700	189,631.62	3,920,033	32,773	20,020	3,940,053
Hollinger	1,932,559	713,421.32	14,747,727	134,841	81,928	14,829,655
March Gold	4,655	533.27	11,024	110	31	11,055
McIntyre	498,653	185,684.61	3,838,441	41,901	23,633	3,862,074
Night Hawk Peninsular	21,604	5,364.50	110,481	1,031	673	111,154
Porcupine Paymaster	28,049	3,064.59	63,363	350	188	63,551
Vipond	79,717	30,452.19	629,503	3,519	2,133	631,636
West Dome Lake	36,946	10,627.10	219,662	1,748	1,096	220,758
Miscellaneous (b)	.....	8.52	176	.....	.....	176
Total	3,180,943	1,145,572.79	23,680,670	216,861	130,030	23,810,700
KIRKLAND LAKE						
Argonaut (c)	35,081	6,915.04	142,946	727	441	143,387
Barry-Hollinger	13,680	4,173.02	85,955	516	308	86,263
Kirkland Lake Gold	10,829	6,111.51	126,336	1,260	663	126,999
Lake Shore	171,197	133,893.00	2,767,809	11,935	7,191	2,775,000
Teck-Hughes	80,074	77,266.13	1,597,233	6,450	3,976	1,601,209
Tough-Oakes-Burnside	43,871	14,819.25	308,400	2,114	1,309	309,709
Wright-Hargreaves	153,392	103,793.12	2,145,404	8,912	5,440	2,150,844
Total	515,124	346,971.07	7,174,083	31,914	19,328	7,193,411
MISCELLANOUES						
Mines, etc. (d)	538	224.07	4,633	555	359	4,992
Nickel-Copper Refineries	.....	4,447.00	91,367	.....	.....	91,367
Total	538	4,671.07	96,000	555	359	96,359
Grand Total	3,696,605	1,497,214.93	30,950,753	249,330	149,717	31,100,470

(a) There should be deducted from the total, $595 which was the discount paid due to differences of exchange.
(b) P. DeSantis and Hughes Gold Mines, Ltd.
(c) In addition to gold, copper in concentrates to the value of $12,331 was marketed.
(d) Includes Goudreau, Blue Quartz and Champion Mines, also Temiskaming Testing Laboratory shipments to Hollinger mine.

The following operators produced gold during the year:—

PRODUCING GOLD MINES, 1926

Name of Company	Name of Mine	Locality	P.O. Address of Manager, etc.
Ankerite Gold Mines, Ltd.	Ankerite	Deloro township	South Porcupine
Argonaut Consolidated Mines, Ltd.	Argonaut	Gauthier township	Argonaut
Barry-Hollinger Gold Mines, Ltd.	Barry-Hollinger	Pacaud township	Boston Creek
Blue Quartz Gold Mines, Ltd.	Blue Quartz	Beatty township	Matheson
Champion Gold Mines, Ltd.	Champion	Hancock township	Fort Erie
Consolidated West Dome Lake Mines, Ltd.	West Dome Lake	Tisdale township	South Porcupine
Dome Mines Company, Ltd., The	Dome	Tisdale township	South Porcupine
Hollinger Consolidated Gold Mines, Ltd.	Hollinger	Tisdale township	Timmins
Kirkland Lake Gold Mining Company, Ltd.	Kirkland Gold	Teck township	Kirkland Lake
Lake Shore Mines, Ltd.	Lake Shore	Teck township	Kirkland Kake
March Gold, Ltd.	March Gold	Deloro township	South Porcupine
McIntyre Porcupine Mines, Ltd.	McIntyre	Tisdale township	Schumacher
Night Hawk Peninsular Mines, Ltd.	Night Hawk Peninsular	Cody township	Connaught Station
Porcupine Paymaster Mines, Ltd.	Paymaster	Deloro township	South Porcupine
Teck-Hughes Gold Mines, Ltd.	Teck-Hughes	Teck township	Kirkland Lake
Temiskaming Testing Laboratory	Small prospects	Northern Ontario	Cobalt
Tough-Oakes Burnside Gold Mines, Ltd.	Tough-Oakes Burnside	Teck and Lebel townships	Kirkland Lake
Vipond Consolidated Mines, Ltd.	Vipond	Tisdale township	Timmins
Wright-Hargreaves Mines, Ltd.	Wright-Hargreaves	Teck township	Kirkland Lake

The list below gives the names and addresses of the more important companies doing development work during the same period:—

Name	Location	P.O. Address	No. Employees	Days Operated
Abitibi Mines, Ltd.	Lightning River	306 Royal Bank Bldg., Toronto.	Contract	200
Baldwin Gold Mining Co., Ltd.	Ebby township	134 King St. E., Toronto	20	150
British Canadian Mines, Ltd.	Mine Centre	8 Bloor St. E., Toronto	46	365
Canadian Associated Goldfields	Larder	306 C.P.R. Bldg., Toronto	41	365
Coniaurum Mines, Ltd.	Porcupine	St. Catharines	73	365
Conroyal Mines, Ltd.	Lebel	911 Kent Bldg., Toronto	31	365
Cooper Gold Mines, Ltd.	Michipicoten	302 Bay St., Toronto	51	306
Crown Reserve Mining Co., Ltd.	Larder Lake	Montreal, Que., P.O. Box 386	10	135
Gold Hill Mining Co., Ltd.	Boston Creek	Haileybury	31	365
Harkness-Hays Gold Mining Co., Ltd.	2 miles east of Schreiber	Schreiber	8	141
Hayden Gold Mines Co., Ltd.	Porcupine	509 Brisbane Bldg., Buffalo		
Kirkland-Hunton Gold Mines, Ltd	Kirkland Lake	32 Imperial Bank Bldg., Toronto.	21	365
Kirk Gold Mines Co., Ltd.	Kirkland Lake	911 Kent Bldg., Toronto	10	200
Kirkland-Hudson Bay Gold Mines, Ltd.	Teck township	New Liskeard	9	171
Manley-O'Reilly Gold Mines, Ltd.	Skead township	17 Main E., Hamilton	21	250
Northland Gold Mines, Ltd.	Kirkland Lake	Kirkland Lake	17	365
Ore Chimney Mining Co.	Barrie township	Northbrook	26	365
Ostrom Gold Mines, Ltd.	Catherine tp.	331 Bay St., Toronto	12	100
Pawnee Kirkland Gold Mines, Ltd.	Lebel township	504 Kent Bldg., Toronto	8	40
Sylvanite Gold Mines, Ltd.	Kirkland Lake	Kirkland Lake	58	310
Walsh-Katrine Gold Mines, Ltd.	Katrine township	Box 361, Cobalt	19	365
		Total	512	

Development.—During the year the new gold producers appearing in the Porcupine field, township of Deloro, were the Paymaster, Ankerite, and March, although the latter shipped only the recoveries from a trial run during the last month of the year. The Night Hawk Peninsular mine closed down May 31. The Kirkland Lake gold mine reappeared as a producer during October, after having been closed down since May 15, 1924. At the end of 1926 there were fifteen producing gold mines in Ontario, of which eight were in Porcupine and seven at Kirkland Lake and vicinity. Three small properties in other areas produced gold during the year.

The important occurrences at Porcupine include a change made at the Hollinger in regard to mining methods below the 2,000-foot horizon, where the back filling of stopes with sand was commenced. The company purchased seven sand claims for this purpose and erected an aerial tram to handle the sand. Towards the end of the year, three new rod mills were delivered, making a total of eight, each of 1,000 tons capacity, in addition to a ball mill now operating. It is expected these three mills will be in operation in 1927, bringing the grinding capacity to well over 8,000 tons per day. At the McIntyre, the new 4,150-foot shaft (the deepest working in Ontario) was completed in June, 1927, hoists have arrived, and electric equipment is being delivered. New discoveries of ore at depth were reported in ground not heretofore prospected. The connecting of the new shaft to the old workings by long drifts which will follow the general course of known ore deposits will add greatly to the ore reserves. The McIntyre management has announced a change from "shrinkage" stoping to the "cut and fill" method as standard practice on the new levels.

In the Kirkland Lake area, the tonnage of the Teck-Hughes was more than doubled by the addition in 1927 of a new unit to their 250-ton mill. The Kirkland Lake mill again commenced to produce, handling from 125 to 160 tons per day. The 450-ton mill of the Wright-Hargreaves is expected to be increased to 600 or 700 tons in 1927. The Lake Shore is now milling around 700 tons per day, at the same time carrying their shaft to 1,500 feet. The deepest workings in Kirkland Lake are below 2,000 feet where the ores have been found to be as high grade if not better than on the upper levels. For example, in sinking the main shaft at the Teck-Hughes ore of $29 grade was found across 16 feet at the sixteenth level. At the Sylvanite mine, which lies between the Wright-Hargreaves and the Tough-Oakes Burnside, a new 200-ton mill was erected and placed in operation in May, 1927. Considerable development work was also carried on throughout the year in the township of Lebel south of Gull lake, also at the Macassa at the west end of the productive zone.

As regards gold mining in northwestern Ontario, the Minto and Grace mines are being opened up in the Michipicoten area. Other gold properties under development include the Foley at Mine Centre; Huronian, west of Fort William in Moss township; and the Harkness-Hays at Schreiber.

Royal Mint, Ottawa.—This branch of the Royal Mint of London was opened January 2, 1908, for the refining of Canadian crude gold bullion and for coinage purposes. The receipts since its inception have consisted of gold from all over Canada as well as from foreign countries. The proportion in 1924 and 1925 from Ontario was small until a new agreement between the Federal Department of Finance and the Mint became operative in December, 1925. By this arrangement, initiated by the Ontario Mining Association, crude gold bullion from Ontario mines was received, coined and transferred to Canadian banks to the credit of the producer. The silver contents were sold

by the Mint at the best available price and the receipts credited to the owner. The desirability of this method of marketing bullion had been emphasized by the return of Canadian currency to par and further by the fact that American exchange was selling at a slight discount. Advantage has therefore been taken of Clause 5 (1) of the Royal Proclamation of 1907 establishing the Mint by which any person might bring bullion to the Mint and have it struck into gold coin. Under this scheme a saving of approximately $46,800 per year will be made on express rates, the calculated saving being based on an estimated output of $30,000,000. A saving in time will be effected as well as insurance costs compared with shipments to branches of the United States Mint where most of the crude bullion has gone in recent years.

The total receipts of crude gold bullion, from all sources in Canada, at the Royal Mint at Ottawa from its opening on January 2, 1908, to the end of 1926 was 7,704,478.34 crude ounces valued at $123,979,756.41. In addition, between the years 1915-1919, gold to the value of nearly 353 million dollars was received from the Bank of England.

RECEIPTS OF CRUDE GOLD BULLION FROM ONTARIO MINES AT THE ROYAL MINT, OTTAWA, 1922-1926

Year	Crude ounces	Precious Metals		
		Gold fine oz.	Silver fine oz.	Total Value $
1922	1,234,895	979,338	160,312	20,352,438
1923	640,535	509,757	80,151	10,588,584
1924	59,220	28,048	4,692	582,960
1925	139,130	105,888	19,130	2,201,974
1926	1,610,195	1,256,570	224,106	26,112,717

World Output—The following statement of output by the leading gold-producing countries for the last pre-war year, for 1915 (year of maximum world production) and for the post-war period, has been abstracted chiefly from annual reports of the Director of the United States mint:

OUTPUT BY LEADING GOLD-PRODUCING COUNTRIES AND STATES
(Millions of Dollars)

Source	1913	1915	1919	1920	1921	1922	1923	1924	1925	1926
World	459.9	468.7	365.8	337.0	330.2	319.4	367.8	389.2	393.3	398.6
Transvaal	182.0	188.0	172.2	168.0	167.7	145.1	189.1	197.9	198.4	205.8
United States	88.9	101.0	60.3	51.2	50.1	47.3	50.2	50.6	48.0	46.3
Canada	16.6	19.0	15.9	15.8	19.1	26.1	25.5	31.5	35.9	36.3
Ontario	**4.6**	**8.5**	**10.5**	**11.7**	**14.6**	**20.7**	**20.1**	**25.7**	**30.2**	**30.9**
Russia	.....	26.3	11.0	1.4	0.9	3.0	5.2	19.8	20.4	20.5
Mexico	19.3	6.6	15.2	15.3	14.2	15.5	16.2	16.5	16.3	16.0
*Oceania	51.8	49.0	26.1	22.6	20.7	18.8	18.1	16.5	14.0	13.5
California	20.4	21.4	17.4	14.8	15.7	14.7	13.4	13.2	13.1	11.9
Rhodesia	14.1	18.9	12.3	11.4	12.1	13.5	13.4	13.0	12.0	12.3
Australia	.....	.....	.....	.....	15.6	15.9	14.9	14.2	11.7	10.9
West Australia	27.1	25.0	15.2	12.8	13.7	11.1	10.4	10.0	9.1	9.0
India	11.2	11.5	10.5	10.3	9.7	9.0	7.9	8.2	8.1	7.9

Maximum World production.....468.7 million dollars in 1915.
Maximum U.S. production.....101.0 " " "
Maximum Transvaal production.....205.8 " " 1926.
*Includes Australia and New Zealand.

It will be noted from the table that Canada now holds third place among the gold-producing countries of the world, and for this position the Province of Ontario is chiefly responsible.

In the following table the value of the total gold output of the Province, exclusive of premium, is given, also that from Porcupine and Kirkland Lake, beginning in 1910 and 1913 respectively:—

TABLE V.—TOTAL GOLD PRODUCTION OF ONTARIO

Year	Total Production, Value	Porcupine		Kirkland Lake	
		Value	Per cent.	Value	Per cent.
	$	$		$	
1866–1891	(a)190,258	.....	.....	.....	.....
1892–1909	(b)2,509,492	.....	.....	.....	.....
1910	68,498	35,539	51.8	.....	.....
1911	42,637	15,437	36.2	.....	.....
1912	2,114,086	1,730,628	81.8	.....	.....
1913	4,558,518	4,294,113	94.1	65,260	1.2
1914	5,544,979	5,206,006	93.8	114,154	2.0
1915	8,501,391	7,462,111	88.6	551,069	6.5
1916	10,339,259	9,391,408	90.8	702,761	6.8
1917	8,698,735	8,229,744	94.5	404,346	4.6
1918	8,502,480	7,767,907	91.4	632,007	7.4
1919	10,451,709	9,941,803	95.1	486,809	4.7
1920	11,686,043	10,597,572	90.7	1,033,478	8.8
1921	14,692,357	13,103,526	89.3	1,524,851	10.4
1922	20,579,569	18,374,658	89.3	2,159,581	10.5
1923	20,136,287	17,313,115	85.9	2,719,939	13.5
1924	25,669,303	22,135,534	86.2	3,446,632	13.4
1925	30,206,432	24,733,120	81.8	5,385,256	17.8
1926	30,950,653	23,680,670	76.5	7,174,083	23.2
Total	215,442,786	184,012,891	85.4	26,400,226	12.3

(a) Estimated.
(b) Maximum yearly output was $424,568 in 1899.

In the year 1925 Ontario passed the Yukon Territory in total value of gold produced, the output of the latter being $181,242,977 for the years 1885 to 1925 inclusive, as compared with $184,492,033 from Ontario. To the end of 1926 Ontario's gross output exceeded that from British Columbia by $15,078,355, production from the latter province beginning in 1858. Maximum output from the Yukon was $22,275,000 in the year 1900, owing largely to production from Klondike placer deposits. Production from British Columbia has been more uniform, the maximum for a single year being $6,149,027 in 1913.

Tables on pages 12 and 13 show yearly production by individual gold mines at Porcupine and Kirkland Lake, respectively, while the statements on pages 14 and 15 show yearly and total dividends paid by individual mines.

Prospecting Activity.—Not since 1907 has there been such activity in Ontario in the staking of mining claims as was witnessed in 1926, when 13,496 claims were recorded. During the intervening years the maximum pre-war recording was 9,746 claims in 1909, and for the post-war period, 6,092 claims in 1923. The chief activity in 1926 centered in the Red, Woman and Narrow lakes areas in Patricia district. The Red Lake rush during the winter of 1925-1926 bore many of the earmarks of the Klondike trek in the late nineties. Interest subsided when the Dome Mines dropped its option on the Howey. However, strong

financial and mining interests took up the reorganized Howey Red Lake Gold Mines and plans for an agressive development campaign were made, and are being carried out during 1927. During the summer of 1926 some promising gold finds were made in the Woman and Narrow Lake area, about fifty miles to the east of Red lake, notably on the Manion-Jackson claims. In the late summer there was considerable staking for gold in the Lake Savant area, Thunder Bay district.

The finding of important high-grade copper deposits in the Rouyn field in Quebec some twenty-five miles east of the interprovincial boundary has stimulated the search for copper in Ontario. Heretofore, the small copper mine was forced to ship ore to distant smelters at prohibitive freight rates. Now the early prospect of a customs copper smelter at Noranda Mines has altered the situation. A few years ago copper ore was mined near Dane Station on the T. & N. O. Railway, and it is well known that the ore at the Argonaut gold mine, half-way to the Quebec boundary, carries considerable copper. Finds of rich copper-zinc ore were reported last autumn from Munro township, nine miles east of Matheson, and development is now under way at the Potter-Doal property in the north part of this township. Again, in the vicinity of Kamiskotia lake, some fifteen miles northwest of Porcupine, a promising copper prospect is under option to the Hollinger mine.

Lead-zinc finds northeast of Sault Ste. Marie; from Ben Nevis and Clifford townships to the north of the Argonaut mine, and elsewhere, are referred to on page 30 under that heading.

TABLE VI.—VALUE OF TOTAL PRODUCTION (GOLD AND SILVER) BY MINES OF THE PORCUPINE AREA (*a*)

Year	Hollinger	Dome	McIntyre	Porcupine Crown and Northcrown	Vipond	Schumacher (*b*)	West Dome Lake	Night Hawk Peninsular	Rea and Newray	Ankerite	Davidson	Preston and Clifton-Porcupine	Total Value (*c*)
1910...	$ 31,194	$ 4,355	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	$ 35,549
1911...	6,000	4,277	.....	.....	$ 5,160	.....	.....	.....	.....	.....	.....	.....	15,437
1912...	909,181	737,499	$ 77,657	.....	16,259	.....	.....	.....	.....	.....	.....	.....	1,740,596
1913...	2,488,022	1,242,625	236,299	$ 326,803	.....	.....	.....	.....	Rea. $18,858	.....	.....	Preston.	4,316,807
1914...	2,719,355	1,059,238	549,166	685,135	73,628	.....	.....	.....	Rea. 125,255	.....	.....	Preston. $15,212	5,231,989
1915...	4,206,015	1,530,287	750,812	Porcupine Crown. 602,436	246,053	$ 48,236	$102,880	.....	.....	.....	.....	.....	7,495,853
1916...	5,073,401	2,153,820	1,218,073	578,322	176,686	225,301	16,814	.....	.....	.....	.....	.....	9,442,417
1917...	4,261,938	1,480,174	1,710,204	377,904	209,738	198,605	44,434	.....	Newray. 1,447	.....	.....	.....	8,285,321
1918...	5,752,371	82,127	1,578,444	124,474	82,868	92,842	103,745	.....	Newray. 1,516	.....	$15,579	.....	7,833,966
1919...	6,722,266	1,290,301	1,978,014	.....	.....	.....	23,910	.....	.....	.....	27,089	.....	10,041,580
1920...	6,219,665	2,020,568	2,223,083	71,529	.....	.....	47,169	.....	.....	.....	11,246	.....	10,690,561
1921...	9,051,276	2,290,264	1,827,761	Northcrown. 97,301 7,943	.....	.....	.....	.....	.....	.....	.....	.....	13,177,244
1922...	12,274,114	4,178,936	2,021,811	.....	.....	.....	.....	.....	.....	.....	.....	Clifton. 1,664	18,479,325
1923...	10,446,412	4,374,144	2,550,129	.....	23,876	.....	.....	.....	.....	.....	.....	Clifton. 8,331	17,405,648
1924...	13,433,063	4,307,624	3,604,874	.....	596,803	.....	60,642	$258,618	.....	.....	.....	Clifton. 5,270	22,266,894
1925...	15,749,109	4,365,923	3,721,499	.....	565,379	.....	287,758	196,947	.....	.....	.....	.....	24,886,615
1926...	14,829,655	3,940,053	3,862,074	.....	631,636	.....	220,758	111,154	.....	$140,588	.....	.....	23,810,700
Total..	114,173,037	35,062,215	27,909,900	2,871,847	2,628,086	564,984	908,110	566,719	147,076	140,588	53,914	30,477	185,156,502

(*a*) In addition to the mines noted above, the following had a production: Porphyry Hill, $4,200 in 1913 and $2,036 in 1915; Porcupine Pet, $5,000 in 1914 and $5,551 in 1915; Gold Reef, $1,547 in 1915 and $588 in 1917; Tommy Burns. $289 in 1917; Paymaster, $2,800 in 1922 and $63,551 in 1926; Ankerite, $140,588 and March $11,055 in 1926; miscellaneous, $2,756 in 1923; P. De Santis, $146 in 1926, and Hughes Gold Mines, Ltd., $30 in 1926. All of these are included in the "Total Value" column. (*b*) Purchased by the Hollinger in 1922.

(*c*) A record of total exchange premiums received in addition to the above amounts shows the following: 1920, $1,265,664; 1921, $1,238,211; 1922, $189,022; 1923, $207,742; 1924, $172,721; 1925, $2,607 discount; 1926, nil; or a net total of $3,070,753 for the 6 years of which we have record.

TABLE VII.—VALUE OF TOTAL PRODUCTION (GOLD AND SILVER) BY MINES OF THE KIRKLAND LAKE AREA

Year	Lake Shore	Wright-Hargreaves	Teck-Hughes	Tough-Oakes Burnside	Kirkland Lake	Argonaut (a)	Barry-Hollinger	Ontario-Kirkland	Total Value (b)
	$	$	$	$	$	$	$	$	$
1913	.....	1,127	.....	66,632	.....	.....	.....	.....	67,759
1914	.....	.....	.....	117,644	.....	5,204	.....	.....	122,848
1915	.....	.....	.....	555,539	.....	.....	.....	.....	555,539
1916	.....	.....	.....	711,625	.....	.....	.....	.....	711,625
1917	.....	.....	66,722	342,831	.....	.....	.....	.....	409,553
1918	416,414	.....	80,570	139,683	.....	.....	(c) 10,114	.....	646,781
1919	263,354	.....	169,590	.....	56,263	2,631	.....	.....	491,838
1920	503,735	.....	247,757	.....	286,901	26,863	.....	.....	1,065,256
1921	495,276	468,751	322,919	.....	242,417	513	.....	.....	1,529,875
1922	471,341	762,753	596,495	107,481	224,396	.....	.....	10,082	2,172,548
1923	547,600	754,979	1,117,963	12,174	223,102	72,512	.....	.....	2,728,331
1924	1,098,572	1,088,725	1,023,025	47,547	46,512	152,072	.....	.....	3,456,453
1925	1,958,720	1,913,401	996,943	263,064	.....	214,183	56,978	.....	5,403,289
1926	2,775,000	2,150,844	1,601,208	309,709	126,999	112,189	86,263	.....	7,193,411
Total	8,530,012	7,140,580	6,223,192	2,673,929	1,206,590	586,167	153,355	10,082	26,555,106

(a) Exclusive of copper values.
(b) Exchange premiums received in addition to the above valuations were as follows: 1920, $110,424; 1921, $121,425; 1922, $19,590; 1923, $37,812; 1924, $24,028; 1925, $231 discount and 1926, $595 discount; a net total of $312,453 for the 7 years of which we have record.
(c) Patricia mine, afterwards called Barry-Hollinger.

TABLE VIII.—DIVIDENDS AND BONUSES PAID BY GOLD MINING COMPANIES TO DECEMBER 31, 1926

Name of Company	Date of Incorporation	Authorized Capital	Capital Stock Issued	Par value per share	Dividends and Bonuses paid to end of 1925, Amount	Dividends and Bonuses paid during 1926, Amount	Rate per cent, 1926 or per share	Total of Dividends and Bonuses paid to Dec. 31, 1926	Date when last Dividend or Bonus was paid
		$	$	$ c.	$ c.	$ c.		$ c.	
*Dome Mines Company, Ltd.	Mar. 27, 1911	4,500,000	4,290,003	No par	8,354,171 25	1,906,668 00	$2.00	10,260,839 25	Oct. 20, 1926
†Hollinger Cons. Gold Mines, Ltd.	May 25, 1916	25,000,000	24,600,000	5 00	30,530,800 00	5,805,600 00	23.6	36,336,400 00	Dec. 31, 1926
Lake Shore Gold Mines, Ltd.	Feb. 25, 1914	2,000,000	2,000,000	1 00	1,620,000 00	1,000,000 00	50.0	2,620,000 00	Dec. 15, 1926
McIntyre-Porcupine Mines, Ltd.	Mar. 16, 1911	4,000,000	3,990,000	5 00	5,207,408 00	798,000 00	20.0	6,005,408 00	Dec. 1, 1926
Porcupine Crown Mines, Ltd.	May 26, 1913	2,000,000	2,000,000	1 00	840,000 00	.....	.....	840,000 00	July 15, 1917
Rea Consolidated Gold Mines, Ltd.	April 5, 1911	1,000,000	200,000	5 00	12,000 00	.....	.....	12,000 00	1915
‡Schumacher Gold Mines, Ltd.	Jan. 6, 1914	2,000,000	1,850,000	1 00	.....	.....	.....	.....	.....
Teck-Hughes Gold Mines, Ltd., The.	1923	5,000,000	4,747,144	1 00	.....	474,714 40	10.0	474,714 40	Aug. 1, 1926
Tough-Oakes Gold Mines, Ltd.	July 15, 1913	3,000,000	2,657,500	5 00	398,625 00	.....	.....	398,625 00	Dec. 27, 1916
Wright-Hargreaves Mines, Ltd.	June 16, 1916	2,750,000	2,750,000	1 00	1,375,000 00	893,750 00	32.5	2,268,750 00	Oct. 1, 1926
Total	.....	.....	.....	.....	48,338,004 25	10,878,732 40	.....	59,216,736 65	.....

*On April 22, 1922, the capital was reduced from $5,000,000 to $4,500,000 and $476,667 distributed to shareholders in addition to dividends above noted.

†Hollinger Consolidated Gold Mines, Limited, is a consolidation of the Acme Gold Mines, Ltd.; Millerton Gold Mines, Ltd.; and Hollinger Gold Mines, Ltd. Dividends include $160,000 paid in 1915 by Acme, also $4,170,000 paid by Hollinger to May 25, 1916, the date of the consolidation.

‡The Schumacher mine was sold to the Hollinger in 1922 and a total of $1,591,000 or 86 per cent. of the assets distributed to shareholders, the final payment being made July 30, 1923.

TABLE IX.—YEARLY DIVIDENDS AND BONUSES PAID BY GOLD MINES, 1912–1926

Year	Porcupine					Kirkland Lake				Total
	*Hollinger Consolidated	Porcupine Crown	Dome Mines	Rea Consolidated	McIntyre	Tough-Oakes	Lake Shore	Wright-Hargreaves	Teck-Hughes	
	$	$	$	$	$	$	$	$	$	$
1912	270,000									270,000 00
1913	1,170,000									1,170,000 00
1914	1,170,000	240,000								1,410,000 00
1915	1,720,000	240,000	400,000	12,000		132,875				2,344,875 00
1916	3,126,000	240,000	800,000			265,750				4,591,750 00
1917	738,000	120,000	300,000		541,542 45					1,699,542 45
1918	1,230,000				543,042 45		100,000			1,873,042 45
1919	1,722,000				364,028 30		100,000			2,186,028 30
1920	2,214,000		416,886		546,042 45		80,000			3,256,928 45
1921	3,198,000		478,947 75		546,042 45		120,000			4,342,990 20
1922	3,198,000		715,000 50		546,042 45		80,000	412,500		4,951,542 95
1923	3,198,000		1,430,001 00		548,542 45		160,000	206,250		5,542.793 45
1924	3,198,000		1,906,668 00		774,125 00		380,000	206,250		6,465,043 00
1925	4,378,800		1,906,668 00		798,000 00		600,000	550,000		8,233,468 00
1926	5,805,600		1,906,668 00		798,000 00		1,000,000	893,750	474,714 40	10,878,732 40
Total	36,336,400	840,000	10,260,839 25	12,000	6,005,408 00	398,625	2,620,000	2,268,750	474,714 40	59,216,736 65

*Includes $160,000 paid by the Acme in 1915 before amalgamation with the Hollinger.

Silver-Cobalt

While the decline in the price of silver from an average for the year of 69.065 cents per ounce in 1925 to 62.107 cents in 1926 undoubtedly affected silver mining operations in Ontario's silver camps, the output achieved during the year was noteworthy in that the decrease, which was expected, amounted to only 6.18 per cent. in quantity. Due to the lowered price, however, the values showed a greater decline.

The Canadian Mining Journal of October 15, 1926, had the following to say regarding the silver situation:—

> The decline in quotations for silver have necessitated a change in operating plans at a number of the silver mines in Northern Ontario. It has become necessary to regulate the grade of ore as a means of increasing the number of ounces available per ton. This is not imposing any unreasonable hardship upon the higher grade mines such as Castle-Trethewey, Keeley, Miller Lake O'Brien, and Tonopah Canadian, but it is conveying a serious threat to older producers such as McKinley-Darragh and La Rose. Also, it is causing serious alarm at such mines as Trout Lake, Lorrain, Mining Corporation, O'Brien and even Nipissing. Officials at local mines are advancing various theories for the somewhat rapid decline in quotations for the metal. For the greater part, the theories are based upon the general comment which comes to hand through class journals and the daily press. The views embrace causes and effect which take in all the possible sources including lack of distribution facilities to the interior of China during the present troublous times, and the domestic troubles which are now rampant in Mexico. They also take into account the full seriousness of the recommendations recently advanced in favour of paper currency based on a gold standard in India. So many factors being advanced simultaneously are believed to suggest the possibility that pessimism may also be a serious factor and that when the situation can be viewed in sober realities, the truth may disclose a less alarming condition than is now generally believed to exist.

A total of twenty-six properties made shipments during the year; eighteen from Cobalt, including small lots shipped by companies making clean-ups and the outputs by several lessees; five in South Lorrain; and three in Gowganda. At Cobalt, the Nipissing, Mining Corporation, O'Brien and McKinley-Darragh-Savage were the most important producers. The Cobalt-Contact Company, operating Green-Meehan, Red Rock and Ruby mines, commenced operating a new 80-ton mill on July 1.

The output and shipments of silver are shown below. It should be pointed out that the figures given are based as nearly as possible on actual sales of bullion and silver contained in concentrates and residues exported, with the gross values as reported by the producers before deducting treatment and shipping charges.

SILVER PRODUCTION, 1925-1926

Source	1925		1926	
	Fine Ounces	Value	Fine Ounces	Value
		$		$
Sales of bullion by the reduction companies, smelters and mines	8,365,093	5,833,856	7,984,980	4,945,167
Contained in concentrates and residues exported	1,249,788	866,273	996,577	595,842
Contained in crude gold bullion	251,829	171,550	249,330	149,717
Recovered by nickel-copper refineries	134,390	92,682	151,429	90,980
Total	10,001,100	6,964,325	9,382,316	5,781,706

TABLE X.—TOTAL SHIPMENTS FROM SILVER MINES, SMELTERS AND REFINERIES, 1904 TO 1926

Year	Bismuth		Copper(a)		Lead(a)		Nickel(b)		Cobalt(c)		Arsenic		Silver		Total Value
	Tons	Value	Tons	Value	Tons	Value	Tons	Value	Tons	Value	Tons	Value	Ounces	Value	
		$		$		$		$		$		$		$	$
1904							14	3,467	16	19,960	72	903	206,875	111,887	136,217
1905							75	10,000	118	100,000	549	2,693	2,451,356	1,360,503	1,473,196
1906							160		321	80,704	1,440	15,858	5,401,766	3,667,551	3,764,113
1907							370	1,174	739	104,426	2,958	40,104	10,023,311	6,155,391	6,301,095
1908							612		1,224	111,118	3,672	40,373	19,437,875	9,133,378	9,284,869
1909							766		1,533	94,965	4,294	61,039	25,897,825	12,461,576	12,617,580
1910							504		1,098	54,699	4,897	70,709	30,645,181	15,478,047	15,603,455
1911							392		852	170,890	3,806	74,609	31,507,791	15,953,847	16,199,346
1912							429	14,220	934	314,381	4,166	80,546	30,243,859	17,408,935	17,818,082
1913							377	13,326	821	420,386	3,663	64,146	29,681,975	16,553,981	17,051,839
1914(d)							90	28,978	351	590,406	2,030	116,624	25,162,841	12,765,461	13,501,469
1915							35	28,353	206	383,261	2,490	148,379	24,746,534	12,135,816	12,695,809
1916							79	59,380	400	805,014	2,160	200,103	19,915,090	12,643,175	13,707,672
1917			53	28,840			155	125,071	337	1,138,190	2,592	608,483	19,401,893	16,121,013	18,021,597
1918			72	35,712	3	453	186	156,893	380	1,640,310	2,545	566,332	17,661,694	17,341,790	19,741,490
1919			110	40,976	12	1,296	276	188,418	298	1,019,479	2,834	485,360	11,214,317	12,738,994	14,474,523
1920			50	17,494	5	792	127	93,233	283	1,605,365	1,883	431,527	10,846,321	10,654,471	12,802,882
1921			103	34,504	3	270	10	7,665	126	616,235	1,491	233,763	8,261,931	5,564,594	6,457,031
1922			93	26,346	16	1,891	61	34,987	(f)776	1,333,676	2,059	299,940	10,711,127	7,658,802	9,355,642
1923(e)	9	48,139	56	16,214	26	3,738	42	19,321	380	1,803,872	2,579	582,794	10,377,846	6,677,367	9,151,445
1924	6	16,079	55	14,290	45	7,295	130	26,862	476	1,662,526	1,915	323,186	10,361,945	7,009,984	9,060,222
1925	10	18,578	77	17,007	31	1,888	290	116,347	558	2,328,517	1,078	113,325	9,614,881	6,700,129	9,295,791
1926	3	6,440	35	5,394	11	1,463	83	30,051	332	1,136,014	2,025	135,549	8,981,557	5,541,009	6,855,920
Total	28	89,236	704	236,777	152	19,086	5,263	957,746	12,559	17,534,394	57,198	4,696,345	372,755,791	231,837,701	255,371,285

(a) Copper and lead are recovered from certain silver ores and concentrates shipped to United States refineries.
(b) Nickel metal and metallic contents of all nickel compounds.
(c) Cobalt metal and metallic contents of all cobalt compounds.
(d) Prior to 1914 an estimate based on assays was made of the nickel, cobalt and arsenic contained in the ores; subsequently actual recoveries have been reported.
(e) Recoveries of bismuth from base bullion were not reported prior to 1923.
(f) Includes 460 tons of speiss residues worth $153,116.

A total of 6,262,249 ounces were produced from the Cobalt Mines. South Lorrain produced 3,044,584 ounces and Gowganda 1,236,640 ounces. These figures show the metal contents of ore and concentrates shipped, but must not be confused with the actual bullion recovered in the reduction operations during the period, on the basis of bullion actually marketed and as contained in concentrates exported, along with the silver recovered from gold mines and nickel-copper matte.

Figures shown in the table on page 16 are different from those published in these reports prior to the year 1924, inasmuch as they more nearly represent the silver actually going as such into the commerce of the country. In 1923 and formerly, statistics of silver production were based on the silver content of all ores or concentrates as shipped by the mines and reported by them, and while such figures bear no exact relation to the silver actually marketed in bullion form they are of considerable historical value as statistical records of individual mines and of mining areas. The change made in the system of compilation merely moves the position or point where the count is made, *i.e.*, from the mine or concentrating plant forward to the point where merchantable bar silver is marketed, except in the case of exports of ore, concentrates or residues where no change in practice was necessary.

Since the discovery of silver at Cobalt in 1903 the silver contents of shipments from the camp and outlying silver areas, as reported by the operators, have been as follows:

TABLE XI.—SILVER SHIPMENTS BY CAMPS, 1904-1926

Year	Average price, cents per ounce (New York)	Silver Content in Troy Ounces, 1904-1926					
		Total Ounces	Cobalt	Casey Township	South Lorrain	Gowganda	Montreal River and Maple Mountain
1904	57.221	206,875	206,875	.....	.....	.....	.....
1905	60.352	2,451,356	2,451,356	.....	.....	.....	.....
1906	66.791	5,401,766	5,401,766	.....	.....	.....	.....
1907	65.237	10,023,311	10,023,311	.....	.....	.....	.....
1908	52.864	19,437,875	19,424,251	500	13,124	.....	.....
1909	51.502	25,897,825	25,658,683	26,185	194,955	.....	18,002
1910	53.486	30,645,181	29,849,981	92,544	221,133	471,688	9,835
1911	53.340	31,507,791	29,989,893	114,789	933,912	468,687	510
1912	60.835	30,243,859	28,605,940	253,824	834,119	549,976	.....
1913	57.791	29,681,975	28,105,505	825,108	248,992	502,370	.....
1914	54.811	25,162,841	24,155,699	499,643	108,199	399,300	.....
1915	49.684	24,746,534	24,280,366	223,939	.....	242,229	.....
1916	65.661	19,915,090	19,008,517	445,900	77,280	383,393	.....
1917	81.417	19,401,893	18,327,258	.....	10,000	1,064,635	.....
1918	96.772	17,661,694	16,807,407	143,901	72,188	638,198	.....
1919	111.122	11,214,317	10,314,689	171,278	4,586	723,764	.....
1920	100.900	10,846,321	10,402,249	.....	8,253	433,352	(*a*)2,467
1921	62.654	8,261,931	7,673,535	1,101	328,886	258,292	117
1922	67.528	10,711,127	9,239,147	1,028	1,284,307	170,651	(*b*)15,994
1923	64.873	10,377,846	7,259,858	.....	2,955,646	160,761	1,581
1924	66.781	9,935,902	6,704,787	.....	2,633,058	598,057	.....
1925	69.065	10,707,235	6,252,115	.....	3,099,964	1,355,156	.....
1926	62.107	10,543,473	6,262,249	.....	3,044,584	1,236,640	.....
Total	.....	374,984,018	346,405,437	2,799,740	16,073,186	9,657,149	48,506

(*a*) Includes 885 ounces from Silver Islet, Lake Superior.
(*b*) Silver Islet, Lake Superior.

In addition to the foregoing which deals with producing mines only, there was considerable work carried on by organized companies, some of which may join the list of producers in the near future. Not including the usual assessment work carried on by individuals, partnerships and syndicates, there was a total of $42,581 expended in wages on development work and employment given to 50 persons. The names of the companies reporting were:—

OPERATING BUT NON-PRODUCING SILVER MINES, 1926

Company	Name of Mine	Location
Capitol Silver Mines, Ltd	Capitol	Gowganda
Casey Mountain Operating Syndicate, Ltd	Casey Mountain	Casey tp.
Crescent Silver Cobalt Mining Co., Ltd	Crescent	Cobalt
Cobalt Argyros Mines, Ltd	Argyros	Cobalt
Genesee Mining Co., Ltd	Genesee	Cobalt
Hector Silver Mines, Ltd	Hector	Gillies Limit
Kerr Lake Mines, Ltd	Kerr Lake	Cobalt
Kirk-Budd Mining Co., Ltd	Kirk-Budd	Gillies Limit
Oxford-Cobalt Silver Mines, Ltd	Oxford-Cobalt	Gillies Limit

Refineries.—The production of refined silver is carried on by two companies in Cobalt which operate reduction plants in conjunction with the mines and mills. The processes of extraction are hydro-metallurgical or wet methods, such as the cyanide process applied to silver-bearing ores. The Nipissing Mines, Limited, and the Cobalt Reduction Company (Mining Corporation), both operate such plants and in addition to high-grade silver bullion, they market flotation concentrates and residues. The refinery of the latter company was not operated in 1926. The major portion of the ore and concentrates shipped out of the Cobalt camp for treatment goes to the Deloro Smelting and Refining Company at Deloro.

TABLE XII.—OPERATIONS OF ONTARIO SILVER-COBALT REFINERIES IN 1926

Schedule	Sales	
	Quantity	Value
Silver bullion.....fine oz.	4,890,586	3,008,500
Arsenic, white..... lb.	3,707,038	116,653
Cobalt products, including metals and metallic content of all oxides, mixed oxides and salts..... "	437,666	996,502
Nickel oxide, and salts..... "	217,816	20,513
Base bullion (*a*)..... "	469,607	130,131
Speiss residues (*b*)..... "		
Total.....		4,272,299

(*a*) Contains silver, lead, bismuth and antimony.
(*b*) Speiss residues contain silver, cobalt, nickel and arsenic.

TABLE XIII.—DIVIDENDS AND BONUSES PAID BY SILVER MINING COMPANIES TO DECEMBER 31, 1926

Name of Company	Date of Incorporation	Authorized Capital	Capital Stock Issued	Par value per share	Dividends and Bonuses paid to end of 1925	Dividends and Bonuses paid during 1926	Total Dividends and Bonuses paid to 31st Dec., 1926	Date when last Dividend was paid
		$	$	$ c.	$ c.	$ c.	$ c.	
Aladdin Cobalt Company, Limited	Aug. 23, 1912	500,000	500,000	5 00	75,000 00	.....	75,000 00	April 30, 1917
Beaver Consolidated Mines, Ltd.	Mar. 1, 1907	2,000,000	2,000,000	1 00	710,000 00	.....	710,000 00	May 31, 1920
Buffalo Mines, Ltd., The (*a*)	April 27, 1906	500,000	500,000	50	2,787,000 00	.....	2,787,000 00	May 28, 1914
Casey Cobalt Silver Mining Co., Ltd.	Dec. 19, 1906	100,000	100,000	1 00	203,249 33	.....	203,249 33	April 22, 1914
Castle-Trethewey Mines, Ltd. (*b*)	Jan. 20, 1922	2,000,000	2,000,000	1 00	18,027 13	.....	18,027 13	April 15, 1925
Cobalt Central Mines Co., Ltd.	Dec. 13, 1905	5,000,000	5,000,000	1 00	192,845 00	.....	192,845 00	Aug. 25, 1909
Cobalt Comet Mines, Ltd. (*c*)	April 16, 1913	1,000,000	1,000,000	1 00	230,000 00	.....	230,000 00	April 1, 1915
Cobalt Silver Queen, Ltd.	April 1, 1906	1,500,000	1,500,000	1 00	315,000 00	.....	315,000 00	Dec. 31, 1908
Coniagas Mines, Limited, The	Nov. 24, 1906	4,000,000	4,000,000	5 00	11,440,000 00	.....	11,440,000 00	May 1, 1924
Crown Reserve Mining Co., Ltd.	Jan. 16, 1907	2,000,000	1,999,957	1 00	6,190,849 00	.....	6,190,849 00	Dec. 28, 1916
Foster Cobalt Mining Co., Ltd.	Feb. 14, 1906	1,000,000	915,588	1 00	45,000 00	.....	45,000 00	Jan. 1, 1907
Hudson Bay Mines, Ltd.	July 16, 1909	3,500,000	3,200,050	5 00	778,909 42	.....	778,909 42	Aug. 31, 1913
Keeley Silver Mines, Ltd.	June 22, 1922	2,000,000	2,000,000	1 00	1,280,000 00	480,000 00	1,760,000 00	Sept. 15, 1926
Kerr Lake Mining Company, Ltd. (*d*)	Aug. 9, 1905	40,000	40,000	100 00	10,299,000 00	150,000 00	10,449,000 00	Oct. 15, 1926
La Rose Mines, Ltd.	May 31, 1908	1,500,000	1,500,000	1 00	6,600,546 84	.....	6,600,546 84	Mar. 24, 1923
Lorrain Trout Lake Mines, Ltd.	Mar. 20, 1923	1,500,000	1,500,000	1 00	150,000 00	.....	150,000 00	July 15, 1925
McKinley-Darragh-Savage Mines of Cobalt, Ltd.	April 27, 1906	2,500,000	2,247,692	1 00	5,955,391 86	.....	5,955,391 86	July 31, 1925
Mining Corporation of Canada, Ltd.	Nov. 23, 1916	8,300,250	8,300,250	5 00	5,706,381 22	415,012 50	6,121,393 72	July 15, 1926
City of Cobalt Mining Co., Ltd. (*e*)	Jan. 7, 1909	1,500,000	1,500,000	1 00	145,000 00	.....	145,000 00	April 15, 1920

TABLE XIII.—*Continued*

Name of Company	Date of Incorporation	Authorized Capital	Capital Stock Issued	Par value per share	Dividends and Bonuses paid to end of 1925	Dividends and Bonuses paid during 1926	Total Dividends and Bonuses paid to 31st Dec., 1926	Date when last Dividend or Bonus was paid
		$	$	$ c.	$ c.	$ c.	$ c.	
Cobalt Lake Mining Co., Ltd. (*e*)	Dec. 22, 1906	3,000,000	3,000,000	1 00	465,000 00	.....	465,000 00	May 29, 1914
Cobalt Townsite Mining Co., Ltd. (*e*)	May 8, 1906	100,000	45,011	1 00	1,042,259 61	.....	1,042,259 61	Nov. 11, 1914
Nipissing Mining Co., Ltd. (*f*)	Dec. 16, 1904	250,000	250,000	100 00	28,578,297 25	750,000 00	29,328,297 25	Oct. 20, 1926
Penn-Canadian Mines, Ltd. (*g*)	April 24, 1912	1,500,000	1,349,705	1 00	175,461 65	.....	175,461 65	Sept. 10, 1917
Peterson Lake Silver-Cobalt Mining Co., Ltd.	April 11, 1906	3,000,000	2,469,802	1 00	462,350 35	.....	462,350 35	Jan. 2, 1917
Right of Way Mining Co., Ltd.	July 13, 1906	500,000	499,518	1 00	324,643 93	.....	324,643 93	Oct. 1, 1909
Right of Way Mines, Ltd.	Sept. 11, 1909	2,000,000	1,685,500	1 00	252,825 00	.....	252,825 00	Mar. 17, 1917
Seneca-Superior Silver Mines, Ltd.	Sept. 29, 1911	500,000	478,884	1 00	1,579,817 20	.....	1,579,817 20	Dec. 15, 1916
Temiskaming Mining Co., Ltd.	Nov. 5, 1906	2,500,000	2,500,000	1 00	2,159,156 25	.....	2,159,156 25	Jan. 31, 1920
Temiskaming and Hudson Bay Mining Co., Ltd.	July 10, 1903	25,000	7,761	1 00	1,940,250 00	.....	1,940,250 00	Nov. 10, 1914
Trethewey Silver Cobalt Mines, Ltd.	May 30, 1906 June 1, 1911	2,000,000	1,000,000	1 00	1,211,998 50	.....	1,211,998 50	Jan. 2, 1919
Wettlaufer Lorrain Silver Mines, Ltd.	Nov. 30, 1908	1,500,000	1,416,590	1 00	637,465 50	.....	637,465 50	Sept. 22, 1913
Total	.....	.....	.....	.....	91,951,725 04	1,795,012 50	93,746,737 54	.....

(*a*) In 1917 the capital stock of the company was reduced from $1,000,000 to $750,000, in 1918 from $750,000 to $500,000, and on December 21, 1919, from $500,000 to $150,000, by returning to shareholders amounts equal to the reduction in capital, leaving 300,000 shares issued of 50 cents each. The mine was sold to the Mining Corporation of Canada, and operated by it in 1920 and subsequently.
(*b*) 200,000 preferred shares par $1.00, redeemed April, 1925, and capital reduced from $2,200,000 to $2,000,000.
(*c*) Cash assets amounting to $50,000 paid on April 27, 1917.
(*d*) In addition a return of capital amounting to $600,000 was made on July 3, 1919, to stockholders of the Kerr Lake Mines, Ltd.
(*e*) Mining Corporation of Canada, Limited, owns and operates the City of Cobalt, Cobalt Lake and Cobalt Townsite mines.
(*f*) Includes $16,288,297.25 paid in dividends by the Nipissing Mines Co. (the holding company) to the end of 1916.
(*g*) Paid out of capital $40,491.15 on September 10, 1917, and an equal amount on April 24, 1918.

Mines shipping over 100,000 ounces in 1926 are given in order:—

Mine	Ounces
Nipissing	1,966,299
Keeley	1,705,530
Mining Corporation of Canada	1,105,459
Frontier Lorrain (Lorrain Operating Co.)	1,104,597
Castle-Trethewey	979,890
O'Brien	867,987
McKinley-Darragh-Savage	340,203
Lorrain Trout Lake	143,399

In Table XI statistics are shown based on the metal contents of shipments of ore and concentrates and should not be confused with the figures in the main table on page 2 and Table X immediately preceding. Silver shown as shipped in the following table is compiled for each mining area and is mainly the silver contents of ore or concentrates shipped to the reduction works at Cobalt or the silver smelters. Of necessity there is a lag and it does not follow that all the ores, etc., shipped have received treatment during the year by smelters, although in the aggregate these figures will agree closely with those for silver bullion sold, as given in the table on page 2 and also in Table X.

In addition to the silver content of ores, concentrates, residues, etc., producing mines are paid for the cobalt content, provided the percentage is sufficiently high. Mine shippers in 1926 were paid $214,326 for 913,877 pounds of cobalt, and $5,394 for 69,502 pounds of copper.

From weekly statements, issued by the General Freight and Passenger Agent of the Temiskaming and Northern Ontario Railway, showing railway shipments of ore, concentrates, etc., from the Cobalt area the following information has been compiled: Total shipments, 12,446 tons, of which 4,795 were consigned to Deloro, 2,666 to United States smelters and refineries, and 978 tons to Europe.

The producers of silver are given in the following list:—

SILVER PRODUCERS IN 1926

Operator	Mine or Source	Location
Brewer, Sullivan & Laurentian Mines.	Adanac lease	Cobalt
Castle-Trethewey Mines, Ltd	Castle-Trethewey	Gowganda
Cobalt Contact Mines, Ltd	Cobalt Contact	Cobalt
Coniagas Mines, Ltd., The	Coniagas	Cobalt
Crown Reserve Mining Co., Ltd.	Crown Reserve	Giroux Lake
Canadian Lorrain Silver Mines, Ltd.	Canadian Lorrain	South Lorrain
Dominion Reduction Co., Ltd	Mill clean-up	Cobalt
Doherty Easson Mining Syndicate, Ltd.	Penn-Canadian	Cobalt
Frontier (Lorrain) Mines, Ltd.	Lorrain Operating & Frontier Lorrain	Silver Centre
Genesee Mining Company, Ltd.	Genesee	Cobalt
Hudson Bay Mines, Ltd., The	Hudson Bay	Cobalt
Masters, S. C.	Silver Queen	Cobalt
Keeley Silver Mines, Ltd., The	Keeley	South Lorrain
Kerr Lake Mining Company, Ltd.	Kerr Lake	Cobalt
La Rose Mines, Ltd.	La Rose	Cobalt
Lorrain Consolidated Mines, Ltd.	Lorrain Consolidated	Silver Centre
Lorrain Trout Lake Mines, Ltd.	Lorrain Trout Lake	Silver Centre
Lynch, C. D.	Peterson Lake	Cobalt
McKinley-Darragh-Savage Mines, Ltd.	McKinley-Darragh	Cobalt
McLeod, J. H.	Foster Cobalt	Cobalt
Menago Mining Company, Ltd.	Colonial	Cobalt
Mining Corporation of Canada, Ltd.	Townsite City, Buffalo, Cobalt Lake	Cobalt
Northern Extension Mines, Ltd.	Aguanico	Cobalt
Nipissing Extension Mines Co., Ltd.	Nipissing Extension	Cobalt
Nipissing Mining Company, Ltd.	Nipissing	Cobalt
O'Brien, Ltd., M. J.	O'Brien	Cobalt
O'Brien, Ltd., M. J.	Miller Lake O'Brien	Gowganda
Reinhardt, Carl	Crown Reserve	Giroux Lake
Tonopah Canadian Mines Company	Walsh & Morrison	Gowganda

Nickel, Copper and Platinum Metals

The tonnage of ore raised by the nickel mines, and treated in the smelters during 1926, showed an increase of around 50,000 tons over the figures for 1925. During the period two companies were active, the International Nickel Company of Canada, operating smelters at Copper Cliff near Sudbury and a refinery at Port Colborne, and the Mond Nickel Company which smelts its ore at Coniston, near Sudbury, and exports the matte to Wales for refining. A portion of the matte made by the former company is exported to Huntington, West Virginia, for the manufacture of Monel metal and the fabrication of nickel articles.

Production of ore during the year from the several mines was as follows:—

	Tons
International Nickel Company—	
Creighton Mine, Frood Mine	691,660
Mond Nickel Company—	
Garson, Frood Extension, Worthington, Levack	630,390
	1,322,050

The actual production of nickel and copper was less than in 1925 for reasons that are well set out in the Annual Report of the International Nickel Company. Net earnings of the Company were $5,556,267 for the year, or an increase of $28,783 over 1925. The following abstracts are from the discussion of the situation by Robt. C. Stanley, president of the Company:—

Sales of metallic nickel were less than during 1925, due principally to a falling off in exports to Europe. There was also a decline in domestic sales of nickel in final quarter of 1926, compared with last quarter of 1925. This apparent loss of business was due to heavy purchases of nickel by consumers for stock in fall of 1925, presumably anticipating price increase of January 1, 1926. Buying of this character was not in evidence in the fall of 1926, as there was no price advance on contract renewals for 1927 deliveries.

During recent years, particularly in 1926, large quantities of nickel-steel armour and deck-plate scrap, resulting from the disarmament programme, were consumed by alloy steel makers. Substitution of this scrap for metallic nickel made inroads into sales of nickel for alloy steel making. There is every evidence that the bulk of this domestic scrap has been used, and that normal consumption of metallic nickel by steel companies may be expected in the near future.

Sales of mill products, both monel metal and rolled nickel, increased substantially in volume, and more than offset the loss of foreign and domestic nickel sales.

Mining, smelting, refining, and development at the Frood mine were referred to as follows:—

Mining and smelting operations at Copper Cliff were continuous throughout the year. Bessemer matte was produced at lower cost than during any previous year. An electrolytic department at Port Colborne, projected in 1925, was completed and is now economically producing a large tonnage of high purity nickel. Changes in furnace and converter practice have enabled your operatives to further reduce costs. The refinery was run continuously throughout the year at a rate regulated to meet consumption and to avoid an undue accumulation of metal stocks.

Your management has been actively engaged in initial stages of development of Frood mine, where diamond drilling has developed further large reserves of high-grade ore. To complete this shaft, erect the permanent surface plant and develop the ore body sufficiently for mining operations, will require several years and involve a substantial capital expenditure. It is the intention to bring this mine into production during the ensuing five years. By following this policy, the Creighton mine ore reserves will be available for an increasing output of monel metal for many years and the Frood ore, which carries much higher precious metal values than Creighton ore, will be refined for nickel. With its present refining process your company will recover the platinum metals from the Frood ore and in consequence will derive additional profit from this operation.

In Table XV, following, the course of the nickel industry during the past five years is presented. That this metal takes on added importance during times of war is indicated by the fact that while in 1913 the quantity of ore smelted was 823,403 tons, it rose in 1918 to 1,559,892 tons, fell, as noted in the table, to 314,120 tons in 1922, and through new markets found for nickel it rose again in 1923 to 1,140,160 tons. Nickel and copper contained in matte exported in 1926 were valued at 18 and 10 cents per pound respectively:—

TABLE XIV.—NICKEL-COPPER MINING AND SMELTING, 1922-1926

Schedule	1922	1923	1924	1925	1926
Ore raised.....tons	259,569	1,187,354	1,411,980	1,264,748	1,322,050
Ore smelted..... "	314,120	1,140,160	1,307,694	1,258,849	1,309,782
Bessemer matte produced..... "	17,324	58,084	65,943	70,280	78,643
Nickel contents of matte..... "	8,678	31,029	34,638	36,596	39,038
Copper contents of matte..... "	5,421	15,769	18,490	19,636	24,159
Matte exported*..... "	19,831	21,450	26,565	32,397	34,908
Matte refined in Canada..... "	10,340	31,765	37,613	38,567	33,489
Men employed.....No.	1,492	2,496	2,459	2,650	3,132
Wages paid.....$	2,009,335	3,093,402	2,859,600	3,487,051	4,359,066

*All matte was exported prior to 1918 when refining in Canada began at Port Colborne, Ontario. The British America Nickel Corporation commenced refining operations at Deschênes, Quebec, in 1920, and closed down finally in July, 1924.

Dividends.—Heretofore the Department of Mines has not received information in regard to dividends paid by nickel companies. The figures which follow are published for the first time in the Annual Report:—

TABLE XV.—TOTAL DIVIDENDS PAID BY NICKEL COMPANIES*

Company	Period (inclusive)	Total to end of 1925	Paid in 1926	Total to end of 1926
Canadian Copper Company.....	1894-1901	$1,975,000	.....	$1,975,000
†International Nickel Co. preferred....	1906-1925	10,695,006	$534,756	11,229,762
†International Nickel Co. common....	1909-1925	54,787,060	3,346,768	58,133,828
Total.....	.....	$67,457,066	$3,881,524	$71,338,590
‡Mond Nickel Company deferred....	1906-1914	£264,043	.....	£264,043
‡Mond Nickel Company preferred....	1904-1925	1,619,989	£236,370	1,856,359
‡Mond Nickel Company common....	1905-1925	1,880,318	112,500	1,992,818
Total.....		£3,764,350	£348,870	£4,113,220
	or	$18,319,586	$1,697,811	$20,017,397
Grand Total.....		$85,776,652	$5,579,335	$91,355,987

*For the Mond Nickel Company the fiscal year ends April 30 and the figures given are to that date.

†Successors to the Canadian Copper Company. The International Nickel Company paid dividends on the common stock from 1909 to 1919, inclusive, and again in 1925 and 1926. Common stock outstanding is $41,834,600, and preferred stock $8,912,600, or a total of $50,747,200.

‡Debenture interest paid by the Mond company was £96,393 for the fiscal year ending April 30, 1926; and from 1912 to 1926, inclusive, totalled £935,156. The issued and paid-up capital of this company is £900,000 common; £1,750,000 cumulative preference, £2,000,000 non-cumulative preference, both of these 7 per cent.; £375,000 of 5 per cent. debenture stock, and £1,000,000 of 5½ per cent. debenture stock; or a total of £6,025,000.

Refineries.—During the year at Port Colborne, the International Nickel Company of Canada recovered electrolytic and refined nickel, nickel oxide, converter copper, nickel sulphate, platinum, palladium and other metals of the platinum group. The record for 1926 is shown in the subjoined table:—

TABLE XVI.—NICKEL-COPPER REFINING, 1926

Schedule		Quantity	Value
			$
Matte, treated	tons	33,489	.....
Nickel oxide, marketed	lbs.	7,644,808	1,805,171
Metallic nickel, recovered	"	25,627,602	6,423,401
Blister copper, recovered	"	18,505,324	2,457,752
Gold, recovered*	ounces	4,447	91,367
Silver, recovered*	"	151,429	90,980
Platinum metals, recovered*	"	19,495	1,559,527
Employees	No.	490	.....
Wages paid	$	.....	793,399

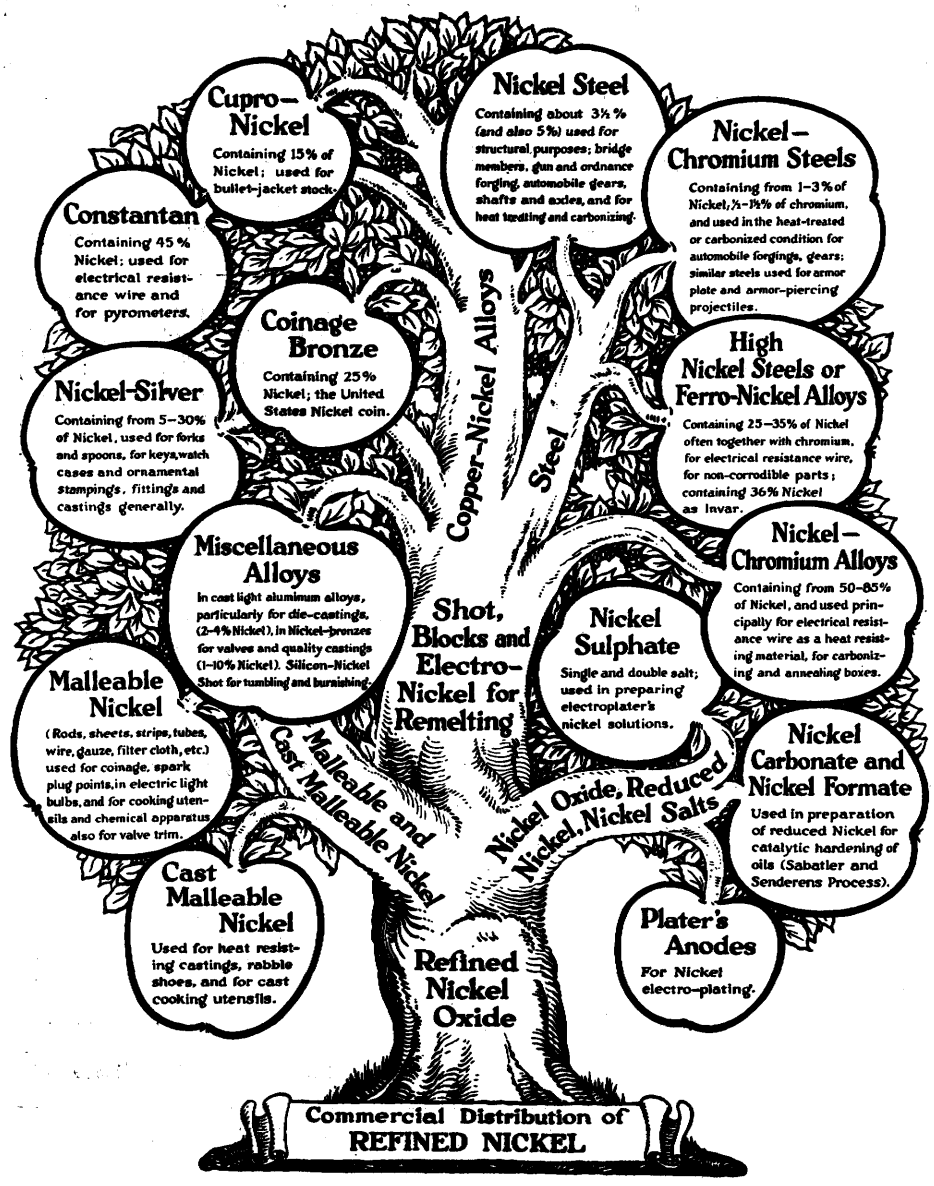
*Includes recoveries by the Mond Nickel Company at Clydach in Wales.

Platinum metals are the most important by-products in the refining of nickel-copper matte. Details regarding precious metals recovered during a five-year period by nickel-copper refineries treating Ontario matte are noted below:

TABLE XVII.—PRECIOUS METALS RECOVERED, 1922-1926

	1922	1923	1924	1925	1926	
	Ounces	Ounces	Ounces	Ounces	Ounces	Value, $
Gold†	2,094	3,574	4,125	4,016	4,447	91,367
Silver	50,239	100,982	122,889	134,390	151,429	90,980
Platinum	4,802	6,810	9,181	8,692	9,471	919,349
Palladium	6,862	7,511	8,923	7,856	9,790	626,166
Rhodium, Ruthenium, Osmium and Iridium	124	304	593	432	234	14,012
Total platinum metals	11,788	15,625	18,697	16,980	19,495	1,559,527

†Includes small recoveries of the rhodium group by the Mond Nickel Company.



Chart, reproduced through the courtesy of the International Nickel Company of Canada, showing ramifications in the distribution and uses of refined nickel.

Sulphuric Acid.—Reference was made in the 1925 Report to the new acid plant of the Mond Nickel Company at Coniston, which began to operate in November, 1925. Waste sulphur gases from the smelting of nickel-copper ores are being utilized for the production of acid by the "contact" process. In January, 1927, W. H. DeBlois, manager of the chemical division of the Mond Nickel Company, presented a paper in Montreal before the local branches of

the Society of Chemical Industry and the Canadian Institute of Mining and Metallurgy on "The Contact Process for Sulphuric Acid," and from this paper much of the following data has been abstracted. The paper was printed in the March issue of both *Canadian Chemistry and Metallurgy* and the *Canadian Mining and Metallurgical Bulletin.*

The smelters of the Sudbury area discharge into the air in the form of sulphur dioxide some 500 tons of sulphur daily, the equivalent of 1,500 tons of sulphuric acid, while Canada's total consumption is about 200 tons daily. The recovery of a small part of this sulphur by the Coniston acid plant represents the first attempt to save this waste product, and an important new industry is now established which will assure Canadian consumers an ample supply of sulphuric acid at a cost below prevailing United States prices. In 1926 this new plant produced 15,756 tons of acid of two grades, namely, 66° Baumé (93 per cent.) and oleum (fuming sulphuric). Two other plants in Canada produce sulphuric acid, but neither of them obtain it as a by-product.

Raw products heretofore used in Canada for sulphuric acid manufacture were either domestic iron pyrites, or imported lump sulphur from Texas. It is possible to produce liquid sulphur dioxide, which would meet the requirements of Canada's pulp and paper industry, by dissolving the impure waste gases at Sudbury, but the cost of heating this water to again drive off the pure sulphur dioxide before compressing and liquefying, in all probability, would prove prohibitive. The adoption of the "contact" process for acid manufacture was decided on because of its adaptability to producing strong acid and oleum to meet the main Canadian demand. Simply stated, this process means the combination of sulphur dioxide with oxygen of the air, using platinum as a catalytic agent, to form sulphur trioxide which only requires the addition of water to produce sulphuric acid. The gas emanating from the basic converters, which bessemerise the blast furnace nickel-copper matte, is almost pure nitrogen and sulphur dioxide, the latter averaging about 14 per cent. by volume. This gas is conducted by hoods covering the converters through flues and chimneys to the upper air, and it is at the hoods that separate flues convey to the acid plant the small part of the gas saved. The importance of a cheap source of sulphuric acid, controlled within the Empire, is apparent. The chief uses in the order named are oil refining, ammonium sulphate, explosives, steel pickling, also the tanning, textile and dye industries.

Iron Ore, Pig Iron, Steel and Coke

During 1926 no shipments of iron ore were made from Ontario mines, and since no ore of domestic origin was reported as charged to the blast furnaces, the entire output of pig iron during the year must be credited to foreign ore, and hence the item of pig iron does not appear in Table I.

The total quantity of iron ore charged during the year at Hamilton and Sault Ste. Marie, was 948,154 tons, from which there was produced a total of 545,737 short tons of pig iron of the following grades: 311,730 tons of basic, 187,361 tons of foundry, and 46,646 tons of malleable iron. The average prices of iron during the period on the Pittsburgh market were as follows: Bessemer, $21.33; basic, $18.55, and No. 2 foundry, $21.64 per long ton. In computing the values given below the basic and malleable were taken at $18.55 and $18.88 respectively, and foundry at $23.05 per long ton. The total value of the pig iron produced during 1926 was $9,805,300.

IRON BLAST FURNACES IN OPERATION, 1926

Name of Company	Furnaces			Fuel used	Location
	No.	Daily capacity, long tons	Days operated		
Algoma Steel Corporation, Ltd.	4	1,500	362	Coke	Sault Ste. Marie
Steel Company of Canada, Ltd.	2	725	365	Coke, coal and gas	Hamilton

BLAST FURNACES IN ONTARIO FOR THE PRODUCTION OF PIG IRON

Company	Location	Furnaces		Remarks
		No.	Daily capacity gross tons	
Algoma Steel Corporation, Ltd.	Sault Ste. Marie	4	1,450	Active
Atikokan Iron Company	Port Arthur	1	175	Idle since 1911
Canadian Furnace Co., Ltd.	Port Colborne	1	325	Idle since Nov., 1923
Canadian Steel Corporation, Ltd.	Ojibway (near Windsor)	2	1,100	Under construction
Midland Iron and Steel Co., Ltd.	Midland	1	120	Idle since Feb., 1921
Parry Sound Iron Co., Ltd.	Parry Sound	1	90	Idle since Oct. 1, 1919
Standard Iron Co., Ltd.	Deseronto	1	60	Idle since June 9, 1919
Steel Company of Canada, Ltd.	Hamilton	2	750	Active

Note.—The first and last mentioned produce open-hearth steel as well as pig iron.

The following table gives particulars of the iron and steel-making industry of the Province for the last five years:—

TABLE XVIII.—IRON AND STEEL STATISTICS, 1922-1926

Schedule	1922	1923	1924	1925	1926
Ontario ore smelted.....short tons	23,398	36,622	8,231	6,830	.....
Foreign ore smelted..... "	1,217,543	1,283,886	836,233	732,356	948,154
Limestone for flux..... "	137,852	283,190	187,571	109,198	218,996
Coke..... "	336,301	576,832	438,323	262,344	503,871
Pig iron produced..... "	293,662	674,428	465,888	412,837	545,737
Value of pig iron produced.....$	6,493,513	15,995,496	9,484,139	8,048,992	9,805,300
Steel made.....short tons	358,126	607,385	499,986	529,327	534,732
Value of steel made.....$	12,812,927	21,133,664	14,196,029	18,904,520	16,710,365

Steel.—Steel ingots to the amount of 477,439 long tons were made in Ontario by five companies. Of these 460,766 tons were basic open hearth while the remainder, 16,673 long tons, were classed as "all other." This material was made for use in the manufacturing plants of the makers.

Direct steel castings derived by the open hearth basic, crucible, and electric processes, totalled 10,902 long tons, of which 8,002 long tons were electric and the balance, open hearth basic and crucible. The major portion of the output, or 7,900 long tons, was made for sale and the remainder for the use of the companies in manufacture.

Ferro-alloys were made by three companies and included ferro-manganese 78-80 per cent., and ferro-silicon of 15 and 50 per cent. silica content. The total output amounted to 37,692 long tons.

STEEL AND FERRO-ALLOY PRODUCERS

Company	Location
Steel Company of Canada, Ltd	Hamilton
Algoma Steel Corporation, Ltd	Sault Ste. Marie
National Castings Co., Ltd	Belleville
Dominion Foundries and Steel, Ltd	Hamilton
Wm. Kennedy & Sons, Ltd	Owen Sound
Canadian Carborundum Co., Ltd	Niagara Falls
Electro Metallurgical Co. of Canada, Ltd	Welland
Abrasive Company of Canada, Ltd	Hamilton
Canadian Electric Castings Co., Ltd	Orillia
Welland Steel Castings, Ltd	Welland

Coke.—The Algoma Steel Corporation, Sault Ste. Marie, and the Steel Company of Canada, at Hamilton, produce coke in conjunction with their blast furnace operations; while the Hamilton By-Products Coke Ovens, Ltd., also at Hamilton, produces coke for domestic purposes, having commenced in January, 1924. At the latter plant the present battery of 25 ovens (450 tons of coal or 315 tons of coke daily) was increased by the addition of 35 Solvay process by-product ovens. The contract for the new ovens was let in February, 1926. The total coke and coke breeze used and sold was 929,838 tons, having a value of $6,714,879, of which 363,408 tons worth $2,936,364 were sold and the balance consumed in the blast furnaces at Sault Ste. Marie and Hamilton.

The materials used and products consumed and sold by the coke plants in Ontario during 1926 are shown in the subjoined table:—

THE COKING INDUSTRY IN ONTARIO, 1926

Kind	Unit	Quantity	Value
MATERIALS USED			$
Bituminous coal, foreign	tons	1,228,845	6,203,907
Sulphuric acid	lb.	10,348,363	160,134
Sulphur	"	416,000	4,480
All other materials	.....	.....	21,230
Total	.....	.....	6,389,751
PRODUCTS MADE			
Coke*	tons	873,264	6,525,134
Coke breeze	"	56,574	189,745
Gas sold and used	M. cubic ft.	9,819,375	2,103,715
Tar and tar products	Imp. gals.	10,016,407	595,564
Ammonium sulphate	lb.	26,816,041	598,920
Light oils	Imp. gals.	1,901,715	123,611
Total	.....	.....	10,136,689

*Does not include 144,220 tons of coke by municipal gas plants.

Of the products made, shown above the major portion of the coke, breeze and gas were consumed in the plants reporting. The total value of materials made and marketed was $10,136,689. During the period the number of wage earners was 285 to whom $502,736 was paid in wages.

In addition to the coke produced and used, as shown in the preceding table, nine other plants were active in the production of domestic gas from imported coal. A list of the producers in Ontario follows:

DOMESTIC GAS PRODUCERS IN ONTARIO, 1926

Company	Location
Board of Light and Heat Commission	Guelph
City Gas Company of London	London
Consumers Gas Company of Toronto	Toronto
Hamilton By-products Coke Ovens, Ltd	Hamilton
Hydro-Electric Power Commission	Cobourg
Ottawa Gas and Electric Companies	Ottawa
Port Hope Gas Company	Port Hope
Public Utilities Commission	Kitchener
Public Utilities Commission	Owen Sound
St. Thomas Gas Department	St. Thomas

Lead and Zinc

The interest manifested in the lead deposits of Ontario during 1924 and 1925 and mentioned in the reports of those years, was continued in 1926, when considerable prospecting and development work was carried on at various points throughout the Province. Of the well-known lead properties in eastern Ontario, the Frontenac mine, near Perth Road in Frontenac county, was under development by the Forbes Galena Mines, Limited; the Hollandia at Bannockburn in Hastings county also received some attention, while the Summerville Lead Mines, Limited, opened up a property in Victoria county. There was also some activity on lead prospects in the Ottawa valley. In recently discovered areas, however, more important developments have been made. Near Chelmsford, about fifteen miles west of Sudbury, the Bunker Hill and Sullivan Mining Company* continued their campaign of diamond-drilling on a zone about four miles in length which roughly follows the boundary between Balfour and Creighton townships. The ore shown up by 60,000 feet of diamond-drilling consists of zinc, lead and copper and also carries values in gold and silver. It is too soon to state how large a deposit is being developed, but there are indications of a large ore body which will mean the establishment of a new mining industry in the Sudbury nickel basin.

Lead-zinc ores have also been disclosed in Algoma district northeast of Searchmont station on the Algoma Central and Hudson Bay Railway, in Galbraith township north of Bruce Mines, and on the north shore of Lake Superior eastward from Port Arthur. Zinc-bearing copper ore has also been traced across the Ontario boundary from the copper fields of Rouyn and vicinity, and outcrops of copper have been noted in Clifford township, and lead-zinc in Ben Nevis. In the northern part of Munro township a most encouraging find of copper-zinc ore was made in November on what is known as the Potter-Doal claims.

The output of lead from all sources in 1926 amounted to 7,398,796 pounds, having a value of $580,730, as compared with 7,268,193 pounds worth $601,704 in 1925. The production from Ontario has been constantly increasing during the past five years. The principal producer, as formerly, was the Kingdon Mining, Smelting and Manufacturing Company from their lead mine and smelter near Galetta on the Ottawa river. The sales by this company during the period were 7,346,180 pounds, while the remainder of the output was contained in base bullion derived from the smelting of silver-cobalt ores at Deloro, and also includes 30,950 pounds produced in 1918 from Bedford township and not heretofore accounted for in the mineral production of the Province.

*This is the parent company. Its subsidiary, Treadwell-Yukon Mining Company, operates the Chelmsford property, now known as the Errington mine.

NON-METALLIC MINERALS

Abrasives

The only abrasive material produced in Ontario during 1926 was 64 tons of quartz pebbles worth $576, which were gathered in the vicinity of Jackfish on the shore of Lake Superior. These were used chiefly in tube mills in the prairie provinces for grinding cement clinker. No production of corundum or garnets was reported. Carborundum, an artificial product made in the electric furnace, has displaced corundum to a large extent in the abrasive field.

Actinolite

Shipments during 1926 amounted to 80 tons, valued at $1000. There is only one producer in the Province, namely, the Actinolite Mining Company, with a mill at the village of the same name, situated about four miles north of Tweed station on the Canadian Pacific railway. The mineral, which is found in serpentine rocks, is mined in the townships of Kaladar and Elzevir, Hastings county, and the head office of the company is Bloomfield, New Jersey. The product, a fibrous form of serpentine, is used principally for roofing purposes as an ingredient in coal-tar compounds. Mining in a small way has been carried on intermittently for many years. No ore was raised in 1925 or in 1926.

Asbestos

The Bowman asbestos property, now known as the Porcupine Asbestos Corporation, Limited, near McKay lake in Deloro township, was the first of its kind in Ontario upon which organized development has been carried out. In 1923, 6 tons worth $2,600 were shipped. In 1924 the output was increased to 172 tons having a value of $91,900; in 1925, 2 tons valued at $901 were marketed; and in 1926, sales were 14 tons worth $3,935. Considerable surface work consisting of a transmission line, camp buildings and a motor road to Timmins have been constructed, with a view to increasing the production.

Barite (Barytes)

There was a production of barite (heavy spar) in 1921 by H. C. Bellew, 6 Saint Sacrament St., Montreal, Que., of approximately 200 tons, from a deposit which is located on lot 20, concession X, township of North Burgess, Lanark county. No shipments, however, were reported during 1921 or 1922.

In 1923 there were shipped 200 tons worth $4,180 from near Tionaga station in the District of Sudbury. In 1924 and 1925 no production was reported. A deposit in Langmuir township, south of Night Hawk lake, was worked in 1918, when 60 tons of ground barite were shipped. It is owned by Canada Night Hawk Mines, Limited.

The great market for barite in the industrial areas of Canada is the paints and pigment industry. This trade desires a very fine grade of material, between 200- and 300-mesh, which must be perfect as regards purity and colour. In 1923, according to a report of the Dominion Bureau of Statistics, the Canadian paint trade consumed more than 2,000 tons of ground barite. Rubber goods took 480 tons and other industries much lesser amounts. The total consumption was then given as 2,747 tons, and in later years must have increased to some extent. The pure white variety, water-floated, is worth about $40.00 per ton.

Feldspar

The mining of feldspar from pegmatite dikes in Ontario is in part a seasonal occupation, in which the major portion of the mining is performed during the summer months. The operations are in the form of quarrying to which the large outcrops of spar readily lend themselves. During the calendar year 1926 there were 22,783 tons of feldspar shipped, of which 3,100 tons were milled in Ontario, and the total value, including that added by grinding, was $199,102, or an increase of $58,043 over the total selling value in 1925, when 17,404 tons worth $141,059 were marketed. The Frontenac Floor and Wall Tile Company of Kingston is the largest grinder of feldspar.

During 1926 some 20 companies and individuals mined and shipped spar, most of which was marketed in Rochester, N.Y., Ohio and Pennsylvania. The largest output by any company was 3,782 tons, and the average for all producers was 1,266 tons. Employment was given to 274 workers who received $131,460 in wages. Shippers in 1926 are noted below:—

FELDSPAR SHIPPERS, 1926

Name	Location of Deposit	P.O. Address
Anderson, J. G	Lot 15, con. A, Head tp., and Wanapitei in Dryden tp.	Lucknow.
Bathurst Feldspar Mines, Ltd	Bathurst tp	230 King St. E., Toronto.
Consolidated Feldspar Mines, Ltd.	Lot 1, con. II, Ratter tp	29 Melinda St., Toronto.
Craig, T. H	Verona	Verona.
Elizabeth Feldspar Mines, Ltd	Mileage 115, C.P. Ry. near Dill.	Toronto, 36 King St. E.
Feldspars, Ltd	Lots 1 and 2, con. XIII and lot 1, con. XII, Loughborough; lots 1 and 2, con. XIII, and lots 1 and 2, con. XII, Portland; lot 1, con. I and lot 2, con. II, Bedford tp.	Toronto, 293 Bay St.
Feldspar Mines Corp'n., Ltd	Lot 11, con. VII, Monteagle tp.	Toronto, 1507 Bank of Hamilton Bldg.
Genesee Feldspar Co., Ltd	Hybla	Rochester, N.Y., 82 Augustine St.
Gilpin Corporation	Lot 3, con. III, Bedford tp	Brunswick, Me., Box 205.
Industrial Minerals Corporation	Wilberforce and Eau Claire	Toronto, 805 Bank of Hamilton Bldg.
Hasselbring and Myhill	Lot 7, con. XIII, Storrington tp.	Sault Ste. Marie, 612 Queen St.
Hurlburt, G. W	Lot 7, con. XIII, Storrington tp.	Toronto, 304 C.P.R. Bldg.
Maine Feldspar Co.*	Lot 3, con. III, Bedford tp	Brunswick, Me., Box 205.
Northern Feldspar Mines, Ltd	Lot 2, con. II, Dill tp	Sudbury, Box 166.
O'Brien and Fowler	Lot 29, con. III, Mattawan tp.	Ottawa, 114 Wellington St.
Orser, S. H	Verona	Perth Road.
Perth Feldspar Co., Ltd	Lots 19 and 20, con. IX, Bathurst tp	Ottawa, Central Chambers.
Rock Products Company	Lot 20, con. IX, Bathurst tp	Toledo, O., 450 Nicholas Bldg.
Verona Quarries, Ltd	Lots 1 and 2, con. XIII, Loughborough tp	Hamilton, Box 354.
Wanup Feldspar Mines, Ltd	Dill tp	Wanup.

*Formerly Gilpin Corporation.

The market for ground or prepared feldspar in the industrial parts of Ontario and Quebec was given as slightly less than 3,700 tons per annum in 1923, when business was at a low ebb. Of this the enamelware, porcelain and pottery trade consumed 2,520 tons, while soaps and washing compounds

accounted for 560 tons ,and the balance was used in the manufacture of abrasive wheels, glass, roofing, floor and wall tile, and paints. The consumption of this ground material has undoubtedly increased during the past few years and might be safely estimated at more than 5,000 tons at the present time.

Fluorspar

Due to the influx of United States fluorspar Ontario producers, except during the war period, have been unable to compete in the limited market available in Canada. The material is used in the iron and steel industry as a flux, in lead refining plants, also in enamel, porcelain, pottery and glass manufacturing. The market available in eastern Canada for both crude and refined fluorspar is not great, and would not amount to much more than 500 tons per year.

During 1925 only 12 tons of crude fluorspar worth $200 were reported as marketed by the Industrial Minerals Corporation of Toronto, all of which came from a deposit near Wilberforce and was recovered in conjunction with quartz mining. No fluorspar was reported as shipped in 1926.

Graphite

Graphite marketed in 1926 was 2,266 tons valued at $158,994 as against 2,345 tons worth $134,213 during the previous year. The total Ontario production was by the Black Donald Graphite Company, near Calabogie in Renfrew county. In 1925, the output was augmented by two other companies, the Timmins Graphite Mines in North Burgess township, and the Graphite Refining Company at Port Elmsley which shipped from stock. The bulk of the product was consigned to United States points.

Average prices for Ceylon graphite rose during 1925 by two cents per pound and at the end of the year were quoted at 6.8 cents. Lump, which sold for 9.0 cents, showed an increase of three and three-quarter cents. The prices at the end of 1926 were seven cents per pound for Ceylon and for Madagascar flake.

The following extract from the annual review number of the Engineering and Mining Journal, January 22, 1927, summarizes the world's situation as regards the industry:

> In the graphite industry there were no new developments of particular importance during 1926. Each of the last five years has shown a progressive advance toward world stabilization, and the industry during the last year has followed the trend toward as complete an adjustment as is often obtained in international mineral products."

Gypsum

Operations in 1926 were confined to those of the Ontario Gypsum Company, Limited, with head office at Paris. Mines and mills are located at Caledonia and Lythmore, Haldimand county. During 1926, 97,402 tons were mined, of which 58,832 tons were calcined. Sales were as follows: crushed, 37,769 tons; fine ground, 1,110; calcined, 3,098; and consumed in the manufacture of various products, 48,010 tons; or a grand total of 89,987 tons valued at $496,059. In 1925, sales amounted to 82,020 tons worth $491,833.

During the period only the Caledonia plant was active, while the Lythmore works shipped from stock. The first-mentioned plant was in operation for 303 days during which time $245,663 were paid to 45 mine and 143 mill workers.

The detail of the gypsum industry, including mining, milling and manufacturing, has been described in Volume XXXIV, Part 2, issued in 1925.

Iron Pyrites

During 1926, small shipments of iron pyrites were made from Ontario mines, although none of the mines were operated. The mineral occurs at widely separated points from eastern Ontario to the region north of Lake Superior. Until 1926, Gulf sulphur was so cheap in price that acid manufacture from iron pyrites became unprofitable, but the rise in price in the year has given many idle deposits a potential value. The utilization of the waste sulphur dioxide gases from the Mond nickel-copper smelter at Coniston, near Sudbury, for the manufacture of sulphuric acid, has in part cut into the field formerly held by the producers of pyrites ore. Heretofore the two most important operators in Ontario producing iron pyrites for the manufacture of acids, were the Grasselli Chemical Company, Limited, and the Nichols Chemical Company, Limited. The former made a small shipment to the United States during the year from the Caldwell mine near Flower Station, while the latter company kept their Northpines mine unwatered and ventilated, but made no shipments.

Ontario pyrites usually carries from 30 to 40 per cent. sulphur, and the bulk of the output heretofore was exported to the United States. The demand for pyrites has fallen off since the Great War, when production exceeded $1,000,000 in valuation both in 1917 and 1918 due to the abnormal demand in Canada and the United States. The total production was 371 tons worth $4,912 in 1926 as against 685 tons valued at $8,799 in the previous year.

Notwithstanding the detrimental factors mentioned above, a search for deposits of iron pyrites was in evidence. During the year the Holdsworth claims, situated two miles from Hawk Junction on the Michipicoten branch of the Algoma Central Railway, was optioned by the Grasselli Chemical Company. Diamond-drilling indicated a large lens of iron pyrites, three cores of which averaged 46 per cent. sulphur and 43 per cent. iron.

Mica

Production in Ontario is mainly from the area south and west of the city of Ottawa in Lanark and Frontenac counties, where small deposits are worked spasmodically by individuals, in addition to more regular operation by a few organized companies. Since very little preparation of the crude crystals in the form of thumb-trimming and splitting is necessary to put the material in a marketable form, and also because many small dealers buy and sell in addition to operating and trimming, it has become necessary in order to avoid duplication to consider the final sales as production. On this account it has been difficult to keep accurate records.

A tabular statement of mica sales during 1925 and 1926 follows:—

MICA SALES, 1925-26

Variety	1925		1926	
	Quantity, Tons	Value $	Quantity, Tons	Value $
Rough-cobbed	142	21,971	55	11,724
Thumb-trimmed	67	45,266	39	10,543
Splittings	.....	.....	22	27,822
Scrap	1,396	15,424	765	8,997
Total	1,605	82,661	881	59,086

The average prices during 1926 did not vary greatly from those of the previous year and were as follows: Scrap, $11.50 per short ton, splittings 62¾ cents per pound, while rough-cobbed mica varies widely in price according to the size of crystals. Thumb-trimmed prices were as follows:—

Size	Price per Lb.	Size	Price per Lb.
1" by 1"	8c. to 14c.	2" by 3"	26c.
1" by 2"	10c. to 22c.	2" by 4"	40c. to 65c.
1" by 3"	20c. to 28c.	3" by 5"	$1 00

During the period only 87 tons of the crude ore were reported as mined. Employment was given to 42 men who received $25,371 in wages.

Following is a list of mica shippers:—

MICA SHIPPERS, 1926

Name of Owner or Producer	Location or Name of Mine	P.O. Address of Manager, etc.
Kent Bros. & Estate J. M. Stonness	Bedford tp	Kingston.
Lee, W. W	Bedford tp	Bedford Mills.
Loughborough Mining Co., Ltd	Loughborough tp	Sydenham.
Martin, A. G	South Burgess tp	Ottawa, 236 Besserer St.
Bennett, H. V	South Elmsley tp	Perth.
Lee, W. W		Bedford Mills.
Stonness, C. A		Westport.
Wilson, Richard		R.R. 2, Hartington.
Smith, D		Perth.
Ennis, E		Perth Road.
McNaughton, G. W		Stanleyville.
Wood, F. J		Godfrey.
Trousdale, J. and Nellis, F		Sydenham.

The lower prices being offered to the small producers of crude mica have, in a large measure, accounted for the decreased output of this mineral. A new feature in this industry in Ontario was the construction in 1926 of a mica-grinding plant at Bancroft, owned by the Orser-McKenzie Mica Milling Company. It is the first in Ontario for the production of different grades of ground mica. The mill commenced early in 1927 and is producing about a ton per day. A grinding plant is also in operation in Hull, Quebec.

The ground material finds a market in the surfacing of roofing materials and wallpapers, and as an ingredient in lubricants and rubber articles. About 600 tons of ground mica are consumed annually in Canada.

Mineral Waters

Below are tabulated records since 1919 of shipments of mineral waters with valuation in bulk form at the works:—

	1919	1920	1921	1922	1923	1924	1925	1926
Imperial gallons	276,833	127,150	308,647	209,072	227,030	201,670	183,012	208,400
Value $	19,290	15,059	14,438	10,528	14,047	13,133	25,452	27,277

The companies producing mineral waters in 1926 were as follows:—

PRODUCERS OF MINERAL WATERS, 1926

Name of Owner, Firm, or Company	Location of Spring or Well	P.O. Address of Manager, etc.
Borthwick, W	Gloucester tp	10 Albert St., Ottawa.
Caledonia Springs Co., Ltd	Gloucester and Clarence tps	2716 St. Urbain St., Montreal, Que.
Deneault, F	Lot 22, con. IV, Clarence tp	Bourget.
Goderich Mineral Water Co	Goderich	Goderich.
Gurd & Co., Ltd., Charles	Caledonia tp	1016 Bleury St., Montreal.
Sanitaris, Ltd	Lot 27, con. XII, Pakenham tp	Arnprior.

Natural Gas

Production of natural gas in Ontario in 1926 from 2,126 wells was 7,776,496 thousand cubic feet, with a retail value of $4,415,918, according to the report (Vol. XXXVI, Part IV) by R. B. Harkness, Natural Gas Commissioner. The selling price ranged from 35 cents to $1.20 per thousand cubic feet. Production in 1925 was 7,257,274 thousand cubic feet. For fuller details the special report above mentioned should be consulted. Labour statistics follow*:—

Schedule	No. Employees	Wages Paid
Gas producers reported	1,008	$720,556
Gas distributors reported	121	133,166
Drilling Contractors	85	76,650
Total	1,214	$930,372

*Includes a few small operators, estimated.

Peat

Peat Fuels, Limited, of Montreal, operated at the Alfred bog, lot 9, con. VII, Alfred township, Prescott county, during 1925 from June 15 to September 9. Peat sold was 1,370 tons at $6.00 per ton. Shipments were consigned to Montreal, Ottawa, and points as far west as Peterborough. No operations were reported during 1926.

Petroleum

A report on "Petroleum in 1926," by the Natural Gas Commissioner, appears in Vol. XXXVI, Part IV. Statistical tables, which are repeated here for convenience, are taken from the above-mentioned report. Other tables are added, the data being supplied by the Dominion Bureau of Statistics.

CRUDE PETROLEUM PRODUCTION,* BY FIELDS, 1922-1926

Field	1922	1923	1924	1925	1926
	Bbls.	Bbls.	Bbls.	Bbls.	Bbls.
Petrolia, and Enniskillen township	64,935	64,158	60,916	53,166	55,485
Oil Springs	43,214	39,090	41,320	39,137	38,349
Moore township	7,275	4,790	4,483	8,195	2,438
Sarnia township	3,224	2,387	2,068	1,905	1,890
Plympton township	695	872	525	1,424	1,047
Bothwell	25,681	27,665	26,700	26,243	25,382
Dover, West } Tilbury	5,482	5,618	3,898	2,957	959
Tilbury East }	127	1,950	.....	.....	.....
Raleigh township	663	302	783	887	676
Onondaga township	489	237	456	261	361
Mosa township	11,959	10,319	8,862	8,397	7,868
Thamesville	384	567	.....	289	2,376
Euphemia township	.....	.....	.....	39	.....
Dawn	217	.....	.....	.....	.....
Dunwich township	387	594	1,351	1,001	139
Romney township	.....	849	2,955	1,235	.....
Total production ..... Bbls.	164,732	159,399	154,317	144,249	136,971
Value ..... $	466,587	395,300	390,423	369,154	376,822
Average price per bbl. ..... $	2 65	2 47	2 51¼	† 2 56	2 73

*Figures to July 1, 1925, supplied by the Supervisor of Petroleum Bounties at Petrolia.

†A bounty of 26¼ cents per barrel (35 Imperial gallons), or a total of $20,152, was paid in addition by the Federal Government under the "Petroleum Bounty Act," up to July 1, when the Act ceased to operate.

CRUDE PETROLEUM AND REFINERY STATISTICS, 1922-1926

Schedule	1922	1923	1924	1925	1926
Crude petroleum production:					
Imp. gals.	5,756,602	5,598,985	5,401,102	5,024,770	4,693,999
*Value...$	466,587	395,301	390,424	367,524	376,822
Imported crude, distilled:					
Imp. gals.	152,888,816	138,527,971	151,381,481	161,895,295	183,347,749
Value...$	13,834,118	11,141,952	11,575,058	13,056,823	16,940
Canadian crude, distilled:					
Imp. gals.	5,612,645	5,837,827	5,123,683	4,859,148	5,017,500
Value...$	462,346	450,467	394,398	358,245	422,159
Per cent. of total	3.54	4.04	3.27	2.92	2.66
Products:					
Illuminating oil...Imp. gals.	36,650,134	33,175,063	28,816,322	18,677,629	8,088,787
Value...$	4,077,350	3,758,185	3,055,188	2,222,569	1,266,577
Lubricating oil...Imp. gals.	14,556,150	11,584,423	12,011,116	13,297,275	16,025,753
Value...$	2,558,278	2,107,530	2,009,732	2,364,320	3,540,786
Benzine, naphtha, gasoline...Imp. gals.	59,223,186	50,884,894	61,493,214	73,083,022	84,936,377
Value...$	13,920,089	8,739,670	9,392,837	11,032,134	14,983,322
Still gas...M. cu. ft.	.....	374,687	524,737	431,713	630,325
Value...$	.....	131,745	172,555	167,869	256,935
*Gas and fuel oil, tar,.Imp. gals.	34,508,790	34,727,265	36,702,043	46,064,129	41,883,125
Value...$	2,510,427	2,367,050	2,494,858	2,947,378	3,182,770
Paraffin wax and candles...lb.	12,063,768	10,484,436	9,112,143	15,502,029	9,858,490
Value...$	329,147	484,416	551,434	734,322	648,303
Tar and grease...lb.	8,186,013	10,612,588	10,325,835	9,301,674	11,260,882
Value...$	265,150	222,675	187,544	177,474	221,826
Acid oil...Imp. gals.	.....	1,126,370	1,350,450	1,858,176	711,970
Value...$	.....	62,006	61,748	85,761	35,823
Acid and Petroleum coke...tons	38,016	31,505	36,200	31,501	45,774
Value...$	263,034	249,425	226,005	212,085	265,841
Miscellaneous...$	.....	.....	29,261	1,596	2,978
Total value of products...$	23,923,475	18,122,702	18,181,162	19,945,508	24,404,801
Employees...Ave. No.	1,393	1,515	1,603	2,165	2,241
Wages paid...$	2,018,765	2,265,307	2,453,082	2,702,034	2,876,150

*The value includes bounty paid to producers.

Refining of oil and the manufacture of oil refinery products were carried on during 1926 by three companies in Ontario, as follows:—

PETROLEUM REFINERIES, 1926

Company	Head Office	Plant
British American Oil Refineries, Ltd....	1312 Royal Bank Bldg., Toronto.	Toronto.
Canadian Oil Refineries, Ltd.....	Toronto.....	Petrolia.
Imperial Oil Refineries, Ltd.....	445 South Christina St., Sarnia...	Sarnia.
Great Lakes Oil Co., Ltd. (idle).....	Wallaceburg, Ont.....	Wallaceburg.
McColl Bros.....	114 Don Esplanade, Toronto....	Toronto.

The average number of employees at the above refineries was 2,241, and the salaries and wages paid totalled $2,876,150. Operations by McColl Bros. commenced in January, 1926. Considerable quantities of sulphuric acid, sulphur, caustic soda, soda ash, litharge, fullers earth and other materials were consumed, a summary of which appears in the subjoined table.

MATERIALS USED IN OIL REFINING OPERATIONS, 1926*

Schedule	Quantity	Cost at Works
Crude oil (domestic) Imp. gals.	5,018,500	$422,159
" " (imported, U.S.A.) "	183,347,749	16,940,505
Sulphuric acid (not made by firms reporting) lb.	35,065,567	194,794
Sulphur (not used in acid manufacture) "	25,294	612
Caustic soda "	2,057,199	67,716
Soda ash "	216,600	3,896
Lime "	68,600	639
Litharge "	163,795	16,349
Fullers earth "	4,742,269	49,672
Compounding material	.....	642,645
All other material	.....	103,657
Shipping containers (barrels, cans, crates, etc.)	.....	1,526,069
Total	.....	$19,968,713

*Table supplied by the Dominion Bureau of Statistics.

A considerable number of by-products are produced in the refining of petroleum apart from the gasoline, kerosene and other heavier oils derived. In the Canadian practice some of these commodities are consumed in the plant operations and no direct income is received from them. The following table shows materials made for sale, as well as those made for the use of the companies:

PRODUCTS MADE IN OIL REFINERIES, 1926*

Schedule	For Plant Use		For Sale	
	Quantity	Value	Quantity	Value
Gasoline Imp. gals.	9,434	$1,579	84,873,078	$14,970,969
Petroleum spirits "	.....	.....	53,869	10,744
Kerosene "	25,859	3,845	8,062,928	1,262,712
Fuel and gas oils "	9,147,666	479,457	32,735,459	2,470,313
Lubricating oils "	14,940	3,326	16,010,813	3,537,460
Grease lb.	3,313	50	10,899,799	218,915
Tar Imp. gals.	35,770	2,861	.....	.....
Petroleum coke tons	1,100	5,855	29,955	210,982
Wax and candles lb.	.....	.....	9,858,490	648,303
Other products—Sludge Imp. gals.	711,970	35,823	.....	.....
Pitch tons	2,120	2,825	.....	.....
Still gas M. cu. ft.	630,325	256,935	.....	.....
Acid and black oil coke tons	11,552	38,490	.....	.....
Linseed oil soap lb.	.....	.....	34,585	2,767
All others	.....	.....	.....	211
TOTAL VALUE $24,164,452	.....	$831,046	.....	$23,333,406

*Table supplied by the Dominion Bureau of Statistics.

Although there were only four plants operating the capital actually employed was considerable. Cost of lands, buildings, plant, etc., supplies of stock on hand, cash, trading and operating accounts, amounted to $20,441,740, or an increase of $4,068,778 over the figures for 1925. The total cost of fuel for the four establishments was $1,609,296, of which $308,621 was derived in the process of manufacture, and included coke, still gas, sludge and pitch. The

cost of the coal consumed, both bituminous and anthracite, amounted to $711,072. The electrical power included in the total cost above amounted to $71,072, while the power of the steam boilers installed totalled 7,072 horsepower, the same as in the previous year.

The following table shows the quantity and value (less freight, exchange and sales tax) of crude oil and its refined products imported into Ontario in the year 1926. Practically all of this came from the United States. The information is furnished by the Department of External Trade and Commerce, Ottawa.

PETROLEUM AND REFINED PRODUCTS IMPORTED INTO ONTARIO DURING 1926

Schedule	Gallons	Value
CRUDE PETROLEUM:		
Fuel and gas oils between .775 and .8235 specific gravity	30,723	$ 6,769
Petroleum, .790 specific gravity or heavier for refining	184,595,902	12,228,044
Total	184,626,625	$12,234,813
REFINED PETROLEUM:		
Gasoline lighter than 0.725 specific gravity (casing head gasoline)	30,237,083	$ 4,197,210
" heavier " 0.725 " "	7,344,583	1,064,787
Kerosene and other illuminating oils	2,260,129	251,048
Lubricating and other oils	5,040,924	1,522,662
Fuel oil of 0.8235 specific gravity and heavier	8,295,190	603,735
Total	53,177,913	$ 7,639,442
PETROLEUM PRODUCTS:		
Axle grease ..... lb.	2,742,347	$ 164,504
Vaseline, toilet and medicinal petroleum	.....	106,883
Paraffin wax ..... lb.	2,004,585	136,552
" " candles ..... lb.	236,986	50,867
Other petroleum products ..... gals.	1,143,428	213,265
Total		$ 672,071
Total net value of petroleum and refined products		$20,546,326
Duty paid on the above in 1926, calculated on existing tariff schedule		1,300,794
Sales tax at 4 per cent		821,853
Freight, approximately		6,724,160
Total value delivered in Ontario		$29,393,133

A comparison of this total with the value of the products of our Ontario refineries shows that over 34 per cent. of refined petroleum products consumed in Ontario or passing through Ontario is imported, but compared with the years 1924 and 1925 the effect of an additional refinery in Ontario is shown. There was a reduction of 7,534,289 gallons of gasoline in the imports. It is apparent that there is still room for more refineries in Ontario.

Quartzite, Quartz and Silica Brick

Statistics of the production of quartzite and quartz in this report refer to the shipments from the quarries. In former reports the output of silica brick was included with the others, but, as agreed with the Dominion Bureau of Statistics, the two items in this report are shown separately. Shipments of quartzite and quartz from Ontario quarries in 1926 amounted to 192,733 tons

having a value of $339,304, while the output of silica brick numbered 1,306,773 worth $56,441. In order to avoid duplication in value, $9,800 is deducted from the gross value of the silica brick ($66,241) to take account of the crude quartz used in the manufacture.

Some 123 wage earners were employed in the quarries to whom $102,230 was paid in wages.

QUARTZITE, QUARTZ AND SILICA BRICK PRODUCERS, 1926

Name of Owner, Firm or Company	P.O. Address of Operator	Location of Quarry
*Algoma Steel Corporation, Limited	Sault Ste. Marie	Mile 19, A.C. Ry.
Anderson, J. G	Lucknow	Wanup.
Dominion Mines and Quarries, Limited	Toronto, Canada Life Bldg.	East Neebish and Killarney
Industrial Minerals Corporation	Toronto, 805 Bank of Hamilton Bldg.	Wanup.
Mond Nickel Company	Coniston	Neelon tp.
Orser, S. H	Perth	Verona.
Rayner, G. W	Toronto, Lumsden Bldg.	Hybla.
Wright & Company	Sault Ste. Marie	Deroche tp., Mile 19, A.C. Ry.

*Produces Silica Brick.

Salt

Revised figures for salt production by Ontario salt companies during 1926 give a total of 252,345 tons having a selling value of $1,388,672, as against 226,315 tons valued at $1,352,504 in the previous year. During the period nine companies operated ten active establishments and employed on the average 466 workers, of whom 32 were females, with a pay roll amounting to $614,790. The salt industry is centred in the southwestern part of the Province (Bruce, Huron, Lambton and Essex counties), which is underlain by salt beds. Salt brine is pumped from wells, evaporated and graded. Included with the total output is the salt equivalent of brine used in chemical plants at Sandwich and Amherstburg, on the Detroit river, for the manufacture of bleaching powder, liquid chlorine, muriatic acid, caustic soda and soda ash.

The several grades and total tonnages, with value of salt, exclusive of packages, marketed for the past five years are tabulated as follows:—

SALT STATISTICS, 1922-1926

Schedule	1922	1923	1924	1925	1926
Land tons	6,585	3,713	4,612	5,125	3,965
Coarse "	28,154	31,282	28,496	33,197	31,192
Fine "	34,684	36,924	42,555	43,286	47,202
Table and Dairy "	41,119	42,468	41,134	46,602	50,461
Pressed Blocks "	2,489	3,431	3,572	4,605	6,505
Brine (salt equivalent) "	63,710	80,099	83,059	93,500	113,020
Total sold or used "	176,741	197,917	203,428	226,470	252,345
Value of products sold or used $	1,573,657	1,674,365	1,337,311	1,466,450	1,388,672
Employees* No.	409	479	439	467	466
Wages $	539,813	508,525	482,263	555,729	614,790

*Employees of chemical works are not included.

Companies producing brine or salt in 1926 were as follows:—

OPERATING SALT COMPANIES, 1926

Name of Owner, Firm or Company	Location of Wells or Works	P.O. Address of Manager, etc.
Brunner, Mond Canada, Limited	Amherstburg*	Amherstburg.
Canadian Salt Company, Limited, The	Windsor	Windsor.
	Sandwich*	
Dominion Salt Company, Limited, The	Sarnia	Sarnia.
†Elarton Salt Works Co., Ltd	Warwick	Watford, R.R. No. 5.
Exeter Salt Works Company, Limited	Exeter	Exeter.
Goderich Salt Co., Limited	Goderich	Goderich.
Kincardine Salt Co., Ltd	Kincardine	Kincardine.
Western Canada Flour Mills Co., Ltd.	Goderich	Goderich.
Western Salt Company, Limited	Courtright	Courtright.
‡Wingham Salt Works	Wingham	Wingham.

*Chemical works using salt brine as raw material.
†This company went into liquidation on July 12, 1926.
‡Idle during 1926, and now owned by Wm. Davies Co., Ltd., Toronto.

Talc and Soapstone

Two talc mills were operated in 1926, namely, those of Geo. H. Gillespie Company and Asbestos Pulp Company, both of Madoc. No crude talc was marketed except that from Henderson Mines, Limited, at Madoc, which supplies the Gillespie mill. Sales advanced over 1925 both in tonnage and value as noted in the accompanying table. Refined talc ranged in price from $9 to $18 per ton according to grade, and was marketed in Canada, the United States, and England.

Included in the total is 110 tons of soapstone which was sawn and marketed by the Grace Mining Company from their property at Eagle lake, Kenora district. This product was consigned to pulp mills in Ontario. The Wabigoon Soapstone Company did some development on their properties in lot H.W. 133, con. II, Zealand township, near Wabigoon. There are also workable deposits near the south end of Wabigoon lake and on an island in the lake itself.

Following are statistics of talc and soapstone for the past five years:—

TALC AND SOAPSTONE STATISTICS, 1922-1926

Schedule	1922	1923	1924	1925	1926
Ground talc shipped*.....tons	12,874	9,531	10,718	13,678	14,882
Total value shipments.....$	178,397	125,124	130,577	174,116	178,986
Employees, mine and mill.....No.	46	57	40	51	50
Wages paid.....$	53,295	36,647	37,075	47,971	47,083

*Includes 17 tons soapstone in 1923, 64 tons in 1925, and 110 tons in 1926.

STRUCTURAL MATERIALS AND CLAY PRODUCTS

General Remarks

Apart from the statistics of structural materials collected from each operator and which in the aggregate reflect the actual conditions of the industry, there are other factors bearing on the subject, concerning which information is available. The Dominion Bureau of Statistics publishes prices of wholesale commodities, index numbers of employment, and building permits granted. Information as to contracts awarded is published monthly in *MacLean Building Review.*

During the past three years the index numbers of wholesale prices of building materials in general declined from 159.1 in 1924 to 153.7 in 1925 and 149.4 in 1926, based on 100 in 1913. The index number of employment in the building and construction industries declined from 136.9 in 1924 to 130.46 in 1925 and increased again to 134.8 in 1926, as compared with 100 for January, 1920.

Building permits in sixty-three Canadian cities in 1926 were valued at $156,386,607. Of this total thirty Ontario cities accounted for $65,373,757 or 41.8 per cent., as noted in the following table abstracted from *A Review of Building Permits in Canada during 1926*, issued by the Dominion Bureau of Statistics :—

BUILDING PERMITS IN ONTARIO, 1920-26

Year	30 Ontario Cities, Value	Toronto Metropolitan Area (*a*) Value	Material Prices Index No. (*b*)	Wages Index No. (*c*)
1920	$58,636,365	$30,049,413	214.9 (*d*)	180.9 (*d*)
1921	59,315,845	31,979,346	183.2	170.5
1922	81,396,259	36,405,625	162.2	162.5
1923	74,673,080	39,530,877	167.0	166.4
1924	57,330,141	29,636,428	159.1	169.1
1925	59,888,867	32,408,636	153.7	170.4
1926	65,373,757	31,588,124	149.4	172.1

(*a*) Includes East and North York municipalities.
(*b*) Applies to average weighted index numbers for Canadian wholesale prices of building materials on the basis of 1913 = 100, as compiled by the Dominion Bureau of Statistics.
(*c*) Average index number of wages in Canadian building trades as compiled by the Federal Department of Labour.
(*d*) Peak year.

The value of Canadian construction contracts awarded for 1926, reported by *MacLean Building Review*, was $372,947,900 as compared with $297,973,000 in 1925. Ontario contracts in 1926 amounted to $141,929,400. Building costs have been stable during the past few years, and material prices are considerably below the peak of 1920.

VALUE OF ONTARIO CONSTRUCTION CONTRACTS, 1922-1926

Classification	1922	1923	1924	1925	1926
Residential	$60,718,000	$55,879,000	$43,090,000	$47,529,600	$52,084,100
Business	39,611,000	34,904,000	27,706,000	32,579,800	38,808,200
Industrial	10,245,000	10,668,000	7,017,000	3,754,700	21,126,900
Engineering	56,054,000	54,701,000	58,228,000	37,381,000	29,910,200
Total	$166,628,000	$156,152,000	$136,041,000	$121,248,100	$141,929,400

Cement

During 1926 three cement mills owned and operated by two companies were active in Ontario, namely, the Belleville (No. 5) and Port Colborne (No. 8) plants of the Canada Cement Company, and St. Marys Cement Company at St. Marys. The Hanover Cement and Stone, Limited, at Hanover, was closed down in September, 1925, after having been purchased by the Canada Cement Company.

The sales showed a slight decline in quantity in 1926 although the number of wage earners and wages paid increased. The quarry operations gave employment to 90 men while the mills were operated by 674 employees. The three plants were active for a total of 1,072 days, or an average of 357 days each.

Details of the Ontario cement industry in the last pre-war year (1913) and subsequently are given in the following table:—

PORTLAND CEMENT STATISTICS, 1913-1926

Year	No. of Operating Plants	Average No. Employees	Wages	Stock on hand Dec. 31st bbls.	Sales		Average Price per bbl. (350 lb.)
					Barrels	Value	
			$			$	$
1913.....	13	1,382	955,729	450,213	3,802,321	4,105,455	1 08
1914.....	11	987	653,351	846,562	2,665,650	2,931,190	1 10
1915.....	7	692	425,170	755,799	2,302,242	2,534,537	1 10
1916.....	7	659	428,774	380,458	2,143,949	2,242,433	1 05
1917.....	6	589	538,355	567,261	2,063,231	2,934,271	1 42
1918.....	4	425	423,580	473,184	1,226,244	1,910,839	1 56
1919.....	5	647	722,029	278,188	2,022,575	3,659,720	1 81
1920.....	5	859	1,283,359	248,142	2,035,594	4,377,814	2 15
1921.....	5	883	1,228,460	174,686	2,723,072	6,425,266	2 37
1922.....	4	768	990,997	396,911	3,104,386	6,235,370	2 01
1923.....	4	852	1,084,711	452,378	3,296,428	5,855,590	1 77
1924.....	4	757	992,808	352,851	3,564,499	5,668,671	1 59
1925.....	4	700	921,643	339,541	3,462,358	5,253,911	1 52
1926.....	3	764	997,089	457,161	3,398,860	4,792,857	1 41

In the United States the factory price of hydraulic cements, per barrel of 380 pounds, averaged $1.77 in 1925 and $1.71 in 1926. It will be noted that the U.S. barrel is 8 per cent. larger than the Canadian, and when price comparisons are made this fact should not be overlooked.

Early in April the Canada Cement Company reduced the price of this commodity from $1.72 to $1.42 per barrel. A month later it made a further reduction to $1.15 per barrel. As a result, the profits of the company were slightly down. The annual report for the twelve months ending December 31, 1926, contained the following:—

> There was a reduction of about $122,000 in operating profits after writing off a depreciation of about $107,000 more than that of the calendar year 1925, and an increase of nearly three-quarters of a million in net working capital.

In the Province of Quebec the National Cement Company cut the price of cement ten to twenty cents per barrel in different localities. The Canada Cement Company, as mentioned above, met these reductions with the result of a general lowering in price to consumers.

Lime

The lime-burning industry in Ontario gave steady employment during the year to 414 men, who received $397,988 in wages. The largest item in manufacturing costs was that of fuel which included coal, gas and wood costing $396,128 during 1926.

The following table shows the lime statistics of the Province for the past five years:—

LIME STATISTICS, 1922-1926

Year	Lime Marketed or Used						Fuel Costs	Employees	Wages
	Hydrated			Quicklime					
	Tons	Total Value	Per Ton	Bush. (70 lbs.)	Value	Ave. Price per bush.			
		$	$		$	c.	$		$
1922..	36,408	455,980	12 52	3,939,954	1,311,563	33.3	312,825	425	408,731
1923..	41,727	519,840	12 46	4,810,421	1,373,823	28.5	556,321	542	549,613
1924..	35,989	438,607	12 19	4,391,050	1,401,545	31.9	394,195	396	402,295
1925..	41,610	477,585	11 47	5,115,882	1,566,540	30.6	375,220	409	436,867
1926..	39,217	457,978	11 68	5,402,261	1,593,468	29.5	396,128	414	397,988

Below are given the names of producers and the location of plants operated in 1926:—

LIME PRODUCERS, 1926

Name of Owner or Company	Location of Kilns	Head Office Address
Alabastine Co., Paris, The.....(*)	Elora and Teeswater.....	Paris.
American Cyanamid Co.....(†)	Niagara Falls.....	Niagara Falls.
Beachville White Lime Co., Ltd.....	Beachville.....	Beachville.
Biederman, Albert G.....	Golden Lake.....	Golden Lake.
Brunner Mond Canada, Limited...(†)	Anderdon tp., near Amherstburg.	Toronto, Bank of Commerce Building.
Cameron, W. M.....	Carleton Place.....	Carleton Place.
Chalmers Lime Works.....	Owen Sound.....	Owen Sound.
Christie, Henderson & Co., Limited..	Hespeler(*), Puslinch, Kelso.	Toronto, 201 Crown Office Building.
Canada Lime Co.....	Coboconk.....	Toronto, 26 Queen St. E.
Dominion Sugar Company.....(†)	Chatham, Wallaceburg and Kitchener.....	Chatham.
Gallagher Lime and Stone Co., Limited	Barton tp.....	Hamilton.
Harvey, E., Limited.....	Rockwood.....	Guelph.
Jamieson, J. M.....	Forester Falls.....	Forester Falls.
Jamieson Lime Co.....	Renfrew.....	Renfrew.
Kirkley, Harry.....	North Fredericksburgh....	Napanee.
Marshall, James.....	Barton tp.....	Hamilton.
Robertson Co., Limited, D.....	Nassagaweya tp.....	Toronto, 26 Queen St. E.
Standard White Lime Co., Limited...	Beachville, Guelph(*).....	Guelph.
Standard Chemical Company, Ltd...	Eganville(*).....	906 Drummond Bldg., Montreal, Que.
Toronto Brick Co., Limited.....	Coboconk.....	Toronto, 60 Victoria St.
Toronto Lime Co., Limited.....	Dolly Varden.....	Toronto, 26 Queen St. E.
Vogan, Samuel.....	Wiarton.....	Wiarton.
Weppler, Henry.....	Glenelg tp.....	Priceville, R.R. No. 2.

*Hydrated lime plants.
†Product used in manufacture of chemicals.

The small lime-kiln for burning quicklime for local use is rapidly disappearing and giving place to larger and more up-to-date plants, several of which are now equipped for the production of hydrated lime. During 1926, the production showed a slight increase. The major portion of the hydrated material, or 27,119 tons, was consumed by the building trades. Quicklime finds its largest market in chemical manufacturing. The consumption percentages of the total shipments during 1926, in order of importance, were as follows: Chemical works, 62.8; building trades, 15.5; dealers, 7.4; sugar refineries, 5.3; pulp and paper, 3.4; and the balance, or 5.6 per cent., by glassworks, tanneries, smelters and other consumer.

Sand-Lime Brick

Sand-lime brick for inside construction of buildings and also for foundations has been widely used during recent years, and has supplanted brick made from clay in many buildings, more particularly in Toronto and environs. An objection to this material, which is cheaper than clay brick, may be found in its application to walls subjected to dampness. Frequently a white powder or scum appears on the inside of foundation walls constructed of sand-lime brick. This is due to the crystallizing of hydrous sodium carbonate (Na_2CO_3) and also a trace of salt (NaCl). The scumming tendency may be largely overcome by quick drying which probably creates some chemical change in the constituents of the brick. Carbonates are soluble in water whereas sulphates in clay products and cement are not.

SAND-LIME BRICK PRODUCERS, 1926

Name of Company	Address	Location of Plant
*Caledon Brick Company, Limited..	240 Gilbert Ave., Toronto...	Toronto.
Canada Sand-Lime Pressed Brick Company, Ltd.	28 Symes Road, Toronto....	Toronto.
Don Valley Brick Works.....	114 Federal Bldg., Toronto..	Todmorden.
Harbour Brick Company, Ltd.....	408 Lumsden Bldg., Toronto.	Toronto.
Hinde Bros.....	134 Northlands Ave., Toronto	Toronto.
Leaside Brick and Sand Company, Ltd.	Wellington.	Leaside.
Shepard, Jas. G., and Company, Ltd.	Wellington.....	Wellington.
†Toronto Brick Company, Ltd.....	60 Victoria St., Toronto.....	Scarboro.
West Lake Brick and Products Company, Ltd.	Wellington.....	West Lake, Prince Edward Co.
Willcox Lake Brick Co., Ltd.....	Richmond Hill.....	Willcox Lake.
York Sandstone Brick Co., Ltd.....	Gerrard and Victoria Park Ave.	East Toronto.

*This company ceased operations in March, 1926.
†Swansea plant idle in 1926.

In 1926 the output of sand-lime brick was 46,869 M. worth $555,847 as against 66,506 M. valued at $820,893 in 1925. These figures include the value of the lime consumed in manufacturing. In Table I the value of the lime has been deducted, thereby eliminating all duplication. The following table gives statistics for the past five years, also comparative values of common clay brick:—

SAND-LIME BRICK STATISTICS, 1922-1926

Year	No. of operating plants	No. of wage-earners	Wages	Shipments				Average value per M. common clay brick
				M.	Total selling value	Average value per M.	Value, lime deducted	
1922	9	178	$222,579	48,449	$786,772	$16.24	.....	$17.09
1923	7	203	233,991	59,080	887,960	15.03	.....	16.77
1924	10	186	195,116	54,410	603,275	11.09	$512,361	16.94
1925	8	202	213,556	66,506	820,893	12.34	677,103	15 28
1926	8	178	171,747	46,869	555,847	11.86	461,376	15.18

Sand and Gravel

Although figures for sand and gravel production as given in Table 1 cover the output of the more important operators, it should be pointed out that because of the seasonal nature of the operations and lack of information many small operators of isolated pits have of necessity been omitted. During 1925 a total of 146 individuals and companies reported production of sand and gravel. In addition several companies were licensed to dredge some of the shoals and shore lines of the Great Lakes and Rivers. A considerable quantity of material was consumed also by the Highways Department and Northern Development Department on road construction. From the above sources there was produced in Ontario 4,899,580 tons worth $2,117,461 in 1926, as against 3,913,292 tons valued at $1,658,700 in 1925.

In compilation of provincial statistics of sand and gravel the material consumed by the railway companies in the Province has never been included for the reason that it is produced by the railways from their own pits and used by them as ballast, no sales having taken place. In the reports of the Dominion Bureau of Statistics this railway ballast is included as production, and this fact should be kept in mind in making any comparisons.

The output of sand and gravel during 1926 was as follows:

Schedule	Tons	Value
Private pit operators.....	2,728,198	$993,441
Recovered by Licensees from Great Lakes and Rivers.....	1,391,381	1,066,242
Northern Development Dept. (Roads).....	780,000	57,778
	4,899,580	$2,117,461

Following is a list of sand and gravel pit operators who marketed or used 1,000 cubic yards or more of these materials during the year:—

SAND AND GRAVEL OPERATORS, 1926.

Name of Owner or Company	Material G—Gravel S—Sand	Location of Deposits	Address
Adair, Dolson	S. and G.	Caledon tp., lot 24, con. V.	Caledon East.
Adelaide, Township of	G.	Adelaide tp., lot 3, con. V.	Arkona.
Armstrong Supply Co., Ltd.	G.	York St., Hamilton	Hamilton.
Ashton, Thos	S.	Victoria Park Ave	Toronto, 1354 Queen St. E.
Austin, H. B	S. and G.	Wellington co	Erin, Box 48.
Baxter, Jas	S. and G.	Dereham tp., lot 17, con. X.	
Bellyou, N. E	S. and G.	Murray tp., lot 6, con. I	Trenton, R.R. 4.
Benson & Patterson	S. and G.	Stamford	Stamford.
Bomberry, J. H	S. and G.	Dereham tp., lot 4, con. II.	Salford, R.R. 1.
Brantford, City of	S. and G.	Webster St., Brantford	Brantford.
Bruce, County of	S. and G.	Bruce county	Walkerton, Box 201.
Burrows, John	S. and G.	Widdifield tp	North Bay, 447 Klock Ave.
Cameron, Chas. M	S. and G.	Mosa tp., lot 3, con. I	Glencoe, R.R. 1.
Campbellford, Town of	S. and G.	Within town limits	Campbellford.
Caradoc, Township of	S. and G.	Caradoc tp., lot 24, 8 L.M.R.	Mt. Brydges.
Carleton, County of	S. and G.	{Lot 34, con. II, Osgoode. {Lot 22, con. I, N. Gower.	Ottawa.
Carroll Bros	S.	Humberstone tp., lots 3, 4, 5, 7, 8, 9, con. I.	Buffalo, N.Y., 490 Ellicott Square.
Cascadden, W. C	S. and G.	Elgin co., lot 22	Aylmer, R.R. 1.
Chatham, Wallaceburg, & Lake Erie Railway Co	S. and G.	Raleigh tp., lot 129, Talbot Rd.	Toronto, 43 Victoria St.
Circurca, Nicholas	S. and G.	Preston	Preston
Conlin, H. L	S. and G.	Scarboro	Toronto, 129 Front St. E.
Cudmore, Mrs. Alice	S. and G.	Usborne, lot 29, con. IV	Hensall, R.R. 1.
Cudmore, J. Walter	S. and G.	Howard, pt. lot 12	Thamesville, R.R. 6.
Dept. Public Highways	S. and G.	Various pits	Toronto.
Dereham, Township of	G.	Dereham tp., lot 22, con. VI.	Mount Elgin, R.R. 1.
Dibble, Wm. H	S. and G.	Zorra E., lot 17, con. VIII.	Woodstock, R.R. 7.
Dodds, Thos	S. and G.	McKillop tp., lot 31, con. VII.	Seaforth, R.R. 1.
Dominion Concrete Co., Ltd.	S.	South Gower tp	Kemptville.
Dowler Bros	S. and G.	Gloucester tp., 4th con., Rideau Front.	Billings Bridge.
Durham Stone & Sand Co	S. and G.	Durham	Toronto, 903 Reford Bldg.
Durr, L.A	S. and G.	McGillivray, lot 3, con. XIX.	Parkhill, R.R. 8.
Elgin County Highways	S. and G.	Elgin county	St. Thomas.
Ellins, W	S.	Etobicoke tp., lot 16, con. D.	Toronto, Scarlet Rd
Empire Limestone Co	S.	Sherkston	Buffalo, N.Y., 19 Hudson St.
Farris, Chas. S	S. and G.	Mosa tp., lot 1, con. I	Glencoe, R.R. 1.
Faulds, Morley	S. and G.	Southwold tp., lot 14, con. V.	Iona Sta., R.R. 4.
Ferguson, R. W	S. and G.	Leeds tp., E. ½ lot 7	Brockville, 72 Pearl St.
Fonthill, Village of	S. and G.	Thorold tp	Fonthill.
Foster, R. R	S.	Ottawa, Canal basin	Ottawa, 278 Echo Drive.
Frid Bros	S. and G.	Dundas Rd. and Macklin St.	Hamilton.
Fuller Gravel Co., Ltd	S. and G.	Fuller	Ivanhoe.
Gibson, James	S. and G.	Morris tp., lot 9, con. VI.	Walton, R.R. 3.
Godson Contracting Co	S. and G.	Brock tp., lot 12, con. IV.	Toronto, 203 Richmond St. W.
Guelph, City of	S. and G.	Guelph, Edinburgh Road	Guelph.
Halliburton, John, & Sons	S. and G.	Guelph tp., con. III	Guelph.
Halpenny, L. E	S. and G.	Arthur tp., lot 28, con. VI.	Arthur.
Harwich, Township of	S. and G.	Harwich tp	Blenheim.
Hewett, Herbert	S. and G.	Malahide tp	Aylmer, R.R. 4.
Hill, John D	S. and G.		Woodstock, R.R. 6.
Hoffman, Jos	S. and G.	Kitchener	Kitchener.
Huron, County of	S. and G.	Huron county	Goderich.

SAND AND GRAVEL OPERATORS, 1926—*Continued*

Name of Owner or Company	Material G—Gravel S—Sand	Location of Deposits	Address
Hydro-Electric Power Commission	S. and G.	Nipigon	Toronto.
Independent Concrete Pipe Co., Ltd.	S. and G.	Blandford and E. Zorra tps.	Woodstock.
Johnston, G. F	S.	Westminster tp., lot 21, con. V.	Wilton Grove, R.R. 2.
Kent, County of	S. and G.	Raleigh, Oxford, Harwich, Romney tps.	Chatham.
Keyes, S. W	S. and G.	E. Oxford tp., lots 16, 17, con. XI.	Woodstock, R.R. 8.
Kilbourne, H	S.	Westminster tp., Wharncliffe Rd.	London, 145½ Wharncliffe Road.
Kingston Sand & Gravel Co.	S.	Kingston tp	Kingston, 183 William St.
Lambton, County of	S. and G.	Enniskillen tp., lot 9, con. XIII.	Sarnia.
LeViness, J. E	S.	Stamford	Niagara Falls, R.R. 3.
Lewis, Geo. A	S. and G.		Ailsa Craig.
Lock, Thos	S. and G.	W. Nissouri tp., lot 18, con. II.	Thorndale.
Lovelace, Edwin J	S.	Pelham tp., lots 6, 7, con. VIII, IX.	St. Catharines, 1 York St.
McAndless, W. E	S. and G.	London tp., lot 24, con. X	Ilderton.
McArthur, Estate of John and K. M.	S. and G.	E. Williams tp., lot 21, con. XVIII.	Ailsa Craig.
McArthur Engineering & Construction Co., Ltd.	S. and G.	Guelph, lots 3, 21, 22, Div. A.	Guelph, 15 Douglas St.
McAuley, P. L	S. and G.	Murray tp., lot 5, con. I	Trenton.
McColl Bros	S. and G.	Aldborough tp., lot 3, con. VI	Rodney, R.R. 1.
Malahide, Township of	S. and G.	Malahide tp., lot 21, con. VI.	Aylmer.
Manning, Frank	S. and G.	S. Norwich, con. XI	Otterville.
Maple Sand, Gravel & Brick Co., Ltd.	S. and G.	Vaughan tp	Toronto, 454 King St. W.
Middlesex, County of	S. and G.	Various pits	London.
Mohawk Sand & Gravel Co.	S. and G.	Brantford tp	Brantford, Box 336.
Murray, J. J	S. and G.	Stamford	Niagara Falls, 1382 Bridge St.
Nevill, Thos., & Son	S. and G.	Malahide tp., lot 7, con. V	Aylmer, R.R. 5.
Northumberland and Durham, United Counties of.	S. and G.	Several pits	Cobourg.
Oxford West, Township of	S. and G.	W. Oxford tp	Woodstock, R.R. 1.
Park, John S	S. and G.	Biddulph tp., lot 30, con. II.	Lucan.
Parry Sound, Town of	S. and G.		Parry Sound.
Pelton, Edgar	S. and G.	Zorra W., lot 20, con. III	Embro, R.R. 1.
Peterborough, City of	G.	Cor. Rogers and Wilson Sts.	Peterborough, 133 Simcoe St.
Ponsford Estate, A. E	S. and G.	Yarmouth tp., lot 1, con. VII	St. Thomas, 605 Talbot St.
Putherbough, John	S. and G.	London	London.
Quick, Chas. R	S. and G.	London, Manor Park	London, 101 Briscoe St.
Quigley, B. C	S.	Saltfleet tp	Hamilton.
Quinn, H. A	S. and G.		Peterborough, R.R. 9.
Ratcliffe, Ltd., E. B	G.	Barton tp., lot 1, con. III	Bartonville.
Rivers, G. Russ	S. and G.	Adelaide	Watford.
Robinson, W. J	S. and G.	Stephen, lot 4, con. III	Crediton, R.R. 1.
Rogers, W. T	S. and G.	Toronto tp., lot 1, con. I	Toronto, 510 Lumsden Bldg.
Sacred Heart College	S. and G.	McKim tp., lot 5, con. IV	Sudbury, Box 1360.
Sand & Supplies, Ltd	S.	N. Dumfries tp	Toronto, 54 University Ave.
Sarjeant Co., Ltd., The	S. and G.	Barrie	Barrie, Box 88.
Seebach, Ed	S. and G.	Ellice tp., lot 8, con. IV	Sebringville, R.R. 1.
Shannon, H. M	S. and G.	Richmond tp., lot 6, con. III.	Napanee, R.R. 5.
Shier, S. R	S. and G.	Usborne tp., lot 14, con. XV.	Kirkton.
Skinner, R	S. and G.	Usborne tp., lot 11, con. V	Exeter, Box 81.

SAND AND GRAVEL OPERATORS, 1926—*Continued*

Name of Owner or Company	Material G—Gravel S—Sand	Location of Deposits	Address
Smythe, Ltd., C.	S.	Etobicoke tp.	Toronto, 477 Runnymede Road.
Spratt, J. A.	S. and G.	Gloucester tp.	Billings Bridge.
Standard Paving, Ltd.	S. and G.	Preston, Hamilton St.	Kitchener, 107 David St.
Stewart, Fenwick	S. and G.	Stanley tp., lot 23, con. IV.	Clinton, R.R. 5.
Stewart, R. T.	S. and G.	Sudbury	Sudbury, 116 Cedar St.
Sutherland, Hugh A.	S. and G.	W. Zorra tp., lot 6, con. II.	Embro, R.R. 4.
Tack, Henry	S.	London tp.	London, P.O. Sub. 1.
Thomson, Geo.	S.	Widdifield tp.	North Bay, 191 Cassels St.
Tuckersmith, Township of.	S. and G.	Tuckersmith, lot 26, con. IV.	Seaforth.
Turner, J. T.	S. and G.	Stanley tp.	Brussels, R.R. 3.
Van Alstine, C.	S. and G.	Trenton	Trenton, Box 538
Wellington, County of	S. and G.	W. Luther, W. Garafraxa and Maryborough tps.	Guelph, Box 258.
White, Homer, & Co.	S. and G.	Hallowell tp.	Picton, Spring St.
Wilks, Geo.	S.	Woodstock	Woodstock.
Willcox, Hervey	S.	Stamford tp., lots 4, 17	Niagara Falls, 985 Bridge St.
Wilson & Quinn	S. and G.	W. Garafraxa tp.	Fergus.
Wilson, M.	S. and G.	Vaughan tp., lot 25, con. IV.	Maple, R.R. 1.
Windsor Sand & Gravel Co.	S. and G.	Leamington	Walkerville.
Woodhull, F. M.	S. and G.	Delaware tp., lot B, con. III.	Lambeth, R.R. 2.
Wright & Co.	S.	Korah, sec. XIII	Sault Ste. Marie.
Yarmouth, Township of	S. and G.	Yarmouth tp., lot 8, con. V.	St. Thomas.

Stone

The production of stone, limestone, sandstone, trap and granite during 1926 was 3,627,971 tons worth $3,258,168 as against 3,023,594 tons valued at $2,817,335 during the previous year. The increases reflect the general improvement in the construction industry throughout the Province. The number of employees rose from 1,170 to 1,400 during the period while wages paid increased from $788,972 to $990,008.

The following table shows the valuation of the several kinds of stone used or marketed during the past five years:—

VALUE OF STONE PRODUCTION, 1922-1926

Year	Limestone	Sandstone	Trap	Granite	Total
	$	$	$	$	$
1922	2,547,485	9,454	167,630	245,357	2,969,926
1923	2,552,555	23,378	149,746	143,549	2,869,228
1924	2,551,291	30,038	133,743	74,296	2,789,368
1925	2,530,623	44,562	154,107	88,043	2,817,335
1926	2,908,520	41,892	212,613	95,143	3,258,168

During the past decade there has been a growing demand for special grades of broken stone in the manufacture of artificial wares and for stucco, dash, poultry grit, etc., using as raw material white dolomite, calcite and feldspar. An incomplete survey showed that a total of 3,524 tons worth $14,405 were

consumed, and which, for compilation purposes, are included with limestone in the table above.

The figures of output during 1926 by varieties were: Limestone, 3,243,978 tons—$2,894,115; sandstone, 8,656 tons—$41,892; trap, 331,429 tons—$212,613; granite, 40,384 tons—$95,143, and miscellaneous, 3,524 tons, worth $14,405.

Both high calcium and dolomitic limestones are to-day becoming valuable for an increasing variety of purposes, for example, in the paper industry pure limestone is required for the sulphate process, and dolomite for sulphite mills. Ground dolomite is used also in the manufacture of artificial stone in order to give the surface a glistening effect more or less similar to natural dressed stone. The term "granite" in the table includes crude monumental and building blocks, also paving blocks. The major portion of the limestone now consumed in Ontario goes into the construction of improved motor highways. Limestone was marketed as follows: Crude building and ornamental blocks 25,543 tons, $131,409; fluxing 212,150 tons, $189,715; for the manufacture of chemicals 5,043 tons, $2,882; rubble and rip-rap 134,220 tons, $100,528; and as crushed stone for roads and concrete 2,867,022 tons, $2,469,581.

The following stone quarries were operated in 1926:—

SANDSTONE

Name of Owner, Firm or Company	Location	Address
Robertson & Company, Ltd., D.	Nassagaweya tp.	Toronto, 26 Queen St. E.
Rogers & Company, Ltd., F.	Glen Williams	Toronto, 1181-1189 Queen St. W.

TRAP

Name of Owner, Firm or Company	Location	Address
Chisholm Construction Company	Field stone from farms	Cornwall.
Fort William, City of	Rifle Range	Fort William.
Mond Nickel Company, Ltd.	Coniston	Coniston.
Mountain Stone Company, Ltd.	Mount McKay, Mission	Port Arthur, Room 9, Bank of Hamilton Bldg.
Ontario Rock Company, Ltd.	Belmont and Methuen tps., near Havelock.	Toronto, 410 Crown Office Bldg.
Parker, A. H.	Lansdowne tp., lot 19, con. II.	Cornwall, 408 First St. E.
Wilford, F. R., and Company, Ltd.	Matilda tp., con. I (field stone).	Lindsay, P.O. Box 119.

GRANITE

Name of Owner, Firm or Company	Location	Address
Edgar Irvine Company, Ltd.	Gananoque	Alexandria.
Gordon Granite Company	Gananoque	Toronto, 18 Toronto St.
Hall, R. Reece	McDougall tp.	Parry Sound.
Horne, Wm.	Butler	Winnipeg, 377 Balmoral St.
Morrison, Wm.	Coehill	Coehill.
Pembroke, Town of	Alice tp., lot 25, range A.	Pembroke, Town Engineer.
Streets & O'Brien	Gananoque	Toronto, 47 Yonge St.

LIMESTONE

Name of Owner, Firm or Company	Location	Address
Barton, Municipality of	Barton tp	Hamilton, Court House.
Beachville White Lime Co., Ltd	Beachville	Beachville.
Bolender Bros	Haliburton	Haliburton.
Bourgie, J. B	Russell tp	Embrun.
Brule & Sons, E. D	Hogs Back	Billings Bridge.
Canada Cement Company, Ltd	Belleville and PortColborne	Montreal, Box 290, Station B.
Canada Crushed Stone Corp'n., Ltd.	West Flamboro tp	Hamilton, Sun Life Bldg.
Carleton, County of	Gloucester tp	Ottawa, Court House.
Cloutier, Grenon	Casselman	Casselman.
Cook & Son, J. S	Amabel tp	Wiarton.
Dorchester N., Township of	North Dorchester tp	Dorchester.
Ellen Cortnell, Estate of	Thorold	Thorold.
Farmer & Sons, Geo	Gloucester tp	Ottawa, 45 Bertrand Ave.
Farr, Mrs. L. G	Haileybury	Haileybury.
Foster, R. R	Merivale Road	Ottawa, 278 Echo Drive.
Gallagher Lime & Stone Co., The	Barton tp	Hamilton, Upper James St.
Galt, City of	North Dumfries tp	Galt, City Hall.
Gordon Crushed Stone Co., Ltd., The	Hagersville	Toronto, 137 Confederation Life Bldg.
Gow, James	Fergus	Fergus.
Grant Bros. Construction Co., Ltd.	Cardinal	Ottawa, 18 Rideau St.
Grenville Crushed Rock Co	Oxford tp	Merrickville.
Hagersville Contracting Co., Ltd	Walpole tp	Hagersville.
Hagersville Quarries, Ltd	Walpole tp	St. Thomas, 4 Flora St.
Humberstone, Tp. of	Humberstone tp	Humberstone, R.R. 1.
Hydro-Electric Power Commission	Stamford tp	Toronto, 190 University Ave.
Holmes, F. T	Mallorytown	Kemptville.
Innerkip, Village of	East Zorra tp	Innerkip, Box 218.
Keeling, James	Owen Sound	Owen Sound, 16th St. E.
Kingdon Mining Smelting & Mfg Co.	Galetta	Montreal, 314 Beaver Hall Hill.
Kingston Penitentiary	Portsmouth	Portsmouth.
Kirkfield Crushed Stone, Ltd	Kirkfield	Toronto, 136 Confederation Life Bldg.
Langton, Thos	Medonte tp	Coldwater.
Law Construction Company, Ltd	Bertie tp	Toronto, 625 Confederation Life Bldg.
Lincoln, County of	Clinton tp., lot 8, con. V.	St. Catharines.
Longford Quarry Company, Ltd., The	Rama tp	Orillia, 6 Peter St.
Markus, Ltd., William	Pembroke tp	Pembroke.
McDonell, Dibblee & Covey	Richmond and Wendover	Montreal, 26 Victoria Sq.
McKay, Alex., Company, Ltd	Owen Sound	Toronto, 2 Browns Ave.
McDonald, A. N	Oakville, (L. Ontario)	Bronte.
McGinnis and O'Connor	Rossmore and Cataraqui	Kingston.
McLean and Stidwell	Yonge tp	Cornwall.
Milligan, F	Iroquois	Iroquois.
Oliver Rogers Stone Company, Ltd.	Owen Sound	Owen Sound, 841 4th Ave. E.
Ontario Stone Corporation, Ltd	North Orillia tp	Toronto, 611 Excelsior Life Bldg
Perkins, Geo. A	Owen Sound	Owen Sound.
Pirson, John	Grantham tp	Stevensville.
Provincial Secretary, Dept. of	Guelph tp	Toronto, Parliament Bldgs.
Queenston Quarries, Ltd	Niagara tp	St. Davids.
Quinlan, Robertson & Janin, Ltd	Crookston	Montreal, 50 Notre Dame St.W.
Quinton & Brundige	West of Brockville	Jasper.
Robertson & Co., Ltd., D	Nassagaweya tp	Toronto, 201 Crown Office Bldg.
Robillard & Son, H	Gloucester tp	Ottawa, 195 Nicholas St.
Roddy, J. M	Kingston	Kingston, 293 Division St.
Routley, H. T	Georgetown, Jarvis and Kincardine	Toronto, 9 Richmond E.
Standard White Lime Company, Ltd.	Beachville	Guelph, 15 Douglas St.
Stormont, Dundas and Glengarry United Counties of.	Finch tp	Cornwall, County Bldg.
St. Marys Crushed Stone Company, Ltd.	St. Marys	Toronto, Bathurst St.
Thompson, W. G	Orillia	Orillia.

LIMESTONE—*Continued*

Name of Owner, Firm or Company	Location	Address
Walker Bros.	Stamford tp.	Thorold.
Webber, John	Dunn Street, Tract 22.	Dunnville.
Welland County Roads	Humberstone tp.	Welland, Box 456.
Welland Ship Canal	Lincoln and Welland cos.	St. Catharines.
Wentworth, County of	Barton and Binbrook tps.	Hamilton, Court House.
Wentworth Quarries, Ltd	Saltfleet tp.	Vinemount.
Windmill Point Crushed Stone Co.	Bertie tp.	Toronto, 625 Confederation Life Bldg.
Winnipeg Roofing Company, Ltd.	Silver Mountain, Thunder Bay district.	St. Boniface, Man.

Clay Products

Brick and Tile.—Under a new classification, adopted in 1924 after consultation with the Canadian National Clay Products Association, it is possible to publish figures showing much greater detail than heretofore as to the kinds of brick produced by different processes of manufacture. Formerly the data on bricks differentiated between kinds only, and no statistics were available relating to "stiff" or "soft-mud" processes or to "dry-press."

Pottery and Porcelain.—The output of rough pottery in the form of flower pots from Toronto, Hamilton and London during 1926 totalled 5,910,000, with a selling value of $87,600 as against 6,200,000 worth $86,000 in 1925. Glazed ware and insulators are also produced in Ontario by five companies, while four firms produced enamelled steel articles and two firms produce enamelled parts in stove production. Considerable quantities of ball clay, china clay, ground barytes, feldspar, quartz, flint and whiting, much of which is imported, is consumed by these manufacturing industries. Ball clay, china clay and whiting come mainly from Cornwall, England.

The Ontario Potteries Company, of Oshawa, the first whiteware pottery firm in Canada, operated in 1924 but closed down during the following year. China clay from England, ball clay from southern Saskatchewan, and Ontario flint and feldspar are the raw materials used. Another company, under the name of Smith Potteries, operated during 1926, but the output was small in value. The porcelain insulator industry, which has of late years grown in importance, depends largely on imported raw materials. Plants are located at Hamilton, Niagara Falls, Peterborough and Georgetown.

In the 1924 report of mineral production[1], mention was made of a deposit of fireclay and china clay located on the east bank of the Mattagami river immediately below Long rapids, which is fifty-five miles due north of Moonbeam station on the National Transcontinental railway. The deposit may be reached by a thirty-four mile winter road from the terminus of the T. and N.O. railway at Oil Can Portage, on the Abitibi river, and some of this material will doubtless be used when transportation improves.

Sewer Pipe.—Production of this variety of clay product is carried on by three companies in Ontario, with plants at Hamilton, Mimico and Swansea. The total sales value during 1926 amounted to $835,206, as against $893,443 during the previous year. All shapes and sizes were manufactured and the clay

[1]Ont. Dept. of Mines, Vol. XXXIV, pt. 1, p. 37.

used was a special variety located at Aldershot, near Hamilton. Much of the product of these operations is disposed of by a selling agency in Toronto organized for that purpose, the Toronto Sewer Pipe Company, for which a charter was granted in 1920.

The following table shows in detail the quantities and values of the several kinds of clay products made and sold in Ontario:—

CLAY PRODUCTS MARKETED, 1926

Kind	Number or Quantity	Value
		$
Brick—Soft, mud process {Face	20,389,328	359,544
Brick—Soft, mud process {Common	35,474,027	522,803
Stiff-mud (wire cut) process {Face	76,078,181	1,537,450
Stiff-mud (wire cut) process {Common	12,109,670	206,242
Dry-press {Face	26,461,287	539,854
Dry-press {Common	3,054,593	39,689
Fancy or ornamental brick (including special shapes, embossed and enamelled brick)	373,641	20,047
Sewer	6,397,029	111,620
Tile, structural: Hollow blocks (including fireproofing and load-bearing tile)...tons	76,794	710,595
Roofing tile...no.	17,018	1,562
Floor tile (quarries)...sq. feet	195,011	43,854
Tile, drain...no.	12,788,036	340,403
Sewer pipe (including copings, flue linings, etc.)...tons	48,176	835,206
Pottery—From domestic clay...no.	5,910,000	87,600
Total Value	.....	5,356,469

The value of clay products marketed for the last pre-war year (1913) and subsequently are given below:—

VALUE OF CLAY PRODUCTS SOLD OR USED, 1913-26

Year	Brick		Pottery	Drain Tile	Sewer Pipe	Total
	Common	Pressed, Fancy, Building Tile, etc.				
	$	$	$	$	$	$
1913	3,283,894	1,162,860	52,875	292,767	600,297	5,392,693
1914	2,336,207	894,381	25,720	277,530	571,750	4,165,597
1915	763,591	375,865	49,387	321,253	361,283	1,871,376
1916	509,559	495,895	87,025	275,471	216,749	1,584,699
1917	713,824	776,302	94,501	546,040	379,923	2,509,590
1918	665,454	592,286	88,275	309,899	362,536	2,018,450
1919	1,966,711	726,500	119,551	354,700	609,100	3,776,562
1920	2,209,265	1,178,656	127,049	359,373	860,811	4,735,154
1921	2,025,643	2,059,606	69,984	397,104	939,463	5,094,696
1922	2,614,120	2,899,205	88,889	368,180	973,824	6,944,218
1923	2,008,614	2,973,006	78,000	283,662	925,858	*6,270,615
1924	944,892	2,883,566	84,100	373,980	851,327	5,137,865
1925	733,693	3,074,780	86,000	360,710	893,443	5,148,626
1926	768,734	3,324,526	87,600	340,403	835,206	5,356,469

*Includes $1,475 worth of silica cement.

SEWER PIPE AND POTTERY WORKS, 1926

Name of Company	Location of Plant and P.O. Address of Manager, etc.
SEWER PIPE	
Dominion Sewer Pipe and Clay Industries, Ltd	Swansea and Aldershot.
Hamilton & Toronto Sewer Pipe Co., Ltd	Hamilton.
Ontario Sewer Pipe & Clay Products, Ltd	Mimico.
POTTERY	
Davis & Son, John	601 Merton St., Toronto.
Foster Pottery Company	Main St. West, Hamilton.
Ferguson, A. W	794 Nelson St., London

BRICK AND TILE PLANTS, 1926

Name	Address	Product
Alvinston, Brick & Tile Co., Ltd	Alvinston, Box 26	Brick and tile.
Bannerman, Geo	Greenock, R.R. No. 1	Brick and tile.
Barnhardt, W. H	Stratford	Brick and tile.
Bartonville Pressed Brick Co., Ltd	Hamilton, 620 Lister Block	Brick.
Batchelor, Samuel	Proton Station	Brick and tile.
Bechtel Brick Co., Ltd., The	Waterloo	Brick.
Booth Brick & Lumber Company	New Toronto	Brick.
Brampton Pressed Brick Co., Ltd	Brampton	Brick.
Broadwell & Son, B	Kingsville, Box 137	Brick and tile.
Caledon Mountain Shale Products	Toronto, 600 Bay Street	Brick.
Campbell, Neil F	West Lorne, R.R. No. 1	Brick and tile.
Canadian Fireclay Products	Toronto, 60½ Adelaide St. East.	Tile.
Canadian Pressed Brick Co., Ltd	Hamilton, 63 Ottawa St. S.	Brick.
Cheeseman, Peter	Hamilton, 670 King St. W.	Brick.
Cooksville Shale Brick Co., Ltd	Toronto, 26 Queen St. E.	Brick and blocks.
Cooper, W. H	Hamilton, 312 Clyde Block	Brick.
Cornhill Sons, Ltd., James	Chatham, Grand Ave.	Brick.
Crang, Jethro	Toronto, 22 Thorne Cres.	Brick.
Crawford Bros	Hamilton, 451 King St. W	Brick.
Curtin, Frank	Lindsay, R.R. No. 4	Brick.
Curtis Bros	Peterborough, Box 809	Brick and tile.
Dalton, M	Dresden, R.R. No. 3	Tile
DeLaplante & Co., J. E	Coleman	Brick.
Deller & Son, Albert	Brownsville	Tile.
Deller Bros	Norwich, R.R. No. 2	Brick, blocks and tile.
Deller, Wm. H	Thorndale, R.R. No. 4	Brick and tile.
Dochart Brick, Tile and Terra Cotta Works	Arnprior	Brick and tile.
Dolan, John	Watford, R.R. No. 2	Tile.
Dominion Sewer Pipe and Clay Industries	Swansea	Brick special forms.
Donaldson, S. E	Harriston, R.R. No. 4	Tile.
Don Valley Brick Works, Ltd., The	Toronto, 114 Federal Bldg.	Brick and blocks.
Douglas Bros	Wilkesport	Tile.
Elliott, Chas	Bluevale	Brick and tile.
Elliott, Jas., Jr	Sault Ste. Marie	Brick.
Elliott, Wm	Glenannan	Brick and tile.
Fort William Brick Co	Fort William, 509 Victoria Avenue.	Brick.
Frid Bros	Hamilton, Dundas Rd. and Macklin St.	Brick.
Gammage, C. R	Dresden	Tile.
Gardiner, Wm	Blenheim	Brick and tile
Godfrey & Co., Thos	Carleton Place	Brick.
Grimsby Brick & Tile Co	Grimsby	Brick.
Hallatt & Son, H	Comber	Brick and tile.
Hallatt, Wm., Clay Products	Chatham, 4 Richards Block	Tile.

BRICK AND TILE PLANTS, 1926—*Continued*

Name	Address	Product
Halton Brick Co., Ltd	Toronto, 28 Symes Rd	Brick
Hamilton Pressed Brick Co., Ltd	Hamilton, Kensington Ave. South.	Brick.
Hill, Aaron	Essex	Brick and tile.
Hill, A. W	Coatsworth, R.R. No. 1	Brick, blocks and tile.
Hircock Bros	Bowmanville	Brick.
Hitch, D. A	Ridgetown, Box 236	Blocks and tile.
Hitch, Thos	St. Thomas, Box 254	Brick, blocks and tile.
Hodder, Mrs. Jos. H., and Sons	Dutton	Tile.
Houston Co., Ltd., The	Tweed	Brick.
Howlett & Sons, Fred	Petrolia, Box 3	Brick, blocks and tile.
Huntsville Brick & Tile Works	Huntsville, Box 308	Brick and tile.
Interprovincial Brick Co., Ltd	Toronto, 30 Toronto St	Brick.
Jackson, W. B	Brantford, 290 Rawdon St.	Brick and tile.
Jamieson Lime Co	Renfrew	Brick and tile.
Janes, D. A	Mt. Brydges	Brick and tile.
Jasperson, B	Kingsville	Brick and tile.
Jervis, N. J	Dorchester, R.R. No. 3	Brick and tile.
Johnston, Jas	Pembroke, R.R. No. 3	Brick.
Kerr, Chas	Goderich, R.R. No. 4	Brick and tile.
Koebel Bros	St. Clements, Box 54	Brick and tile.
Kruse Bros	Seaforth, R.R. No. 3	Brick and tile.
Labey & Son, Geo. A	Foxboro	Tile.
Lindsay, Earl	Wallaceburg, R.R. No. 2	Tile.
Marsters, Wm. P	Port Rowan	Brick and tile.
Martin, Thos. E	Thamesville, R.R. No. 4	Brick and tile.
McComb, Chester	Denfield, R.R. No. 2	Brick and tile.
McCormick Bros	Watford, R.R. No. 5	Brick and tile.
McEachern and Sons, N	Highgate	Brick and tile.
McIvor Bros	Cobourg, Box 636	Brick.
McMahon, Robert	Kerwood, R.R. No. 2	Tile.
Merkley's, Ltd	Ottawa, 53 Queen St	Brick, blocks and tile.
Middleton, Chas	Wyoming	Tile.
Milton Pressed Brick, Ltd	Milton	Brick.
Miner, M. F	Kingsville	Tile.
Moscow Brick & Tile Works	Greenock, R.R. No. 1	Brick and tile.
Napanee Brick & Tile Works (J. Chapman)	Napanee, R.R. No. 3	Brick and tile.
National Fire Proofing Co., Ltd	Toronto, 601 Dominion Bank Bldg.	Blocks and tile.
O'Dell & Sons, Wm	Ingersoll, R.R. No. 1	Brick and tile.
Ollman Bros	Hamilton, 111 Macklin St.	Brick.
Ontario Denison Tile Co., Ltd	Windsor, 24 Wyandotte St.	Brick and tile.
Ontario Government (Department of Prov. Secretary).	Toronto (Mimico plant)	Brick, blocks and tile.
O'Reilly, T. E	Ottawa, 320 Bay St	Brick.
Ott Brick & Tile Mfg Co., The	Kitchener, 33 King St. E	Brick and tile.
Ottawa Brick Mfg. Co., Ltd., The	Ottawa, 53 Queen St	Brick.
Owen Sound Brick Co., Ltd., The	Owen Sound	Brick.
Parks, H. W	Dresden, R.R. No. 2	Tile.
Paxton, Fred R	St. Catharines, 242 Queenston St.	Brick.
Pembroke Brick Co., The	Pembroke	Brick.
Phillips & Son, Thos	Lucknow, R.R. No. 2	Brick and tile.
Phippen & Field	Toronto, 150 Dawes Rd	Brick.
Phinn Bros	London, 238 Briscoe St	Brick, blocks and tile.
Piggot & Co., Geo	Toronto, 72 Guestville Ave.	Brick.
Port Rowan Brick & Tile Co	Port Rowan	Brick, blocks and tile.
Price & Cumming	Toronto, 58 Wellington St. East.	Brick.
Price & Smith	Toronto, 458 Greenwood Ave.	Brick.
Richardson & Son, J	Kerwood	Brick and tile.
Riselay Brick Co., Ltd	Hamilton, Main St. W	Brick.
Russell, Jos	Toronto, 40 Blake St	Brick.
Sadler, Frederick L	Dublin	Brick and tile.
Shale Products, Ltd	Inglewood	Brick.

BRICK AND TILE PLANTS, 1926—*Continued*

Name	Address	Product
Smith, Alex, & Son	Dutton, R.R. No. 2	Brick and tile.
Snelgrove, Andrew	Beaverton	Brick and tile.
Sproat, William M	Seaforth, R.R. No. 4	Tile.
Sun Brick Co., Ltd	Toronto, 1104 Bay St.	Tile.
Sutherland, W. A	Parkhill, Box 293	Brick and tile.
Standard Brick Company, Ltd	Toronto, 363 Broadview Ave.	Brick.
Staples Brick and Tile Co., Ltd	Staples	Brick and tile.
Stratford Brick, Tile & Lumber Co	Stratford	Brick and tile.
Steele, Edwin	Vankleek Hill	Brick.
Streetsville Brick Co., Ltd., The	Toronto, 26 Queen St. E.	Brick.
Stroh, M. C	Conestogo	Brick and tile.
Superior Brick & Tile Co., Ltd	Fort William	Brick and tile.
Tope, Richard, Estate of	Hamilton, 171 Queen St. S.	Brick.
Toronto Brick Company, Ltd	Toronto, 60 Victoria St.	Brick.
Voakes and Son, D	Ruscomb	Brick and tile.
Wagstaff, Albert H	Toronto, 348 Greenwood Ave.	Brick.
Wagstaff, Charles	Lindsay, R.R. No. 4	Brick and tile.
Wallace & Son, R	North Bay, 66 First Ave. E.	Brick.
Wein, Aaron	Crediton	Brick and tile.
Winch Bros	Paisley	Tile.
Windsor Brick & Tile Co	Windsor, Exchange Bldg.	Brick, blocks and tile.
Woodslee Brick & Tile Co	Woodslee	Brick and tile.
Wright & Sons, Geo	Comber, Box 56	Tile.

Mining Company Incorporations

A summary of mining companies incorporated and licensed in Ontario for the last pre-war year and subsequently is given hereunder—

ONTARIO MINING COMPANIES INCORPORATED AND LICENSED, 1913-1926

Year	Incorporated			Extra-Provincial Companies Licensed	
	No.	Nominal Capital	"No Par" Shares	No.	Capital for use in Ontario
		$			$
1913	119	78,000,000	.....	12	21,735,000
1914	80	39,030,000	.....	13	5,445,000
1915	59	42,005,000	.....	2	10,200,000
1916	83	109,079,500	.....	8	7,011,650
1917	100	117,183,000	.....	7	7,202,000
1918	59	49,800,000	.....	7	15,000,000
1919	149	223,600,000	.....	10	9,554,197
1920	119	146,094,000	.....	12	9,435,000
1921	67	105,715,000	.....	6	1,030,000
1922	91	181,040,000	.....	6	830,500
1923	88	179,295,500	.....	6	1,775,000
1924	85	156,485,000	.....	2	200,000
1925	70	107,400,000	9,010,000	3	162,510
1926	145	165,655,750	22,386,500	6	4,850,000

Under the provisions of the Ontario Companies Act, companies of extra-provincial incorporation are required to take out a license in Ontario and stipulate the amount of capital used in connection with mining enterprises where the land is situate within the Province.

MINING COMPANIES WITH SPECIFIED CAPITAL INCORPORATED IN ONTARIO IN 1926

Name of Company	Head Office	Date of Incorporation	Capital
Andargo Mines Corporation, Ltd	Toronto	Nov. 24	$2,000,000
Bagamac Rouyn Mines, Ltd	Haileybury	Dec. 18	4,000,000
Baldwin-Kirkland Gold Mines, Ltd	Toronto	July 28	5,000,000
Beardmore Gold Mines, Ltd	Toronto	Nov. 17	5,000,000
Bellevue Mines, Ltd	Toronto	Dec. 28	1,000,000
Berry Kirkland Mines, Ltd	Toronto	Apr. 7	150,000
Big Lake Mining Corporation, Ltd	Toronto	Dec. 7	50,000
Blue Lake Sand & Gravel, Ltd	Toronto	June 17	50,000
B. I. Mining Company, Ltd	Toronto	July 16	2,000,000
Bourke-Red Lake Mining Development Co., Ltd.	Montreal	July 9	3,000,000
British American Fuel Corporation, Ltd	Toronto	Oct. 26	*200,000
British Red Lake Mines, Ltd	Toronto	July 6	300,000
Cabot Development Corporation, Ltd	Toronto	Dec. 18	40,000
Consolidated Feldspar Mines, Ltd	Toronto	Feb. 11	100,000
Cooper Gold Mines, Ltd	Toronto	Feb. 11	2,000,000
Commodore Mines, Ltd	Toronto	Oct. 1	40,000
Coulson Gold Mines, Ltd	Toronto	Dec. 22	100,000
Crown Reserve Consolidated Mines, Ltd	Toronto	July 17	3,000,000
Crucible Graphite Company, Ltd	Toronto	Jan. 13	*400,000
Darling Gold Mines, Ltd	Uxbridge	June 28	150,000
Demel Mines, Ltd	Toronto	June 11	40,000
Diarch Silver Mines, Ltd	Haileybury	Sept. 16	1,500,000
DeSantis Development Company, Ltd	Timmins	Dec. 28	40,000
Douglas Fuel Company, Ltd	Windsor	Dec. 8	40,000
Eldorado Gold Mines, Ltd	Toronto	Feb. 10	3,000,000
Enright Mining Company, Ltd	Elk Lake	May 3	3,000,000
Essex Oil Fields, Ltd	Toronto	Apr. 17	60,000
Farrell Lorrain Mines, Ltd	Toronto	Feb. 17	2,000,000
Farrell Rouyn Mines, Ltd	Toronto	Apr. 27	2,000,000
Farquhar Mines, Ltd	Sault Ste. Marie	May 7	40,000
Ferguson-Lorrain Mines, Ltd	Haileybury	Aug. 6	2,000,000
Finch-Canadian Petroleums, Ltd	Windsor	Jan. 19	500,000
Fisher Quebec Gold Mines, Ltd	Toronto	Nov. 2	3,000,000
Forbes Galena Mines, Ltd	Kingston	Jan. 15	*150,000
Friday Mines, Ltd	Timagami	May 26	2,000,000
Golden Eagle Mining Company, Ltd	Windsor	July 12	1,000,000
Gold Ridge Mining Company, Ltd	Port Arthur	Mar. 12	40,000
Goudreau Exploration & Development Co., Ltd.	Sault Ste. Marie	Mar. 10	100,000
Graham Island Mining Company, Ltd	Toronto	Jan. 19	2,000,000
Grimston Porcupine Gold Mines, Ltd	Timmins	Jan. 28	1,000,000
Guinea Gold Mines, Ltd	Kirkland Lake	Aug. 26	2,000,000
Haileybury-Mattagami Coal Mines, Ltd	Haileybury	May 14	1,000,000
Harris Consolidated Mines, Ltd	Toronto	Mar. 16	12,000,000
Hecla Coal, Oil & Mining Company, Ltd	North Bay	June 1	1,000,000
Hilltop Gold Mines, Ltd	Toronto	Jan. 21	5,000,000
Howey Gold Mines, Ltd	Toronto	Mar. 12	5,000,000
Hudson-Mattagami Exploration & Mining Co., Ltd	Toronto	Jan. 21	2,000,000
Hudson Red Lake Development, Ltd	Toronto	Apr. 12	60,000
Huleroy Mines, Ltd	Haileybury	July 30	40,000
Imelda Birch Lake Mines, Ltd	Toronto	June 12	200,000
International Red Lake Gold Mines, Ltd	Toronto	June 21	200,000
Katoomba Mining Interests, Ltd	Toronto	May 15	50,000
Katrine Divide Gold Mines, Ltd	Toronto	Jan. 29	3,000,000
Kayloar Mines Agency, Ltd	Toronto	Oct. 9	500,000
Keewatin-Porphyry Development Company, Ltd	Toronto	Apr. 1	250,000
Keora Mines, Ltd	Toronto	July 12	2,500,000
Keweenaw Silver Mines, Ltd	Toronto	Sept. 16	1,000,000
Lang Red Lake Mines, Ltd., The	Toronto	June 18	100,000
Louis Walsh Coal Company, Ltd	Port Arthur	Aug. 13	100,000
Lower Contact Silver Mining Company, Ltd	Ottawa	Feb. 11	500,000
Macassa Mines, Ltd	Toronto	Apr. 12	3,500,000
MacHewitt Gold Mines, Ltd., The	Port Arthur	Apr. 15	1,000,000
McArthur Gold Mines, Ltd	Timmins	Dec. 7	500,000

*No par shares issued in addition. See list of "No Par" companies on page 59.

MINING COMPANIES WITH SPECIFIED CAPITAL INCORPORATED IN ONTARIO IN 1926—*Continued*

Name of Company	Head Office	Date of Incorporation	Capital
McCallum Red Lake Mines, Ltd.	Toronto	Apr. 12	$2,000,000
McDonough Exploration and Development Co., Ltd.	Toronto	Mar. 11	50,000
McMillan Gold Mines, Ltd.	Sudbury	Dec. 31	2,000,000
McNeely Red Lake Holdings, Ltd.	North Bay	Apr. 22	100,000
Malartic Mining Company, Ltd., The	Toronto	Mar. 13	100,000
Marclay Mines, Ltd.	Toronto	June 7	3,000,000
Martic Mines, Ltd.	Toronto	June 11	40,000
Metals Development, Ltd.	Toronto	Apr. 8	2,500,000
Meteor Lake Placers, Ltd.	Ottawa	June 14	150,000
Mineral Belt Mines, Ltd.	Grimsby	Nov. 26	300,000
Monargo Mines, Ltd.	Ottawa	Nov. 18	3,500,000
Myrtay Mines, Ltd.	Toronto	Dec. 6	500,000
Narrow Lake Mining Company, Ltd.	Toronto	Dec. 18	3,000,000
Neale Hollandia Lead Mines, Ltd.	Toronto	Apr. 23	200,000
Neepatyre Minerals & Products, Ltd.	Fort William	July 7	250,000
Northern Feldspar Mines, Ltd.	Sudbury	Jan. 13	100,000
Northern Ontario China Clay Corporation, Ltd., The	Toronto	Apr. 21	6,000,000
Northern Ontario Coal Corporation, Ltd., The	Toronto	Apr. 21	2,500,000
Ontario-Alberta Oil Development Company, Ltd.	Toronto	May 7	50,750
Ontario Salts & Chemical Company, Ltd., The	Toronto	May 18	40,000
Ontario-Woman Lake Mines, Ltd.	Toronto	June 7	200,000
Oro Gold Mines, Ltd.	Toronto	July 31	2,500,000
Ossian Gold Mines, Ltd.	Toronto	Oct. 11	4,000,000
Ottawa Valley Mines, Ltd.	Ottawa	Feb. 8	2,000,000
Parora Mines, Ltd.	Toronto	May 20	1,000,000
Peterson Cobalt Mines, Ltd.	Toronto	June 10	3,000,000
Peterborough Exploration Company, Ltd.	Peterborough	June 10	100,000
Pioneer Mines, Ltd., The	Toronto	Feb. 1	3,000,000
Plata Mines, Ltd.	Toronto	June 5	2,000,000
Powell Mining Properties (Rouyn), Ltd.	Toronto	Aug. 28	3,000,000
Quinn Stone & Ore Company, Ltd.	Port Arthur	Nov. 30	200,000
Red Lake Centre Mines, Ltd.	Toronto	Mar. 19	300,000
Red Lacus Mines, Ltd.	Toronto	Apr. 1	1,000,000
Red Lake Metals Corporation, Ltd.	Toronto	Mar. 10	3,000,000
Red Lake Prospectors Sydnicate, Ltd.	Ottawa	Jan. 19	150,000
Ribago Copper Corporation, Ltd.	Haileybury	Nov. 19	4,000,000
Sampson & Company, Ltd., C. E.	Toronto	July 26	40,000
St. George Mines Securities, Ltd.	Toronto	Feb. 10	100,000
St. Marys Crushed Stone, Ltd.	Toronto	Mar. 23	50,000
Savant Mines, Ltd.	Toronto	Nov. 24	40,000
Shook Coal Company, Ltd.	Toronto	Aug. 26	25,000
Spence, Strattan Oil Company, Ltd.	Chatham	May 27	300,000
Standard Exploration Company, Ltd.	Toronto	June 19	40,000
Summerville Lead Mines, Ltd.	Toronto	Jan. 11	600,000
Telluride Gold Mines, Ltd.	Toronto	July 28	1,000,000
Temisko Mines Investments, Ltd.	Toronto	July 23	*500,000
Thompson Cadillac Mines, Ltd.	Toronto	Jan. 14	2,000,000
Thor Mines, Ltd.	Toronto	Dec. 14	300,000
Thunder Bav Iron Mining Company, Ltd.	Port Arthur	Oct. 11	500,000
Tyrrell Red Lake Mines, Ltd.	Hamilton	May 27	3,000,000
Union Oil Company of Pennsylvania (Canada Division), Ltd.	Toronto	Feb. 18	40,000
Wanup Feldspar Mines, Ltd.	Lucknow	Oct. 15	100,000
Wiltsey-Coghlan Mines, Ltd.	Toronto	Nov. 10	3,000,000
Wolcott-Fisher Mines Company, Ltd.	Niagara Falls	June 4	100,000
Wolf Lake Mines, Ltd.	Toronto	Apr. 14	1,500,000
Woman Lake Mining Corporation, Ltd.	Toronto	May 29	1,000,000
Yakima Rico Mining Company, Ltd.	Haileybury	Oct. 16	3,000,000
Young-Davidson Mines, Ltd.	Toronto	Apr. 8	3,000,000
Total (121 companies)			$165,655,750

*No par shares issued in addition. See list of "No Par" companies on page 59.

MINING COMPANIES INCORPORATED IN ONTARIO IN 1926 HAVING SHARES WITHOUT NOMINAL OR PAR VALUE*

Name of Company	Head Office	Date of Incorporation	No. of Shares
Abate Red Lake Development, Ltd	Toronto	July 23	3,000
Baglow Red Lake, Ltd	Toronto	Apr. 16	20,000
Bathurst Mines, Ltd	Toronto	Dec. 8	2,000,000
British American Fuel Corporation, Ltd	Toronto	Oct. 26	*100,000
Canada Radium Mines, Ltd	Haliburton	May 25	2,500,000
Canadian Red Lake Development Company	Toronto	May 4	250,000
Cochenour Red Lake, Ltd	Toronto	May 27	8,000
Conroyal Mines, Ltd	Toronto	July 29	7,500,000
Crucible Graphite Company, Ltd	Toronto	Jan. 13	*40,000
Daimpre Mining and Development Company, Ltd	Toronto	Sept. 11	500
Dunlop Red Lake Syndicate, Ltd	Toronto	Mar. 17	16,000
Federal Gold & Copper Mines, Ltd	Toronto	Aug. 16	20,000
Foley Red Lake Gold Mines, Ltd	Toronto	July 5	200,000
Forbes Galena Mines, Ltd	Kingston	Jan. 15	*10,000
Great North Mines Corporation, Ltd	Sault Ste. Marie	Nov. 22	5,000,000
Larose-Rouyn Mines, Ltd	Toronto	Oct. 7	3,000,000
Lartic Mining Corporation, Ltd	Toronto	Jan. 12	200,000
Mineral Areas, Ltd	Toronto	Apr. 9	10,000
Mineral Explorations, Ltd	Toronto	Apr. 26	15,000
Noroque Mines, Ltd	Toronto	Feb. 15	1,000
Northern Red Lake Mines, Ltd	Sioux Lookout	July 23	1,000,000
Norwesque Gold Mines, Ltd	Toronto	Dec. 18	20,000
Ontario Gold Prospectors, Ltd	Toronto	Apr. 7	10,000
Red Lake-Rouyn Gold Mines Exploration Co., Ltd	Toronto	Mar. 25	150,000
Rouyn-Boischatel Development Company, Ltd	Toronto	Apr. 10	250,000
Summit Oil Company, Ltd	Welland	June 2	3,000
Temisko Mines Investments, Ltd	Toronto	July 23	*50,000
Toronto Red Lake Exploration Syndicate, Ltd	Toronto	Mar. 19	10,000
Total (28 companies)			22,386,500

*Also see list with specified capital. Four companies having both stated capital and "No Par" shares are included in both lists.

Companies of Extra-Provincial incorporation holding mining lands in Ontario are required under The Ontario Companies Act to take out a license and specify the amount of capital used in Ontario in connection with mining.

Following is a list of the companies so licensed in 1926:—

MINING COMPANIES LICENSED IN 1926 BY ORDER-IN-COUNCIL

Name of Company	Date of Incorporation*	Date of License	Capital for use in Ontario
Anglo-Canadian Mining & Refining Co., Ltd	May 5, 1925	Jan. 20	$1,000,000
Four Nations Reserve Mining Co., Inc	Delaware	Aug. 25	2,500,000
North American Lead and Refining Co., Ltd	Nov. 16, 1925	Dec. 7	100,000
Shield Development Co., Ltd., The	Nov. 17, 1926	May 21	200,000
Societe D'Electro-Chimie, D'Electro-Metallurgie et des Acieries Electriques D'Ugine, and Societe Electrometallurgique de Montricher	France	May 27	50,000
Treadwell Yukon Co., Limited	Delaware	May 18	1,000,000
Total (6 companies)			$4,850,000

*Incorporations under *The Companies Act*, Revised Statutes of Canada 1906, Part 1 of Chapter 79. Where incorporation is outside of Canada the state or country is noted.

Mining Revenue

The revenue of the Department of Mines for the fiscal year ending October 31st, 1926, is given in detail hereunder:—

ORDINARY.			
MAIN OFFICE			
Sand and Gravel—			
Royalties	$106,197.27		
Licenses	4,430.28		
		$110,627.55	
Casual Fees		786.66	
Sale of Record Books—Unwrought Metal Sales Act		43.00	
Boring Permits		4,855 00	
Contingencies		183.28	
Explorations and Investigations		75.25	
			$116,570.74
BRANCHES			
Inspection—Cable Testing Fees		$1,362.00	
Assessment—Taxes			
Acreage	$33,431.01		
Profit	410,974.17		
Gas	12,583.86		
		$456,989.04	
Chemical and Assay—Fees		3,090.82	
Mine Rentals			
Mining Leases	$11,288.46		
Licenses of Occupation	4,783.50		
Gas Leases	50.00		
		$16,121 98	
Miners—			
Licenses	$69,351.71		
Permits	3,101.00		
Recording Fees	100,010.30		
Miscellaneous	3,145.40		
Rent of Office Building	65.00		
		$175,673.41	
Draughtsman, North Bay—Fees		1,010.02	
Natural Gas Commissioner—			
Permits	$140.00		
Fees	746.95		
		$886.95	
Temiskaming Testing Laboratories—Fees		23,752.02	
Sulphur Fumes Arbitrator—Damages Collected		4,380.71	
			$683,266.93
CAPITAL.			$799,837.67
Mining Recorders—Mining Land Sales			38,578.14
			$838,415.81

MINING LANDS SOLD AND LEASED IN YEAR ENDING OCTOBER 31, 1926*

District	Sales			Leases			Total		
	No.	Acres	Amount	No.	Acres	Amount	No.	Acres	Amount
			$ c.			$ c.			$ c.
Timiskaming	211	7,816.98	20,694.75	116	4,273.75	2,402.56	327	12,090.73	23,097.31
Cochrane	79	3,049.16	7,437.19	....	.....	.....	79	3,049.16	7,437.19
Thunder Bay	15	622.55	1,561.38	....	.....	.....	15	622.55	1,561.38
Sudbury	6	238.10	675.63	45	1,756.90	751.87	51	1,955.00	1,427.50
Algoma	14	498.59	1,288.23	....	.....	.....	14	498.59	1,288.23
Kenora	3	117.00	331.00	....	.....	.....	3	117.00	331.00
Nipissing	2	100.00	150.00	....	.....	.....	2	100.00	150.00
Elsewhere	7	288.00	813.00	....	.....	.....	7	288.00	813.00
Total	337	12,730.38	32,951.18	161	6,030.65	3,154.43	498	18,761.03	36,105.61

*These figures do not agree with corresponding items of the revenue statement above which records collections of moneys actually received during the fiscal year.

MINING CLAIMS RECORDED IN THE SEVERAL MINING DIVISIONS, 1907-1926

Mining Division	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
Timiskaming.	7,860	1,650	1,343	1,021	922	516	1,326	215	222	156	269	184	244	329	159	328	971	735	634	438
Coleman.....	291	270	150	40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sudbury.....	456	254	1,859	1,131	2,309	776	483	237	233	464	262	168	673	267	319	701	436	559	546	1,367
Sault Ste. Marie	291	100	.....	818	119	137	127	23	92	44	135	199	90	90	216	541	498	284	451	395
Port Arthur...	317	370	475	207	183	180	182	353	641	172	180	66	171	108	120	296	222	300	494	1,278
Kenora.....	.....	73	102	95	89	91	.....	25	23	45	32	48	31	25	53	168	150	77	229	935
Parry Sound...	102	56	.....	26	15	5	.....	2	.....	10	25	12	39	33	Closed	.....	.....	.....	.....	.....
Larder Lake..	3,813	540	180	84	1,252	541	1,575	718	915	783	160	423	1,015	712	918	2,344	1,736	1,219	890	1,532
Montreal River	866	1,321	2,573	344	98	126	63	28	2	56	294	293	134	81	143	174	400	471	291	100
Gowganda.....	.....	.....	3,064	513	258	194	68	23	14	51	113	52	145	215	101	55	33	444	220	96
Porcupine.....	.....	.....	.....	2,150	3,756	538	496	240	262	401	236	48	136	192	273	760	1,424	556	620	1,297
Kowkash.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	160	135	2	9	21	3	148	206	438	150	28
Red Lake.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5,827
Total.....	11,996	4,634	9,746	5,792	9,001	3,104	4,320	1,864	2,427	2,342	1,841	1,495	2,687	2,073	2,305	5,515	5,976	5,083	4,525	13,293

STATEMENT OF MONEYS REMITTED BY MINING RECORDERS FOR THE FISCAL YEAR ENDING OCTOBER 31, 1926

Mining Division	Name of Recorder	Address	Purchase Price	Forest Reserve Permits	Miner's Licenses	Recording Fees	Miscellaneous Fees	Total
			$	$	$	$	$	$
Sudbury.....	Campbell, C. A....	Sudbury.....	3,605.90	515.00	5,191.00	8,796.75	138.75	18,247.40
Porcupine.....	Donaghue, W. A...	S. Porcupine...	7,153.90	210.00	5,241.00	4,851.00	406.50	17,862.40
Larder Lake.....	Ginn, H. G.....	Swastika.....	18,402.80	20.00	5,748.00	9,966.00	734.75	34,871.55
Kenora.....	Holland, H. E.....	Kenora.....	335.00	.....	3,994.50	7,917.00	134.25	12,380.75
Timiskaming.....	McAulay, N. J.....	Haileybury....	2,470.40	395.00	8,351.00	3,920.75	219.40	15,356.55
Sault Ste. Marie.....	Miller, W. N.....	Sault Ste. Marie	1,420.98	125.00	2,677.00	4,363.25	100.00	8,686.23
Port Arthur.....	McGregor, C. F....	Port Arthur...	1,077.75	1,141.00	5,314.00	7,395.50	157.50	15,085.75
Gowganda.....	Coghill, J. M.....	Elk Lake.....	3,769 64	450.00	543.00	1,144.00	181.75	6,088.39
Montreal River.....	Coghill, J. M.....	Elk Lake.....	1,324.57	.....	684.00	1,180.00	153.50	3,342.07
Kowkash.....	O'Rourke, M. F....	Tashota.....	.....	110.00	798.00	414.00	29.25	1,351.25
Red Lake.....	Holland, H. E.....	Goldpines.....	975.00	.....	7,673.00	48,744.00	889.75	58,281.75
		Total.....	40,535.94	2,966.00	46,214.50	98,692.25	3,145.40	191,554.09

SUMMARY OF BUSINESS TRANSACTED IN THE SEVERAL MINING DIVISIONS DURING THE CALENDAR YEAR, 1926

Schedule	Sudbury	Porcupine	Larder Lake	Sault Ste. Marie	Port Arthur	Kowkash	Timiskaming and Coleman	Gowganda	Montreal River	Kenora	Red Lake* Mar. 1-Dec. 31	Total
1. Letters received during year	3,364	2,706	7,273	1,075	3,851	327	2,078	557	993	3,216	2,757	28,197
2. Letters written during year	2,407	2,453	7,280	480	3,254	349	1,758	594	850	2,999	1,829	24,253
3. Miners' Licenses issued	659	725	612	278	614	59	661	18	42	680	1,235	5,583
4. Miners' Licenses renewed	449	584	727	282	468	104	1,119	134	184	139	429	4,619
5. Mining Applications recorded	1,367	1,297	1,532	395	1,278	28	438	96	100	935	5,827	13,293
6. Mining Applications cancelled	287	437	1,578	99	103	17	253	99	117	232	2,100	5,322
7. Agreements, Transfers, etc., recorded	353	776	687	213	294	43	252	124	139	99	1,358	4,338
8. Receipts for Miners' Licenses, Permits, Recording Fees, etc. $	16,585.65	18,512.75	21,142.84	6,262.26	17,555.50	1,225.00	12,326.90	2,336.50	2,275.00	11,036.50	60,444.75	169,703.65
9. Receipts as Purchase Money or Rental $	3,805.38	5,721.48	18,769.51	1,465.71	1,484.00	.....	3,302.07	801.07	2,367.51	438.00	975.00	39,129.73
10. Claims of which surveyors' plans were filed	37	112	170	100	14	.....	21	9	10	5	522	1,000
11. Disputes entered	8	12	1	3	5	.....	.....	.....	1	13	26	69
12. Disputed cases decided by Recorders	.....	.....	.....	2	.....	.....	.....	.....	.....	7	.....	9
13. Appeals to Mining Court	3	1	.....	.....	.....	.....	.....	.....	.....	6	9	19
14. Extensions of time granted	118	115	566	112	29	.....	63	55	67	32	519	1,676
15. Certificates of Record granted	42	42	183	19	19	.....	41	23	33	4	236	642
16. Certificates of Performance of Work granted	42	50	214	16	14	.....	44	23	35	12	94	544
17. Claims for which papers were forwarded to the Department for issue of title	39	52	183	12	5	.....	38	16	33	4	9	391
18. Forest Reserve Permits issued	20	23	.....	17	115	10	42	38	.....	.....	.....	265
19. Substitute Miners' Licenses issued	5	28	.....	2	12	2	20	4	4	5	15	97

*Claims transferred from Kenora Mining Division were 143 on March 1, and 519 on June 10.

Mining Tax Act.—Under this act a graduated tax is levied on the net profits of mining companies in excess of $10,000 per annum. The basic rate is 3 per cent.

The following statement, prepared by the Accounts Branch of the Department, gives details of the Profit Tax, collected under the supervision of G. R. Mickle, Mine Assessor, for the fiscal year ending October 31, 1926:—

DETAILS OF PROFIT TAX

GOLD—		
Dome Mines Company, Ltd.	$21,177.46	
Hollinger Consolidated Gold Mines, Ltd.	216,353.61	
Lake Shore Mines, Ltd.	12,812.72	
McIntyre Porcupine Mines, Ltd.	8,710.85	
Teck-Hughes Gold Mines, Ltd.	5,277.59	
Wright-Hargreaves Mines, Ltd.	17,370.04	
Vipond Consolidated Mines, Ltd.	686 46	
		$282,388.73
SILVER—		
Castle-Trethewey Mines, Limited	$6,471.21	
Keeley Silver Mines, Ltd.	17,586.14	
Lorrain Trout Lake Mines, Ltd.	2,000.48	
Menago Mining Co., Ltd.	222.55	
Mining Corporation of Canada, Ltd.	11,372.30	
Nipissing Mining Co., Ltd.	8,840.12	
		46,492.80
NICKEL-COPPER—		
International Nickel Co. of Canada, Ltd.	$67,155.57	
Mond Nickel Co., Ltd.	14,899.84	
		82,055.41
MICA—		
Loughborough Mining Company		37.23
Total		$410,974.17

Departmental Correspondence

The volume of correspondence necessary for the work of the Department in all its branches is considerable. Figures supplied by the Files Branch show that for the fiscal year ending October 31, 1926, communications received through the several offices numbered 39,094, and communications sent out, 38,000.

Correspondence in connection with the office of the Minister of Mines is not included, nor is that pertaining to applications for patent or lease of mining lands—the latter files being kept in the Department of Lands and Forests.

Branches of the Department, including offices of the Mine Assessor, Mining Court, Inspector of Mines, Publications and Statistics, had communications totalling 10,807 incoming and 14,162 outgoing.

Temiskaming Testing Laboratories

This plant, which is equipped for sampling and assaying, has been operated by the Ontario Department of Mines since July, 1921, under the management of A. A. Cole, Mining Engineer of the T. & N. O. Railway Commission, and George Dickson, Superintendent.

The following is a financial report for the year 1926, with comparative figures for previous years beginning with 1922:—

COMPARATIVE FINANCIAL STATEMENT OF THE TEMISKAMING TESTING LABORATORIES, 1922-1926

Schedule	1922	1923	1924	1925	1926
Cash receipts	$18,096 19	$18,699 22	$26,032 20	$19,922 37	$20,302 51
Earnings	17,749 51	20,117 81	25,417 61	20,041 08	21,119 98
Expenditures	19,173 19	19,781 25	23,206 66	20,043 31	20,658 19
Operating Profit or Loss	L $1,424 68	P $336 56	P $2,200 95	L $2 23	P $461 79

Following is a brief statement of the work of the year:—

Assaying.—Gold, 3,637 samples; silver, 2,769; copper, 716; silver bullion, 423; cobalt, 106; arsenic, 10; nickel, 47; zinc, 102; lead, 31; miscellaneous, 25; moisture determination, 30.

Ore Testing.—Cyanide tests requiring use of plant and equipment for 23 days.

Silver Ore Milled and Sampled.—2 lots weighing 969,04 tons.

Gold Ore Milled and Sampled.—3.48 tons.

Base Bullion Melted.—121 bars containing 113,451.47 gross ounces of silver.

Gold Ore Purchased.—34.70 tons for which $449.92 was paid.

Cobalt-Silver Residues Shipped to Deloro.—27 cars weighing 860.86 tons in which was contained 73,960 ounces of silver, and cobalt, running from 4.38 to 7.81 per cent.

Gold Ore Shipped to Hollinger Mine.—48.6 tons containing $44.44 per ton in gold and 25.31 ounces in silver—value received, $2,268.96.

Provincial Assay Office

As an aid in the development of the mineral resources of Ontario an assay office was established in July, 1898, by the Bureau (now Department) of Mines, at Belleville. For convenience the office was moved to 5 Queen's Park, Toronto, in November, 1911.

The Provincial Assayer, W. K. McNeill, reports as follows for 1926:—

FREE ASSAYS UNDER THE PROVISIONS OF THE MINING ACT OF ONTARIO

Mining Division	Samples received for Free Assays during 1926														
	Gold	Silver	Copper	Iron	Cobalt	Lead	Zinc	Tin	Nickel	Tungsten	Platinum	Manganese	Soda	Potassium	Total
Eastern Ontario*	20	4	....	1	...	1	1	....	...	...	...	...	1	1	29
Fort Frances*	49	3	1	1	...	....	....	....	...	...	2	...	...	...	56
Kenora	5	3	....	....	...	....	....	....	...	...	...	...	...	...	8
Kowkash	2	1	....	....	...	2	....	....	1	...	...	...	...	...	6
Larder Lake	74	7	16	....	...	7	7	4	1	1	...	...	...	...	117
Mississagi Reserve*	2	1	....	....	...	1	1	....	...	...	...	...	...	...	5
Montreal River	2	12	....	....	2	....	....	....	...	...	...	...	...	...	16
Parry Sound*	2	....	....	....	....	....	....	....	...	...	...	...	...	2	4
Porcupine	36	3	....	....	...	1	....	....	...	...	...	...	...	...	40
Port Arthur	49	11	3	4	...	2	3	....	...	...	...	1	...	...	73
Red Lake	279	12	3	1	...	1	2	1	...	...	1	...	...	...	300
Sault Ste. Marie	67	6	3	....	...	1	18	4	2	1	...	1	...	...	103
Sudbury	27	10	7	1	...	2	9	....	...	...	...	...	...	...	56
Timiskaming	16	5	1	2	2	2	....	1	1	...	2	...	...	...	42
Total	632	94	35	10	4	20	41	11	5	2	5	2	1	3	865

*All records for these Divisions are kept at the office of the Deputy Minister of Mines, Toronto.

The Assay Office has been in operation without interruption during the entire year and the usual variety of work has been done with the assistance of T. E. Rothwell, Chemist and Assayer, also Robert Stewart and Reginald Eyre, Laboratory Assistants.

The following is a statement of the samples submitted by the general public for which the regulation fee was charged, and also those submitted by geologists and officers of the Department of Mines. Assays per month ranged in number from 147 to 260.

CUSTOMS ASSAYING AND GENERAL WORK, 1926.

Gold	1,416 samples.
Silver	314 samples.
Copper	80 samples.
Lead	62 samples.
Zinc	44 samples.
Iron	21 samples.
Radium	14 samples were submitted on which reports were issued. A number were radio-active.
Silica	7 samples.
Ochres	4 samples.
Nickel	4 samples.
Potash	4 samples.
Platinum	7 samples.
Miscellaneous	14 samples of other minerals were tested. These included 3 each of graphite and tungsten; 2 of cobalt; 1 each of arsenic, tin, antimony, sulphur, molybdenum and water.
Identification	112 samples were received by mail and reports issued. A large number were brought directly to the Laboratory; of these no record was kept.
Rocks	27 samples were submitted by geologists of the Department of Mines for complete analysis.
Total	2,137

The schedule of charges, effective June 1, 1926, for the Provincial Assay Office and Chemical Laboratory is as follows:—

TARIFF OF FEES FOR ANALYSIS AND ASSAYS

1. Assays:	Fee
Gold	$1 50
Silver	1 50
Gold and silver in one sample	2 50
Platinum minerals	5 00
Gold and platinum minerals in one sample	7 00
Separation of platinum minerals	Prices on application.
2. Iron Ores:	
Iron (metallic)	$1 50
Silica	1 50
Iron and insoluble residue	2 50
Ferrous oxide	2 00
Phosphorus	3 00
Sulphur	2 50
Iron, suiphur, phosphorus and insoluble	8 00
Manganese	3 00
Titanium	4 00
Complete analysis	Prices on application.
3. Limestones, Dolomites, Marls, Clays, Shales:	
Determination of:	
Insolubles	$1 50
Silica	2 50
Ferric iron	3 00
Ferrous iron	2 00
Alumina	3 00
Lime	2 00
Magnesia	2 50
Potash	5 00
Soda	5 00
Alkalies (in one sample)	6 00
Water (combined)	2 00

Moisture	$1 00
Carbon dioxide	2 00
Sulphur	2 50
Phosphorus anhydride	3 00

4. Examination of Clay, Shale, or Cement Rock for Cement Manufacture:

Determination of:
Silica, Iron oxide, Alumina, Lime, Magnesia, Sulphur, and Volatile matter.....Prices on application.

5. Coke, Coal, Peat, etc.:

Determination of

Moisture	$1 00
Volatile combustible	1 50
Fixed carbon	1 50
Ash	1 50
Sulphur	2 50
Phosphorus	3 00
Calorific value (B.t.u.)	5 00
Ultimate analysis	Price on application.

6. Mineral Waters.....Price on application.

7. Ores and Minerals:

Determination of:

Alumina	$3 00
Antimony	4 00
Arsenic	3 00
Bismuth	4 00
Cadmium	4 00
Chromium	5 00
Cobalt	5 00
Nickel	5 00
Cobalt and Nickel in same sample	6 00
Copper	2 00
Fluorite	4 00
Lead	2 00
Molybdenum	4 00
Manganese	3 00
Tin	4 00
Zinc	3 00

8. Rocks, Complete Analysis.....Price on application.

9. Slags, Sand, etc.....Price on application.

10. Identification of Minerals and Rocks not Requiring Chemical Analysis.....Free.

11. Test for Radio-Activity.....Free.

Any analytical work not specified in this list will be undertaken on application to the Provincial Assayer.

The pulp of each sample is retained for future reference.

Terms

Money in payment of fees, sent in by registered letter, post office order, postal note, or express order, and made payable to the Provincial Assayer, must invariably accompany sample to ensure prompt return of certificate, as no examination is commenced until the regulation fee is paid.

Directions

Samples will be dealt with in the order of their arrival. In every instance specimens and samples should be accompanied by statement specifying the precise locality from which they were taken.

Crushed samples representing large quantities, or samples less than five pounds weight may be sent by mail as third-class matter. Samples not exceeding eleven pounds in weight may be sent by parcel post. The name and address of sender should be written plainly on

each parcel. Instructions, with money in payment of fees, should be contained in a separate letter. Samples may be sent by express, charges prepaid.

Sample bags addressed to this laboratory for sending ore pulp by mail may be obtained free on application; also canvas bags for shipping.

Samples should be addressed as follows:

PROVINCIAL ASSAY OFFICE,
East Block, Parliament Bldgs,.
TORONTO, ONT.

Diamond-Drilling

Diamonds.—About the middle of the last century engineers first took advantage of the intensive hardness of diamonds, by far the hardest known abrasive, for drilling operations. The method of application, now in common use, is the diamond-drill which consists of a boring crown set with diamonds and fixed at the end of a system of hollow rods. The drill is brought to bear on the rock with even pressure and at a speed of 400 to 500 revo'utions per minute.

The size of diamonds used depends on the diameter of the crown, the range in size being from ¾ to 6 carats. Diamond core drills are made in a wide range of diameters from 1¾ inches up to 20 inches, the large sizes being used for borings in coal mines and oil wells. Carbons (black Brazilian diamonds) because of their hardness and toughness, are usually used for this work. The specific gravity of the diamond is 3.5 but as carbons are more or less porous, the specific gravity of usable stones ranges from 3.3 to 2.9, the denser stones usually being of higher grade. Carbons are graded into four qualities on a specific gravity basis and prices vary accordingly. Prices also vary according to size and shape of the stones. The best grades and larger sizes are the cheapest in the long run, particularly for exacting work.

Development.—An index of the activity in one method of prospecting and the estimation of the extent of ore deposits may be found in the statistics of diamond-drilling carried on during the year. There were some fifteen companies actively engaged in drilling during 1926. Reports were received from fourteen, covering their operations within the Province, while an estimate was made for the one concern not reporting. As the work carried on by this latter company was quite limited, the resulting statistics may be assumed as correct.

In all 1,986 holes were drilled by 71 machines with a total of 385,932 feet of core recovered, or 70.85 miles. As might be expected the major portion of the work reported was by the well-established and larger gold mines at Porcupine where 1,470 holes were drilled with a total of 198,441 feet of core recovered. The Sudbury nickel-copper and new zinc fields of that area followed with 145 holes and 79,352 feet of core. The drilling in this section was much deeper than in other places in that fewer holes gave a much larger footage of core saved.

The total number of wage-earners was 254 to whom $330,930 were paid. Much of this work is highly specialized, more particularly the diamond-setting, or those who set the borts or black diamonds in the bits, while the drill-runners themselves must be highly trained. At the time of writing there is a shortage of diamond-setters.

A diamond-drilling crew ordinarily comprises one diamond-setter, one runner, one helper and one to attend to engines used for power, or a minimum of four, but usually five men to a shift.

Statistics of operations in the several fields follow:

ONTARIO RECORD OF DIAMOND-DRILLING IN 1926

Area	Number of holes	Feet of core
Porcupine	1,470	198,441
Sudbury	145	79,352
Kirkland Lake	185	50,493
Red Lake	48	18,000
Michipicoten	40	10,742
Gowganda	13	6,138
Cobalt	35	6,030
Renfrew County	20	4,745
Beardmore Area	7	3,506
South Lorrain	6	2,212
Kent County*	5	1,950
Lightning River	4	1,438
Goudreau	4	1,095
Nipigon	1	290
Miscellaneous	3	1,500
Total	1,986	385,932

*Testing for oil.

Complete answers as to the actual number of machines in use were not supplied by the operators, but a close estimate places the number at 71 for the whole Province.

DIAMOND-DRILL OPERATORS IN ONTARIO IN 1926

Name	Ontario Address	No. of drills active
Chisholm, D. D	Timmins	3
Dome Mines, Ltd	South Porcupine	4
*Hollinger Consolidated Gold Mines, Ltd	Timmins	6
Miller Lake O'Brien Mine	Gowganda	1
McIntyre Porcupine Mines, Ltd	Schumacher	3
Mitchell, W. J., Diamond-Drill Company, Ltd	Cobalt	6
Morissette, N	Haileybury	2
Ontario Diamond-Drilling Co., Ltd	Sudbury	8
Reed & Ryan	Timmins	10
Smith & Travers	Sudbury	15
Sterling Diamond-Drilling Co	Excelsior Life Bldg., Toronto	2
Sudbury Diamond-Drilling Co., Ltd	Sudbury	8
Sullivan Machinery Co., Ltd	37 Colborne St., Toronto	1
*Vipond Consolidated Mines, Ltd	302 Bay St., Toronto	1
Wabigoon Bay Gold Mines	Dryden	1
Total		71

*Work performed on these properties was done by contract; F. Badeski, Timmins, contractor.

CLASSES FOR PROSPECTORS, 1926-1927

By W. L. Goodwin

Introduction

After making preparations in Toronto during the month of October, the campaign was opened in Renfrew on November 9. The classes were held in seventeen places, covering Ontario from Renfrew in the East to Kenora in the West and as far north as Cochrane and Sioux Lookout. The last class in Cartier was completed on May 27. Both in preparing the materials and in carrying on the classes, I had the efficient assistance of M. J. Splane, of Haileybury. For securing places of meeting and for other assistance in organizing and advertising the classes, I am indebted to many friends, particularly the following:

J. L. Murray, Mayor, Renfrew.

R. P. Watt, Clerk-Treasurer, Renfrew.

I. Samson, Mayor, Sudbury.

C. A. Campbell, Mining Recorder, Sudbury.

Lorne Burk, Treasurer, Blind River.

W. N. Miller, Mining Recorder, Sault Ste. Marie.

J. W. Curran, Sault Ste. Marie.

Mayor Barker, North Bay.

C. G. Watson, Department of Mines Draughting Office, North Bay.

Mayor Hamilton, Haileybury.

N. J. McAulay, Mining Recorder, Haileybury.

W. J. McLean, Mgr. Hotel Haileybury, Haileybury.

Mayor Weeks, Englehart.

H. Geo. Ginn, Mining Recorder, Swastika.

Rev. J. F. Anderson, Kirkland Lake.

J. Atwell Hough, Crown Lands Agent, Matheson.

R. J. Ennis, Mgr. McIntyre Mines, Schumacher.

Jas. Shewan, Chief Acct. McIntyre Mines, Schumacher.

A. M. Dewar, Iroquois Falls.

R. C. Mortson, Cochrane.

A. C. Vaughan, Sioux Lookout.

Railway Young Men's Christian Association, Sioux Lookout.

Mayor Francis, Port Arthur.

Bruce L. Morrison, Port Arthur.

Mayor Crawford, Fort William.

Mayor Fife, Kenora.

J. D. C. Smith, Mining Recorder, Kenora.

Railway Young Men's Christian Association, Cartier.

Attendance

The attendance at the classes was as follows:—

Places	Average for Day Classes	Average for Evening Classes	Registered for Day Classes
Renfrew	11	26	26
Sudbury	18	25	37
Blind River	28	48	68
Sault Ste. Marie	31	52	60
North Bay	27	44	48
Haileybury	26	31	49
Englehart	14	30	33
Kirkland Lake	16	81	31
Matheson	15	21	32
Schumacher	17	35	29
Iroquois Falls	26	19	41
Cochrane	12	24	27
Sioux Lookout	24	54	46
Port Arthur	22	49	53
Fort William	7	53	16
Kenora	15	25	26
Cartier	12	29	21
Total	321	646	643

In addition to the routine work of the classes, addresses were given by invitation to clubs, boards of trade, etc. In these addresses there was an opportunity to discuss sound methods of forwarding the development of our mineral Industries by backing the prospector.

During the season 1926-27 it has been possible to give more attention to instruction in prospecting methods. Most of the older prospectors have now attended the classes, and a considerable number of young men are working into the business. These find the instruction given in the classes a good foundation upon which they can build by private reading and study of specimens. The business of prospecting is becoming more attractive as its organization grows. it is also more and more apparent that the prospector must be made part of the whole organization for the development of new mines and that he must be able to make a living out of the business while searching for prospects.

A great many prospectors have in the past paid little attention to anything but gold. The search for the base metals has been rather neglected. For several years the instruction in the classes has been directed largely towards fitting men to prospect for copper, zinc and lead.

An interesting part of the work for 1925-26 included suggestions as to favourable areas for prospecting. This bore fruit last summer in the opening up of the Lake Savant area. Prospectors have been recommended to give attention to territory not too far from transportation. There is much of such territory easily reached that has either never been prospected or only cursorily examined. The discoveries of last summer show that re-examination of easily accessible areas may be more fruitful than seraches made further afield.

MINING ACCIDENTS IN 1926

By

Chief Inspector of Mines, T. F. Sutherland, Toronto; Inspectors, Geo. E. Cole, Timmins; D. G. Sinclair, Sudbury; J. G. McMillan, Cobalt; A. R. Webster, Toronto.

Accidents during 1926

During the year 1926 at the mines, metallurgical works, quarries, clay, sand, and gravel pits regulated by the Mining Act of Ontario, there were 2,248 accidents reported to the Department up to January 15, 1927. Twenty-eight of these accidents were fatal, resulting in the death of thirty-two men. This is a decrease from 1925 of ten men killed. In 1925, nine men were killed at the quarries, clay, sand, and gravel pits; and in 1926, six men were killed in these operations.

Distribution	Fatal	Non-fatal	Total
Mines, underground	16	1,405	1,421
Mines, surface	3	473	476
Metallurgical works	3	161	164
Quarries	3	142	145
Clay, sand, and gravel pits	3	39	42
Total	28	2,220	2,248

Fatal Accidents

A comparison of fatal accidents for the last five years is given in the following table:—

Distribution	1922	1923	1924	1925	1926
Mines, underground	15	21	23	30	20
Mines, surface	3	3	1	1	3
Metallurgical works	0	4	2	2	3
Quarries, clay and sand pits	12	2	14	9	6
Total	30	30	40	42	32

By months, the fatalities occurred as follows:—

January	4	July	2
February	6	August	5
March	6	September	2
April	2	October	1
May	1	November	1
June	1	December	1
Total			32

Classifying the fatalities according to the industry gives the following:—

Nickel mines and metallurgical works	4
Silver mines and refineries	5
Gold mines and mills	14
Lead mines	3
Quarries	3
Clay, sand, and gravel pits	3
Total	32

ANALYSIS OF FATALITIES AT MINES, 1921-1925

Cause	1922	1923	1924	1925	1926
	per cent.	per cent.	per cent.	per cent.	per cent.
Falls of ground	11.11	25	25	19.35	17.39
Shaft accidents	44.44	16.66	29.16	19.35	26.09
Explosives	11.11	20.83	16.66	25.8	43.48
Miscellaneous underground	16.66	25	25	29.03	.....
Surface	16.66	12.5	4.16	6.45	13.04

TABLE OF FATAL ACCIDENTS IN MINES, METALLURGICAL WORKS AND QUARRIES, AND GRAVEL, SAND, AND CLAY PITS, 1901–1925

Year	Persons killed at metallurgical works and mines	Persons employed at metallurgical works and producing mines	Persons employed at non-producing mines (estimated)	Total persons employed	Fatal accidents per 1,000 employed
1901	13	4,135	550	4,685	2.77
1902	10	4,426	450	4,876	2.05
1903	7	3,499	400	3,899	1.79
1904	7	3,475	400	3,875	1.8
1905	9	4,415	500	4,915	1.83
1906	11	5,017	750	5,767	1.9
1907	22	6,305	1,140	7,445	2.93
1908	47	7,435	1,750	9,185	5.11
1909	49	8,505	2,000	10,505	4.66
1910	48	10,862	2,000	12,862	3.73
1911	49	12,543	2,000	14,543	3.37
1912	43	13,108	2,000	15,108	2.84
1913	64	14,293	2,000	16,293	3.93
1914	58	14,361	1,500	15,861	3.6
1915	22	13,114	1,500	14,614	1.51
1916	51	14,624	2,000	16,624	3.07
1917	36	16,791	1,000	17,791	2.02
1918	32	14,726	500	15,226	2.1
1919	39	11,926	1,000	12,926	3
1920	29	10,486	1,000	11,486	2.61
1921	24	8,436	1,000	9,436	2.54
1922	30	9,500	1,500	11,000	2.72
1923	30	10,500	1,500	12,000	2.5
1924	40	11,000	1,500	12,500	3.2
1925	42	11,500	1,500	13,000	3.23
1926	32	11,500	1,500	13,000	2.46

The occupation and nationality of the men killed are set out in the following table:—

Occupation	English-speaking	Finn	Ukranian	Czecho-Slovak	Italian	Belgian	Croatian	Jugo-Slav	Total
Miner	2	1	.....	.....	1	1	1	.....	6
Labourer	5	.....	1	.....	.....	.....	.....	.....	6
Shaftman	4	2	1	.....	.....	.....	.....	.....	7
Sledger	.....	.....	.....	1	.....	.....	.....	.....	1
Foreman	3	.....	.....	.....	.....	.....	.....	.....	3
Fireman	1	.....	.....	.....	.....	.....	.....	.....	1
Shoveller	2	.....	.....	.....	.....	.....	.....	.....	2
Brakeman	1	.....	.....	.....	.....	.....	.....	.....	1
Cagetender	2	.....	.....	.....	.....	.....	.....	.....	2
Scaler	.....	.....	.....	.....	.....	.....	.....	1	1
Crusher operator	2	.....	.....	.....	.....	.....	.....	.....	2
Total	22	3	2	1	1	1	1	1	32

The ages of the men killed were as follows:—

Age	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	Total
Number killed	2	5	2	9	7	3	2	1	1	32

Infection

Records show that infection followed in 246 cases out of a total of 2,220 non-fatal accidents in 1926.

Location	No. of accidents	Accidents followed by infection	Per cent. infection
Mines, underground	1,405	184	13
Mines, surface	473	39	8.2
Metallurgical works	161	12	7.4
Quarries	142	9	6.3
Clay, sand, and gravel pits	39	2	5.1
Total	2,220	246	11

Accidents from Explosives

Cause	Number of accidents	Number injured	
		Fatal	Non-fatal
Struck by rock from blast	3	.....	3
Premature explosion	2	.....	2
Delayed too long lighting fuse	3	.....	3
Drilled into explsive	7	.....	7
Sledging, struck explosive	2	1	1
Returned to delayed blast	2	1	1
Loading holes	4	6	2
Picked into explosive	6	4	3
Total	29	12	22

Prosecutions

Before Magistrates Atkinson, on March 3, 1926, the Kirkland Rand, Limited, were convicted of negligence in not properly protecting men working in the shaft. Information was laid under Subsection 221, Section 164, Part IX, of the Mining Act of Ontario.

An appeal was entered by the company, and the decision of the magistrate was upheld.

MINES OF ONTARIO IN 1926

By

Chief Inspector of Mines, T. F. Sutherland, Toronto; Inspectors, J. G. McMillan, Cobalt; D. G. Sinclair, Sudbury; Geo. E. Cole, Timmins; A. R. Webster, Toronto,

As an introduction to a description of the mines and metallurgical plants of the province, it will probably be found advantageous to give a list of the same. The list which follows is alphabetically arranged, both for metals or minerals extracted, and also for the names of the companies concerned. The inclusion of any given property in this list does not necessarily imply that it is a producing one, or that it is being worked at the present time. The table contains the names of all operating properties and works inspected in 1926.

Lists of the principal stone quarries and clay pits are added at the end.

MINES AND METALLURGICAL WORKS

Operator	Mine	Manager	Address
ASBESTOS			
Porcupine Asbestos Corporation, Ltd.	Porcupine Asbestos	Paul Ogilvie.....	Box 1030, Timmins.
CHINA CLAY			
Hudson-Mattagami Exploration & Mining Co., Ltd.	Hudson-Mattagami	C. M. McCarthy...	8 Bank of Toronto Bldg., Toronto.
COAL			
British-Colonial Coal Mines of Canada, Ltd.	British-Colonial..	Alex. Wilson.....	Larchwood.
Hudson-Mattagami Exploration & Mining Co., Ltd.	Hudson-Mattagami	C. M. McCarthy...	8 Bank of Toronto Bldg., Toronto.
COPPER			
Amity Copper Gold Mines, Ltd.....	Johnston.....	Sidney A. Pain.....	Boston Creek.
Potter Doal Mines, Ltd.....	Potter Doal.....	Carl Erickson.....	Matheson.
DOLOMITE			
Crystallite Stone Products Co.....	Crystallite.....	P. Stringer.....	Bancroft.

MINES AND METALLURGICAL WORKS—*Continued*

Operator	Mine	Manager	Address
FELDSPAR			
Bathurst Feldspar Mines, Ltd.	Bathurst	Ira Marks	Perth.
Consolidated Feldspar Mines, Ltd.		Morgan U. Kemerer	29 Melinda St., Toronto.
Cotnam, G. C. L.	Cotnam	Lamarche Bros.	Pembroke.
Craig, T. H.	Craig		Verona.
Crystal Feldspar Co.	Crystal	P. J. Dwyer	Hybla.
Dewar, Duncan, & Gibson, W. H.	Aylen	Duncan Dewar	Pembroke.
Elizabeth Feldspar Mines, Ltd.	Elizabeth	Alex. McPhee	Sudbury.
Ferril, J. T.	Ferril		Bird's Creek.
Genesee Feldspar Co., Inc.	Genesee	P. MacDonald	Hybla.
Kemerer, Morgan U		C. Stoklosar	Hybla.
Mackey Feldspar Co.	Mackey	Rudolph Carniel	Mackey.
McQuire-Robinson Radium & By-Products Co., Ltd.	McQuire	P. W. Checkley	Mackey.
Northern Feldspar Mines, Ltd.	Northern	A. Weisman	Sudbury.
O'Brien & Fowler, Ltd.	O'Brien & Fowler.		Mattawa.
Perth Feldspar & Mining Co., Ltd.		A. Campbell	Perth.
Purdy, George	Purdy		Eau Claire.
Rock Products Co., The	Rock Products	W. A. Hannah	Toledo, Ohio.
Verona Quarries, Inc.	Verona	C. A. McMahon	Verona.
Wanup Feldspar Mines, Ltd.	Wanup	E. Holditch	Sudbury.
Weisman, A.	Weisman		Sudbury.
GOLD			
Ankerite Gold Mines, Ltd.	Ankerite	W. H. Seaman	Box 535, South Porcupine.
Argonaut Consolidated Mines, Ltd.	Argonaut	D. R. Thomas	Argonaut.
Baldwin Gold Mining Co., Ltd.	Baldwin	T. Travaille-Williams	Kenogami Lake.
Barry Hollinger Gold Mines, Ltd.	Barry Hollinger	R. M. Treloar	Boston Creek.
Bennett Mining Co., Ltd	Bennett	C. W. Bennett	Sesekinika.
Bennett Mining Co., Ltd	Smith Labine	C. W. Bennett	Sesekinika.
Blue Quartz Gold Mines, Ltd.	Blue Quartz	N. O. Carpenter	Matheson.
British Canadian Mines, Ltd.	Foley	Charles Baycroft	Mine Centre
Canadian Associated Goldfields, Ltd.	Associated Goldfields	T. A. Graves	Larder Lake.
Champion Gold Mines, Ltd.	Champion	Chas. Brent	Kenora.
Cline Canadian Gold Mines, Ltd.	Cline	James Cline	Goudreau.
Coniaurum Mines, Ltd.	Newray	John Redington	Schumacher.
Conroyal Mines, Ltd.	Kirk Gold	Hugh Jardine	Kirkland Lake.
Consolidated West Dome Lake Mines, Ltd.	Dome Lake	D. M. McPhail	Box 523, South Porcupine.
Cooper Gold Mines, Ltd.	Cooper	J .C. Kirkland	Wawa, via Hawk Junction.
Cooper Gold Mines, Ltd.	Minto	J. C. Kirkland	Wawa, via Hawk Junction.
Crown Reserve Consolidated Mines, Ltd.	Crown Reserve	N. T. Everet	Kirkland Lake.
De Santis Development Co., Ltd.	De Santis	Peter de Santis	Box 1299, Timmins.
Dome Mines, Ltd.	Dome	H. P. de Pencier	South Porcupine.
Four Nations Reserve Mining Co., Inc.	Four Nations	Victor E. Lundberg.	Kenogami Lake.
Furness Gold Mines, Ltd.	Furness	J. C. Houston	907 Kent Bldg., Toronto.
Gold Hill Mines, Ltd.	Gold Hill	D. H. Angus	Haileybury.
Gosselin Syndicate	Gosselin	Placide Gosselin	Timagami.
Goudreau Gold Mines Co., Ltd.	Goudreau	Colin S. Johnston	Goudreau.

MINES AND METALLURGICAL WORKS—*Continued*

Operator	Mine	Manager	Address
GOLD—*Continued*			
Harkness Hays Gold Mining Co., Ltd.	Harkness Hays	W. Dean Hays	Schreiber.
Hewitt Mining Co., Ltd. (negotiating for purchase)	Hewitt		Room 39, Carleton Chambers, Ottawa.
Hill Top Gold Mines, Ltd.	Hill Top	Henry Reamsbottom	Boston Creek.
Hollinger Consolidated Gold Mines, Ltd.	Hollinger	A. F. Brigham	Timmins.
Howey Gold Mines, Ltd.	Howey	D. G. H. Wright	Red Lake.
Kirkland Hunton Mines, Ltd.	Hunton	John McPhee	Kirkland Lake.
Kirkland Lake Gold Mining Co., Ltd.	Kirkland Lake	W. M. Sixt	Kirkland Lake.
Kirkland Rand, Ltd.	Kirkland Rand	W. R. Osborne	Kirkland Lake.
Kirkland Townsite Gold Mines, Ltd.	Kirkland Townsite	Sidney A. Pain	Kirkland Lake.
Lake Shore Mines, Ltd.	Lake Shore	E. B. Knapp	Kirkland Lake.
Macassa Mines, Ltd.	Macassa	A. J. Keast	Kirkland Lake.
McCarthy Webb Goudreau Mines, Ltd.	McCarthy Webb.	M. B. R. Gordon	Goudreau.
McIntyre-Porcupine Mines, Ltd.	McIntyre	R. J. Ennis	Schumacher.
McMaster Mining Syndicate	McMaster	Harry McMaster	Rose Grove.
McMillan Gold Mines, Ltd.	Elliott	E. J. McMillan	Sudbury.
Manley O'Reilly Gold Mines, Ltd.	Manley O'Reilly.	Walter A. J. Manley & William O'Reilly	Boston Creek.
March Gold, Ltd.	March	E. S. McEwen	Box 533, South Porcupine.
March Gold, Ltd.	Maidens-McDonald	E. S. McEwen	Box 533, South Porcupine.
March Gold, Ltd. (under option)	Clucas-Booker	E. S. McEwen	Box 533, South Porcupine.
New York Porcupine Mines, Ltd.	Martin	Harry W. Darling	Box 489, Timmins.
New York Porcupine Mines, Ltd.	Scott Veteran	Harry W. Darling	Box 489, Timmins.
Night Hawk Peninsular Mines, Ltd.	Night Hawk Peninsular		371 Bay St., Toronto.
Northland Gold Mines, Ltd.	Northland	J. J. Byrne	Kirkland Lake.
Ore Chimney Mining Co., Ltd.	Ore Chimney	J. M. Wolchuck	Northbrook.
Ossian Gold Mines, Ltd.	Ossian	Ralph Hurd	Swastika.
Ostrom Gold Mines, Ltd.	Meco-Catharine	George E. Silvester.	Boston Creek.
Ostrom Gold Mines, Ltd.	Ostrom-Catharine	George E. Silvester.	Boston Creek.
Pawnee-Kirkland Gold Mines, Ltd.	Pawnee-Kirkland.	J. J. Byrne	Kirkland Lake.
Porcupine Paymaster Mines, Ltd.	Paymaster	H. E. Clement	Box 508, South Porcupine.
Power & Mines Corporation, Ltd.	Grace (Michipicoten)	E. D. Brewer	Michipicoten River.
Queen Lebel Gold Mines, Ltd.	Queen Lebel	E. B. Wood	Kirkland Lake.
Shield Development Co., Ltd.	Huronian	J. G. Harkness	Kashabowie.
Sylvanite Gold Mines, Ltd.	Sylvanite	C. E. Rodgers	Kirkland Lake.
Teck-Hughes Gold Mines, Ltd. (The)	Teck-Hughes	D. L. H. Forbes	Kirkland Lake.
Tough-Oakes Burnside Gold Mines, Ltd.	Tough-Oakes Burnside	Alan Stuart	Kirkland Lake.
Vernor, A. C.	Holding	A. C. Vernor	Shiningtree.
Vipond Consolidated Mines, Ltd.	Vipond	Robert E. Dye	Timmins.
Walsh-Katrine Gold Mines, Ltd.	Walsh-Katrine	Hugh Walsh	Crown City.
Wright-Hargreaves Mines, Ltd.	Wright-Hargreaves.	James E. Grant	Kirkland Lake.
GRAPHITE			
Black Donald Graphite Co., Ltd.	Black Donald	John Patno	Calabogie.

MINES AND METALLURGICAL WORKS—*Continued*

Operator	Mine	Manager	Address
GYPSUM			
Ontario Gypsum Co., Ltd.	Caledonia	A. J. Parkhurst	Caledonia.
Ontario Gypsum Co., Ltd.	Lythmore	A. J. Parkhurst	Caledonia.
LEAD			
Forbes Galena Mines, Ltd.	Frontenac	J. M. Forbes	36 Central Chambers, Ottawa.
Heck, George	Heck	W. B. Rundle	Burridge.
Kingdon Mining, Smelting & Manufacturing Co.	Kingdon	R. R. Rose	Galetta.
LEAD AND ZINC			
Dominion Resources Syndicate		E. J. Cowain	Madoc.
Neale Hollandia Lead Mines, Ltd.	Hollandia	W. J. Neale	Bannockburn.
North American Lead & Refining Co., Ltd.	Ogema	D. C. Kemerer	Dorion.
Treadwell Yukon Co., Ltd.	Errington	Joseph Errington	Toronto.
MICA			
Loughborough Mining Co., Ltd.	Lacey	G. W. McNaughton.	Sydenham.
Orser & Wilson	Orser & Wilson		Bancroft
NICKEL AND COPPER			
International Nickel Co. of Canada, Ltd.	Creighton	J. L. Agnew	Copper Cliff.
International Nickel Co. of Canada, Ltd.	Frood	J. L. Agnew	Copper Cliff.
Mond Nickel Co., Ltd.	Frood Extension	A. D. Carmichael	Box 480, Sudbury.
Mond Nickel Co., Ltd.	Garson	A. L. Sharp	Garson.
Mond Nickel Co., Ltd.	Levack	F. J. Eager	Levack.
Mond Nickel Co., Ltd.	Worthington	W. J. Mumford	Worthington.
SILVER			
Beaver Auxiliary Mines, Ltd.	Beaver	H. L. Donaldson	Elk Lake.
Bellellen Silver Mines, Ltd.	Bellellen	John Mathewson	Silver Centre.
Blair Gowganda Silver Mines, Ltd.	Blair Gowganda	Murray D. Kennedy	Gowganda.
Canadian Lorrain Silver Mines, Ltd.	Canadian Lorrain.	Hugh McMillan	Silver Centre.
Capitol Silver Mines, Ltd.	Capitol	Angus D. Campbell.	Bestel.
Casey Mountain Operating Syndicate, Ltd.	Casey Mountain	R. G. Williamson	Judge.
Castle-Trethewey Mines, Ltd.	Castle-Trethewey.	Angus D. Campbell.	Bestel.
Clifton Consolidated Mines, Ltd.	Provincial	Maurice E. Young.	Cobalt.
Cobalt Argyros Mines, Ltd.	Hargreaves & Cobalt merger	C. H. Heron	Cobalt.
Cobalt Contact Mines, Ltd.	Cobalt Contact	J. M. C. Dunlop	Cobalt.
Cobalt Contact Mines, Ltd.	Green-Meehan	J. M. C. Dunlop	Cobalt.
Cobalt Contact Mines, Ltd.	Hunter	J. M. C. Dunlop	Cobalt.

MINES AND METALLURGICAL WORKS—*Continued*

Operator	Mine	Manager	Address
	SILVER—*Continued*		
Cobalt Contact Mines, Ltd.	Red Rock	J. M. C. Dunlop	Cobalt.
Cobalt Twentieth Century Mining Co., Ltd.	Cobalt Twentieth Century	S. S. Sager	North Cobalt.
Coleroy Gowganda Mines, Ltd.	Coleroy	John W. Shaw	Gowganda.
Coniagas Mines, Ltd.	Coniagas	F. D. Reid	Cobalt.
Crescent Silver Cobalt Mining Co., Ltd.	Crescent	S. W. Barber	Guelph.
Doherty-Easson Mining Synd., Ltd. (under option)	Penn-Canadian	J. C. Houston	Haileybury.
Enright Mining Co., Ltd.	Devlin	Horace F. Strong	Haileybury.
Fenning, Louis, *et al*	Beaver (Thunder Bay)	Louis Fenning	Stanley.
Friday Mines, Ltd.	Friday	J. R. Sproat	1103 Washington Blvd. Bldg., Detroit, Mich.
Genesee Mining Co., Ltd.	Genesee	F. L. Steenman	Cobalt.
Gowganda-Duggan Silver Mines, Ltd.	Gowganda-Duggan	Neil Morrison	Gowganda.
Gowganda Keora Silver Mines, Ltd.	Keora	Thomas Reilly	Gowganda.
Hamilton, J. W., *et al*	Hamilton	Frank Clement	Gillies Depot.
Haultain Mining Co., Ltd.	Haultain	F. A. S. Carnegie	Gowganda.
Hector Silver Mines, Ltd.	Hector	W. J. Adair	Haileybury.
Keeley Silver Mines, Ltd.	Keeley	M. C. H. Little	Silver Centre.
Kerr Lake Mines, Ltd.	Kerr Lake	Robert R. Brown	Cobalt.
Keweenaw Mines, Ltd. (under option)	Red Jacket	L. K. Fletcher	Haileybury.
Keweenaw Mines, Ltd. (under option)	York O'Brien	L. K. Fletcher	Haileybury.
Kirk Budd Mining Co., Ltd.	Kirk Budd	Cecil Cave	Cobalt.
Lakeside Lorrain Silver Mines, Ltd.	Lakeside Lorrain	M. P. MacDonald	Silver Centre.
La Rose Mines, Ltd.	Violet	G. E. H. Booth	Cobalt.
Lorrain Consolidated Mines, Ltd.	Lorrain Consolidated	Horace F. Strong	Haileybury.
Lorrain Trout Lake Mines, Ltd., under management of Mining Corporation of Can., Ltd.	Trout Lake	M. F. Fairlie	Cobalt.
McKinley-Darragh-Savage Mines of Cobalt, Ltd.	McKinley	H. C. McCloskey	Cobalt.
McKnight, Alex., *et al* (lessee)	Giant Silver Nugget	Owen Enright	Cobalt.
McLeod, John H. (lessee)	Foster	John H. McLeod	Giroux Lake.
Meteor Development Co., Ltd.	Meteor	H. L. Wilson	Cobalt.
Mickle Silver Mines, Ltd.	Mickle	Harry Coles	Elk Lake.
Millcrest Mining Co., Ltd.	Millcrest	W. H. Fairburn	Bestel.
Mining Corporation of Canada, Ltd.	Mining Corporation	M. F. Fairlie	Cobalt.
Mining Corporation of Canada, Ltd.	Crompton	M. F. Fairlie	Cobalt.
Mining Corporation of Canada, Ltd.	Frontier	M. F. Fairlie	Cobalt.
Mining Corporation of Canada, Ltd.	H. S. 310	M. F. Fairlie	Cobalt.
Mining Corporation of Canada, Ltd.	Little Keeley	M. F. Fairlie	Cobalt.
Newton Lorrain Syndicate	Newton	R. O. Morrow	Silver Centre.
Nipissing Mining Co., Ltd.	Nipissing	Hugh Park	Cobalt.
Nipissing Mining Co., Ltd.	Nipissing Lorrain	Hugh Park	Silver Centre.
Northern Extension Mining Co., Ltd.	Agaunico	R. McNaughton	Cobalt.
O'Brien, M. J., Ltd.	Miller Lake O'Brien	H. G. Kennedy	Bestel.
O'Brien, M. J., Ltd.	O'Brien	J. G. Dickenson	Cobalt.
Ontario Solid Silver Mines, Ltd.	Solid Silver	James A. McRae	Cobalt.
Paragon Hitchcock Mines, Ltd.	Paragon Hitchcock	Joseph P. Welsh	Elk Lake.
Parora Silver Mines Co., Ltd.	Parora	Joseph M. Hickingbottom	Cobalt.
Peterson Cobalt Mines, Ltd.	Peterson	D. J. Russell	Cobalt.

MINES AND METALLURGICAL WORKS—*Continued*

Operator	Mine	Manager	Address
SILVER—*Continued*			
Plata Mines, Ltd.	Hylands-Johnston-Gardiner	L. K. Fletcher	Gowganda.
Reinhardt, Carl (lessee)	Crown Reserve	Carl Reinhardt	Cobalt.
Shaw, John W., *et al* (lessee)	Chambers Ferland	Joseph Gaynor	Cobalt.
Silver Bullion Mines, Ltd.	Silver Bullion	Murray D. Kennedy	Gowganda.
Silver Sill Mining Co., Ltd.	Silver Sill	Horace F. Strong	Haileybury.
Tonopah Canadian Mines Co. (under option)	Gamble	Ernest Craig	Gowganda.
Tonopah Canadian Mines Co. (under option)	Hart	Ernest Craig	Gowganda.
Tonopah Canadian Mines Co. (under option)	Morrison	Ernest Craig	Gowganda.
Tonopah Canadian Mines Co. (under option)	Walsh	Ernest Craig	Gowganda.
Trainmen Silver Mining Co., Ltd.	McAndrew	John J. McAndrew	Cobalt.
Victory Silver Mines, Ltd.	Victory	W. D. Taylor	Cobalt.
Wigwam Silver Mines, Ltd.	Wigwam	John W. Sanderson	Gowganda.
W. J. Nine Silver Mines, Ltd.	W. J. Nine	Leonard Smith	Gowganda.
SOAPSTONE			
Grace Mining Co., Ltd.	Grace	W. J. Richards	Kenora.
Wood, H. H.	Wood	H. H. Wood	Mine Centre.
TALC			
Asbestos Pulp Co., Ltd.	Asbestos Pulp	Roy Taylor	Madoc.
Gillespie, Geo. H., Co., Ltd.	Henderson	Geo. H. Gillespie	Madoc.
METALLURGICAL WORKS			
Algoma Steel Corporation	Blast furnace	Jas. H. Bell	Sault Ste. Marie.
Cobalt Reduction Co., operated by Mining Corporation of Canada, Ltd.	Silver refinery	M. F. Fairlie	Cobalt.
Deloro Smelting and Refining Co., Ltd.	Silver refinery	S. B. Wright	Deloro.
International Nickel Co. of Canada, Ltd.	Blast furnace	Donald MacCaskill	Copper Cliff.
International Nickel Co. of Canada, Ltd.	Nickel refinery	H. W. Walter	Port Colborne.
Mond Nickel Company, Ltd.	Blast furnace	John F. Robertson	Coniston.
Steel Company of Canada, Ltd.	Blast furnace	H. G. Hilton	Hamilton.

QUARRIES

County	Operator	Address	Location	Product
Algoma district	Dominion Mines & Quarries, Ltd.	Little Current	Killarney	Quartzite.
" "	Dominion Mines & Quarries, Ltd.	McLennan	East Neebish island	Quartzite, coarse and screened.
Bruce	Alabastine Co. of Paris, Ltd.	Teeswater	Lot 14, con. VI, Culross.	Hydrated lime.
Carleton	Belanger, Victor	Hawkesbury	Gloucester tp.	Limestone for roads.
"	Robillard, H., and Sons	Quarries, via Ottawa	Gloucester tp.	Limestone for roads.
Cochrane district	Northern Development Department, Ontario Government	Cochrane	Lamarche tp.	Crushed rock for road surfacing.
Essex	Brunner Mond Co. of Canada, Ltd.	Amherstburg	Lots 6, 7, 8, con. I; lots 2, 3, con. II, Anderdon	Limestone for chemical works.
Frontenac	Freeman, L. G.	106 Cowdy St., Kingston	Kingston tp.	Building stone.
"	Regiopolis College	T. Gallivan, R.R. 1, Kingston	Bracken farm, Frontenac tp.	Building stone.
"	Roddy, J.	Kingston	Kingston tp.	Building and crushed limestone.
"	Silica Sand Co., Ltd.	Geo. M. Thompson, Box 264, Kingston	Lots 19, 20, con. I, Pittsburgh	Sandstone.
Grenville	Grenville Crushed Stone, Ltd.	J. P. Bains, Oxford Mills	Lots 8, E. ½ 9, con. IV; S. ½ lot 8, con. III, Oxford	Crushed and screened limestone for ballast.
Grey	Chalmers, Stewart	Owen Sound	Owen Sound	Lime.
"	Keeling, James	1179 16th St., Owen Sound	8th St., Owen Sound	Building stone.
"	Lapierre & Checkley	Owen Sound	Owen Sound	Limestone for building.
"	McKay, Alex. L.	E. Rowbottom, Owen Sound	Owen Sound	Building stone; crushed stone.
"	Oliver Rogers Stone Co.	Owen Sound	Owen Sound	Building stone; crushed stone.
Haldimand	Gordon Crushed Stone Co., Ltd.	Hagersville	Walpole tp.	Crushed stone.
"	Hagersville Contracting Co	Hagersville	Lots 13, 14, con. XIII, Walpole	Crushed stone for roads and concrete.
"	Hagersville Quarries, Ltd.	Hagersville	Lot 13, con. XIII, Walpole	Crushed stone for roads and concrete.
Halton	Christie Henderson Co., Ltd.	Kelso	Lot 4, con. V, Nassagaweya	Grey lime.
"	Hurst & Rogers	1193 Queen St. W., Toronto	Lot 26, con. X, Esquesing	Building stone.
"	Logan, Hugh	Glen Williams	Lot 27, con. IX, Esquesing	Building stone.
"	Robertson, D., & Co	Milton	Esquesing tp.	Lime and building stone.
"	Routley, H. T.	R.R. 1, Georgetown	Con. VII, Esquesing	Crushed stone.

QUARRIES—*Continued*

County	Operator	Address	Location	Product
Halton	Toronto Lime Co., Ltd	Limehouse	Esquesing tp	Lime and building stone.
Hastings	Canada Cement Co	Point Anne	Point Anne	Limestone for cement.
"	Canada Crushed Stone Co	George Rayner, Bancroft	Dungannon tp	Marble.
"	Quinlan & Robertson	Crookston	Lot 10, con. X, Huntingdon	Building stone.
Kenora district	Horne, William	Butler, via Ignace		Monumental stone and paving blocks (granite).
Lanark	Cameron, James	Fallbrook	Lot 4, con. XI, Drummond	Pegmatite for road material.
"	Cameron, William	Carleton Place	Lot 24, con. XI, Drummond	Lime.
Leeds	Gordon, David J	Gananoque	Lot 11, con. II, Leeds	Red granite.
"	Leeds and Grenville County	J. J. Webster, R.R. 4, Lansdowne	Lot 17, con. IV, front of Leeds and Lansdowne	Crushed stone.
"	McAdam, James	Box 173, Gananoque	Lots 10, 11, 12, Con. I, Leeds	Paving blocks and cut stone.
"	Street & O'Brien	Box 73, Gananoque	Lot 6, con. II, Leeds	Granite paving blocks.
Lincoln	Queenston Quarry Co	St. Davids	St. Davids	Crushed, monumental, sawn limestone.
"	Wickett, James A	Geo. E. Stocker, 16 Salter St., Toronto	Grantham tp	Crushed stone.
Norfolk	Routley, H. T	Jarvis	Lot 19, con. XIV, Townsend	Crushed stone.
Ontario	Longford Crushed Stone, Ltd	Longford Mills	E. part lots 23, 24, Front range, Rama tp.	Crushed stone.
Oxford	Beachville White Lime Co	Beachville	Beachville	Stone, lime, agricultural lime.
"	Standard White Lime Co	Beachville	Beachville	High calcium, magnesium, and hydrated lime.
Perth	St. Marys Cement Co	St. Marys	Blanchard tp	Limestone for cement.
"	Thames Quarry Co	St. Marys	St. Marys	Limestone.
Peterborough	Ontario Rock Co	Preneveau	Lot 7, con. VI, Belmont	Crushed trap.
Prescott	Bissonnette, A	Alfred	Longueuil tp	Limestone.
"	McDonald, Neil A	R. Allard, L'Orignal	Longueuil tp	Limestone.
Renfrew	Jamieson Lime Co	Renfrew	Lot 5, con. II, Horton	Crystalline limestone and lime.
"	McDonald & McLeod	Pembroke	Wilson's farm, Pembroke	Crushed rock.
"	Markus, William	Pembroke	Lot 12, con. I, Pembroke	Limestone.
Russell	McDonell, Dibblee & Covey	Clarence	Con. I, Clarence	Limestone.
Simcoe	Langton, Thomas	Coldwater	Lot 19, 20, con. XII, Medonte	Crushed stone.
"	Ontario Stone Co	R.R. 4, Orillia	Lot 10, con. IV, N. Orillia	Crushed stone.

Sudbury district	MacNamara Construction Co	Sudbury	Rumford	Crushed stone for roads.
" "	Mond Nickel Co., Ltd	Coniston	At Coniston smelter	Quartzite for flux.
Thunder Bay district	Fort William, City of	Cyril Symmes, City Engineer, Fort William	At foot of Mt. McKay	Road material.
Thunder Bay district	Mountain Stone Co	J. F. Hewitson, 9 Bank of Hamilton, Port Arthur		
Timiskaming district	Abitibi Pulp & Paper Co	August Johnson, Haileybury	S. ½ lot 10, con. V, Bucke (owned); W. ½ lot 11, con. III, Bucke (leased)	Limestone.
Victoria	Canada Lime Co	Coboconk	Coboconk	Limestone.
"	Kirkfield Crushed Stone Co	Kirkfield	Lot 49, con. IX, Eldon	Crushed limestone.
"	Toronto Brick Co	Coboconk	Coboconk	Lime.
Waterloo	Christie Henderson Co	Hespeler	Hespeler	Hydrated lime.
Welland	Bertie Township	Ridgeway	Lot 21, con. III, Bertie	Crushed rock for roads.
"	Bertie Township	Stevensville	Lot 8, con. VIII, Bertie	Crushed limestone for roads.
"	Canada Cement Co	Port Colborne	Port Colborne	Limestone for cement.
"	Canada Cement Co	Port Colborne	Lot 5, con. I, Wainfleet	Limestone for cement.
"	Law Construction Co	Ridgeway	Lot 13, con. V, Bertie	Limestone for roads.
"	Pirson, John	Stevensville	Lot 8, con. VII, Bertie	Crushed stone.
"	Walker Bros	Thorold	Lots 31, 32, con. IX, Stamford	Limestone for flux and paper mills.
Wellington	Alabastine Co. of Paris	Elora	Nicol tp	Hydrated lime and agricultural lime.
"	Christie Henderson Co	R.R. 2, Puslinch	Lots 2, 3, con. I, Puslinch	Hydrated lime.
"	Gow, James	Fergus	Fergus	Crushed limestone.
"	Harvey, E., & Son	Rockwood	Rockwood	Limestone and lime.
"	Ontario Lime Co	J. Harvey, Rockwood	Rockwood	Lime.
"	Ontario Reformatory	Box 1448, Guelph	Guelph	Crushed limestone for roads.
"	Standard White Lime Co.	Guelph	Wellington tp	Hydrated lime.
Wentworth	Barton Township	Mount Hamilton	Lot 13, con. VII, Barton	Crushed and screened limestone.
"	Canada Crushed Stone Corp., Ltd	Dundas	Dundas	Crushed and screened limestone and building stone.
"	Gallagher Bros	R.R. 2, Hamilton	Lot 14, con. VI, Barton	Limestone and lime.
"	Marshall, James	Hamilton	Lot 14, con. VII, Barton	Limestone and lime.
"	Middleton, J.	Ancaster	Ancaster	Building stone.
"	Wentworth Quarry Co., Ltd	Vinemount	Lot 4, con. V, Saltfleet	Crushed and screened limestone.

CLAY PITS

County	Operator	Address	Location
Halton	Caledon Mountain Shale Brick Co	Credit Forks	Lot 10, con. IX, Caledon.
"	Halton Brick Co	Terra Cotta	Lot 28, con. II, Esquesing.
"	Interprovincial Brick Co	Milton Heights	Milton Heights.
"	Milton Pressed Brick Co	Plant No. 1, Milton	Lot 1, con. I, Esquesing.
"	Milton Pressed Brick Co	Plant No. 2, Milton	Con. I, Esquesing.
"	Toronto Brick Co	Milton	Lot 14, con. I, Trafalgar.
Lincoln	Grimsby Brick & Tile Co	Grimsby	Lot 22, con. I, Clinton.
"	Paxton & Bray	230 Queenston St., St. Catharines	Queenston St., St. Catharines.
Peel	Brampton Pressed Brick Co	Brampton	Lot 9, Centre Rd., Chinquacousy.
"	Caledon Mountain Shale Products	Credit Forks	Lot 10, con. IV, Caledon.
"	Cooksville Shale Brick Co	Cooksville	Con. III, Toronto.
"	Interprovincial Brick Co	Terra Cotta	Lot 29, con. V, Chinquacousy.
"	Milton Pressed Brick Co	Streetsville	Streetsville.
"	Streetsville Pressed Brick Co	Streetsville	Streetsville.
Perth	Barnhardt, W. H.	Stratford	Stratford.
"	Stratford Brick, Tile & Lumber Co	Stratford	Stratford.
Thunder Bay district	Fort William Brick & Tile Co	Fort William	Fort William.
Waterloo	Ott Brick & Tile Co	Kitchener	Kitchener.
Wentworth	Bartonville Pressed Brick Co	620 Lister Bldg., Hamilton	Bartonville.
"	Canadian Pressed Brick Co	Bartonville	Bartonville.
"	Crawford Bros	King and Macklin Sts., Hamilton	King and Macklin Sts., Hamilton.
"	Dominion Sewer Pipe and Clay Industries, Ltd.	Mimico	E. Flamborough tp.
"	Frid Bros	Macklin St., Hamilton	Dundas Rd. and Macklin St., Hamilton.
"	Hamilton Pressed Brick Co	Kensington Ave. S., Hamilton	Kensington Ave., Hamilton.
"	Hamilton Toronto Sewer Pipe Co	R. H. New, Wentworth Ave., Hamilton	E. Flamborough tp.
"	New, Edward	133 George St., Hamilton	Ancaster Rd.
"	Ontario Sewer Pipe Co	Mimico	E. Flamborough tp.
York	Butwell, Richard	Humber Bay	Humber Bay.
"	De Laplante, J. E	Coleman	Dawes Rd., Toronto.
"	Don Valley Brick Works	Don Valley	Don Valley ,Toronto.
"	Morley, W	Coleman	Dawes Rd., York tp.
"	Mt. Dennis Brick Works	2 Ruthven Place, Mt. Dennis	Mt. Dennis.
"	Ontario Paving Brick Co	353 Weston Rd., Weston	Weston Road, Weston.
"	Phippen and Field	150 Dawes Rd., Toronto	Dawes Road, York tp.
"	Pickett (Geo.) Co	Mt. Dennis	Mt. Dennis.

York	Pigott & Co	Eglinton Ave., Mt. Dennis	Mt. Dennis.
"	Price & Cummings	Humber Bay	Humber Bay.
"	Price & Smith	Greenwood Ave., Toronto	Greenwood Ave., Toronto.
"	Russell, Joseph, Estate	40 Blake St., Toronto	Blake St., Toronto.
"	Standard Brick Co	Greenwood Ave., Toronto	Greenwood Ave., Toronto.
"	Sun Brick Co	52 Toronto St., Toronto	Don Valley, Toronto.
"	Toronto Brick Co	Sun Life Bldg., Toronto	Greenwood Ave., Toronto.
"	Wagstaff, A. H., & Co	Greenwood Ave., Toronto	Greenwood Ave., Toronto.

ASBESTOS

Porcupine Asbestos Corporation, Limited

This company has an authorized capital of $2,000,000 divided into shares of $1 each, par value.

The officers and directors of the company are: Lyon Cohen, president; Milton Hersey, vice-president; Lawrence Cohen, managing director. The directors are: Lyon Cohen, Lawrence Cohen, H. Bronfman, and Milton Hersey, all of Montreal; and S. G. Eplett of Timmins. Jas. G. Ross of Montreal was consulting engineer. Work at the property was directed by Paul Ogilvie. The mine address was Box 1030, Timmins, Ont.

The property is situated in the township of Deloro, district of Cochrane, and comprises claims Nos. 8,415, 8,709, and 9,745 situated centrally in the township.

Operations were carried on from March 1 to August 15, 1926. The power line from the Ankerite mine to the asbestos property was completed and the plant operated by electrically driven machinery. A Chicago pneumatic compressor, type NSB, 14 by 12 inches, was driven by a 75 h.p. induction motor, and a 3 h.p. motor drove a Fairbanks-Morse centrifugal pump.

The rock was mined in an open pit, and drilling was done with two tripod and two plugger drills. The rock was hoisted from the pit by a swing derrick operated by a double-drum contractor's hoist driven by a 35 h.p. induction motor. A steel box, capacity 1½ cubic yards, is used to carry the rock, which was being handled at the rate of 150 cubic yards a day. Most of the crude asbestos was hand-picked in the pit, and a further saving was made by cobbing and hand-picking in a cobbing shed.

After being hoisted from the pit, the rock was dropped into side-dump cars and hauled to the cobbing shed by an 8-ton gasoline-driven locomotive.

The asbestos occurs in narrow veins in small fracture zones running nearly north and south in a large mass of dark-green serpentine. The open pit also takes this direction, and at the time of suspending operations the pit had reached a depth of 60 feet, a width of 50 feet, and a length of 130 feet. A determined effort was made to develop a commercial body of asbestos, but it was found that while the quality of the asbestos was equal to that of the Quebec deposits, there was not a sufficient quantity of the fibre to make the venture a paying one. The average length of fibre saved was one inch, and it was of No. 1 quality. In composition the Deloro asbestos is very much like that of Quebec except that the alumina and iron content are lower and the combined water higher, making it more adaptable for spinning and general manufacture.

A comparison of the Quebec and Deloro asbestos was made by the Milton Hersey Company of Montreal:—

	Deloro chrysotile	Quebec chrysotile
	per cent.	per cent.
Silica	40.85	40.49
Alumina	.60	1.27
Ferric oxide	1.02	2.53
Magnesia	41.40	41.41
Lime	trace	.....
Combined water	14.64	14.06
Organic matter	trace	.....

The mining operations were done on a contract basis by D. Verochio, of Montreal.

CHINA CLAY

Hudson-Mattagami Exploration and Mining Company, Limited

An account of the operations of this company is given under the heading "Coal."

COAL (Anthraxolite)

British-Colonial Coal Mines of Canada, Limited

Mining operations on the property of the British-Colonial Coal Mines of Canada, Limited, lot 10, concession I, township of Balfour, district of Sudbury, were discontinued early in the spring of 1927, at which time the incline had reached a depth of approximately 240 feet.

These operations were conducted under the superintendence of Alex. Wilson, Larchwood, who employed a crew of five men during the activities.

Hudson-Mattagami Exploration and Mining Company, Limited

This company has been carrying on prospecting work for several years in the area about the Mattagami river below Smoky Falls. Efforts for a time were directed to the development of some china-clay deposits located on the east bank of the river a short distance below Long rapids.

In the winter of 1925-26, a campaign of drilling was carried on in the township of Kipling half a mile south of the boundary of Sanborne township. The syndicate held properties on both sides of the river some 6 miles below Long rapids. Here the river passes through clay banks which reach to a height of 60 feet above the water's edge. Along the shores have been found slabs of float of a lignitic nature. The drilling was done on the east bank of the river to explore for coal seams. Two holes were drilled to depths of 60 and 114 feet, and seams of coal varying from 2 to 7 inches were reported.

In March and April, 1926, an attempt was made on the west shore to sink a shaft, 8 by 16 feet, to explore the ground. Considerable difficulty was experienced, owing to water and the clay walls. The size of the shaft had to be reduced to 6 by 12 feet, and eventually it reached a depth of 62 feet, having passed through some 40 feet of clay impregnated with material of a carboniferous nature. It was reported that a seam of 2 feet in thickness had been encountered at the bottom of the shaft.

In May another shaft, 6 by 8 feet, was started some 30 feet away from the other. This had to be reduced to 3 by 5 feet; a depth of 65 feet had been reached in the shaft when it was abandoned.

When visited in August both shafts were filled with water to the level of the river, but the collars of the shafts were some 25 feet above the water's level. During the winter and spring there were 24 men at work at the property. C. M. McCarthy of Toronto was in charge of the work. Plant and supplies were brought in by winter road, a distance of 60 miles, from mile 68 on the Island Falls branch of the Temiskaming and Northern Ontario Railway. At the property there was a Sullivan portable air compressor, 5 by 5½ inches, gas driven, and a 12 h.p. V.T. boiler.

In August, 1926, an attempt was being made to explore the ground to the west of the river by means of a core-drill, but the drillers experienced great difficulty in getting any depth over 85 feet, which was not enough to intersect any seams encountered in the shafts sunk near the river.

No further work was to be considered until after the railway was constructed from Kapuskasing to Smoky Falls. Supplies could then be brought to the property over a road 12 miles in length.

The head office of the syndicate is at 8 Bank of Toronto Building, Toronto.

COPPER

Amity Copper Gold Mines, Limited

Amity Copper Gold Mines, Limited, with a capital of $3,000,000, in shares of $1 par value, was formed to operate the Johnston property, south half, lot 5, concession VI, Pacaud township, district of Timiskaming, at Boston Creek station.

An option was taken on this property by Sidney A. Pain and associates in October. A mining plant, consisting of a hoist and a 320 cubic foot air compressor, driven by a gasoline engine, was installed. A 50-foot shaft was sunk in November. The vein was crosscut at 30 feet at this level, and 60 feet of drifting was done. The shaft was continued to a depth of 130 feet early in the year, and the vein crosscut at a distance of 35 feet; and 300 feet of drifting was done at this level in the first quarter of 1927. Diamond-drilling was begun in April. Ten men were employed in the mining operations.

Potter Doal Mines, Limited

This company was incorporated in Ontario on January 11, 1927. The authorized capital is 3,000,000 shares of no par value, of which 2,227,456 were issued. The claims owned by the company include 34 in Munro township (L. 17,028-32, 17,034-37, 17,165-68, 17,175-76, 17,179-80, 17,182-85, 17,187-89, 17,265-71, 17,392-94) and seven in Warden township (L. 17,167, 17,169-70, 17,177-78, 17,181, 17,186). These claims lie about 16 miles northeast of the town of Matheson, in the fifth and sixth concessions of Munro and the first concession of Warden, district of Cochrane.

The officers of the company are: C. A. Gentles, president; D. M. Hogarth, vice-president; C. D. H. McAlpine, secretary-treasurer; Carl Erickson, manager. The directors of the company are: C. A. Gentles and A. J. Agar, of Toronto; D. M. Hogarth, of Port Arthur; and R. S. Potter, of Matheson. The head office of the company is at 302 C.P.R. Building, Toronto, and the mine office address is Matheson, Ont.

The original discovery on the claims was made on November 19, 1926, by Paul E. Doal, of Matheson, along the north boundary of what is now claim L. 17,180, which comprises the southeast quarter of the north half of lot 7, concession VI, Munro township. Following the incorporation of the company, work was started in January, 1927, and the following frame buildings were erected: office, 14 by 20 feet; cookery, 16 by 24 feet; storehouse, 14 by 20 feet; core-house, 10 by 16 feet.

In February four diamond-drill holes, totalling 660 feet in depth, were drilled by the Sudbury Diamond Drilling Company. Work was also carried on along the outcrop of the ore body, and 28 tons of ore was mined, drilling being done with hand steel. The ore was hauled to Matheson and shipped to Cateret, N.J., to the U.S. Smelting and Refining Company. Returns from the shipment gave the following values in metals: copper, 15.22 per cent.; zinc, 4.15 per cent.; silver, 2.70 ounces to the ton; and gold, 0.045 ounces to the ton.

The ore body occurs as a lenticular mass in a contact between two very basic basalt flows and is associated with intrusions of diabase and diorite.[1] In the ore, chalcopyrite and pyrrhotite are banded with sphalerite. The walls of the ore body are well defined and have a dip of N. 70°. The outcrop where the discovery was made shows a width of 8 feet, and prospecting showed that this width continued over a length of 30 feet and then tapered off. The strike of the ore body is N. 68° W.

When the property was inspected on March 25, 1927, there was no machinery. The management had no immediate plans for sinking a shaft. It was proposed to make an electrical survey of the claims, and the work was to be undertaken by the Lundberg-Swedish-American Prospecting Corporation.

Sixteen men were employed.

DOLOMITE

Crystallite Stone Products Company

The Crystallite Stone Products Company, of Hamilton, operated the dolomite mine on lots 3 and 4, concession XII, Herschell township, Hastings county, from April 17 to December 24, 1926, and shipped 1,467 tons of dolomite to Hamilton. They employed an average of six men.

P. Stringer, Bancroft, is manager.

FELDSPAR

Bathurst Feldspar Mines, Limited

This company started to operate a feldspar property on lot 16 and the north half of lot 15, concession VIII, Bathurst township, Lanark county, in October, 1926, and shipped about three cars per week.

They employed about 12 men. Ira Marks, Perth, is manager.

T. H. Craig

T. H. Craig mined and shipped feldspar from May 1 to the end of the year. The property is on lots 1 and 2, concession X, Loughborough township. The average number of men employed was nine.

J. T. Ferril

J. T. Ferril operated a feldspar mine on lot 27, concession III, Monteagle township, Hastings county, for a short time in 1926.

He employed five men while operating and shipped about 350 tons of rough feldspar to the Crystallite Stone Products Company, of Hamilton.

Genesee Feldspar Company

The Genesee Feldspar Company, of Rochester, operated its property in concession VII, Monteagle township, Hastings county, throughout the year. They also opened up a mine on lot 14, concession VIII, of the same township, from which they shipped two cars of feldspar.

[1]For a description of the geology of the area, *see* P. E. Hopkins, The Beatty-Munro Gold Area, Ont. Bur. Mines, Vol. XXIV, pt. 1, 1915. *See also* Map No. 28*b*, Gold Area between Lakes Abitibi and Night Hawk, which accompanies Vol. XXVIII, pt. 2.

The total amount shipped during the year was about 4,800 tons. The average number of men employed was 25.

George E. Worth, Rochester, is manager; and P. MacDonald, Hybla, is mine superintendent.

Rock Products Company

This company operated for eleven months near Balderson on lot 20, concession IX, Bathurst township, employing an average of 16 men.

W. A. Hannah is manager.

Verona Quarries, Incorporated

This company operated a feldspar property throughout 1927 on lot 1, concession XIII, Portland township, with an average of 14 men. The pit is about 60 feet deep and produced about 2,000 tons during the year.

C. A. McMahon is manager.

GOLD

Ankerite Gold Mines, Limited

This company is capitalized at $2,000,000, divided into shares of $1 par value each. The company owns three claims, M. E. 60-62 in the township of Deloro, district of Cochrane. Work for the most part has been confined to claim M. E. 60.

Early in 1926 the Ankerite Gold Mines, Limited, was formed to acquire the assets of the North American Gold Corporation, which owned the group of claims known as the Ankerite. In the new company the Porcupine Goldfields Development and Finance Company, Limited, holds an 86 1/3 per cent. interest, and the balance belongs to the North American Gold Corporation.

The officers of the Ankerite Gold Mines, Limited, are as follows: H. R. Norsworthy, president; F. R. Weekes, vice-president; J. E. Dorion, secretary-treasurer. H. E. Doelle was manager until March 20, when he was succeeded by W. H. Seaman. The directors of the company are: H. R. Norsworthy, F. R. Weekes, and J. E. Dorion, all of Montreal; C. E. C. Smith, National Club, Toronto, and W. S. Walton, Royal Bank Building, Toronto. The head office is at the Canada Cement Building, Montreal. The mine address is Box 535, South Porcupine, Ont.

Mining work was actively carried on during the year 1926 and milling operations began on June 19, 1926.[1] The No. 2 shaft, the main working shaft, was completed to a depth of 620 feet on March 3, 1926. This is a four-compartment shaft, two compartments being used for hoisting rock and a third as a cageway for men and materials.

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[1]For flow-sheet and description of mill, *see* Ont. Dept. Mines, Vol. XXXV, pt. 1, 1926, p. 95.

The following is a summary of the development work done in 1926:—

	Feet	Cubic feet
Sinking	154	.....
Station-cutting	.....	5,448
Raising	326	.....
Drifting	832	.....
Crosscutting	580	.....
Total	1,892	5,448

During the year the average number of men employed was 101, of whom 14 were employed in the mill, 65 in the mine, and general 29.

Argonaut Consolidated Mines, Limited

This company operated their property in Gauthier township, district of Timiskaming, in 1926 with a working force of 100 men. The officials of the company are: J. H. Rainville, president; F. A. Labelle, first vice-president; J. A. Naud, second vice-president and general manager; Louis A. Marchand, treasurer; A. Brodeur, secretary; D. R. Thomas, general superintendent. The head office is at 145 St. James St., Montreal.

The following is from the report of the general superintendent for 1926:—

The interior shaft was sunk from the 750-foot to the 1,000-foot level in the first quarter of the year. On April 15 crosscutting was started on the 1,000-foot level, and on the 875-foot level a few days later. In July stopes Nos. 815 and 1,014 were opened up, and early in August stope No. 1,018 was found. From July to the end of the year, the two new levels produced 10,677 tons of ore, or 30.4 per cent. of the year's production.

In addition to 227 feet of shaft-sinking, mine development included 99 feet of station-cutting, 4,678 feet of drifting and crosscutting, and 4,139 feet of diamond-drilling.

The production from 35,081 dry tons milled was $142,816.22 in gold and silver, and $38,245.42 in copper, or an average of $5.27 per ton, of which $4.06 was for the gold and $1.09 for the copper content.

The amalgamation and flotation process was continued in use with improved results. The average ratio of concentration was 41.6:1.

Expenditures amounted to $339,721.54, or $9.68 per ton milled, divided as follows: mining, $3.05; development, $3.11; milling, $1.75; marketing, 78 cents; and general expense, 99 cents

Barry Hollinger Gold Mines, Limited

This company operated their property in Pacaud township, district of Timiskaming, during 1926 with an average force of 70 men. The company has an authorized capital of $3,000,000 in shares of $1 par value. H. C. Crowe is president, and Robert Fennell, 807 General Assurance Building, Toronto, is secretary-treasurer; L. B. Smith was succeeded as superintendent, late in the year, by R. M. Treloar.

The shaft was deepened 377 feet to the 1,000-foot level, and two new levels were opened at 800 and 1,000 feet. Lateral work comprised: drifts, 724 feet; crosscuts, 325 feet; raises, 59 feet; stations, 2,990 cubic feet; and slashing, 3,040 cubic feet. On the 800-foot level, No. 7 vein was crosscut at 265 feet from the shaft, and an ore shoot 140 feet long was opened up with two high-grade patches, 40 feet in length, at either end.

These developments resulted in ore reserves of 12,800 tons in No. 7 vein, which has a width of from 4 to 6 feet, and 6,666 tons in No. 5 vein.

The 50-ton concentrating mill treated 3,908 tons in the first four months of the year. The mill was then enlarged to 100 tons' capacity and converted to a cyanide mill, which treated 9,802 tons of ore of a value of $7 to $8 per ton in the last three and a half months of the year.

The compressor was changed from steam to electric drive, and a third 150 k.v.a. transformer was added to the electrical equipment. The steam hoist was replaced by a new double-drum electric hoist.

Bennett Mining Company, Limited

This company has an authorized capital of $2,000,000, divided into shares of $1 par value each.

The officers of the company are: W. F. Bennett, president and managing director; Murray Gordon, vice-president; C. E. Johnson, secretary-treasurer. The directors are W. F. Bennett, Murray Gordon, H. V. Bourlier, A. Denison, J. W. Cooper, all of Toronto; W. G. Neal, Walton; and Karl K. Homuth, Preston. The head office of the company is at 1 St. Clair Avenue West, Toronto.

The claims owned by the company in Maisonville township, district of Timiskaming, comprise Nos. 3,687-89, L.15,770-72, L.16,094-99, twelve in all. Four more claims were staked immediately to the west. The company also has nine claims in McVittie township and two in the Gillies limit in the Cobalt area. The main group of claims on which work is now being done includes the Smith Labine claims, three in number, comprising parts of lots 9 and 10, concession II, Maisonville township, district of Timiskaming.

Work on the claims in Maisonville township was carried on throughout the year 1926. The shaft, located at about the centre of claim No. 3,688, was continued to a depth of 530 feet. Levels were cut out at the following depths: 125, 250, 375, and 500 feet. Crosscutting had commenced at the 500-foot level early in 1927.

During the year 25 men were employed.

Blue Quartz Gold Mines, Limited

This company has an authorized capital of $3,000,000, divided into shares of $1 par value each. The officers of the company are: H. C. Crowe, president; Jas. A. Tuck, vice-president; Miss A. V. Marat, secretary-treasurer. The directors are: H. C. Crowe, Jas. A. Tuck, and J. Bennet, all of Toronto; J. H. W. Crowe, Birmingham, England; and H. Hibbard, Gillingham, England. The head office of the company is at 1104 Northern Ontario Building, Toronto. On May 1, 1926, N. O. Carpenter succeeded J. G. McGregor as superintendent at the mine, which is located in Beatty township, district of Cochrane. The mine office is at Matheson, Ont.

From May 1 to December 31, 1926, the following work was done: drifting, 55 feet; crosscutting, 535 feet; sinking, 118 feet; raising, 4 feet. There were 1,320 tons of ore hoisted.

The winze, 1,000 feet northwest of the main shaft, was sunk from the 500- to the 625-foot level and crosscutting done to pick up the extension of what is known as the 502W ore body at the 500-foot level. It is stated that on the 602W ore body 15,350 tons have been developed having a value of $15 per ton and averaging 6 to 8 feet in width.

Early in 1927, the winze was being sunk to the 750-foot level and crosscutting was to follow to explore the extension of what is known as 602E and 602W, developed on the 625-foot level.

In 1927, it is proposed to enlarge the main shaft from two to three compartments, from the 200-foot level to the surface, and to continue the main shaft to the 1,000-foot level. Below the 200-foot level, the shaft has three compartments to the 500-foot level.

The average number of men employed during the year was 28. Hector McQuarrie was mine captain.

British Canadian Mines, Limited

Underground work on the Foley mine near Mine Centre was suspended on June 3, 1927.

At the time of writing (August, 1927), a small force is being maintained overhauling the plant and doing a small amount of prospecting in the surrounding area under the supervision of Chas. Baycroft.

The development work accomplished in the mine since the review published in the Thirty-fifth Annual Report of the Department of Mines consists of: 2,450 feet of drifting and crosscutting on the 850-foot level; 380 feet of drifting on the 600-foot level; 390 feet of drifting and crosscutting on the 400-foot level; 643 feet of drifting and crosscutting on the 200-foot level; 168 feet of shaft raise above the 400-foot level; a station cut on the 200-foot level preparatory to holing through the shaft-raise from the 400-foot level.

Canadian Associated Goldfields, Limited

This company operated their property at Larder lake in McVittie township, district of Temiskaming, during 1926 with a working force of 30 men. T. A. Graves is manager.

A new headframe was erected to accommodate three compartments, and the shaft was enlarged from the 360-foot level to the station. The stations on the 115-, 235-, and 360-foot levels were enlarged to take care of double tracks. A total of 1,200 feet of drifting and crosscutting was done during the year, mainly on the 750- and 1,000-foot levels.

The power-house was enlarged, and an 1,800 cubic foot air compressor installed.

The mill building, 132 feet by 175 feet, was completed and the following equipment installed: an 8-foot Marcy ball mill; tube mill, 5 by 16 feet; thickeners, 40 by 14 feet; and agitators, 22 by 18 feet.

The ore is crushed in a jaw crusher at the shaft head and passes to the ball and tube mills for fine grinding over a belt elevator. The latter is close-circuited with a Dorr classifier. After grinding, the ore goes to a dewatering thickener, then to two agitators for cyanidation and three additional clarifying thickeners for washing. Precipitation is by Crowe vacuum and Merrill press.

Champion Gold Mines, Limited

No mining was done at the Champion mine in Kenora district during 1926.

During the summer of 1926, the workings were dewatered, under the direction of Chas. Brent, president and general manager of the company, for examination purposes.

Coniaurum Mines, Limited

This company has a capitalization of $5,000,000, divided into 1,000,000 shares of $5 par value. The officers of the company are: R. W. Leonard,

president; A. L. Bishop, vice-president; Fraser D. Reid, general manager; J. J. Mackan, secretary-treasurer. The directors are: R. W. Leonard and A. L. Bishop, St. Catharines; Fraser D. Reid, Cobalt; Alex. Longwell, W. G. Watson, J. E. Day, and J. Y. Murdoch, Toronto.

The mines are in the township of Tisdale, district of Cochrane. The mine office address is Schumacher, Ont. The head office of the company is at St. Catharines, Ont.

The balance sheet taken from the financial report for the year 1926 shows the following:—

ASSETS

CAPITAL ASSETS (Coniaurum mine):		
Cost of property	$2,197,903.21	
Mine development	615,447.35	
	$2,813,350.56	
Machinery and plant	116,636.84	
Camps and buildings	60,490.15	
Construction work in progress	811.79	
Camp equipment	2,170.37	
Assaying and engineering equipment	873.82	
Office equipment	1,002.45	
		$2,995,335.98
Investments		300,689.72
Current assets		55,820.33
Deferred charges		632.53
Discount on stock		1,650,000.00
		$5,002,478.56

CAPITAL AND LIABILITIES

Capital stock, authorized and issued	$5,000,000.00	
Current liabilities	2,478.56	
		$5,002,478.56

The following statement of the working account is also taken from the financial report for the year ending December 31, 1926:—

DEBITS

Head office administration	$9,595.33	
Mines office and supervision	19,162.37	
Mining	233,367.16	
Maintenance	3,768.07	
Camp expense	2,490.07	
Lands and roads	54.59	
Legal expense	1,222.90	
Transportation and travelling	897.17	
Taxes and royalties	2,275.26	
Fire insurance	2,406.46	
Accident insurance	6,686.63	
Employees' bonus	377.64	
		$282,304.15

CREDITS

Interest on investments and bank deposit	$10,393.78	
Rents	496.00	
Cash discounts	185.82	
Net cost of mine development for the year transferred to mine development account	271,228.55	
		$282,304.15

The mine development account gives the following:—

DEBITS

Balance, January 1, 1926, forward	$342,586.49	
Adjustment re previous year's operations	1,632.31	
Net cost of mine development for the year transferred from working account	271,228.55	
		$615,447.35

CREDITS

Cost of development to date transferred to balance sheet	$615,447.35

The following development work was done during the year 1926:—

	Feet
Drifting	1,774
Crosscutting	5,362
Raising	897
Winzes	312
Shaft-sinking	524
Shaft-timbering	522
Diamond-drilling	2,663

The total development work done to January 1, 1927, including work done by the Coniagas Mines, Limited (working under Newray option), is:—

	Feet
Drifting	5,269
Crosscutting	14,662
Raising	1,163
Winzes	312
Shaft-sinking	1,616
Shaft-timbering	1,602
Diamond-drilling	20,904
	Tons
Total tons of waste hoisted	118,912
Total tons of ore hoisted	10,795

A summary of the ore developed by drifting from the commencement of operations to January 1, 1927, is as follows:—

ORE DEVELOPED BY DRIFTING TO JANUARY 1, 1926

Level	Vein No.	Location	Length	Width	Assay	Remarks
			feet	feet		
400-foot...	5	Old workings....	175	15	$6.13	Developed by old company. Computed by mill test.
700-foot...	2	E. & W. 9.....	270	4.1	12.60	Face and back sampled.
	5a	N. & S. 5 vein...	65.5	3.4	5.99	" " "
	5	W. 9 X.C.....	29	5.4	5.08	" " "
1,000-foot...	5	E. & W. 9.....	95	6.3	5.73	" " "
	5	" 9.1.....	36	4.3	5.29	" " "
	7	" 10.....	291	4	5.21	" " "
	7	" 11.....	95	3.75	8.50	" " "
	9	" 10.....	47	3.2	66.90	" " "
	9	W. 10.....	65	2.8	8.53	" " "
	10	E. & W. 12.....	182	4.8	7.83	" " "
500-foot...	10	Old work.....	184	7.6	7.00	Computed from Kerr Lake Mining Company's assay plan of Goldale.
Total...	....	.....	1,534.5	.....	.....	.....

ORE DRIFTED ON DURING THE YEAR 1926

Level	Vein No.	Location	Length	Width	Assay	Remarks
			feet	feet		
1,000-foot...	11	E. & W. 11.1.....	95	2.85	$3.20	.....
	12	E. of dike.....	12	2.5	6.83	Face and back sampled.
	12	W. of dike.....	135	3.1	6.56	" " "
	12a	E. 11.1.....	173	3.1	19.57	" " "
1,125-foot...	5	E. & W. winze.....	6	3	2.50	Cut by X.C.
	9	E. & W. winze.....	32	2	4.83	13 feet length of winze; 19 feet drift.
1,250-foot...	9	W. 10.....	15	3	10.57	Changed from 7 W. 10.
	8	E. & W. M-2.....	116	3.8	6.61	.....
1,500-foot...	1	W. 10.....	81	2.8	7.95	.....
	7	E. & W. 10.....	145.5	3.1	7.67	.....
Total...	....	.....	810.5	.....	.....	.....

ORE DEVELOPED FROM JANUARY 1 TO MARCH 31, 1927

Level	Place	Length	Width	Assay
		feet	feet	
1,500-foot.	7 W. 10.....	204.5	2.5	$10.87 (No. 2 lens)
	7 W. 10 E. head.....	21	2.7	7.08
	7 W. 10 N.H. G.E.....	25	3.3	41.48
	8 E. & W. 11.....	90	3	6.32
Total...	.....	340.5	.....	.....

Operations during 1926 included the completion of development on the 1,000-foot level, the sinking of the main shaft to a depth of 1,500 feet, and the exploration of the 1,250- and 1,500-foot levels.

The projected programme for 1927 is to explore the three mineralized zones of fracture at the 1,250- and 1,500-foot levels and to deepen the main shaft to 2,000 feet preparatory to deeper development.

It is anticipated that when the year 1927 is further advanced sufficient ore will be disclosed to ensure the continuous operation of a 500-ton mill, which will be proceeded with if justified.

During the year 1926 a machine shop, 32 by 30 feet and 17 feet high, and a carpenter shop, 36 by 26 feet and 16 feet 4 inches high, were erected. The average number of men employed during the year was 80, of whom 45 were in the mine and 35 on the surface.

Operations at the mine are under the direction of John Redington, superintendent, and Douglas Jones, mine captain.

Conroyal Mines, Limited

This company is a reorganization of Kirk Gold Mines and has an authorized capital of 7,500,000 shares of no par value. J. A. Morden is president; J. S. Knechtel, vice-president; A. E. Barratt, secretary-treasurer. G. E. Harrison and J. H. Macabe, of Toronto, were added to the directorate during the year. The head office is at 910-11 Kent Building, Toronto. Hugh Jardine is manager, and 30 to 40 men are employed at the property, which is in Lebel township, district of Timiskaming.

During the year the shaft was deepened by 265 feet, and stations were cut at the 425- and 550-foot levels. Seventy feet of work was done on the 300-foot

level; and early in 1927, 55 feet of drifting was done and a 458-foot crosscut driven on the 300-foot level south.

During 1925 and 1926 a total of 3,755 feet of diamond-drilling was done in six holes. These holes were drilled to the following depths: 900, 800, 350, 980, 305, and 420 feet.

Consolidated West Dome Lake Mines, Limited

This company has an authorized capital of $5,000,000, each share of a par value of $1. It owns 360 acres in the southeast portion of Tisdale township, district of Cochrane.

The officers of the company are: Sir Henry M. Pellatt, president; Wm. H. Kinch, first vice-president; Charles L. Sherrill, second vice-president; F. L. Hutchinson, secretary-treasurer; Duncan M. McPhail, manager. The directors of the company are: Sir Henry M. Pellatt, Richard L. Baker, J. A. Murray, Chas. L. Sherrill, and Frank G. Stevens, all of Toronto; Wm. H. Kinch and Frank L. Babst, of Buffalo, N.Y.; A. A. McKelvie and F. L. Hutchinson, of New Liskeard, Ont.

Mining and milling operations were carried on continuously throughout the year 1926, the ore produced coming from the 6th to the 12th levels.

Ore Production

Level	Tons
600-foot	3,000
750-foot	6,500
900-foot	3,000
1,050-foot	22,446
1,200-foot and winze	2,000
Total	36,946

The development work done during the year 1926 was confined entirely to the exploration of No. 3 vein. A winze was sunk 150 feet from the 1,050-foot level to the 1,200-foot level at a point 425 feet east of the crosscut from the main shaft. Sixty-five feet of drifting was done, and 2,000 tons of ore assaying $15 was taken out of the winze.

Drifting to the extent of 535 feet was done to the east on No. 3 vein at the 1,050-foot level. An ore shoot 400 feet long was opened up, making 980 feet of ore opened up on this level. No work has been done on the upper levels as far as this ore shoot, and it is not yet known whether this is a continuation of an ore body that was mined from the 60- to the 400-foot level in the old Dome Lake mine in the early days, or whether it is the apex of an ore shoot from a lower horizon.

During the year 1926 the following work was done:—

Mining and Development

Levels	Drifting	Raising	Sinking	Station-cutting
	feet	feet	feet	
600-foot	.....	90	.....	.....
600-foot substation	70	.....	.....	.....
750-foot	.....	30	.....	.....
900-foot	344	180	.....	.....
900-foot substation	120	.....	.....	.....
1,050-foot	669	80	162	7 by 7 by 80 feet
1,200-foot	65	.....	.....	12 by 22 by 14 feet
Total	1,268	380	162	4,816 cu. ft.

MILLING

Total tons milled	36,946
Average daily tonnage	101.2
Gross value ore milled	$239,348.86
Total loss in tailings	18,590.26
Net value recovered (gold, $219,670.67; silver, $1,087.93)	220,758.60
Average value per ton	6.478
Average recovery per ton	5.975

From August 23, 1924, to December 31, 1926, the mill has treated 83,563 tons of ore and produced $519,059.32 gold bullion. This production has come entirely from No. 3 vein.

The following statements are taken from the auditors' report in the report to shareholders for the year ending December 31, 1926:—

OPERATING ACCOUNT FOR THE YEAR ENDING DECEMBER 31, 1926

REVENUE:		
Gold bullion	$220,670.59	
Rental of equipment	1,430.20	
Cook camp revenue	292.99	
Sale of scrap	100.00	
	$222,493.78	
Expense in excess of revenue	46,996.49	
		$269,490.27
EXPENSE:		
Mining costs, including plant repairs and maintenance	$154,852.80	
Milling charges	52,031.36	
Mine office expense and management	8,609.99	
General expense, head office	9,706.88	
Head office management	4,999.92	
Transfer fees	1,999.92	
Insurance and workmen's compensation	10,774.18	
Taxes	4,135.82	
Gold bullion marketing charges	2,578.25	
Travelling expense	1,024.36	
Interest and exchange	876.42	
Depreciation	17,900.37	
		$269,490.27

EXPENDITURE ON DEVELOPMENT AND PRODUCTION LESS REVENUE

	Expenditure	Revenue	Excess of expenditure over revenue
Period ending December 31, 1922	$21,391.62	$144.30	$21,247.32
Year ending December 31, 1923	89,690.35	631.20	89,059.15
Year ending December 31, 1924	219,224.29	61,768.22	157,456.07
Year ending December 31, 1925	289,178.07	240,134.50	49,043.57
Year ending December 31, 1926	271,013.78	224,017.29	46,996.49
Total	$890,498.11	$526,695.51	$363,802.60

NOTE: The mill commenced production on August 23, 1924.

During the year 1926 the average number of men employed was 80, of whom 55 were employed in the mine, 11 in the mill, and 14 general.

The balance sheet for the year ending December 31, 1926, shows the following:—

ASSETS

Current assets	$16,240.36	
Deferred charges	11,423.91	
Property accounts:		
Mine property	3,494,985.76	
Buildings, depreciation provided for	54,315.09	
Plant and equipment, depreciation provided for	104,097.29	
Expenditure on development and production, less revenue	363,802.60	
Other assets:		
Commission on sale of stock	37,999.50	
Discount on sale of capital stock	1,069,999.60	
		$5,152,864.11

LIABILITIES

Current (including $5,566.66 due to officers and directors)	$39,094.21	
Special Suspense Account "A"	113,769.90	
Capital stock (5,000,000 shares of $1)	5,000,000.00	
		$5,152,864.11

Regarding the item "Special Suspense Account," the following is taken from the report of the president to the shareholders:—

Your directors are unable to recommend to you the adoption of the auditors' report, as they have not been able to satisfy themselves as to the item of $113,769.90, shown as a liability under the heading "Special Suspense Account."

When the agreements, under which this company was incorporated and acquired the assets of Dome Lake and West Dome, were entered into, it was understood and agreed between the parties that Mr. C. H. Manaton should be appointed secretary-treasurer of the company and have charge of the head office business of the company. Acting in that capacity, he from time to time submitted to your directors statements exhibiting the financial affairs of the company. In none of these statements was any mention made of this item, but on receipt from Mr. Manaton of his statement as of 31st August, 1926, certain details were requested from Mr. Manaton, including his trial balance. On the trial balance so obtained there appeared a credit item, "Special Suspense Account, $113,769.90," and Mr. Manaton in his letter of October 25, 1926, to the present secretary, gave the following explanation of this item:—

"SPECIAL SUSPENSE: Varied amounts paid into the company by myself when no money was available for upkeep will be written off to 'Development Account'."

A meeting of the directors was held in December, 1926, at which Mr. Manaton was requested to explain to the directors this item, which he refused to do, stating that the information should be obtained from the auditors of the company.

The auditors' report was obtained as soon as possible, in which they reported that Mr. Manaton claimed that the said sum of $113,769.90 represented advances made by him personally to the company. Your directors were not satisfied with this explanation and accepted the resignation of Mr. Manaton and appointed the Trusts and Guarantee Company, Limited, transfer agents for the company, to replace the former transfer agents.

The present transfer agents report irregularities in the company's stock ledgers, but there has not been sufficient time to enable your directors to come to any conclusion as to the extent of the irregularities, and recently Mr. Manaton has made the statement that the item in question is the proceeds of the sale of the shares of certain shareholders entrusted to him.

A thorough investigation of the company's stock ledgers and the operations of Mr. Manaton must be made to ascertain to what extent, if any, there has been an over-issue of shares, and what part, if any, of the said $113,769.90 represents the sale of shares so over-issued.

Your directors, therefore, recommend that the annual meeting of the shareholders be adjourned to the 10th of May, 1927, to enable the necessary investigation to be made and satisfactory plans completed to finance the company.

Cooper Gold Mines, Limited

This company has an authorized capital of $2,000,000 in shares of a par value of $1.

The head office of the company is Suite 52, Trusts and Guarantee Building, 302 Bay Street, Toronto. The officers and directors of the company are: W. H. Stafford, president; J. Mackintosh Bell, managing director and consulting engineer; A. S. Hamilton, secretary; E. H. Blake and R. S. Dening, directors.

The mine offices are at Wawa, via Hawk Junction, Ont. The staff at the mine is composed of J. C. Kirkland, manager; E. P. Edwards, assayer and engineer; J. Knox, Jr., underground superintendent; and W. L. Loughrin, accountant.

The holdings of the company consist of the Minto and Cooper block of claims, both in township 29, range 23, Algoma district, 22 claims in all.

Underground development has been confined to the Minto block. Underground operations were commenced on May 6, 1926. Day and night shifts of eight hours each were worked during all lateral work, and two drills were used in this work. While sinking No. 2 shaft, three shifts were worked and three drills operated. All lateral work was suspended during the sinking operations.

The following is a summary of the development work completed on the property up to and including April 30, 1927:—

No. 1 Shaft, which is located on the middle east side of claim No. 3,134, was completed by former operators. It is a two-compartment shaft, 11 by 5 feet, inclined at approximately 45 degrees. The vertical depth is 95 feet, and the inclined, 120 feet. The development work done by this company was at the 87-foot (vertical) level.

No. 1 Shaft Development

	Feet	
Station-cutting	90	(drifting equivalent)
North drift	794	
South drift	1,024	
Total	1,908	

No. 2 Shaft, which is located in the middle of claim No. 3,132, was commenced in October, 1926, and completed in January, 1927. It is a vertical, three-compartment shaft 14 feet 6 inches by 6 feet (outside timbers), and is 340 feet deep. Stations were cut at 121, 221, and 321 feet, leaving a 19-foot sump.

No. 2 Shaft Development

	Feet
First Level (121 feet):	
Station-cutting	20
Crosscutting	14
Second Level (221 feet):	
Station-cutting	21
Crosscutting	187
North drift	81
South drift	80
Third Level (321 feet):	
Station-cutting	35
Crosscutting	91
North drift	205
South drift	201
Total station-cutting	76
Total drifts and crosscuts	859

In addition to the above underground development work, 2,533 feet of diamond-drilling was done on claim No. 3,132 of the Minto block and 1,346 feet on claim No. 3,090 of the Cooper block.

Crown Reserve Consolidated Mines, Limited

This company operated its property at Larder Lake, McVittie township, district of Timiskaming, for the first six months of 1926 with a working force of 23 men. N. J. Evered is manager.

A total of 1,104 feet of drifts and crosscuts were driven on the 425- and 550-foot levels.

De Santis Development Company, Limited

The De Santis Development Company, Limited, of Timmins, was formed to acquire and develop claims known as the De Santis group in the southwest corner of Turnbull township, district of Cochrane. The group comprises the following claims: P. 8,604, 8,722, 8,741, 8,743-45, 9,167, 9,176.

The company is capitalized at $40,000, divided into shares of $100 par value each. The officers of the company are: Ferreri Biagio, Timmins, president, and Guiseppe Guistini, Timmins, secretary. The address of the company is Box 1299, Timmins, Ont.

Early in 1927 preparations were made for the sinking of a shaft on claim P. 8,604 where a quartz vein containing gold was discovered in 1920. This vein is described as follows:[1]—

> The vein lies in a small body of granite which intrudes gabbro on the south and is cut by a large diabase dike on the west. This dike parallels and is 6 feet distant from the vein, which strikes N. 13° W. and dips vertically. The vein proper is 170 feet long and pinches out at the south end. At the north end, however, the granite is fractured, and stringers extend from the vein to the edge of the outcrop, a distance of 50 feet. The maximum width is 4 feet, widening to 5 feet at the bottom of an 8-foot pit near the centre of the vein.
>
> Near the north end of the vein, a branching vein two and one-half feet wide strikes S. 38° E. It consists of quartz and pink and white calcite, apparently unmineralized, and shows perfect comb structure with projecting crystals of quartz.
>
> The main vein contains pyrite and chalcopyrite in fractures in the quartz. The sulphides are most abundant along the walls, and along the east wall a width of 4 to 6 inches is particularly well mineralized. Much finely disseminated native gold was observed in this high-grade streak, both in the sulphides and in the quartz. About half a ton of this material was taken to Timmins by dog-sled during the winter of 1924 and was stored preparatory to a mill run.

A shaft, 5½ by 9 feet, was sunk to a depth of 125 feet, at which level 45 feet of crosscutting was done. Work was discontinued on June 15, 1927. The plant consists of two vertical tubular boilers, 12 and 15 h.p.; one Canadian Ingersoll-Rand compressor, straight-line type, capacity 110 cubic feet per minute; and one 6- by 8-inch Jenckes hoist. The buildings are all of log construction and include a power-house, 20 by 40 feet; a cookery, 20 by 30 feet; sleeping camp, 20 by 30 feet; and storehouse, 18 by 24 feet.

During sinking operations 15 men were employed and were directed by Peter de Santis.

Dome Mines, Limited

The authorized capital stock of the Dome Mines, Limited, consists of 1,000,000 shares of no nominal or par value, of which 46,666 are held under an agreement in trust for the company; the dividends on these shares are returned to the treasury of the company.

The mine is in the township of Tisdale, district of Cochrane. The directors of the company are: Jules S. Bache and Morton F. Stern, New York; Alex. Fasken and R. F. Segsworth, Toronto; G. C. Miller and R. W. Pomeroy, Buffalo, N.Y.; Dwight B. Lee, Detroit, Mich.; and Innis P. Allen, Rochester, N.Y.

On December 10, 1926, W. S. Edwards, a former director of the company and one who had much to do with the original staking and afterwards the promotion of the company, died.

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[1]Kamiskotia Gold Area, Ont. Dept. Mines, Vol. XXXIV, pt. 6, 1925, p. 59.

The executive officers of the company are: Jules S. Bache, president and treasurer; H. P. De Pencier, first vice-president and general manager; Morton F. Stern, third vice-president; Alex. Fasken, secretary; C. W. Dowsett was general superintendent until May 1, 1927, when he resigned to go to South Africa; E. P. Goetz, assistant treasurer and assistant secretary; C. C. Calvin, assistant secretary; John B. Robinson, assistant secretary. The offices of the executive and financial departments are at 42 Broadway, New York, and the Toronto office is at 36 Toronto Street.

In the annual report to the shareholders for the year ending December 31, 1926, the balance sheet shows the following:—

ASSETS

CAPITAL:		
Mining claims and properties	$3,483,793.36	
Plant, etc, at depreciated values as per appraisal plus additions since	2,961,646.76	
		$6,445,440.12
CURRENT		1,805,440.67
DIVIDEND ASSURANCE FUND consisting of:		
Cash in bank	$22,852.02	
Government, railway, and other bonds at cost	2,196,579.25	
		2,219,431.27
		$4,024,871.94
PREPAYMENTS AND DEFERRED CHARGES		22,701 74
		$10,493,013.80

LIABILITIES

CAPITAL AND SURPLUS:		
Capital: Authorized 1,000,000 shares of no nominal or par value, all authorized to be issued for the properties and assets of the old company, the Dome Mines Company, Limited, at $7 per share	$7,000,000.00	
Surplus	1,313,007.94	
		$8,313,007.94
CURRENT:		
Accounts, salaries, and wages payable	$105,358.30	
Accrued income and other taxes	173,091.66	
Dividend payable January 20, 1927 $500,000.00		
Less: Dividends on shares held in trust for the company as above 23,333.00		
	476,667.00	
Unclaimed capital repayment and dividends	35,575.52	
		$790,692.48
RESERVES:		
Operating equalization	$35,263.15	
Amortization of premium on bonds	4,522.77	
Depreciation plant and equipment	1,349,527.46	
		$1,389,313.38
		$10,493,013.80

The net excess of current assets over current liabilities (including dividend payable January 20, 1927, amounting to $476,667) is the sum of $3,234,179.46, which includes the sum of $2,219,431.27 set apart as a dividend assurance fund, as compared with the sum of $3,489,083.97 for the excess of current assets over current liabilities in 1925, which included the sum of $2,065,993.07 set apart for the dividend assurance fund.

The operating and profit and loss account for the year ending December 31, 1926, showed the following:—

EXPENDITURE

		Cost per ton milled
OPERATING AND MAINTENANCE:		
Mining, including hoisting	$717,036.17	$1.290
Development	757,706.94	1.364
Crushing and conveying	80,615.45	.145
Milling	500,891.30	.901
Bullion expense	20,866.90	.038
Fire protection	9,121.83	.016
Warehouse expense	10,093.22	.018
Auditors' expense	2,645.13	.005
Administrative expense—mine office	117,754.36	.212
Administrative expense—executive office	20,425.09	.037
Provincial and municipal taxes	53,476.47	.096
Insurance	25,167.31	.045
	$2,315,800.17	$4.167
Reserve for Dominion of Canada and U.S. income war tax	90,966.33	.164
	$2,406,766.50	$4.321
Profit for year	1,784,834.24[1]	
	$4,191,600.74	

REVENUE

EARNINGS:		
Amalgamation bullion	$2,380,118.43	
Cyanidation bullion	1,559,971.70	
		$3,940,090.13
Non-operating revenue		251,510.61
		$4,191,600.74

APPROPRIATION ACCOUNT

Reserved for depreciation of buildings, plant, etc.	$442,797.96	Surplus Dec. 31, 1925	$2,019,664.92
Expenditure Howey Gold Mines, Limited, written off	113,417.11	Bonus to mine management and staff for 1925	16,905.00
Dividends Nos. 34, 35, 36	1,430,001.00	Additional Dominion	11,703.15
Dividend No. 37 payable Jan. 20, 1927	476,667.00	Profit for year ending Dec. 31, 1926	1,784,834.24
Surplus Dec. 31, 1926	1,313,007.94		
	$3,775,891.01		$3,775,891.01

During the year under review there were four dividends paid amounting to $1,906,668.

The following information is taken from the report of the general manager:—

During the year, 656,521 tons were hoisted, of which 555,700 was ore and was sent to the mill and treated; 100,821 tons was waste which was dumped on the surface.

The 555,700 tons milled yielded bullion worth $3,940,090.13, the average yield being $7.0903 per ton, as compared with $8.2349 per ton for the previous year. The tonnage milled is 104.81 per cent. of that of the previous year.

The yield of ore for the years 1925 and 1926 are as follows:—

Source	No. of tons		Value per ton	
	1925	1926	1925	1926
Stopes	487,448	522,410	$8.614	$7.3877
Development	42,752	33,290	6.295	5.6674
Total	530,200	557,700	$8.452	$7.2846

[1]Profit for 1925 was $2,053,008.78.

The ore drawn from Dome Extension ground during the year was 76,456 tons, valued at $505,591.58, or $6.6128 per ton.

Stoping was carried on at all levels from the 3rd to the 15th, except at the 4th and 5th. No development of any consequence was done above the 14th level, and most of the work done on this latter level has not located any continuous ore body.

At the 15th level, No. 3 (main) shaft and No. 4 winze were connected, and crosscuts and drifts from this connection opened up ore indicated in holes diamond-drilled from the 13th and 14th levels. Stopes Nos. 1,506-8 were expected to connect with ore bodies Nos. 1,404 and 1,405 on the 14th level. These workings are all in the sediments except the western end of drift No. 1,502, which is in Keewatin greenstone for 670 feet from the station; east of this there is 20 feet of porphyry before the sediments are reached.

At the 16th level, connection is also made between No. 3 shaft and No. 4 winze. Some ore has been developed, notably in the east end of drifts Nos. 1,606 and 1,607. Diamond-drilling from this level, northwest of No. 4 winze, indicated ore between the 17th and 18th levels.

To develop the ore intersections shown in the drill holes, a three-compartment, vertical winze, No. 5, was sunk from the 16th level at a point 1,200 feet east of No. 3 shaft to a depth of 338 feet, with stations at the 150- and 300-foot levels, known as the 17th and 18th. The winze is in greenstone to within a few feet of the bottom, where the porphyry is encountered at the south side. The porphyry is 375 feet south of the winze at the 16th level.

Diamond-drilling has been done from the 17th-level station, and one hole, No. 982, started to the south and dipping below the level cut ore; all of the intersection, 296 feet, is in the sediments except the last 26 feet, which is in porphyry. Crosscuts were driven on the 17th and 18th levels, and some ore was developed on the 17th.

No. 5 winze is equipped for sinking considerably deeper and will permit exploring a large area to the east in Dome Extension territory.

SUMMARY OF DEVELOPMENT WORK FOR YEAR 1926

Level	Drifts	Cross-cuts	Drift cross-cut slashing	Raises and winzes	Box-holes	Raise and winze slashing	Sta-tions	Shafts	Total	Dia-mond drilling
	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet
3rd	48	46	21	.....	.....	.....	.....	.....	115	309
5th	30	.....	4	.....	.....	.....	.....	.....	34	.....
6th	178	.....	12	5	159	.....	.....	.....	354	.....
7th	32	43	20	190	49	2	.....	.....	336	2,312
8th	233	134	41	146	52	3	.....	.....	609	910
9th	402	183	32	249	387	23	.....	.....	1,276	1,690.5
10th	394	241	41	549	456	20	.....	.....	1,701	1,683
11th	90	69	18	96	94	.....	.....	.....	367	648
12th	399	54	5	271	455	22	.....	.....	1,206	1,416
13th	982	6	80	406	737	.....	.....	.....	2,211	2,856.5
14th	1,238	913	179	380	467	18	.....	.....	3,195	7,296.5
15th	2,556	406	359	226	830	66	31	.....	4,474	4,291.5
16th	3,135	508	624	536	.....	86	566	253	5,708	13,218.5
17th	114	186	22	9	.....	.....	73	150	554	619
18th	.....	223	.....	.....	.....	.....	79	38	340	.....
Total...	9,831	3,012	1,458	3,063	3,686	240	749	441	22,480	37,250.5

The cost of development work was $1,364 per ton milled, as against $1.413 for the preceding year. In the charges were included outside development done during the year, an expenditure of $56,270.88 in a total of $757,706.94.

Diamond-Drilling.—During the year 37,250.5 feet of diamond-drilling was done, as compared with 38,939.94 in the previous year.

Ore Reserves.—In his remarks on the ore reserves, the general manager states that the development work has failed to open up a tonnage of ore equal to that milled during 1926 and the indications do not leave much hope that the coming year will see any improvement in this respect, unless the development campaign discloses larger ore bodies than those that have been found during the past two years.

The broken ore in the stopes has been reduced somewhat and now stands at 575,000 tons, as compared with 620,000 tons for the previous year. Including this broken ore, it is stated that there is two years' ore supply remaining in the mine.

Exploration.—During the year the Howey property at Red lake, held under option, was examined, and 18 diamond-drill holes, totalling 7,335.25 feet of drilling, were put down. The results obtained were not considered sufficiently encouraging to justify a continuance of the option.

The claims of the Red Lake Prospectors Syndicate to the west of the McIntyre claims on Red lake were also thoroughly prospected, and the option was dropped.

The claims farther west in the same area staked by the company's prospectors were also examined, and some surface work was done; it is the intention to do further work.

The Mill.—The following are the results of the mill operation for the year:—

	Total value	Value per ton
Heads, 555,500 tons	.....	$7.2846
Amalgamation bullion	$2,380,118.43	4.2831
Cyanidation bullion	1,559,971.70	2.8072
Total	$3,940,090.13	$7.0903

NOTE: For the previous year the value per ton of bullion was $8.2349.

The tonnage milled was 25,500 greater than for 1925, the increase being largely the result of higher temperature gained by live steam in the mill water.

The milling costs for 1926 were $0.901 per ton, as compared with $0.925 for 1925.

During the year 1926 the average number of employees was: mine, 475; mill, 56; surface, 160; total, 691.

Operating costs amounted to $4.167 per ton milled, as compared with $4.467 for the preceding year. The reduction was partly due to some ore having been drawn from the broken ore reserves, and this has partly been offset by the mining in small shoots from intermediate levels.

Four Nations Reserve Mining Company, Incorporated

This company is a Delaware corporation which owns mining claims L.14,821, 12,178, and 10,554 in Grenfell township, district of Timiskaming. The company

has a capital of $2,500,000, in shares of $1 par value. The officials of the company are: Victor E. Lundberg, president; R. A. Elliott, first vice-president; Jacob Friedman, second vice-president; Samuel Matz, treasurer; Frederick Hinners, secretary; Charles Vogel, assistant secretary. The head office of the company is at 1440 Broadway, New York.

The company began operations on the property, which is situated one mile northwest of Kenogami station, in May, 1926, with a force of 3 men, which was increased during the summer and fall months to a working force of 37 men. A mining plant, consisting of a 150 h.p. boiler, a 500 cubic foot air compressor and a 10- by 12-inch cylinder hoist, was installed. A bunk-house, 24 by 30 feet; a cook camp, 24 by 30 feet, a power-house, 30 by 40 feet; and a 45-foot headframe were erected.

A two-compartment shaft had been sunk to a depth of 26 feet when operations were suspended from November 30 until the following August.

Gold Hill Mines, Limited

This company has a capital of $3,000,000 in shares of $1 par value. The directors of the company are: D. H. Angus, president; E. W. Kearney, vice-president; C. F. Tuer, secretary-treasurer; H. J. Scott and George Tough. The head office is at Haileybury, Ont. The property is in Catharine township, district of Timiskaming. Dan Hughes is mine captain, and 30 men are employed.

The following buildings were erected: a steel shop, 22 by 28 feet; a transformer house, 8 by 12 feet; a two-storey cook camp, 28 by 36 feet; a 70-foot headframe, and an addition to the power-house.

The shaft was sunk from 400 to 800 feet in depth, and four new levels were established. Lateral development included 640 feet of drifts, 291 feet of crosscuts, and a 14-foot raise.

The mine was closed down for the first two months of 1927 for the installation of a 125 h.p. boiler, a 1,250 cubic foot air compressor, and a double-drum hoist, following which work was begun on excavating the foundations for a 75-ton mill.

Gosselin Syndicate

The Gosselin Syndicate operated their property in Cassels township, five miles northeast of Timagami station. Placide Gosselin is manager, and five men are employed.

The work done on this property during the year 1926 consisted of 90 feet of sinking in a winze on a 60-degree incline, 14 feet of drifting, and a few test pits, 3 or 4 feet deep. The shaft is 73 feet deep, and a winze has been sunk 225 feet on a 55-degree incline. Drifts have been started from the latter at depths of 35 feet, 45 feet, and 210 feet.

Goudreau Gold Mines Company, Limited

Mining and milling operations at the property of this company, in township 28, range 26, district of Algoma, were discontinued on May 31, 1926.

Surface exploration and a diamond-drilling campaign is being undertaken during the summer of 1927 under the supervision of Colin S. Johnston.

Harkness Hays Gold Mining Company, Limited

The officers and directors of this company are: E. Edward Bickel, New York, president; W. Dean Hays, Schreiber, general manager and chairman of the board of directors; Hallett Addoms, New York, secretary-treasurer; H. Harkness, Fort William, and W. F. Langworthy, Port Arthur. The mine is about two miles east of Schreiber on the main line of the Canadian Pacific Railway.

During 1926, work on the adit level was carried on by hand-drilling. In January, 1927, an Ingersoll-Rand, gasoline-driven compressor, 310 cubic feet per minute, a drill sharpener, and rock drills were added to the equipment.

When the property was visited on August 1, 1927, work on the adit level was temporarily suspended and surface exploration only was being done.

A total of approximately 1,200 feet of drifting and crosscutting had been completed on the adit level.

The work is under the direction of W. Dean Hays, general manager. Six men were employed at the time of writing.

Hewitt Mining Company, Limited

This company was incorporated under the Ontario Companies Act in 1927, with an authorized capital of $1,000,000, divided into 200,000 shares of a par value of $5 each.

The officers of the company are: Alexander M. Wood, president; Ralph Hewitt; Solomon Zeitlin, secretary. The directors are: Alexander M. Wood, New York; Ralph Hewitt, Ottawa; Solomon Zeitlin and Abraham Pollack, New York. The head office of the company is Room 39, Carleton Chambers, Ottawa, Ont.

The company is negotiating for the purchase of the following claims: T.R.P. 2,995 and 12,038 in McArthur township and T.R.P. 2,987 and 6,057 in Bartlett township, district of Timiskaming. These claims lie about 20 miles south of South Porcupine, township of Tisdale.

Early in 1927 work was done on claim T.R.P. 6,057 and a pit sunk to a depth of 30 feet. Nine men were employed.

Hill Top Gold Mines, Limited

This company has a capital of $5,000,000 in shares of $1 par value. The directors of the company are: A. Marland Woolnough, president; A. C. Thorburn, vice-president; George Tough, managing director; A. J. Young, Toronto, secretary-treasurer; and George Wilkie. In the first half of the year, the company acquired the north half of lot 10, concession V, and the south half of lots 10 and 11, concession V, Catharine township, district of Timiskaming; while a mining plant was being installed, they began the sinking of a shaft by hand on August 1. Henry Reamsbottom was manager, and 20 to 30 men were employed.

Commodious camp buildings were erected, as well as a power-house, 32 by 48 feet, and a 45-foot headframe.

The plant consists of two boilers of 30 and 50 h.p., a 325 cubic foot air compressor, and a 6- by 8-inch Jenckes hoist.

The shaft was continued to the first level at 140 feet, and 7 feet of drifting was done from the station at that depth.

Hollinger Consolidated Gold Mines, Limited

The authorized capital of this company is $25,000,000 in 5,000,000 shares of $5 par value each; 4,920,000 shares of these were outstanding on December 31, 1926.

The officers of the company are: Noah A. Timmins, president; L. H. Timmins, vice-president; John B. Holden, secretary and treasurer; A. F. Brigham, general manager; and John Knox, assistant general manager. The directors are: Noah A. Timmins, L. H. Timmins, Wilfred L. McDougald, Jules R. Timmins, and Leo H. Timmins, all of Montreal; John B. Holden and Wilson Bell, of Toronto. The mine and head office are at Timmins, Ont., and the general office is at 602 Royal Bank Building, Toronto.

The following information is taken from the sixteenth annual report of the directors to the shareholders covering operations for the year ending December 31, 1926:—

ASSETS

CAPITAL:		
Mining properties		$22,493,785.17
Plant, brought forward from 1925	$622,567.20	
Additions during 1926	835,207.45	
	$1,457,774.65	
Less depreciation for 1926	1,174,170.87	
		283,603 78
Investments in other companies, less depreciation for 1926		62,999.30
Tailings disposal site, less depreciation for 1926		33,667.20
		$22,874,055.45
DEFERRED		920,349.63
CURRENT:		
Cash on hand	$1,190,246.20	
Bullion in transit	386,698.66	
Accounts receivable	97,128.13	
Bonds and debentures	10,160,768.01	
Accrued interest on investments	151,617.68	
		$11,986,458.68
		$35,780,863.76

NOTE: In the bonds and debentures is included the amount of $5,125,000 for 6 per cent. first mortgage serial gold bonds, par value $5,225,000, of the Abitibi Electric Development Company, Limited. The values assigned to these securities represent the actual cost of the power development at Island Falls.

LIABILITIES

CAPITAL STOCK:			
Authorized		$25,000,000.00	
In treasury		400,000.00	
			$24,600,000.00
CURRENT:			
Wages unpaid and accounts payable			570,804.36
Reserve for taxes, Dominion of Canada and town of Timmins			439,217.20
SURPLUS:			
Balance of account from 1925		$9,776,762.48	
Profits from January 1 to December 31, 1926		7,392,215.05	
		$17,168,977.53	
Less—Dividends	$5,805,600.00		
Plant depreciation	1,174,170.87		
Tailings site depreciation	12,625.20		
Investments in other companies and properties written down	5,739.26		
		6,998,135.33	
Net surplus carried forward			$10,170,842.20[1]
			$35,780,863.76

[1]The net surplus for the year 1925 was $9,776,762.48.

The profit and loss statement is taken from the general manager's report covering operations for the year ending December 31, 1926:—

			1926	1925
SOURCES OF INCOME:				
Gold and silver produced			$14,780,636.60	$15,786,405.04
Interest on investments, etc			876,164.18	342,850.66
			$15,656,800.78	$16,129,255.70
DISPOSAL OF INCOME:	1926	1925		
General charges	$954,519.29	$791,615.95		
Milling charges	1,599,854.44	1,745,259.86		
Mining charges	5,076,505.60	5,292,152.81		
			7,630,879.33	7,829,028.62
Operating profit			$8,025,921.45	$8,300,227.08
Paid out in dividends			5,805,600.00	4,378,800.00
			$2,220,321.45	$3,921,427.08
DEDUCT (taxes):				
Ontario		$216,353.61		
Timmins		35,000.00		
Tisdale		1,006.90		
Dominion of Canada and Timmins		381,345.89		
			$633,706.40	$693,246.44
DEPRECIATION:				
Plant		$1,174,170.87		
Tailings disposal site		12,625.20		
Investments in other companies and properties written down		5,739.26		
			1,192,535.33	1,481,177.75
Added to surpuls			$394,079.72	$2,159,910.72

The yearly average costs are given as follows:—

DISTRIBUTION OF GENERAL CHARGES

Account	Sundries	Labour	Stores	Total	Per ton milled
General miscellaneous charges and administration	.....	$483,334.45	$137,890.84	$621,225.29	$0.3215
Surface services	.....	50,783.09	41,550.83	92,333.92	.0478
Insurance	$16,202.34	.....	.....	16,202.34	.0084
Marketing bullion	65,231.16	.....	.....	65,231.16	.0338
Workmen's Compensation	.....	159,492.00	.....	159,492.00	.0825
Discount on U.S. exchange	34.58	.....	.....	34.58	.....
Milling charges	.....	629,613.07	970,241.37	1,599,854.44	.8278
Mining charges	.....	3,186,983.42	1,889,522.18	5,076,505.60	2.6268
Total	$81,468.08	$4,510,206.03	$3,039,205.22	$7,630,879.33	$3.9486

The total cost per ton of ore milled in 1925 was $4.0565.

The Mine.—The development progress during the year 1926 was as follows:—

Level	Shafts	Drifts	Cross-cuts	Raises	Diamond-drilling	Timbering		Excavation
						Shafts	Stopes	
	feet	feet	feet	feet	feet	feet	feet	tons
Surface	.....	.....	.....	.....	4,891	.....	.....	.....
100-foot	.....	860	64	.....	1,656	55	.....	.....
200-foot	.....	1,843	1,766	.....	7,846	100	1,239	30
300-foot	.....	2,675	1,843	.....	8,632	100	660	.....
425-foot	.....	1,835	1,216	.....	8,825	125	937	358
550-foot	.....	1,741	1,303	95	7,342	125	609	30
675-foot	.....	1,683	662	.....	9,032	125	814	40
800-foot	.....	2,036	2,977	.....	6,404	125	1,241	192
950-foot	.....	1,567	968	45	3,740	150	1,204	.....
1,100-foot	.....	1,054	234	.....	5,485	150	264	.....
1,250-foot	.....	1,070	3,088	.....	6,199	150	721	806
1,400-foot	.....	1,693	3,240	76	10,356	150	1,706	216
1,550-foot	5	3,827	6,029	.....	9,326	168	2,858	847
1,700-foot	150	6,299	7,655	.....	7,631	300	184	1,563
1,850-foot	150	4,077	5,573	168	8,790	300	1,127	3,734
2,000-foot	331	3,311	5,853	15	7,556	380	80	5,927
2,150-foot	501	.....	1,939	25	1,306	417	159	1,565
2,300-foot	174	.....	.....	35	.....	157	.....	275
2,450-foot	150	.....	.....	.....	.....	150	.....	320
2,600-foot	150	.....	.....	.....	.....	150	.....	315
2,750-foot	248	.....	89	.....	.....	288	.....	625
2,900-foot	175	.....	189	.....	.....	169	.....	415
3,050-foot	150	.....	129	.....	.....	150	.....	272
3,200-foot	150	.....	34	111	.....	141	.....	425
Total	2,334	35,571	44,851	570	115,017	4,125	13,803	17,955

The total sinking, drifting, crosscutting, and raising for 1926 was 83,326 feet, and for 1925 was 68,926 feet.

At January 1, 1927, the central shaft had reached a depth of 2,388 feet. The main shaft was at 2,168 feet; No. 11 at 2,174 feet; and No. 19 (Schumacher) at 2,082 feet. Some 1,500 feet east of the central shaft, No. 23 shaft is being sunk from the 2,000-foot level to the 2,750-foot level to assist in developing the central section of the mine at lower levels. No. 21 shaft was sunk to a depth of 3,200 feet from surface, and at 3,160 feet crosscutting was done to connect with the central shaft. This connection is to be followed by raising to complete the central shaft to the same depth. No. 21 shaft was started at the 1,550-foot level.

At the beginning of 1927 stoping was being done at a depth of 1,850 feet, a beginning being made at the 2,000-foot level.

MINE PRODUCTION

Level	Broken ore in mine, Jan. 1, 1926	Ore broken during 1926	Ore removed during 1926	Broken ore in mine, Dec. 31, 1926
	tons	tons	tons	tons
Above 100-foot	3,947	19,974	17,851	6,070
Above 200-foot	65,195	157,961	124,493	98,663
Above 300-foot	36,442	98,785	83,080	52,147
Above 425-foot	134,860	115,586	165,019	85,427
Above 550-foot	66,530	176,823	145,982	97,371
Above 675-foot	58,607	82,124	86,642	54,089
Above 800-foot	38,224	70,734	72,065	36,893
Above 950-foot	81,596	146,060	114,009	113,647
Above 1,100-foot	321,884	87,087	281,542	127,429
Above 1,250-foot	214,731	182,145	279,877	116,999
Above 1,400-foot	93,647	378,130	248,643	223,134
Above 1,550-foot	4,360	252,184	151,850	104,694
Above 1,700-foot	.....	71,566	64,835	6,731
Above 1,850-foot	.....	81,320	67,597	13,723
Above 2,000-foot	.....	26,673	26,673	.....
Total, 1926	1,120,023	1,947,152	1,930,158	1,137,017
Total, 1925	.....	2,192,130	1,929,528	.....

During the summer months of 1926 a considerable quantity of sand filling was removed from the surface and taken to the mine for filling in stopes from which ore had been removed. In the fall and winter of 1926 preparations were made to handle sand and gravel from claims in the northeast portion of the township of Tisdale. The material is loaded by steam-shovel into a hopper and is carried on a belt-conveyor to buckets at a tramway, by which the sand and gravel is taken to a dumping station near the central shaft. Arrangements are also made to dump this filling material, when required, at various points, from which it is carried by belt-conveyor or tram to dumping stations which are convenient to the veins. The tramway is 3½ miles in length.

At the central shaft there are now installed two hoists, each consisting of a cylindrical drum, divided so as to accommodate the ropes for the ascending and descending skips, which work in balance. The drum is 12 feet in diameter and 12 feet in width. The hoists are designed for a depth of 3,200 feet and are capable of an hourly output of 280 tons, the net weight per lift being 14,000 pounds.

The net weight of each skip is 4 tons, and the maximum rope speed is 3,000 feet per minute. A tachograph records each trip, the rope speed during the trip, and the signals. Each hoist is equipped with Lilly controls for overwind and overspeed.

The drums are driven through single reduction gearing by 2,000-horsepower motors of the wound rotor type and reversible induction, 2,200 volts, 3-phase, 25 cycles. They are specially designed to withstand the mechanical and electrical stresses incident to reversible winder duty.

SUMMARY OF ORE RESERVES

Vein No.	Tons	Value per ton	Estimated gross value Dec. 31, 1926	Estimated gross value Dec. 31, 1925
Veins over $10:				
97	334,680	$19.79	$6,624,731	$6,348,582
200	3,682	16.54	60,882	60,882
100	2,183	15.28	33,362	.....
220	3,947	14.40	56,837	.....
84	264,635	14.32	3,788,888	5,330,005
86	113,500	13.40	1,521,208	3,240,248
48	6,588	11.92	78,500	78,500
1	108,744	11.23	1,221,492	1,051,895
44	56,339	11.18	629,686	224,932
58	130,814	11.14	1,456,689	1,339,121
5	18,615	10.95	203,758	241,022
111	20,884	10.93	228,164	271,352
11	12,966	10.83	140,382	115,654
92	70,792	10.80	764,461	1,070,522
38	8,759	10.70	93,748	69,335
50	103,403	10.61	1,097,293	1,186,246
13	19,783	10.60	209,659	191,249
47	13,463	10.58	142,471	142,471
66	78,506	10.46	820,825	401,619
17	1,792	10.43	18,691	.....
18	9,262	10.40	96,367	.....
101	80,393	10.35	831,992	432,113
15	83,745	10.35	866,375	1,219,231
63	155,569	10.31	1,603,531	1,421,881
14	33,564	10.29	345,500	345,500
10	19,598	10.28	201,410	208,820
61	8,698	10.11	87,962	87,962
96	1,096	10.00	10,960	33,300
Total	1,766,000	$13.16	$23,235,824	$25,112,442
Veins, $10 to $8:				
56	84,213	$9.98	$840,240	$553,976
114	76,588	9.96	762,977	.....
65	112,575	9.96	1,121,772	1,370,453
8	10,567	9.78	103,371	103,371
26	28,575	9.78	279,476	229,242
107	291,938	9.64	2,813,674	1,872,325
91	231,509	9.53	2,207,019	2,611,543
51	81,965	9.39	769,819	855,064
87	26,509	9.32	247,159	151,174
2	101,044	9.12	921,504	939,048
85	329,622	9.11	3,004,103	3,272,795
88	55,529	9.06	503,080	533,742
55	457,812	9.02	4,128,255	5,428,671
16	15,152	8.94	135,511	102,277
33	113,070	8.91	1,007,038	964,982
68	35,611	8.86	315,681	263,040
4	46,001	8.78	403,821	346,940
37	27,811	8.71	242,215	207,600
52	59,482	8.70	517,359	585,502
95	222,114	8.62	1,913,698	1,652,545
9	59,018	8.57	505,776	304,256
12	153,729	8.57	1,316,766	1,662,288
53	212,516	8.51	1,807,934	2,142,049
54	139,967	8.42	1,179,008	1,397,717
59	52,954	8.25	436,714	343,622
99	15,086	8.04	121,360	110,389
116	.....	.....	.....	100,007
Total	3,040,957	$9.08	$27,605,330	$28,104,618
Veins, $8 to $6:				
113	20,380	$7.86	$160,088	$147,449
64	1,096	7.60	8,330	8,330

SUMMARY OF ORE RESERVES—*Continued*

Vein No.	Tons	Value per ton	Estimated gross value Dec. 31, 1926	Estimated gross value Dec. 31, 1925
Veins, $8 to $6—*Continued:*				
150	5,363	$7.37	$39,518	$41,811
226	54,336	7.22	392,295	762,135
90	1,535	7.20	11,052	11,052
82	5,841	7.20	42,055	79,326
115	21,560	7.14	153,893	47,884
39	7,914	7.12	56,331	125,020
19	26,359	7.00	184,579	.....
201	8,552	7.00	59,864	.....
3	13,028	6.82	88,829	104,677
153	3,657	6.43	23,528	.....
7	8,431	6.34	53,452	55,398
45	4,291	6.20	26,604	26,604
67	3,629	6.11	22,173	.....
Total	185,972	$7.11	$1,322,591	$1,409,686
Total ore reserves	4,992,929	$10.45	$52,163,745	$54,626,746
Surface outcrops	80,280	7.50	601,730	663,343
Add probable ore in veins under $6	2,706,025	4.92	13,316,258	9,778,710
Total	7,779,234	$8.49	$66,081,733	$65,068,799

The Mill.—Milling results were as follows:—

Ore milled	tons	1,932,559
Average value per ton		$7.99
Gross value		$15,449,437.60
Deduct loss in tailings		668,801.00
Net value recovered		$14,780,636.60
Average tons per day		5,295
Per cent. of possible time run		93.8
Tons per 100 per cent. running time		5,568
Solution precipitated per ton of ore		1.45
Value per ton in tailings		$0.35
Cyanide consumed per ton of ore	lbs.	0.464
Zinc consumed per ton of ore	lbs.	0.079
Zinc consumed per ton of solution	lbs.	0.055
Lime consumed per ton of ore	lbs.	2.168
Lead nitrate per ton of ore	lbs.	0.015
Average value of pregnant solution		$5.30

In the mill the stamps have given way entirely to rod and ball mills, of which there are eight rod mills, 26½ by 14½ feet, and one ball mill, 7 by 6 feet.

For finer grinding the ball mill is followed by two tube mills, 6 by 16 feet; five of the rod mills each have two tube mills, 6 by 16 feet, following, and three rod mills have each two tube mills, 5 by 20 feet, following. All these tube mills are in closed circuit with duplex Dorr classifiers. Pebbles are used in the tube mills.

The rod mill feed has one-half of one per cent. on 1-inch, 2 per cent. on ¾-inch, and 79 per cent. through half-inch square-mesh screen. The discharge from the rod mill has 10 per cent. on 14-mesh, 16 per cent. on 20-mesh, and 32 per cent. through 200-mesh. The classifier overflow has approximately 63 per cent. through 200-mesh and goes direct to concentration.

The sulphides are removed on concentrating tables, of which there are 38 single-deck and 141 double-deck Deister tables. A low-grade tailing is taken from the tables. The same pulp and the same tonnage is passed to each table.

The concentrate is reground in two tube mills, 4 by 16 feet, and two tube mills, 5 by 20 feet, using 1¼-inch iron balls. The concentrate is reground so that 99 per cent. will be minus 200 mesh and less than 0.05 per cent. remains on 150-mesh.

The reground concentrate is next thickened and agitated for 16 hours, in a solution with 1¼ pounds NaCN per ton.

The table tailings are thickened to approximately 52 per cent. solids and agitated for 16 hours in a solution of 0.75 pounds of NaCN per ton.

All agitator tails are combined and treated in one of three ways:—

1. Double Oliver filtration with repulping;
2. Three-step decantation followed by Oliver filtration; or
3. Moore filtration. (This is not at present in use.)

In the agitation section, 20 Pachuca tanks, 15 feet by 45 feet, with 45-degree bottom, are installed. They handle 4,200 tons per day. The remainder of the agitation consists of 11 Dorr type, 20 by 24 feet; 4 Dorr type, 14 by 20 feet; 2 Dorr type, 30 by 20 feet; and 2 Dorr type, 22 by 20 feet.

The decantation plant consists of seven 3-step rows of single-tray thickeners, 40 by 14 feet. Standard counter-current practice is followed, barren solution and secondary filter effluent being added to the last tank of each row. Pulp is delivered to the secondary filters, 52 per cent. solids.

The primary Oliver filters number six and are 14 by 16 feet. The discharge from these is repulped and passed to secondary filters, which consist of twelve 14- by 16-foot drum filters. Barren solution is used for washing the cake of the primary filters and in repulping the discharge.

Cake from the secondary filters is collected on a 36-inch belt-conveyor, repulped with water in a beater, and pumped, as will also be the Moore filter cake, to the tailings disposal site.

The Moore filtration consists of two 3-tank and 2-basket units and has a capacity of 1,000 to 1,100 tons. Each basket has 60 leaves, 6 feet 4 inches by 6 feet 10 inches.

Employees.—The average number of men employed during the year was 2,482 (for 1925, the number was 2,668), distributed as follows:—

Miners:		Mechanics:		General:	
Exploration	31	Operation	124	Mill and refinery	270
Development	408	Maintenance	177	Engineering staff	78
Production	1,132	Construction	73	Clerical staff	54
				Miscellaneous	135
Total, 1926	1,571	Total, 1926	374	Total, 1926	537
Total, 1925	1,742	Total, 1925	381	Total, 1925	545

Kirkland Hunton Mines, Limited

This company operated the property in Teck township, district of Timiskaming, during the year with an average force of 20 men. The officials are Leo Erenhous, president; Simon N. Stein, vice-president; William B. McPherson, 171 Yonge Street, Toronto, secretary-treasurer.

The inclined winze was continued to a depth of 300 feet, and a total of 1,050 feet of drifts and crosscuts were driven on the 675-foot level. A second winze was put down to a depth of 50 feet on this level. A crosscut of 130 feet was driven on the 1,250-foot level.

Six diamond-drill holes were put down from February to June, 1927. No. 1 was drilled 879 feet at 75 degrees north from the station; No. 2, 347 feet north

at 75 degrees; No. 3, 988 feet south from the station at 45 degrees; No. 4, 995 feet horizontal on the 675-foot level; No. 5 was drilled 635 feet horizontal on the 375-foot level; and No. 6 was drilled horizontal on the 125-foot level.

Kirkland Lake Gold Mining Company, Limited

The authorized capital of this company is $5,000,000 in shares of $1 par value, 1,000,000 of which are preferred shares. A total of 986,112 preferred shares and 3,972,226 common shares are outstanding. The directors are: D. B. Hanna, president; J. B. Tyrrell, vice-president and managing director; W. D. McPherson, R. G. O. Thompson, and A. C. Matthews. R. Graham is secretary, and the head office is at 810 Lumsden Building, Toronto. W. M. Sixt is superintendent, and from 50 to 75 men are employed at the mine, which is in Teck township, district of Timiskaming.

The agreement entered into with the Anglo-French Exploration Company of London, England, on March 22, 1924, by which that company controlled operations, has been terminated by mutual agreement.

The following summary of operations for the year is taken from the managing director's report:—

The main or central shaft was sunk from a depth of 2,073 feet to 2,408 feet, or 34 feet below our 2,350-foot level, which is actually 2,374 feet below the collar of the shaft.

The shaft was timbered from the 1,975-foot level down to the 2,350-foot level, and stations were cut at the 2,100-, 2,225-, and 2,350-foot levels, after which ladders, pipes, and electric cables were installed in the manway.

Crosscuts were driven southward on the above levels to the "main break," which continues to dip southward at an angle of about 85 degrees to the horizontal, and from these crosscuts and from those above them, drifting was prosecuted eastward towards the eastern boundary of our property, while on the lower two levels drifting was prosecuted westward as well as eastward.

Ore, often of very high grade, was encountered on all these levels, most of that on the lower levels being west of the crosscuts from the shaft.

All the evidence at hand points to the conclusion that in this section especially the ore already developed is the top of an ore body of very substantial proportions, the main body of which will be made accessible as the deeper levels are reached and opened.

Development work during the year was as follows:—

	Feet
Shaft-sinking	335.1
Crosscutting	1,065.79
Drifting	2,368.09
Station-cutting	113.4
Total	3,883.38

In accordance with our agreement with the Chaput-Hughes Mines, Limited, mentioned in our report of last year, the long crosscuts running southward from the shaft at the 1,600-foot level were continued for 37 feet to the north boundary of the Chaput-Hughes mining claim, after which drifts and crosscuts were driven in that property for 1,585 feet, in fulfilment of our agreement. This makes a total of 5,468 feet, or more than a mile, of crosscutting, drifting, and sinking accomplished by our staff and miners during the year on these two contiguous mining properties.

When the mill was started up again in October last, we were satisfied that we could keep it continuously supplied with ore with the certainty of steady profits. During the three months that it has been in operation, we have continued development of the mine to the limit of our power capacity and at the same time we have made a very handsome profit from operations, so that we start the year 1927 without indebtedness and with a substantial sum in cash or bullion to our credit.

The ore raised during the year was drawn from the various levels as follows:—

Level	Tons
1,850-foot	263
1,975-foot	2,944
2,100-foot	5,514
2,350-foot	1,076
Total	12,743

Although the mill had evidently received careful attention, both while it was running and after it was closed down, repairs and additions were found necessary. The whole plant was therefore overhauled, necessary repairs and additions were made, and everything was put in readiness for operation, but still we had no place where we could deposit our mill tailings. However, permission was finally obtained from the Mining Commissioner to run our tailings into Kirkland lake. As soon as this permission was granted, a 6-inch wire-wound wooden pipe, 3,200 feet long, was constructed on trestles from the mill to the lake. This pipe is now carrying away the tailings from the mill satisfactorily, and by its installation, all question of the disposal of our tailings has undoubtedly been solved for a long time to come.

In order to provide an efficient and permanent water supply for the mines in the area the township of Teck laid a 10-inch water main from the town of Kirkland Lake to our mine, assuring us of an abundant supply of water for the mill and also for fire protection, as well as providing pure water for domestic purposes, which latter is such an important factor in safeguarding the health and efficiency of the workmen.

The mill was started on October 1 and has continued to run smoothly and satisfactorily since that date. The tonnage treated has increased, until in December it attained an average of 150 tons a day, the total tonnage milled for the three months being 10,829 tons, from which was obtained gold to the value of $126,999.66.

In the Kirkland Lake area, and in fact throughout the pre-Cambrian regions of northern Canada, gold is associated with red acid syenite and porphyry, syenite being the more abundant and prominent of these two rocks in the western portion of the Kirkland Lake gold field, and the extent and width of these acid rocks is closely related to the extent and richness of the gold-bearing veins associated with them.

On the surface of the company's mine property, syenite did not occur except in very narrow stringers, though it is recorded in the government reports as occurring on the claims to the east, but it was encountered in our No. 1 or eastern shaft at a depth of 108 feet, and in our main or central shaft, which is 550 feet west of No. 1 shaft, at a depth of 500 feet, giving it a pitch westward of 71 feet in 100, or an angle of 36 degrees to the horizontal in this distance.

Wherever there was an opportunity to examine it, ore was found to begin about 150 feet below the top of the syenite and to continue thence downwards, forming an irregular ore shoot pitching downward and westward in the vein on the "main break." From this ore shoot $1,079,009.01 of gold was extracted prior to the year 1925, and there is still rich ore at the west end of the shoot below the 1,100-foot level.

In descending the main shaft, the band of syenite becomes quite narrow at a depth of about 1,300 feet and continues narrow to 1,900 feet, where it suddenly expands to a width of 160 feet, and from there downwards it continues to expand until at 2,350 feet it is at least 220 feet wide, with the north side not yet reached.

In connection with this expansion in width of the syenite, which pitches from the east westward as it does above, rich gold ore has now been found from the 1,600-foot level near the eastern boundary of our property on every level down to the 2,350-foot level, where it runs 800 feet west of that boundary, and throughout this distance we are, in my opinion, just at the top of the main ore-bearing zone.

Kirkland Rand, Limited

This company operated its property in Teck township, district of Timiskaming, until December 18, with a working force of about 25 men. W. F. Empey is president, and W. R. Osborne, superintendent.

A total of 876 feet of drifting and crosscutting was done on the 800-foot level after the fiscal period ending June 15, 1926.

Kirkland Townsite Gold Mines, Limited

This company operated for the six months' period, April to September, inclusive. The board of directors comprises R. H. Lyman, president; V. A. Gordon, secretary-treasurer; Frank E. Davison, Harry Oakes, F. W. Duncan, G. A. Bagshaw, and E. H. Horne. Sidney A. Pain is manager, and 20 men were employed. The property is in Teck township, district of Timiskaming.

The shaft was sunk to the 550-foot level by July 1, and to the 585-foot level in September. Three short diamond-drill holes, totalling 840 feet, were drilled underground in July.

Lake Shore Mines, Limited

This company has a capital of $2,000,000 in shares of $1 par value. The directors of the company are as follows: Harry Oakes, president; William H. Wright, vice-president; Louis Oakes, Albert Wende, and Ernest Martin. The head office is at Kirkland Lake, Ont. E. B. Knapp is superintendent, and 280 men, on an average, are employed. The mine and mill are in Teck township, district of Timiskaming.

The superintendent reports as follows for the fiscal year ending June 30, 1927:—

During the year 214,335 dry tons of ore were treated, yielding bullion to the amount of $3,105,047.85. This shows an increase of 88,659 tons milled over last year with a corresponding increase of bullion of approximately $870,000.

TOTAL PRODUCTION SINCE THE COMMENCEMENT OF MILLING OPERATIONS IN 1918

Period	Months	Tons milled	Bullion production
Mar. 1, 1918, to Nov. 30, 1918	9	14,948	$369,680.31
Dec. 1, 1918, to Nov. 30, 1919	9	11,907	294,513.72
Dec. 1, 1919, to Nov. 30, 1920	12	18,889	483,701.93
Dec. 1, 1920, to Nov. 30, 1921	12	21,681	460,186.37
Dec. 1, 1921, to June 30, 1923	19	36,825	833,664.89
July 1, 1923, to June 30, 1924	12	24,223	578,242.59
July 1, 1924, to June 30, 1925	12	96,838	1,812,494.66
July 1, 1925, to June 30, 1926	12	125,676	2,235,184.40
July 1, 1926, to June 30, 1927	12	214,335	3,105,047.85
			$10,172,716.72
Plus exchange premiums			145,537.30
Total			$10,318,254.02

Mining and Development.—During the year, 294,854 tons of ore were broken, of which 270,381 came from mining and 24,473 tons from development. Of this amount, 214,335 dry tons were hoisted and milled, the balance being added to the broken ore reserves which now amount to 262,053 tons with an assay value of $5,079,130.50.

An inclined winze was sunk from the 1,000-foot level to the 1,200-foot level on No. 2 vein, showing the usual values as found on this vein.

The main shaft has been deepened to the 1,600-foot level, and stations have been cut each 200 feet, with a loading pocket at the 1,550-foot level.

A vertical raise has been put up from the 800-foot level to the 200-foot level in preparaion for the new shaft, the size of which will be approximately 14 by 17 feet.

SUMMARY OF ORE AND WASTE HOISTED

Level	Ore	Waste
200-foot	0	740
400-foot	30,780	1,117
600-foot	97,395	1,537
800-foot	89,870	2,009
1,000-foot	1,801	2,988
1,200-foot	257	3,876
1,400-foot	357	3,429
1,600-foot	41	6,393
Total	220,501	22,089

DEVELOPMENT FOOTAGE FOR YEAR

Level	Drifts	Cross-cutting	Raises	Shafts	Winze	Total footage	Diamond-drilling	Box-holes	Station-cutting	Sump
	feet	feet	feet	feet	feet	feet	feet	cu. ft.	cu. ft.	cu. ft.
200-foot...	.....	94.5	27	.....	.....	121.5	.....	.....	.....	.....
400-foot...	102.5	.....	975	.....	.....	1,077.5	.....	6,720	3,360	.....
600-foot...	.....	172.76	1,626.5	.....	.....	1,799.26	.....	2,058	.....	.....
800-foot...	520.9	44.2	1,422.5	.....	.....	1,987.6	.....	13,203	.....	.....
1,000-foot...	290.35	.....	72	.....	225	587.35	553	600	5,471	.....
1,200-foot...	44	66.5	.....	183.34	.....	293.84	.....	.....	8,782	1,155
1,400-foot...	.....	.....	.....	200	.....	200	.....	.....	3,662	.....
1,600-foot...	15	.....	.....	222	.....	237	.....	.....	23,687	.....
Total....	972.75	377.96	4,123	605.34	225	6,304.05	553	22,581	44,962	1,155

The total development and exploration work from the beginning of operations to the present time are as follows:—

	Feet
Drifting	24,104.73
Cross-cutting	5,067.53
Raising	9,546
Sinking	2,254
Winzing	225
Diamond-drilling	13,663.5
Ore passes	889.73
	Cubic feet
Station-cutting	103,664
Box-holing	99,009
Sump	18,001

Milling.—The addition to the mill building was completed during the year and a third ball and tube mill unit installed. Additional filters have been erected, and mill run tests made on primary filtration show sufficient success to warrant the installation of further filters.

A Hummer screen is now in closed circuit with the ball mills and works out with very satisfactory results.

General.—The close of the year sees the completion of the hoist-room on No. 1 shaft, a concrete powder magazine, and a new installation of the substation to a more central location.

One modern cottage has been completed, also a 25-by 60-foot greenhouse for the use of the accommodation building.

A tile assay office is now under construction.

Macassa Mines, Limited

The authorized capital of this company is $3,500,000 in shares of $1 par value, of which 2,600,006 have been issued. The directors are: Harry Oakes, president; Willis A. Matson, vice-president; Arthur G. Slaght, Gordon C. Edwards, and Robert A. Bryce, managing directors. Larmour Soliague, of 217 Bay Street, Toronto, is secretary-treasurer. A. J. Keast is superintendent, and 30 to 35 men were employed.

The company was incorporated April 12, 1926, and work began two weeks later. The old buildings of the Elliott-Kirkland Mines in Teck township, district of Timiskaming, were repaired, and a 1,011 cubic foot air compressor and electric hoist and motors added to the plant.

The superintendent reports as follows for the fiscal year ending March 31, 1927:—

The first work consisted of assuring ourselves that the major portion of the development work would be done on the main break of the camp. Crosscuts north and south, the north on the 300-foot level and the south on the 500-foot level, decided this; and after the completion of these crosscuts the vein fracture near the shaft was developed westwards on the 300-, 400-, and 500-foot levels, the greater part of the work being done on the 500-foot. This fracture splits into two just west of the shaft, and both of these were developed.

While values were erratic and low on the whole, the development has shown an improvement in the formation with depth. Likewise, deep diamond-drilling indicated an increase in the favourable ore-bearing rocks, the syenites, etc., between 900 and 1,200 feet in depth.

A summary of the work accomplished is as follows:—

Crosscutting, 1,513 feet; drifting, 2,693 feet; raising, 21 feet; surface diamond-drilling, 7,014 feet in 14 holes; underground diamond-drilling, 767 feet in one hole. Waste hoisted, 10,470 tons.

The property closed down two months later on May 31, 1927, after an additional 198 feet of drifting and 408 feet of crosscutting had been done.

McIntyre-Porcupine Mines, Limited

The authorized capital of this company is $4,000,000, divided into 800,000 shares of a par value of $5, of which 798,000 are issued.

The officers of the company are: J. P. Bickell, president; W. J. Sheppard, vice-president; M. P. Van Der Voort, secretary; Balmer Neilly, treasurer. The directors are: J. P. Bickell, Toronto; W. J. Sheppard, Waubaushene; J. B. Tudhope, Orillia; D. H. McDougall, Stellarton, N.S.; Jos. Errington, Toronto.

R. J. Ennis is general manager. The mines and plant are at Schumacher in the township of Tisdale, district of Cochrane. The head office of the company is at the Standard Bank Building, Toronto. A by-law was submitted at the annual meeting in June, 1927, to change the head office of the company from Toronto to the mine office at Schumacher.

During the year the company acquired by staking and by options certain claims in the Kamiskotia area and in Warden township and carried out exploration work on these properties.

The fifteenth report of the company covers a period of nine months due to a change in the fiscal year authorized at the annual meeting in 1926. The report covers operations for a period ending March 31 instead of June 30.

The balance sheet for the period ending March 31, 1927, shows the following:—

Assets	
Current	$2,031,899.87
Investments	819,993.23
Fixed	7,572,847.87
Deferred charges	83,127.90
Total	$10,507,868.87
Liabilities	
Current	$291,322.68
Reserves	3,025,638.67
Capital	3,990,000.00
Surplus	3,200,907.52
Total	$10,507,868.87

The surplus for the previous period of twelve months was $3,176,805.88. The current assets include Dominion of Canada bonds valued at $1,238,375. The fixed assets show that during the nine months' period ending March 31, 1927, there was $519,775.18 expended on additions to plant and equipment.

Among the liabilities, the reserves show a charge of $2,876,651.64 for depreciation of plant, equipment, and development expenditures on Porcupine properties.

The profit and loss statement as for June 30, 1926, to March 31, 1927, shows the following:—

Earnings—bullion recovery		$2,957,060.97
Operating costs	$1,460,731.12	
Administrative and general expense	137,953.89	
Total operating costs—before providing for taxes and depreciation		$1,598,685.01.
Operating profit—before providing for taxes and depreciation		$1,358,375.96
Non-operating revenue		77,470.02
		$1,435,845.98
Appropriations for municipal, provincial, and Dominion taxes for current nine-month period		58,673.19
Net profit for the nine-month period—before depreciation provision—transferred to surplus account		$1,377,172.79

The net profit for the previous year was $1,721,382.51.

During the period three dividends of 5 per cent. each were paid, aggregating $598,500. Other deductions from the surplus account include:—

Development undistributed—written off	$332,924.19
Tailings disposal rights purchased from Goldale Mines, Limited	20,000.00
Workmen's Compensation Board special assessment for silicosis	24,477.78
Provision for depreciation, buildings and equipment	381,585.18

The surplus as at March 31, 1927, was $3,200,907.52, as compared with $3,176,805.88 at June 30, 1926.

The fifteenth report also gives the following information:—

MINING

	Tons
Ore broken in stopes	329,080
Ore from development	68,509
Total ore	397,589
Ore hoisted	384,242
Waste hoisted	73,013
Total ore	457,255

Broken ore reserves in the stopes amount to 328,474 tons of $7.95 ore, an increase of 13,347 tons. The application of horizontal cut-and-fill methods of stoping in some areas on the lower levels, in which the shrinkage method of stoping is not satisfactory, will tend to reduce dilution of ore and also the necessity for a large reserve of broken ore.

SUMMARY OF ORE HOISTED

Level	Tons	Assay	Value
1,125-foot	8,281	$7.80	$64,697
1,250-foot	14,269	9.25	132,233
1,375-foot	21,301	7.75	164,783
1,500-foot	24,465	5.50	135,074
1,625-foot	31,606	7.15	226,138
1,750-foot	48,685	7.90	386,427
1,875-foot	20,576	9.95	204,489
2,000-foot	58,799	8.50	498,893
2,125-foot	14,055	11.85	166,296
2,250-foot	31,343	6.65	208,366
2,375-foot	38,336	6.25	238,807
2,500-foot	29,086	9.80	284,848
2,625-foot	25,303	10.15	256,461
2,750-foot	10,447	4.60	48,330
2,875-foot	7,690	4.90	37,620
Total	384,242	7.95	3,053,462

Development

The sinking of No. 11 shaft was completed to the 4,131-foot level early in March, 1927, a total of 1,195 feet during the nine months' period. With the hoisting equipment installed it was expected to have the shaft fully equipped and sufficiently connected with the No. 6 (main) shaft workings to go into commission early in September, 1927. These connections will be at the 1,875-, 2,375-, and 2,875-foot levels, the two former being completed.

During the period under consideration better facilities for disposal of waste increased the development and made it possible to handle 10 per cent. more ore with the hoisting equipment at the main shaft.

No. 3 Vein.—Stopes produced 53,815 tons of ore with an average grade of $11. On the levels from the 1,500- to the 2,125-foot, a total footage of 1,921 feet of drifting was accomplished, of which 1,500 feet was in ore of medium grade.

No. 5 Vein.—Stopes produced 31,840 tons of ore with an average grade of $7.20. On the 1,625-foot level, an easterly extension of this vein was developed and 260 feet of drifting showed $7 ore over a width of 8 feet.

No. 7 Vein.—Stopes produced 141,491 tons of ore with an average grade of $8.40. A total footage of 3,243 feet of drifting was done on this vein from the 1,125- to the 2,875-foot levels. Approximately 1,600 feet was in ore of of $7.50 grade over 8½ feet, and 600 feet below $6. Diamond-drilling disclosed a parallel series of lenses lying to the north of the main vein between the 2,375- and 2,750-foot levels. The total length in which the lenses occur is about 300 feet, and several intersections of above average grade ore occur over widths of 12 feet.

No. 8 Vein.—Stopes produced 14,564 tons of ore with an average grade of $8.15. On the 1,250- and 1,375-foot levels, 603 feet of ore, averaging $9.50 over 8½ feet, were developed.

No. 9 Vein.—Stopes produced 46,241 tons of ore with an average grade of $9.70. A total of 1,628 feet of development was done at the 1,250-, 1,750-, 2,500-, and 2,625-foot levels, of which 1,560 feet were in ore of $6.50 grade over a width of 9 feet.

No. 10 Vein.—Stopes produced 44,967 tons of $5 ore. A total footage of 2,531 feet was done on all levels from the 1,750- to the 2,750-foot; 1,050 feet was in ore of $5 grade. The easterly section of the vein showed marked improvement on the 2,875-foot level, 480 feet of ore averaging $8.60 over 8½ feet in width.

No. 12 Vein.—This vein was not developed during the period.

No. 14 Vein.—This vein was intersected by 18 Q crosscut in Plenaurum ground, lying to the east and 250 feet south of No. 12 vein. Seven hundred feet of ore, averaging $8.10 over 8½ feet, was developed. This vein is part of the Jupiter system, and its development is considered one of the important features of the work of the period.

SUMMARY OF DEVELOPMENT AND EXPLORATION, JULY 1, 1926, TO MARCH 30, 1927

Period	Drifts	Cross-cuts	Raises	Winzes	Shafts	Stations	Sumps	Pockets and passes	Total footage	Total excavation	Diamond-drilling
	feet	feet	feet	feet	feet	cu. ft.	cu. ft.	cu. ft.	feet	cu. ft.	feet
1	1,369	510	19	.....	143	2,152	.....	.....	2,041	2,152	1,736
2	1,467	627	.....	.....	127	11,975	.....	.....	2,221	11,975	2,018
3	1,395	632	.....	.....	117	6,285	.....	.....	2,144	6,285	1,809
4	1,470	698	.....	.....	128	6,207	.....	.....	2,296	6,207	1,928
5	1,114	663	27	.....	134	6,482	.....	.....	1,938	6,482	1,815
6	1,285	443	49	.....	130	5,224	.....	.....	1,907	5,224	1,536
7	1,529	313	58	.....	190	.....	.....	.....	2,090	.....	1,762
8	1,309	177	36	.....	198	.....	.....	.....	1,720	.....	1,521
9	1,449	483	23	.....	28	8,578	.....	.....	1,983	8,578	1,619
Total	12,387	4,546	212	.....	1,195	46,903	.....	.....	18,340	46,903	15,744
Previous years	84,545.8	37,692.3	9,399.4	579.7	11,424.9	487,969	36,823	133,102	143,642.1	657,894	147,337.5
Total to date	96,932.8	42,238.3	9,611.4	579.7	12,619.9	534,872	36,823	133,102	161,982.1	704,797	163,081.5

ESTIMATED ORE RESERVES

	Tons	Assays	Value
McIntyre claims	699,696	7.80	$5,446,021
McIntyre Extension claims	210,309	9.90	2,087,747
Jupiter claims	362,778	9.30	3,370,018
Plenaurum claims	74,641	8.35	624,928
Broken ore in stopes	328,474	7.95	2,601,506
Total	1,675,898	8.43	$14,130,220

NOTE.—In the estimate of ore reserves allowance has been made for dilution of broken ore by wall rock.

For the year ending June 30, 1926, the estimated ore reserves were 1,443,111 tons of an average value of $9 and a total value of $13,443,111.

ANALYSIS OF MINING COSTS PER TON MILLED

	Stoping	Drifting	Cross-cutting	Raising	Stations and sumps, No. 11 shaft	Sinking, No. 11 shaft	Total cost	Cost per ton
Labour	$359,412.51	$91,538.66	$41,633.44	$2,141.07	$10,160.45	$96,279.32	$601,165.45	$1.5598
Explosives	60,454.69	44,124.14	17,486.07	908.67	468.21	10,513.28	133,955.06	.3476
Supplies	53,816.67	11,719.00	4,263.43	168.60	492.08	11,914.88	82,374.66	.2137
Power	24,600.46	8,947.35	3,637.59	355.44	1,178.17	9,221.94	47,940.95	.1244
Timbering	74,863.90	.....	3,623.52	.....	8,853.53	70,844.32	158,185.27	.4105
Shaft repairs and alterations	3,369.31	.....	.....	.....	.....	345.91	3,715.22	.0096
Steel sharpening	22,778.24	14,501.28	4,777.56	322.51	453.86	7,897.30	50,730.75	.1316
Drill repairs	10,612.01	5,708.23	1,470.31	134.45	3.60	2,777.47	20,706.07	.0537
Surveying and engineering	12,295.58	3,953.75	1,152.08	151.32	92.15	1,139.28	18,784.16	.0487
Sampling and assaying	23,752.16	4,387.49	1,370.72	.....	.....	137.63	29,648.00	.0769
Pumping and ventilating	13,062.14	.....	185.86	.....	190.61	6,025.20	19,463.81	.0505
Tramming	40,362.00	7,369.06	2,205.19	80.90	.....	.....	50,017.15	.1298
Surface tramming	.....	.....	1,376.69	.....	792.59	13,355.55	15,524.83	.0403
Hoisting	68,191.43	12,531.04	8,039.71	130.97	2,631.58	39,463.01	130,987.74	.3399
Total	$767,571.10	$204,780.00	$91,222.17	$4,393.93	$25,316.83	$269,915.09	$1,363,199.12	$3.5370
Less: Charged to undistributed development	.....	.....	30,209.57	.....	25,316.83	269,915.09	325,441.49	.8444
	$767,571.10	$204,780.00	$61,012.60	$4,393.93	.....	.....	$1,037,757.63	$2.6926
Exploration	.....	.....	.....	.....	.....	.....	28,193.40	.0732
							$1,065,951.03	$2.7658
Examination of prospects	.....	.....	.....	.....	.....	.....	8,661.23	.0224
Total	.....	.....	.....	.....	.....	.....	$1,074,612.26	$2.7882
Unit cost per ton	$1.9916	$0.5313	$0.1583	$0.0114	.....	.....	.....	.....

The cost per ton milled during the operating year 1925-26 was $3.0874.

Milling

During the nine months under review, the mill treated 385,409 tons of ore, of an average value of $8.08 per ton, or a gross value of $3,113,500.07, as compared with 460,909 tons of an average value of $8.72 per ton, and a gross value of $4,020,326 for the operating year 1925-26. The bullion recovered in 1926-27 was $2,957,060.97 and contained 142,100 fine ounces of gold and 35,125 fine ounces silver.

PRODUCTION SINCE THE COMMENCEMENT OF MILLING OPERATIONS IN 1912

Period	Months	Tons milled	Value per ton	Gross value	Recovery per ton	Total value
1912	12	14,500	$7.00	$101,555.16	$5.25	$76,166.38
1913	12	31,979	7.85	251,314.45	7.05	225,752.25
Jan. 1, '14, to Mar. 31, '15	15	85,654	8.87	760,232.16	8.39	718,331.71
Apr. 1, '15, to Mar. 31, '16	12	105,758	7.71	815,345.49	7.38	779,990.94
Apr. 1, '16, to June 30, '17	15	195,307	10.00	1,954,793.28	9.55	1,864,914.28
July 1, '17, to June 30, '18	12	178,327	10.05	1,793,197.55	9.61	1,714,258.00
July 1, '18, to June 30, '19	12	179,874	9.78	1,759,627.40	9.29	1,671,646.03
July 1, '19, to June 30, '20	12	188,835	11.52	2,175,891.31	11.02	2,080,178.44
July 1, '20, to June 30, '21	12	171,916	11.67	2,005,672.00	11.08	1,904,326.36
July 1, '21, to June 30, '22	12	193,971	10.69	2,074,088.40	9.99	1,937,105.07
July 1, '22, to June 30, '23	12	240,615	9.96	2,397,303.00	9.35	2,249,741.63
July 1, '23, to June 30, '24	12	360,140	9.69	3,488,863.00	9.14	3,291,178.22
July 1, '24, to June 30, '25	12	400,259	9.43	3,774,068.00	8.86	3,546,637.52
July 1, '25, to June 30, '26	12	460,909	8.72	4,020,326.00	8.25	3,804,774.90
July 1, '26, to Mar. 31,' 27	9	385,409	8.08	3,113,500.07	7.67	2,957,060.97
Total	.....	3,193,453	$9.55	$30,485,777.27	$9.03	$28,822,062.70

MILLING COSTS

	Labour	Supplies	Repairs and maintenance	Power	Total	Cost per ton
Ball milling	$7,099.95	$19,257.88	$627.00	$9,226.98	$36,211.81	$0.0904
Tube milling	5,403.98	49,175.47	1,728.33	22,332.37	78,640.15	.2040
Classification	4,954.07	3,268.78	426.30	2,908.68	11,557.83	.0300
Pumping and elevating	5,704.58	4,688.17	118.30	3,235.83	13,746.88	.0357
Agitation	5,704.58	855.14	102.60	4,496.75	11,159.07	.0290
Thickening	5,704.58	2,281.91	782.50	1,690.17	10,459.16	.0270
Clarification	7,817.67	2,912.16	183.60	1,308.05	12,221.48	.0317
Precipitation	5,704.58	11,928.41	163.00	1,613.76	19,409.75	.0504
Reagents	.....	48,652.31	.....	.....	48,652.31	.1262
Filtration	8,134.53	3,477.91	499.60	2,717.63	14,829.67	.0385
Refining and assaying	10,184.12	6,528.22	205.20	382.10	17,299.64	.0449
Heating	.....	5,551.68	98.10	.....	5,649.78	.0147
Tailings disposal	.....	2,462.52	2,058.86	1,915.22	6,436.60	.0167
Mill alterations	1,192.02	1,272.09	.....	.....	2,464.11	.0064
Total	$67,604.66	$162,312.65	$6,993.39	$51,827.54	$288,738.24	$0.7492

The milling costs for the year 1925-26 were $0.8322.

OPERATING COSTS

	Total	Per ton milled
Exploration	$28,193.40	$0.0732
Development	270,186.53	.7010
Breaking and stoping	767,571.10	1.9916
Examination of prospects	8,661.23	.0224
Total mining costs	$1,074,612.26	$2.7882
Crushing and transportation	52,497.57	.1362
Milling	288,738.24	.7492
Heating and maintenance—buildings and camps	34,753.39	.0902
Mercantile store and welfare expenses	10,129.66	.0262
Management, bullion marketing, and general expense—mine office	56,721.48	.1472
Administration and general expense—head office	67,936.29	.1763
Insurance, general	13,296.12	.0345
Total	$1,598,685.01	$4.1480

The total operating cost for the year 1925-26 was $4.6025.

The average number of men employed during the nine months was 782, of which 614 were employed in the mine, 65 in the mill, and 173 general.

McMaster Mining Syndicate

During 1926, this company operated their property near Rose Grove in Boston township, district of Timiskaming, with a force of seven men. Harry McMaster is manager, and A. H. Wallace, mine captain.

Crosscuts had been driven 480 feet northwest and 190 feet southeast on the 250-foot level by November, when operations were transferred to the west side of the railway, and test-pitting was done to find bed rock.

A camp building, 16 by 18 feet; an office, 16 by 24 feet; a smithy, 15 by 20 feet; and a power-house, 18 by 35 feet, were erected on the new site.

The sinking of a new shaft began in February, 1927.

McMillan Gold Mines, Limited

This company was incorporated under the Ontario Companies Act on the 31st of December, 1926, with a capital of $2,000,000, divided into 2,000,000 shares of $1 each.

The officers of the company are: Dr. John H. Banks, New York, president; G. A. Foote, Sudbury, vice-president; Chas. B. Goldsborough, New York, secretary. The directors are: Rufus L. Patterson, John H. Banks, Chas. B. Goldsborough, J. W. Boardman-Milligan, all of New York; J. G. Henry, G. A. Foote, and E. J. McMillan, Sudbury.

The companys holds 28 claims in the township of Mongowin, district of Sudbury, on which exploratory work by diamond-drilling was done under the McMillan Development Company.

A two-compartment shaft was started on the property in the spring of 1927, which when visited on June 3 had reached a depth of 200 feet with a station cut at the 125-foot level.

The development programme of the company calls for the sinking of this shaft to a depth of 550 feet and the prosecution of lateral work on the 125-, 225-, 325-, 425-, and 525-foot levels.

E. J. McMillan is the mine superintendent and employed a force of 32 men at the time the property was visited.

Manley O'Reilly Gold Mines, Limited

This company has a capital of $3,500,000 in shares of $1 par value. John Riffer is president; John Conroy, vice-president; and Samuel W. Summerville, secretary-treasurer. The head office is at 19 Main Street, Hamilton, Ont. Walter A. J. Manley and William O'Reilly are joint managers, and 15 men are employed. The property is in Skead township, district of Timiskaming.

Drifts and crosscuts totalling 600 feet were driven on the 200-foot level, and in the last quarter of the year the shaft was sunk from 240 feet to 375 feet and a level established at 350 feet.

Early in 1927 the power-house was enlarged to 32 by 28 feet, and a 90 h.p. boiler, 550 cubic foot air compressor, and an 8- by 10-inch Rand hoist were added to the plant.

A new company, Manor Gold Mines, Limited, with a capital of $5,000,000 and having the same board of directors, was formed by reorganization in 1927.

March Gold, Limited

This company is capitalized at $3,500,000, divided into shares of $1 par value each. The former capitalization was $1,500,000 in shares of 10 cents par value each. The change was ratified on June 15, 1927.

The officers of the company are: Henry Kobler, president; Bert Conderman, vice-president; Bernard N. Hyman, secretary; Frank J. C. Bull, treasurer. The directors are: Henry Kobler, Bernard N. Hyman, Frank J. C. Bull, Charles Schmidt, Clarence H. Leo, Gustave R. Loesch, Henry J. Tiedt, Samuel B. Darlich, all of Buffalo, N.Y.; and Bert Conderman, of Hornell, N.Y. E. S. McEwen was superintendent from June 23, 1926, following Logan Ball. The head office of the company is 331 White Building, Buffalo, N.Y. The mine address is Box 533, South Porcupine, Ont.

The company have holdings in the central north portion of Deloro township, district of Cochrane. Four claims, H.R. 823, 833, 899, and 900, are owned outright. With the completion of a payment in March, 1928, the company will own the Maidens-McDonald claims, H.R. 832 and 926, originally owned by the Coniagas Mines, Limited. Two claims, H.R. 844 and 845, the Clucas-Booker group, are held under option.

Mining operations were carried on throughout the year 1926. The No. 3 shaft on H.R. 833 was sunk from 240 feet to 330 feet, and levels were estab ished at 170 and 300 feet. Stopes were started on the No. 3 vein, which had been located in 1925 by diamond-drilling. This did not prove successful. With the negotiations for purchase of the Maidens-McDonald claims on March 19, 1926, crosscutting was commenced from No. 3 shaft to the northeast at the 300-foot level and north at the 170-foot level, and Nos. 5 and 6 veins were opened up on claim H.R. 832. These veins, which are 5 to 7 feet in width, are parallel and 35 to 40 feet apart. They strike N.W. 15° S.E. and dip 65° N. Drifting was done both ways on these veins.

The following is a summary of the development work done to February 15, 1927:—

Level	Drifting	Crosscutting	Raising
	feet	feet	feet
170-foot	910	360	15
300-foot	690	660	75
Total	1,600	1,020	90

There was also 90 feet of sinking done at No. 3 shaft and 155 feet of sinking in the inclined shaft on claim H.R. 832. This inclined shaft had been sunk to a depth of 100 feet on a dip of 65° following the No. 5 vein. Connections were made with the levels of the No. 3 shaft.

On July 4, 1926, the mill was started on rock stoped from No. 3 vein, and after operating one month was closed down until November 17, 1926, when it was started again on ore stoped from veins Nos. 5 and 6.

The Company continued milling operat ons until February 15, 1927, and suspended mining operations on March 15, 1927, intending to resume at an early date.

The mill building is 155 by 50 feet, of frame structure covered with tar paper and composition shingles; the roof is covered with heavy felt, hair insulator, and galvanized iron.

From the mine, rock is hoisted and dumped into a 100-ton bin in the shaft-house and is fed to a 15- by 24-inch jaw crusher and then to a set of 12- by 30-inch rolls. It is next conveyed to a 400-ton bin in the mill, and thence as a one-inch product to a Hardinge mill, 6 feet by 36 inches, using 6-inch forged-steel balls. The pulp then passes to a duplex Dorr classifier, the overflow going to a 5- by 18-foot tube mill and the underflow to a 30-foot, double-tray thickener. The tube mill operates in closed circuit with the classifier. Agitation follows thickening, in 7 Pachucas, 9-foot diameter and 17 feet high. The Oliver filter is 10 feet wide and 12-foot diameter.

Sand clarifying is used instead of a clarifying press. Two steel tanks, 12-foot diameter, are used; they are fitted with a grid bottom and a covering of cocoa-matting and fine canvas with a top of 6 to 8 feet of clean sand.

The Crowe vacuum process is used with zinc dust precipitation and is followed by a 36-inch Perrin square press.

The capacity of the plant is 150 tons a day.

The electric motors include the following: 150 h.p. slip ring motor for ball mill; 100 h.p. slip ring motor for tube mill with flexible couplings and fitted with herringbone gears; 50 h.p. induction motor for crusher; 30 h.p. induction motor for an 11- by 12-inch compressor; 20 h.p. induction motor for rolls; two 10 h.p. induction motors for centrifugal pumps; six 7½ h.p. induction motors for centrifugal, vacuum, and solution pumps; four 5 h.p. induction motors for diaphragm pumps and thickener, classifier and ball mill feeder, a triplex pump, a belt conveyor, and an Oliver filter; four 3 h.p. induction motors for Oliver filter, and boosters; 2 h.p. induction motor for Ricks vacuum pump.

Water supply for the mill and plant is obtained from McDonald lake, where a 3-inch centrifugal pump, driven by a 20 h.p. induction motor, discharges into a 6-inch wood stay pipe line, 4,465 feet in length. Eighty-five gallons a minute are obtained in this service.

Electric power for motors and lighting is obtained from the lines of the Northern Canada Power Company. All motors in mine and mill are 550 volts. Pumping from the mine is done by a 7- by 10-inch Gould triplex pump, driven by a 20 h.p. induction motor.

Additions to buildings include a carpenter, machine, and blacksmith shop, 30 by 75 feet, a dry-house, 40 by 25 feet, with accommodation for 100 men. The machine shop is equipped with a 20-inch drill press, 18-inch lathe, 24-inch shaper, 6-inch pipe machine, power hack and emery wheels. A 1½ h.p. motor is used to drive the machinery. The blacksmith shop includes a Leyner drill sharpener, oil furnace, and forge.

The assay office is equipped with a 5 h.p. motor to drive the pulverizer and jaw crusher.

During the year 95 men were employed: 52 in the mine, 10 in the mill, and 33 general. Geo. Schmeltzle was mine captain, and S. C. Sterling, mill superintendent.

New York Porcupine Mines, Limited

This company has a capitalization of $2,500,000 in shares of $1 par value each. The head office of the company is at 211 H. & R. Building, Syracuse, N.Y. The officers and directors of the company are as follows: Edward G. Ten Eyck, president; Smith T. Fowler, vice-president; Thos. K. Smith, secretary; Michael E. Monahan, treasurer; Henry M. Sage, Michael Lemp, Joseph Montgomery, Arthur C. Meade, and Willard H. Knapp, directors. Harry W. Darling, Box 489, Timmins, Ont., is consulting engineer.

The company owns the Scott Veteran claim, south half of lot 10, concession IV, township of Tisdale, district of Cochrane, and the Martin claim, which is the south half of lot 4, concession I, township of Tisdale. Work was carried on at the Martin claim from April, 1926, to the end of the year. Shaft-sinking was resumed June 10, 1926, and the shaft sunk from a depth of 30 feet to 272 feet. Stations were cut at 125 and 250 feet. At the lower level, 65 feet of crosscutting was done to the north and 65 feet to the south from the shaft, which has three compartments, two 4 feet 8 inches by 4 feet 8 inches, and one 4 feet 8 inches by 4 feet.

Twenty-eight men were employed under Andrew E. Taylor as mine captain.

Night Hawk Peninsular Mines, Limited

This company suspended operations at the mine at Night Hawk lake, Cody township, district of Cochrane, on May 31, 1926. The workings have been kept pumped out during the year.

The head office of the company is at 371 Bay Street, Toronto, and the executive offices at 87 Vandergrift Building, Pittsburgh, Pa.

Northland Gold Mines, Limited

This company operated their property in Gauthier township, district of Timiskaming, with a force of 25 men. The authorized capital of the company was increased early in 1927 from $2,000,000 to $2,750,000. The board of directors comprise H. P. Hermance, president; J. J. Byrne, vice-president and managing director; M. J. Stearns and W. A. Newell, Ogdensburg, N.Y.; and O. B. Earle, Toronto. W. A. Thompson is secretary-treasurer, and the head office is at the mine, Kirkland Lake, Ont.

The following is a summary of development for the year: sinking, 500 feet; drifting, 420 feet; crosscutting, 950 feet; stations, 7,801 cubic feet; sump, 1,680 cubic feet; slashing, 1,548 cubic feet.

Sinking was resumed at the 500-foot level in November, and the shaft continued to a depth of 1,000 feet early in April, 1927.

Ore Chimney Mining Company, Limited

The Ore Chimney Mining Company, Limited, operated the gold mine near Northbrook in Frontenac county during the year with an average of 30 men.

The winze was completed to a depth of 125 feet below the 400-foot level and the level opened up at 500 feet. About 90 feet of drifting was done northeast and southwest on this level.

Power is supplied to the mine by the company's hydro-electric plant on the Skootamatta river.

A. E. Fletcher, Northbrook, is president, and J. M. Wolchuck is manager.

Ossian Gold Mines, Limited

This company has a capital of $2,000,000 in shares of $1 par value. Dr. Bennetto, of 20 Douglas Street, Guelph, Ont., is vice-president and general manager. The property is in the township of Ossian, district of Timiskaming.

During the year 1925, 5,000 feet of diamond-drilling was done on this property in 19 holes. Surface work was begun towards the end of December. A 60 h.p. boiler and a 300 cubic foot air compressor was added to the plant in January, 1926. Crosscuts were driven 85 feet east and 75 feet west on the 100-foot level, and 500 feet of drifting was done in the early months of the year. Ralph Hurd was manager, and 20 men were employed.

Ostrom Gold Mines, Limited

This company was formed in April, 1925, with a capital of $5,000,000, to take over the properties of the Ostrom-Catharine Development Company and the Meco-Catharine Development Company in lots 6 and 7, concession IV, and lots 8 and 9, concession III, of Catharine township, district of Timiskaming.

The directors of the company are: George E. Sylvester, president; Le Roy Johnston, vice-president; Boyd A. C. Caldwell, Maurice Welsh, H. S. Welsh, E. R. Ostrom, F. P. McRostie. The head office is at Toronto, and the mine office at Boston Creek. George E. Sylvester is manager, and 8 men are employed.

Two log camps were built in 1922, and surface work began on these claims in 1923 and was continued in 1924. In 1926, 2,293 feet of diamond-drilling was done in nine holes, and a shaft was put down 60 feet on a 66-degree incline.

A mining plant, comprising two 60 h.p. boilers, a 612 cubic foot two-stage air compressor, and a 10- by 12-foot hoist was installed; a 40-foot headframe; a power-house, 30 by 42 feet; and an office, 30 by 21 feet, were erected early in 1927.

Pawnee-Kirkland Gold Mines, Limited

This company owns claims L.S. 464-67 in Lebel township and one claim in Teck township, district of Timiskaming. The company has a capital of $3,000,000 in shares of $1 par value. The directors are: C. F. Jordan, president; E. L. Wettlaufer, vice-president; W. S. Walton and O. B. Earle, Toronto; George W. Morris, Buffalo, N.Y.; and M. C. Smith, Burlington, Ont. Roy W. Weldon is secretary. The head office is at 504 Kemp Building, Toronto. J. J. Byrne is manager.

Operations began in November on the claims south of the King-Kirkland with the building of roads. A 90 h.p. boiler, a 340 cubic foot air compressor, and a 7- by 10-foot hoist were moved to the property in December and installed in January. A power-house and office building were erected, and shaft-sinking began February 1, with a force of 26 men and 5 wood-cutters.

Porcupine Paymaster Mines, Limited

The authorized capital of this company is $2,000,000, divided into shares of $1 par value. These shares are assessable. The thirteenth assessment was called on October 15, 1926. The company is controlled by the Premier Paymaster Mines Company, which has a capitalization of $3,000,000, divided into shares of $1 par value each. Of these, 1,400,000 are issued.

The holdings of the company are in Deloro township, district of Cochrane, and comprise ground formerly owned by the Standard Gold Mines, Limited, and the McLean Gold Mines, Limited. These claims lie along the north border of Deloro township.

The officers of the company are: E. H. Walker, president; J. A. Frohock, first vice-president; A. S. Fuller, second vice-president; R. M. Davis, secretary-treasurer; H. E. Clement, general manager. W. W. Hudson was superintendent until April 1, 1927. The directors of the company are: E. H. Walker, J. A. Frohock, A. S. Fuller, and D. B. Pattison. The head office of the company is at 79 Milk Street, Boston, Mass. The mine address is Box 508, South Porcupine, Ont.

Mining operations were carried on throughout the year 1926, and milling was commenced on April 24, 1926.[1]

To permit of increased tonnage in the mill, a new shaft, No. 3, was started in the fall of 1926 and was made by raising from the 400- and 300-foot levels. The new shaft lies 400 feet to the west of No. 2, which has for some years past been the main working exit. Nos. 2 and 3 shafts are now connected at the 300-

[1]For flow-sheet and description, *see* Ont. Dept. Mines, Vol. XXXV, pt. 1, 1926, p. 123.

and 400-foot levels. It is the intention, when No. 3 shaft is in operation, to use No. 2 for men and material as well as for development below the 400-foot level.

No. 3 shaft has four compartments, each 4 feet 10 inches by 5 feet 9 inches. The outside measure of the timbers is 12 by 14 feet. Two compartments will be used for skips to be operated in balance and to have a capacity of 2¼ tons each.

At No. 3, a headframe 90 feet high has been erected (July 1, 1927) and a Canadian Ingersoll-Rand double-drum, electrically driven hoist installed. The drums are 42 inches in diameter, with 30-inch face. The motor is 100 h.p., and the hoisting speed 750 feet per minute. The lifting capacity of the hoist is 8,000 pounds.

At No. 2 shaft a Canadian Ingersoll-Rand double-drum hoist has also been installed. While of the same type as that at No. 3, its drums are 48 inches in diameter, with 36-inch face. With a 75 h.p. motor it has a hoisting speed of 600 feet per minute. Its lifting capacity is 10,000 pounds.

The following is the development work done during the year 1926:—

Level	Diamond-drill holes	Drifting	Crosscutting	Raising
	feet	feet	feet	feet
Surface	3,090			
100-foot	2,134	98.2	371.4	108.4
200-foot				174.7
300-foot	814	187.9	232	100
Total	6,038	286.1	603.4	383.1

At the Ankerite 475-foot level, there was 336 feet of drifting done from September 30 to December 31, 1926. The company is also carrying on development on claim L.O. 323, which lies east of the Ankerite mine. This work is being done by the Ankerite Gold Mines, Limited, under an arrangement with the Porcupine Paymaster, from the 475-foot level of the Ankerite mine.

During the year an addition was made to buildings for the accommodation of employees. An excellent two-storey dormitory, 104 by 28 feet, was built and includes recreation and reading rooms as well as bathrooms on both floors. The walls and partitions are insulated with Insulex.

During the year the average number of men employed was 135, of whom 75 were employed in the mine, 12 in the mill, and 48 general. M. Donovan was mine captain, and Ronald A. Vary, mill superintendent.

Following is a statement of assets and liabilities of the Premier Paymaster Mines Company, the controlling company, as of December 31, 1926:—

ASSETS

INVESTMENTS:		
1,999,994 shares Porcupine Paymaster Mines, Ltd. (total issued and outstanding, 2,000,000 shares)	$2,570,000.00	
Advances to Porcupine Paymaster Mines, Ltd., for the purchase of additional claims	250,280.28	
		$2,820,280.28
Porcupine Paymaster Mines, Ltd.—current account		1,533,381.38
Furniture and fixtures		2,504.61
Notes receivable		146,039.31
Accounts receivable		7,442.65
Cash		111,693.06
Deferred charges		3,160.00
		$4,624,501.29

LIABILITIES

CAPITAL STOCK:	
Authorized, 3,000,000 shares.	
Unissued, 1,598,527 shares.	
Issued and outstanding, 1,401,473 shares	$1,401,473.00
Capital surplus	3,223,028.29
	$4,624,501.29

Power and Mines Corporation, Limited

Incorporated under the laws of the Dominion of Canada with an authorized capital of $1,500,000, divided into 300,000 shares of preferred stock of a par value of $5 each and 1,500,000 shares without par value, the Power and Mines Corporation, Limited, was granted a license under the Extra Provincial Corporations Act, dated January 5, 1927, authorizing it to carry on business in the Province of Ontario and to use within the province capital to the extent of $100,000.

The directors are: Jacob A. Jacobs, president, Thomas Jones, Nap. G. Kirouac, Sir Frederick C. W. Loomis, R. A. Darwin, and Granville Gilmore, all of Montreal.

The operations of the company at the Grace mine in the Michipicoten area, district of Algoma, are under the management of E. D. Brewer. W. E. Simpson, Swastika, is consulting engineer.

Deepening of the old shaft was commenced at the 300-foot level on April 17, 1927.

When the property was visited on July 15, 1927, the shaft had been completed to the 400-foot level, a station and sump cut, and approximately 200 feet of drifting and crosscutting completed on that level.

On the surface the following additions and alterations had been made to the plant: a frame compressor and hoist-house erected; a 1,050 cubic foot, Sullivan, Angle Compound compressor installed; a new headframe and mill trestle built, a log powder magazine, 16 by 20 feet; cap and fuse house; two new log camps, and a log cabin.

Thirty-two men were employed on the property at the time of this visit, nine of whom were employed underground.

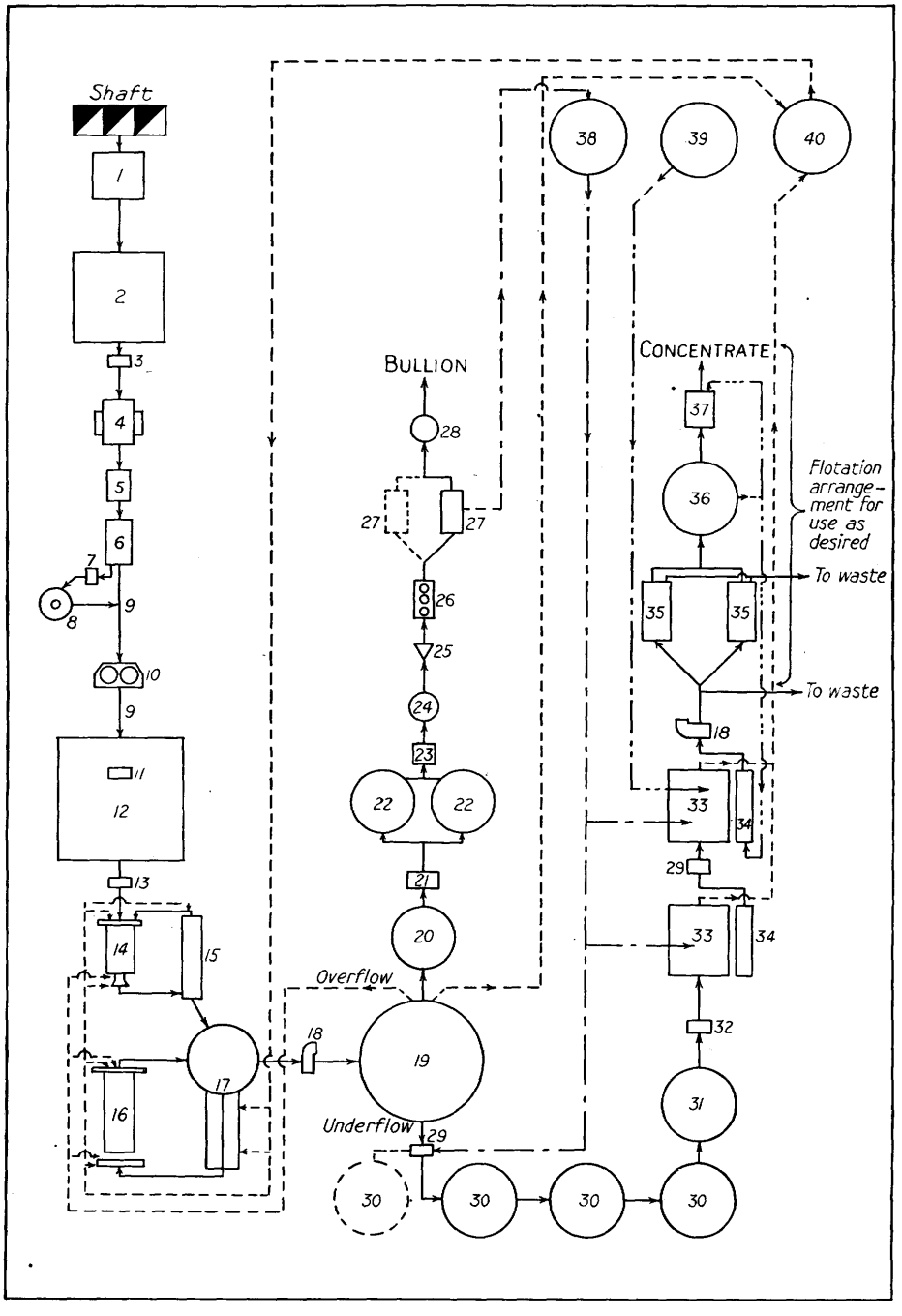
Shield Development Company, Limited

The Shield Development Company, Limited, operating the Huronian mine, Moss township, district of Thunder Bay, is capitalized at $200,000, divided into 2,000 shares of $100 each.

The officers and directors are: Norman R. Fisher, president; F. W. Tofield, secretary-treasurer; J. D. Paterson, Alistair Fraser, C. S. Gzowski, and C. N. Monsarrat, all of Montreal.

During the summer of 1926 the plant mentioned in the last Annual Report of the Department of Mines was installed, the mine dewatered, and lateral work commenced on the bottom level of the old shaft (approximately 120 feet). This work, drifting to the northeast and southwest, has been continued to date, operating on a single shift per day.

Twenty men are employed at the mine, four of whom constitute the underground force. J. G. Harkness is mine superintendent.



SYLVANITE GOLD MINES FLOW-SHEET,
September 1, 1926.

REFERENCE

1. Grizzly, 12 by 12 feet.
2. 200-ton bin.
3. Magnetic pulley, 36 by 12 inches.
4. Allis-Chalmers jaw crusher, 15 by 24 inches.
5. Bucket elevator.
6. Revolving screen, 4 by 8 feet.
7. Magnetic pulley, 18 by 12 inches.
8. 6-inch gyratory for screen oversize.
9. 18-inch conveyor belt.
10. Allis-Chalmers crushing rolls, 42 by 16 inches.
11. Tripper.
12. 600-ton bin.
13. 20-inch conveyor belt, ratchet feed.
14. Marcy rod mill, 5 by 10 feet.
15. Dorr Simplex classifier, 3 by 18 feet.
16. Allis-Chalmers tube mill, 5 by 16 feet.
17. Bowl classifier, 6 feet by 31 feet 8 inches by 18 feet.
18. 3-inch Wilfley sand pump.
19. Dorr thickener, 36 by 12 feet.
20. 24-leaf clarifying tank, 12 by 10 feet.
21. Gould vacuum pump, 8 by 10 inches.
22. Pregnant solution tank, 14 by 14 feet.
23. Steady head tank.
24. Crowe vacuum, 3 by 8 feet.
25. Zinc feeder.
26. Aldrich triplex pump, 5 by 6 inches.
27. Merrill filter press, 20-frame, 36-inch.
28. Monarch furnace, No. 275.
29. Dorr duplex suction pump, No. 4.
30. Dorr agitator, 18 by 20 feet.
31. Filter feed storage tank.
32. Dorr duplex pressure pump, No. 4.
33. Oliver filter, 12 by 12 feet.
34. Repulper.
35. Flotation machines, 12 feet, double, K. & K.
36. Settling tank, 17 by 12 feet.
37. Oliver filter, 6 by 6 feet.
38. Barren solution storage, 16 by 16 feet.
39. Water storage, 16 by 16 feet.
40. Mill solution storage, 16 by 16 feet.

Sylvanite Gold Mines, Limited

Sylvanite Gold Mines, Limited, township of Teck, district of Timiskaming, has an authorized capital of $3,500,000 in shares of $1 par value. The directors of the company are: Edward L. Koons, Buffalo, president; William L. Marcy, vice-president; Clark L. Ingham, treasurer; Ralph Hochstetter, Oliver Cabana, Jr., Albert Wende, and James Y. Murdock, directors. William S. Walton, 603 Royal Bank Building, Toronto, is secretary. The head office is at Kirkland Lake, Ont., and the Buffalo office at 619 Erie Bank Building, Buffalo, N.Y. C. E. Rodgers is superintendent, and the working force was increased from 35 to 70 men.

Lateral development for the fifteen months' period ending March 31, 1927, included drifts, 3,104 feet; crosscuts, 3,656 feet; raises, 200 feet; and 8,708 feet of diamond-drilling. The tonnage hoisted was 21,000 tons, and 700 feet of stopes were prepared and timbered.

The construction of a 200-ton cyanide mill was begun May 10, and the mill went into operation a year later, in May, 1927. The mill is of steel frame construction, and the equipment is shown on the accompanying flow-sheet. The plant is of steel construction and has been designed for exceedingly fine grinding as an aid to extraction of the gold from the telluride ores which occur at Kirkland Lake. Rod and tube mill grinding, in closed circuit with Dorr classifiers, is followed by thickening, agitation, and double filtration. Provision has been made for flotation, either before or after cyanide treatment, if this is found advisable.

Teck-Hughes Gold Mines, Limited

The Teck-Hughes Gold Mines, Limited, Teck township, district of Timiskaming, has an authorized capital of $5,000,000, in $1 shares, of which 4,747,144 shares are issued. The officers of the company are: Charles L. Denison, president; Albert W. Johnston, vice-president; George C. Miller, secretary; William C. Himrod, treasurer; K. P. Emmons, assistant treasurer. The directors are: Charles L. Denison, Albert W. Johnston, and J. F. Thompson, New York; Robert W. Pomeroy, George C. Miller, Conrad E. Wettlaufer, and W. W. Reilley, Buffalo. D. L. H. Forbes is general superintendent, and on an average, 270 men are employed.

The general superintendent reports for the fiscal year ending August 31, 1926, as follows:—

During this period 79,564 dry tons of ore were treated, from which bullion amounting to $1,461,366.99, or $18.37 per ton, was recovered. The gross revenue was $1,510,616.05, or $18.99 per ton. The total direct operating cost was $700,004.98, or $8.80 per ton; depreciation on fixed plant amounted to $58,977.74, or $0.74 per ton, making the total of direct and indirect charges $758,982.72, or $9.54 per ton. The net operating profit was $751,633.33, or $9.45 per ton. After setting up a reserve of $33,193.12 for federal taxes, the net surplus was $718,440.21.

Following is a statement of operating costs in detail:—

	Total cost	Cost per ton
Development and exploration	$234,827.87	$2.95
Mining	204,893.54	2.58
Milling	141,188.31	1.77
General expense	119,095.26	1.50
Total of direct charges	$700,004.98	$8.80
Depreciation on fixed plant	58,977.74	0.74
Total direct and indirect charges	$758,982.72	$9.54

Construction work charged to capital account absorbed $136,834.96. Of this amount, $89,150.62 was spent on plant additions and $47,684.34 on new dwellings and camp buildings.

Development work amounted to 8,753.3 feet as follows:—

	Sept. 1, 1925, to Aug. 31, 1926	Total to date
	feet	feet
Drifting	5,915.1	23,063.7
Crosscutting	1,835.3	10,691.8
Raising	926.4	2,340.6
Winzing	6	1,098.9
Shaft-sinking	70.5	2,748.9
Total	8,753.3	39,943.9

Development work produced 23,457 tons of ore that was treated in the mill, 279 tons of low-grade that was stock-piled, and 6,569 tons of waste rock hoisted to surface dumps. About 15 per cent. of the total development wotk was on levels from the 6th to the 10th, and new ore in important amounts was found on the 7th, 8th, and 10th levels. Following is a summary of development along the No. 3 vein system on the three new levels below the 10th:—

Level	Exploration on No. 3 vein system	Total drifting	Drifting in ore	Total crosscutting	Crosscutting in ore
	feet	feet	feet	feet	feet
11th	870	1,564	836	293	25
12th	1,095	1,970	1,477	339	62
13th	896	1,728	1,424	884	162
Total	2,861	5,262	3,737	1,516	249

The No. 3 vein system on the new levels was found to have widths up to 90 feet and to contain two and frequently three parallel veins or ore bodies. Those on the north and south sides of the vein system are the more important in length and richness, while the intermediate ore bodies, although usually of lower grade, have in many instances considerable width but are quite irregular in outline.

Diamond-drill exploration amounted to 6,911 feet. This together with former drilling makes a total of 10,402.7 feet of diamond-drill exploration to date. Of the recent borings the most important were three inclined, downward-pointing holes drilled from the 13th level and traversing the No. 3 vein system at about equal intervals down to 2,300 feet in a vertical plane normal to the vein at the central shaft. All three of these holes gave satisfactory geological evidence of the downward continuation of the vein system, and cores of varying gold assay were obtained in all three holes from the intersections with the vein system. The geological information obtained from this diamond-drilling is reliable, but no particular importance is attached to the core assays other than as evidence of the continuation of the vein system down to great depth below the present lowest workings.

After deep level development and exploration had given some of the gratifying results referred to above, further steps in the direction of gradual expansion consistent with known ore resources were taken. Work was commenced early in the summer preparing for further shaft-sinking, camp enlargement, and the construction of a first unit of an entirely new mill adjacent to the central shaft. Some of the results from this work in increased earnings are expected in the early part of 1927.

The shaft was completed to a depth of 2,270 feet, and the 19th level established at 2,230 feet by August 1, 1927. Hoisting is done by skips of 56 cubic feet or two tons' capacity in balance. Ore passes feed to loading pockets 30 feet above the 14th level. A 15- by 30-inch jaw crusher is being installed between the 13th and 14th levels.

The first half of the new 300-ton mill went into operation in February and the second half in August, 1927. The crushing plant includes a 15- by 30-inch jaw crusher, a No. 6 fine reduction McCully gyratory crusher. Grinding is

done in cyanide solution. Rod mills are used for coarse grinding and ball tube mills for fine grinding. Bowl classifiers are used for separation of the finished product followed by Dorr thickeners, agitators, and Pachuca tanks. Filtration is by three-stage American filters.

A 10-ton high-grade pilot flotation and cyanide plant for treatment of high-grade ore is under construction, together with the second mill unit of 300 tons capacity.

New equipment includes a 1,200 cubic foot Bellis and Morcon air compressor, a new carpenter shop, and a trestle bridge to carry the waste dump westward across the creek.

Tough-Oakes Burnside Gold Mines, Limited

This company has an issued capital of 5,000,000 shares of $1 par value. The directors of the company are: F. H. Phippen, president; James Y. Murdock, vice-president; A. Burt, treasurer; Arnold Ivy, W. H. Beatty, W. D. Wilson. M. Musselman is secretary, and the head office is at 217 Bay Street, Toronto. Alan Stuart is manager, and 115 men are employed. The mine is in the township of Teck, district of Timiskaming.

The following is taken from the manager's report for the fifteen months' period ending March 31, 1927:—

At January 1, 1926, the lowest level of the mine was at 1,100 feet. At March 31, 1927, two new levels had been opened up at 1,225 feet and 1,345 feet by means of a winze sunk 343 feet on the incline. Other underground development included for the period 3,837 feet of crosscuts; drifts, 3,001 feet; raises, 130 feet; winzes, 254 feet; stations and ore pockets, 114 feet.

The net revenue from bullion produced from 57,616 tons milled was $353,015.54. With the exception of 3,387 tons taken from the surface dump, the whole of the mill tonnage was obtained from current stopings and development operations. Of this, 33,857 tons were drawn from 1104/1004, 904/902 vein systems below the 800-foot level, 9,117 tons from Nos. 1, 2, and 11 vein systems above the 550-foot level, and 10,950 tons from development.

The capacity of the mill was increased to take care of from 210 to 220 tons per day by the addition of a set of 32- by 14-inch rolls and a Hardinge super-thickener to take care of the additional tonnage passing through the decantation plant.

An electric hoist was installed at the No. 3 incline. A new heating plant and boiler-house and a new change-house to accommodate 80 men were erected at No. 3 main shaft.

Vipond Consolidated Mines, Limited

This company is capitalized at $2,500,000, divided into shares of $1 par value each. This is an increase of $500,000 over that of the previous year. Of the authorized capital stock, 2,250,000 shares are issued.

The officers of the company are: F. H. Hamilton, president; John H. Black, vice-president; J. Mackintosh Bell, managing director; R. S. Dening, secretary. The directors are: F. H. Hamilton and Sir A. Hamilton Grant, London, England; James W. Bain and John H. Black, Toronto; J. Mackintosh Bell and W. H. Stafford, Almonte; and R. T. Shillington, Haileybury. The head office of the company is at Suite 52, Trusts and Guarantee Building, Toronto.

During the year under review (ending July 31, 1927), four adjoining claims formerly known as the Porcupine Crown and Thompson Krist properties were purchased from British Porcupine Mines, Limited, for 250,000 shares of the Vipond Consolidated Mines, Limited. The property now consists of eight claims containing approximately 320 acres. The company also controls (by virtue of owning 889,613 shares out of a total issued capital of 1,150,000) the Inspiration property of three claims. These are all situated in the southwest portion of Tisdale township, district of Cochrane. Together with these, the Vipond company has a three-quarter interest in the Ridgeley claims, six in number, lying immediately east of the Coniaurum property.

The balance sheet for the year ending July 31, 1927, is given in the fifth annual report as follows:—

ASSETS

CAPITAL:		
Mining claims and properties as per balance sheet July 31, 1924	$1,432,442.84	
Acquired during year ended July 31, 1927, from British Porcupine Mines, Limited	215,737.95	
		$1,648,180.79
Mine, mill, camp and office buildings, plant machinery and equipment as appraised July 31, 1924	$301,240.87	
Additions at cost for year ending July 31, 1925, and July 31, 1927	99,476.84	
Additions at cost for year ending July 31, 1927, including British Porcupine Mines, Limited	54,207.20	
		$454,924.91
Shares in other companies at cost		102,540.27
		$2,205,645.97
CURRENT:		
Including cash on hand and in banks; provincial and railway bonds at cost; bullion en route and on hand; accounts and interest receivable, mining and milling supplies		250,383.01
DEFERRED:		
Including development expenditures undistributed; insurance and other prepayments		55,087.79
		$2,511,116.77

LIABILITIES

CAPITAL:		
Capital stock (authorized 2,500,000 shares at $1 per share) issued and outstanding	$2,250,000.00	
Surplus	57,270.36	
		$2,307,270.36
CURRENT:		
Accounts and wages payable and accrued charges		41,362.99
RESERVES:		
For depreciation of buildings, plant, and machinery, and for Dominion income taxes and provincial production taxes		162,453.88
		$2,511,116.77

The operating account shows the following:—

REVENUE

Bullion proceeds, less exchange		$704,899.87	
Bond and bank interest earned	$5,990.61		
Miscellaneous recoveries	638.75		
		6,629.36	
			$711,529.23

EXPENDITURE

Development	$75,772.03	
Mining, including hoisting	244,331.52	
Crushing, conveying, and milling	127,856.29	
Shipping and marketing bullion	6,018.05	
General camp maintenance	10,531.19	
Administration and general expense, mine	28,604.19	
Administration and general expense, Toronto	7,148.16	
Transfer and directors' fees	19,446.89	
Insurance, including special compensation assessments	27,222.19	
Provincial and municipal taxes	5,013.91	
Balance carried down	159,584.81	
		$711,529.23

The profit and loss appropriation account shows the following:—

DEBIT

Redemption of pre-production development costs	$50,091.75	
Reserved for plant depreciation	40,041.72	
		$90,133.47
Reserved for Dominion income taxes		2,751.47
Dividend, 3 per cent., paid April 15, 1927		67,500.00
Surplus July 31, 1927, carried to balance sheet		57,270.36
		$217,655.30

CREDIT

Surplus, July 31, 1926	$58,070.49	
Balance brought down	159,584.81	
		$217,655.30

Mining.—During the operating period ending July 31, 1927, 95,700 tons of ore were hoisted, of which 82,949 tons were taken from the stopes, as compared with 64,676 and 46,299 tons for the previous year.

The cost of ore delivered to the primary crushing plant was $2.55, as compared with $2.48 for the previous year.

Development.—During the operating year ending July 31, 1927, the following development was carried out underground:—

Operation	Feet	Cost per foot	
		1926-27	1925-26
Drifting and crosscutting	3,043	$13.67	$12.28
Raising	672	17.40	16.43
Total footage	3,715		

A total of 14,435 feet was drilled with diamond-drill, the cost per foot averaging $1.56, compared with 15,306 feet at $1.61 per foot for the previous year.

Ore Reserves.—The total ore reserves as at July 31, 1927, were estimated to contain approximately 170,000 tons having a gross value of roughly $1,400,000.[1] Of this amount, 50,893 tons of a gross value of $409,318 were broken. It is pointed out in the fifth annual report that the ore reserves as at July 31, 1927, are less than the amount shown in the previous year's report by more than a million dollars—a figure greater than the amount of the pro-

[1]Ore reserves, July 31, 1926, were estimated as 300,000 tons, valued at $2,475,000, of which 55,000 tons were broken.

duction during the year together with the loss in extraction, in spite of discoveries of low-grade ore made in the newly acquired property. The drastic reduction is set down to two causes:—

1. Several of the more important blocks have, in process of extraction, failed to provide ore of the grade or quantity expected and on the evidence now available require reduction.

2. A considerable number of the less important blocks have been deleted entirely in view of the fact that on the information obtained during the year it is considered that the margin of profit is so small as to render the extraction of problematical value.

It is, however, shown that these figures make no allowance for any ore below the outcrop of vein No. 16 and in other localities where ore is known to exist but of which there are insufficient data available upon which to base calculations.

From the extensive exploration conducted at various horizons, down to and below the deepest level, the chances of discovery of important deposits are cited as becoming gradually restricted in the original four claims of the company; but it is added that a considerable number of relatively extensive areas, both in the original claims and in the ground purchased from British Porcupine Mines, Limited, from which, in certain instances, encouraging information has been obtained by diamond-drilling, warrant exploration. The Ridgeley claims are also considered as presenting speculative interest in view of the results being obtained in the adjoining Coniaurum property.

Milling.—The mill was in operation continuously throughout the year, and 95,799 tons of ore were treated, having an average value of $8.21 per ton, as compared with 64,676 tons of an average value of $9.74 for the previous year. From a gross value of $786,568.74, the bullion recovered during the year ending July 31, 1927, was $704,899.87

VALUE OF BULLION PRODUCED TO DATE

Bullion produced during 1925-26	$704,899.87
Bullion produced during former years	2,336,420.85
Total	$3,041,320.72

Costs of Production.—The costs of production, based on 95,799 tons milled, were as follows:—

	Cost per ton	
	1925-26	1926-27
Development	$2.36	$0.79
Ore extraction	2.48	2.55
Crushing, conveying, and milling	1.37	1.34
Shipping and marketing bullion	.08	.06
General camp maintenance	.19	.11
Administration at the mine	.46	.30
Head office expense	.09	.07
Corporate expense	.28	.20
Taxes	.02	.05
Insurance	.27	.29
Total	$7.60	$5.76

There were 150 men employed, distributed as follows: mine 100, mill 22, surface 28. Robert E. Dye was general superintendent, Alex. Hattie, mine captain, and John Davis, in charge of the mill. The mine office address is Timmins, Ont.

A. H. Woodman

A. H. Woodman, with one or two other men, was prospecting for gold during part of the summer of 1927 on lot 28, concession IX, Clarendon township, Frontenac county. They dewatered by hand an old pit, took samples, and did some hand-drilling. They had no plant and ceased work about August 4.

Wright-Hargreaves Mines, Limited

This company has an issued capital of $2,750,000, in shares of $1 par value, which it is proposed to change to 5,500,000 shares of no par value. The directors are: Oliver Cabana, Jr., president; Edwin Lang Miller, vice-president and secretary; Ralph Hochstetter, Charles G. Duffy, Oliver G. Donaldson, and John A. Kloepfer. Gerard F. Miller is treasurer. The executive offices are at Liberty Bank Building, Buffalo, N.Y. James E. Grant is general manager, and 250 men are employed. The mine is in Teck township, district of Timiskaming.

The treasurer's report showed a profit on the year's operation of $1,331,447.10, and other income amounting to $61,299.32. The dividends paid amounted to $618,750. The surplus, after deducting $100,000 for taxes and $114,000 for depletion, amounts to $1,025,822.41.

The general manager reports as follows:—

During the year 153,392 tons of ore were treated, and the bullion recovered amounted to $2,150,843.92, with an average value per ton of $14.02. The mill operated 88.4 per cent. of its possible running time and treated an average of 420 tons per day. Analysis of operating cost, reproduced below, shows a total cost per ton milled, including expenditures for exploration and development, of $5.34 per ton.

Analysis of Operating Costs

	Total cost	Cost per ton milled
Development and exploration	$107,306.76	$0.700
Stoping	232,532.11	1.516
Tramming and hoisting	109,972.54	.717
Milling	184,381.72	1.200
Marketing bullion	13,973.98	.091
General charges	82,521.18	.538
Depreciation of plant and equipment	88,708.53	.579
Total	$819,396.82	$5.341

Summary of Development and Exploration
December 31, 1926

	Drifting	Shaft-sinking	Crosscutting	Diamond-drilling
	ft. in.	feet	ft. in.	ft. in.
December 31, 1925	18,508 6	2,381	3,032 6	4,750 6
Fiscal year	3,772 0	827	635 0	602 0
December 31, 1926	22,280 6	3,208	3,667 6	5,352 6

The summary of total bullion production, including the value per ton treated as well as actual tons milled, since the commencement of operations in 1921, is herewith shown:—

Period	Months	Tons milled	Value per ton	Bullion produced
May to December, 1921	8	36,081	$13.00	$468,665.64
1922	11	66,181	11.52	762,752.84
1923	12	79,242	9.52	754,978.81
1924	12	84,487	12.89	1,088,725.53
1925	12	147,939	12.93	1,913,401.82
1926	12	153,392	14.02	2,150,843.92
Total	.....	567,322	$12.59	$7,139,368.56

Mining and Development.—The underground operations for the year just past embraced a campaign of stoping on the upper and intermediate levels on both the north and south veins, together with a programme of sinking to the lower levels.

On the north break (No. 1 shaft) within the past few weeks, we completed our shaft-sinking programme to the 1,500-foot level. During the period of sinking, stations were cut at the 1,375- and 1,500-foot levels. The drifting done on the levels mentioned has proved a continuity of our high-grade north vein and to date has shown the same high-grade values and widths as encountered above.

The main shaft (No. 3, south break) was sunk to the 1,375-foot level, and stations were cut at the 1,125-, 1,250-, and 1,375-foot levels. The results encountered in cutting the stations and drifting were very encouraging, showing higher values and greater length and width than that experienced on the 1,000-foot level. Recently a station was cut at the 1,375-foot level, and the vein at this point showed 17 feet of $15 ore. A crosscut was run between No. 1 and No. 3 shafts on the 1,250-foot level, and another crosscut is being run at the present time on the 1,500-foot level to join No. 1 and No. 3 shafts. This will greatly facilitate the handling of ore.

On the whole, our past year's development underground was very encouraging, auguring well for the future by placing in sight more values than have been shown heretofore, as well as having proven up our property to 1,500 feet in depth.

Milling.—During the past year there was no concerted effort made to increase our tonnage per day, but our efforts were rather toward a study of perfecting our existing method of operations. In consequence, our tonnage for the year was practically the same as that of 1925. However, a few changes were made toward bettering conditions.

A classifier was installed for the purpose of returning the coarse product to the ball mills, which greatly facilitated our grinding. Also, one of our primary thickeners was replaced with a super-thickener, which increased our primary thickening capacity and thereby relieved a cause which at times reduced our milling capacity on account of the inability to settle all the ore ground.

We carried on considerable research work in connection with the flotation of our telluride ores, with the object of obtaining the greatest extraction possible. Flotation cells were installed, as well as a roasting furnace, the result of which has shown considerable saving in tons of concentrates.

Construction.—Owing to the limited hoisting and air pressure capacity, we were unable to do very much exploration work. In order to overcome this condition, a Nordberg hoist was installed the latter part of the summer, with a capacity of 3,000 feet. This addition has greatly relieved our hoisting situation.

Further, a 2,500-foot Belliss and Morcom compressor has been ordered for delivery this month. This will speed up things by doubling our air capacity and will enable us to do much more development and exploration work, especially in our east and west claims adjoining Sylvanite and Lake Shore, respectively, which are practically untouched. Both these claims are larger than the one we are now working on.

An ore pocket is being put in at the 1,250-foot level, No. 3 shaft (main shaft), and two skips have been purchased and will be operating shortly.

An addition to the power-house was made, and foundations were put in for the new 2,500-foot compressor. An addition was made to the mill building, to accommodate the flotation equipment. A new headframe was erected on No. 1 shaft, to accommodate the new Nordberg hoist installed last summer. The dry-house was enlarged to accommodate the increasing number of our workmen. The capacity of our refinery was doubled by adding another bullion furnace.

To sum up, our year's programme has been very encouraging, both as to underground development and milling, as well as the indications shown for continued enlargements in the future.

GRAPHITE

Black Donald Graphite Company, Limited

The mine and mill of the Black Donald Graphite Company, Limited, are situated on Whitefish lake, Brougham township, Renfrew county, 14 miles from Calabogie. The post office address of the company is Calabogie.

The company is capitalized at 300,000 shares of $100 par value. The officers are: R. F. Bunting, president and treasurer; R. A. Telfer, Calabogie, Ont., secretary; John Patno, general superintendent.

Owing to improved market conditions the mill worked on double shift for the first ten months of the year, milling 4,532 tons of ore and producing 415 tons of flake, 209 tons of crystalline, and 1,642 tons of amorphous graphite. Most of the ore came from the 250-foot level. The open pit part of the incline shaft was retimbered during the last three months of the year, and in 1927 the work of sinking a vertical, three-compartment shaft to a depth of 300 feet was begun.

Eighty men are employed.

GYPSUM

Ontario Gypsum Company, Limited

The Ontario Gypsum Company, Limited, operated during the whole year, employing an average of 192 men.

The year's production showed a slight increase, 97,402 tons of ore being mined and milled. The products consisted of hardwall plaster, gypsum board, blocks, and stucco finish, also crushed gypsum, 37,769 tons of which was shipped to manufacturers of cement.

The gypsum block plant, previously owned by the Ebsary Gypsum Company, continued to manufacture roof, floor, and partition tile.

Underground workings were extended 1,700 feet west, 1,950 feet east, and 1,550 feet north; 139,100 cubic feet of ore were mined from rooms, and 35,200 cubic feet from pillars.

A. J. Parkhurst is general superintendent, L. V. Robinson is assistant general superintendent, and John Renwick is mine captain.

LEAD

George Heck

George Heck commenced operations on a lead property on lot 17, concession VI, Bedford township, Lanark county, in the summer of 1927.

On August 8, the pit was about 30 feet deep. The vein was about 14 inches wide at one place, but pinched out. It was said to be showing again in the bottom of the pit, which could not be seen owing to broken rock from the last blast.

The plant consists of one 22 h.p. boiler and hoist with derrick.

W. B. Rundle, Burridge, is superintendent.

Kingdon Mining, Smelting and Manufacturing Company

The plants of this company near Galetta, in the township of Fitzroy, Carleton county, were in continuous operation throughout the year 1926.

The main shaft was sunk an additional 126 feet, from 1,075 to 1,201 feet. A station was cut at the 1,150-foot level, equipped as are the 900- and 1,025-foot stations with a locomotive shed where the storage-battery locomotives on these levels may be overhauled and the batteries charged.

Crosscutting from the shaft to the vein on the 1,150-foot level, a distance of 222 feet, was completed.

A total of 3,622 feet of drifting was done throughout the mine, as follows:—

Level	Drift	
	East	West
	feet	feet
650-foot	.....	44
775-foot	154	.....
900-foot	.....	805
1,025-foot	722	856
1,150-foot	537	504

Stoping during the year was carried on chiefly on the 650-, 775-, 900-, and 1,025-foot levels.

The dry stopers previously used in the stopes were largely replaced during the year by self-rotating water stopers.

An Ingersoll-Rand cross-compound compressor, 900 cubic feet per minute, driven by a 150 h.p. General Electric synchronous motor was added to the compressor equipment.

A skip-hoist, built by Canadian Vickers, Montreal, geared to a 250 h.p. Crocker Wheeler motor, was installed. The 7-inch diameter drum of this hoist is divided into two compartments, one 4 feet wide, carrying the skip-rope, and the other 3 feet 6 inches wide, carrying the counterweight cable.

A new blacksmith shop, a storehouse, and a new powder magazine were erected.

Extensive alterations were made in the mill, the chief pieces of new equipment installed being two James Vibropact screens, four James jig cells and a 5- by 6-foot Hardinge mill. An elevator tower was built and equipped to facilitate tailings disposal.

At the smelter the Scotch hearth was in continuous operation, in addition to which the blast furnace was blown in on October 25 and ran for 16 days on grey slag from the hearth operations.

R. R. Rose is mine superintendent; J. U. MacEwan, smelter superintendent; R. E. Vear, mine captain; and C. A. Chisholm, engineer.

LEAD AND ZINC

North American Lead and Refining Company, Limited

The North American Lead and Refining Company, Limited, operating the Ogema mine in Dorion township, Thunder Bay district, is capitalized at $600,000. The officers and directors of the company are: H. V. Pogue, president; R. E. Kemerer, vice-president; A. M. Duns, secretary-treasurer; H. E. Knobel, consulting engineer and resident director; D. C. Kemerer, manager.

During the summer of 1926, the company confined its operations to surface exploration on the three claims comprising the Ogema group. During the

winter of 1926-27, the plant was taken into the property, which is approximately 9 miles from Dorion stations on both the Canadian Pacific and Canadian National railways. The plant consists chiefly of a Chicago pneumatic compressor, 300 cubic feet per minute, driven by a 50 h.p. oil engine; a 6- by 8-inch hoist; a 20 h.p. boiler; and blacksmith shop equipment.

When the property was visited on July 28, 1927, the old adit level had been repaired and a two-compartment shaft raised from that level to the surface, a distance of 80 feet; a headframe had been erected and operations underground were being confined to cleaning out and enlarging an old winze below the adit level to conform with the dimensions of the shaft raised above the level. It is proposed to continue this shaft to the 375-foot level to permit lateral work being done at the 125-, 250-, and 375-foot levels. An automobile road was under construction connecting with the Nipigon Highway at Dorion.

A force of 17 men was employed at this time.

Treadwell Yukon Company, Limited

This company was incorporated under the laws of the state of Delaware. The authorized capital stock is $11,500,000, divided into 1,500,000 shares of common stock of a par value of $1 each and 100,000 shares of preferred stock of a par value of $100 each. A license under the Extra Provincial Corporations Act, dated May 18, 1926, authorized the company to use within the Province of Ontario capital to the extent of $1,000,000.

The following brief history, up to September 15, 1927, of the operations of the company at the Errington Mines, Creighton township, Sudbury district, was supplied by G. M. Wiles, general superintendent of the company's operations.

The Errington Mines, located in Sudbury district, six miles from the town of Chelmsford, are being developed by the Treadwell Yukon Company, whose main office is in San Francisco.

The presence of ore-bearing sulphides within the boundary of the ground now controlled by the Treadwell Yukon Company has been known for many years, and it is only through recent advance in metallurgical practice that these ores can now be regarded as commercial.

In 1900, Mr. Joseph Errington directed some prospecting work on one of the few outcrops and found good ore, but his principals refused to consider the property because of the complex nature of the ore. Later considerable surface work was done on an outcrop appearing on what is called the Ollier Lot. Still later a diamond-drill hole encountered ore at a point about 3 miles east from the point where Errington did his first work; this diamond-drill work was done in a search for anthracite coal, but at a depth of about 600 feet ore sulphides were encountered. Mr. Errington afterward acquired the drill cores and recognized in them the same ore that appeared in his early operations and also on the surface workings on the Ollier Lot; he thereupon conceived the idea of possible continuous ore occurrence throughout all the intervening area. With this idea in mind he acquired options on a large area of ground and then submitted the whole proposition to his mining associates in Canada, but as they had no interest in base metal operations the idea did not appeal to them. Mr. Errington then presented the whole matter to the Treadwell Yukon Company who, after having the ground examined, took over Errington's options in July, 1925, and proceeded immediately on an extensive diamond-drilling campaign, which lasted about a year. Approximately 50,000 feet of drilling was done, but the work was too widespread to permit of accurate interpretation of the results. However, they did justify a campaign of underground exploration work. Ground for the first shaft was broken in July, 1926. Since that time the shaft has been sunk to the 300-foot level, and about 5,000 feet of drifting and crosscutting has been done. Ground for shaft No. 2 was broken in May of this year (1927), and the sinking of this shaft is now under way. Considerable money has been spent for camp facilities necessary to take care of a crew of 200 men for offices, shops, surface equipment, a water-supply system, assay office, etc.

Ground has been broken for the No. 1 mill, and its erection is now under way. This mill will be more or less experimental, since the best process of the treatment of the ore will have to be very carefully studied and worked out. The mill should be in operation by the end of the year.

At present (September, 1927) the company is completing the installation of electrical plants at Nos. 1 and 2 shafts, the work of sinking No. 1 shaft and

the lateral work mentioned above having been carried out under steam power. A transmission line, connecting with the Wahnapitae Power Company's system at the Murray mine, has been constructed; a transformer building has been erected at the mine; and electric hoists and compressors are being installed at the shafts.

Joseph Errington, Toronto, is manager, and G. M. Wiles, general superintendent.

MICA

Loughborough Mining Company, Limited

This company operated the Lacey mine on lot 11, concession VII, Loughborough township, continuously during the year. About 3,000 pounds of mica per week was mined from the stopes at the open pit. They employed an average of 13 men. The officers are: M. F. Westover, Schenectady, N.Y., president; G. W. McNaughton, Sydenham, manager; R. Smith, superintendent.

NICKEL AND COPPER

International Nickel Company, Incorporated

This company owns all the capital stock of the International Nickel Company of Canada, Limited.

The officers and directors of the parent company remain as reported in the Thirty-fifth Annual Report of the Department of Mines.

The following information is extracted from the twenty-fifth report of the company, dated March 1, 1927, and covers the fiscal and calendar year ending December 31, 1926:—

The report submitted herewith covers the fiscal and calendar year ended December 31, 1926. In making comparisons with the last report issued it must be recalled that the fiscal year has been changed to conform to the calendar year, and consequently the figures shown on the attached financial statement are for twelve months ended December 31, 1926, and for nine months ended December 31, 1925, respectively.

Total net earnings for the year of $5,556,267.41 exceeded the total net earnings for the twelve months of 1925 by $28,783.41. Sales of metallic nickel were less than during 1925, due primarily to a falling off in exports to Europe. There was also a decline in domestic sales of nickel in the final quarter of 1926, as compared with the last quarter of 1925. This apparent loss of business was due to the heavy purchases of nickel by consumers for stock in the fall of 1925, presumably anticipating the price increase of January 1, 1926. Buying of this character was not in evidence in the fall of 1926, as there was no price advance on contract renewals for 1927 deliveries.

During recent years, particularly in 1926, large quantities of nickel-steel armour and deck-plate scrap, resulting from the disarmament programme, were consumed by alloy steel-makers. The substitution of this nickel-bearing scrap for metallic nickel made inroads into your company's sales of nickel for alloy steel-making. There is every evidence that the bulk of this domestic scrap has been used and that normal consumption of metallic nickel by steel companies may be expected in the near future.

Sales of mill products (Monel metal and rolled nickel) increased substantially in volume and more than offset the loss of foreign and domestic nickel sales.

New applications of nickel and Monel metal are being constantly sought, and many new projects are receiving attention in your research laboratories. To obtain tangible results from work of this character necessarily takes much time and effort. Your management believes that the co-ordinated activities of the sales and development departments have increased and will continue to increase the company's business.

It is desirable to call your particular attention to the lists of uses of nickel and Monel metal shown on pages 14 and 15 of this report. It is within the power of the stockholders to render practical assistance to the company in exploiting the use of nickel and Monel metal.

Operations.—Mining and smelting operations at Copper Cliff were uniform and continuous throughout the year with the gratifying result that Bessemer matte was produced at lower cost than during any previous year.

As forecast in the last report, your management has been actively engaged in the initial stages of development of the Frood mine, where diamond-drilling has developed further large reserves of high-grade ore. The preliminary surface plant for sinking a permanent shaft on this property has been erected; and sinking on the new shaft, begun in September, 1926, is progressing satisfactorily. To complete this shaft, erect the permanent surface plant, and develop the ore body sufficiently for mining operations, will require several years and involve a substantial capital expenditure. It is the intention of your management to bring this mine into production during the ensuing five years. By following this policy, the Creighton mine ore reserves will be available for an increasing output of Monel metal for many years and the Frood ore, which carries much higher precious metal values than Creighton ore, will be refined for nickel. With its present refining process, your company will recover the platinum metals from the Frood ore and in consequence will derive additional profit from this operation.

During the past year the company's standard-gauge, steam-operated railway system at Copper Cliff, embracing 22 miles of track, has been electrified. By substituting low-cost, hydro-electric current from the company's Spanish River power-station for coal, a very substantial saving in operating expense has been gained.

An electrolytic department at Port Colborne, projected in 1925, was completed during the year and is now economically producing a large tonnage of high-purity nickel. Changes in furnace and converter practice have enabled your operatives to further reduce costs. The refinery was run continuously throughout the year at a rate regulated to meet consumption and to avoid an undue accumulation of metal stocks.

Operations at the Huntington works were uninterrupted; due to increased production, as a result of a greater volume of sales, operating costs were the lowest thus far shown at the company's rolling mill. Hot mill facilities became inadequate, and your management was authorized by the directors to double the capacity of this department and install additional cold-rolling and polishing equipment for high-finished sheets. The installation of this equipment will be completed and available for production in 1927.

As a result of a demand for high-finished, cold-rolled nickel and Monel metal strip, your management equipped a department during the past year to produce this form of material.

Your plants have all been maintained in a high state of efficiency, and changes in process and equipment have been made in each instance where there was an opportunity to effect lower operating costs or better the quality of the product.

Capital Expenditures and Adjustments.—For the fiscal year ended December 31, 1926, there were expended and charged to capital account sums aggregating $2,339,796.87, as compared with $3,995,476.53 for the nine months ended December 31, 1925. The distribution of capital expenditures was as follows: Copper Cliff, $537,371.17; Port Colborne, $615,317.19; Huntington works, $1,173,080.47; Bayonne works and New York office, $14,028.04.

Items of principal importance covered by the expenditures enumerated were the new Frood shaft and electrification of the railway system at Copper Cliff; extension of the electrolytic refinery at Port Colborne; new strip-mill department and additional mill equipment at Huntington.

Your board of directors approved the sale of the company's holdings in New Caledonia, since it was deemed undesirable to continue further the maintenance charges of these small tonnages of relatively inaccessible ore in view of the large ore reserves recently developed at the Frood mine.

Financial.—Annexed hereto are the consolidated general balance sheet and the profit and loss statement of the company and its subsidiaries, covering the year ended December 31, 1926, audited by Messrs. Price, Waterhouse & Company.

The operating profit for the twelve months was $7,191,283.43, from which was deducted for depreciation of plants $1,072,236.57 and $456,624.60 for depletion of ore reserves, and $106,154.85 for Orford works property expense, leaving a net profit for the twelve months of $5,556,267.41, compared with a net profit of $4,237,400.27 for the preceding nine months. After deductions for preferred dividends ($534,756) and common dividends ($3,346,768) and adjustment due to the disposal of the New Caledonia properties, amounting to $296,353.66, the surplus on December 31, 1926, was $16,680,482.46, an increase of $1,378,389.75.

Earnings applicable to the common stock were $5,021,511.41, equivalent to $3 per share for the year.

The balance sheet shows that the additions to property account, less recoveries and value of foreign companies, were $1,893,443.21 and that $93,167.98 was written off for dismantlement and charged to the reserve fund. The total property account, after deducting depreciation and depletion of ore reserves, is $53,424,609.02, as compared with $53,060,026.98 on December 31, 1925.

The net current assets of $15,531,017.19 are in excess of last year's figures by $475,882.84.

Dividends.—Six dollars per share was paid on the preferred stock in four dividends of $1.50 each, and $2.00 per share was paid on the common stock in four quarterly instalments of 50 cents each.

Outlook.—No change in your company's policy of sales promotion is contemplated. Your distributors are now well organized and aggressively commercializing new applications originating through development and research.

The use of nickel for improving cast iron, mentioned in the last report, is advancing satisfactorily and in time should provide an outlet for a large tonnage of metallic nickel. Nickel steel is finding a place in new industries, thus augmenting the consumption of nickel by alloy steel makers.

Foreign sales, which constitute a substantial part of your company's business, fell off badly in 1926, but sales improved during the last quarter. Your management is now building up a foreign organization to develop the use of nickel in Continental Europe and Great Britain. By an adaptation of the methods now used successfully in America, this new development effort should result in a gradual but substantial increase of foreign business.

Sales of Monel metal and rolled nickel produced at the Huntington works continue to increase in volume, and the diversity of uses to which these products are put tends to stabilize this portion of your business. There is every reason to believe that the sales of mill products will continue to grow as rolled nickel and Monel metal become more widely known.

Generally speaking, your company has no serious problems to face in the immediate future. Products are constantly improving in quality, and operating costs are being satisfactorily lowered. Your management has every reason to believe that the company is still in a period of constructive expansion, which its established sales methods are well designed to promote and which should not be checked by anything less than acute and widespread business depression.

Shareholders.—The number of preferred shareholders was 1,433 on December 31, 1926, as compared with 1,472 on December 31, 1925. The number of common-share holders was 11,162 on December 31, 1926, as against 9,204 on December 31, 1925. The total number of shareholders at the close of the calendar year was 12,226, compared with 10,334 on December 31, 1925.

CONSOLIDATED GENERAL BALANCE SHEET, DECEMBER 31, 1926

Assets

		Dec. 31, 1926	Dec. 31, 1925
PROPERTY ACCOUNT:			
Properties owned and operated, including investments in stocks of Nickel Corporation, Ltd., and Société Minière Caledonienne as at December 31, 1925		$65,219,783.08	$61,311,289.10
LESS amount written off for dismantlement		93,167.98	86,982.55
		$65,126,615.10	$61,224,306.55
Additions less recoveries	$2,339,796.87		
LESS foreign companies disposed of	446,353.66		
		1,893,443.21	3,995,476.53
		$67,020,058.31	$65,219,783.08
DEDUCT:			
Reserves:			
Depreciation of plants	$9,857,662.30		8,878,593.71
Depletion	3,737,786.99		3,281,162.39
		13,595,449.29	$12,159,756.10
INVESTMENTS:		$53,424,609.02	$53,060,026.98
Sundry securities		1,583,685.85	1,523,624.40
		$55,008,294.87	$54,583,651.38
CURRENT ASSETS:			
Inventories	$9,701,477.38		8,386,181.37
Accounts and bills receivable	2,867,417.62		2,471,163.68
Interest receivable	54,246.38		77,355.81
Advances	129,756.76		150,957.11
Government securities	3,258,293.75		3,232,412.50
Loans on call (secured)	600,000.00		1,800,000.00
Cash	960,686.97		1,198,417.14
		17,571,878.86	$17,316,487.61
		$72,580,173.73	$71,900,138.99

LIABILITIES			
CAPITAL STOCK:			
Preferred 6 per cent. non-cumulative (89,126 shares, $100 par value)		$8,912,600.00	$8,912,600.00
Common (1,673,384 shares, $25 par value)		41,834,600.00	41,834,600.00
		$50,747,200.00	$50,747,200.00
Ten-year serial 5 per cent. purchase money notes		2,300,000.00	2,844,444.44
CURRENT LIABILITIES:			
Accounts payable and pay-rolls	$1,185,701.87		782,313.34
Bills payable	.....		355,555.56
Taxes accrued	721,299.05		989,637.61
Dividends unclaimed	171.75		157.75
Preferred stock dividend No. 85 payable February 1, 1927	133,689.00		133,689.00
		2,040,861.67	$2,261,353.26
FUNDS AND RESERVES:			
Insurance and contingent		811,629.60	745,048.58
SURPLUS:			
December 31, 1926, as per statement annexed		16,680,482.46	15,302,092.71
		$72,580,173.73	$71,900,138.99

CONSOLIDATED GENERAL PROFIT AND LOSS STATEMENT

(For Twelve Months Ended December 31, 1926)

		Dec. 31, 1926 (12 months)	Dec. 31, 1925 (9 months)
EARNINGS OF ALL PROPERTIES after deducting manufacturing, selling expense, ordinary repairs, and maintenance		$8,195,141.01	$6,325,809.74
OTHER INCOME		167,621.33	102,291.22
Total income		$8,362,762.34	$6,428,100.96
DEDUCT:			
General office expense	$560,774.91		406,770.81
Reserved for federal and franchise taxes (estimated provision)	610,704.00		715,795.96
		1,171,478.91	$1,122,566.77
Net operating income		$7,191,283.43	$5,305,534.19
DEDUCT:			
Orford Works property expense	$106,154.85		80,788.09
Depreciation and depletion (provision for)	1,528,861.17		979,845.83
Foreign companies not included	.....		7,500.00
		1,635,016.02	$1,068,133.92
Profit for the year		$5,556,267.41	$4,237,400.27
DIVIDENDS:			
Preferred	$534,756.00		401,067.00
Common	3,346,768.00	3,881,524.00	1,673,384.00
Balance		$1,674,743.41	$2,162,949.27
SURPLUS, January 1, 1926		15,302,092.71	13,139,143.44
		$16,976,836.12	$15,302,092.71
Adjustment on disposal of foreign companies		296,353.66	.....
SURPLUS, December 31, 1926		$16,680,482.46	$15,302,092.71

Creighton Mine

Mining operations of the International Nickel Company of Canada, Limited, at Creighton mine were continuous throughout the year 1926.

The bulk of the production was obtained from the mining of stopes and pillars between the 14th and 16th levels. Other stoping, producing a considerable tonnage, was done on the 20th, 23rd, and 26th levels.

Development work, consisting of drifting, crosscutting, raising, and boxholing was done throughout the mine.

A fan was installed on the 30th level to facilitate the ventilation of the lower levels, where recent development work has opened up ore in portions of the mine considerably removed from the older workings. This fan, driven by a 100 h.p. motor is drawing approximately 90,000 cubic feet of air per minute through the workings and delivering it to the bottom of No. 3 shaft whence it finds its return to surface.

The average force employed at Creighton during the year was 456 men.

The mine staff consists of W. J. Rolfe, superintendent; Chas. Lively, mine foreman; J. E. Treasure, assistant mine foreman; John Symons, master mechanic; A. Mackenzie, chief electrician; and R. H. Keast, head surveyor.

Frood Mine

During the summer months of 1926 a small amount of ore was mined on the 3rd level through No. 1 shaft at the Frood mine and shipped to Copper Cliff for test purposes.

This work, employing a crew of about 16 men, was in charge of J. W. Brown.

Towards the end of September preliminary work on the sinking of the new main shaft (No. 3 shaft) was commenced. After sinking about 40 feet with temporary rigging, the concrete collar was placed and the sinking-plant and headframe installed. Work was resumed at the face on December 11, 1926, using the regular sinking-plant.

This shaft, a vertical shaft, in the footwall of the deposit is divided into four main compartments longitudinally, each 14 feet 4 inches by 6 feet in the clear. One end compartment is subdivided to give a skip hoistway in one corner, a pipe and cable compartment in the other corner, with a ladderway between.

The shaft is 16 feet by 28 feet, 2 inches, outside the timbers. All plates, dividers and corner posts are 10- by 10-inch, the intermediate posts 6- by 10-inch, and all guides 4- by 8-inch, British Columbia fir. The sets are placed on an interval of 7 feet, centre to centre.

For hoisting during the sinking operation, two 3-ton skips, run in balance, are being used in addition to a man cage. These conveyances are all equipped with 30-foot extension runners, which permit them being lowered directly to the face, below the permanent timbering.

When equipped for permanent operations, the shaft will allow the use of two man and supply cages with a deck area, 5 feet by 13 feet 4 inches, two ore skips, 5 by 5 feet in cross-section, and a rock skip of the same section, which will operate in balance with a counterweight.

The sinking operations are in charge of J. P. Hussey.

Copper Cliff Smelter

Three blast furnaces, three converters, the Wedge furnace and reverberatory plant were in continuous operation throughout the year.

The smelter-yard tracks, as well as all tracks connecting with the Canadian Pacific and Algoma Eastern railways and the company's tracks to the Frood mine, were electrified during the year, all standard-gauge steam locomotives being replaced with electrics.

There were no changes during the year in the staff in charge of smelter operations.

Mond Nickel Company, Limited

The Canadian staff of the Mond Nickel Company, Limited, at Coniston consists of: C. V. Corless, general manager; Oliver Hall, mines manager; John F. Robertson, smelter manager; W. H. De Blois, sales manager of sulphuric acid plant; L. J. Ingolfsrud, chief engineer; W. H. Soule, electrical superintendent; W. A. MacDonell, cashier; Frank Simms, purchasing agent; E. T. Austin, smelter superintendent; K. S. Clarke, superintendent of sintering and concentrating plants; and E. H. Jordan, superintendent of sulphuric acid plant.

Coniston Smelter and Plants

Three blast furnaces and three to four converters were in continuous operation at the Coniston smelter throughout the year 1926. The sintering plant, concentrator, and acid plant were also in continuous operation. No changes or additions were made in the equipment of these plants.

The quartzite quarry at Coniston produced 52,095 tons for converter flux.

The average force employed at the Coniston plants was 653 men.

Frood Extension Mine

Development operations at the Frood Extension mine were carried out throughout the year 1926. The shaft was sunk an additional 294 feet from 1,736 to 2,030 feet, stations being cut at 1,850 and 2,000 feet. On the 1,700-foot level, the main crosscut was advanced 150 feet to the footwall, and 1,050 feet of drifting was completed along the footwall contact. Ten crosscut raises (at 45 degrees), Nos. 1, 3, 5, 7, 2, 4, 6, 8, 10, and 12, were driven from the footwall drift towards the hanging wall. The footage completed in these raises is approximately 1,200 feet. On the 2,000-foot level, 1,995 feet of drifting and crosscutting was completed.

A brick powder magazine was constructed on surface. This building measures 20 by 30 feet.

A. D. Carmichael is mine superintendent. A force, averaging 116 men, was employed on the property during the year.

Garson Mine

Operations at Garson mine were steady throughout the year under A. L. Sharp, mine superintendent.

Development totalling 3,359 feet, comprising 2,433 feet of drifting and crosscutting, 884 feet of raising, and 42 feet of winze, was completed during the period. The tonnage hoisted was practically the same as for 1925, being 367,294 tons in 1926 as compared with 322,059 in 1925.

The average force maintained was 295 men.

Levack Mine

Mining operations at Levack mine were continuous during the year 1926. The bulk of the production was obtained from stopes and development on the 7th level. A total of 9,462 feet of development work was completed. This consisted of 4,277 feet of drifting and crosscutting and 5,184 feet of raising. The total tonnage hoisted during the year was 448,257 tons, an increase of 36,696 tons over the previous year.

A new brick powder-magazine was constructed, having a capacity of two cars of explosives.

F. J. Eager is superintendent. The average force at the mine during the year was 318 men.

Worthington Mine

During 1926, 202,664 tons of ore and waste were hoisted at the Worthington mine. The shaft was sunk an additional 300 feet and a station cut at the 1,200-foot (8th) level. Other development completed during the period consisted of 750 feet of drifting and crosscutting and 35 feet of winze.

W. J. Mumford is mine superintendent, and the mine force during the year averaged 180 men.

SILVER

Beaver Auxiliary Mines, Limited

This company operated their property at Elk Lake, township of James, district of Timiskaming, during the first half of 1926 with a force of 30 men. H. L. Donaldson was manager, and William Fraser, contractor.

The shaft was sunk 485 feet below the 300-foot level to a point where a heavy flow of water was encountered, which prevented lateral work being carried on at the 800-foot level according to plan. In addition to the shaft-sinking, a total of 285 feet of crosscutting, 291 feet of drifting, 50 feet of station-cutting, and 12 feet of raising was done mainly on the 600-foot level.

A smaller force of men was employed intermittently during the latter half of the year up to December 4, when the property was closed down.

Bellellen Silver Mines, Limited

The company began unwatering the mine in South Lorrain, district of Timiskaming, on September 8, and mining was commenced on October 4. John Mathewson was superintendent, and 26 men were employed.

A 750 cubic foot air compressor and a 125 h.p. motor were installed. A total of 423 feet of drifts and crosscuts were driven, 320 feet being on the 3rd level and 103 feet on the 4th level of the mine; in addition a 67-foot raise was driven in the last quarter of the year.

In the first quarter of the year 1927, the work was continued under Harold Fancy, and 418 feet of drifting was done.

Blair Gowganda Silver Mines, Limited

This company owns a group of five claims, G.G. 4,077, M.R. 1,205-6, 2,298 and 1,006, in Nicol township, district of Timiskaming, north of Leroy lake. W. J. Blair, of Barrie, Ont., is president, and Murray D. Kennedy is manager.

The company did surface trenching on these claims with a force of five or six men during the summer of 1926. A small boiler and hoist was installed late in October, and a two-compartment shaft was sunk to a depth of 111 feet during the winter months.

Canadian Lorrain Silver Mines, Limited

The authorized capital of this company is $3,000,000, of which 2,700,000 shares are issued. The board of directors comprises: F. H. Hamilton, president; J. A. Dunn, vice-president; J. Mackintosh Bell, managing director; W. H. Stafford, and H. Whittingham. R. S. Dening is secretary, and the head office is at 302 Bay Street, Toronto. The property is in South Lorrain, district of Timiskaming.

Hugh McMillan is manager, and 75 men were employed.

The following is taken from the managing director's report for the fiscal year ended February 28, 1927:—

Depth of the main shaft remained unchanged during the period under review. From that shaft there are working levels at the 80-foot, 150-foot, and 240-foot horizons. The deeper levels at 350 feet and 410 feet are reached by means of winzes. During the year a 50-ton mill was completed and put into operation, and a new and effective headframe was erected. Mining operations were continuous during the year, and the following work was carried out: winze sinking, 64 feet; raising, 242 feet; drifting and crosscutting, 5,271 feet; drifting in conjunction with Gilgreer mines, 665 feet.

The more important remunerative developments were those obtained in No. 5 vein at the 150-foot horizon, where the operations disclosed shoots of milling ore corresponding to the three shoots previously developed in the same vein at the 250-foot level. At the 150-foot level, shoot C was developed for a length of 67 feet, averaging at the level 105 ounces over 48 inches; shoot B for a length of 66 feet, averaging 86 ounces over 36 inches; and shoot A for a length of 15 feet, averaging 41 ounces over 31 inches. The E ore shoot on No. 17 vein at the 350-foot level was followed downwards by a winze, which was sunk to the 410-foot horizon. Good milling ore, averaging 80 ounces over 20 inches with high-grade patches, persisted for about 50 feet below the 350-foot level.

The mill went into commission during December for a tuning-in period, in which it was fed with material of inferior grade. The installation of the flotation unit, which greatly improved the extraction, was not completed until March. During the period, December 12 to February 28, 1927, 3,481 tons averaging 12.21 ounces of silver were treated, from which a 63.55 per cent. extraction was obtained. Production for the period based on actual smelter returns was 14,985 pounds of picked ore, returning 26,567.47 ounces of silver, and 981 pounds of cobalt and 123,626 pounds of concentrates, returning 27,020.35 ounces of silver. Prior to the commencement of milling operations, 31.11 tons of high-grade ore resulting from development operations were shipped, producing 90,560 ounces of silver and 3,579 pounds of cobalt, making the total net production for the period 200,825 pounds, from which returns were received for 144,148 ounces of silver and 4,560 pounds of cobalt.

The production for the period from March 1 to May 31, 1927 was 77,707 ounces of silver of an estimated value of $43,646.75. The cost of operations was $51,729.16. It was decided to cease stoping operations and to run the mill on dump rock, mine work being limited to exploration. This exploration during the month of June did not result in any important discoveries, and it was decided to close the mine. It is felt, however, that there remain many good chances for finding new ore bodies in various parts of the property, but the search for these must be considered as part of the systematic scheme of exploration extending probably over many months.

Capitol Silver Mines, Limited

This company had a force of 20 to 25 men engaged in surface work on mining claims H.S.363-65, 369, and 352 during the first half of the year. These properties are in Nicol and Haultain townships, district of Timiskaming.

Three diamond-drill holes were put down on the shaft on claim H.S.351, totalling some 2,000 feet. The management is the same as for the Castle-Trethewey Mines.

Casey Mountain Operating Syndicate, Limited

This company took an option in May on any two claims of the six claims owned by the Casey Mountain Mining Company, Limited, in Casey township, district of Timiskaming, 11 miles northeast of New Liskeard. The syndicate has a capital of $150,000, in $1 shares, and comprises R.G. Williamson, president; Stuart Scott, vice-president; H. H. Fockler, Newmarket, Ont., secretary-treasurer; D. W. Lepard, A. Cunningham, Toronto; H. C. Hall, William Hall, and J. W. Brown, Fort Qu'Appelle, Sask.; W. H. Wright, Balcares. An 8- by 10-inch cylinder hoist was installed, and on September 15 work began with a force of six men on the 235-foot level in No. 2 shaft. The southwest drift was continued 123 feet to a point 180 feet from the west crosscut, and a winze was begun at a point where some high-grade was found in the vein.

The workings on this level include crosscuts 100 feet east and 285 feet west. and drifts 125 feet south and 90 feet southwest, in addition to the drift mentioned.

Castle-Trethewey Mines, Limited

The authorized capital of this company is $2,000,000 in shares of $1 par value The property is in Haultain township, district of Timiskaming. The board of directors comprises: J. P. Bickell, president; J. B. Tudhope, vice-president; W. J. Sheppard, S. R. Wickett, and D. H. McDougall. Balmer Neilly is secretary-treasurer. The head office of the company is at 602 Standard Bank Building, Toronto. R. J. Ennis is consulting engineer. H. G. Young, who was mine manager during 1926, was succeeded in the early part of 1927 by Angus D. Campbell. The mine and mill superintendents are E. H. Clemens and George Barkhouse.

The working force averaged 120 men during 1926.

The following is taken from the manager's report for the nine months' period, July 1, 1926, to March 31, 1927:—

PRODUCTION

Concentrates shipped, dry tons	258.9	
Ounces, per ton	2,946	
Total fine ounces silver recovered	762,861.47	
Average price obtained per ounce	$0.5765	
Revenue from sale of silver		$389,307.42
Cobalt produced, pounds	22,672	
Revenue from sale of cobalt		3,068.60
Total revenue		$392,376.02

PRODUCTION SINCE COMMENCEMENT OF OPERATIONS

Period	Months	Tons milled	Ounces per ton recovered	Gross production, ounces	Gross value, silver and cobalt
Feb. 1, '22, to June 30, '22	5	Sorting	.....	40,000	$28,000.00
July 1, '22, to June 30, '23	12	Sorting	.....	62,811	41,146.80
July 1, '23, to June 30, '24	12	7,607	46.03	350,147	229,656.95
July 1, '24, to June 30, '25	12	30,273	30.62	927,088	637,712.10
July 1, '25, to June 30, '26	12	34,425	29.03	999,234	683,601.48
July 1, '26, to Mar. 31, '27	9	29,136	26.18	762,861	426,928.53
Total	.....	101,441	.....	3,142,141	$2,047,045.86

SUMMARY OF DEVELOPMENT

	Shafts	Drifts	Crosscuts	Raises	Winzes	Total
No. 3 shaft	.....	4,943	1,948	781	.....	7,772
No. 1 shaft	68	.....	18	.....	.....	86
Total	68	4,943	1,966	781	.....	7,858

Total footage of drifts, raises, and winzes	5,724 linear feet.
Percentage of this footage in ore	14.3 per cent.
Development produced 4,937 tons of 22.8-ounce grade ore	112,571 ounces.

SOURCES OF ORE FROM MINE

Source	Tons	Grade, ounces	Total, ounces
Development	4,937	22.8	112,571
Stopes	22,189	33.1	734,262
Mill dumps	2,015	20.0	60,300
Total	29,141	31.1	907,133

MILLING

	Tons
Ore treated from mine	27,121
Ore treated from dumps	2,015
Total	29,136
	Ounces
Silver recovered	762,861
Silver in tailings	55,297
Total	818,158

CONCENTRATES PRODUCED (ESTIMATED)

	Pounds	Ounces
Jigs	168,697	390,206
Sands	255,967	359,709
Slimes	93,176	21,285

OPERATING COSTS (9 MONTHS, 1926-27)

	Total cost	Per ton	Per ounce
Development	$104,688.68	$3.593	$0.137
Mining	56,892.71	1.953	.074
Tramming and hoisting	18,393.98	.631	.020
Milling	43,120.71	1.480	.056
Shipping	8,065.34	.277	.016
Smelting and refining	18,086.53	.621	.024
General expenses—mine	12,169.89	.418	.016
Head office expenses	12,662.78	.435	.017
Maintenance, insurance, etc.	5,136.99	.177	.006
Total	$279,217.61	$9.585	$0.366

No. 1 Shaft, Claim R.S.C. 106

This shaft, which was the original prospect shaft of the mine, was reopened in March, 1927. It had been sunk some years ago through 140 feet of Keewatin rock into the underlying diabase. Most of the work was done from the 300-foot level close to the contact. Some silver was found in the veins explored at that time.

The shaft is now being deepened from the 300- to the 450-foot level, where the first exploration will be carried on. The old buildings on this claim were replaced and a new electrically driven compressor installed. The buildings now are: Switch-house and transformer station, hoist and power-house, headframe, cookery and sleep camp with accommodation for 25 men. The power plant consists of three 100 k.v.a., 1,200- to 550-volt transformers; a 750 cubic foot air compressor with 150 h.p. motor, and a 10- by 12-inch air hoist. The total cost of the buildings and plant was $19,484.72. The operating costs, during this period, for pumping and cleaning out the workings and for sinking and cutting the station on the 450-foot level were $8,516.62.

The claim is well located between the producing claims of the Miller Lake O'Brien and the Tonapah Canadian Mines and has most favourable prospects.

General

Other new construction consisted of a pumping station at Babbs lake, with buried 6-inch wood-stave water-line to the mine, the whole costing $14,760.76; four new houses for the staff at $12,092.60; and two new low-pressure boiler heating plants at $6,097, to replace the old central-heating plant. The latter have already paid back their cost in saving in operation.

The development done, 7,858 linear feet in nine months, is large for the tonnage milled; but the nature of the diabase ore deposits demands the carrying out of a large amount of development. Ore is being mined from No. 10 vein, the richest vein on the property, on the 700-foot level over 600 feet below the overlying Keewatin rock, and conditions are favourable for the ore going deeper.

Cobalt Argyros Mines, Limited

Cobalt Argyros Mines, Limited, a subsidiary of the Lucky Tiger Combination Gold Mining Company, Limited, began operations under lease on December 1, 1925, on the Hargreaves and Cobalt Merger properties, Coleman township, district of Timiskaming, operating through Kerr Lake No. 3 shaft. C. H. Heron is manager, and 20 men were employed.

The drift on No. 3 vein was continued for 100 feet on the Hargreaves property and for 700 feet on the Merger property. A crosscut 200 feet long was driven on the latter and a raise was put up 90 feet on the former property.

A test pit was sunk 40 feet on mining claim No. 19,438, block 32, Gillies limit, district of Timiskaming, under an option on five claims belonging to Hill and Gibbons, at the end of the ye .r.

An option was taken on the Mosher group of thirteen claims, two and a half miles southwest of Timagami station, and three diamond-drill holes were put down on mining claims Nos. 4,065 and 4,061 to depths of 292 feet, 192 feet, and 210 feet between March 14 and April 6, 1927. The option was relinquished.

Cobalt Contact Mines, Limited

Cobalt Contact Mines, Limited, operated the Green-Meehan and Red Rock properties, township of Bucke, district of Timiskaming, during the year with an average force of 48 men. J. M. Aitken is president; George Coles, vice-president; Alexander M. Hamilton, G. W. Adams, Clifford E. Smith, Frank Loring, and Sir Augustus Fitzgeorge, directors. James A. Stewart is secretary-treasurer, and J. M. C. Dunlop, manager. The head office of the company is at 8 Bloor Street East, Toronto.

The Cobalt Contact property in Bucke township was operated until May 6, when the option was relinquished, during which time 28 feet of shaft-sinking and 210 feet of drifting was done.

The option on the Law property to the north of the Contact mine was given up on January 10, after 65 feet of drifting had been added to the work of the previous year.

On the Hunter property 50 feet of shaft-sinking was done, making the shaft 70 feet deep.

The work on the Green-Meehan and Red Rock properties included 2,684 feet of drifts, 832 feet of crosscuts, 281 feet of raises, and a 20-foot winze. The tonnage stoped was 14,042 tons, with an additional 1,985 tons on the Cobalt Contact property.

A mill with a capacity of 60 to 100 tons, using concentration and flotation of slimes, was constructed. It began operating in July and treated 7,883 tons.

Cobalt Twentieth Century Mining Company, Limited

This company began work on July 13 on their property in the northeast corner of Coleman township, district of Timiskaming, with a force of three to four men. S. S. Sager, of 45 North Division Street, Buffalo, N. Y., is manager.

A 40-foot prospect shaft was enlarged to a depth of 25 feet. There are two other shafts on the property, one 165 feet and the other 350 feet in depth. In former years, some 200 feet of drifting had been done in No. 1 shaft and about 350 feet in No. 2 shaft at or near the bottom.

Coleroy Gowganda Mines, Limited

During 1926 this company operated their property at Leroy lake, in Nicol township, district of Timiskaming, with an average of 24 men. The officials of the company are: John A. McAndrew, president; E. V. Nisbet, secretary-treasurer; John W. Shaw, manager. The head office of the company is at 272 Bay Street, Toronto.

During the first half of the year, development work was continued on the 488-foot level and on a new level established at 563 feet by means of a winze. In August, sinking was resumed to deepen the shaft from 488 feet to 650 feet, and this was completed early in October. The east crosscut on the 650-foot level was driven 96 feet from the station, and No. 4 and No. 1 veins were cut at 50 and 100 feet from the shaft. No. 4 vein was followed 177 feet southwest and a branch vein for 13 feet. No. 1 vein was followed north for 133 feet and south for 132 feet. Some ore was found on the 650-foot level, which is considered the most promising horizon, and also in the winze from the 488-foot level.

A summary of the development for the fiscal year ending March 31, 1926, includes 1,749 feet of drifts, 233 feet of crosscuts, a 76-foot winze, 160 feet of shaft-sinking, and 50 feet of slashing.

New installations included a 720 cubic foot air compressor, a 125 h.p. motor, and a 60-gallon triplex electric pump on the 488-foot level.

Coniagas Mines, Limited

The following information is taken from the annual report of the Coniagas Mines, Limited, for the year ending December 31, 1926.

Coniagas

Mining operations were restricted to the removal of party walls on the east boundary of the property. This work was performed by the Nipissing Mining Company and resulted in the recovery of 87,140 ounces of silver as per assay.

A final clean-up of the mill floors and sumps yielded a total of 49,966 ounces of silver.

General salvage operations were continued, during which machinery and equipment were overhauled and sold or held for future use. Several houses owned by the company were sold and all surplus buildings dismantled and removed.

The total production of silver from the mine to December 31, 1926, amounted to 32,685,039 ounces. This includes approximately 500,000 ounces from the Trethewey property.

The following table is interesting as a summary of production and costs during the life of the Coniagas mill:—

Year	Tonnage milled	Total cost per ton, mining and milling	Ounces of silver produced	Total cost per ounce, mining and milling
1908	14,064	$16.03	1,457,240	$15.473
1909	19,038	11.25	1,407,288	15.218
1910	33,539	7.65	1,929,531	13.294
1911	52,320	6.34	3,789,273	8.800
1912	53,627	8.77	3,508,377	13.399
1913	54,890	8.79	3,572,398	13.503
1914	54,522	7.66	2,497,394	16.731
1915	55,437	6.39	2,002,053	17.692
1916	56,972	5.81	1,773,286	18.990
1917	60,929	5.74	1,344,267	26.014
1918	68,597	5.94	974,264	41.769
1919	71,744	5.56	940,267	42.396
1920	97,634	5.74	994,235	56.153
1921	113,279	4.58	1,301,515	39.869
1922	121,953	3.83	1,158,882	40.282
1923	140,774	2.70	1,309,792	28.978
1924	86,808	3.56	581,185	53.119
Total	1,156,127	.....	30,541,247	.....
Per unit	.....	$5.5989	.....	$21.194

The Coniagas Reduction Company, Limited

Operations at the smelter during the year have been confined to the disposal of finished products, stores, equipment, etc., on hand at the time of cessation of operations in 1924.

Established in 1908 to treat the ores and concentrates produced from the Coniagas mine at Cobalt, as well as treatment of custom ores and concentrates, and to recover therefrom their constituent products (which ores and concentrates at the time were being sent to the United States for treatment and for which revenue was only received for the silver content), the following schedule of production at this plant for 17 years may be of interest:—

STATEMENT OF ORE TREATED AND METALS SHIPPED

Year	Mine ore and concentrates treated	Silver shipped	Metal content of cobalt products shipped	Metal content of nickel products shipped	Metal content of arsenic products shipped	Metal content of copper products shipped	Gold shipped
	tons	ounces	lbs. avdp.	lbs. avdp.	lbs. avdp.	lbs. avdp.	ounces
1908	175.2	55,391.1	.....	.....	.....	.....	.....
1909	1,144.4	1,639,762.5	.....	.....	84,246	.....	.....
1910	1,788.9	2,820,118.1	12,987	685	483,006	.....	.....
1911	2,869	5,642,803.1	36,178	9,092	1,328,991	.....	.....
1912	2,376	5,267,046.6	154,552	60,078	903,463	.....	.....
1913	2,499.5	5,014,010.6	281,622	147,914	537,877	.....	.....
1914	1,932.9	3,613,341.9	273,530	144,010	1,209,694	.....	.....
1915	2,165.3	3,465,946.0	96,670	92,438	944,282	.....	.....
1916	3,183	3,952,672.1	324,430	35,687	745,937	.....	.....
1917	3,452.5	2,978,415.6	247,312	100,636	524,958	.....	.....
1918	2,281.7	2,390,737.4	227,763	232,802	1,040,890	.....	.....
1919	1,867.9	1,741,841.2	158,292	108,044	1,308,937	232	.....
1920	1,289.7	896,355.9	217,902	112,042	746,479	47,015	.....
1921	1,412.9	1,486,857.0	58,346	7,279	278,425	33,571	19.29
1922	184.7	380,766.4	99,748	101,809	457,341	126,920	.....
1923	1,975.1	150,613.31	127,043.3	35,688.27	356,694.75	.....	.....
1924	.....	155,662.82	136,919.95	17,547.35	67,696.18	17,548.6	.....
1925	.....	64,860.02	58,921.16	50,544.8	6,554.91	3,364.42	.....
1926	.....	1,393.42	.....	127,868.51	546,834	7,945.34	.....
Total	30,598.7	41,718,595.07	2,512,216.41	1,384,164.93	11,572,305.84	236,596.36	19.29

NOTE.—The gold (19.29 ounces) was recovered from refinery sludge at the termination of operations.

The financial statement of this company presented shows that, after deducting current liabilities, the quick assets at the end of the year amounted to $700,289.53.

Prospecting in 1926

During 1926, the company continued an aggressive search for another mine in undeveloped parts of Northern Ontario and Quebec. Most of the effort was centred in the townships of Boischatel, Duprat, and Montbray, Quebec.

In Boischatel, fourteen claims owned by the company and also a large block of ground acquired under an option to purchase were prospected. On the latter block a discovery of disseminated chalcopyrite in a porphyritic andesite was made, but as this was a very low grade, the option was relinquished.

In Montbray and Duprat the company owns a large block of ground astride the township line separating the two townships and also a few detached claims. In the southwestern corner of Duprat on Coniagas claims A. 5,362 and A. 5,363, an interesting zone, striking N. 30° E. astronomic, was found during the summer, Along this zone chalcopyrite has been found at irregular intervals for a distance of 1,400 feet; the chalcopyrite is disseminated in thyolite, and although fine specimens may be obtained the bodies so far found seem too low grade to be of commercial value. In addition to this main ore zone, chalcopyrite has been found at several other places, all of which warrant further work. A preliminary dip-needle survey was made of all the claims, and this will be continued in 1927. Although a considerable amount of work was done on this block, only a very small part of it has yet been trenched. Some of the showings are attractive enough to invite a diligent search for ore. Lines are now being cut, in preparation for an electrical survey to be made of part of these claims, by the Swedish American Prospecting Corporation.

The company has optioned a block of ten claims, two in Dasserat, seven in Boischatel, and one in Duprat. This ground was acquired because it lies adjacent to claims of our own upon which discoveries have been made.

In the Red Lake area, district of Patricia, a small crew of men performed the necessary assessment work on a group of claims staked by one of the company's prospectors. Nothing of importance has so far been found on this ground.

An option was given to March Gold, Incorporated, Buffalo, N.Y., to purchase, under an escrow agreement, the Maidens-McDonald claims for the sum of $250,000 cash and 100,000 shares of stock of $1 par value in their operating company, and under this option agreement your company has received $100,000 cash and 100,000 shares of stock in the March Gold, Limited, in which company the title deeds of their property in the Porcupine area are vested. This company owns and operates a 200-ton mill on the property. The sale of these claims is considered advantageous to your company.

Enright Mining Company, Limited

The Enright Mining Company, Limited, took over the old Devlin property in the southeast corner of James township, district of Timiskaming, in March, 1926, comprising the east half of the south half of lot 1, concession I, and began repairing the buildings with a force of five men. The company has a capitalization of $3,000,000 in shares of $1 par value, of which 1,000,000 shares are issued. The board of directors comprises Senator Currie, of Montreal, president; E. S. Turner, managing director; and Arthur T. Forbes, secretary-treasurer. The head office is at 89 St. Francois Xavier Street, Montreal. Horace F. Strong of Haileybury is manager, and William Fleming, mine captain.

For the next four months, 15 to 18 men were employed repairing the plant and making roads, and underground work began on August 2, when the force was increased to 38 men, including 5 diamond-drillers and 10 wood-cutters. A total of 430 feet of drifting and crosscutting and 15 feet of winzing was done on the 100-foot level, and 280 feet of drifting on the 200-foot level, besides a certain amount of diamond-drilling.

Louis Fenning

Louis Fenning, on behalf of himself and associates in New York, was preparing to dewater the old workings of the Beaver mine, O'Connor township, district of Thunder Bay, when the property was visited on July 19, 1927.

Considerable repairs to the existing two shafts above the adit level and to the timbering and tracks on the adit level had been made prior to this date, and a boiler was being set up to operate pumps and open up the two levels reported to be developed below the adit level. Three men were employed on this work.

While the work was undertaken primarily for examination purposes, it is understood that operations will be commenced immediately should the results of the examination prove encouraging.

Friday Mines, Limited

This company has a capital of $2,000,000 in shares of $1 par value. R. C. Vokes is president; W. H. Schaffer, vice-president; J. R. Sproat, secretary and manager. The head office is at 1103 Washington Boulevard Building, Detroit, Mich. The company owns three claims, Nos. 19,505, 12,825, and 12,826 on Lorrain lake in Lorrain township, twelve miles northeast of Timagami station.

The company began trenching and sinking test pits on the property in May with a force of four men. Three pits were sunk to depths of 12, 16, and 34 feet, and the vein was exposed on the surface for 400 feet. The property was closed after five months' operation.

Genesee Mining Company, Limited

In January, 1926, the company began operations on the property in Bucke township, district of Timiskaming, with a force of 11 men, and continued for two months. F. L. Steenman was manager.

A crosscut was driven southeast on the 350-foot level, and a shallow winze put down on No. 16 vein west of the former winze.

Gowganda-Duggan Silver Mines, Limited

This company resumed operations on their property in Donovan township, district of Timiskaming, with a force of 20 men on September 1, after a six months' shut-down. The officials of the company are: F. Macklin, Blenheim, president; Archie Fyfe, Orillia, vice-president; Joseph Montgomery, secretary-treasurer, Federal Building, Toronto. Neil Morrison is mine superintendent.

A 65 h.p. boiler was added to plant, the shaft was continued from a depth of 139 feet to a depth of 312 feet, and levels were established at 150 and 300 feet. During the first half of 1927, drifting was done on the 150-foot level 65 feet east and 60 feet west from a 20-foot crosscut. On the 300-foot level, 235 feet of crosscuts and 208 feet of drifts were driven.

Gowganda Keora Silver Mines, Limited

This company operated their property at Calcite lake, Lawson township, district of Timiskaming, except during the months of May, June, and July, until October 20, 1926. Thomas Reilly was manager, and 20 men were employed.

A larger hoist was installed and the following amount of lateral work done on the different levels: 120 feet of drifting and crosscutting on the 150-foot level, 290 feet and 60 feet of raising on the 195-foot level, and 330 feet of drifting and crosscutting on the 270-foot level.

The mill was operated during the first four months of the year and treated 260 tons of ore, making a total of 760 tons in all.

Keeley Silver Mines, Limited

This company has a capital of $2,000,000 in shares of $1 par value. The officers and directors are: F. H. Hamilton, president; J. Mackintosh Bell, managing director; W. H. Stafford, James W. Bain, John H. Black, R. T. Shillington, and E. Tuerk, directors. R. S. Dening is secretary-treasurer, and the Toronto office is at 302 Bay Street. The property is at Silver Centre, South Lorrain, district of Timiskaming.

M. C. H. Little is resident manager, and 135 to 140 men are employed.

In spite of the very serious drop in the price of silver, the profit for the year amounted to $538,698.32, and the dividend rate of 24 per cent. per annum, including bonus, has been maintained. The net surplus stands at $720,725.33.

The managing director reports as follows for the fiscal year ended February 28, 1927:—

The most satisfactory features of the operations during the past year are to be found in the facts that the monthly production of approximately 125,000 ounces of silver was maintained and that, in spite of the serious decline in the price of that commodity, the dividend requirements were more than earned.

Summary of Underground Operations.—During the year the following underground development has been carried out:—

	Feet	Cost per foot
Drifting and crosscutting (No. 3 shaft)	7,922	$14.62
Raising	738	18.22
Winze-sinking	104	63.58
Diamond-drilling	1,002	5.88

Some 25,082 tons of ore were hoisted. Of this amount, 21,237 tons were taken from the stopes; the remainder came from development.

The cost per ton of ore delivered to the primary crusher averaged $4.46.

Results of Development.—The most important developments during the period under review were those obtained in the western part of the property, more particularly in No. 28 vein at the 11th level, 820 feet below the collar of No. 3 shaft. In this locality three shoots of ore, having an aggregate length of 166 feet and an average assay of 1,800 ounces over 6 inches, were developed. One of these shoots has been followed downwards, by means of a winze 75 feet deep, and good ore persisted to a depth of 58 feet. Development is now proceeding at the 12th or 895-foot level.

Mill Statistics.—During the year, 24,705 tons of ore were milled. Abbreviated statistics are as follows:—

Ore milled	24,705 tons.
Heads, average	24.3 ounces.
Tails, average	3.14 ounces.
Extraction, average	87.5 per cent.
Average running time	81.3 per cent.

Production.—Production for the year (based on actual smelter returns) was as follows:—

	Pounds, net	Silver, ounces	Cobalt, pounds
Picked ore	578,366.5	1,114,296.91	67,134
Concentrates	1,486,376	525,711.05	118,696
Total	2,064,742.5	1,640,007.96	185,830

The corresponding figures for the silver and cobalt produced during the previous year are 1,514,407 ounces and 181,054 pounds, respectively.

PRODUCTION DURING PREVIOUS YEARS

	Pounds, net	Silver, ounces	Cobalt, pounds
1913	322	872.7	.....
1914	2,327.4	3,183.03	.....
1918	145,048	39,557.25	1,061
1919	31,766	4,565.82	3,160.3
1920	119,770	8,253.44	9,896.86
1921	676,411.5	313,230.88	60,566.72
1922 and 1st 2 months 1923	2,286,497	1,140,961.56	196,927
Fiscal year 1923-24	1,973,832.75	1,600,739.68	171,357
Fiscal year 1924-25	2,668,241.75	1,880,351.88	228,450
Fiscal year 1925-26	2,077,548	1,514,407.48	181,054
Total	9,981,764.4	6,512,123.72	852,472.88
Fiscal year 1926-27	2,064,742.5	1,640,007.96	185,830
Total production to February 28, 1927	12,046,506.9	8,152,131.68	1,038,302.88

COST OF PRODUCTION

(Based on 24,924 tons of ore treated, producing 1,640,007.96 ounces of silver)

	Total cost	Per ton	Per ounce
Development	$138,319.71	$5.55	$0.084
Ore extraction	94,739.40	3.80	.058
Ore sorting	7,587.79	.31	.004
Milling	44,078.37	1.77	.027
Shipping and marketing	70,404.68	2.83	.043
Administration	39,052.65	1.56	.024
General maintenance	36,457.27	1.46	.022
Head office expense	9,263.59	.37	.006
Corporate expense	24,084.99	.97	.015
Taxes	14,287.91	.57	.009
Total	$478,276.36	$19.19	$0.292

Ore Reserves.—The total ore reserves opened up in the mine as at February 28, 1927, are estimated at approximately 22,000 tons, containing about 1,091,000 ounces of silver and 74,000 pounds of cobalt. These figures make no allowance for the new ore being developed from the bottom of the winze, 75 feet below the 820-foot horizon.

Kerr Lake Mines, Limited

This company has a capital of $2,400,000 in shares of $4 par value. The officers of the company are: Adolph Lewisohn, president; Sam. A. Lewisohn, vice-president; E. H. Westlake, 61 Broadway, New York, secretary-treasurer.

Robert R. Brown was manager, and 4 to 8 men were employed at the mine in Coleman township, district of Timiskaming.

The manager reports as follows for the fiscal year ending August 31, 1926:—

Production from development work on adjacent and parallel veins to the south of the main east vein amounted to 13,200 pounds of ore, containing 9,035 ounces of silver. While the possibilities for high-grade production in this area are not entirely exhausted, development work failed to disclose ore of commercial grade and was discontinued.

Development work consisted of 30 feet of drifting and 129 feet of raising on the 90-foot level; 22 feet of drifting, 47 feet of crosscutting, and 125 feet of raising on the 140-foot level;

and 30 feet of drifting and 70 feet of raising on the sublevel between. Considerable open-benching and side-slashing was done on silver-bearing veins.

During the winter a group of claims was staked northeast of the centre of Dufresnoy township in the Quebec copper-gold area. These claims were located on formation alone and have been prospected with a limited amount of expenditure during the summer.

Keweenaw Mines, Limited

Keweenaw Mines, Limited, financed by the Noranda Mines, Limited, took an option on the York O'Brien and Red Jacket properties in the Gillies limit, district of Timiskaming, and began pumping out the old A6 shaft on December 15, 1926. Walter E. Segsworth is president; L. K. Fletcher, manager; and Frank Harrison, contractor.

The following buildings were erected: a hoist-house, 20 by 20 feet; a combined smithy and dry-house, 20 by 36 feet; a magazine and a 33-foot headframe. A 10- by 12-inch Jenckes hoist was installed, and mining began on January 22, 1927.

The property was operated until early in July, and 2,200 feet of drifts and crosscuts were driven, half of which were on the 110-foot level and half on sub-levels. Four raises were also driven, totalling 130 feet.

Kirk Budd Mining Company, Limited

The authorized capital of this company is $1,000,000. The officials of the company are: Willard Jones, Utica, N.Y., president; P. Daymont, Utica, N.Y., secretary-treasurer; Cecil Cave, Cobalt, managing director. The company operated the property in Gillies limit, district of Timiskaming, from May 5 to June 1, with a force of six men and extended the drift 120 feet eastward on the 150-foot level. They also operated for five weeks, from September 15, driving another 100 feet.

Lakeside Lorrain Silver Mines, Limited

The company began unwatering the mine in the township of South Lorrain, district of Timiskaming, on May 17 and shut down a month later after continuing the shaft from 90 to 113 feet in depth.

W. R. Van Reynolds is president; Joseph Montgomery, secretary-treasurer; and M. P. MacDonald, manager. The head office is at 611 Federal Building, Toronto.

Surface trenching was carried on with a force of six men on claims H.R.136 and 147 during the last two months of the year.

La Rose Mines, Limited

This company has a capital of $1,500,000 in shares of $1 par value. The board of directors remains the same as last year. E. W. Nesbitt, Woodstock, is president; William Cameron, 36 King Street East, Toronto, secretary; and G. E. H. Booth, manager.

The company operated the Violet mine, Coleman township, district of Timiskaming, for the first seven months of 1926 with a force of 35 men. Development work, mainly on the 470-, 590-, 880-, and 930-foot levels, consisted of 605 feet of drifting, 210 feet of raising, and 30 feet of shaft-sinking. Stoping amounted to 1,007 cubic yards.

Shipments amounted to 5,821.73 tons, of which one ton was high-grade ore, of a net value of $46,524.75.

Lorrain Consolidated Mines, Limited

This company operated their property in South Lorrain, district of Timiskaming, in the first five months of the year with a working force of 15 to 20 men. Horace F. Strong, of Haileybury, is consulting engineer. A total of 460 feet of drifts and crosscuts and 50 feet of raising was driven on the 175-foot level, after the report of the last fiscal year which ended on March 31, 1926.

McKinley-Darragh-Savage Mines of Cobalt, Limited

This company has a capital of $2,500,000 in shares of $1 par value. The mine and head office are at Cobalt, Ont. R. Home Smith is president, and the directors remain the same as last year. H. C. McCloskey is manager, and on an average 80 men are employed.

The silver recovered during 1926 from the mine and leases amounted to 408,531 ounces, and the silver recovered to date to 21,517,141 ounces. A total of 345,200 ounces was shipped. The average price received was 59.276 cents, and costs were 59.445 cents per ounce. Total costs were $242,850.98, equivalent to $5.68 per ton of ore mined, or 59.44 per ounce recovered. Mining costs were $96,779.88, equivalent to $2.26 per ton, or 23.69 cents per ounce. Milling costs were $68,892.53, equivalent to $1.61 per ton milled, or 21.9 cents per ounce.

Development footages were as follows: crosscuts, 268 feet; drifts, 600 feet; raises, 518 feet; winzes, 30 feet; a total of 1,416 feet. The total ore broken was 37,767 tons.

The Princess lease was allowed to expire on November 1; and the Right of Way lease, from which 4,200 tons of mill rock was obtained, was also dropped.

The mill treated a total of 42,739 tons, or an average of 108 tons per day. Average mill heads were 8.5556 ounces per ton, and mill tails, 1.213 ounces per ton. The percentage of extraction was 86, and the ration of concentration 84 to 1. The mill recovered 314,426 ounces of silver.

While the recovery of silver was only 8,000 ounces less than in the previous year, and costs were reduced 5.5 cents per ounce, the average price of silver was 9.6 cents less, and a small operating loss is shown for the year. Extensive development work was carried on during the year, but no ore bodies of a profitable nature were encountered; and the older workings have been gradually mined out.

Meteor Development Company, Limited

This company operated the Meteor property in Coleman township, district of Timiskaming, for the first six months of the year with a force of 12 men. W. A. Edwards, Bank of Weston, Weston, W.Va., is president, and George Wilson, secretary. H. L. Wilson is mine captain.

At No. 1 shaft, a crosscut was driven 60 feet south and a drift 150 feet east on the vein. At the west winze, a drift was driven 190 feet east on a mud seam, and crosscuts were driven 115 feet north and 212 feet south on the bottom level at a depth of 135 feet.

Mickle Silver Mines

Two mining claims in Mickle township, district of Timiskaming, adjoining the old Mapes Johnson mine on the west, were taken up by Mickle Silver Mines, and about 40 feet of sinking was done in the summer of 1926.

Harry Coles was superintendent.

Millcrest Mining Company

The company began surface work on their claims north of the Capitol property in Haultain township, district of Timiskaming, on October 15, 1925. These claims comprise Nos. 328-32.

The company has a capital of $2,000,000, with 1,900,000 shares issued. The board of directors is as follows: Sir Henry Pellatt, president, J. A. Murray, H. Blain, Stuart B. Playfair, and A. F. Demary. The company's office is at 420 Bank of Hamilton Building, Toronto.

Small camp buildings were erected, and 16 men were employed in shaft-sinking in the first five months of the year.

In March a mining plant, consisting of a 330 cubic foot gasoline-driven air compressor and a 7- by 10-inch hoist was installed. About 200 feet of drifting was done on the 112-foot level following the completion of the shaft sinking.

W. H. Fairburn was manager, and A. J. Anderson, mine captain.

Mining Corporation of Canada, Limited

This company has an issued capital of $8,300,250 in shares of $5 par value. The directors and officers of the company are: J. P. Watson, president; W. R. P. Parker, first vice-president; G. M. Clark, second vice-president; E. H. Rose, J. G. Watson, A. B. Stodart, C. E. Trafford, directors; M. F. Fairlie, mine manager; G. C. Ames, secretary. The head office is at 1512 Bank of Hamilton Building, Toronto.

The average number of men employed at Cobalt was 180, of which 50 were employed in the mill of the Cobalt Reduction Company, a subsidiary of the corporation. The working force in South Lorrain averaged 155 for the year, of which 25 were employed in Lorrain Trout Lake mines, which are partly owned and under the management of the Mining Corporation.

The year's operations resulted in a net profit of $511,186.50. Two dividends of $207,506.25 each, amounting to 5 per cent. in all, were declared in 1926.

At the Cobalt properties, the greatly increased production over that of the previous year resulted in a reduction in ore reserves. The tonnage of such reserves at the end of the year was approximately 43,000 tons, with silver content of slightly over 1,000,000 ounces.

A group of claims comprising 218 acres on the east side of Cross lake has been optioned. Diamond-drilling has shown sufficiently interesting structure to justify further work, and the plans for this are under consideration.

The following is taken from the resident manager's report for 1926:—

In spite of increased exploration and development work at the Cobalt properties, new ore put in sight did not equal that extracted, and a falling off in ore reserves is to be noted. This is to be expected, as the areas favourable for development are rapidly being reduced.

At the South Lorrain properties, there were no major developments of high-grade ore, but much promising ground remains for exploration.

Silver production for the year, from all classes of ore, showed an important increase, being 2,210,053 ounces as compared with 2,032,105 ounces for the previous year. This increase was entirely in mill-grade ore from the Cobalt properties. The total tonnage of mill ore from the orporation's mines was 57,874 tons, as compared with 54,979 tons for the previous year.

PRODUCTION IN 1926

	Tons treated	Ounces produced
Cobalt properties	51,266	1,105,456
South Lorrain properties	6,940	1,104,597
Total	58,206	2,210,053

Included in the above production were the following items: 207.94 tons of high-grade ore containing 910,575.32 ounces of silver, which was shipped direct to the smelter; 108.05 tons of low-silver high-cobalt ore containing 5,568.23 ounces of silver, also shipped without treatment; 15.72 tons of fines containing 14,126.33 ounces of silver, treated in the Cobalt Reduction plant.

Production of cobalt ore was greatly curtailed owing to lessened demand, the total weight of cobalt metal paid for being 85,316 pounds as compared with 293,324 pounds in the previous year. This does not include cobalt metal contained in concentrates.

The details of tonnage treated, production, etc., from mill ore are given in the table below:—

Tons of mill ore treated	57,874
Assay value, ounces per ton	25.81
Ounces contained	1,494,001.05
Ounces returned by Reduction Company	1,279,783.12
Percentage returned under contract	85.66

Past Production.—The table below gives the production by years from the mines of the corporation. The aggregate amounted to 42,582,256 fine ounces at December 31, 1926.

PRODUCTION IN FINE OUNCES TO DECEMBER 31, 1926

	Cobalt mines	South Lorrain mines	Total
Prior to 1908	118,616	.....	118,616
Year ended December 31, 1908	633,516	.....	633,516
" " " " 1909	442,254	.....	442,254
" " " " 1910	471,965	.....	471,965
" " " " 1911	1,777,002	.....	1,777,002
" " " " 1912	2,827,826	.....	2,827,826
" " " " 1913	3,784,718	.....	3,784,718
January 1, 1914, to March 31, 1914	866,622	.....	866,622
April 1, 1914, to December 31, 1914	3,185,124	.....	3,185,124
Year ended December 31, 1915	4,563,956	.....	4,563,956
" " " " 1916	4,457,441	.....	4,457,441
" " " " 1917	4,485,542	.....	4,485,542
" " " " 1918	1,708,252	.....	1,708,252
" " " " 1919	1,230,653	.....	1,230,653
" " " " 1920	1,664,018	.....	1,664,018
" " " " 1921	1,226,717	.....	1,226,717
" " " " 1922	1,462,269	.....	1,462,269
" " " " 1923	727,115	1,333,334	2,060,449
" " " " 1924	851,280	521,878	1,373,158
" " " " 1925	898,008	1,134,097	2,032,105
" " " " 1926	1,105,456	1,104,597	2,210,053
Total	38,488,350	4,093,906	42,582,256

Mining Operations

Cobalt.—There was produced and milled from the Cobalt properties a total of 51,266 tons of mill ore with head assay of 25.34 ounces per ton and silver content of 1,298,899 ounces. As in the previous year, the Cobalt Lake property supplied by far the largest proportion of the above tonnage. Unfortunately the proximity of the lake bottom prevents the complete extraction of profitable ore on eight of the producing veins on this property.

On the Cobalt Lake property, the ore shoot on No. 16 vein was extended a further 105 feet, making a total length of 430 feet of stoping ore. A drift on this vein was carried 125 feet further south but did not disclose ore of commercial grade.

The ore shoot on No. 11 vein was extended to a total of 290 feet, being an addition of 125 feet. The ore limits on this vein have also been established.

Veins Nos. 14, 15, 21, and 23, all branch veins of No. 16, were developed further to the west, and stoping carried out on them during the year.

A new vein, No. 28, parallel to No. 11, gave an ore shoot 130 feet in length. Number 30, a branch from this vein, was also discovered during the year and has been stoped for a length of 70 feet.

The 4th and 5th levels were reopened through No. 5 winze, and developments were satisfactory on veins Nos. 4 and 2 and the Fault vein. On the 5th level, a promising new vein, at present being developed, was cut near the south boundary. Another new vein exposed in diamond-drilling on the 5th level has so far been disappointing under development.

During the coming year a lower level will be opened by winze from the 5th level to develop the new vein mentioned above and to explore the ground west of the Cobalt lake fault. Also exploration will be carried out in the area between the Keewatin contact and the reverse fault to locate if possible the lower sections of No. 11 and No. 16 veins and their branches below the fault.

On the Townsite and City of Cobalt properties, stoping was carried out on No. 14 and No. 31 veins as well as on "C" and No. 34 and their branches.

During the year, further work will be carried out in the south section of the Townsite.

South Lorrain.—From the Frontier and Crompton properties, the following shipments of ore were made during the year: 6,608 tons of mill ore, with head assay of 29.52 ounces and silver content of 195,102.19 ounces; 15.72 tons of fines assaying 898.62 ounces and containing 14,126.33 ounces; 108.05 tons of cobalt ore assaying 51.53 ounces and containing 5,568.23 ounces; 207.94 tons of high-grade ore assaying 4,379.03 ounces and containing 910,575.32 ounces. The total silver content of all classes of ore was 1,125,372.07 ounces.

A remarkable improvement in the silver content of the high-grade ore is to be noted, the average assay per ton being 4,379.03 ounces, as compared with 2,755.69 ounces for the previous year.

Although there were no outstanding developments of high-grade ore at the South Lorrain properties, the following results of development work may be noted:—

On the Watson vein a high-grade ore shoot, 53 feet in length and with an average width of seven inches of 1,500- to 2,000-ounce ore, was exposed above the 3rd level. No stoping has been done on this ore. A considerable addition was made to a high-grade ore shoot previously developed above the 150-foot level. Another small shoot of high-grade was opened above the 5th level. In addition, a number of bodies of mill grade ore were developed both on the Watson and No. 1 veins, as noted in the quarterly reports.

Further work on the Wood's and Watson veins in the diabase formation was deemed inadvisable, and future exploration of these veins awaits the completion of the winze to the lower diabase-Keewatin contact. This winze on the Crompton property is being sunk from the 7th level of No. 3 shaft. Six hundred feet of sinking will have been completed in March. The new level will be 1,200 feet from surface. With the completion of sinking, crosscuts will be run to both the Wood's and Watson veins, and exploration of them carried out in both the diabase and Keewatin formations. The future of the Frontier and Crompton properties depends largely on the results of this work.

On the Little Keeley property, work on the 4th level was discontinued and for the past few months has been confined to drifting on the 6th level on No. 2 vein and an east branch vein. Although no commercial ore has yet been opened up, the strength and character of No. 2 vein offers excellent chances for successful development.

On claim H.S. 310, which is the centre of a group owned by the corporation, a shaft has been completed to a depth of 325 feet. These claims are located two and a half miles east of the Frontier near Lake Timiskaming. The geological structure is identical with that of the sedimentary area of Cobalt, and exploration by diamond-drill will be carried out in the sediments at an horizon about 50 feet above the Keewatin contact.

THE COBALT REDUCTION COMPANY, LIMITED

Concentrating Plant.—This plant ran 362 days during the year. An average of sixty-four stamps ran 529,183 out of a possible 556,360 stamp-hours, or 95.11 per cent. of the possible running time. The tonnage of mill ore treated in the low-grade plant was 73,422, against 85,581 tons in 1925.

This tonnage was shipped by:—

	Tons
The Cobalt mines of the Mining Corporation of Canada, Limited	51,266
The South Lorrain mines of the Mining Corporation of Canada, Limited	6,624
Lorrain Trout Lake Mines, Limited	7,110
Sundry	8,422
Total	73,422

Comparative details of concentration treatment for 1926 and 1925 follow:—

	1926	1925
Tons treated	73,422	85,581
Average assay	$24.78	$24.71
Ounces contained	1,819,783.49	2,115,084.49
Tons concentrate produced	793.38	1,048.38
Average assay	$1,301.97	$1,108.83
Ounces contained	1,032,960.76	1,162,478.67
Percentage of extraction by table concentration	56.76	54.96

Flotation Plant.—All the slime produced by crushing and grinding and the table-tailing (after regrinding in tube mills) were treated by flotation.

Details of tonnage, extraction, etc., are given below:—

	1926	1925
Tons of slime treated	72,628.48	84,532.56
Average assay	$10.83	$11.27
Ounces contained	786,822.73	952,605.82
Tons of flotation concentrate produced	1,101.41	1,418.79
Average assay	$566.72	$542.45
Ounces contained	624,193.56	769,617.48
Percentage of extraction	79.33	80.79

SUMMARY OF MILLING OPERATIONS

	1926		1925	
	Total	Extraction	Total	Extraction
		per cent.		per cent.
Tons of ore milled	73,422	.....	85,581	.....
Average assay	$24.78	.....	$24.71	.....
Ounces contained	1,819,783.49	.....	2,115,084.49	.....
Table concentrate produced, ounces	1,032,960.76	56.76	1,162,478.67	54.96
Flotation concentrate produced, ounces	624,193.56	34.30	769,617.48	36.39
Total ounces produced	1,657,154.32	91.06	1,932,096.15	91.35

High-Grade Plant.—This plant was not operated during the year. The balance of the 1925 production of residues, amounting to 961 tons, was shipped during the year. Table concentrate, which in previous years had been treated in the high-grade plant, were shipped to the smelter.

General Costs.—The total cost of operations was $296,836.60, against $380,207.99 in 1925, the greater part of the reduction being caused by the closing down of the high-grade plant.

The cost of marketing the table and flotation concentrate produced, including freight, smelter treatment and refining charges, value of smelter deduction, etc., is included under "Operation" in the table below and amounted to $115,633.80 in 1926, or $1.57 cents per ton of ore treated.

The cost per ton of ore treated was $4.043 against $4.442 in 1925. A much larger proportion, than in 1925, of total ore treated came from the Cobalt mines of the Mining Corporation, resulting in a higher ratio of concentration and consequent reduction in smelter costs.

TOTAL COST OF OPERATION

	Labour	Material	Other	Total	Per ton
Administration and general	$6,187.62	$913.60	$8,154.60	$15,255.82	$0.208
Operation	63,786.29	41,183.77	163,503.41	268,473.47	3.656
Head office	.....	.....	13,107.31	13,107.31	.179
Total cost of operation	$69,973.91	$42,097.37	$184,765.32	$296,836.60	$4.043

Earnings.—The gross earnings were made up of customs charges to the Mining Corporation of Canada, Limited, and subsidiaries and treatment charges on purchased ore, etc.

The operating profit was:—

By earnings	$335,851.24
Less total cost	296,836.60
Profit at plant	$39,014.64

There were no capital expenditures during the year.

Net Profit.—The net profit was:—

By profit at plant		$39,014.64
Less federal taxes	$1,048.71	
Written off plant	34,436.70	
		35,485.41
Net profit		$3,529.23

The above amount was paid out in dividends to the Mining Corporation of Canada, Limited.

LORRAIN TROUT LAKE MINES, LIMITED

This company has a capital of $1,500,000 in shares of $1 par value, one-third of which are owned by the Mining Corporation of Canada. The property in South Lorrain, district of Timiskaming, is operated in conjunction with the Frontier and Crompton properties by the Lorrain Operating Company, a subsidiary of the Mining Corporation of Canada, which employed from 135 to 170 men during the year, 25 of whom were employed in the Trout Lake mines.

The following is taken from the resident manager's report for 1926:—

Operations

No. 1 Shaft.—Further exploration at the 475-foot level was discontinued early in the year after several hundred feet of drifting. Development of ore on the 8th level of the neighbouring Keeley Silver Mines encouraged hope of improved results at greater depth, and preparations were made for further sinking. This became unnecessary when the Keeley company kindly offered to carry drifting south on to your property at an horizon 165 feet below the 475-foot level. This work proved unproductive of results. Later in the year when the Keeley had sunk to their 10th level, similar work was done for the company at that horizon, or 305 feet below the 475-foot level. This work, just recently completed, exposed a persistent vein carrying cobalt and nickel ore but low silver values. In view of inconclusive results, the company is not justified in sinking further from No. 1 shaft. There are still possibilities at the lower diabase-Keewatin contact, and such exploration may at a later date be done from No. 2 shaft.

On the upper levels at this shaft, further drifting was done on the Wood's and branch veins, but no new ore was developed. Crosscutting to the east was also unproductive.

Other work at No. 1 shaft during the year was confined to the stoping of previously developed ore. There still remains a small tonnage of mill-grade ore to be removed during the coming year.

No. 2 Shaft.—In the early part of the year, exploration work was confined to drifting on No. 2 and other branch veins on the 350-foot level. On No. 2 vein two short shoots of mill-grade ore were exposed, and these have not yet been developed further.

Later, a winze was sunk 150 feet to the 500-foot level, and drifting was again carried out on No. 2 vein and others. On this level, No. 2 vein was stronger and carried more cobalt, in places showing widths of 15 inches of solid cobalt ore. Silver values, however, were not important.

The winze was later deepened to 625 feet, which level is approximately 150 feet above the diabase contact. Drifting on this level has exposed two short shoots of commercial ore, the more important one showing a length of 31 feet with an average width of 7 inches of 800-ounce ore.

The greater strength of No. 2 vein and improved values shown on the 625-foot level encourages the hope of still greater improvement nearer the diabase contact and justifies the opening of another deeper level.

Production

Failure to develop new ore resulted in a marked falling off in production for the year. The total tonnage of mill ore shipped by rail to the plant of the Cobalt Reduction Company was 7,110 tons, with an average silver assay of 20.78 ounces per ton and silver content of 147,716 ounces. Production from this ore was 126,863 ounces of silver.

In addition, 9.39 tons of high-grade ore containing 16,536 ounces of silver was shipped direct to the smelter.

The total silver production for the year was 143,399 ounces, as compared with 436,302 ounces for the previous year.

Conclusion

With the opening up of a new deep level early in the year, drifting and crosscutting to the north and south can be carried out in Keewatin formation at a favourable horizon above the diabase contact.

While results of exploration work for the past year have been disappointing, there is great hope for improvement in the coming year in the new territory to be explored from No. 2 shaft.

Newton Lorrain Syndicate

The syndicate employed five men at their property in South Lorrain township, district of Timiskaming, installing a mining plant during the winter and resumed sinking operations in May with a force of 18 men under Andrew McGarry as superintendent. The syndicate has a capital of $150,000 and is composed of a group of men from London, Ont., including J. B. Hay, trustee; R. O. Morrow, manager; Sam Ameara, John McHale, H. Heyman, G. Thompson, and R. Cairncross. The head office is at 331 Richmond Street, London, Ont.

The shaft was continued from 180 feet to a depth of 520 feet, and a level was established at 500 feet on which a crosscut was driven 100 feet south before the property closed down at the end of the year.

Nipissing Mining Company, Limited

Nipissing Mines Company, Limited, has a capital of $6,000,000 in shares of $5 par value. The directors of the company are: E. P. Earle, president and treasurer; Alexander Fasken, secretary; J. T. Crabbs, Richard T. Greene, August Heckscher, David Fasken, and Hugh Park. The head office is in the Excelsior Life Building, Toronto, and the New York office is at 165 Broadway. The mine and mill are in Cobalt.

The operating company is the Nipissing Mining Company, Limited, with a capital of $250,000 in shares of $100 par value. The directors are: David Fasken, president; E. P. Earle, vice-president and treasurer; Alexander Fasken, secretary; Richard T. Greene and Hugh Park. The operating officials are: Hugh Park, general manager; E. V. Neelands, manager; Cyril W. Knight, geologist; J. M. Carter, mill manager.

The net value of Nipissing shipments in 1926 was $1,260,692.96, and the net income of the operating company was $164,310.62. During the year there was paid in dividends $720,000, making a total of $28,320,000 to date, which is 472 per cent., or $23.60 per share. The operating company's surplus at the end of the year was $3,819,000, as compared with $4,405,000 a year ago. On an average, 270 to 300 men are employed.

The general manager reports as follows for the year 1926:—

SHIPMENTS IN 1926

	Silver, fine ounces	Net value
Silver bullion	2,985,649.56	$1,853,538.70
Residue	36,967.24	62,054.76
Total shipments	3,022,616.80	$1,915,593.46
Less custom bullion	1,056,317.18	654,900.50
Shipments of Nipissing product	1,966,299.62	$1,260,692.96

PRODUCTION IN 1926

	Silver, fine ounces	Gross value	Net value
Shipments in 1926	1,966,299.62	$1,270,749.51	$1,260,692.96
On hand at mine, December 31, 1926	1,088,469.42	849,168.14	836,644.27
Total	3,054,769.04	$2,119,917.65	$2,097,337.23
On hand at mine, December 31, 1925	1,114,171.69	1,005,225.50	989,119.74
Nipissing production	1,940,597.35	$1,114,692.15	$1,108,217.49

TOTAL SHIPMENTS TO DECEMBER 31, 1926

Year	Dry weight, pounds	Silver, Gross ounces	Gross value, silver plus cobalt, nickel, and arsenic paid for	Net value received
1904	124;659	32.13	$24,163.90	$23,887.52
1905	939,373	753,153.90	505,638.28	471,666.61
1906	4,019,494	2,214,821.60	1,576,852.94	1,421,655.54
1907	4,804,426	2,239,551.89	1,373,088.57	1,234,492.35
1908	7,009,998	2,893,031.44	1,526,686.32	1,364,478.03
1909	12,825,169	4,646,869.21	2,417,767.21	2,180,407.02
1910	13,388,039	5,596,135.80	3,008,957.80	2,742,842.58
1911	5,829,254	4,678,074.14	2,507,196.98	2,381,712.54
1912	3,701,726	4,719,578.21	2,893,276.54	2,827,317.62
1913	2,657,250	4,844,169.41	2,945,335.30	2,920,714.26
1914	868,425	3,999,862.51	2,226,429.66	2,207,427.72
1915	383,868	4,623,957.78	2,425,065.85	2,383,877.91
1916	4,275,804	3,819,768.50	2,737,569.36	2,687,530.85
1917	5,922,508	3,798,801.54	3,338,682.41	3,239,151.62
1918	4,148,760	4,116,076.70	4,238,666.53	4,165,353.98
1919	1,473,354	3,080,069.93	3,561,440.07	3,539,573.85
1920	7,386,488	2,814,852.28	2,627,937.76	2,539,250.71
1921	211,980	3,016,760.42	1,754,345.83	1,745,411.07
1922	6,036,449	3,845,011.83	2,906,102.87	2,886,719.20
1923	226,372	3,227,887.52	2,104,394.04	2,093,829.16
1924	1,401,472	2,828,287.06	1,923,171.13	1,911,213.31
1925	1,357,912	2,413,697.18	1,698,025.28	1,686,601.52
1926	1,673,998	1,966,299.62	1,270,749.51	1,260,692.96
Total	90,666,778	76,136,750.60	$51,591,544.14	$49,915,807.93

SOURCES OF PRODUCTION

From underground:	Tons
Shaft No. 19	2,535
Shaft No. 49	12,674
Shaft Nos. 63 and 86	39,712
Shaft Nos. 73 and 80	27,884
Shaft Nos. 92 and 407	1,688
Total	84,493
In battery bin, December 31, 1925	712
	85,205
In battery bin, December 31, 1926	650
Total ore milled	84,555

The various products treated in the high-grade plant were:—

HIGH-GRADE ORE TREATMENT

	Tons	Assay	Ounces contained
Nipissing concentrate	564	1,998	1,126,484
Custom ore	325	2,993	973,445
By-products	37	2,247	83,785
Total	926	2,358	2,183,714

The refinery treated precipitate and custom bullion containing 2,857,728 fine ounces. Shipments of bullion amounted to 2,985,650 fine ounces. Shipments of cobalt-nickel residue amounted to 771 tons.

LOW-GRADE MILL

	Tons	Assay	Ounces contained
Ore treated	84,555	23.53	1,989,359
Recovered in products:			
Precipitate	28	24,465	685,026
Coarse concentrate	471	2,383	1,122,513
Fine concentrate	104	832	86,566
Metallics	.....	.....	1,777
Total recovery	.....	.....	1,895,882

Average tailing, 1.11 ounces; recovery, 95.30 per cent. Forty stamps ran 302 days, 14 hours, or 82.9 per cent. of possible running time. They crushed 279.43 tons per day, or 6.99 tons per stamp per day.

The tons treated and the head assay were slightly lower than in 1925. Stoping operations produced a harder and more difficult ore to treat than in former years, requiring increased supplies and repairs.

Cost per ton: labour, $0.950; supplies, $1.466; power, $0.595; shops, $0.193; credits, $0.052; total, $3.152.

SUMMARY OF UNDERGROUND WORK, 1926

Shaft No.	Drifting	Crosscutting	Raising	Sinking	Total	Stoping
	feet	feet	feet	feet	feet	cu. yds.
19	.....	.....	.....	.....	.....	412
49	633	8	130	.....	771	3,064
63	1,794	1,951	238	.....	3,983	11,683
73	1,933	2,461	490	14	4,898	6,021
92	128	.....	38	.....	166	170
177	4,163	3,374	686	.....	8,223	1,148
405	.....	145	.....	.....	145	.....
407	192	2,169	43	6	2,410	250
Total	8,843	10,108	1,625	20	20,596	22,748

Summary of Results

The production of silver for the year was 1,940,000 ounces, a decrease of about 12 per cent. from 1925. The cost per ounce was considerably higher, due to less ounces treated and to the marked increase in amount of underground work.

The average New York price of silver was 62.11 cents per ounce, ranging from a high of 68.50 in January to a low of 51.50 in October, a variation of 17 cents. The average for 1926 was almost 7 cents lower than the average for 1925. The effect of this drop on the value of the year's production was $135,000.

Underground exploration and development amounted to 20,000 feet, as compared with 13,000 feet in 1925. Work was carried on at eight shafts, the number of faces being 280, exclusive of stopes.

Development work was concentrated on branch veins, a number of which produced mill ore and small tonnages of high-grade. Several of the older workings were reopened, and some of them contributed to the year's production to an appreciable extent. Stoping operations, particularly on the older veins, exceeded expectations. Exploration work discovered several veins, two of them being of fair importance.

The estimated ore reserves are 34,000 tons, containing 794,000 ounces. The tons are the same as of a year ago; the ounces are 212,000 less, a decrease of 21 per cent. As time goes on, their calculation can be made with more certainty than in former years. The general situation at Cobalt is in line with expectations expressed in previous reports, namely that new discoveries are not likely to be of major importance; that stoping operations are becoming more restricted and laborious; and that the gradual depletion of high-grade ore makes it increasingly difficult to maintain a regular production.

At South Lorrain, fairly encouraging results were obtained from the year's work. Exploration of a conglomerate area, similar geologically to the most productive part of Cobalt, disclosed nothing of value or interest. Exploration of a Keewatin area underlying the diabase sill was attended with more success. In addition to the large cobalt vein found late in 1925, which has shown only low silver values to date, another strong vein was discovered, which has been partly developed by several levels and raises over much of its length of 500 feet.

In the progress of this work, a number of more or less disconnected ore lenses of varying size and richness were encountered. Some of them showed ore of remarkable richness over widths of two to ten inches. A small shipment of high-grade was made at the close of navigation, to be followed by more substantial amounts in the spring of 1927. It seems probable that additional lenses will be encountered from time to time as development work proceeds.

As advised in the report for 1925, an option was taken on a group of claims in Montbray township, Quebec, where an outcrop showing values in gold and copper had been found. Surface work was carried on throughout the winter, followed later by diamond-drilling. Results to date on the original discovery have been only fairly interesting. A somewhat similar deposit was later found about 1,500 feet away, but not connected with the first occurrence. This also was diamond-drilled and its general outline partly determined. While some favourable assays were obtained, principally in copper, results to date on both discoveries indicate small deposits probably too low in grade to be profitable in themselves. Further work was interrupted by the discovery in October of a third occurrence, about 1,000 feet from the first deposit.

A fractured zone, covered by deep overburden, has been traced for 400 feet, with the ends still undetermined. Scattered surface trenches and pits show lenses of ore at several points, in vein-like occurrences, which are irregular in size and value. The greatest width so far uncovered shows 9 feet of high-grade copper and gold, while the average of several exposures shows 3 feet of 10 per cent. copper and $10 gold. Some sections assay considerably higher in both metals.

Diamond-drilling is now determining the general features of the deposit, to be followed by underground work. Drilling results to date have shown irregularity, both as to widths and values, with general results somewhat below surface sampling. On the other hand, a number of holes have been quite satisfactory.

The area is interesting, and while some encouraging results have been obtained over comparatively narrow widths, further work is necessary before the future of the property can be predicted. Other portions of the property are now being electrically surveyed.

The company considered a large number of properties during the year, but no options were taken. Several prospecting parties were in various fields, but nothing of interest was found.

Nipissing Lorrain Mine

The Nipissing Mining Company, Limited, operated this property in South Lorrain township, district of Timiskaming, during the year with an average force of 60 men. Hugh Park is general manager, and Carl Train, superintendent.

The production and results of development are included in the Nipissing Mines report.

Northern Extension Mining Company, Limited

The company continued to operate the Agaunico property until the end of October with a force of a dozen men. D. L. Jemmett, of Cobalt, is president, and R. McNaughton is superintendent.

In March, two diamond-drill holes were drilled at a point 200 feet west of the shaft from the 100-foot level, 400 feet north and 350 feet south. Sub-

sequently a level was opened up at a depth of 136 feet, and the vein was drifted on for 175 feet west and 55 feet east of the station.

Four cars of cobalt ore were shipped during the year, with a total dry weight of 242,745 pounds. The lots included in these shipments were 48,863 pounds, assaying 17.29 per cent. cobalt; 64,468 pounds, assaying 13.19 per cent.; 57,555 pounds, assaying 19.015 per cent.; 50,769 pounds, assaying 20.9 per cent.; 14,792 pounds, assaying 19.66 per cent.; and 6,298 pounds assaying 15.32 per cent.

M. J. O'Brien, Limited

Miller Lake O'Brien Mine

The Miller Lake O'Brien mine, township of Nicol, district of Timiskaming, is owned and operated by M. J. O'Brien, Limited. J. G. Dickenson is general manager, and H. G. Kennedy, assistant manager. An average of 70 men is employed.

Production was confined to the last quarter of the year and amounted to 103,000 ounces of silver from 2,133 tons milled.

The following is taken from the assistant manager's report for 1926:—

The year just closed, though not a banner one from the point of silver production, has been one of improvement in mine condition, mill, and surface equipment.

The wonderful success attained in the exploration and development of the new 650-foot level resulted not only in proving the known ore-bearing system, Nos. 72, 73, and 74, to continue to and below this level, but in uncovering a new system of ore-bearing veins north of No. 5 winze which gives great promise of developing large bodies of a good grade of mill ore, with some shoots of high-grade. A new crosscut was driven from No. 1 vein on the 350-foot level to a point chosen for a new central winze, No. 6, which when completed will eliminate both No. 4 and No. 5 winzes as a means of operating all levels below the 350-foot.

The mill was completely overhauled and changed from stamp- to ball-milling. The necessary machinery was installed to give the plant a daily capacity of 80 to 100 tons, as against 30 to 35 tons in the old mill.

The necessary high-tension line, switch-house, and transformer equipment for the delivery of Northern Canada power to the property was installed so as to assure adequate additional power for all needs over and above that obtained from the Gowganda Power Company. The old shaft-house was demolished and replaced by a modern shaft-house containing a new sorting and preliminary crushing plant which will allow of maximum production.

O'Brien Mine

The O'Brien mine in Coleman township, district of Timiskaming, is owned and operated by M. J. O'Brien, Limited. J. G. Dickenson is general manager, and 150 men are employed besides a field force varying from 3 to 15 men.

The production in 1926 was 1,200,329 ounces of silver from 54,571 tons milled and 23 tons of high-grade ore. The concentrates shipped to Deloro smelter amounted to 1,757 tons.

Development work during the year consisted of 97 feet of sinking, 403 feet of raising, and 2,522 feet of drifts and crosscuts. Stoping amounted to 41,875 tons.

Ontario Solid Silver Mines, Limited

The property in Cane township, district of Timiskaming, was operated for the three months, May to August, with a force of seven men, and 146 feet of drifting was done on the 100-foot level east. James A. McRae is manager.

Paragon Hitchcock Mines, Limited

This company began rebuilding camps and overhauling plant on their property near Wabun station, district of Timiskaming, on the Elk Lake branch of the T. & N.O. Railway on October 21, 1925.

The company has a capital of $2,000,000, and the head office is in Collingwood, Ont. The board of directors comprises: Donald McKay, president; Reginald Gilpin, vice-president; David Melville, secretary; Dr. Conley, Charles Pitt, Joseph Knox, W. R. Hitchcock, Richard Fisher, L. L. Robinson, and Joseph P. Welsh. Joseph P. Welsh is manager, and 15 men are employed.

Sinking began in the shaft at the 200-foot level in February, 1926, and a station was cut at the 330-foot level in August. A total of 295 feet of drifting and crosscutting was done on this level. The plant consists of two 60 h.p. boilers, a 600 cubic foot air compressor, and a 6- by 8-inch hoist.

One new, modern bungalow was erected, and alterations were made to several other buildings to place them in first-class condition.

Mine operations for the year comprised 1,757 feet of drifting, 672 feet of crosscuts, 67 feet of winzes, and 52 feet of raising. Only 44,660 cubic feet of stoping was done, owing to the fact that no milling was done until late in September. On the 350-foot level, a 482-foot crosscut was driven to provide a new tram route from No. 1 crosscut to the point chosen for No. 6 winze. The station for the new winze was excavated and 17 feet of sinking done. No work was done on the old level between 350 and 525 feet.

Parora Silver Mines Company, Limited

This company began surface work on three 20-acre claims, T.21,028-30, one mile south of Cobalt, in June with a force of three men. The property is situated in the southeast quarter of the south half of lot 8, concession V, Coleman township, district of Timiskaming. Joseph M. Hickingbottom is manager.

A log camp, 21 by 26 feet, was built. Five men were employed in the fall months in an effort to deepen a 40-foot shaft on the property. Considerable difficulty was experienced in handling the water without a plant.

Peterson Cobalt Mines, Limited

The authorized capital of this company is $3,000,000 in shares of $1 par value and is a reorganization of the Peterson Lake Cobalt Mining Company, Limited. The head office of the company is at 301 Royal Bank Building, Toronto. D. J. Russell is manager, and 25 men are employed. The property is in the township of Coleman, district of Timiskaming.

The company began pumping out the No. 3 shaft in August. Mining began September 15 and was continued until late in June, 1927. Development work comprised 70 feet of drifting and 150 feet of crosscutting on the 155-foot level. A winze was sunk 175 feet to the 330-foot level, and a winze started from that level on a 22-degree incline in order to follow the lower contact.

Plata Mines, Limited

Plata Mines, Limited, a subsidiary of Noranda Mines, Limited, took over the option on the Hylands-Johnston-Gardiner claims in Nicol township, district of Timiskaming, on June 1. They installed a mining plant and began mining operations in August. L. K. Fletcher was manager, and 30 men were employed.

New installations included a 720 cubic foot air compressor, a 125 h.p. motor, a 10- by 12-inch hoist, and a 42-foot headframe.

The shaft was deepened from 100 feet to 285 feet, and stations were cut at 200 feet and 265 feet. Crosscuts were driven 150 feet north and 130 feet south on the 200-foot level, and 250 feet north and 130 feet south on the 265-foot level.

Altogether some 2,800 feet of drifts and crosscuts were driven up to April 15, 1927, when the mine was closed. Most of this work was done on the 265-foot level, where 830 feet was driven partly on veins crossing the property in an east-southeast direction from the outlet of Miller lake.

Carl Reinhardt

The Crown Reserve mine in Coleman township, district of Timiskaming, was operated during the year under lease by Carl Reinhardt with a working force of 12 men.

In January, a hoist was installed on the 200-foot level at No. 29 winze near the north boundary, and the 250-foot level was put in shape for work. Stoping was continued on No. 29 vein between the 250- and 200-foot levels until the middle of March. A drift on a sublevel on No. 25 vein, at about the centre of the property, also opened up some mill rock. In the latter part of March exploratory drifting and raising at a number of points in the mine between the 150- and 300-foot levels resulted in a high-grade ore shoot being discovered in a vein, No. 45, paralleling the south boundary of the property which carried ore between the 100- and 200-foot levels for about 90 feet in length. Stoping of this ore continued throughout the summer and during September, the high-grade being shipped to the Deloro smelter and the mill rock by truck to the Cobalt Reduction Company.

Mill rock was also produced in May from vein No. 29 above the 250-foot level and from vein No. 44 above the 150-foot level. In September a raise was put up 40 feet from vein No. 44 from the 200-foot level, and further drifting done at the 150-foot level, some mill rock being produced from the latter work. In October a crosscut to the northwest from the west end of the Gear vein system on the 200-foot level was continued about 75 feet with negative results, and drifting continued up to the middle of September on vein No. 44 from the 150-foot level produced some mill rock.

In November a raise was put up 35 feet from the 200-foot level on vein No. 48 in the main east crosscut, and in December raising and drifting was done on the Gear vein above the 200-foot level with negative results.

The production was 72,695 ounces of silver, from 1,708 tons of ore.

John W. Shaw and Associates

The Chambers Ferland property in Coleman township, district of Timiskaming, was leased by John W. Shaw, Ernest Perry, A. A. Amos, and Joseph Gaynor in July, 1926.

During the second half of the year, it was worked with a force of three or four men, and 4¾ tons of high-grade ore were shipped, which ran about 1,200 ounces of silver to the ton.

Silver Bullion Mines, Limited

This company carried on operations at the property at Leroy lake, Nicol township, district of Timiskaming, from June 1 to September 15 with a force of 15 men. Murray D. Kennedy was manager. About 400 feet of drifting was done on the 275-foot level.

Tonopah Canadian Mines Company

During 1926, the Tonapah Canadian Mines Company exercised the option held on the Walsh, Gamble, and Hart claims and continued mining operations on these properties as well as on the Morrison property, which is held under option to purchase. The company is a subsidiary of the Tonapah Mining Company of Nevada. The officials are: Charles R. Miller, chairman of the board; W. L. Haehnlen, president; M. B. Huston, vice-president, in charge of operations; P. S. Bickmore, secretary-treasurer. The office of the company is at 572 Bullitt Building, Philadelphia. Ernest Craig is resident manager, and 90 men are employed. The properties are in Nicol township, district of Timiskaming.

The Northern Canada Power Company completed connections and began supplying electric energy about the middle of March, and a 1,500 cubic foot air compressor, driven by a 250 h.p. synchronous motor, was installed at the Walsh property, and a compressor about half this size at the Morrison property.

During the time that the mill was under construction, development work underground was reduced to a minimum in order to keep down the capital charge. However, during the year a total development footage, by drifting, crosscutting, and raising, of 1,575 feet was accomplished. With the mill now in operation it is proposed to enlarge the development campaign.

Considerable work was done on the Morrison and Stevens property during the year. On the Stevens property no ore was found, and the option was surrendered. On the Morrison property the development was continued throughout the year, and more development will be needed to determine its ultimate value.

The mill was completed and put in operation about the first of Semptember and during the months of September and October treated ore in the dump on the Walsh property. During the month of November the mill treated ore from the Morrison property for a mill test of this ore, and in December treated ore from the mines on the Walsh property.

Trainmen Silver Mining Company, Limited

This company operated the McAndrew property in Gillies limit, district of Timiskaming, from May 15 to October 4 with a working force of six men. John J. McAndrew is manager.

The shaft was continued from a depth of 76 feet to 107 feet, and a 19-foot station was cut on the south side at the 100-foot level. A crosscut was continued 236 feet to the east.

Victory Silver Mines, Limited

This company operated their property in southeast Coleman, district of Timiskaming, with a working force of from six to ten men. W. D. Taylor is superintendent.

A crosscut was driven 40 feet east on the 177-foot level, and drifts were continued 240 feet southeast and 45 feet northwest. Ore was encountered in the vein 40 feet southeast of the crosscut for about 50 feet in length. An inclined raise was put up at this point, and a sublevel was established at 35 feet, where considerable work was done on patches of ore in the vein.

A shipment of 9 tons of high-grade ore, assaying about 1,400 ounces to the ton, was made in the spring of 1927, and test shipments of mill ore of 37 and 40 tons were made to the Cobalt Reduction Company.

Wigwam Silver Mines, Limited

This company did 435 feet of drifting and crosscutting on the 190-foot level below the adit in the early part of the year, with a force of 15 men. John W. Sanderson is manager, and Horace F. Strong, consulting engineer. This property is in Haultain township, district of Timiskaming.

W. J. Nine Silver Mines

W. J. Nine Silver Mines, a subsidiary of the Huronian Belt Company, carried on operations on the W. J. Nine claim in Nicol township, district of Timiskaming, during the year with a force of 20 to 25 men. Leonard Smith was superintendent.

A 720 cubic foot air compressor, driven by a 125 h.p motor, and an 8- by 10-inch hoist were installed. The shaft was continued from a depth of 55 feet to a depth of 400 feet, Keewatin-diabase contact being encountered at a depth of 188 feet. Lateral work totalling 1,838 feet was done during the fiscal year, mainly on the 400-foot level.

SOAPSTONE

Grace Mining Company, Limited

The Grace Mining Company, Limited, capitalized at $5,000,000, divided into 1,000,000 shares of $5 each, has the following officers and directors: Jas. S. Porter, president; C. G. Oelheim, secretary-treasurer; Jas. S. Porter, Chas. P. Blake, Edward J. Blake, F. W. Burow, Chas. Rossow, Chas. F. Rossow, Max E. Rossow, Geo. W. Butler, C. G. Oelheim, all of Buffalo, N.Y.; and A. H. Pierce, Hamburg, N.Y., directors.

The quarry and plant on Eagle lake in Kenora district were operated during the summer of 1926 and again for a short period in the spring of 1927, but operations had ceased prior to July, 1927, when the area was visited.

W. J. Richards of Kenora, Ont., was manager of the operations.

TALC

Asbestos Pulp Company, Limited

This company operated the mine and mill, near Madoc in Hastings county, continuously during the year. A crosscut was run 47 feet north from the shaft to the vein on the 325-foot level. Drifts were run 100 feet west and 200 feet east on the vein, and ore chutes were installed. The raise was completed from the 325-foot level to the escapement shaft.

Ore was supplied to the mill from the 325-foot level. The production for the year was 3,969 tons of ground talc. An average of 19 men was employed.

Henry Taylor, Belleville, is president; and Roy Taylor, Madoc, is manager.

Geo. H. Gillespie Company, Limited

The Henderson mine in Hastings county, one mile from Madoc, and the mill in Madoc village, owned by the Geo. H. Gillespie Company, Limited, were in continuous operation during 1926, with a slight increase of production over 1925, 10,802 tons of ground talc being shipped. No new development work was carried on underground during the year, the ore coming from the 300-foot west stope.

An average of 21 men was employed.

Geo. H. Gillespie is president, and M. H. Ludwig is secretary-treasurer.

METALLURGICAL WORKS

Algoma Steel Corporation

In 1926, the blast furnaces of the Algoma Steel Corporation at Sault Ste. Marie operated as follows: No. 2 furnace operated all year, producing 87,497 tons of pig. No. 3 furnace operated 218 days from March 29 to November 2, producing 122,190 tons. Nos. 1 and 4 furnaces were idle all year.

During the period that two furnaces were on blast, 195 men were employed, and about 100 men during the time that No. 2 furnace was the only unit in operation.

Jas. H. Bell is blast-furnace superintendent, with Jas. Dale as assistant superintendent.

Deloro Smelting and Refining Company, Limited

During the year 1926, the silver, arsenic, and cobalt oxide plants were operated on a somewhat restricted production basis on account of market conditions. Some important improvements in processes were made during the year with improved metallurgical results.

The metals department produced a slightly larger quantity of stellite, and it is hoped that the application of this alloy in various new directions may result in increased demands in the future.

The insecticide plant was operated during the greater part of the year, the principal product being calcium arsenate, the use of which has materially increased during the past two years.

The average number of men employed by the company during the year, including staff, was 325.

At the end of April, 1927, the company had operated for a full year without a "compensation" accident.

The officials of the company are: M. J. O'Brien, president; J. A. O'Brien, vice-president; F. A. Bapty, secretary-treasurer; S. F. Kirkpatrick, managing director; S. B. Wright, general manager; R. A. Elliott, superintendent.

International Nickel Company of Canada, Limited

The refinery at Port Colborne was operated continuously throughout the year.

Steel Company of Canada, Limited

The company's two furnaces at Port Colborne operated continuously during 1926. A total of 483,698 tons of ore from the Lake Superior region was treated. "A" furnace produced 110,338 tons and "B" furnace produced 171,966 tons, making a total of 282,304 tons of basic, malleable, and foundry iron.

A sintering plant, with a capacity of 4,000 tons per months of single shift, was constructed during the year. The flue dust is collected from the furnaces sintered into clinkers and returned to the furnaces.

On an average, 143 men were employed.

The officers of the company are: C. S. Wilcox, chairman; R. H. McMaster, president; H. S. Alexander, secretary; H. H. Champ, treasurer; R. G. Wells, works superintendent; H. G. Hilton, blast furnace superintendent.

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DEPARTMENT OF MINES

HON. CHAS. MCCREA, *Minister of Mines* THOS. W. GIBSON, *Deputy Minister*

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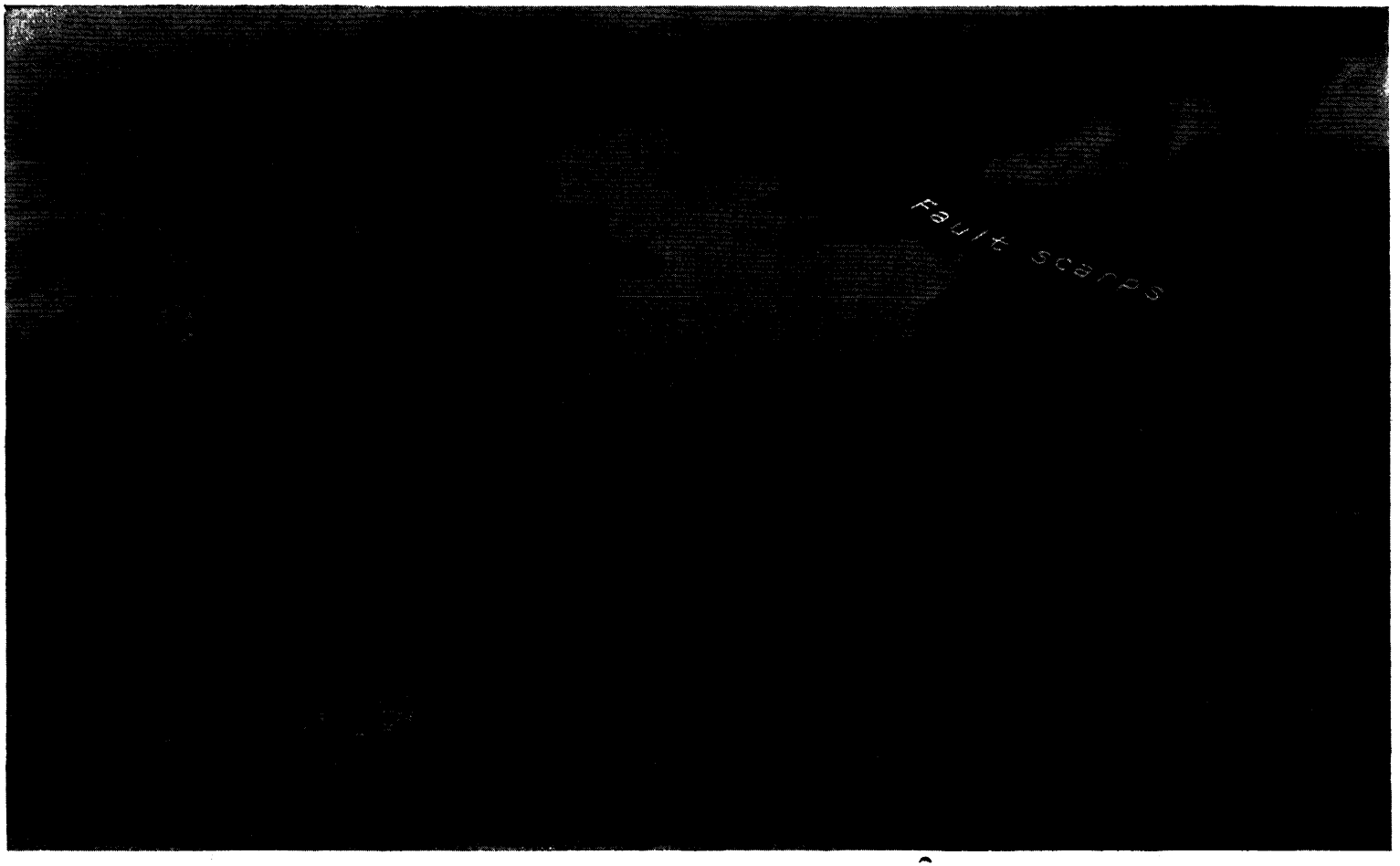
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AERIAL VIEW LOOKING EAST ALONG WAWA LAKE. NOTE THE FAULT SCARP ALONG THE SOUTH SIDE OF THE LAKE.

Michipicoten Gold Area, District of Algoma

By T. L. Gledhill

INTRODUCTION

Michipicoten river flows into the east end of Lake Superior at a point about 100 miles north of Sault Ste. Marie. The river gave its name in 1897 to the first mining division to be set aside in Ontario, following the discovery of gold on the south shore of Wawa lake. This was the forerunner of a series of mineral discoveries in the Michipicoten area, which included the Helen and Magpie iron mines as well as the pyrite and gold deposits at Goudreau.

The gold area borders on Lake Superior and is situated a few miles east of Michipicoten Harbour. It is included for the most part in township 29, range 23, of the district of Algoma. At present the more promising gold finds extend in a belt northward from High falls, on the Michipicoten river, to Mackey point on Wawa lake. It is probable that gold-bearing veins may also be found south of High falls, since an exploratory map of this area, made in 1906, shows small bosses of acid rocks intrusive into Keewatin schists. Gold has been found also on Manitowik, a lake northeast of Wawa lake, and near Goudreau.

Tourists find the country attractive. The Prairie Club of Chicago has camped near Michipicoten Mission for several summers. Good trout fishing can be had in Wawa lake, Firesand river, and Michipicoten river. General supplies are available at Wawa, Michipicoten Mission, and Hawk Junction; also limited hotel accommodation.

Access to the Area

Wawa Station, on the Michipicoten branch of the Algoma Central, is the nearest railway service to the centre of mining operations in the area. A wagon road about four miles long runs south to the Minto mine from Wawa Station, touching en route Wawa city at the west end of Wawa lake. Another road runs from Wawa city to Michipicoten Mission. The south end of the gold camp, including the Grace mine, is served by a road from Michipicoten Mission on Lake Superior. There are a large number of other roads and trails in the camp, and these are indicated on the map accompanying this report.

The gold area is within easy reach of Michipicoten Harbour. In the summer a weekly passenger and freight steamer calls at the Harbour on its trip from Sault Ste. Marie to Michipicoten island.

Field Work and Acknowledgments

Field work was commenced early in August and continued until late in September. Up to this time there was no detailed geological survey of the gold area south of Wawa lake. The writer with three assistants studied the geology about the chief prospects, made plane table surveys at the Grace and Minto mines, and pacing surveys in certain directions to intercept the greatest amount of exposed rock and rock structure. The traverses were tied to surveyed claim

lines and to the township lines. The magnetic deviation in this area is about 4° W.

The writer wishes to thank his three assistants, A. Graham, F. J. Sugden, and H. Smith, for their help during the course of the work, and also the officials of the operating companies. Thanks are especially due to J. M. Bell, J. Kirkland, W. M. Goodwin, E. P. Edwards, and N. E. Odell at the Minto; to Robert Patterson at the Grace; and to the late Robert Pinard, prospector. Angus Gibson, Gordon L. Michael, J. H. Teare, and S. Lawrence supplied useful information on the history of the camp and on the various discoveries. G. W. McLeod, mining engineer of the Algoma Central and Hudson Bay Railway, kindly gave much useful data on the various deposits in the Michipicoten area.

Much information on the general geology of the Michipicoten field is contained in previous reports by Robert Bell, A. P. Coleman, A. B. Willmott, J. M. Bell, and A. L. Parsons. The latest study of Michipicoten geology, prior



Looking west from the Helen mine at Boyer lake.

to that of the writer, was made by W. H. Collins, T. T. Quirke, and Ellis Thomson for the Geological Survey of Canada and published in 1926 as Memoir No. 147, entitled "The Iron Ranges of Michipicoten." This report and its maps were of great assistance in supplying information on the general geology and topography of the country adjacent to the gold area.

The maps and plates in the present report were prepared by P. A. Jackson, A. Braidwood, and J. Ledingham, and the assays and rock analyses were made by W. K. McNeill, T. Rothwell, and W. Green.

General Character of the Area

Topography

The Michipicoten gold area is more hilly than is usual for Northern Ontario. It lies between 1,000 and 1,450 feet above the sea, and the highest hills reach

elevations of nearly 350 feet. A series of hills north of Michipicoten Harbour are the highest in Ontario. The crests of the higher hills, even with their relatively great elevation, fit into the old peneplain surface about Lake Superior. The peneplain is dissected deeply near the mouths of the Michipicoten and Magpie rivers and has been cut back from the lake, so that it shows a line of steep rock cliffs facing the water.

Extensive sand plains occupy the valleys of the Magpie and Michipicoten rivers inland from their mouths where they enter Lake Superior at a common estuary near the Michipicoten Mission. Sand benches of several different levels can be seen perched along the rock walls of the valleys of these rivers. Except for the sand plains, which are of no agricultural value, the country is rocky, and there are no roads or settlements besides those near the Harbour, mines, or railway.

There is a noticeable increase in gradient of the major streams five or ten miles from Lake Superior, and it is in these last few miles that the large waterfalls of the Magpie and Michipicoten rivers are located. The Magpie river drops 375 feet in the last ten miles of its course, and the Michipicoten river 275 feet in the last six miles.

Iron formation is the greatest hill-maker. The top of the high ridge of this rock east of the Helen iron mine affords a panorama of the gold area.

Forests

There is still a large extent of virgin forest of mixed woods, such as birch, spruce, and balsam, which grow to a large size, especially over the carbonate type of iron deposits. Very little of the country has been burnt over. The largest burnt area lies to the north of the gold field and near the iron ranges; another is situated northeast of High falls.

Waterways

The Magpie and Michipicoten rivers were used as canoe routes until the Algoma Central railway gave a much better means of travel. These canoe routes served in the early days to bring supplies to the Hudson's Bay posts along Lake Superior from Moose Factory on James bay and are still used by tourists who find good fishing in their waters.

Game and Fish

The Indians in the area are giving less attention to trapping than formerly, with the result that fur-bearing animals are increasing. Beaver, otter, and mink are fairly common, and also black bear away from the scene of mining activity. Moose are plentiful, and a few red deer have been seen.

Pike and pickerel are in nearly every stream or lake, while lake and brook trout are only in the clear, cool waters. Wawa lake and the Michipicoten river and its branches are trout waters; trout are absent in the Magpie waters.

Climate and Agriculture

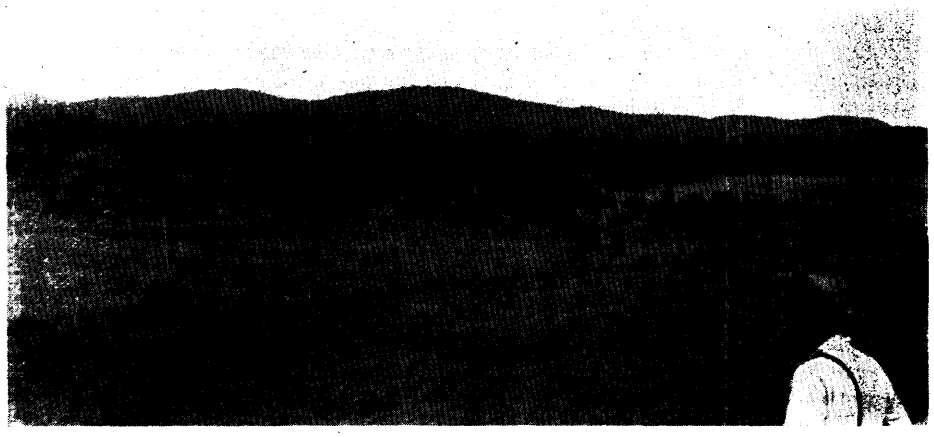
The summers are temperate and fairly dry, with moderately warm days and cool nights; the winter season lasts from November to May, but the temperature is not extremely low. It is possible for the inhabitants of Michipicoten to raise

enough garden produce to supply their own requirements, but the land generally is unimportant from an agricultural point of view.

Some attention has been paid to horticulture by the residents of Wawa city and Michipicoten Mission. Vegetables mature and reach a large size. The Dysey farm, at the south end of township 29 and south of the Grace mine, grows good hay.

History and Development

The following historical outline is taken from earlier reports on the Michipicoten area and in part was received verbally or in writing from pioneers, a number of whom survive.



Looking northeast over the Dysey farm in the southern part of the Michipicoten gold area.

In 1866, iron was the first metal to attract attention, and some mining was done on Gros Cap peninsula near Michipicoten Harbour. In 1897, the first gold discovery was made at Wawa lake. Later, prospectors who came to find gold discovered the Helen, Magpie, and other iron-ore bodies.

The history of the Michipicoten gold camp really starts with the discovery of gold-bearing quartz on what is now known as Mackey point on Wawa lake. The find was accidental. An Indian, Wm. Teddy, and his wife paddled over to the point one day to camp for lunch. While Mrs. Teddy was dipping a pail of water from the lake she observed some bright objects which aroused her curiosity. She called her husband's attention to them, and he was curious enough to break off a few samples, which he showed to a Mr. Mackey then at Wawa. Mackey succeeded in interesting a New York man sufficiently for him to furnish the sum of $1,200, which Teddy demanded for his discovery. The Associated Press gave out the news of the gold discovery, and soon a stampede was on, which brought many types of men and women to the new gold field. Some of these adventurers were old placer miners diverted to Michipicoten from the rush to the Klondike in 1898. The sand benches along the Michipicoten river at once attracted their attention, and they staked placer claims which were worked vigorously. There is no reliable evidence that any placer gold was found; the placer miners quickly disappeared.

Those who went into the bush at all were mostly coal-miners and oil-drillers from Ohio and Pennsylvania, chiefly sent in by individuals or syndicates. These

people did locate and acquire some promising claims, on which they spent a considerable amount of money with apparently encouraging results. There were a few old-time prospectors from the western United States and British Columbia, but they were dissatisfied from the start; the conditions were not to their liking. They did not take kindly to the canoe, pack-sack, and tump-line as a means of transportation. They had been accustomed to the Rocky Mountain canary (donkey) to do their packing. Their old adits and shafts tell the story. Most of them did not leave the Mission and took the first boat out. In 1927 many of these obstacles are removed.

Following the gold rush, a number of prospectors went into the country about Wawa lake to search for iron. The result was the discovery of what was afterwards known as the Helen mine, which was promoted by F. H. Clergue.



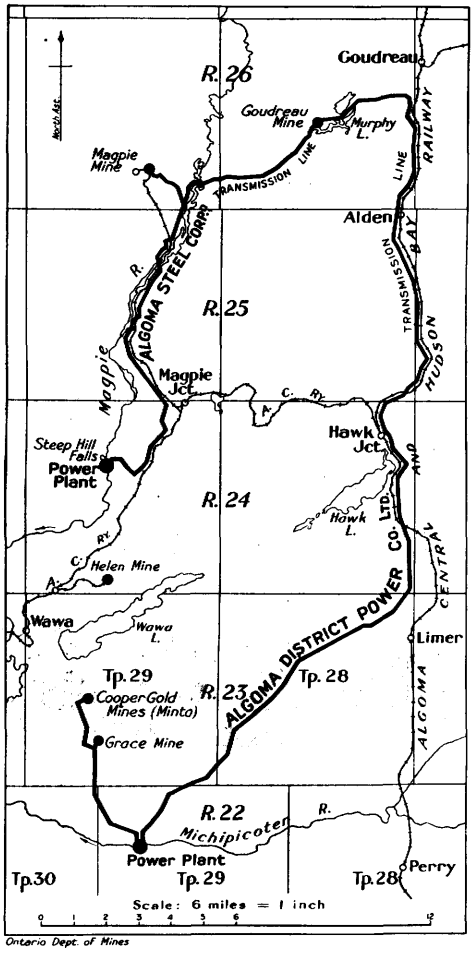
William Teddy, of the Mission, and his wife found the first gold in Michipicoten in 1897 on Mackey point, Wawa lake.

Before the close of 1899, the prospectors turned their sole attention to gold-bearing quartz, as an Order-in-Council was issued, which was temporarily revoked in 1909, forbidding the staking of iron claims by the general public. One of the most energetic of the new corps of prospectors was James H. Teare, who arrived in the area in 1899. Before the end of the year he made eight discoveries of visible gold and staked nearly fifty claims, including the groups known as the Kitchigami and Norwalk.

The Grace mine, claim D.J. 7, was staked by A. B. Blackinton who turned it over gratis to Julius George, a young German, who afterwards discovered the main Grace vein. George sold this group of claims to the Algoma Commercial Company, which was a subsidiary of the Lake Superior Corporation. They sank a shaft at the Grace to a depth of 300 feet and did about 800 feet of lateral work. At the surface the vein was 14 inches wide; at the 100-foot level it narrowed to almost nothing and then widened below this. At 300 feet it showed a width of 5 feet of a bluish-white quartz carrying visible gold. The mine and mill ran

successfully until 1903 when the Lake Superior Corporation went into the receiver's hands.

Angus Gibson then optioned the Grace group of 42 claims. Gibson and associates sold the property, retaining an interest. High financing on the part of the purchasers resulted in a close-down, although much gold was milled in the meantime.



Sketch map showing location of power plants and transmission lines serving the Michipicoten and Goudreau areas, Algoma district.

After these operators left, George Newell and Angus Gibson cobbed the ore dump twice, putting through the mill a binful of about 60 tons each time. The first run amounted to $2,040, or $34 to the ton in gold, and the second ran $1,680, or $28 to the ton. All debts were paid, but no money was left for further development, hence the property was placed on the market. The history of the mine was chequered for the next sixteen years until R. N. Bond and Colonel Royce of Toronto took over the property. They interested J. A. Jacobs of Montreal, who agreed, for a controlling share, to furnish the money for development. The Star property adjoining the Grace was taken over.

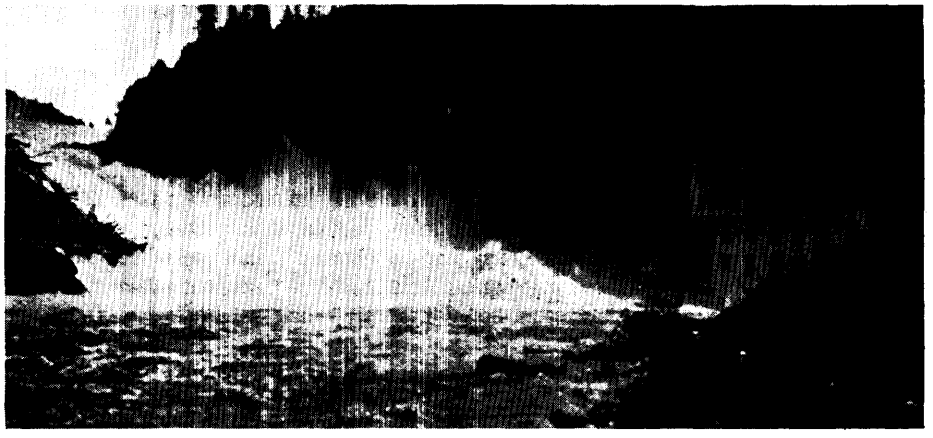
Other early attempts at mining were made on the veins at the Kitchigami, Norwalk, Mariposa, Golden Reed, Minto, Hornblende, and Ganley prospects.

Mining of recent importance has been carried out chiefly by the Pioneer Mining Corporation and its subsidiary company, the Cooper Gold Mines, Limited. At present they are concentrating their efforts on the Minto vein and the Jubilee lake break, a short distance northwest of the Minto. The Power and Mines Syndicate of Montreal has unwatered the Grace mine and is re-examining it along with the Cora claims near Jubilee lake. A new surface plant is being installed to extend the old workings of the Grace.

Extensive surface work was also done last summer by individual claim-holders.

Water Power

The Michipicoten and Goudreau camps are now being supplied by power developed at High falls and Steep Hill falls on the Michipicoten and Magpie



Plant of the Algoma District Power Company at High falls, Michipicoten river. The penstock is carried up over the hill behind the power-house.

rivers, respectively. The Michipicoten river at present has an increased volume, since the height of land at the southeast of Dog lake has been cut through to tap the water of Crooked lake, which now joins that of Dog lake and the headwaters of the Michipicoten river and adds to the potential hydro-electric power at High falls. High falls has a total drop of 128 feet and is capable of developing 7,500 horse-power, and Steep Hill falls, 2,600 horse-power. It is possible to increase the power at High falls by building a dam.

The High Falls plant has been recently acquired from the earlier Detweiler interests by the Insulls of Chicago, who are prepared to furnish power at low cost to all legitimate mining enterprises.

GENERAL GEOLOGY

As may be seen from the table, the majority of the rock formations are of igneous origin; and like so many of the rocks in the pre-Cambrian of Ontario, the structural and the age relations of the various igneous members are complex and difficult in places to interpret.

Table of Formations

QUATERNARY:	Glacial and other surficial deposits.
	Great unconformity
PRE-CAMBRIAN	
KEWEENAWAN:	Diabase dikes.
	Igneous contact
ALGOMAN INTRUSIVES:	Porphyrite, various diorites, granodiorite, granite and lamprophyres.
	Igneous contact
DORÉ SERIES:	Sediments, including conglomerate, greywacké, and arkose.
	Erosional unconformity
	Igneous contact (by granite represented by pebbles in the Doré series)
KEEWATIN VOLCANICS:	Chiefly basic flows with interbedded fragmental volcanics, together with iron formation.

Keewatin

The oldest formation within the map area and also one of the most extensive is the Keewatin. It is well exposed to the north, west, and east of the gold area, particularly north of Wawa lake near the Helen and Magpie iron mines, and is probably a thick formation, on account of its closely folded and faulted structural nature; but within the area containing the gold, the patchy and greatly altered Keewatin is of small volume since it is largely eroded. In places these old rocks have been so metamorphosed by igneous intrusions that they are now dark-coloured diorites that have lost their Keewatin features, and it is difficult to separate them from the intrusive diorite.

The Keewatin consists essentially of basic lava flows, together with beds of volcanic fragmental rocks, siliceous iron formation, and calcareous bodies that in places form an iron ore.

The Keewatin cover in this region was probably several thousand feet thick, and its structural history shows that the rocks have passed through many earth movements that followed the more intense foldings and faultings of the Lake Superior basin.

It is a much mooted point at present as to whether the Doré series of conglomerates and other sediments of the same series are in sequence with the lava flows of the Keewatin. It is suggested by the writer that the Doré series represents estuarian deposits, or in places alluvial fans, and that the area immediately east of Michipicoten Harbour was the site of much sedimentation in early pre-Cambrian or Lower Huronian times. This was the case in other areas about Lake Superior where heavy beds of conglomerates were laid down, especially in the Vermilion iron district of Minnesota.

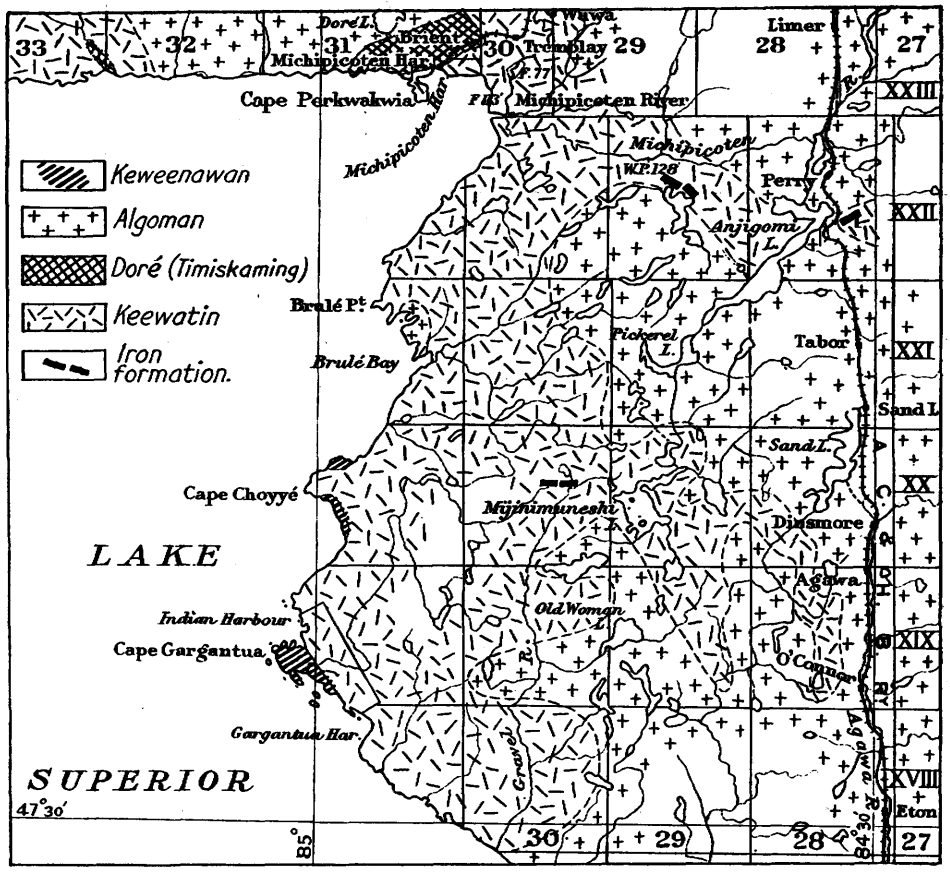
The Keewatin of the Michipicoten area is singular in regard to the large volume of carbonates it contains, which in places appear to be bedded along with quartzites. These carbonate rocks can be seen on the Gibson iron claims in the northeast part of township 29, range 23, at the Helen iron mine, and eastward from this mine.

To the west of the gold area the Keewatin is much sheared. In the southern part of the gold area the Keewatin is not extensive, but south of the Michipicoten river at High falls it is apparently again in considerable volume, judging by a reconnaissance map made in 1906 of the southeastern iron ranges of Michipicoten.

To the southeast the Keewatin is recrystallized and in contact[1] with a massive biotite-oligoclase granite.

In places within the gold area some masses of greenstone schist, which are now nearly pure chlorite, are probably engulfed portions of the basic Keewatin roof.

On the western tip of Mackey point, an intrusive tongue of quartz porphyry cuts a cover of amphibolite, which is apparently a recrystallized basic Keewatin



Key map showing general geology south of the Michipicoten river.
Scale, 8 miles to the inch.

volcanic, and which is made up essentially of hornblende with small amounts of carbonate and chlorite. The texture is coarse, and the rock shows large hornblende crystals intergrown at various angles. All the outcrops of this type are near the margins of the Wawa batholith. The composition of this rock is not greatly different from ordinary Keewatin chlorite schist, from which it is probably derived by recrystallization caused by contact action of the Algoman intrusives.

The main difference, chemically, is the greater amount of ferric iron, water, and carbon dioxide in the chlorite schist. This change was probably produced by dynamic alteration, and the recrystallization of the schist would partly eliminate the ferric iron, water, and carbon dioxide.

[1] *See* map by A. P. Coleman accompanying Ont. Bur. Mines, Vol. XV, pt. 1, 1906.

ANALYSES OF AMPHIBOLITE AND KEEWATIN CHLORITE SCHIST

	Amphibolite, Mackey point	Keewatin chlorite schist, Sturgeon Lake gold field
	per cent.	per cent.
SiO_2	45.40	43.28
TiO_2	1.42	1.40
Al_2O_3	16.93	16.61
Fe_2O_3	3.59	1.39
FeO	9.01	11.21
MgO	7.58	5.15
CaO	8.16	9.28
Na_2O	2.77	2.67
K_2O	.84	.05
H_2O	3.34	4.23
CO_2	1.24	5.06
Total	100.28	100.33

Doré Sediments

Willmott and Coleman placed the Doré series in the Huronian, and W. H. Collins considers the Doré as Keewatin in age. These sediments have never been shown to be in sequence with the Keewatin flows. They contain granite pebbles and are cut by dikes of a younger granite. In places the Doré has a large content of banded iron formation or jaspilite fragments and consists mainly of mechanically prepared material, such as conglomerate, arkose, and greywacké. It is quite probable that the Doré sediments are the equivalent of the Timiskaming series in other proved gold fields in Northern Ontario, such as Porcupine and Kirkland Lake, where they are located in folds in the Archean rocks. If this is so, it adds a favourable aspect to the structure. From their highly sheared nature, the Doré series might be taken to be as old as the Keewatin rocks, but it must be remembered that this series near Michipicoten Harbour is situated in a zone of excessive shearing and bordered by easily yielding Keewatin volcanic tuffs.

Algoman Intrusives

Following the deposition of the Timiskaming sediments in the northern part of the area unconformably on the Keewatin, the combined cover was intruded by batholithic masses, presumably in Algoman time. These plutonic rocks, cooled at depth, appear, as the result of erosion, through the Keewatin cover in a number of places, one of the larger areas being south of Wawa lake and extending south of the Michipicoten river at High falls.

The intrusive rocks of the gold area show a fair amount of differentiation and are in accord with the accepted theory that the more basic facies are usually the first to crystallize. The field relations show that the most acid rock, the granodiorite porphyry, cuts all the other Algoman rocks with the exception of the Algoman lamprophyres, which were late as they cut the gold-quartz veins.

Plutonic Types

The plutonic or granitoid intrusive rocks of the Michipicoten area are described in the following paragraphs.

Porphyrite.—There are extensive masses of porphyrite, a dark porphyry with rectangular, light-coloured phenocrysts of feldspar. This rock outcrops in

volume near the Grace mine and as far south as the Dysey farm. Porphyrite is also found on claim No. 3,132, just east of the Minto vein.

Besides the plagioclase phenocrysts, near albite in composition, the porphyrite has a large content of biotite and zoisite and in places hornblende. The plagioclase feldspars are partly altered to zoisite or epidote. The biotite, which is apparently a late product, replaces the hornblende and is especially plentiful in the porphyrite that has been jointed and filled with quartz stringers. A blue chlorite has also been developed near the quartz veins. The alteration to biotite shows that the solutions passing through these rocks carried potash. The replacement to biotite is not accompanied by sulphides outside of the vein. In a few instances the porphyrite contains abundant round phenocrysts of crushed quartz.

The porphyrite varies from place to place, and some kinds are really quartz diorite porphyry.

ANALYSIS OF QUARTZ DIORITE PORPHYRITE FROM GRACE MINE

	Per cent.
SiO_2	66.70
TiO_2	.67
Al_2O_3	15.03
Fe_2O_3	1.44
FeO	3.03
MgO	2.00
CaO	3.85
Na_2O	3.96
K_2O	2.28
H_2O	.89
CO_2	.38
Total	100.23

Specific gravity, 2.788

Granodiorite and Diorite Intrusives.—Underlying apparently the entire gold area and outcropping in isolated places within it, wherever erosion has exposed it, is a large intrusive mass of granodiorite. This rock (Fig. 1) is medium-

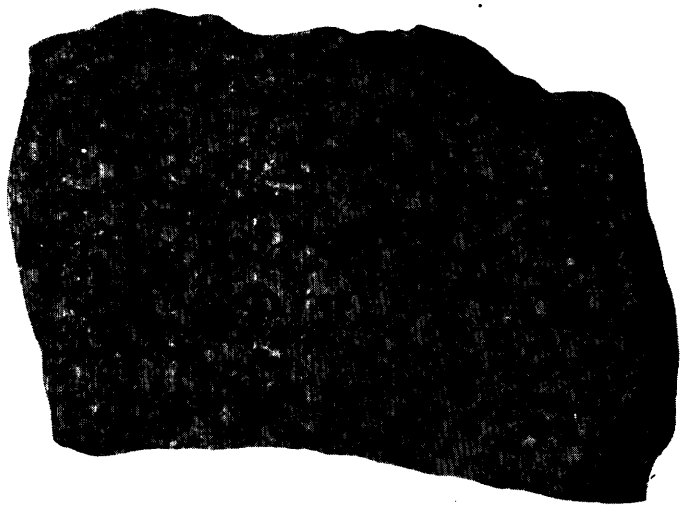
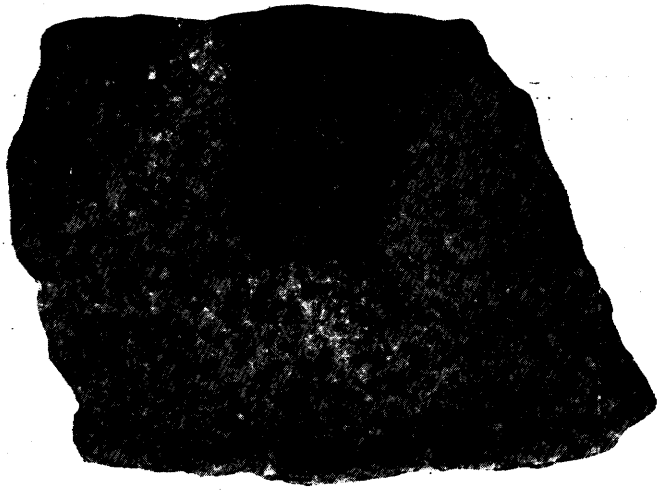


Fig. 1—Specimen (one-half natural size) of granodiorite from vicinity of High falls.

grained, granitoid in texture, and light-coloured. It is composed principally of acid plagioclase-feldspars, quartz, hornblende, and biotite. The plagioclase, which is near oligoclase in composition, is crowded with late pneumatolytic products consisting of epidote, carbonate, and sericite. Biotite is the chief ferric mineral, and in places it is changed to chlorite. The broadest outcrops appear north and south of High falls on the Michipicoten river.

The gold deposits are closely connected with the granodiorite and the granodiorite porphyry, since these rocks form the wall rocks of some of the principal gold-quartz veins. In places, as near the Michipicoten river, the granodiorite is sheared and the shear structures are filled with vein quartz, which probably came from the cooling granodiorite magma. The quartz porphyry has been called locally "tapioca porphyry" on account of the resemblance of the abundant opalescent quartz phenocrysts to cooked tapioca grains (Fig. 6). The granodiorite and its porphyritic variety appear to be the only



Xenolith of "contact diorite" (one-half natural size) seen in granodiorite near Minto lake.

rocks within the camp that have large amounts of vein quartz associated with them. Pegmatite dikes were not found in the gold area.

An intrusive boss of granodiorite lying west of the Goudreau gold mine in the Goudreau area matches closely in mineralogy and appearance the granodiorite at High falls in the Michipicoten camp; in the Goudreau area, as in Michipicoten, the granodiorite exhibits local shear zones that are filled with gold-quartz veins.

Granodiorite has not been commonly noted in the intrusives of Northern Ontario, but it is present in a number of places, especially in the roof portions of small granitic masses where the Keewatin cover has been scarcely removed, as near the St. Anthony gold mine on Sturgeon lake.[1] It is probable that it has generally been classed as granite.

Several varieties of diorite can be seen in Michipicoten which vary greatly in colour and mineralogy. Some are richer in quartz than others. Northwest of the Grace mine on claim D.J. 13, porphyrite is cut by a quartz diorite that grades into a granodiorite.

[1]Ont. Dept. Mines, Vol. XXXIII, pt. 6, 1924, pp. 31-33.

ANALYSIS OF GRANODIORITE FROM CLAIM D.J. 13

	Per cent.
SiO_2	63.16
TiO_2	1.06
Al_2O_3	17.31
Fe_2O_3	2.49
FeO	3.39
MgO	1.25
CaO	3.10
Na_2O	4.66
K_2O	1.40
H_2O	1.68
CO_2	.72
Total	100.12

Specific gravity, 2.773

Biotite-Oligoclase Granite.—This rock is a massive, light-coloured rock of medium texture. In the hand specimen it is possible to determine biotite, plagioclase, and quartz. The petrographic microscope shows epidote, zoisite,



Specimen (one-half natural size) of biotite-oligoclase granite, Michipicoten area.

sericite, and a little microcline. The main feldspar is near oligoclase in composition. The quartz grains show little or no crushing, and the rock is nowhere gneissoid. Pegmatite and aplite commence to show in the area of this granite, but they were absent in the intrusives near the gold-quartz veins.

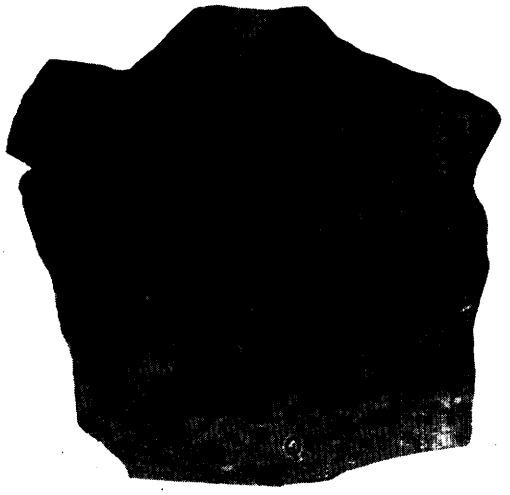
ANALYSIS OF BIOTITE-OLIGOCLASE GRANITE, NEAR THE SOUTHEAST PART OF TOWNSHIP 29, RANGE 23

	Per cent.
SiO_2	72.45
TiO_2	.38
Al_2O_3	14.76
Fe_2O_3	1.24
FeO	1.33
MgO	.80
CaO	3.27
Na_2O	3.08
K_2O	1.70
H_2O	.67
CO_2	.31
Total	99.99

Specific gravity, 2.722.

Lamprophyre Dikes

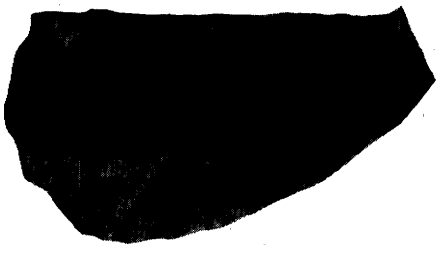
The granodiorite and diorite intrusions were followed by fissuring and diking on an extensive scale. The last dikes consist of lamprophyre, which for convenience can be divided into mica and non-mica varieties. Some dikes have olivine as an abundant phenocryst; others have biotite. The lampro-



Altered, olivine-bearing lamprophyre dike, Minto mine. Note vein quartz and light-coloured, altered border of the dike. (One-half natural size.)

phyre dikes show better underground than on the surface. The probability is that they are a late facies of the dioritic intrusions.

Chemically they are characterized by containing, with a medium or low silica percentage, a considerable quantity of alkalies, especially potash; the oxides of the diatomic elements are also abundantly represented. This shows

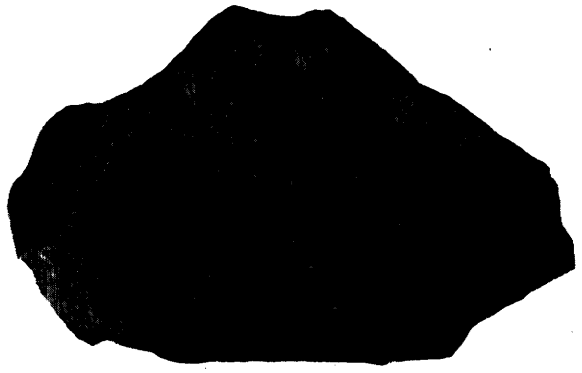


A narrow lamprophyre dike that cuts the Minto gold-quartz vein. It has been bleached in colour over its entire width by the alteration to carbonate. (One-sixth natural size.)

itself in the commoner types of lamprophyres by an abundance of biotite. The lamprophyres as a family are rich in ferromagnesian silicates; they are generally fine-grained rocks, and their structure is in some respects unusual.

A common accessory in some of the Michipicoten lamprophyres, and an essential mineral in certain types, is olivine (Fig. 2), which builds relatively large, perfect crystals or sometimes groups of rounded grains. It is occasionally

found fresh, but very commonly represented by pseudomorphs of carbonates and serpentine. This alteration is interesting because it has given the dikes a peculiar, spotted appearance (Fig. 3). The light-coloured spots in the dikes



A picrite lamprophyre dike that cuts the Minto gold-quartz vein. The olivine phenocrysts have been carbonatized, rounded, and made a lighter colour by the alteration. Note the fine-grained, light-coloured border of the dike next to the vein quartz. (One-sixth natural size.)

are rounded in outline, and under the microscope the spots are seen to be a carbonate and serpentine replacement of olivine phenocrysts. This type is found at the Minto, and good examples can also be seen along the south shore of Wawa lake.



Fig. 2—Photomicrograph showing lamprophyre dike, Minto mine, with fairly fresh olivine phenocrysts, biotite, and magnetite. (×26, one nicol.)

The mica lamprophyres are especially subject to decomposition and may have 20 to 30 per cent. of calcite and other secondary alteration products, such as chlorite. These mica lamprophyres are also at the Minto as well as the olivine-bearing type.

Most of the dikes are nearly vertical and appear to be most numerous near the gold-bearing quartz veins which they usually intersect nearly at right angles. They are found from Wawa lake south to the Michipicoten river and appear only in or near the structural breaks. Farther north a mica lamprophyre cuts the iron ore body at the Magpie mine. Generally speaking, the lamprophyres

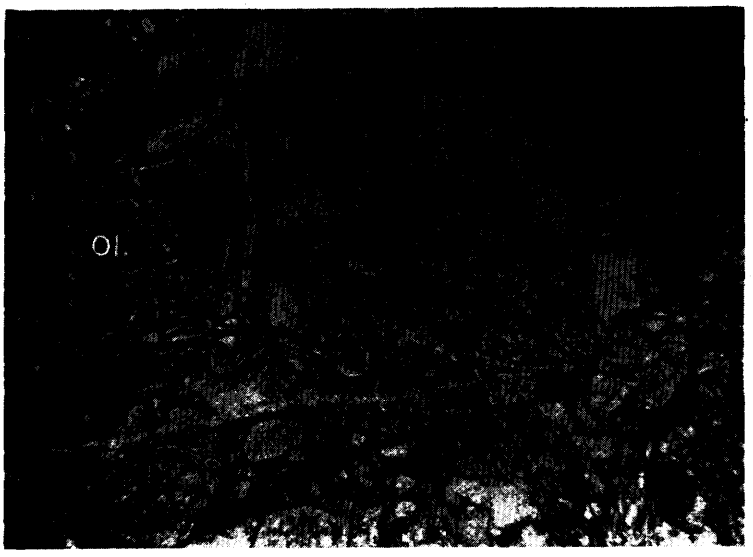


Fig. 3—Photomicograph showing carbonatized olivine phenocrysts in the biotite picrite variety of lamprophyre dike, Minto mine. (×26, one nicol.)



Fig. 4—Photomicrograph showing barren quartz veinlet cutting lamprophyre dike, Grace mine. Crystal growth bands shown in the quartz. (×26, one nicol.)

are later than the gold mineralization, but at the Norwalk mine arsenopyrite crystals were seen in a thin section of a lamprophyre dike. At the Grace mine a few banded quartz veinlets cut a lamprophyre, but they are of a late, barren type (Fig. 4).

Pieces of lamprophyre that have been exposed for a number of years on the dump at the Grace and Norwalk mines are now soft and rotten. In this respect they resemble kimberlite, a rock of similar mineral composition of the South African and other diamond fields.

Keweenawan

Diabase Dikes

In the Michipicoten gold area the diabase dikes are not the usual, fresh, olive-green spotted ones that appear in other areas near Lake Superior; they are dark and of the quartz-bearing variety. Diabase dikes are not numerous, the principal outcrops being found near the Norwalk, Grace, and Minto mines. Like other diabase dikes of the area they usually strike northwest and are not very wide. A dike of quartz diabase was seen in a shear zone on the power line west of the Grace mine; this dike had been intruded along a north-south shear zone and had been faulted by later movement.

Lake Superior Sandstone

It is of some significance to find fairly flat lying Keweenawan sandstone and conglomerate on the shore of Lake Superior a short distance south of the mouth of the Michipocoten river, near Capes Gargantua and Chaillon (Choyyé). The flat dip of this sandstone shows that the rocks of the Lake Superior basin near it have not had much crustal disturbance since the close of the pre-Cambrian.

Quaternary

The Michipicoten area has apparently been subjected to continual erosion since the close of the pre-Cambrian as no trace of later sediments or igneous rocks has been found. Doubtless the topography was more rugged at the close of pre-Cambrian time, and part of this unevenness is retained. The glaciers of the Pleistocene probably rode over a surface covered by deep soils. A large mass of soft hematite ore remained, north of Wawa lake at the Helen iron mine, where it was locally protected from glacial erosion.

Glacial phenomena are in evidence over the entire area, but the covering of glacial material is extremely thin, excepting in the main valleys of the Magpie and the Michipicoten rivers. The large valleys near Lake Superior, like the one west of Wawa lake, are sand filled; gravels of this period are uncommon. The glacial striae trend N. 55° E. mag., the glaciers having moved from northeast to southwest.

It is possible that the deeper valleys were completely filled by glacial sand, the upper surface of which corresponded with the several levels of glacial Lake Superior. The rivers that now flow through these valleys have been rejuvenated by the lowering of the base level in Lake Superior at the close of the glacial period. The Magpie and Michipicoten rivers have cut their way through the sand, the remainder of which is perched on the valley walls in a form similar to river terraces. Placer miners attacked these sand terraces in the first gold rush of 1897, but they were not successful in finding gold.

Geological Structure

The structures may be divided into (1) primary, such as sedimentary and igneous, and (2) secondary, such as folding and fracturing (joints, faults, and fissures).

Primary Structures

Most of the structures have to do either directly or indirectly with igneous activity. Sedimentary structures are of minor importance and are restricted chiefly to the Doré series, which lie northwest of the gold area. However, there is a small volume of sediments within the gold area in the form of Keewatin agglomerate and banded iron formation.

The primary structures of the different igneous formations have to be inferred from meagre field data. The structure of the porphyrite is that of an irregular, flat, sill-like mass; the structure of the granodiorite is that of a batholith with stock and tongue-like protuberances penetrating the roof rocks. Such stocks of granodiorite and injection tongues of diorite and porphyrite can be traced to the underlying batholith and probably represent in part conduits through which the gases and magma reached the surface. The form of the porphyrite and diorite tongues as well as their content of angular fragments of the roof, i.e. Keewatin greenstones, afford evidence of the nature of this injection. On account of the lack of extensive areas of bared rock surface, a good view of the intrusive pattern is wanting. The diabase and lamprophyre are clearly in dikes, having a north and south trend in the majority of cases.

Secondary Structures

Folding.—The fragmental evidence for the nature of the folding in the area is obtained from the Keewatin agglomerate, which strikes northeast and dips at fairly steep angles that were southward in a number of places. It is probable that the Keewatin series was folded and sheared, before the entrance of the Algoman intrusives, by the intrusion of older granites that are now represented by pebbles in the Doré conglomerate.

The Keewatin iron formations and Doré sediments show by their outcrop plan and structure that the major axis of folding for the area was east and west, but it is probable that the Wawa batholith and other Algoman intrusives in the area have caused local variations from this regional pattern of folding. Evidence obtained on the west edge of the Wawa batholith, in the Keewatin schists, showed that the trend of the schistosity was more nearly north and south, 310° mag., and roughly parallel to the west edge of the Wawa batholith, as shown on the general map of the gold area; the schistosity planes dip steeply eastward. That the axis of folding in the area of the Wawa batholith was northwest-southeast is suggested by the trend of the narrow iron range just south of High falls.

Fracturing.—Nearly all of the fractures are accompanied by some displacement. The planes of jointing vary from place to place and with the various rock types. Two main systems were noted traversing the diorite and porphyrite alike. One set appeared to trend about N. 20° W. with nearly vertical dip corresponding to the trend of a number of the lamprophyre dikes. The other set trends about N. 70° E. and has flatter dips, which are southward in a number of places. At the west end of Minto lake these lines of weakness are well illustrated in the surface pattern of the outcrops and may be seen on the map of the Minto mine included in this report.

Faulting.—The area is traversed by innumerable faults, and though on an average the amount of relative movement (slip) due to any one fault is small, yet in the bulk their results are likely considerable. Because of the large number of faults in the rocks of fairly homogeneous nature, it is difficult to determine the combined effects of their throws.

In no place throughout the camp was it possible to collect sufficient data for the complete solution of the fault problems. This was due to the lack of sediments and other marker horizons, to the homogeneity of the rocks bordering the faults, and also to the lack of underground details due to the comparative youthfulness of the camp.

Faulting has commonly taken place along the borders of the lamprophyre dikes, especially along the biotite variety. This relation of the dikes to faulting can be seen in the cross-faults on the Minto vein. Faulting and shearing has also been localized by the linear bands of Keewatin basic schists that have yielded more readily than the massive, competent dioritic intrusives that surround them.

Faults of different ages are present. In general the more extensive fault fissures having a filling of gold-bearing quartz strike a little west of north and dip at fairly steep angles towards the east, but there are exceptions. The northeast-southwest set of faults and shear zones displace the gold-bearing veins, the rule of offset being towards the right hand. The absence of a later fracturing is evident in places in this type of vein, judging by the glassy appearance of the quartz and the unbroken crystals of black tourmaline. In the veins carrying gold, the dark tourmaline has been ground into a black, amorphous mass.

It is noteworthy in connection with the structure of the area that this strip of country lies in a belt of rocks which is located on the axial line of the Lake Superior geosyncline. The strike of the large, longitudinal faults in the copper-bearing rocks of Keweenaw point, northern Michigan, if produced eastward would pass through the Michipicoten gold area. The regional map of the area, Map 155A of the Dominion Geological Survey, shows a linear chain of lakes with a northeast-southwest trend stretching east from Wawa lake. This direction has been a line of heavy faulting up to late pre-Cambrian time. An aerial photograph of Wawa lake, taken in October, 1926, by G. Swartman, of the Ontario Forestry Branch (see frontispiece), shows clearly two marked and continuous fault scarps closely bordering the south side of Wawa lake.

Wawa Lake Batholith

The Wawa batholith that underlies the gold area is a small intrusive body compared with the main, and larger, granitic mass to the southeast. In surface plan it is rudely elliptical with the northwest tip resting on the west end of Wawa lake. The longer axis of the ellipse, which is about six miles long, strikes N. 20° W. The shorter axis is three and a half miles long.

The Wawa batholith has a prominent set of tensional fissures developed along its northwest-southeast axis, and it was mainly in this set of fissures, which followed closely upon the igneous intrusion, that the gold-bearing quartz was deposited. Later on, compression was put on the tensional fissures, which resulted in overthrusting and shearing.

Metamorphism by the batholith was most profound in the granite country southeast of the gold area, and along Firesand river. It is probable that the lateral thrust movement originated here and moved out towards the northwest. The surface of the batholith appears to have a steep slope towards the west and

a flatter one on its east side. The crest line of this asymmetric intrusive mass was probably along the line of the belt of the productive gold quartz veins, which extend northwestward from High falls.

ECONOMIC GEOLOGY

This section includes a general account of the most important facts and reasonable inferences concerning the occurrence, structure, and character of the ore deposits, followed by the main conclusions regarding their origin and age.[1]

Types of Deposits

Three main types of deposits have been recognized in the area and may be enumerated as follows:—

1. Ore deposits in true fissure veins with definite hanging- and foot-walls. Such veins display, in contrast to other types, fairly uniform widths and values

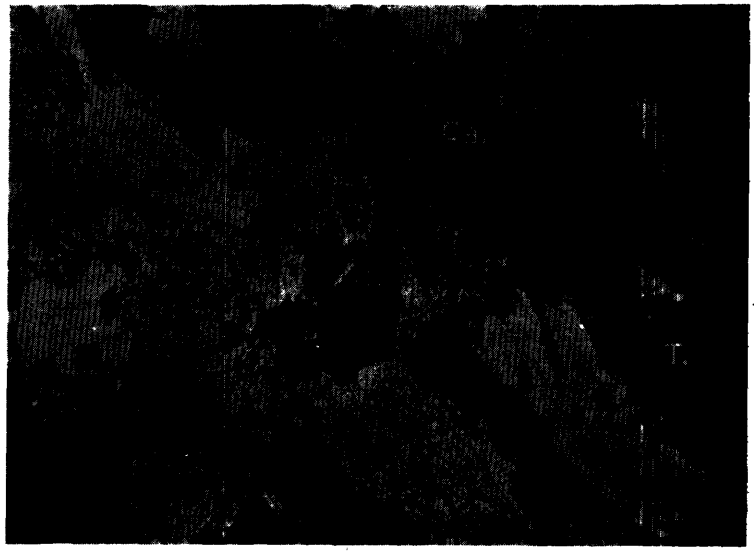


Fig. 5—Photomicrograph showing tourmaline-bearing gold-quartz from old Jubilee vein. A single large tourmaline crystal has been fractured and the fracture filled with sericite quartz, carbonate, and pyrite (black). (×26, one nicol.)

of ore. Examples are the Minto and Grace veins. Tourmaline is in minor amount and sulphides are prominent.

2. Fissure veins in which sulphides are deficient and tourmaline common. Veins of this type appear on Mackey point and on the Cooper property, claim No. 4,596. The gold is chiefly native and in vugs (Fig. 5).

3. Fissure veins bordered by schist that is also mineralized. This type appears at the War Eagle, Norwalk, and on the west side of Jubilee lake. Arsenopyrite and tourmaline are common, and pyrrhotite is in minor amount at the War Eagle and Norwalk. The wall-rock alteration is more intense than in

[1]For detailed descriptions of individual deposits the reader is referred to "Description of Mines and Prospects," page 29.

types Nos. 1 and 2, and consists of tourmaline-sericite-biotite replacement of sheared diorite or greenstone.

It is probable that classes Nos. 1 and 3 will furnish the greater part of the gold ore in the camp.

Fissure Vein System

The accompanying geological maps show in plan the fissure vein systems with their direction and spacing. Productive vein fissures are not closely spaced, and composite veins are the exception.

The better veins have slickensided walls and very few vugs. Some of the minor and unproductive veins found near the main veins and at variance with their strike are in fissures that show little movement on their walls.

The fissures have great persistence in the porphyrite, particularly where it is in contact with the steeply dipping tongues of diorite, with steep-walled cupola stocks of granodiorite, or with the intrusive ridges of quartz porphyry. The firm and homogeneous younger Algoman intrusives have apparently reinforced, with strong rock ribs, the older porphyrite of the batholithic roof and formed ground which would fracture under crustal stresses in such a way as to be traversed by remarkably persistent fissures. The rock included in these zones was thoroughly fractured, while the wall rock as a whole was characterized by solidity. In such cases conditions were favourable for persistent veins.

In addition to the main fissures a number of co-ordinate fissures lie at oblique directions to the main ones. It is probable that the forces of fissuring were resolved into only two components in the homogeneous rocks; but where they traversed mixed rocks, these forces were resolved into many components which had little influence upon the direction and persistence of the main vein fissures.

The vein fissures probably originated as tensional fissures that later on had imposed on them compressional stresses. The rock stresses found relief in the fissures which were controlled largely by formational contacts.

Diking

The vein fissures are cut by a series of lamprophyre dikes which have a northwest or northeast trend corresponding to the directions of the pronounced joint planes of the area. In some places, as on the south shore of Wawa lake, they appear to fill narrow shear zones. A few of the dikes branch, but they are not commonly faulted.

Faulting

Secondary fracturing or faulting of the fissures is fairly common, and in some instances it was possibly contemporaneous with the dike intrusion. The amount of movement has been greater in the secondary than in the primary ore-bearing fissures, as evidenced by the wide gouge or attrition clay zones and friction breccias in the cross-faults. Some of the secondary fractures are very persistent and form watercourses, which were encountered in mining. Underground it is hard to obtain evidence for the direction of the fault striae.

Ore Shoots

Shape and Size

The ore, to date, is in quartz veins of the fissure type and in several cases in the sheared rocks bordering such veins. As a rule the better veins have few branches. The walls of the veins are usually the assay walls. This feature is

helpful in mining as it reduces the amount of dilution by waste rock. The ore shoots, which are in a general way lenticular with the vertical dimension the greatest, usually pitch southward at a steep angle.

This is no doubt due to the intersection of the two more common sets of fissures in the area, one trending west of north and the other east of north, with the line of intersection having a steep southward pitch. Similar features of shape and pitch of ore shoots occur in other pre-Cambrian fields such as at Porcupine,[1] Ontario, and on the Champion reef of the Kolar gold field, Mysore, India.[2] In fact this point is a common one in pre-Cambrian gold ore shoots and the knowledge of it should be useful in underground development.

Pyrite and Chalcopyrite as Gold Carriers

After a separation of the magnetic pyrrhotite from the non-magnetic pyrite and chalcopyrite, by means of fine crushing and a magnet, it was found that the pyrite and chalcopyrite carried sixteen times as much gold per ton as the pyrrhotite from the same sample of vein material. The unseparated sulphides were first treated with mercury in order to collect any native gold present before the assays were made.

Localization of Ore Shoots

Many factors have been influential in the localization of ore shoots; in part they were mechanical or physical and in part chemical, as follows:—

1. The Physical Character of the Country Rock Composing the Ore-bearing Ground.—The character of the rock has not only been influential, as already pointed out, in the control of the fissuring but also in the localization of the ore shoots within the fissures. Contacts between solid, homogeneous formational units have been favourable places for thorough fracturing and shearing. Thus the mineralizing solutions have been permitted to circulate within a restricted zone of moderate width. It might be expected then that the better shoots would be found in a vein fissure traversing the formational contacts.

2. The Contacts of Veins with Faults Having Impervious Walls or with Strong Dikes, Particularly the Footwall or Under Side of Dikes.—It is apparent in a few cases seen in the gold area that cross-dikes and faults have played a part in the localization of rich shoots of gold ore. Since gold was one of the latest metallics to appear in the veins, it may have followed the entrance of the dikes, which in this case would influence the value and location of the ore shoot. In other mining camps, such as Rossland, B.C., the lamprophyre dikes caused enrichment in the ore bodies by forming barriers for the ore solutions, and there has been a ponding of these solutions against such dikes. Fault gouge has the same effect as the dikes. Chlorite schist as an impervious hanging wall for one vein was found to act as a dam for the ascending gold solution.

3. The Chemical Character of the Wall Rock.—In those deposits which consist of mineralized Keewatin schist, basic schist has been a favourable feature, since by its original iron content it has helped to form pyrite, pyrrhotite, and arsenopyrite, which in turn have aided in the precipitation of the gold.

4. Chemical Reaction.—Chemical reaction between the mineralizing solutions carrying gold and the solid minerals, such as pyrrhotite, pyrite, and

[1]A. G. Burrows, Ont. Dept. Mines, Vol. XXXIII, pt. 2, 1924.

[2]Thomas Pryor, The Underground Geology of the Kolar Gold Field, Trans. Inst. Min. & Met., London, 33rd session, 1923-24.

chalcopyrite, appears to have been a factor in the localization of the ore shoots. The common association of higher gold values with pyrite and chalcopyrite, especially when fractured, seems to indicate that such a reaction has taken place.

Rock Alteration

The country rock formations are in places highly and extensively altered, chiefly by replacement processes connected with the ascent of heated igneous and hydrothermal solutions and the formation of the ores.

In a number of places the more basic rocks have had new biotite formed by replacement near the fissures used by the hydrothermal solutions in their ascent. Along with this biotite, black tourmaline is sometimes found. Pyrite and pyrrhotite and a little chalcopyrite were also deposited in the walls of the fissures.



Fig. 6—Photomicrograph of quartz phenocryst showing resorption in granodiorite porphyry at Minto mine. (×26, one nicol.)

It is noteworthy that the more granitic facies near the veins show less hydrothermal alteration than the diorite porphyries or porphyrite.

Some of the basic schists formerly having abundant chlorite are now composed largely of biotite and a bluish-green chlorite. This alteration is prevalent near lamprophyre dikes.

Where the fissure veins are well mineralized, the biotite and other femic minerals have had a more intense alteration and now consist of sericite and carbonates. This type of hydrothermal sericite usually contains as an admixture some common sulphide such as pyrite. In other places sheared bands of acid Keewatin tuff have been altered to sericite schist, but this variety of sericite is largely dynamic in origin, has few sulphides, and was not permeated by hydrothermal solutions such as those that brought in the sulphides and gold.

It might be added here that the biotite-chlorite-sericite-tourmaline type of rock alteration, in conjunction with high temperature sulphides such as arsenopyrite and pyrrhotite, together with the lenticular character of the veins, places the Michipicoten gold deposits in the deep-seated class.

Alteration of Granodiorite Porphyry at the Minto Mine

The course of the alteration near the veins was studied mineralogically in thin section, and chemically in the wall rock of the Minto vein at 100 feet below the surface. The quartz vein, at the point the samples of sheared and massive porphyry were taken, was about five feet wide and contained massive sulphides with gold. The alteration spread for a few feet out from the vein walls. The fresh rock is a greyish-white granodiorite porphyry, the groundmass of which consists of orthoclase, oligoclase, sericite, biotite, quartz, and a little pyrite. The phenocrysts are quartz and oligoclase. The altered rock is also light-grey. The rock, while retaining a trace of its porphyritic structure, has been changed to biotite, carbonate, sericite, and quartz; some of the feldspar has survived shearing.

	Massive Porphyry	Sheared and Altered Porphyry	Gains	Losses
	per cent.	per cent.	per cent.	per cent.
SiO_2	67.91	66.32	2.72	.....
TiO_2	.38	.47	.26	.....
Al_2O_3	14.25	15.27	3.13	.....
Fe_2O_3	.58	.90	.89	.....
FeO	2.12	1.80	.82	.....
MgO	1.52	1.59	.23	.....
CaO	2.52	1.79	.....	1.90
Na_2O	4.18	3.55	.....	1.60
K_2O	2.35	3.88	4.26	.....
H_2O	1.33	1.30	.....	.03
CO_2	2.67	3.34	1.92	.....
FeS_2	.11	trace	.....	.....
Total	99.92	100.21	.....	.....
Specific gravity	2.713	2.737	.....	.....

By multiplying the figures of the percentage composition by the specific gravities of the rock mass, the constituents per 100 cubic centimeters of fresh and altered rock are obtained. These figures compared give the gains and losses for each constituent during alteration; and from these may be calculated the gains and losses in percentage of the original mass of 271.3 grammes of fresh rock. These gains or losses in percentage may be applied directly by addition or subtraction to the figures of the chemical analysis of fresh rock. There has been a notable loss of sodium and calcium. The additions comprise silica, titanium oxide, alumina, ferric and ferrous iron, magnesia, water, and carbon dioxide. New biotite is formed in the sheared rock.

From this it follows that the mineralization in deposits of this class has been effected by solutions capable of substituting K_2O for Na_2O. The alkaline earths have been fixed in part as carbonates. The total result indicates action by hot ascending solutions containing more potash than soda and having a variable amount of alkaline carbonates and free carbon dioxide.

Oxidation

There is comparatively little oxidation of the ores by surface waters containing free oxygen, excepting in a few cases. The iron and copper sulphides remain unchanged to within a few feet of the surface. If deep weathering ever took place, all trace of it has been swept away by subsequent erosion and Pleistocene

glaciation. In places where the rock has been sheared and covered by low ground, oxidation has affected some of the iron oxides and they now appear as red seams having a resemblance to veinlets of pink feldspar.

At the Grace mine, a "red ore shoot" on the surface north of the main shaft was reported to have assayed $112 per ton in gold. Doubtless some secondary enrichment occurred on the surface in this honeycombed, sulphide-bearing part of the vein. Similar cases have been seen by the writer in other Ontario gold camps.

Character of Ores and Gangues

Classification of Ores

1. Quartz veins with sulphides of the high temperature type, such as pyrrhotite, pyrite, and chalcopyrite (Fig. 13). Native gold is present, but is rarely seen with the naked eye. Tourmaline, ankerite, and biotite also appear



Fig. 7—Photomicrograph showing fractured pyrite bordered by ankerite and quartz containing veinlets of less disturbed chalcopyrite (white) from the Minto mine. (×25.)

in the ore, with tourmaline in subordinate quantity (Figs. 7, 14). The Minto vein is an example.

2. Quartz veins with sericite, pyrrhotite, arsenopyrite, and chalcopyrite at the Grace mine. Native gold is fairly common in this ore. The quartz is much granulated and in places has a pale, bluish colour (Fig. 11).

3. Mineralized schist with sericite, tourmaline, arsenopyrite, and pyrite as the chief constituents. Native gold is scarce. This type is found at the Norwalk and War Eagle veins (Fig. 8).

4. Glassy quartz veins, with pyrite as the common sulphide and tourmaline as the chief gangue mineral besides quartz, outcrop on Mackey point. The gold occurs as small particles in vugs and is sporadic. The quartz is of two generations.

5. Sheared diorite with quartz lenses consisting of greatly crushed quartz, sericite, finely disseminated native gold, pyrite, and chalcopyrite. This type is found on the west side of Jubilee lake.

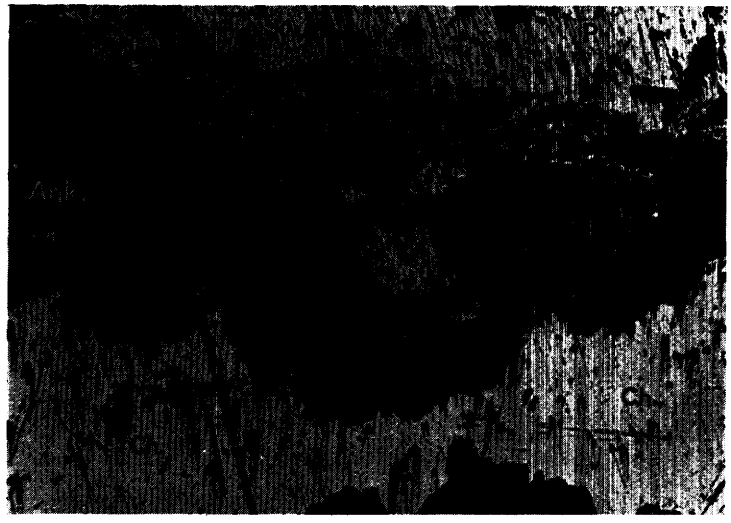
6. Some galena- and sphalerite-bearing quartz veins were seen near the old Pixley shaft on the Minto property and on claim No. 3,491.

Value of the Ores

The values in the typical ores of the camp are largely in gold. Ore running $4 and under per ton is graded poor; from $4 to $8, medium; from $8 to $15, good; and from $15 up, very good.

Mineralogy

In the following description of the minerals found in the Michipicoten area, those found only as rock-forming constituents are not included. With a few exceptions, the minerals are nearly always massive and are found in or near the veins.



Photomicrograph showing crushed pyrite bordered by ankerite and the ankerite replaced by chalcopyrite. (×25.)

Native elements	Gold.
Sulphides	Chalcopyrite, pyrrhotite, pyrite, galena, sphalerite, arsenopyrite.
Oxides	Quartz, hematite, magnetite.
Arsenates	Erythrite.
Carbonates	Calcite, ankerite.
Silicates	Chlorite, sericite, biotite, tourmaline, serpentine.

Gold.—Gold comes as fine impregnations in arsenopyrite, pyrrhotite, pyrite, and ankerite. It also is found in grains and flakes in the vein quartz. A part of the gold of the ordinary sulphide ores is in the free state, the percentage of the free-milling gold varying with the type of ore.

In what form the combined gold occurs has not been determined. Pyrite and chalcopyrite seem to be the best companion minerals of gold.

In the quartz vein, as on Mackey point, the gold is found as small crystals on the walls of vugs and is accompanied by a later generation of milky-coloured quartz.

Chalcopyrite.—Chalcopyrite is an important companion mineral of gold and is seen more frequently in association with pyrrhotite, as at the Minto vein.

It is usually massive but also occurs in veinlets and replaces schist inclusions. It is later than the pyrrhotite and pyrite (Fig. 7).

Arsenopyrite.—Arsenopyrite has apparently formed under dynamic conditions, since it has a needle-like habit and replaces sericite schist similarly to needles of black tourmaline that occur along with it (Fig. 8). The War Eagle claim shows the best specimens of arsenopyrite and tourmaline in sericite schist.



Fig. 8—Photomicrograph showing nest of arsenopyrite crystals (black) in War Eagle ore. A few tourmaline crystals also show; the remainder is quartz and sericite. (×26, one nicol.)



Fig. 9—Photomicrograph showing sericitized, sheared diorite replaced in part by dark tourmaline, Jubilee lake break. (×26, one nicol.)

Tourmaline.—Black tourmaline crystals are found in vugs in vein quartz and also in the sheared wall rock bordering the veins (Fig. 9). It is general in this camp.

Fineness of the Gold of the Michipicoten and Goudreau Areas

In order to compare the Michipicoten and Goudreau gold areas, the fineness of the gold from several veins in each camp was determined. According to mining experience, the gold in the deeper seated gold-quartz veins is finer than the gold from the veins of the Tertiary lavas, which may have as much as fifty per cent. silver (24 carat or pure gold is 1,000 points fine).

Locality	Description	Fineness
Goudreau Gold Mines	yellow gold	877
Goudreau Gold Mines	light-coloured gold	618
Cline Canadian Gold Mines, Goudreau	yellow gold	927
Grace Mine, Michipicoten	yellow gold	914
Minto Mine, Michipicoten	gold in sulphides	871
Jubilee lake, Michipicoten	yellow gold	836
Vipond Mine, Porcupine	yellow gold	911

As shown above, the fineness of the gold may vary in the same mine. In fineness the gold is comparable with that of the Porcupine area and possibly contains a little more silver. No gold-silver tellurides were found in the Michipicoten and Goudreau areas to interfere with the calculation of the fineness of the native gold. The average fineness of the gold from a number of Californian quartz lode deposits was 757; the highest was at 903, and the lowest, 612.[1] These Californian gold deposits belong to the intermediate depth zone, therefore the gold is less fine than that of the deeper zones found in Michipicoten and Goudreau.

Origin of Ore Deposits

The gold deposits in the Michipicoten camp are all of the primary type and are found in quartz fissure veins as well as in mineralized schist, but combinations of the two types also appear. From the way the ore occurs in veins and lodes, along fractures or bands of fractures, and replacing the minerals of various country rocks, it is evident that the deposits were formed after the consolidation of the country rock through the agency of aqueous mineral-laden solutions closely connected with igneous activity. An additional proof of this origin of the ores is afforded by microscopic sections of the ore, which show the secondary origin of all the ore minerals and the gradual replacement of the original components of the rocks and vein quartz by them.

The ore deposits of Michipicoten, then, may be classified as epigenetic replacement deposits formed along shear or fissure zones. That is, the ore has been introduced up the channels of the shear zones and fissures as hot, alkaline, aqueous solutions and gases from below under conditions of high temperature and pressure.

It is inferred from field and laboratory data that there were at least two periods of mineralization; in the first period emanations caused wall rock alterations and filling of the fissures with quartz and an introduction of the vein sul-

[1]W. Lindgren, U.S. Geol. Surv., Prof. Paper, No. 73, 1912, p. 69.

phides with probably some gold; in the second period there were alkaline solutions carrying gold that were introduced after the sulphides were fractured. The metallic gold in the alkaline solutions may have been precipitated by the chalcopyrite,[1] especially where the chalcopyrite crystals were fractured.

The fissures did not follow the exact contacts the whole way but traversed independently the rocks of both formations. The character of the ore and the size and shape of the ore shoots appear to be largely dependent upon the kind of country-rock formation and its varying susceptibility to fissuring and replacement.

In connection with the porphyries at Butte, Montana, Sales makes the following remark:[2]—

> The principal part played by the quartz porphyry has apparently been the opening of the way for vein-forming waters of deep-seated origin to reach the higher regions where the ore deposits are now found, while the ultimate source of the metals of the ores was probably in the original granite magma. The direct source may have been the same magma locally which furnished the quartz porphyry, the latter rock following the earliest fracturing and at the same time stimulating an upward movement of the ore-bearing waters.

The Michipicoten quartz porphyry is merely a textural variation of the main mass of granodiorite, although it is a later facies of that mass, forced into the zones of earliest fracturing. The same is true of the granodiorite and related porphyries that are gold-bearing, to the northeast, at the Goudreau gold mines in the Goudreau area.

Age of Ore Deposits

The gold ores of the Michipicoten camp are probably Algoman in age, considering the massiveness of the adjacent plutonic rocks, such as the granodiorite, and the fact that the shearing in the igneous masses is local rather than regional. There is a probability that the Algoman intrusives near Wawa lake were responsible for the folding of the Doré sediments. The gold-quartz veins have never been found to date to cut the Doré series, which outcrop a short distance northwest of the gold area.

DESCRIPTION OF MINES AND PROSPECTS

The gold-quartz veins and mineralized shear zones are not in a continuous line but rather *en échelon*, and a number of the productive veins appear to have a common dip to the east. However, a few gold-quartz veins lie outside of the margins of this belt.

In general, the veins south of Trout creek on the Wawa Syndicate's group are characterized by having arsenopyrite as a vein sulphide and larger volumes of granodiorite and porphyrite showing near them than those at the north end of the camp. North of Trout creek arsenopyrite fails, the sulphides are more massive, tourmaline is more common, and porphyrite is not prominent as a country rock.

The accompanying geological map indicates the position of the different veins and properties.

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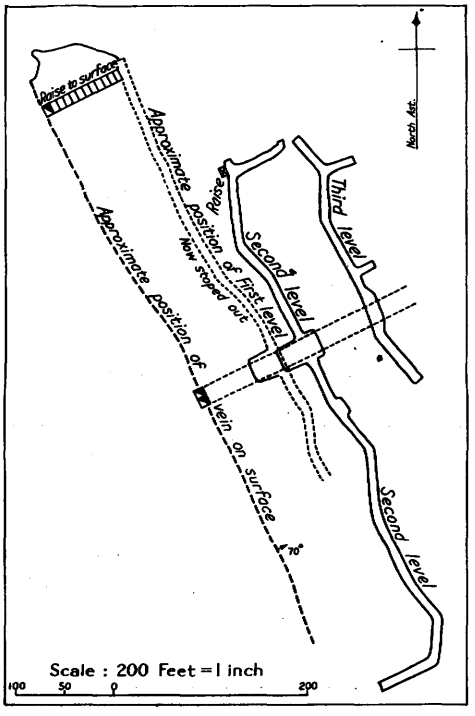
[1] H. N. Stokes, Econ. Geol., 1906, p. 650.

[2] Bull. Am. Inst. Min. Eng., No. 80, August, 1913, pp. 1,523-631.

Grace Mine

The Grace vein, lying near the centre of the camp, was the chief gold producer in Michipicoten's early days and has been mined to a depth of 300 feet. At present it is being further explored by the Power and Mines Syndicate of Montreal, who have deepened the old shaft and have found coarse gold at 372 feet.

The Grace property consists of a group of 42 claims covering 886 acres, to which has been added the Star property. The outline of the group is nearly square.



Plan showing workings, Grace mine.

Underground Development

Mining operations were commenced in July, 1900, by the owners, the Algoma Commercial Company, and continued until about the end of 1903. When examined by Inspector D. G. Boyd on August 12, 1903, a shaft 4½ by 9 feet had been sunk along the vein at an inclination ranging from 67° E. at the surface to 80° near the bottom, a depth of 304 feet. The 100-foot level consisted of a drift southward along the vein for 68 feet and one northward for 188 feet. At the 200-foot level, drifts extended 204 feet south and 115 feet north from the shaft. At the 300-foot level, 108 feet of drifting had been done, about equally north and south, and a winze connected the north end of this level with the 200-foot level at a point 57 feet north of the shaft.

A longitudinal section of the vein (Fig. 10), prepared in 1912, shows that the vein had been stoped out from the 200-foot level to the surface and a small

amount of stoping done on the 300-foot level just north of the shaft. An output of gold was commenced during the autumn of 1902, but there is no published statement of the amount produced.

The mill was equipped with ten 950-pound Allis-Chalmers stamps, a Blake jaw crusher 7 by 10 inches, and three 6-inch Frue vanners. The ore was reduced by stamps and then run over amalgamation plates. This method was wasteful, as 60 to 80 per cent. only of the gold was recovered. As a result, a quantity of fairly rich tailings remain from the early milling. The arsenic in the ore will necessitate flotation methods in order to make an efficient gold recovery. Steam was used

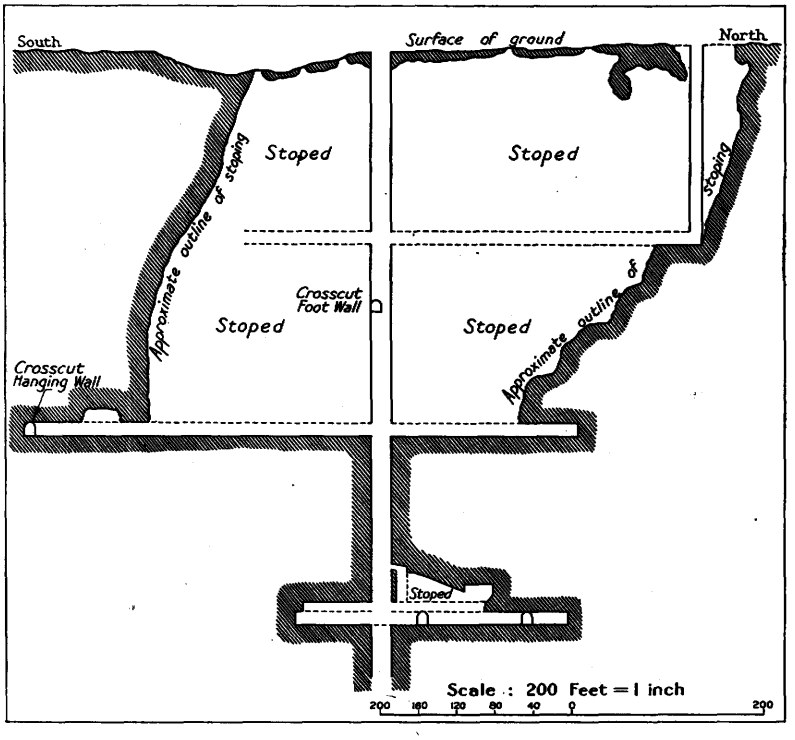


Fig. 10—Longitudinal projection showing stopes and drifts, Grace mine.

up to 1907 when electric power from High falls took its place. The Power and Mines Syndicate have recently installed new hoisting and compressor machinery.

Some notes on this mine are given in the earlier historical part of this report, pages 5 and 6.

Geological Features

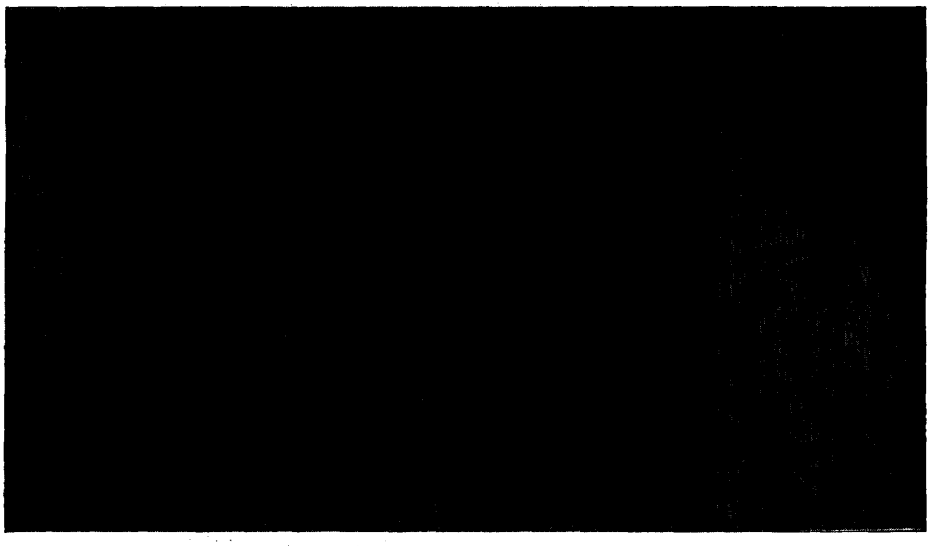
The main vein is situated on claim D.J. 7. The principal rock bordering the vein is a porphyrite or diorite porphyry, which forms the larger part of the ridge near the mill and shaft. This rock has been jointed and crushed, and hydrothermally altered near the vein. The jointing is indicated by the pattern on the differentially weathered surface, which is light-coloured, the feldspar phenocrysts standing out in relief (see photograph on page 32).

To the north greenstone schist is more prominent and occupies a large sheared zone on the first large northeast-southwest displacement north of the

shaft. To the west intrusions of quartz diorite are common. A large sheared zone in Keewatin rocks lies along the west boundary of D.J. 8 and strikes a little east of north. The power line follows this break for some distance. Diabase appears in several places as north-south dikes and crosses the north end of the Grace vein in a northeast direction. A dike of coarse pink granite was seen north of the large greenstone shear zone and east of the old cabin near the north part of the vein. A high granodiorite ridge outcrops at the north end of the main vein.

Vein System and Character of Ore

The quartz veins on this group of claims are in two sets, one striking a little west of north and the other northeast. The veins of this latter set appear to be less mineralized. They carry small amounts only of sulphides, are glassy in appearance, and have a gangue of ankerite and tourmaline. In a few places, for



Differential weathering of quartz veinlets in jointed porphyrite, adjoining Grace mine.

example several hundred feet north of the main Grace vein, these barren veins cut the shear structure on the strike of the main vein. One of these poorer types of veins is located in a sheared area of greenstone beside the road near the northeast corner of claim D.J. 11.

The productive vein ranges in width from a few inches to five feet and averages two and a half feet. The strike is about N. 15° W., and the dip 70° E. The vein can be traced for about 200 feet along the surface, and the faulted and sheared structure on the strike of the vein for several hundred feet farther, especially to the north. The northward continuation has been cross-faulted and does not contain large or continuous quartz veins, but consists of schist with biotite alteration and impregnations of arsenopyrite. The large continuous quartz vein with proved commercial qualities appears to terminate at its north end at a cross-dike of lamprophyre.

In the vein the quartz has been intensely crushed, and sheared porphyrite has been included in it. The vein has definite walls with little gouge. The wall-

rock material in the vein is chiefly sericite and has been replaced by pyrite, pyrrhotite, arsenopyrite, chalcopyrite, and native gold. Ankerite is also present (Fig. 11).



Breccia with ankerite (black) and vein quartz filling, Grace mine. (One-half natural size.)

At the surface the vein is said to have contained some spectacular specimens of native gold.

The lamprophyre dikes that cut the Grace vein could not be studied underground as the mine was flooded. It is reported that the ore was richer against



Fig. 11—Specimen (one-half natural size) of highly granulated vein quartz, Grace vein, with bands of included schist wall rock selectively replaced by sulphides.

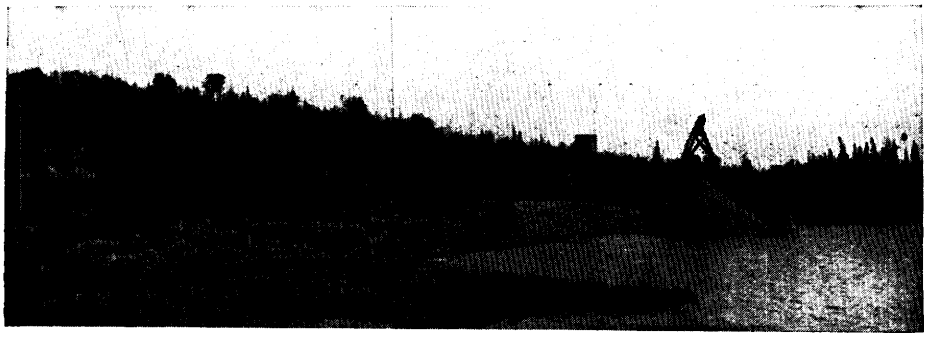
these dikes. Specimens of lamprophyre were found on the waste pile which had banded veinlets of barren quartz, others with veinlets of carbonate, and a few that had impregnations of pyrite.

Several small veins have been found on the Grace group, but they are most abundant near the main discovery. A few veins were discovered on the shores of a small lake at the north end of claim D.J. 63. A vein striking north and south and carrying gold with arsenopyrite is located at the north end of Mountain lake, at the south central part of claim D.J. 66. A small vein outcrops near the northeast corner of claim D.J. 12.

In prospecting, it is well to keep in mind the location of ridges of quartz porphyry. Such a ridge is found several chains south of the south side of Bond lake on the power line. Another ridge is on the power line on the west central part of claim D.J. 16. These quartz porphyry ridges are shown by a special colour on the accompanying map.

Value of the Ore

The ore shoot at the Grace mine is at present about 200 feet long at the surface and pitches at a steep angle towards the south. It is difficult to say much about the distribution of valuable ore on account of the lack of first-hand information in a water-filled mine. An old assay chart shows that the valuable ore is



View of the Minto mine.

unequally distributed and ranges from very high to low. This is probably due to the structural differences, and the pinching and swelling in the vein. According to Peter Nissen, superintendent in 1901, the average assay of ore found in the mine was $12 per ton.

Minto Group

The original Minto group of ten claims has been extended by the inclusion of several adjoining claims. The present activity of the Cooper Gold Mines, Limited, a subsidiary of the Pioneer Mining Corporation, Limited, who are developing this group, is confined chiefly to the Minto vein at the east end of Minto lake, on claim No. 3,134 (see insert map), and along Jubilee lake on claim No. 3,400. This company also controls the Wawa Syndicate group to the south and the Cooper group to the northeast of the Minto vein.

The Pioneer Mining Corporation, Limited, from March, 1926, has been conducting an intensive exploratory programme by underground mining on the Minto vein, by diamond-drilling the same vein, by drilling the Jubilee, Trout Creek, and Cooper veins, and by much surface stripping on the various prospects. Several old shafts, including the Jubilee and Pixley, were unwatered and sampled.

Ore has been indicated to the extent of a 550-foot shoot on the 85-foot level at the Minto vein, a 170-foot shoot on the surface along Jubilee lake, and others on the north side of Trout creek. The Minto vein has been cut by a diamond-drill at nearly 500 feet vertically and carried gold at that depth.

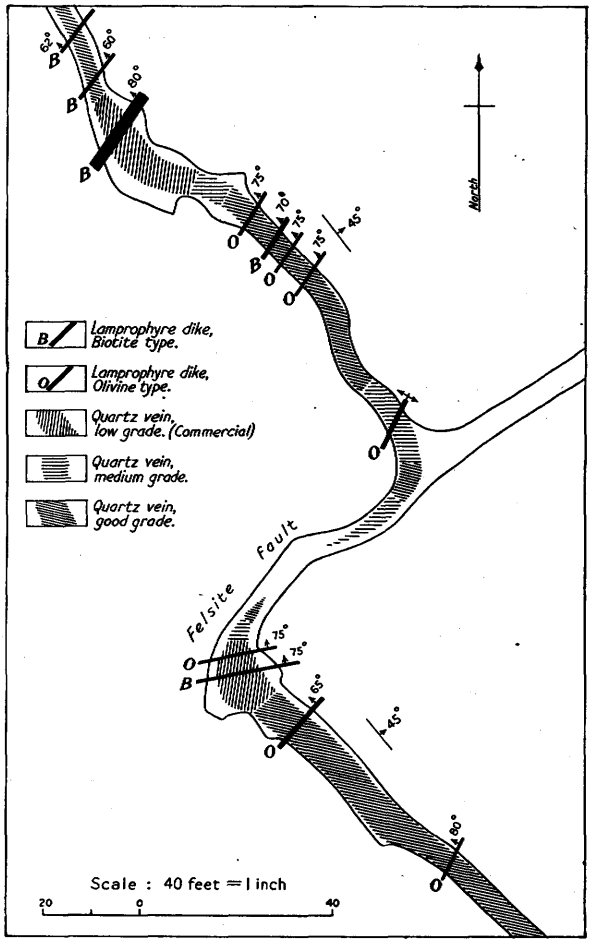


Fig. 12—Plan of part of the 85-foot level, Minto mine, to show the lamprophyre dikes and the tenor of ore in the Minto vein.

The Minto vein was originally staked by Sam Berailldt in the early days; he sold it to Colonel D. Tisdale for $600.

Underground Development

The original shaft is situated at the east end of Minto lake near the east boundary of claim No. 3,134. It was sunk on an incline to a depth of 100 feet on the vein, which dips 48° E. The present work deepened the old shaft, and 1,700 feet of drifting was done on the 85-foot level.

A new vertical, three-compartment working shaft, with a present depth of 350 feet, has recently been finished; it lies about 1,200 feet southeast of the old shaft. New levels on the vein are being established at 220 and 320 feet from the new shaft.

Geological Features

The intrusive rocks on this group of claims are quartz diorite and granodiorite, and they form the framework for roof pendants of greenstone.

Quartz porphyry borders the Minto vein and carries several dollars in gold per ton where it is fractured and mineralized. In a number of places near the vein, diabase dikes cut the diorite complex; and underground lamprophyre dikes are prominent. These dikes cut the quartz veins almost at right angles.



Shear structure in diorite near Minto lake.

Vein System

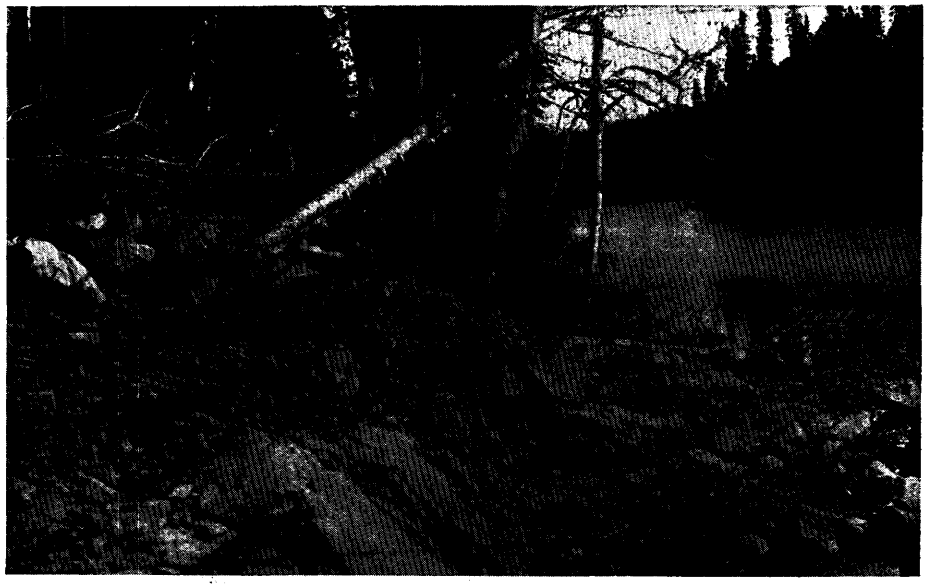
The main Minto vein is a linear fissure vein that strikes N. 20° W. and dips 48° E. The vein has been disjuncted into three sections by cross-faults that are later than the gold deposition. There is another set of veins that strikes northeast, parallel to the cross-faults. The schist vein just north of the old Minto shaft is an example. Some of the northeast-southwest veins are probably unimportant commercially, since a number of them contain carbonates and tourmaline with very few sulphides. The native gold found in this type of vein is sporadic.

On the Jubilee break, fairly wide quartz veins with a tourmaline and ankerite gangue are found on the east side of the lake; and on the west shore of the lake opposite the more noticeable quartz veins, there is a mineralized, sheared, and sericitized diorite that contains commercial shoots of gold ore. Small quartz lenses are found in this sheared diorite. The Jubilee lake veins and shearing strike a little east of north and dip about 50° E.

The veins on the Wawa Syndicate claims on Trout creek, about three-quarters of a mile south of the Minto vein, consist of quartz lenses enclosed by

mineralized, sheared diorite. These veins strike northeast and dip at fairly low angles towards the south. Several gold-bearing veins are known on this group. The course of Trout creek near the veins probably represents the strike of the main break.

The vein at the Minto that carries commercial gold ore is bordered by chlorite schist on its hanging-wall side for the greater part of its length, and it is apparent from the structural relations of the rocks near the Minto vein that the juncture of a weak rock like the chlorite schist with the massive diorites has formed a line of weakness that has afforded an avenue of relatively easy entrance for the Minto quartz porphyry and its attendant gold-bearing quartz vein. Where both walls are of porphyry the ore is not so rich.



Larry Peters' find of gold-bearing sericite schist on the west shore of Jubilee lake.

Form and Structure of the Ore Bodies

Since many of the veins on the properties of the Cooper Gold Mines, Limited, are still in the surface development stage, it is a little early to decide on their form and structure. The bulk of the underground information was obtained from the Minto vein.

Underground the vein pinches and swells and has an average width of from five to six feet. The ends of the vein sections have been bent by cross-faults, which contain no ore, so that they are dragged around and follow in the plane of the cross-fault. Besides this large-scale deformation of the vein, the quartz has been fractured several times. The thicker and more rigid parts of the Minto vein have a smaller gold content than the thinner sections which have received more favourable fracturing (Fig. 12).

Character of the Ore

In the Minto vein native gold can rarely be seen with the naked eye; it is generally fine and mixed with fairly coarse and massive pyrrhotite, pyrite,

and chalcopyrite (Fig. 13). The sulphides are usually massive and seldom have crystal outlines. Patches of massive sulphides several feet across were seen.

The vein in certain places shows massive sulphides with no thin bands of schist included in the quartz; in other places the schist, altered to biotite,

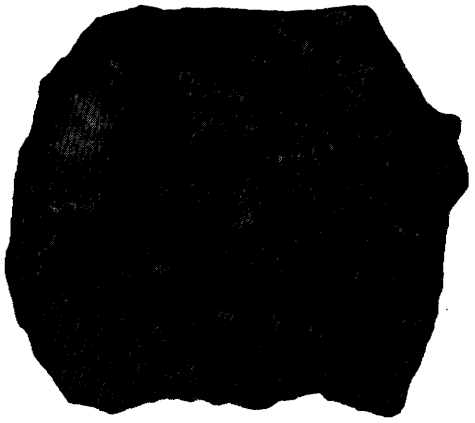


Fig. 13—Specimen (one-half natural size) of one type of Minto ore showing pyrrhotite, chalcopyrite, and pyrite in quartz and ankerite. Note the crushed border of sulphide masses. Veinlets of pyrite also cut the pyrrhotite.

forms dark seams through the quartz (Fig. 14). Quartz of this type is more granular than the variety with no schist inclusions. In places the seams of schist are replaced by sulphides, and this in turn has been favourable for gold deposition.

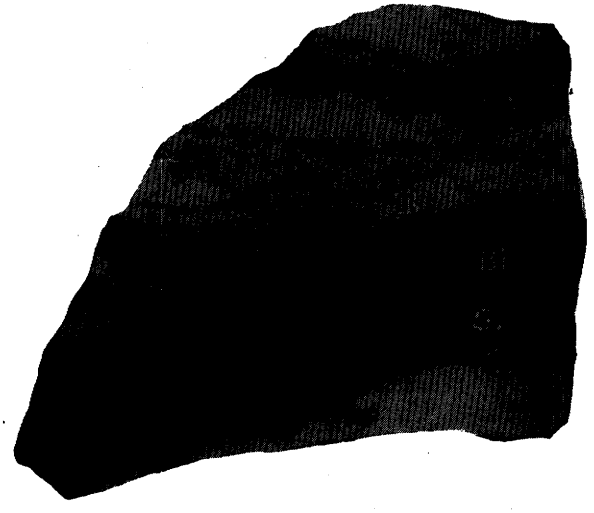


Fig. 14—Specimen (one-half natural size) showing bands of biotite in highly granulated vein quartz, Minto vein. The lighter band is fine-grained sulphides replacing biotite.

The sulphides are usually intimately intergrown, but separate areas of each are also common. In some cases the sulphides are finely crushed, and these crushed bands in places outline the massive sulphides.

The coarsely crystalline ankerite in the Minto vein contains pyrite, chalcopyrite, and pyrrhotite and gives fair gold assays.

It might be said that the higher values in gold are dependent on: (1) extensive crushing in the vein; (2) the amount of sulphides (the more sulphide the higher the gold content); (3) the crushing of the sulphides (fractured and crushed vein sulphides carry more gold than the massive ones); (4) the presence of chalcopyrite, especially fractured chalcopyrite. Chalcopyrite is favourable because it was the sulphide precipitated just prior to the gold.

It is probable that the ore emanated from the more acidic facies of the batholith since the ore solutions contained boron, for the formation of tourmaline, and potash to form biotite and sericite.

Value of the Ore

Hand specimens of the better mineralized portions of the Minto vein may run as high as $70 per ton, but composite channel sampling gives an average grade of about $11 per ton. There is only a small dilution of the ore in the quartz veins, since the vein walls are assay walls and the lamprophyre dikes intersecting the vein are of small volume and produce little waste rock.

Milling tests have not been made on the Minto ore, but no trouble from arsenic or bothersome gangue is anticipated. The treatment will be similar to that of the gold-bearing sulphides of the Porcupine area.

Norwalk Mine

This property, consisting of 17 claims of 618 acres, is situated about two miles south of the Grace mine; the power line from High falls passes through the centre of it. This group of claims, containing several gold-quartz veins, was originally staked by J. H. Teare. Operations were started in 1901 by the Manxman Gold Mining Company and were continued until early in 1903. The mine was then idle until 1908, when it was acquired by the Norwalk Mining Company, who worked the mine during 1909. In 1910 it was transferred to the Le Page Gold Mining Company, and some work was done during that year. It was secured in 1919 by the Grace Mining Company, who overhauled the machinery but did no mining. Mr. Angus Gibson, of Sault Ste. Marie, is one of the principal present owners.

Underground Development

When work finally ceased, a shaft had been sunk to a depth of 254 feet. Two levels were established, one at 110 feet where 100 feet of drifting was done, and another at 200 feet with 120 feet of drifting. A cross-cut was driven 20 feet west from a point 48 feet down in the shaft. On the first level ore has been stoped to a height of 30 feet. No production of gold is recorded by the Department of Mines.

The following notes were received from Mr. Angus Gibson of Sault Ste. Marie on the underground work at the Norwalk mine:—

> The greater part of the work was performed on the Mabel claim, B.Y. 38, where a shaft was sunk to a depth of over 200 feet. The vein was about 10 inches wide on the surface, but was very rich. It dipped under a northward-facing bluff at an angle of about 35 degrees. At a depth of 90 feet or so, it steepened in dip to an angle of 70 to 80 degrees, and a drift was run to the south from the point where the dip changed. The native gold at depth was coarser than on the surface, and pockets of very rich ore were encountered. The men who did the work at the bottom of the 200-foot shaft said that the vein was five feet wide there. Some gold-bearing rock was removed and milled from an open cut just west of the shaft.

A shaft has been sunk on the Fred C. claim, B.Y. 62, to a depth of 128 feet. A large vein was found. At 50 feet in depth, a crosscut 50 feet long was made and showed 24 feet of vein matter. Hand samples from the surface carried $11 per ton in gold. A party, who last sampled the vein, reported a $60 assay.

Surface Plant

The shaft is on claim B.Y. 58 and is connected by a tramway with the mill, which is situated beside a small lake 1,300 feet to the west. The mill contains ten Fraser and Chalmers stamps (No. 112), a boiler, a 46-horsepower engine, and amalgamating plates. The power plant includes electric motors, air compressor, hoisting engine, and jaw crusher. Electric power from High falls on the Michipicoten river, a few miles to the south, was used in the last operations.

Geological Features

The western part of the Norwalk group is made up of sheared Keewatin schists and quartz porphyries. North, south, and east of the mill, granodiorite forms the greatest volume of rock and has included in it patches of greenstone. Diabase dikes were seen at the Fred C. shaft and on the north side of the lake on B.Y. 53. Several steep east-west rock ridges traverse the Norwalk group of claims.

Vein System

At the main shaft, the vein is in a sheared zone in granodiorite, which strikes east. The vein dips 35° S., and an inclined shaft has been sunk following the dip of the vein. As the mine was filled with water, the character of the vein could be learned only from the small visible part of the outcrop and from material on the mine dump. In general it may be said that the veins on this property are single fissure veins closely connected in origin with the granodiorite, which is rich in quartz and almost porphyritic.

A slightly different type of vein appears on B.Y. 66 and 67, where quartz lenses occur in an ankerite lode in a sheared area of Keewatin and strike northwest. A short distance away, dikes of fine-grained, sheared quartz porphyry appear. Coarse gold has been found here in the carbonate-quartz mineralization.

Other veins are known on claims B.Y. 52, 60, 62, and 65; their general strike is northwest.

Form and Structure of the Ore Bodies

No detailed information is possible concerning ore shoots on the main vein on B.Y. 58, but from surface indications the ore shoot follows the plane of the quartz vein. Part of the ore is in mineralized, sheared granodiorite, some of which was blasted near the shaft and milled. It is said to have contained a small amount of gold per ton.

Character of the Ore

The ore from the main shaft consists of mineralized quartz, containing pyrite and arsenopyrite, and mineralized schist composed largely of sericite, pyrite, and arsenopyrite. The quartz of the Norwalk vein in most places has a fairly glassy lustre, but where it has inclusions of wall rock it has a sugary texture due to crushing.

A pit on the hill a short distance south of the Norwalk shaft contains a quartz vein that is five or six feet wide. This vein is slightly fractured and has patches of massive sulphides such as pyrite and arsenopyrite; fair gold assays are reported from it.

At the Fred C. shaft a quartz vein with a northwesterly strike is surrounded by greenstone and diabase. The ore is a massive pyrrhotite with some chalcopyrite. Assays from this vein are reported to be commercial.

Value of the Ore

No account was available of the tenor of the ore mined during the operations of 1903 and 1909. An assay of schist mineralized with fine needles of arsenopyrite from the Norwalk shaft carried $3.80, and one on the coarse arsenopyrite and pyrite from the pit south of the Norwalk shaft carried $2.30 per ton in gold.

Kitchigami Mine

The Kitchigami vein, found in the early days of the camp by J. H. Teare, is similar to the Norwalk vein; it lies in a fissure in massive granodiorite, strikes northwest, and dips about 45° N.E. A band of greenstone forms the hanging wall of the vein where it was examined at the inclined shaft a little north of the mill.

The mill buildings are still standing, but the machinery is partly dismantled. Electric power from High Falls power plant was used during the early mining operations.

The following data were received from Angus Gibson of Sault Ste. Marie:—

The Kitchigami group consists of seven claims: C.B. 1 and 2 and Y. 333-37. The main vein is opened by three shafts and one pit, the reason being that originally the staking was done by different men on the same strike. These owners were subsequently bought out by the Kitchigami Company. There are four shafts. The distance between Nos. 1 and 4 is 361 feet.

No. 1 shaft is about 100 feet deep and has a station at 65 feet, where drifts of 21 feet each have been run north and south. The north drift showed very good values. No. 3 shaft is down 110 feet, the vein having a smooth foot wall, and is from eight to nine feet wide in the deeper part of the shaft. No. 4 shaft is said to be 90 feet deep. The surface showing at No. 4 was rich to a depth of 25 feet where the vein was faulted. Gold-bearing quartz can be secured on various parts of the property.

One parallel vein, 100 feet east of the main vein, is well defined and outcrops on the high hill near the Kitchigami power-house. It has a length of nearly half a mile.

Lamprophyre dikes cut the quartz veins, and pendants of greenstone were seen at and near the mine. On account of the shafts being flooded and the dump of vein material having been much cobbed, it was difficult to arrive at an idea of the commercial value of the veins. It is reported that coarse gold was not uncommon in the early workings.

Principal Prospects

Golden Reed

The veins of the Golden Reed group are off the main mineral belt which stretches northward from the Norwalk mine. The group lies near the southeastern part of township 29, range 23, and is served by a wagon road from the Mission. In 1926, this road was extended for a mile or so to the northeast to reach the Laccolith claims.

The Golden Reed Mining Company acquired claims J.L. 84, and Nos. 173, 174, 175; Mr. M. Gates, of Sault Ste. Marie, Mich., was president of the company in 1909.

The shaft, which is located on claim J.L. 84, is 40 feet deep on an incline of 60 degrees.[1] It was sunk at the junction of two veins, one trending north of east and the other at right angles to it. The mill is a short distance from the shaft, and the ore is hoisted directly into the mill. A crusher, a Huntingdon mill, and amalgamation plates were installed and a few tests made, steam power being used. The company were awaiting electric power from High falls at the time of the visit of E. T. Corkill, Inspector of Mines, in 1909; but the power line was never extended to this property.

A belt of northwestward-trending granitic and dioritic rocks extends across the road near the mill on claim J.L. 84. East of the mill basic schists and amphibolite are in some volume.

A 30-foot adit has been driven west on the vein from the collar of the main shaft. The veins are in granodiorite and consist of a glassy-looking quartz. In places the vein shows widths of as much as three feet. Pyrite and chalcopyrite formed the chief vein sulphides, but were not widespread or plentiful. No native gold was seen. Some work has been done on a vein said to carry native gold in quartz on claim No. 133.

Cooper and Ganley Veins

The Cooper and Ganley prospects are situated northeast of the Minto vein. The Cooper vein, which has been diamond-drilled by the Pioneer Mining Corporation, is really a northward continuation of the Ganley vein, which was found in the early days of the camp. This long vein, which has been stripped for several hundred feet on the surface, strikes N. 30° E. and dips 45° E. The vein is a fissure one, and some of the schist, especially at the north end of the Cooper vein, is mineralized with sulphides and gold as well as showing replacement by biotite and tourmaline.

In the vicinity of the gold-quartz veins, pendants of greenstone are enclosed by diorites of varying composition; the principal shearing and faulting strikes northwest and southeast.

The northern end of the vein on the Cooper property was carefully examined by the Cooper Gold Mines, Limited. After trenching and drilling they found that the ore shoot exposed on the surface was not so continuous underground.

The gold is erratic and chiefly in vugs, but there are places in the vein where the sulphides were more abundant and the gold values more consistent. Between the work on the north end of the vein and the old Ganley shaft, a large piece of native gold was seen in the outcrop of the vein. The Ganley vein quartz has a massive appearance with few sulphides showing.

A shaft 50 feet or so deep was put down on the Ganley vein. An old boiler and hoisting machinery were seen lying near the shaft, exposed to the weather.

Hornblende Vein

The Hornblende vein is on claim No. 84. It strikes east and dips south. The diorite wall rock of the vein has been sheared and shows replacement by biotite and tourmaline.

It was beside this vein in the early days that Peter Nissen built a trial battery of two stamps, invented by himself. Apparently the vein did not pay, but the stamps have since brought the inventor a large revenue as they were used extensively on the Rand, South Africa, where the tough ore yielded to the force of the heavy stamps.

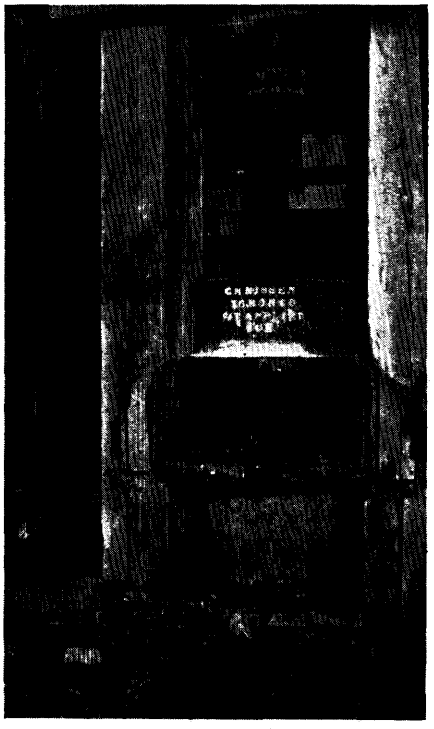
[1]Ont. Dept. Mines, Vol. XVIII, 1909, pp. 91-92.

A picture of one of the original Nissen stamps in the old Hornblende mill, which is perched on a high rocky cliff in sight of the Minto road, is shown in the photograph below. A few improvements have since been added to these stamps, first tried out in Michipicoten.

Laccolith Group

The Laccolith Mining Company have two large groups of claims, one near Michipicoten Mission, where a set of cabins was built and some diamond-drilling done; the other group lies along the east border of township 29, range 23.

Near the Mission the principal work was performed at the contact of a small granitic boss with Keewatin greenstone. Some gold was found, but no details are known about the form or structure of the vein system.



Nissen stamp, Hornblende mill, Michipicoten.

On the eastern group north of Leroy lake, the claims are underlain by Keewatin greenstones. Several small quartz veins were seen by the writer; one outcrops near the northeast corner of a small lake on claim No. 1,258.

In general, the veins in this eastern group strike nearly north, in accord with the general trend of the greenstone mass that encloses them.

Gibson Iron Claims

A group of fifteen claims was staked several years ago near the northeast corner of township 29, range 23, by Angus Gibson and associates of Sault Ste. Marie. The country covered by these claims is rather flat, and the east side of the group is chiefly a sand plain; but small outcrops of carbonate rock show above the sand.

The main object of economic interest is a band of dolomitic rock, probably of Keewatin age, that passes through the claims from southwest to northeast. On the surface the carbonate has been weathered, and a shallow layer of soft hematite covers the solid iron-bearing carbonates below. The important point to ascertain concerning this occurrence is the amount of iron connected with the solid carbonates below. Several trenches have been dug along the carbonate rock and in a few places the carbonate appears to have a considerable iron content. The better type of carbonate is coarsely crystalline, exhibits bright cleavage faces, and is heavy in the hand. A chemical analysis shows the carbonate to be a ferruginous dolomite.

An analysis for the total iron content of a hand sample of the better looking carbonate showed 6.96 per cent. metallic iron and 0.77 per cent. metallic manganese.

Because this area is near the Helen iron range to the northwest and is known to carry bodies of iron carbonate, it is worth while to prospect further the band of iron-bearing carbonates.

The western edge of the carbonate is bordered by a ridge of Keewatin greenstone; near this greenstone the carbonate mass has been faulted and shows a little more hematite. On the east and northeast of the group of camps, the carbonates have been bleached and recrystallized, as the result of igneous contact action, to a white, coarse marble that contains blebs of magnetite and scales of biotite. On account of the small number of outcrops it is impossible to say much about the contact action on this carbonate band of rocks. If dikes could be located cutting the carbonate, an enrichment of iron might be found near them, providing a structural basin was present that favoured surface enrichment of iron. The band of carbonate appears to strike about N. 20° E.

Weary Willie

On this claim (No. 3,396) situated in the face of a cliff near the north bank of the Michipicoten river, a quartz vein was staked in the early days; since then it has been stripped and a small test pit has been sunk on it.

The rocks that enclose the vein are highly sheared Keewatin basic rocks. The vein has a bluish colour and is between two and three feet wide. Ankerite, the iron-bearing vein carbonate, is prominent in and near the vein, and pyrite is the chief vein sulphide.

The break is very definite and the vein doubtless extends a great distance, probably as far as the Willis claim to the northwest where a shaft has been sunk on a vein, similar in appearance, on the continuation of the strike of the Weary Willie vein.

Claims B.Y. 31 and 81

Several pits and adits have been made on a group of claims along the Mission road on claims B.Y. 31 and 81. The country rock is a basic Keewatin volcanic. A banded iron formation, consisting of jaspilite, silica, and some pyrite, attracted the attention of the prospectors in the early days. There is no definite fissure vein or gold mineralization with the banded iron formation at these pits. An assay of the pyrite-bearing iron formation gave no values in gold. A little farther west in the same rocks a fissure vein of quartz outcrops on the face of a steep Keewatin cliff and has been explored by two adits; it is fairly well mineralized.

Cora

The old Cora shaft is situated at the north end of Jubilee lake on claim No. 2,489. The Cora vein is a continuation of the Jubilee and on the same strike with it. The quartz is glassy and contains much black tourmaline and ankerite like that at the Jubilee shaft. Pyrite is the chief sulphide, but it is not abundant.

The heavy shear zone that borders the west shore of Jubilee lake passes through this claim. The old work was confined to two fairly deep test pits. Diorite and greenstone form the principal country rocks. The Power and Mines Syndicate, who have optioned the two Cora claims, have built cabins and propose to explore the veins in 1927.

Mackey Point (Y. 103)

On this point an amphibolite or coarse greenstone, either massive or sheared, is the main rock; it is intruded by a granodiorite porphyry, which forms a submerged ridge that is best exposed at the west end of the point.

The gold-quartz veins dip into and apparently originate in the intrusive ridge of porphyry. Veins on the north side of the point dip southward at a steep angle towards the porphyry; those on the south side of the point dip about 45° N. All the veins strike east. Two fairly deep pits and several shallow ones were seen on the south side where most of the veins are located.

The native gold is mostly in vugs in the quartz veins; black tourmaline is fairly common, and sulphides are not abundant.

Mariposa Group

This group of claims, comprising J.D. 1, 2, 3, and 4, touches the Grace group at its northeast corner. In the early days a shaft was sunk to a depth of 208 feet on the incline of the vein, which dips at a steep angle towards the north. This shaft is situated on claim J.D. 2. Several pits were also put down.

A dark grey diorite is the chief country rock near the vein. West of the shaft the large northwest-southeast vein is intersected by a vein striking northeast near the outcrop of a lamprophyre dike.

The vein quartz is glassy, with ankerite as the main gangue and pyrite as the chief sulphide mineral. It is reported that the better gold content in the vein was found west of the shaft near the vein intersections.

Vein on Claim No. 3,375

A large quartz vein, several feet wide, extends northwestward across claim No. 3,375. This vein is one of the most continuous in the camp and passes at the northwest end on to the Mariposa group; its commercial value is not known at present, but in the sections examined it had very few sulphides.

Andargo Group

On the old tote road between Wawa and Hawk lakes, northwest of the Gibson iron group, a zone mineralized with chalcopyrite carrying values in gold and silver has been staked by J. H. Teare for a Sault Ste. Marie syndicate. This discovery has recently been optioned to the Coniagas Mining Company for further exploratory work.

The country rock is a Keewatin greenstone which has been brecciated over a zone twenty feet wide; this brecciated belt strikes at 100° mag. The Keewatin

schists trend N. 70° E. mag., and the schistosity planes dip 70° N. The chalcopyrite mineralization was observed along a distance of a few hundred feet. A diorite porphyry outcrops at the west end of the break.

Further exploration of this prospect will be necessary to determine its commercial possibilities.

Along the road to the west of the discovery a conglomerate resembling that of the Timiskaming series was seen. The rocks in the vicinity merit further prospecting since the Algoman intrusives and Keewatin schist relations are favourable for mineralization.

Soo Mining Company

This claim (No. 3,491) is reached by a rough branch road that runs east from the Mission road at a point a little south of the Grace mine. The greater part of the rock on this claim is Keewatin greenstone, which is cut by small bodies of diorite.

One feature that distinguishes the mineralization here is the occurrence of galena and sphalerite in a sugary-textured quartz vein. These sulphides do not make up a very large percentage of the vein matter, so that the commercial metal values would be either in gold or silver, not in lead or zinc. A pit six feet deep and about twenty feet long has been made on the vein. Another vein system a short distance to the north has pyrrhotite as the main vein sulphide.

Sunrise Vein

A number of mineralized quartz veins in diorite appear near the northeast corner or No. 1 post of claim Y. 330. Most of the veins here strike a little south of east. The Sunrise vein proper is about 100 feet east of the No. 1 post and crosses several claims that come together near the shaft. The Sunrise discovery is served by a road that runs east from the Minto mine.

A cabin is situated about thirty feet northeast of the No. 1 post, and the old shaft is about 70 feet east of this cabin. The wall rock of the vein is a fine-grained grey diorite, which has been sheared in places, and shows biotitic alteration. A lamprophyre dike was apparently encountered underground, as this rock was seen on the dump. The glassy vein quartz is either white or grey. The common vein sulphides were noted; chalcopyrite was the most plentiful.

Stenabaugh Vein

A vein on this claim (No. 3,723) was explored by the Stenabaugh brothers. The vein strikes N. 85° E. mag., and the bordering rock is a Keewatin greenstone. The vein is a single, well-defined fissure one, but in a few places along the same strike a network of smaller quartz veins takes its place. The smaller veins are more prominent towards the west end of the vein system, where there is more carbonate and fewer sulphides.

A set of small parallel veins outcrops on the slope north of the east end of the large vein. The schistosity planes dip 80° S.

Near the east end a 15-foot test pit has been sunk on the vein. In this place sulphides are a little more prominent but are not conspicuous. The writer obtained a high gold assay here on a sample of the best-looking vein matter. Native gold is reported from this pit. About 250 feet of the vein has been exposed by stripping.

Willis Vein

Near the centre of this claim (No. 3,290), on low ground, an old shaft was seen that had been sunk on a vein of bluish quartz a few feet wide. The shaft is said to be 6 by 8 by 60 feet and was sunk by a Mr. Willis in 1900.

The vein matter, of bluish quartz and ankerite, is identical with that of the vein on the Weary Willie claim to the southeast on the same strike. The Keewatin rocks that underlie the claims in this vicinity are heavily sheared and merit further prospecting.

Smith Vein

A continuous quartz vein, which strikes N. 30° W., was found on claim No. 4,596 and is known as the Smith vein. This vein has been stripped for several hundred feet and is fairly uniform in width, the average being about 30 inches.

Native gold was seen in a few places, especially where a branch vein is given off to the west. Very few sulphides appeared in the quartz; the wall rock was an altered Keewatin greenstone.

O'Keefe Vein (Claim No. 4,641)

Near the south shore of Wawa lake a narrow northwest-southeast vein was found close to the Smith vein. The country is very hilly in this vicinity, and the vein appears on the face of a steep ridge that faces north and borders the south shore of Wawa lake. The maximum width of the O'Keefe gold-quartz vein was about six inches. The quartz is crushed and shows pyrite and chalcopyrite and some fairly coarse gold. The country near the O'Keefe and Smith veins has been heavily faulted. Further prospecting may reveal larger and richer veins.

Claims Nos. 3,250 and 3,251

A wide quartz vein, locally known as the "Big Dome," was found near the southwest corner of claim No. 3,250 and partly on claim No. 3,251. The general strike is north, and the vein is surrounded by greenstone. About 200 feet of this large quartz mass was trenched and examined by the Cooper Gold Mines, Limited, but was not found to be of commercial importance. In places the vein is about thirty feet wide and narrows towards the north.

Claim No. 4,293

Considerable work was performed in exploring a vein system near the southeast corner of claim No. 4,293. The vein is fairly wide and appears to strike northwest. There is carbonate containing pyrite near the quartz vein proper. The chief vein sulphides associated with the quartz are pyrite, pyrrhotite, and chalcopyrite.

Within the six-rayed system of trenching were found greenstone, porphyry, vein quartz, carbonates, and amphibolite. Four shallow pits were also put down during the recent development.

Widths of over twenty feet can be obtained on vein quartz if measurements are taken northwest-southeast. It is probable that this is the strike of the vein. The strike and dip of the vein were obscured by drift.

Discovery of Cobalt Bloom

The writer was shown some cobalt bloom or erythrite by Larry Peters, who claimed to have found it near the Mission road southwest of the west end of Wawa lake. Mr. Peters also stated that it was found in diabase. It would be worth while to investigate this discovery since cobalt bloom is one of the surface indications of the silver veins at Cobalt, Ont., the bloom being a weathering product of a cobalt mineral that in places accompanies native silver.

McPhail, Goodman, Burns, Leishman Group

A large rectangular group of twelve unsurveyed claims has been staked about half a mile west of the Minto vein. Very little development work has been done on this ground, which has some potentialities. If the Jubilee break is found to continue to the southwest, it will cut across the southeast corner of the group.

The west edge of these claims is fairly close to the main Keewatin greenstone contact. On account of the proximity of the group to known breaks and gold-bearing ground, further prospecting is warranted.

Shier Group

This group of claims, comprising, J.D. 12, 13, 14, 15, and No. 3,104, lies about half a mile east of Jubilee lake and about the same distance northeast of Minto lake. Several veins were seen by the writer. One vein that crossed the west boundary of claim No. 3,105 was made up of glassy quartz and a few sulphides. It was bordered by diorite on the south and chlorite schist on the north and cut by a lamprophyre dike. The vein strikes a few degrees south of east, dips 45° N., and averages from four to five feet in width. Another vein was seen on the central part of the east boundary of claim J.D. 14, which had an easterly strike and was bordered on the north by quartz porphyry and on the south by granodiorite. The gangue was ankerite, biotite, and chlorite, and the sulphide was coarsely crystallized pyrite.

A vein outcropipng near the northeast corner of claim J.D. 12 strikes N. 70° E. and dips 60° S. It averages three or four feet in width and has inclusions of Keewatin schist, which are pyritized in places. Diorite forms the hanging wall and a carbonatized schist, the footwall.

A vein said to carry native gold and to have an easterly strike is reported to occur near the southeast corner of claim No. 4,616.

Valenti Group

The Valenti group is situated a short distance northeast of High falls and comprises claims Nos. 1,498, 1,509, 4,105, 1,481, 1,482, 4,106, 1,488, and 1,483. One set of veins lies on the west side and another on the east side of the creek. The western set are about 300 feet north of the cabin. They are enclosed by Keewatin basic schist and have been cross-faulted into three sections. Their strike is northwest. The quartz is well mineralized and in the north and south sections contains commercial values in gold, in widths of from three to four feet.

The vein on the east side of the creek has the same strike as those on the west side and is almost in line with them. A 10-foot pit has been sunk at the north end of this vein. The chief sulphide is pyrite, and the vein is not far from a ridge of granodiorite to the southeast. The gold assays are not as high as in the west veins, but an assay of several dollars per ton over a width of 96 inches was obtained at the pit on its southeast side.

The Valenti cabin is near the southeast corner of claim No. 1,498. The valley here is sand filled, and little stripping has been done. The gold found justifies further work. Some very rich gold-bearing float was found on the east side of Firesand river, about 200 yards northeast of the Valenti cabin.

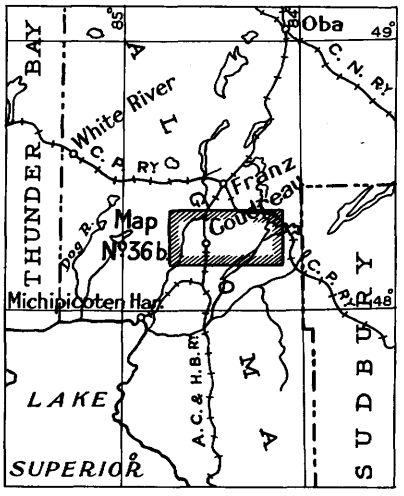
War Eagle

The vein system on claim No. 3,492 is situated a short distance northeast of the Dysey farm. There has been considerable stripping done, and two pits have been sunk on this claim. At the north end of the workings a well-mineralized, vertical, quartz fissure vein about three feet wide cuts through a hill composed of greenstone and quartz porphyry. At the base of the hill a pit has been sunk on the vein. A little south of the pit, Keewatin schist filled with small, branching quartz veins has been contorted and drag-folded in a northeast direction.

At the southern part of the trenching, a hillside has been stripped to bed rock, and there has been exposed on it a large quartz vein that strikes north. The Keewatin schist that forms the principal rock in this place is filled with small quartz veinlets that have been drag-folded and granulated; in places the chlorite schist has been altered to biotite. Where the sulphides are most abundant, needles of arsenopyrite and tourmaline and crystals of pyrite are found in a sericite schist (Fig. 8). This ore assayed $9.20 per ton in gold.

The gold mineralization on this claim is in a roof pendant of basic Keewatin schist. The schistose gold-bearing rock appears to extend northeast and southwest, while the pronounced fissure quartz veins trend north and cut the schist belt. Mineralization and quartz veins were noted east and west of the work on claim No. 3,492.

Channel sampling on the War Eagle veins along the southern vein system has shown commercial assays in gold. The problem on this claim is to decide the volume of commercial gold ore.



Key map, scale 50 miles to the inch, showing position of the Goudreau-Lochalsh area.

Goudreau-Lochalsh Gold Area, District of Algoma

By T. L. Gledhill

INTRODUCTION

Goudreau village, after which the mining area has taken its name, is seventeen miles south of Franz and 177 miles north of Sault Ste. Marie. Prospectors' supplies may be obtained either at Goudreau or Lochalsh, besides hotel, mail, express, and telegraph service.

The gold discoveries are fairly recent, the first gold having been found at Webb lake in 1918. The area has not been thoroughly prospected, and the geology is favourable for gold. Immense tonnages of pyrite are also available.



Goudreau village, 1926.

The mineralized area is a long and narrow one, several miles in width, stretching from the Magpie river at the west to Dog lake on the east, a distance of about forty miles. The main claim-staking has been done in a double row of townships in ranges 26 and 27 of the district of Algoma. The gold-bearing rocks are not confined to this area alone; similar rocks extend to the west and east. These, however, have been little prospected. Gold is also known to occur on Jackfish and Manitowik lakes to the south.

Access

The field can be reached either from Goudreau or Lochalsh railway stations, the latter being at the east end and the former near the centre of the discoveries. An automobile road built by the Ontario Government leads west from Goudreau to the property of the Goudreau Gold Mines, Limited, on Murphy lake, and east

as far as the Cline Canadian Gold Mines, Limited. From the Cline property to Lochalsh the road is rather rough. A branch road from Lochalsh serves the claims surrounding Godon lake. A bush road has been cut from the Goudreau Gold Mines in a northeasterly direction to the Magpie river. Canoe routes were used to reach the various parts of the field in the roadless days, but a canoe is now unnecessary except to visit outlying places such as Jackfish and Boundary lakes.

Several old tote roads cross the map area, the principal one being the Pic road, parts of which can still be used. By railway the distance from Goudreau to Michipicoten Harbour is forty miles. This down-grade track was used during the World War in shipping pyrite from the Goudreau deposits by lake steamers.

The ride from Sault Ste. Marie to Goudreau on the Algoma Central railway affords many fine views of waterfalls, lakes, and rocky ravines. Lake Superior and the islands near its shore can also occasionally be seen from the train. In autumn the multi-coloured maple woods of the Agawa river canyon are a delight to the eye.

Field Work and Acknowledgments

The writer with three assistants, A. Graham, F. J. Sugden, and H. Smith, commenced a study of the gold deposits early in June, 1926, and later on in the season examined those of the Michipicoten gold area, near Michipicoten Harbour.

The purpose of the season's investigation was to determine the various rock types, the structure, and the mineralization associated with the gold. Cross-section lines were run by pacing to discover the extent of the favourable gold-bearing rocks. The maps issued by W. H. Collins and associates in Memoir No. 147 of the Geological Survey of Canada were of great help and have been freely used in the preparation of the map accompanying this report.

Large-scale surveys were made with a plane table of the principal gold occurrences, namely: Goudreau Gold Mines, Limited, the McCarthy-Webb veins, the Pinard discovery north of Pine lake, and the veins on the Cline property. The details in these key maps present some of the finer points of the rocks and structures connected with the gold deposits.

All the gold finds known at the time of the writer's visit were examined, including the old Emily gold prospect on Dog lake.

Many kindnesses were received from the residents of Goudreau and from prospectors in the field. This opportunity is taken to thank them for their hospitality and co-operation.

Previous Geological Work

The Goudreau area has received attention chiefly on account of its pyrite and gold deposits. A. G. Burrows,[1] Provincial Geologist, examined the spectacular gold finds made by Thomas Murphy in 1921 and outlined the boundary of the small plutonic boss to the west of Murphy lake.

Professor Ellis Thomson described the Goudreau gold deposits in the Summary Report of the Canadian Geological Survey, 1921, pages 17D to 26D, and in Memoir No. 147, 1926.

The pyrite deposits at Goudreau have been known for more than twenty years and have been visited by a number of geologists, including A. B. Willmott and A. P. Coleman. The economic importance of the pyrite was not realized until the World War, when it became imperative to obtain a supply of sulphur.

[1]Can. Min. Jour., Aug. 5, 1921, pp. 621-22.

On account of the size, high grade, and accessibility of these pyrite deposits, they were intensely worked during the years 1915-18. W. H. Collins and associates have made them an object of study, the results of which have been published recently in Memoir No. 147 of the Canadian Geological Survey.

The Goudreau area has been well described by G. W. McLeod, mining engineer of the Algoma Central and Hudson Bay Railway, in the Canadian Mining Journal, April 20, 1923, pages 295-97; and the gold area was described in the Bulletin of the Canadian Mining Institute for March, 1926, by G. W. McLeod and G. S. Cowie.

Discoveries of Gold

Goudreau and the surrounding country became known as a gold camp in 1918, following the discovery of native gold by J. W. Webb near Webb lake, eight miles east of Goudreau, on claims staked for pyrite and now known as the McCarthy-Webb property. Interest had been attracted to the pyrite and iron ranges of Goudreau several years before the Webb gold discovery. Following this, the activities of the prospectors were soon directed towards the gold. Staking was chiefly confined to townships 48 and 49 along the Canadian Pacific railway, and a number of promising discoveries were made.

In November, 1920, gold was found near the north shore of Godon lake, in township 47; since then many claims have been staked in that township.

In April, 1921, a rich shoot of coarse gold was discovered by Thomas Murphy and James Perry on Murphy lake, in the central part of township 28, range 26. After this find several hundred claims were staked, covering nearly all of township 28 and parts of the adjoining townships.

As fresh discoveries were made, staking around them spread; at the present time there is a continuous belt of claims, ranging from one to six miles in width and extending east and west for a distance of twenty-five miles.

The more recent discoveries have been made north of Pine lake, near Maskinonge lake, on claim No. 4,200; at the east end of Jackfish, a large lake south of Pine lake; and on claim A.C. 495 of the Porter-Premier group west of Murphy lake.

Gold had been found as early as 1896 on Dog lake at the Emily prospect.

Topography and Forests

The Goudreau field is part of the old pre-Cambrian peneplain about Lake Superior and is in accord with its usual subdued features. There is no pronounced ridge-making rock.

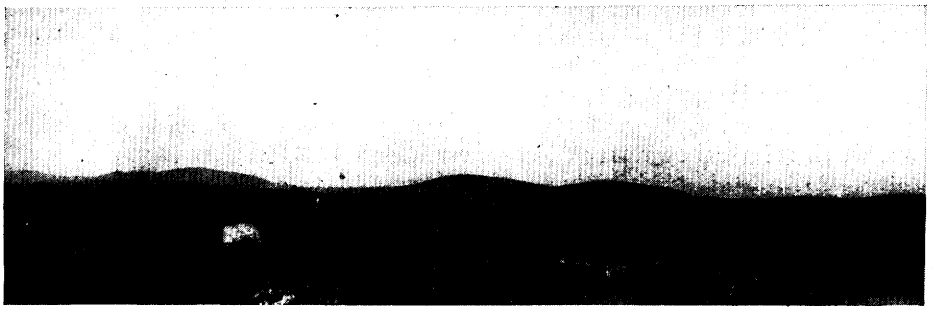
The surface of the area presents a series of east-west, low, parallel ridges and an occasional north-south ridge, with sandy or marshy ground between them. The rocky elevations seldom rise more than seventy-five feet above the general level; exceptions occur in the granitic areas east and west of Herman lake and in some of the hills near Dog lake. The valleys are sculptured out along the lines of more intense shearing, and the lakes are also along these zones. The average level of the country above sea-level is about 1,200 feet.

The whole area containing the pyrite and gold deposits has been burned over several times, the last fire being about fifteen years ago. The present forest is chiefly second-growth poplar and birch of small diameter. Cedar and spruce grow mainly in the low, wet ground. There is little timber left excepting in the swampy areas or near the waterways. A small stand of red pine at Pine lake has survived the fire.

The northern half of the eastern part of the field is largely sand plain overgrown with small jackpine. Outside of the ridges and higher ground, the rock is covered with sand and gravel. Generally this drift covering is not deep, but the discoveries of gold and pyrite are confined almost invariably to the better exposed ground.

The pyrite deposits of the iron-range type, which contain small amounts of magnetite and pyrrhotite, have been found in part through the drift cover by dip-needle surveys.

The drainage of the Goudreau area has been impaired by glacial damming, so that the run-off finds its way into the Michipicoten or Magpie river systems by a series of small streams, or is held in land-locked lakes. The height of land between Hudson bay and Lake Superior waters follows approximately the line of the Canadian Pacific railway, which runs north and south of Missanabie station on Dog lake.



Range of granite hills north of Maskinonge lake.

Fish and Game

Pike and pickerel are found in the warmer lakes and rivers, but trout prefer the cold, clear water. Several small lakes west of Herman lake contain lake trout, and brook trout may be caught in McVeigh creek. In July, 1926, the writer saw a 15-pound grey trout from one of the small lakes west of Herman lake. Dog lake has recently been stocked with black bass. Trout are caught in the waters of the Michipicoten river, but not in those of the Magpie.

Since the large trees have been destroyed by fire, fur-bearing animals have diminished in number. However, mink, beaver, otter, and fox are fairly plentiful. The 15-year-old growth of poplar and birch makes a splendid cover and food for large numbers of moose as well as a small number of red deer.

Hydro-Electric Power

The Goudreau area is favourably situated in respect to hydro-electric power, especially the west end of the camp. Two large waterfalls have been developed, one at High falls on the Michipicoten river and the other at Steep Hill falls on the Magpie river. Power lines from these two locations meet at Goudreau, and a proposed continuation of the present line, east of Goudreau, has been surveyed. During the summer of 1926 the Insull power interests of Chicago built a new power line from High falls to Goudreau. The line from the Steep Hill Falls plant was continued from the property of the Goudreau Gold

Mines to Goudreau. This power development now serves half of the gold area as well as the principal pyrite deposits. High falls is capable of developing 7,500 horse-power, and Steep Hill falls, 2,800 horse-power. Both the Magpie and Michipicoten rivers have a number of smaller falls that are of importance. The power sites are situated near Lake Superior because the gradients of the Magpie and Michipicoten rivers increase suddenly in the last six or ten miles of their courses.

Hydro-electric power for the east end of the Goudreau gold field could be developed at the Big Stony Portage falls near the outlet of Dog lake on the Michipicoten river. The headwaters of the Magpie and Michipicoten rivers contain a number of large lakes, like Dog, Whitefish, and Manitowik, which serve as storage basins.



Power plant of Algoma Steel Corporation at Steep Hill falls on the Magpie river.

Pneumatic Drills for Development Work

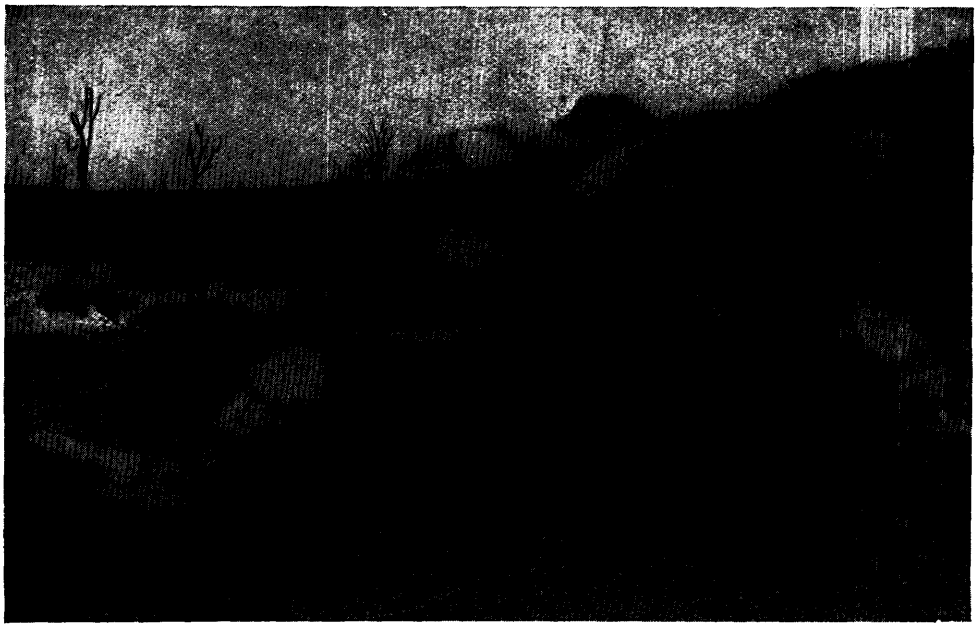
On the Fred Brandt group of claims near Goudreau, a large amount of development work, in the form of rock trenches and test pits, was done in a very efficient manner by the use of a small gasoline-driven air compressor. As machine methods of prospecting are becoming more important, a short description of the drill outfit and its advantages will be given.

One air-driven drill required the services of three men for the various operations, such as sharpening the drill steel, attending to the compressor, using the drill, and in the removal of the blasted rock. Air from the compressor was utilized to supply the draft for the blacksmith's forge, thus saving the services of a man and the cost of a hand blower. The hotter fire made possible by the compressed air resulted in a quicker and better sharpening of the drills.

Portable pneumatic drill outfits of this type are a distinct advance on hand-drilling methods, both in the amount of work done and in the cost of the work, air-drilling being about 50 per cent. less expensive than hand-drilling. Small air

compressor outfits with drum hoists attached have been used to sink shafts to 150 feet and to drift at that level. Water-pump attachments are also possible, such pumps being useful in unwatering shafts and trenches.

The advantages of the pneumatic drill over the hand drill are clear when one considers that a person unskilled in rock-drilling can drill more and deeper holes at almost any angle with an air drill. Being able to point the holes at angles that would be inconvenient with hand drills results in the breaking of more rock in a given period and in a saving of dynamite. Gasoline tractors have been used to draw the compressors over bush roads and also to furnish the additional power needed in hoisting rock. The cost of the complete outfit is only a few thousand dollars.



Portable pneumatic drill with compressor, double-drum hoist, and tractor.

GENERAL GEOLOGY

Introduction

The Goudreau gold field is situated near the north edge of a wide belt of Keewatin rocks that extends northeast from Michipicoten Harbour. The Goudreau rocks, especially the massive ones, resemble the gold-bearing rocks near High falls at the south end of the Michipicoten gold field.

Apparently the pre-Cambrian rocks have been undergoing peneplanation since the close of the pre-Cambrian period. The old mamillated rock surface is now partly covered by unconsolidated glacial and Recent deposits of sand, gravel, clay, and peat.

Table of Formations

QUATERNARY:	Sand, gravel, clay, and peat beds.
PRE-CAMBRIAN	
KEWEENAWAN:	Quartz and normal diabase dikes and masses of peridotite.
Intrusive contact	
ALGOMAN-LIKE INTRUSIVES:	Granodiorite, quartz diorites, quartz porphyries, syenite, cancrinite-nephelite syenite.
Intrusive contact	
TIMISKAMING-LIKE SEDIMENTS:	Slate, greywacké, arkose, conglomerate.
Great uniformity	
LAURENTIAN-LIKE GNEISS:[1]	Represented chiefly by gneissoid boulders in the Timiskaming series bordering the gold area on the north.
Intrusive contact	
KEEWATIN:	Altered and schistose basalt, rhyolite, dacite, slates, carbonate beds, quartzite, and banded iron formation.

Keewatin

The oldest and most extensive series of rocks in the area are the Keewatin volcanics and sediments. They were originally basalt flows, tuffs, agglomerate, carbonate beds, quartzite, and banded iron formation or jaspilite. These rocks, which are highly folded and intensely sheared, form the cover of the granitic rocks which outcrop only here and there as a result of erosion.

Regionally, the Keewatin series has been altered to a mixture of quartz, carbonate, chlorite, and zoisite, as in other Lake Superior areas, the change from the original basalts being accomplished mainly by additions of carbon dioxide and water. Some of the volcanics bordering the pyrite deposits have been altered to ottrelite-bearing sericite and chlorite schist. The pillow structure and vesicles of the lavas as a rule have been destroyed by crushing and shearing.

Laurentian

There is no direct proof that granite of Laurentian or, in other words, Archean age exists in the area. Pebbles and boulders of an old Laurentian-like granite are found in the Timiskaming sediments.

Timiskaming

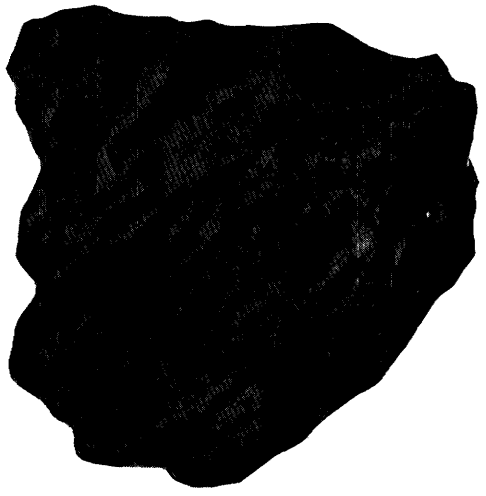
Between the main granite mass at the north and the small bosses of granite that brought the gold are a few narrow belts of old sediments extending east and west and consisting of conglomerate, greywacké, arkose, and slate. They have been highly folded and sheared like the Keewatin volcanics in which they are enfolded. The conglomerate contains masses of jaspilite. Mechanically prepared rock fragments make up the bulk of these sediments as they do in sediments of the Timiskaming type in other areas.

[1]The question of two ages of granitic rocks in this area has not been settled.

Algoman

The massive granitoid rocks and their porphyritic variations, which form the gold-bearing intrusives in the Goudreau field, are called Algoman provisionally. Their age, relative to the main mass of granite to the north, is unknown. There is a likelihood that these massive rocks are parts of the main batholiths that were intruded after the Keewatin series was deformed.

The gold-bearing rocks appear as interrupted masses of varying size, roughly parallel with and bordering the edge of the main contact between the Keewatin and the granite; they have a jagged margin where they touch the Keewatin schists. In form they are bosses, ridges, or dikes. One of the principal bosses, near the centre of township 28, range 26, is a granodiorite consisting of



Specimen (one-half natural size) of brecciated Keewatin basalt with calcite matrix from the Herman lake syenite area.

coarse crystals of biotite, quartz, and acid plagioclase. Local shear zones and fissures in this mass contain gold-quartz veins, and other veins are found in the sheared greenstones and porphyries that border it. The gold-bringing porphyries are merely textural variations of the coarser acid intrusives, with quartz as the chief phenocryst. In places where the dikes are parallel to the grain of the Keewatin schists, they have been highly sheared, and the two rocks are difficult to distinguish; the porphyry having more feldspar generally weathers with a lighter colour.

Pegmatite dikes are absent in the Goudreau area, and no lamprophyre dikes were seen as in the Michipicoten area to the southwest.

Herman Lake Alkali Syenite

The occurrence of alkali syenite was indicated in the Goudreau area by drift boulders of syenite that were strewn over the country to the southwest of Herman lake, a number of boulders of syenite being found as far away as Murphy lake in township 28, range 26. The syenite near Herman lake has been described by Ellis Thomson in Memoir No. 147 of the Canadian Geological Survey. The present writer studied the occurrence and found a large number of outcrops.

The syenite at Herman lake is in place on either side of a small creek that empties into the northeast corner of the lake. On the north side of the creek the alkali syenite is covered by a thin layer of drift and can be seen in a number of places. In certain localities, cancrinite and nephelite are common and show themselves by the pitted nature of the outcrop. Frequently the soda-potash feldspars, which are domino-shaped, are arranged in parallel lines. Many different textures may be seen in a small outcrop. Biotite is fairly plentiful, and pyroxene appears in a few places. Patches of white, coarsely crystalline calcite with biotite are mixed with the syenite in certain spots. Zircon, sodalite, and other minerals common to other bodies of alkali syenite were absent.

On the south side of the creek valley the syenite is pink, fine grained, and almost free of dark minerals such as biotite and pyroxene.

Again, near the east central side of Herman lake, syenite of the cancrinite type was seen in place a few hundred feet back from the lake shore. Lenses of carbonate, with biotite and pyrite in them, are located in basic Keewatin schist near this syenite, and small dikes of syenite cut the Keewatin schist.

In the Algoma Central railway rock-cuts along the west side of Herman lake, the Keewatin schist shows heavy local shears and many slickensided surfaces. It is into this heavily sheared zone that small dikes of syenite have been intruded. This prominent shear zone extends westward from the nose of the syenite ridge.

It is apparent from a comparison of the Keewatin schist near the syenite and granite at Herman lake that the syenite intrusion was accompanied by much shearing and dislocation of the old schist.

A point of interest in connection with the Herman lake syenites is the fact that the Keewatin in the vicinity of Herman lake contains large volumes of carbonate. A mile or so south of Herman lake, heavily bedded limestone outcrops near the pyrite deposits. Carbonate was commonly noted in bunches in the syenite. There is a probability that the Herman lake alkali syenite has resulted, in part, from the fluxing of the granite magma of this area by carbonate.

Two of the Herman lake alkali syenites were analysed by the Provincial Assay Office. One is a dark-grey syenite made up of feldspar, nephelite, cancrinite, calcite, and biotite; the other is lighter coloured and finer grained, but the minerals are similar. Both have domino-shaped microcline-microperthite-feldspars arranged in subparallel fashion, with the felspathoids and biotite as an interstitial filling.

Analysis of Herman Lake Alkali Syenites

	Light-coloured alkali syenite	Dark-coloured alkali syenite
	per cent	per cent.
SiO_2	55.93	46.27
TiO_2	.49	.63
Al_2O_3	18.84	20.76
Fe_2O_3	.73	4.81
FeO	2.30	3.53
MgO	1.03	1.77
CaO	4.16	5.69
Na_2O	7.66	8.48
K_2O	5.28	5.24
H_2O	.92	.65
CO_2	2.91	2.15
Total	100.25	99.98
Specific gravity	2.641	2.802

Keweenawan

The Keweenawan rocks are represented by diabase dikes that fill fissures that have sliced the crust from northwest to southeast; they are usually narrow, seldom exceeding fifty feet in width. These dikes are fairly common in the Goudreau area, especially near the pyrite deposits, but so far they have never been shown to have metallic deposits related to them.

The diabase is of two kinds: quartz and normal augite. A few dikes contain olivine. In age the quartz-bearing dikes are the older of the two, but they are not as common as the normal type; in one or two places they were seen on the strike of gold-bearing fault zones. The gold-bearing quartz veins and pyrite deposits are cut by the diabase, which is considered a nuisance in mining.

Pleistocene and Recent

The ridges and higher ground in the Goudreau field are generally free from glacial debris, which is limited mainly to the lower ground.

Plains of outwash glacial sand are confined to the east end of the camp about Pine and Godon lakes. Pine lake is bordered by an extensive sand plain which is pitted with kettle-like depressions. The sand of these outwash plains is not well stratified; it is fairly clean and of small-grain size. Sand plains of large extent appear in the northern part of township 48, range 27; between Godon and Brothers lakes; west of Godon lake; and also south of the main Goudreau pyrite deposits.

Morainic gravel merges with the eastern outwash sands near Spring and Dobbs lakes. Gravel is common at the pyrite pits of the Nichols Chemical Company, where it contains boulders of rounded masses of pyrite. In the pyrite areas the gravel merges downwards into the gossan of the pyrite bodies. Residual pyrite sand has formed in pre-glacial time and is now forming at the east end of the Nichols Chemical Company's pits.

Gravel useful for railroad ballast is located along the railway near Goudreau. The glacial deposits surrounding Goudreau do not include the blue glacial lake clay seen in other areas in Northern Ontario.

Glacial pot-holes in Keewatin rocks, each about six feet in diameter, were found a short distance east of Goudreau and northwest of the village cemetery.

Rock Structures

The rock structures can be separated into two divisions, primary and secondary. The primary structures are those that belonged to the rocks before they were broken or deformed and include such features as the form of the intrusions and the bedding of the sediments. The secondary structures are associated with crustal disturbance and can be classified as folding, faulting, shearing, and jointing.

The rocks underlying the area are very old and have been subjected to a number of crustal movements, both local and regional. The principal crustal disturbances are related to batholithic intrusions, of which there has been at least one large one. The local structures were caused by the smaller masses of granitic rocks that have punched up through the Keewatin rocks, which were previously deformed by the larger and earlier granite mass.

Primary Structures

The dip and strike of the Keewatin flows and volcanics is inferred from the disturbed beds of pillow lava, water-lain tuff, and the sedimentary banded iron

formation. The strike of the Keewatin volcanics and the iron formation is northeast, but some of the smaller bands of iron formation have been twisted around from this strike.

The Algoman porphyries are generally guided by the schistosity of the Keewatin cover, but in places they cut across the schist. The fact that the Algoman rocks are crosscutting and that they carry gold-bearing quartz veins and quantities of tourmaline is sufficient proof of their intrusive nature.

Secondary Structures

Shearing.—Few of the Keewatin rocks in the area have escaped alteration. The regional shearing becomes more pronounced as the granite to the north is approached. The local shear structures are connected with the smaller masses of Algoman intrusives.

The schistosity planes trend east and west and in most places dip steeply northward. The east-west trend of the shearing has decided the lines of intrusion for the smaller tongues and dikes of Algoman rocks.

A complementary set of shear zones and faults traverse, in northwest and northeast directions, the small, massive Algoman bosses as shown in the granodiorite mass west of Murphy lake, where the breaks contain gold-bearing quartz veins.

Folding.—The area as a whole agrees closely with the structure shown in the Lake Superior geosyncline. The axis of folding trends northeast and is registered best by the narrow bands of sedimentary iron formation and Timiskaming sediments. The bedding planes vary in angle and direction of dip. The dips are usually steep, the variation being between 20 and 90 degrees. At the east end of the Nichols Chemical Company's operations, the iron formation is flat lying. On the portage between Bearpaw and Pine lakes the Keewatin has been closely folded, and reversals of dip are shown.

Faulting.—It is difficult to determine the amount of fault displacements where such marker horizons as the Timiskaming sediments, bands of iron formation, or diabase dikes are absent. This difficulty is chiefly due to the uniformity of appearance of the fairly homogeneous Keewatin schist complex. Undoubtedly many faults strike parallel to the grain of the Keewatin schists, but they are mainly shown by the fissure veins of quartz and narrow porphyry dikes.

The country about Goudreau has been faulted along northwest-southeast lines in a large number of places in late pre-Cambrian times, since the fissures are filled with dikes of Keweenawan diabase.

The valley of McVeigh creek is a fault valley belonging to the north-south set of faults. The Agawa river canyon to the south is practically in line with the McVeigh creek fault. The Algoma Central Railway made use of these narrow defiles in selecting its right of way northward through a country that is, away from the canyons, full of east-west rock ridges. In the vicinity of Michipicoten Harbour similar profound north-south faults have displaced the rocks horizontally for several thousand feet.

The rule of lateral displacement by cross-faults, for dikes and veins that trend northward, is towards the right hand; and for bands of Timiskaming sediments, dikes of porphyry, and iron formation that trend east, towards the left.

Jointing.—Rock joints are of minor importance in the Goudreau camp and show mainly in the areas of massive Algoman rocks. The joints form a complementary set similar to the fault pattern and trend northwest.

ECONOMIC GEOLOGY

Gold

The gold mineralization of the Goudreau-Lochalsh area is dependent on intrusive bosses, ridges, and dikes of Algoman rocks of intermediate composition.

The form and size of these intruding rocks are ideal for the accumulation of gold-bearing solutions near their crests, but other factors should also be present, such as faulting and shearing, in order to complete the necessary features for a commercial gold deposit.

The gold deposits of Goudreau belong to the deep-seated class since they contain tourmaline and pyrrhotite. The wall-rock alteration is also of the deep-seated type.

The source of the gold solutions is fairly well established by the fact that the local shear zones in the small-sized, massive plutonics contain quartz veins that have some coarse gold in them.

The main system of gold-quartz veins is east and west, parallel to the lines of weakness in the Keewatin schist cover, and is dependent to a large extent for its strike on the east-west pattern of the porphyry dikes that accompany them. In places the quartz veins strike north and south, but these veins are few in number and generally poor in gold. The veins found up to the present are seldom over three feet in width and have steep dips that are usually southward.

The greater part of the gold is found in fissure quartz veins although, in places, the wall rock is mineralized as well. The vein walls may be either sheared Algoman porphyry or Keewatin chlorite schist; some of the vein fissures pass from one to the other of these two rocks. Near the veins the Keewatin rocks have been hydrothermally altered by the vein solutions to form sericite, chlorite, and biotite, the type of alteration depending partly on the acid or basic nature of the wall rocks.

In form the veins are usually tabular and occupy fault fissures. Most of the veins are lenticular, have few branches, and do not continue along their strike for great distances. Two gold-bearing breccia zones, each over twenty feet wide, have been discovered; they trend northwestward. One lies near the southeast corner of Herman lake, in line with the east shore of the lake, the other is on claim No. 4,200, north of Pine lake. In places, mineralized, parallel gold-bearing shear zones are limited to the width of local shear structures in an otherwise fairly massive rock.

The gold is found both as the native metal and combined with the sulphides, especially pyrite and chalcopyrite. Generally speaking the sulphides do not carry much gold. Native gold is fairly common. The quartz in the richer gold-bearing veins has been highly granulated, and two generations of quartz have been distinguished.

As in the Michipicoten area, black tourmaline is one of the common vein silicates and appears in or near most of the veins. The metallic minerals are the simple sulphides commonly found in the deeper seated gold deposits, such as pyrite, pyrrhotite, chalcopyrite, sphalerite, and galena. Pyrrhotite and pyrite are more plentiful than the others. Sphalerite and galena are uncommon. A little arsenopyrite was seen on the dump near a shaft on claim No. 3,559.

Pyrite

Pyrite is one of the chief economic minerals of the Goudreau camp. The position of the pyrite bodies is shown on the general map of the Goudreau-Lochalsh area.

The country for several miles east and south of Goudreau is underlain by linear bands of Keewatin sediments made up of quartzite, carbonates, and banded iron oxides, which are bordered by acid and basic sheared Keewatin volcanics. The sediments have been folded along northeast-southwest lines and dip at various angles that are as low as 20 degrees near the pyrite.

The quartzite forms a capping for the richer bodies of pyrite, which grade downwards in a number of places into the carbonate member, but the carbonate may be missing in certain localities. The tabular bodies of pyrite at the holdings of Nichols Chemical Company and the Rand Consolidated Company average thirty feet in thickness but in places may be 100 feet thick. Pyrite of this type has as much as 10 per cent. of magnetic material, made up of magnetite and pyrrhotite. Large tonnages of residual pyrite sand of pre-gracial and post-glacial age have been found on the outcrops of this type of pyrite.

Another type of pyrite is in large vertical lenses in zones of heavy brecciation along the same belt of rocks as the tabular masses. This pyrite is coarser grained, has a very small magnetic content, and is a higher grade ore. It is not as easily mined as the tabular bodies that were worked by open-cut methods and steam-shovels during 1914-18. The lenticular type appears in volume at the Morrison No. 3 deposits and at the Holdsworth deposit near Hawk Junction. On the Holdsworth, pyrite lenses 1,100 feet long, 525 feet deep, and 18 to 25 feet thick have been shown by diamond-drilling.

It is probable that the tabular masses of pyrite are metasomatic replacements of beds of iron oxides or carbonates, while the lenticular pyrite bodies are the result of replacement and the filling-in of zones of brecciation and faulting. Veins of pyrite can be found cutting banded iron oxides of the sedimentary type, and shreds of banded silica are frequently found intermixed with the pyrite. Ottrelite, which has been developed in the schist near the pyrite, is generally considered to be a mineral formed by igneous contact action about basic intrusive rocks like gabbro.

Pyrite is used mainly in the manufacture of sulphuric acid. To make sulphuric acid by the contact process it is necessary to have pyrite that has no lead or arsenic, since these elements poison the catalyser used in the process. The Goudreau pyrite is practically free of lead and arsenic.

The tabular masses of pyrite contain a small percentage of silica and pyrrhotite; this brings down their sulphur content to an average of 30 to 35 per cent. In the lenticular type of deposit, such as the Holdsworth, there is little silica or pyrrhotite to lower the sulphur content of the ore, which averages 46 per cent.

Several million tons of pyrite are available in the first 200 feet below the surface in the Goudreau and Hawk Junction camps. More details of the extent and geology of the Goudreau pyrite deposits are given in Memoir No. 147 of the Canadian Geological Survey.

Recommendations to Prospectors

Quartz veins, feldspar and quartz porphyries, and shear zones containing sulphides, especially cubical pyrite, chalcopyrite, sphalerite, or galena, are all signs of the work of late magmatic extracts from the granite batholith underlying the Goudreau area. The batholith came to a standstill under a cover of Keewatin greenstones. Throughout the world pre-Cambrian gold ores are generally associated with the end products of batholithic masses. To be of commercial value, these late mineralizations by oxides, sulphides, and native metal such as gold, must be concentrated in favourable geological structures, such as fault fissures or zones of intense shearing.

As the result of studies of gold deposits in the various mining camps, it has been found that the vicinity of small masses of grantitic rocks and their associated porphyries is the most favourable place in which to expect a gold deposit. The apparent reason is that the smaller bosses are protuberances on the broad surface of the granite below and that the ore-bearing solutions have a tendency to rise under pressure to these higher peaks in the batholith.

Following up this argument, it is better to have very small areas of acid intrusives showing through the batholith cover, since the ore deposits formed about these intrusive plugs are mainly collected near their crests and in the roof rocks. With too deep an erosion, as shown by the broadening of the areas of acid rocks, the ores are lost when the roof rocks are worn off.

After locating a favourable intrusive body of Algoman rocks, it is well to examine its borders. The quartz veins and mineralized shear structures have a tendency to run east and west, as they follow along the schistosity planes of the sheared Keewatin roof. For this reason the east and west sides of the bosses are more favourable.

If the bosses of Algoman rocks are irregular in surface plan, it is well to examine the arms of Algoman rocks that extend out into the Keewatin and also to examine the bays of Keewatin rocks that invade the edge of the outcropping intrusives.

An examination of the rocks in the vicinity of all the acid intrusives east and west of Goudreau is advisable, especially the rocks north and northwest of the Magpie iron mine.

In the Goudreau area, the favourable places for gold are along a belt of small-sized, acid, intrusive rocks that border the main granite mass to the north, and in a belt a few miles south of and parallel to the edge of the granite. In this belt the plutonic intrusives show themselves as small bosses, ridges, and dikes surrounded by the Keewatin roof rocks.

The main break in the Goudreau camp follows a chain of linear lakes that extend northeast and southwest. Another zone of gold-bearing rocks lies to the south of the main Goudreau belt on Jackfish lake and extends east to the old Emily mine on Dog lake.

The shear and fault zones likely to carry gold are recognized (1) by local bands of intense shearing in the Keewatin or the acid intrusives; (2) by porphyry dikes and fissure veins of quartz; (3) by the rusting of pyritized schist bands; (4) by zones of brecciation or crushing with a filling of quartz.

The veins and shear zones in which the gold has been deposited generally extend along their strike in straight lines, and additional parts of the veins can be found by running a picket line along the strike of known veins.

Panning the oxidized portions of vein outcrops is very useful in locating gold-bearing zones, but care must be taken, since many of the rusted outcrops in the pre-Cambrian have a shallow gold enrichment. Safe conclusions as to the commercial qualities of the veins or mineralized shear structures can be drawn only after the removal of the rusted capping by blasting the rock, and the channel sampling and assaying of the vein matter.

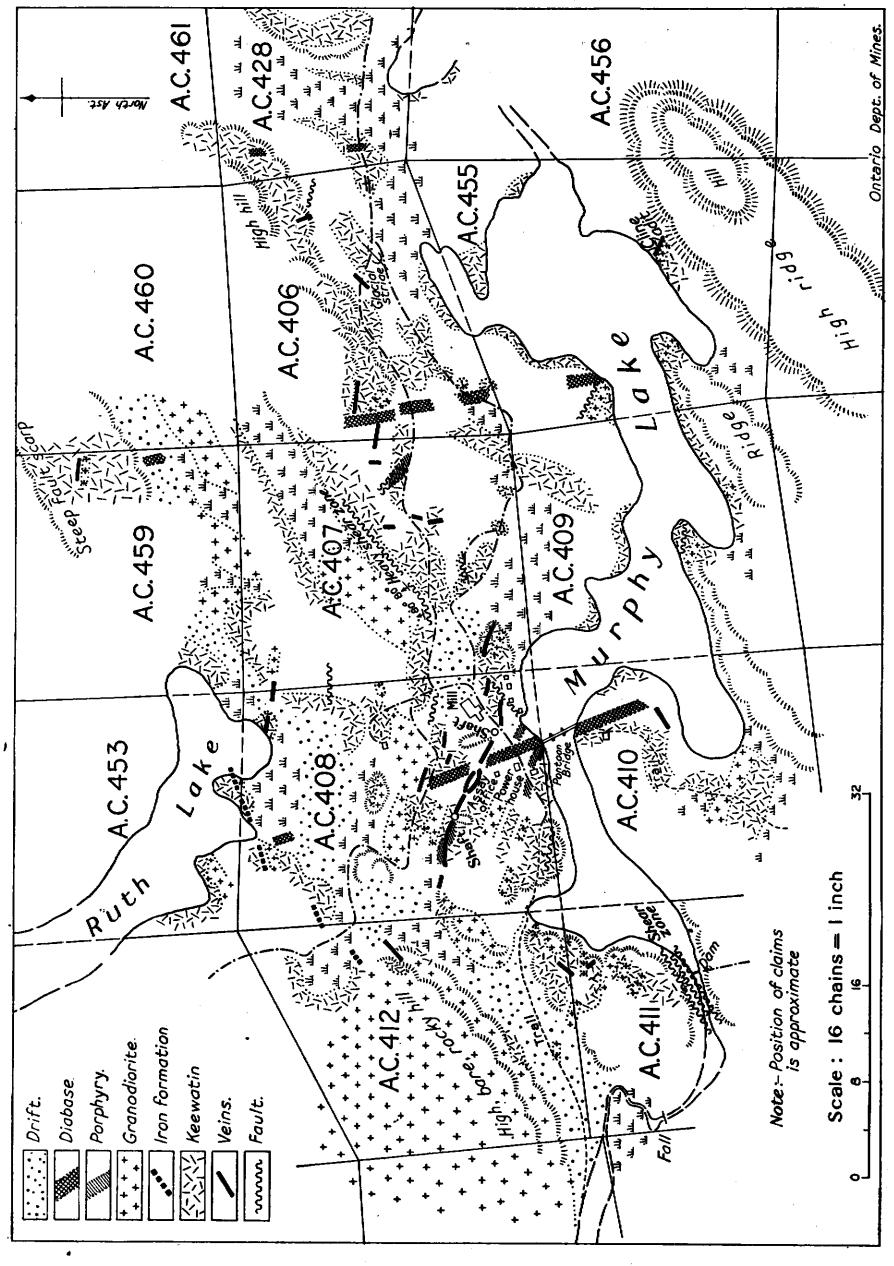
In prospecting for pyrite, strong surface indications are sometimes seen, such as rusty-coloured water and rusty creek beds. New pyrite bodies have been located by examining the rocks on the strike of the known pyrite ore bodies, for the pyrite deposits are generally linear along east-west lines. The fact that the pyrite has a magnetic content of magnetite and pyrrhotite, has been used to locate it under a drift cover by means of a dip needle. Bands of dark, iron oxide sand on the surface led to the discovery of the Holdsworth pyrite ore bodies near Hawk Junction, which are only feebly magnetic.

Description of Mines and Principal Claims

TOWNSHIP 28, RANGE 26

Goudreau Gold Mines, Limited

The original discovery on this group was made near the southeast corner of claim A.C. 408 by Thomas Murphy of Goudreau while he was trapping in the area in April, 1921. Murphy had strolled away from the fire, after having lunch,

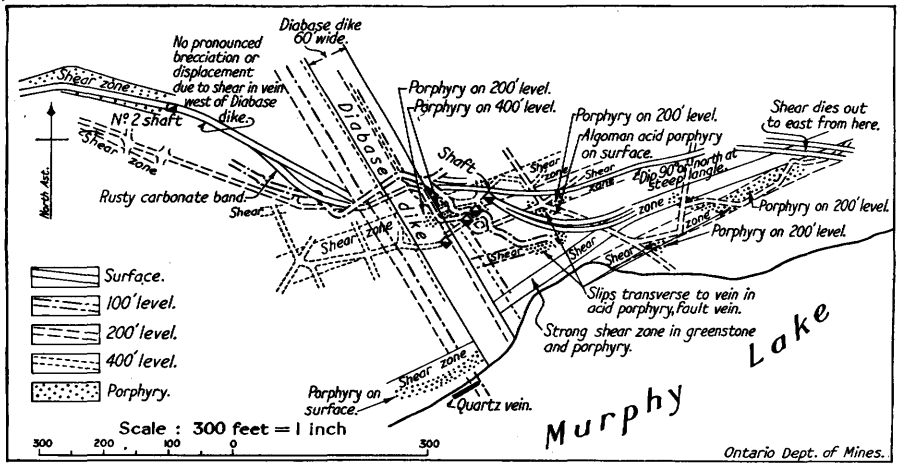


SKETCH SHOWING GEOLOGY OF GOUDREAU GOLD MINES, LIMITED, TOWNSHIP 28, RANGE 26, DISTRICT OF ALGOMA.

to some high ground on the north side of Murphy lake. On finding a quartz vein he scraped away the moss, finally uncovering the rich shoot of coarse gold that started a new wave of prospecting in the area west of Goudreau.

A. V. J. Selkirk of Franz and James Perry of Goudreau became associated with Murphy, and twelve claims in the vicinity of the find were staked. The late A. R. Porter of Toronto optioned the group and turned it over to the present company, the Goudreau Gold Mines, Limited. This company was organized in 1921 to develop the Murphy claims, which comprise 534 acres in the central part of township 28, range 26. The company is capitalized at $2,500,000 with shares at $1 par value.

A mining plant has been installed, including an electric motor, a 1,080 cubic foot air compressor, two electric hoists, office, assay plant, blacksmith shop, sleeping and cook camps. Recently a mill and shaft-house were built. The mill contains a jaw crusher, gyratory crusher, ball mills, and two amalgamation tables. Electric power was supplied during mining operations from Steep Hill



Mine plan, Goudreau Gold Mines, Limited
(after A. D. McDonald, 1926).

falls on the Magpie river. No bullion production is recorded, and operations ceased in the spring of 1926. Further development is planned by the company for 1927.

Two shafts, 500 feet apart, have been sunk on the main vein, and these were connected by a drift on the 200-foot level. No. 1 shaft was put down on the shoot of coarse gold just east of a north-south diabase dike; it is inclined and follows the plane of the vein, which dips southward at about 70 degrees down to the 200-foot level. At the bottom, 425 feet, the shaft is in the diabase dike. No. 2 shaft, which is on the vein 500 feet west of No. 1 shaft, is vertical and 200 feet deep. Four levels have been established from the No. 1 shaft, the one on the 200-foot level being the most extensive. Other development work has been done with test pits and diamond-drills. A plan of the underground work and a plane table survey map of the surface geology are included in the present report.

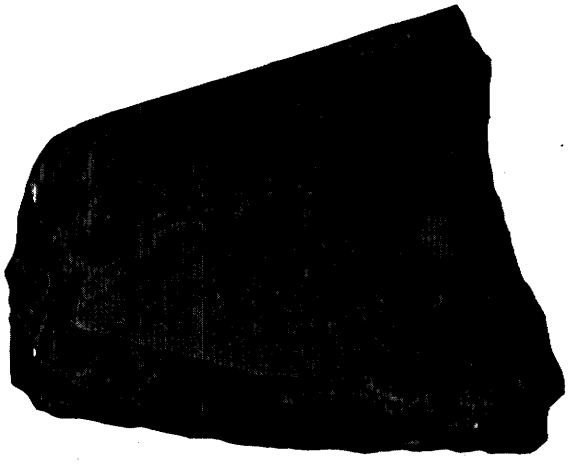
In 1922 the provincial Government built a road, about four miles in length, connecting the mine with Goudreau station on the Algoma Central railway.

Rocks.—The rocks in the neighbourhood of the Goudreau Gold Mines vein are chiefly sheared basic Keewatin lavas. About a quarter of a mile west of

No. 1 shaft, a boss of massive granodiorite has punched up through the Keewatin schist and sent out tongues and ridges of acid material along the shear planes of the Keewatin.

The main quartz vein can be traced westward almost to the edge of the granodiorite boss, where it is cut off by a heavy northeast-southwest shear zone, which has dislocated the diabase dike, veins, porphyries, and schist. The granodiorite boss where this shear zone touches it has been turned into a fissile schist.

A few small areas of granodiorite lie within a short distance north and south of the vein system near the shafts. The acid quartz porphyries appear as narrow east-west dikes near the veins or form the vein walls. In some instances, especially east of No. 1 shaft, the porphyries are almost as highly sheared as the Keewatin schists that enclose them.



Finely banded ankerite surrounding quartz, which contains native gold, with a second generation of clear quartz outside of the carbonate band. The crenulated seams are chlorite. Specimen (one-half natural size) from the Goudreau mine.

A diabase dike, which trends northwest and is about sixty feet wide, lies a short distance east of No. 1 shaft. This dike cuts and slightly displaces the gold-quartz veins, as well as the schist and porphyries. Its dip underground swings from a steep slope towards the southwest to a reversed dip towards the northeast at a depth of a few hundred feet.

There has been intense brecciation along the borders of the diabase. The Keewatin walls of the dike contain black carbonate, serpentine, and quartz stringers. Some arsenides and antimonides of nickel and cobalt have been found near the dike walls, but they are not associated with the gold since the dike is younger than the gold deposit.

Veins.—The main vein system lies just north of the west arm of Murphy lake on high ground. Branch veins are uncommon, although a few small ones were noted. The exposed section of the Murphy vein averages from two to three feet in width, strikes a little south of east, and has been traced on the surface for about 1,400 feet. A vein on claim A.C. 455, on the south side of the east arm of Murphy lake, lies on the strike of the Murphy vein and may possibly be an easterly continuation of it.

The spectacular shoot of coarse gold is close to No. 1 shaft and extends for about twenty-five feet along the surface. The quartz vein in this spot is about two feet in width and is enclosed by hydrothermally altered chlorite schist. The coarse gold is located on the crushed, hanging-wall side of the vein, which dips steeply southward. This magnificent showing of native gold ranges from less than an inch to several inches in width. The gold is accompanied by pyrite, chalcopyrite, pyrrhotite, and finely banded, dark ankerite.

A pale green chlorite is common in the rich gold-bearing quartz (see photograph on page 67). Some of the streaks of native gold lie near the wall of the vein where the schist and quartz are mixed. The chlorite schist in such locations has been hydrothermally altered to biotite and sericite with some tourmaline. It also contains blebs of pyrrhotite. The silicate in the vein quartz is chiefly chlorite, and the sulphides are pyrrhotite and chalcopyrite; a little dark sphalerite also shows. Some of the leafy gold is enclosed by pyrrhotite. One specimen con-



Photomicrograph showing bands of carbonate, which shows cleavage, and quartz in gold-quartz vein, from Goudreau mine. (×26, one nicol.)

tains leaves of whitish gold, associated with massive chalcopyrite and some dark sphalerite, in quartz. The rich shoot of gold is nearly vertical and extends from the surface at least to the floor of the drift on the 100-foot level. Native gold in finer grains can be seen in the vein near No. 2 shaft and in a few places east of No. 1 shaft.

The greenstone schist east of No. 1 shaft on the 200-foot level is sprinkled with fine blebs of pyrrhotite and rhombs of carbonate.

East of No. 1 shaft a sheared acid dike, now sericite schist, has formed a zone of easy dislocation, and all the rocks and veins near it are badly disjointed. The vein of ankerite here is more continuous than the broken quartz veins. West of No. 1 shaft the vein is unbroken and easier to follow.

Fault planes along the vein walls west of the diabase dike on the 200-foot level show horizontal striae and burnished pyrrhotite.

At the west end of the 200-foot level a face of quartz six feet wide was exposed, carrying a channel value of $6 in gold per ton.

Between the two shafts the main vein is continuous, and a narrow shear zone, which is largely ankerite, is cut by the vein. The ankerite is poor in gold. Ankerite is less pronounced westward from No. 2 shaft, and the veins have a more consistent gold content.

At the east end of the main vein prismatic quartz crystals line the walls of the fissure, and the remainder of the fissure is filled with ankerite that has small ladder veins of quartz. A parallel intergrowth of vein quartz and carbonate was noted (see photomicrograph on page 68).

Origin of the Coarse Gold.—The coarser grained gold is generally platy and, for the most part, has been deposited in cracks in the dark vein quartz. Some of it is pale in colour and is alloyed with silver. While the rocks around the rich shoot are, for the most part, hidden on the surface by buildings and by mine timber underground, sufficient data were gathered to enable the writer to say that this shoot of high-grade gold ore is primary in origin and was probably localized by an intersecting system of ore channels at the juncture of crushed acid porphyry dikes and quartz veins. Such intersections are the locus in many mines of unusually rich ore. That the alkali-carrying porphyries played a part in the gold deposition is shown by the addition of potash to the chlorite schist, or, in other words, the replacement of chlorite by the alkali-bearing silicate biotite, and a few crystals of dark tourmaline. The richer parts of the veins on this property have wall rocks that show replacement by potassic solutions. This feature should form a guide in locating the better vein sections.

The biotite-sericite-tourmaline wall-rock alteration in the basic schist, and the pyrrhotite with the gold, shows that the rich gold shoot at No. 1 shaft was brought in at a fairly high temperature by the acid porphyries.

Farquhar Group

The Farquhar group of four claims lies on the south side of the Gutcher lake granodiorite boss about half a mile west of Murphy lake. The main vein on the group is situated along the north boundary of claim A.C. 442, in an area where Keewatin basic schist and granodiorite are mixed and the glacial drift is of small extent.

The gold-quartz vein on which the development work has been concentrated reaches widths of three feet. It lies in nearly vertical fault fissures bordered by a few feet of sheared granodiorite, which is pyritized. It strikes east parallel to the general grain of the schist. Cross-faults have dislocated it into short sections. Small quartz lenses with gold mineralization appear near the west end of the large vein.

The discovery vein, consisting of glassy quartz, is cellular in the outcrop and carries coarse gold in spots. Pyrite, chalcopyrite, pyrrhotite, and sphalerite rich in iron are the vein sulphides, and they appear in irregularly distributed areas in the vein. Black tourmaline and ankerite occur in the quartz as well as the sulphides, and biotite has been developed in the chloritic wall rock.

In a few instances the native gold has been rolled out by movements that followed its deposition.

The vein system has been stripped over several chains, but a long continuous section has not been found.

Brighton

Claim A.C. 451 is about half a mile southwest of the west end of Murphy lake. The vein system consists of irregular quartz lenses in Keewatin basic schist, which is intruded by tongues of acid porphyry. The schist near the

veins is pyritized. The veins are irregular, contorted, and broken into small sections, and are nowhere large.

Cline Claim A.C. 452

Claim A.C. 452 is about a quarter of a mile southwest of Murphy lake, the discovery vein being a few chains south of the transmission line, which crosses the north end of the claim, in an area of basic Keewatin schist. The vein system is a north-south one, about eight feet wide, made up of several parallel, small quartz veins lying close together. Sulphides appear in the quartz and in the layers of schist between the veins. The vein system extends for several hundred feet north and south and has been broken into three or four sections by northeast-southwest cross-faults, the displacements being toward the right. Fair gold assays were reported from the north end of the vein where the largest pit was sunk.



Photomicrograph showing crushed pyrite (dark) partly replaced by chalcopyrite (light), T. T. Barnes copper claim. (×25.)

Barnes Copper Claim

Claim A.C. 1,434 is located a mile northwest of the west end of Murphy lake and near the north edge of the Gutcher lake boss of granodiorite, in a mixed area of basic schist and acid porphyry dikes. The porphyry and Keewatin lavas are both highly schistose, and some of the narrow, highly sheared structures have been replaced by lenses of massive chalcopyrite. Shreds of iron formation lie near the chalcopyrite, but vein quartz is not prominent. The schistosity planes dip steeply northward and strike N. 80° E.; the shear structures and the copper sulphide dip 60° S. and intersect the regional shear zone of the Keewatin. The copper mineralization appears at intervals across the porphyry-schist zone for a width of 275 feet and was traced eastward for several hundred feet. Assays on the nearly pure chalcopyrite gave several ounces in silver per ton and a trace of gold. Further prospecting is warranted in this vicinity.

McCauley

Claim A.C. 473 lies about a quarter of a mile north of the east end of Perry lake and a few feet south of the transmission line from Steep Hill falls. The vein, which is about three feet wide is in basic schist and strikes at 110° mag. The vein filling is mainly ankerite or carbonate, with a few ladder or cross-veins of quartz, and has been stripped for about 50 feet. Tourmaline appears in the quartz, but sulphides are scarce. The Gutcher lake granodiorite boss lies a short distance to the north.

From Murphy Lake to Cedar Falls

By following the power line from the Goudreau Gold Mines on Murphy lake westward to Cedar falls on the Magpie river, an idea can be obtained of the structure and mineralization along the south side of the Gutcher lake granodiorite boss. Just south of the boss the Keewatin basic lavas are highly schistose and contain dikes of acid porphyry and a few gold-quartz veins, already described, on claims A.C. 451, 452, and 473. Quartz veins of a glassy appearance containing a few sulphides were noted in an area of porphyry dikes north of Perry lake. For a mile or so east of Cedar falls quartz veins as well as porphyry are scarce, probably because of the distance from the Gutcher lake granodiorite boss. Highly sheared Keewatin agglomerate outcrops at either side of Cedar falls.

Paquette Group

The Paquette group of four claims (A.C. 774-77) lies about two miles northwest of Murphy lake on the south side of a large swampy depression. The rocks are mainly Keewatin schist intruded by a few tongues of acid porphyry. The main vein, which is situated along the south boundaries of claims A.C. 777 and 774, strikes at 100° mag. and is less than a foot wide. A narrow shear zone borders the vein. The absence of sulphides, favourable wall-rock alteration, and the glassy appearance of the vein point to a probable low gold content in the Paquette vein, which has been picketed for a length of eight chains. There is a cabin on the south central part of claim A.C. 774.

Porter-Premier Group

Renewed interest in this group of eight claims was shown last summer after the discovery, during development work, of an east-west vein which averaged three feet in width and passed through the centre of claim A.C. 495. The vein is located in a local shear zone in the Gutcher lake boss of granodiorite at a point about a mile and a quarter southwest of the west end of Murphy lake. The sheared granodiorite walls consist of pyritized sericite schist, which contains spots of black tourmaline. The chief vein sulphides are pyrite, chalcopyrite, and some dark sphalerite. The vein trends east and dips northward at 70 degrees; a 225-foot section has been stripped, and a 23-foot test pit has been sunk at a point about half-way along the vein. Coarse gold was seen in several spots, especially where the walls were highly sericitized and tourmaline was plentiful. Movement along the vein fissure, after the gold deposition, has rolled the gold out on surfaces of crushed tourmaline and sericite. The Porter-Premier vein is approximately on the strike of the Farquhar vein, which lies about 20 chains to the east. Other veins may be found on this large group of claims, which are underlain mainly by granodiorite.

McMahon

Claim No. 1,712 is about 20 chains northwest of Goudreau station. The rocks are basic Keewatin volcanics, which are cut by a few narrow intrusive

tongues of acid porphyry as wide as 30 feet in places. Several narrow east-west quartz veins with visible gold were found near the centre of the claim. The quartz veins are mainly located near the contact of the acid porphyry with the Keewatin.

Brandt Group

Extensive development work was done by Fred Brandt during 1926 on a group of fourteen claims situated in the angle between the Murphy Lake road and the Algoma Central railway. Exploration was efficiently carried out by the aid of a two-drill air compressor.

Keewatin basic schists cut by a number of acid porphyry dikes accompanied by small quartz veins were the main geological features. Large continuous quartz veins have not been found, but several shear zones containing gold-bearing quartz were discovered. At one place, on claim A.C. 520, on the east shore of Jackson lake, the writer examined a vein that contained chlorite, tourmaline, pyrite, chalcopyrite, and coarse gold. Small quartz veins and porphyry dikes, which trend east and west, were seen on nearly all of the fourteen claims. The west end of the Brandt group is about three-quarters of a mile east of the eastern extremity of the holdings of the Goudreau Gold Mines, Limited, and in the same mineralized belt of rocks.

South of Doherty Lake

On claim A.C. 427, just south of the narrows at the west end of Doherty lake, acid porphyry dikes were seen cutting Keewatin basic schists. One well-defined quartz vein over a foot wide is located a few chains south of the narrows at a porphyry-Keewatin contact. The vein contains ankerite, tourmaline, and pyrite and was reported to give fair gold assays. Near the north end of claim No. 648 some assessment work was in progress on a vein system containing massive chalcopyrite, which is said to be auriferous. The chalcopyrite was confined to a fissure vein and would have no commercial value unless the gold content was high and the volume large.

The writer went as far south as the Robinson group of claims (Nos. 805-8, 1,147). On claim No. 806 there is a small lake with a cabin on its east shore. At the northwest corner of this lake there is a narrow band of pyrite. North of the lake the Keewatin schist contains a few narrow quartz veins. North and east of the same lake the more acid and light-weathering Keewatin has been altered to an ottrelite schist, as noted by W. H. Collins on page 102, Memoir No. 147, Canadian Geological Survey.

South of Perry Lake

It is known that acid porphyry dikes and small bosses, as well as fissure quartz veins, are located south of Perry lake and along the south shore of the lake. The veins in this vicinity that were seen by the writer lacked sulphides, were glassy in appearance and of the type generally barren of gold. This area has not been fully prospected and should be looked over carefully.

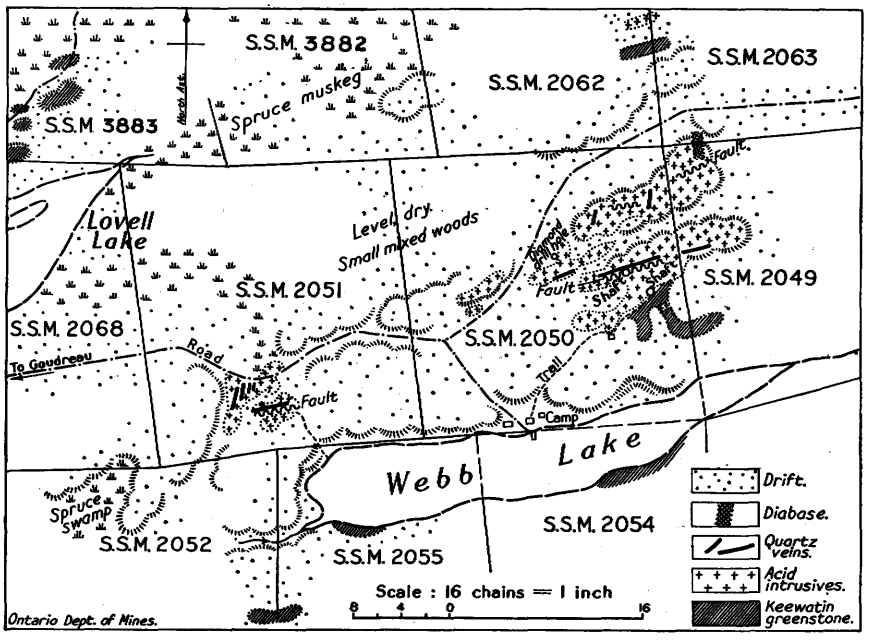
Gutcher

Claim A.C. 549 lies in the area of the Gutcher granodiorite boss. Gold has been found in a quartz vein, one to three feet wide, that carries pyrite, chalcopyrite, and ankerite. The vein has been exposed for 200 feet along its strike, which is at 125 degrees. The dip is 70° N. Near this vein, a wider vein has been found that shows less favourable indications of gold.

Banville-Page

Claim No. 532 lies at the north end of Rowan lake, a small lake on the north side of the road from Goudreau to Murphy lake. Gold has been found on this claim in a band of disturbed iron formation, which is cut by numerous quartz stringers. The country rock is a basic Keewatin schist. The cross-stringers of quartz contain a little chalcopyrite as well as specks of gold.

It is reasonable to expect that further prospecting about the small acid intrusives, in this township and in the area north of the Magpie iron mine, will disclose additional deposits of gold.



Sketch showing geology in the environs of the McCarthy-Webb Gold Mines, Limited, Township 49, District of Algoma.

TOWNSHIP 49, RANGE 27

McCarthy-Webb

The McCarthy-Webb group consists of seven claims located in the south central part of township 49. The vein system crosses two claims in an easterly direction and shows on the three main parallel rock ridges of quartz diorite in which are local, parallel shears. The diorite is bordered on the south by basic Keewatin greenstone, and light-coloured porphyries are absent on these ridges.

The structure is not complex, as the gold-bearing veins are limited to the shear zones in the diorite. The schistosity planes dip steeply north at 70 degrees and strike nearly east. The main and wider shear is on claim No. 2,050, near the south side of the more southerly diorite ridge close to the contact between the diorite and the Keewatin chlorite schist. At the contact, the Keewatin chlorite schist has been pyritized for a width of a few feet, but this pyritized material carries little gold.

The gold is found both in the native state with quartz and finely divided with fine-grained pyrite. The gold mineralization is accompanied by tourmaline and by hydrothermal alteration in the shear zones, the schist bordering the



Pit on sheared, gold-bearing ridge, McCarthy-Webb claims, looking east.

veins being changed to chlorite, sericite, and quartz, and in places impregnated with fine, cubical pyrite (see photomicrograph below).

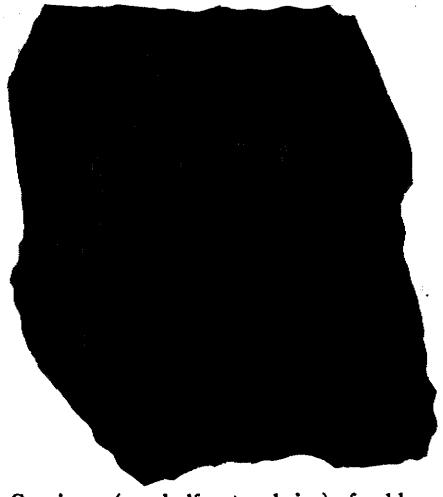


Photomicrograph showing sericite, quartz, and pyrite (black) in sheared gold-bearing diorite, McCarthy-Webb group. (×26, crossed nicols.)

The vein walls are assay walls, since the mineralized shear zones merge gradually on either side into the more massive diorite. Rusted, sugary-textured quartz veins and rusty patches on the rock surface indicate the position of the

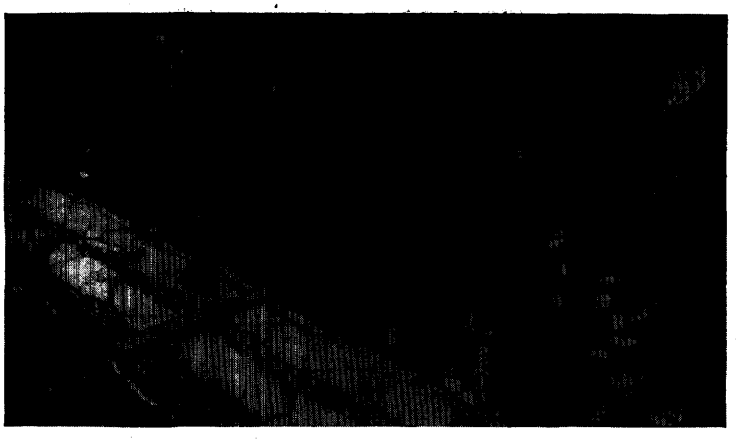
gold-bearing quartz and schist. The vein quartz in places shows shreds of schist (see photograph below).

The quartz veins belong to two systems. An earlier east-west set, which is highly granulated, holds the bulk of the gold and strikes with the grain of the



Specimen (one-half natural size) of gold ore, from McCarthy-Webb claims, showing slivers of sericite-chlorite schist in vein quartz. The schist is selectively replaced by cubical pyrite.

schist. These veins are smaller but more plentiful than the north-south set, which cuts them. In places they are numerous and closely spaced, and they could be mined together. Native gold is visible in a number of these veins. The wider north-south veins are white and glassy, have few sulphides, but contain large quantities of black tourmaline in the form of thin parallel seams,



Tourmaline bands in a north-south quartz vein, McCarthy-Webb claims.

which fill fractures in the quartz parallel to the walls of the veins (see photograph above and on page 76).

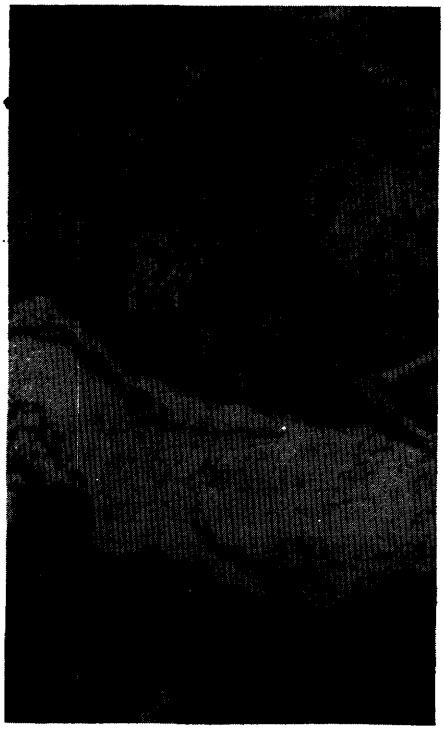
The work so far has been confined to the exposed rock ridges or thinly covered outcrops and consists of stripping, trenching, sinking of test pits, and

diamond-drilling. The two test pits, each about 30 feet deep, were sunk on the two better and wider shears zones near the south boundary of the rock ridges.

The mineralogy of the veins is simple, pyrite being the main vein sulphide and tourmaline the principal silicate. Tourmaline appears in the two sets of veins, but is confined mainly to the north-south set. Pyrrhotite, chalcopyrite, and specular hematite were also noted.

A hand specimen of the better mineralized schist, with pyrite, sericite, and quartz, carried $30.20 per ton in gold when assayed by the Provincial Assayer.

On claim No. 2,048, south of the east end of Webb lake, the Keewatin schist is cut by east-west dikes of acid porphyry, which are fissured and contain



Large north-south quartz vein and contorted east-west veins on McCarthy-Webb claims.

veins of glassy quartz carrying black tourmaline but only a few sulphides. These veins were reported to give low assays for gold.

A small creek entering the west end of Webb lake is very rusty, and local magnetic compass disturbances in the vicinity of the creek may indicate a body of pyrite ore beneath the drift.

The main problem on the McCarthy-Webb group is to find the better gold-bearing shear structures and then to determine the volume of mineralized rock in these shear zones.

Morrison (Cabin) Claim

Claim No. 2,075 is owned by the Algoma Exploration and Development Company of Sault Ste. Marie. It is located on the north shore of Goudreau lake in the southeast corner of the township. The veins and structure are

similar to those of the McCarthy-Webb. The rusty bands in the schist, however, are less pronounced, and the transverse north-south veins with tourmaline are more common. The better veins strike east but are small and spaced too widely and irregularly to mine together.

Herman Lake Area

During July and August, 1926, some prospecting was done near this lake. A pit was sunk at the contact between syenite and Keewatin greenstone where the channel at the east side of the lake leads east to Otto lake. A little chalcopyrite, accompanied by epidote and small amounts of vein quartz, was found, but the gold content was very low. About 30 chains southeast from the southeast corner of Herman lake, there is a breccia zone filled with quartz veinlets and chalcopyrite. This breccia was said to give fair gold assays.

Kremser Float

A few years ago some high-grade, gold-bearing float was found in glacial drift beside the old tote road near the No. 4 post of claim No. 3,908. When the writer saw the pit from which the rich sample of honeycombed gold quartz came, it was filled with clay and angular drift boulders; but it was possible to pick out pieces of rusty, cellular masses of quartz similar to the one that furnished the good gold specimen. The cellular quartz was accompanied by rotten boulders of dark-green chlorite schist. The writer had previously examined the gold mineralization on the south shore of Maskinonge lake and was struck with the similarity of the Kremser float to the vein quartz and chlorite schist there. At the Maskinonge Lake prospect, gold could be panned in the oxidized zone but was scarce in the solid rock below. It is a fairly safe assumption that the Kremser float came from near the Maskinonge lake discovery, as the schist and quartz match and the glacial movement was in the right direction to transport it from there southwestward to the place of the Kremser find.

Bearpaw Portage

Along the creek between Bearpaw and Pine lakes, a zone of sheared basic Keewatin schists and dikes of intrusive acid porphyry are exposed, and the local highly disturbed nature of the schist points to the major axis of Pine lake being a structural line of weakness.

A few small quartz veins lie in and near the porphyry dikes, and a 4-foot band of pyritized Keewatin schist was noted. Fair gold assays are reported from the pyritized schist.

Algoma Exploration Company

This company has a large number of claims that extend west from the east boundary of the township to a point near its centre. The group is about two claims wide north and south, the north central boundary touching the south side of Maskinonge lake. A large part of the area within the group is drift covered. The claims are underlain by Keewatin basic lavas that are cut by dikes of acid porphyry, especially near the south shore of Maskinonge lake. Some diamond-drilling was done near the southwest side of this lake at the time of the find of rich gold float by Kremser in this vicinity.

Between the Nichols Pyrite Deposit and Herman Lake

A trail leads north to the southeast corner of Herman lake from the plant of the Nichols Chemical Company. Just north of the pyrite outcrops, heavy

beds of crystalline carbonate were seen. These were bordered on the north by basic Keewatin lavas that persisted to Herman lake. Several reversals in schistosity dip were noted, especially north of the pyrite deposits. In the vicinity of McVeigh creek, small quartz veins were seen near narrow dikes of acid intrusive porphyry. The porphyry dikes were most prominent on the south and east sides of claim No. 4,398. A few chains west of the McVeigh Creek bridge, a mineralized north-south breccia structure outcrops on the south side of the creek. Some small quartz veins were seen between McVeigh creek and Herman lake.

North and South of Lovell Lake

North of Lovell lake on claim No. 4,015, explored by the Michael Syndicate, and near the centre of this claim, quartz veins as much as eight feet in width show in a breccia zone in Keewatin basic schist. The chlorite wall rock is altered



No. 2 shaft, Cline Canadian Gold Mines.

to biotite, and the quartz contains tourmaline. The schistosity strike is N. 35° mag., and the dip 80° N. The vein quartz has been crushed but has few sulphides. The vein system forks, the northwest branch having vein quartz with some pyrrhotite and chalcopyrite. The gold samples from this locality have not given very high assays.

Another narrow vein was seen on the north side of claim No. 4,014 and five chains west of the No. 1 post of this claim. This vein extends east and west and is at the contact between Keewatin greenstone and intrusive porphyry; the shear structure near the vein is impregnated with pyrite.

South of Lovell lake, on claims Nos. 2,052 and 2,069, quartz veins and rocks were seen that were similar to the McCarthy-Webb discovery. Native gold was visible in a few places. The gold is fairly close to the large pyrite deposits that lie to the west. As on the McCarthy-Webb group, the gold mineralization is in parallel shear zones in a ridge of intrusive diorite, the zones being from 10 to 15 feet wide; irregular patches of rusty schist on the outcrop surface indicate the zones of gold mineralization.

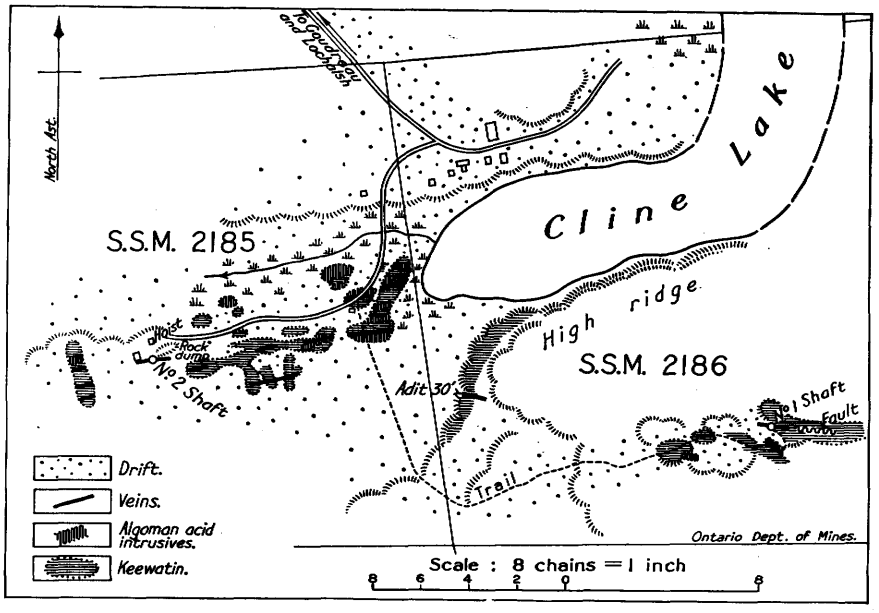
South of the West End of Pine Lake

The country for a mile south of Bearpaw portage, at the west end of Pine lake, is underlain by basic Keewatin schists, which are cut by small east-west dikes of acid porphyry. A few narrow quartz veins were noted on the east side of claim No. 4,657. On claims Nos. 4,657 and 4,460, a northwest-southeast dike of diabase outcrops near the township line. A large swamp and sand covered area appears a mile or so south of Bearpaw portage and hides the rocks.

TOWNSHIP 26, RANGE 26

Gold on Jackfish Lake

During the summer of 1926, gold was found near the east end of Jackfish lake in sugary-textured, rusty quartz veins enclosed in basic Keewatin schist. The volume of these veins is not known at present, but a sample of the rusty quartz was assayed and gave $10.40 per ton in gold.



Sketch showing geology, Cline property.

TOWNSHIP 48, RANGE 27

Cline Canadian Gold Mines, Limited

The Cline group of six claims in the central part of the township contains several gold-quartz veins, which are accompanied by dikes of acid porphyry in a mass of basic Keewatin schist. The surface of this group is largely drift covered, and two or three large east-west ridges cross the property.

Two shafts have been sunk on the veins: No. 2 shaft on claim No. 2,186 west of Cline lake, and No. 1 west of it on claim No. 2,185. The principal veins, which are on claims Nos. 2,185 and 2,186, are shown on the accompanying sketch map. The main group of veins outcrops at the west end of Cline lake.

Most of the veins are less than a foot wide, but a few larger ones have been found; these all strike a little south of east and dip steeply southward. James P.

Cline, prospecting in 1926, found a fairly wide gold-bearing vein south of the outcrops at No. 2 shaft. Although the veins are narrow they yield very high gold assays, and native gold can be seen in a number of places.

The gold is fine grained and appears as specks in the much-granulated vein quartz. The sulphides are pyrite, pyrrhotite, and chalcopyrite, and the wall-rock alteration is of the sericite-chlorite-biotite type. Quartz veins with tourmaline and epidote were seen in a few places.

The porphyry dikes and the Keewatin schist have both been sheared. East of No. 2 shaft the acid porphyry can be seen cutting across the planes of the schist. The better gold-bearing veins are in fissures in the acid porphyry dikes.

This group of claims was optioned by an English company in 1924 from James P. Cline, the company being known as the Cline Canadian Gold Mines.



Photomicrograph showing vermicular chlorite in gold-quartz, claim No. 4,200. (×82, one nicol.)

After assuming charge, the company put up a group of log buildings, installed a compressor and hoist, and sank two shafts, No. 1 to a depth of 100 feet and No. 2 to 200 feet. A large amount of surface stripping was also done. Exploration by the English company stopped in the spring of 1926; Mr. Cline did some further work in the autumn of the same year.

The Cline group is connected by wagon roads, with both Goudreau and Lochalsh, the Goudreau road being in better repair.

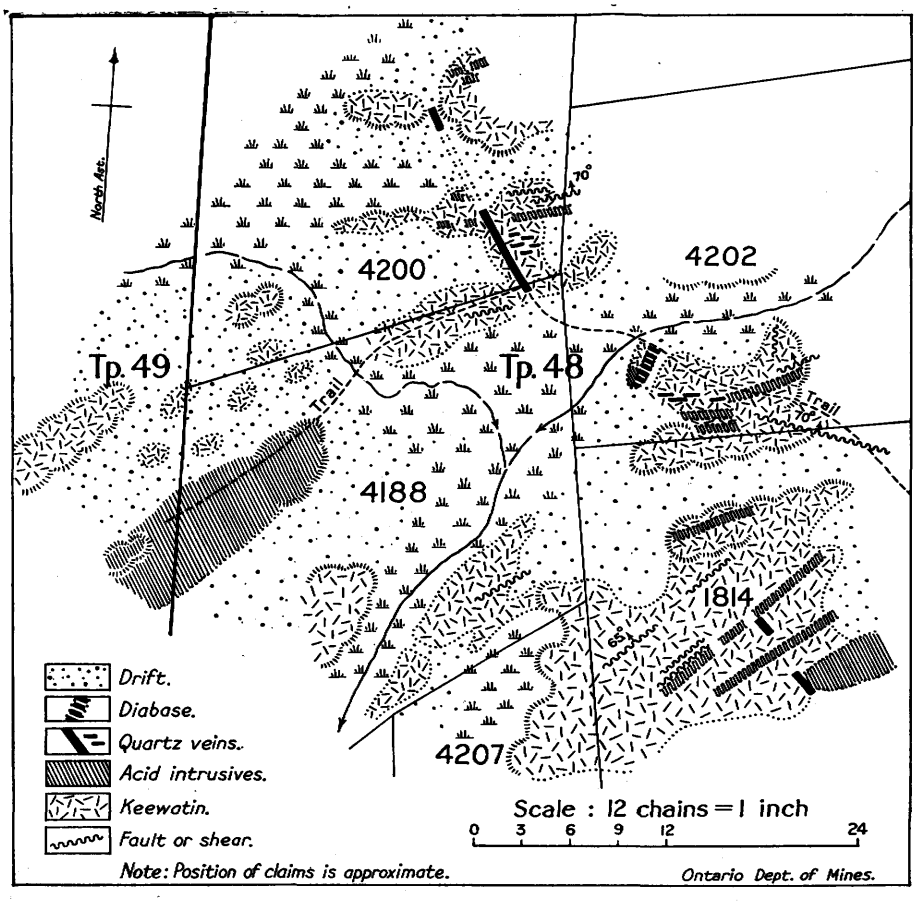
North from Cline Canadian Gold Mines

North from the No. 2 post of claim No. 2,292 for three-quarters of a mile, the country is sand covered; then outcrops of sheared basic Keewatin lavas appear that are cut by acid porphyries and a number of north-south diabase dikes. The quartz veins in this locality are small and do not show any sulphides. The shear zone at this point is in line with the break on the east side of Indian lake, which lies to the southeast. About a mile and a quarter farther north the

rock exposures terminate at a broad east-west, sand-filled valley. A large mass of diabase outcrops on the south side of the valley. The country in this vicinity has been burned over thoroughly, and a large amount of it is sand covered.

Michael Syndicate

Along the east side of claim No. 4,200, in the west central part of the township a few chains from the township line, the late Robert Pinard found a wide



Sketch showing geology in the vicinity of a gold discovery north of Pine lake, townships 48 and 49, district of Algoma.

breccia zone in Keewatin basalt, which contained quartz, pyrite, and native gold (see photomicrograph on page 80).

Vermicular chlorite and fairly coarse gold can be found in a number of places in the vein quartz.

The brecciated zone has been traced north and south across two or three claims; it has a maximum width of 30 feet and a length of several hundred feet; and it strikes a little west of north. The south end comes very close to a large lens of massive pyrite. On the east side of the gold-bearing vein and also at the south end of the vein breccia, small east-west acid porphyry dikes and narrow gold-quartz veins were seen in a Keewatin basic schist. The country

to the west of the gold zone is largely sand covered, but ridges of fine-grained acid porphyry can be seen cutting Keewatin basic schists.

The brecciated gold ore is made up of a filling of vein quartz about irregular fragments of basic Keewatin lavas that are pyritized. The gold is in fine grains included in the vein quartz. Assays for gold of $2 per ton are fairly common in the less crushed and more poorly pyritized places, and from $12 to $15 per ton in the better but more widely spaced intervals situated from north to south along the breccia zone. The relations of the rocks, structure, and veins can be seen on the geological sketch map included in this report.

McCormick

Claim No. 2,179 borders on the east side of Indian lake, a small lake a short distance northeast of the Cline property. The mineralization consists of a series of small quartz stringers on the south border of a sheared dike of acid porphyry, which intrudes basic Keewatin schist. The veins strike a little south of east and appear to have little mineralization by sulphides or gold. The porphyry and shear zones on this claim are on the strike of similar shear zones and porphyry dikes at the north of Godon lake on the Lochalsh Syndicate group.

Stobie-Boyle

The Stobie-Boyle group of eight claims lies about three-quarters of a mile southwest of the west end of Godon lake. Trails lead to the claims from Godon lake and from the Cline property.

The drift cover is extensive in the area occupied by this set of claims. One vein was seen a few feet north of the cabin that is situated at the southeast corner of claim No. 4,090. This vein is about 18 inches wide, runs east and west, and is enclosed by basic Keewatin schists. The content of the vein is chiefly ankerite with a few sulphides. Some narrow quartz veins of barren appearance were examined in a burned area, underlain by Keewatin basic schist, about a quarter of a mile southeast of the cabin on claim No. 4,090. A few large trenches were dug in this locality.

Edwards Group

The Edwards group is made up of seven claims (Nos. 4,013, 3,303, 3,862, 3,559, 3,846, 3,304, 3,553) situated about half a mile east of Pine lake on the Goudreau wagon road. The claims are owned by Peter Edwards of Sault Ste. Marie and were under option during 1925-26 to the Hollinger Gold Mines, Limited.

This group is underlain by a belt of sheared basic Keewatin lavas, which has been intruded by east-west acid porphyry dikes. An overburden of clay and sand hides much of the rock surface.

In the southeast corner of claim No. 3,559, a test pit and trenches were dug on a mineralized zone containing vein quartz, tourmaline, pyritized basic schist, a little arsenopyrite, and some chalcopyrite. High gold assays were obtained, but on account of the overburden and faults, the volume of the deposit has not been determined.

Huronian Belt

Near the northwest corner of claim No. 2,183, 20 chains south of No. 2 shaft on the Cline property and a few chains away from the Hollinger pit, some exploration was done by the Huronian Belt Company. The work consisted of several earth trenches and a test pit. The basic schist near the vein was pyritized

and contained fair amounts of gold. A narrow band of iron formation was seen a few feet north of the pit where the gold was found. Overburden and faults made it difficult to work out the size and shape of the deposit.

Lochalsh Syndicate

This syndicate has a group made up of seven claims that extend from near the northwest shore of Godon lake to the wagon road leading to Lochalsh. The rocks are fairly well exposed, as part of the woods are burned off. The dominant rock is Keewatin basic schist, which is intruded by narrow acid dikes that trend a little south of east. A few small veins were seen near the north boundaries of claims Nos. 3,919, 2,204, and 2,219, but the wall rock was not mineralized and the quartz veins themselves did not show consistent mineralization. Tourmaline and ankerite were prominent in and near the veins. The shear that passes through this group of claims is in line with the one that crosses Indian lake to the northwest and the Michael-Webb group to the southeast.

Boundary Lake Area

The claims near Boundary lake can be reached either by canoe from Godon lake or by a trail leading south from the Michael-Webb group at the east end of Godon lake.

A small quartz vein with little gold mineralization in or near it was seen on claim No. 2,898 near the southwest corner of the lake. The country rock of Keewatin basic lava was recrystallized.

A short trip was made by trail from the southeast corner of Boundary lake to claim No. 3,000, where a vein had been found and explored by C. Reed of Sault Ste. Marie. The country between the lake and claim No. 3,000 was extensively drift covered.

In the vicinity of the vein, which extends east and west, the rocks are better exposed and consist of recrystallized basic Keewatin lavas. At the west end of the vein, a mass of intrusive quartz diorite was noticed. The vein is from one to two feet wide, and the basic schist near it is pyritized, but the widths and lengths of pyritized Keewatin are very irregular. A little chalcopyrite and some specular hematite were noted in the vein matter. The quartz veins, which are small and lenticular, extend along the strike of the fault fissures for several hundred feet.

TOWNSHIP 47, RANGE 27

Michael-Webb Group, Godon Lake

The Michael-Webb group of four claims lies near the 3-mile post on the township line between townships 47 and 48. Three cabins have been built near the shore at the east end of Godon lake, and a wagon road connects the camp with Lochalsh station.

The main vein system lies in a highly sheared zone in Keewatin volcanics and is about 90 feet wide. The zone has been localized by an easily yielding bed of volcanic tuff bordered by fairly massive Keewatin pillow lavas. The schistosity planes dip 80° N., and strike at 100° mag.

Lenticular quartz veins with a maximum width of six feet were seen in the sheared zone, and the schist bordering the veins has been pyritized. At the east end of the trenching, a dike of acid porphyry 25 feet wide has intruded the shear zone. A few small veins were noted parallel to the larger ones of the main shear.

This prospect has been diamond-drilled and examined by mining companies. Commercial gold assays were obtained along the vein system in several spots over stoping widths. The deposit has not yet been fully explored.

The shear zone on this property is in line with other shear zones north of Godon lake on the Lochalsh group and to the east on the Johnson claim, No. 2,486, near Brothers lake.

East of Godon Lake

On claim No. 2,484, owned by J. W. Speers, near its north boundary there is a 3-foot pyritized shear zone in the basic Keewatin lavas.

Near the southwest corner of the Johnson claim, No. 2,486, a shear zone four feet wide in basic Keewatin contains an 8-foot, east-west, acid porphyry dike. A short distance north of the south boundary of claim No. 2,486, shear zones and small, poorly mineralized quartz veins were seen. This claim represents the width of the greenstone ridge that runs east of Godon lake towards Brothers lake. The ridge drops off at the east side of claim No. 2,486 to a sand plain that continues east as far as Brothers lake. A large treeless sand plain about a mile wide lies south of claim No. 2,486. The first rock to the south is on claims Nos. 4,264 and 4,265. A trail runs from Godon to Brothers lake.

In the area between Godon lake and claim No. 2,486, the rocks are dominantly Keewatin basic lavas, which are intruded by a few dikes of acid porphyry, and Keweenawan diabase.

From the high peridotite hill at the northwest corner of Dog lake to Brothers lake, the country is underlain by Keewatin basic lavas that contain dikes of acid intrusives and a few north-south diabase dikes. From Brothers lake to the high hill, two miles or so to the south, the rocks are Keewatin lavas similar to those east of Godon lake.

Emily Mine, Dog Lake

The gold at the Emily mine on Dog lake was the first found in the area, as it was discovered in 1896. The Emily claims, Nos. 2,017, 1,114, and 2,015, lie about five miles southwest of Missanabie station on the Canadian Pacific railway, across Dog lake. The Emily prospect can be visited by motor boat in a few hours from Missanabie.

During the Goudreau staking, the claims came almost as far east as those of the Emily group. In 1901 and 1902, the owners, now the Algoma Steel Corporation, sank a shaft to a depth of 56 feet on claim No. 1,114 and put down three diamond-drill holes. Lack of money resulted in a cessation of prospecting by the first company in 1903, and nothing has been done since.

At the time of the writer's visit, in July, 1926, the old workings were filled with water, but several rock dumps and old pits indicated the nature of the rocks and mineralization. Keewatin basic schist is the country rock, and there is a small quantity of iron formation and a pale-green quartzite. Apparently dikes of porphyrite occur near the veins, as this rock was seen on the dumps. A north-south diabase dike cuts the banded iron formation, which dips at a low angle to the northeast.

It is reported that several tons of ore from a rusty quartz vein bordered by pyritized schist were shipped for a mill test. This ore gave $30.16 per ton in gold by amalgamation, and $18 per ton remained in the concentrate and tailing.

The main vein of rusty quartz is about four feet wide, strikes east and west, and has been traced for several hundred feet. Channel assays of as much as $44 per ton in gold have been obtained across a few sections of the vein.

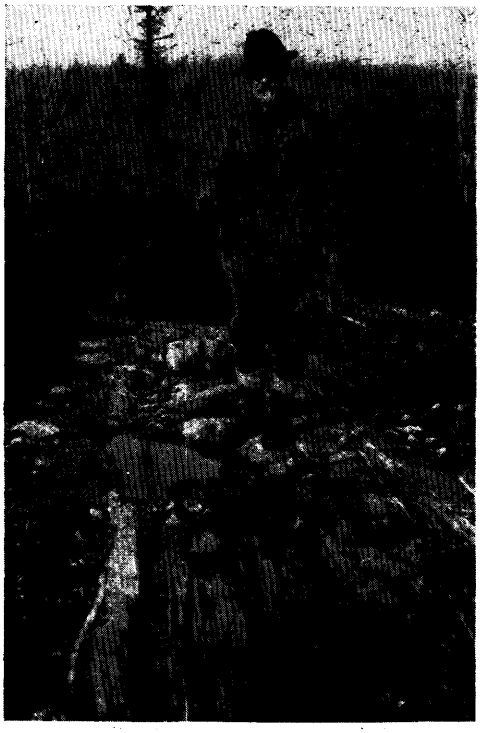
Claim No. 2,016

Near the Emily mine, on claim No. 2,016, a Toronto syndicate has done some stripping on an east-west quartz vein in Keewatin basic schist. This vein is crossed by the trail from the boat landing on the Emily prospect. Vein carbonates are plentiful near and in the vein. Only a few sulphides were seen. The veins are short and lenticular, the maximum width being about two feet.

APPENDIX

Gold in Hawkins and Walls Townships, East of Langdon Station

A belt of highly schistose Keewatin greenstones, over a mile wide and bordered by granite, pass in an easterly direction through the townships of Hawkins and Walls and cross the Algoma Central railway at Langdon, con-



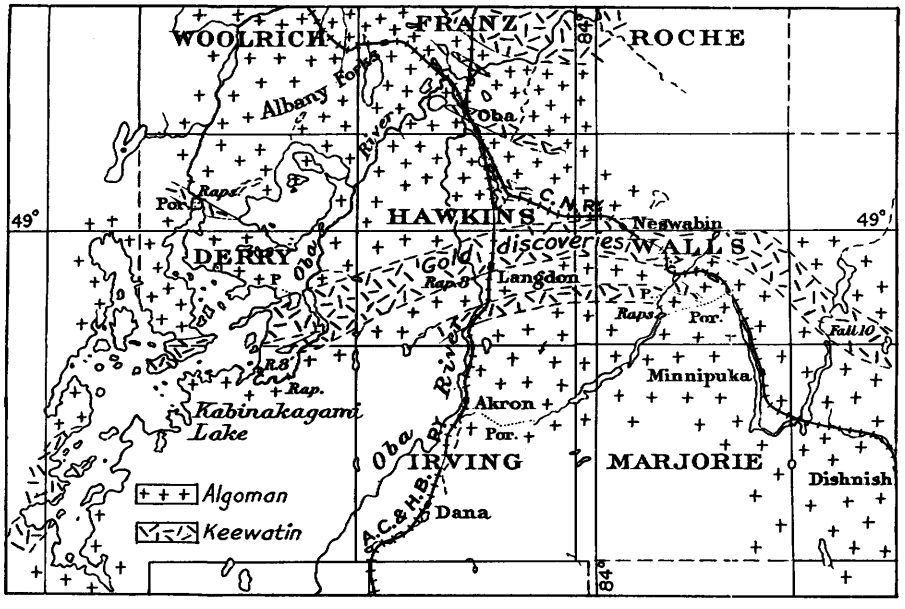
Parallel set of gold-quartz veins and porphyry dikes in sheared basic Keewatin schist on Culbert claim.

tinuing westward to Kabinakagami lake; the entire length of the belt is about 30 miles. A few miles to the south of this Keewatin band is another narrower and shorter one of the same rocks. The basic schists have been partly recrystallized to hornblende and have intruded into them along their schistosity strike, in *lit par lit* fashion, parallel dikes of acid porphyry. The gold-quartz veins which lie in the vicinity of the porphyry dikes are also arranged in the same parallel fashion (see photograph above). Massive pegmatite dikes cut across

the greenstone, porphyries, and quartz veins alike, and all four are cut by later north-south Keweenawan diabase dikes. The country is flat, and the only rock that is well exposed is the ridge on which the quartz veins occur. Farther north and south, drift and swamp hide the rocks.

The Culbert and Peterson claims, on which several finds of native gold have been made, can be reached by a trail a mile or so long from a point on the Canadian National railway about 6½ miles south of Oba. A trail leading east from Langdon on the Algoma Central railway serves the west end of the staked area.

The quartz veins are narrow, glassy, and tabular, seldom exceeding a foot in width, and the dominant wall rock for the veins and porphyries is a recrystallized basic Keewatin schist. The porphyry dikes are narrow and where mixed



Key map showing general geology of the Langdon-Neswabin gold field.
Scale, 8 miles to the inch.

with the dark schist range from a fraction of an inch to a few feet in width. They are light weathering, being composed largely of feldspar.

Native gold was seen in several places, and coarse gold can be obtained on the Culbert claim, No. 4,689, and the Peterson claim, No. 4,687. Galena, pyrite, chalcopyrite, and rusty spots in the quartz veins indicate the richer gold-bearing vein sections. North and south cross-faults on the Culbert claim dislocate the veins slightly, and it is in these places that the gold is most plentiful.

A few claims have been staked west of Langdon on the same belt of schist. The writer worked in this area in 1915 and remembers finding galena in the rocks along the bank of the Oba river west of Langdon, and chalcopyrite lenses in Keewatin basic schist at the east end of Kabinakagami lake close to the end of the portage from Oba river to the lake.

The gold-quartz veins seen in these townships are too small and too widely spaced to justify mining, but it is worth while to know that gold is found along this schist belt and that further prospecting may disclose larger veins.

The writer is grateful for the help and information on this area that was supplied to him by Stuart Culbert of Oba.

Shiningtree Silver Area, District of Timiskaming

By Geo. B. Langford

Introduction

The recent successful developments in the silver areas of Gowganda and South Lorrain have raised the question as to whether there are any other areas with similar possibilities that have been overlooked. With this in view, the Ontario Department of Mines authorized a re-examination of the Shiningtree area during the summer of 1926.

For assistance, both in the field and in preparing this report, the writer wishes to thank Geo. F. Browne, assistant; Duncan MacDonnell, Edward Archibald, W. F. Currie, and J. Work.

Previous Work

The first geologist to visit this area was E. M. Burwash,[1] who was attached to Niven's survey party during the location of the Algoma-Nipissing boundary in 1896. His report dealt briefly with the iron range in the southwest corner of Tyrrell township, and the rocks immediately west of it.

In 1901, A. P. Coleman[2] made a further examination of the same iron range and traced it for a distance of three and a half miles. He also made observations on the rocks of Shiningtree lake.

R. B. Stewart[3] examined the west half of Leonard township in 1912, made a geological sketch map, and described the rocks and mining properties.

W. H. Collins[4] in his report on the Onaping Map-Area, which includes the Shiningtree area, gives detailed descriptions of all the formations mentioned in this report, together with the metamorphic, structural, historic, and economic geology of the region. Unnecessary duplication of Collins' work was avoided, and the reader is referred to his excellent treatise for more detail than is included in this report. All references to Collins' work will apply to the "Onaping Map-Area," except where otherwise stated.

Bibliography

References to the Shiningtree silver area are to be found in the following reports:—

E. M. Burwash, Ont. Bur. Mines, Vol. VI, 1896.

A. P. Coleman, "Iron Ranges of the Lower Huronian," Ont. Bur. Mines, Vol. X, 1901.

W. H. Collins, "The Florence Lakes and Montreal River District," Geol. Surv. Can., Sum. Rept., 1909; "The Montreal River District," Geol. Surv. Can., Sum. Rept., 1910; "Geology of Onaping Sheet, Ontario," Geol. Surv. Can., Sum. Rept., 1911, 1912; "Onaping Map-Area," Geol. Surv. Can., Mem. No. 95, 1917.

R. B. Stewart, "The Shiningtree Silver Area," Ont. Bur. Mines, Vol. XIX, pt. 2, 1913.

[1]E. M. Burwash, Ont. Bur. Mines, Vol. VI, 1896, pp. 173-75.
[2]A. P. Coleman, Ont. Bur. Mines, Vol. X, 1901, pp. 182-85, 211.
[3]R. B. Stewart, Ont. Bur. Mines, Vol. XIX, pt. 2, 1913, pp. 187-93.
[4]W. H. Collins, Onaping Map-Area, Geol. Surv. Can., Mem. No. 95, 1917.

Location and Access

The Shiningtree silver area is situated about half way between the West Shiningtree gold area and the Gowganda silver area, being about fifteen miles from either by road or trail. It includes Leonard township, and small parts of the adjacent townships.

Transportation facilities have been greatly improved within the past year. A winter road fifteen miles long was cut during the winter of 1925-26 from West Shiningtree to the middle of Leonard township. This road runs around the south end of Shiningtree lake and links up with the gravelled highway from West Shiningtree to Westree on the Canadian National railroad. The total distance from the steel to the centre of Leonard township is 39½ miles. In addition to this, a power line and winter road are being constructed from the West Shiningtree area to Gowganda. They will cross the lower end of Shiningtree lake, and will serve the northern end of the area.

The best canoe route to Shiningtree lake is from West Shiningtree, via the west branch of the Montreal river. A circuitous route from Gowganda, via Spawning lake, is used when coming from the east.

Topography

The area is relatively flat, with a few northward-striking rocky ridges, the highest of which rise about 200 feet above the lakes. The southwestern and central parts are swampy. A good stand of timber covers the area, and as a result rock outcrops are not numerous. This is especially true of the eastern half where heavy glacial drift is present.

The creeks are all small and useless for canoeing, with the exception of the outlet of Shiningtree lake and the west branch of Wapus creek. The lakes all occupy rock depressions. Spider and Black lakes strike in a northwesterly direction, while the general trend of the others is north or northeast. This is due to structural differences as explained later.

General Geology

The consolidated rocks are all of pre-Cambrian age; their areal extent can be seen on the accompanying map. The following tabulation is given in descending order, the oldest being at the bottom.

TABLE OF FORMATIONS

QUATERNARY	
PLEISTOCENE and RECENT:	Boulder clay, sand, and gravel.
	Unconformity
PRE-CAMBRIAN	
POST-KEWEENAWAN:	Quartz diabase and olivine diabase dikes.
KEWEENAWAN:	Quartz diabase sill.
	Intrusive contact
ANIMIKEAN (Cobalt Series):	Upper: Quartzite. Lower: Conglomerate, thin-bedded greywacké, quartzite, and conglomerate.
	Unconformity
KEEWATIN:	Late: Rhyolite flows, tuffs, breccias, and associated sediments. *Unconformity* (?) Greenstone, pillow lava, and iron formation.

Keewatin

These are the oldest rocks in this area; they have been much folded and metamorphosed, although they have not been badly schisted. Some pillow lava is to be seen on Shiningtree lake, but for the most part the term "greenstone" is the most applicable name for these rocks.

The iron formation is of two types. The northern range, in the northwest corner of Leonard township and the southwest corner of Tyrrell township, consists of banded jasper and grey chert.[1] The outcroppings consist chiefly of hills of broken angular blocks, the result of weathering. The southern range, on the west side of Wapus lake, has been traced for a distance of 4,000 feet and consists of a highly siliceous mixture of hematite and magnetite.[2]

Late Keewatin

The late Keewatin rocks consist of rhyolite, tuff, flow breccia, slate, and arkose or feldspathic quartzite. They have been folded so that now they have dips ranging from 30 to 70 degrees, and strike generally N. 30° W. They occupy a large area in the northern part of Leonard township and extend northward into Tyrrell township.

These rocks have been subjected to much less severe metamorphism and folding than have the Keewatin greenstones. This can be seen in the difference in the degree of alteration of the feldspars, in the general appearance of the rocks, and in the fact that the rhyolite series, with dips up to 70 degrees, is lying on greenstones with vertical dips.

Although the rhyolite, tuffs, breccias, and associated sediments probably belong to the pre-Huronian, as that term is used by Collins, it is the opinion of the writer that they are separated from the Keewatin greenstones and iron formation by an unconformity representing a considerable time interval. Collins also appreciated this when he wrote:—

> It [rhyolite of Leonard township] may have been competent enough to resist the deformative forces which affected the iron formation, but it seems more likely that it is much younger.[3]

Their stratigraphic position could not be determined any more accurately than later than the Keewatin greenstone and iron formation and earlier than the Animikean, for the following reasons:—

1. On the portage from Spider to Black lake a piece of flow breccia was found containing a 2-inch fragment of jasper. Although this piece of rock was loose, it closely resembled the bed rock which outcropped in a 10-foot bluff about 25 feet from the place where the fragment was found. A close search, however, failed to locate any more jasper fragments. The only jasper in this vicinity is generally conceded to be not older than the Keewatin. In order to contain erosion fragments of the Keewatin jasper, the rhyolite flows must be later, and probably considerably later than the jasper and greenstone.

2. Where it outcrops on Spider lake, the rhyolite series is predominantly igneous; but farther east, in the vicinity of Black lake, a change to a predominantly sedimentary character is quite noticeable. Such sedimentary series are not usually found associated with Keewatin greenstones.

3. The relationship between the rhyolite and the Animikean can be seen on the portage between Spider and Bobs lakes. Here the Animikean sediments can be seen unconformably overlying the rhyolite.

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[1] *See* Coleman and Burwash, op. cit.
[2] W. H. Collins, Geol. Surv. Can., Sum. Rept., 1910, p. 201.
[3] W. H. Collins, op. cit., p. 44.

The depressions occupied by Black lake and Spider lake are along the axes of folds in the late Keewatin series, thus accounting for the direction of these lakes being different from that of their neighbours. The other lakes in this area occupy depressions caused by faulting, which varies in strike from north to N. 40° E.

Animikean (Cobalt Series)

This is a sedimentary series consisting of two distinct formations. The older, the Lower Cobalt formation, is composed of a basal conglomerate resting unconformably on the Keewatin, thin-bedded greywacké, quartzite, and on upper conglomerate. The whole series resembles very closely the boulder clay and outwash deposits characteristic of the Pleistocene glaciation.

The basal conglomerate (see photograph below) consists of subangular and rounded boulders of granite, schist, gneiss, quartzite, and jasper, the largest being as much as three feet in diameter. These are cemented by a fine-grained matrix of rock debris, partially altered to chlorite.



Lower Cobalt basal conglomerate at Shiningtree lake. Note large boulder three feet to the right of the hammer.

The greywacké is thin-bedded, and in some instances the layers, which are about a quarter of an inch thick, are of alternate greyish-green and pinkish-grey colours. A thin conglomerate containing quartzite lenses overlies these fine-grained rocks. This contact is conformable in some cases and unconformable in others.

The thin upper conglomerate consists of boulders of a fairly uniform size, with very little cementing material. They represent the same rock types as those as seen in the basal conglomerate.

The basal conglomerate is the same rock that has been called tillite by numerous writers. Although the general appearance of the rock in the Shiningtree area would suggest a glacial origin, no positive proof could be found to support this. Consequently, the term "conglomerate" is used because this formation can be traced, with practically no interruption, to Gowganda, where the basal conglomerate of the Cobalt series contains many boulders weathered directly from the underlying rocks.[1]

[1]A. G. Burrows, Ont. Dept. Mines, Vol. XXXV, pt. 3, 1926, p. 12.

The younger or Upper Cobalt formation is a well-sorted feldspathic quartzite varying from fine to medium grained. Only small areas of it occur, and it conformably overlies the Lower Cobalt formation. It is not thick in this area.

The entire Cobalt series is relatively flat-lying, with a few folds of local character as seen on the east shore of Bobs lake (Fig. 2). Although these folds occur in the greywacké, they are not thought to be due to incompetency during folding, for nowhere in the Cobalt series is there sufficient folding to produce

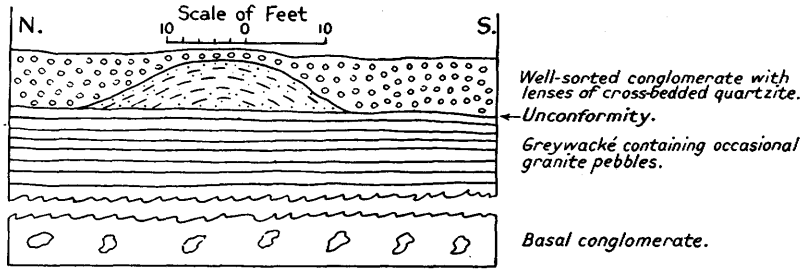


Fig. 1—Section through the Lower Cobalt formation on the north boundary of Leonard township, west of Bobs lake. Although the position of the basal conglomerate is here assumed, the relation between these rocks is well illustrated.

such an effect. Collins,[1] who postulates a glacial origin for the basal conglomerate of the Cobalt series, has attributed these folds to movements of the glacial ice before the greywacké was consolidated.

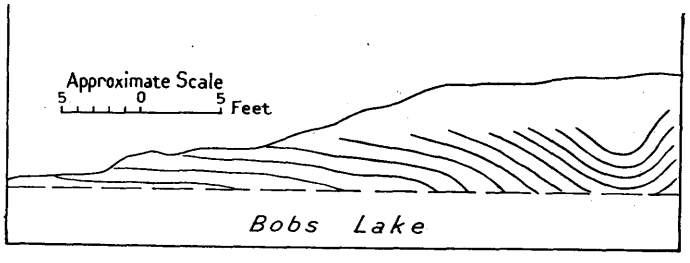


Fig. 2—Folded greywacké (Cobalt) on Bobs lake. Note how the folds die out in 20 feet. This is characteristic of the folds in this formation.

To the east of Black lake it is often difficult to distinguish between the coarse quartzitic sediments of the late Keewatin and the fine phases of the Cobalt conglomerate. This difficulty is increased by the presence of large swamp areas and the smallness of the outcrops.

Keweenawan

To this age is ascribed the major diabase intrusion, which is reponsible for the silver deposits. This rock is a quartz diabase and occurs principally in a large northward-striking sill which runs east of Shiningtree lake and dips to the east. Numerous observations made on both contacts confirmed this dip and

[1]W. H. Collins, op. cit., pp. 67-68.

showed it to vary from 15 to 30 degrees. Small patches of the same diabase are numerous. The attitude of these, and of the large area on the boundary line between North Williams and Leonard townships, was not determined.

Calculations based on a 15° dip across the wide exposure of the sill east of Shiningtree lake indicate a thickness of about 1,700 feet. This is probably exaggerated as a number of northward-striking faults, with the western or hanging walls downthrown, cut the diabase across this area. The total thickness is likely to be less than 1,000 feet. A section north of Spike lake gives a thickness of 400 to 500 feet (Fig. 5). Between Wapus and Shiningtree lakes, it is possible that the sill splits into an upper and lower branch, the upper one outcropping through the Saville Syndicate property and the lower one running towards Baker lake.

The sill diabase varies in texture from very fine or traplike, near the contacts, to coarse and gabbroic, with crystals an inch or more in length. The chief minerals are plagioclase, with about the composition of labradorite, augite, and quartz. The first two occur as ophitic intergrowths and the quartz as an interstitial filling, often in micrographic intergrowth with the feldspar. This feldspar is not entirely the soda-lime plagioclase of the normal diabase, but consists of more or less albite and occasionally a little microcline.

Concentrations of this quartz-feldspar intergrowth have given rise to small areas of red rock, which outcrop at several points along the upper contact of the diabase. Two of the most prominent of these occur, one at the point where Horseshoe lake joins Spider lake, and the other on the peninsula between Spider lake and Spud lake. On first sight these areas have the appearance of small intrusions of red syenite and are always coarsely crystalline. When one of these bodies is approached from the diabase their presence is indicated by the occurrence of red feldspar. This increases in amount, with a corresponding decrease in the pyroxene and plagioclase of the normal diabase, until it forms the bulk of the rock.

The possibility of these being due to assimilation or differentiation has been discussed by several writers,[1] and it has been well demonstrated that the melting of the Cobalt series by the intruding diabase was responsible for the production of the red rock in some areas. In the second outcrop of the red rock above noted, some patches of this material occur near the contact between the diabase and the Cobalt series which may well be partially melted fragments of the latter. This points towards assimilation as the cause of this rock type.

Numerous small aplite dikes occur in the diabase sill and the wall rocks. These are usually less than two feet in width and are probably related to the same magma that produced the diabase.

Post-Keweenawan

The rocks belonging to this age consist of a number of small diabase dikes, rarely over a chain in width, with a northerly strike. They occur in large numbers around Spider and Black lakes. Because of their unimportance from an economic viewpoint, no attempt was made to trace them or to distinguish between the two varieties that occur—quartz diabase and olivine diabase. They weather to a dark-brown colour, which makes it easy to distinguish them from the Keweenawan diabase. Under the microscope considerable magnetite can be seen in the olivine diabase. Nowhere were they seen to cut the Keweenawan.

[1]N. L. Bowen, Jour. Geol., Oct.-Nov., 1910; W. G. Miller, Ont. Bur. Mines, Vol. XIX, pt. 2, 1913, p. 103; W. H. Collins, op. cit., p. 90; A. G. Burrows, Ont. Dept. Mines, Vol. XXXV, pt. 3, 1926, p. 15.

Pleistocene and Recent

Swamp and glacial drift constitute the bulk of the overburden. Stratified clay is notably absent, although stratified sand occurs. The largest swamp areas are in the southwestern and central parts of Leonard township. The eastern quarter of the township is covered with a heavy mantle of boulder clay. In the southeast corner of the area it is arranged in a series of northerly-striking hills, which give the topography a decidedly rolling character. Near the crossing of Wapus creek is an esker which can be traced for about a quarter of a mile. Two sets of glacial striae were seen on Shiningtree lake, one striking N. 5° W., and the other N. 25° W.

Structural Geology

The faulting which has taken place in this area is particularly noticeable east of Shiningtree lake. Here a number of northerly-striking ridges occur which often have their west faces almost perpendicular and the east ones gently sloping.

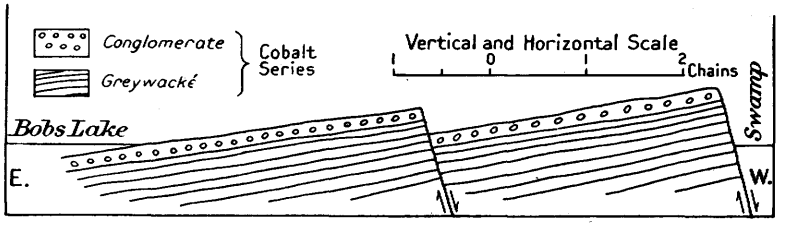


Fig. 3—Section along the north boundary of Leonard township west from Bobs lake.

Although some of these, particularly in the diabase, may be due to differential weathering, others are undoubtedly due to a number of faults with small throws. Proof of this can be seen in the ridges west of Bobs lake where conditions as shown in Fig. 3 may be seen. These ridges usually have a northerly direction, but sometimes swing towards the east as much as 40 degrees.

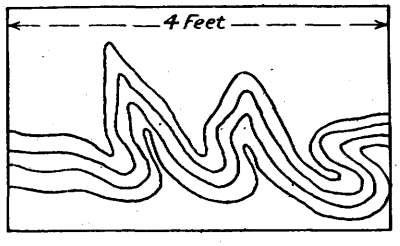


Fig. 4—Sketch showing the shortening of incompetent late Keewatin slate, seen at the south end of Black lake. A shortening of 50 per cent. is here illustrated.

The faulting took place at two different periods and at about the same time as the vein filling. The first faulting was the more pronounced and accounts for most of the movement. It preceded the injection of the gangue minerals into the veins and was followed by a fracturing and slight movement, which reopened the veins or formed new cracks. Into these later-formed fissures were injected the metallics, accompanied by more gangue. The importance of this last faulting is thus emphasized.

The Keewatin rocks have been highly folded with the production of some schisting and vertically dipping beds. The next series, the late Keewatin, was subjected to disturbances along a northeast-southwest line and thrown into a series of folds with some wrinkling up of the incompetent beds (Fig. 4). This series now has dips of from 30 to 70 degrees. Since Keewatin time very little folding has taken place. The Animikean series does not show dips greater than 15 degrees, except in the small flexures already noted. Fig. 5 is a section showing all of the pre-Cambrian formations in this area and demonstrates their stratigraphic and structural relationship.

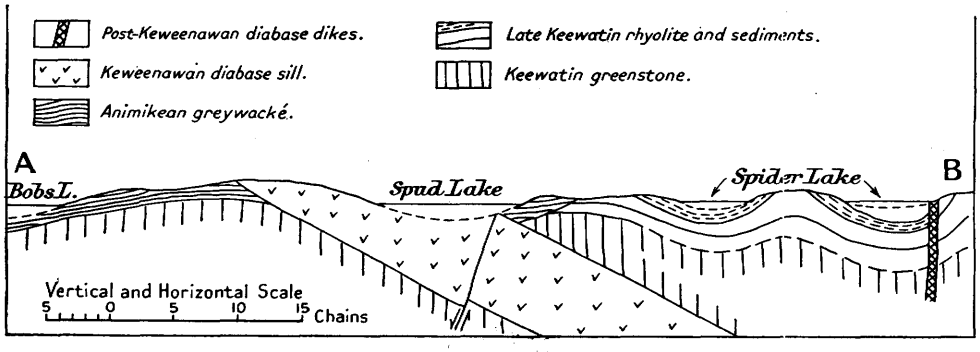


Fig. 5—East-west structure section along line A-B north of Spike lake. The diabase sill here is dipping at 30 degrees, which is the maximum for this area. Farther south it flattens to about 15 degrees. The thickness of the late Keewatin and Animikean rocks is assumed, while the vertical attitude of the Keewatin is diagrammatic only.

Economic Geology

Silver

The silver-bearing veins occur chiefly in the Keweenawan diabase sill near the upper contact, and occupy vertical fissures running in directions which range from north to N. 40° E. They vary in width from knife edges up to several feet. The widest seen was a stockwork, on the west shore of Nellie lake, which has a width of six feet.

The filling of the fissures, which occured shortly after the intrusion of the diabase, took place at two periods synchronous with the faulting. The first filling was chiefly calcite with some quartz. Many of the large veins were filled at this time and can be recognized by the coarsely crystalline white calcite and comb quartz. The second filling was of grey or pink calcite accompanied by quartz, silver, niccolite, chalcopyrite, smaltite, and bismuth. These later-filled veins are usually narrow (less than one foot), and the pink or grey calcite is medium grained. In some cases they consist of two or three inches of solid niccolite and smaltite. The silver occurs as small flakes or scales in cracks in the calcite, or adhering to the diabase walls.

The first vein-filling occurred after the first faulting and before the second faulting, while the second vein-filling followed the second period of faulting. For this reason the metal-bearing veins may cut either the diabase or the large, coarsely crystallized veins. On the Archibald claim, silver-bearing veins also cut the diabase at right angles to the general direction of faulting.

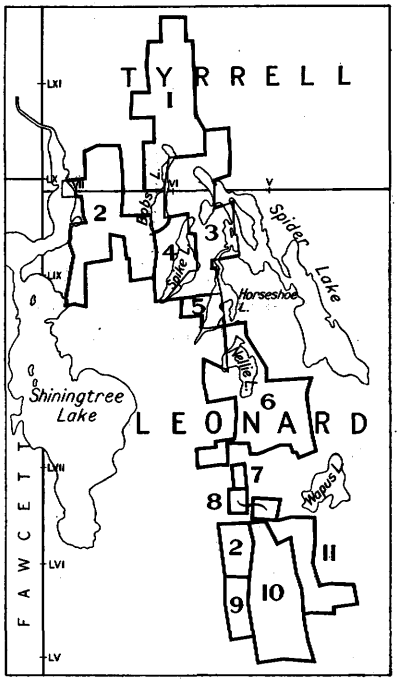
Iron

The northern iron range has never been seriously developed. Consisting as it does of jasper and chert, it is rather unattractive as an iron deposit. The

Wapus Lake range, which consists of a mixture of silica, magnetite, and hematite, has a known length of 4,000 feet and in places is 40 feet wide. Although picked samples of it are said to run 52 per cent. iron,[1] no large bodies of ore have been found.

Development of the Area

The first staking to be done in Leonard township was in 1908,[2] when prospectors from Gowganda recognized the similarity in the two areas. By the end of 1909, five-eighths of Leonard had been staked.[3] Silver was discovered on several claims, and this led to considerable activity during the years 1910, 1911, and 1912. With a few exceptions, nothing has been done on the properties since 1912, and as a result the surface showings have been practically all covered up by the washing in of mud and sand, and the second timber growth. The parts quoted in the following descriptions have been taken from the report of Stewart, who visited the area in 1912.[4]



Key map showing the principal groups of mining claims. Scale, 2 miles to the inch.

REFERENCE

1. Currie.
2. Leonard Silver Mines, Limited.
3. Walker Silver Mines, Limited.
4. G. E. Martel.
5. Steep-Thompson.
6. Nellie Lake Syndicate.
7. Neelands.
8. Caswell-Eplett.
9. E. L. Greave.
10. Saville Exploration Syndicate.
11. Archibald.

Description of Properties

Saville Exploration Syndicate

"The holdings of this company comprise a group of eleven claims, which are situated south and west of Fournier [Wapus] lake. Silver was first found in the area on this property in May, 1909. Considerable surface work has been

[1]W. H. Collins, Geol. Surv. Can., Sum. Rept., 1910, p. 201.
[2]A. G. Burrows, Ont. Bur. Mines, Vol. XVIII, pt. 2, 1908, p. 2.
[3]T. W. Gibson, Ont. Bur. Mines, Vol. XIX, pt. 1, 1910, p. 52.
[4]R. B. Stewart, Ont. Bur. Mines, Vol. XIX, pt. 2, 1913.

done on the claims. Many well-defined veins occur in several places on the property. Much bloom, with smaltite, copper pyrites, and a small amount of bismuth, was observed in several of the veins. No silver was found in place, but small specks were found in pieces of vein matter that had been taken out of one of the veins. The trenches are filling up again to a certain extent, so that small isolated showings of silver could easily escape detection. All the veins that were visited are in the diabase. No work was in progress on this property during the season."

Surface work has been carried out recently, and veins have been uncovered on claims H.S. 864-68 and H.S. 872-74. Silver has been reported from a number of these veins and was seen in place in one. W. F. Currie, of Toronto, now owns this group.

Turnbull

"These claims T.C. 395 and 396 [now belonging to Leonard Silver Mines, Limited] are situated immediately west of those of the Saville Exploration Syndicate. The country rock is diabase. On one of the claims a large calcite vein has been uncovered for about three chains. This vein is three or four feet wide in places. Just west of the large vein, another one occurs that will average probably eight or ten inches in width for a distance of about three claims. The two veins have a strike of about N. 30° E. mag. In the vicinity of the large veins many small stringers occur, one of which carries cobalt bloom."

E. L. Greave

"This group of three claims [G.G. 3,507-9] is located just south of Turnbull's. Surface work was being carried on when the writer visited the property. Three veins, three to six inches wide, occur in the diabase on the most southerly claim. Small amounts of silver were seen in the three veins. The gangue material is quartz and calcite, with small quantities of copper pyrites, galena, and smaltite. Surface work on the most northerly claim has exposed two veins of quartz and calcite associated with aplitic material, but no silver had been discovered."

Caswell-Eplett

"These claims (W.D. 1,145 and 1,146) are located a little west of Fournier [Wapus] lake and immediately north of the claims of the Saville Exploration Syndicate. The formation is chiefly diabase, but the contact between the diabase and the Cobalt series occurs on W.D. 1,145. Quite extensive surface work has exposed many veins on W.D. 1,146. Cobalt bloom occurs in several of the veins. Small flakes of native silver were found in the black muck-like material in a small vein just west of the shaft.

"The most extensive underground work in the area has been done on W.D. 1,146. Mining operations were not in progress when the writer was on the property, but some information regarding the underground work was obtained from Mr. Grant Caswell. A vertical shaft was sunk 100 feet on a vein that showed silver at the surface. A crosscut was run 100 feet east and the same distance west from the shaft. On the east side a calcite vein, eighteen inches wide, and a vein of niccolite, four to six inches wide, were crossed. A calcite vein was found on the west side of the shaft.

"The plant consists of a 20 h.p. upright boiler, a 5 by 5 hoist, three pumps, and a Rand drill."

These claims are now G.G. 4,881 and G.G. 4,884.

Archibald

"This claim lies immediately east of the group of claims of the Saville Exploration Syndicate. Part of the property is heavily overburdened with sand that shows slight stratification. The rock formation is diabase. Surface work has exposed three veins from three to six inches wide and having a general north-south strike. Many smaller stringers and fissures occur in the vicinity of these veins. A small quantity of native silver was observed in one of the larger veins. Quartz and calcite are the chief vein-filling materials. Small amounts of galena, copper pyrites, and cobalt bloom are present."

This group now includes seven claims and during the summer of 1926 was under option to a Toronto syndicate. A shaft was sunk, which showed silver for a depth of eighteen feet over widths of six to eight inches. This silver occurred as flakes or scales in cracks in the diabase and calcite of the vein and was accompanied by chalcopyrite and smaltite.

Neelands

"This claim (H.S. 448) lies just north of W.D. 1,146. Considerable surface work has exposed six or seven veins a few inches in width and with a strike of north to N. 60° E. The formation is diabase. Quartz and calcite are the chief vein-filling materials, but copper pyrites and cobalt bloom are present, and in one vein niccolite, one to two inches wide, occurs. No silver was seen on this property, but the writer was informed that good samples of native silver had been taken from one of the veins."

Nellie Lake Syndicate

"This company have a group of nineteen surveyed claims located in the vicinity of Nellie lake. The chief underlying rock is diabase, but some claims in the group are located on Keewatin. Extensive surface work has been done on several of the claims and many veins have been exposed, of which some are very large. During the season a shaft 34 feet deep was sunk on a large vein that occurs on T.C. 730 and T.C. 731. This vein has been uncovered for a distance of about eight chains and is five to six feet wide in places. Its average width is probably about two feet. The gangue material is calcite, but cobalt bloom, smaltite, niccolite, and bismuth in small quantities are present. The vein has almost vertical dip and strikes, in a general way, about N. 25° E. No silver was seen in this vein.

"Several other shafts and test pits, varying from 20 to 30 feet in depth, have been sunk on promising-looking veins on these claims."

This group is largely controlled by J. B. O'Brian of Toronto, and further development is contemplated.

McIntosh Mines, Limited

"This company's claims [now known as Walker Silver Mines, Limited] are located west of Spider lake in Leonard township.

"The prevailing formation is diabase, but areas of the underlying conglomerate and banded slate occur on several of the claims.

"Just east of Spike lake, a vein six to eight inches wide has been uncovered for several chains. The gangue is quartz and calcite, with considerable copper pyrites and cobalt bloom. This vein dips at a high angle to the west. The surrounding rock has been severely shattered, and many smaller veins occur in the immediate vicinity. A shaft 65 feet deep has been put down on this vein.

"Just east of the vein described above, another vein has been located. This is a very long vein, that runs in a southwesterly direction on to B.G. 264, crosses the northwest corner of Dalton Thomas' [G.G. 5,288] claim and appears in B.G. 252 for several chains. This vein varies in width from a mere crack to five feet in width. It dips in places at a high angle to the west. Calcite and quartz are the chief vein-filling materials, but copper pyrites and cobalt bloom are abundant. Where the vein crosses Dalton Thomas' claim, niccolite one inch wide occurs."

L. O. Hedlund

"This group of three claims is located in the southeastern portion of Leonard. The formation is diabase overlying the Cobalt series. A vein striking about northeast has been uncovered for several chains. A test pit has been put down on this vein, which is about a foot wide at the pit. Calcite and quartz are the chief vein materials. Cobalt bloom, small quantities of smaltite and copper pyrites are present."

Exploration Syndicate of Ontario

"This company control a very large number of claims in the area. At Shiningtree lake a number of claims have been located on the west side. South of the lake a group of 28 claims has been staked on several areas of diabase that occur in that locality. No veins were seen on this group, but the writer was informed by Mr. Smith, formerly engineer for the company, that a strong vein of smaltite occurs on one of these claims."

Steep-Thompson

These claims, G.G. 5,288 and 5,289, are situated on Horseshoe lake, and the veins seen suggest that they are an extension of the McIntosh veins. They strike N. 20° E. magnetic, and carry niccolite, smaltite, chalcopyrite, and cobalt bloom in veins of quartz and calcite.

Currie

This is a group of thirteen claims north of Bobs lake, in Tyrrell township. Surface work and a 20-foot test pit have uncovered several veins. The gangue minerals are quartz and calcite and occupy fissures running about N. 20° E. magnetic. Some of the veins are three to four feet wide and are mineralized with chalcopyrite, smaltite, pyrite, bismuth, and cobalt bloom.

Evidence of surface work and test-pitting could be seen at many points in Leonard township, but unfortunately the workings were all but obliterated, and no information was available as to the showings uncovered.

In 1910 and 1911, considerable stripping was done on the Wapus Lake iron range. This deposit, in the 4,000 feet uncovered, failed to show any large bodies of ore and was abandoned. No interest has been shown in these iron deposits since that time.

Future of the Area

The prospects of finding commercial deposits of iron in this area are not good. The only deposits seen were hard and siliceous, and the failure to locate any large ore bodies on the most promising of them is significant. On the other hand, the future of the silver deposits has yet to be decided. Silver occurs in the area, and the geological conditions are favourable for its concentration in veins. The question to be answered is, Did the diabase bring in a large amount of silver?

The answer to this can only be made after the country has been carefully prospected and developed.

In prospecting in this area the following points should be kept in mind:—

1. The diabase sill dips to the east, and the upper or eastern contact is the more favourable.

2. Veins may be found in the overlying or underlying rocks, but the diabase itself seems to be the most promising.

3. Small veins of grey or pink calcite, which may cut either the diabase or the large veins, are more promising than these large veins.

Wasapika Section, West Shiningtree Gold Area, District of Sudbury

By Geo. B. Langford

Introduction

During the latter part of the 1926 field season, an examination was made of the best-exposed part of the Wasapika section of the West Shiningtree gold area in an endeavour to map the intrusives that are associated with the gold deposits. The area examined is in the southwest corner of MacMurchy township and embraces two miles along the zone on which the Kingston, Atlas, White Rock, West Tree, Bennett, and McIntyre-MacDonald properties are located. Extensive outcrops permitted mapping in detail (see insert map), and the assistance of Geo. F. Browne and the resident managers, Duncan MacDonnell and P. MacDonald facilitated the work.

A 20-mile automobile road now connects the settlement of Shiningtree (the centre of the West Shiningtree area) and Westree on the main line of the Canadian National railway. In addition a winter road and electric power line to Gowganda are under construction. Accessibility to a railroad and the possibility of power will eliminate two factors which have done much to retard legitimate mining development.

No attempt was made to map all the veins seen, nor were any of them assayed for values. The spectacular specimens from the Atlas and West Tree mines, together with the free gold that can be seen in many veins (*in situ*) demonstrate conclusively that the conditions were, at one time, right for gold deposition. The purpose of this paper is to show the geological relations observed in the field.

General Geology

The consolidated rocks of this area all belong to the pre-Cambrian as follows:

MATACHEWAN(?):	Quartz diabase dikes.
ALGOMAN(?):	Quartz porphyry intrusives.
KEEWATIN:	Basalt, pillow lava, and ash beds.

Keewatin

The Keewatin flow rocks are all of the basic type and show considerable pillow structure. Some massive basaltic flows show good columnar jointing. In general they represent the typical greenstone types as seen in many other areas of Keewatin rock.

The ash beds occupy the depression under Michiwakenda lake, as can be seen in the diamond-drill cores and the dump of the West Tree mine, and occur again on the west side of Atlas hill. In the drill-cores they appear as 20- to 50-foot bands separated by flows of greenstone. One band has been metamorphosed into a graphitic slate, and a considerable quantity of this material can be seen on the West Tree dump. The others consist of a fine-grained mass of sericite, calcite, and chlorite with numerous quartz grains. In hand specimens they show only the quartz "eyes" in a fine-grained, grey matrix, and may be mis-

taken for a fine-grained quartz porphyry. They are classified as ash beds on account of the lack of any flow structure and because they are intercalated with undoubted Keewatin lavas. They dip 70° S.W.

Algoman(?)

Hopkins[1] and Finley[2] have placed the porphyries of this area as Algoman, chiefly because the granite in the adjoining areas has been called Algoman. Field relations in the Wasapika section show only that these rocks are later than the Keewatin and earlier than the Matachewan.

The porphyry bodies cut both the pillow lava and the basalt with a north-westerly strike, and dip 60°-70° S.W. In addition to a granitic texture, this rock type shows a finer crystallization near the contacts and often contains inclusions of the wall rock. Finley and Hopkins each recognized and mapped parts of these, and called them quartz and feldspar porphyries. In thin sections the rock is seen to contain orthoclase and plagioclase feldspars, quartz as interstitial crystals and in micrographic intergrowth with the feldspar, calcite, sericite, and chlorite. In general the rock has a greyish-green or pinkish colour, and the feldspar crystals show up prominently.

Matachewan(?)

Diabase dikes are very common. As a rule they are under one chain in width, but may be numerous enough to form a large percentage of the bed rock. Quartz diabase and olivine diabase both occur, but the latter only in small volume. The primary minerals in the quartz diabase (often porphyritic) are augite, feldspar, magnetite, and quartz as interstitial grains or in micrographic intergrowth with the feldspar. Some of the feldspars occur as large rounded phenocrysts, as much as three inches across, which weather to light-grey patches. This gives a characteristic mottled appearance to the dikes, all of which show a dark brown surface.

The most westerly of the diabase dikes that cross the north line of the Atlas property is cut by a diabase dike about 18 inches wide. This dike cuts both the diabase and the wall rock in its tortuous path, which was traced for about two chains. Under the microscope it shows the same minerals as the quartz diabase, except that quartz is absent and olivine present. The extent to which the olivine diabase occurs is not known, for the only dikes examined microscopically are those on the White Rock and Atlas properties, all of which are quartz diabase except as above noted.

Although the evidence clearly shows the relative age of these diabase types, it cannot be positively stated that the quartz diabase is of Matachewan age and the olivine diabase of Keweenawan age, since the necessary horizon marker, the Cobalt series, is missing in the Wasapika area.

The possibility of the quartz diabase being much earlier than the olivine diabase, coupled with the similarity of the former to the Matachewan diabase in the Gowganda[3] and Anima-Nipissing Lake[4] areas, strongly suggests, however, that the quartz diabase is of Matachewan age.

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[1]Percy E. Hopkins, West Shiningtree Gold Area, Ont. Dept. Mines, Vol. XXIX, pt. 3, 1920, pp. 53-64.

[2]F. L. Finley, Wasapika Section, West Shiningtree Gold Area, Ont. Dept. Mines, Vol. XXXV, pt. 6, 1926, pp. 83-96.

[3]A. G. Burrows, Gowganda Silver Area, Ont. Dept. Mines, Vol. XXXV, pt. 3, 1926, p. 10.

[4]E. W. Todd, Anima-Nipissing Lake Area, Ont. Dept. Mines, Vol. XXXV, pt. 3, 1926, pp. 91, 94.

Structural Geology

The basement Keewatin rocks have been folded so that they now show steep dips varying from 60 to 80 degrees. Along the southwest side of Michiwakenda lake and in the vicinity of the White Rock shaft, they all dip to the southwest. Judging from one outcrop of a brecciated flow-top that dips northeast, it is possible that the greenstones and ash beds form a close-folded anticline with its axis lying along Michiwakenda lake.

The quartz porphyry intrusives are elongated along the strike of the Keewatin and dip southwest at about 60 degrees. They seem to have exerted an important influence on the location of the fissures in which the quartz veins are found. A study of the map reveals the following facts: (1) The veins all occur within a few chains of the porphyry. (2) On the West Tree, White Rock, and Atlas properties, the main veins have the same strike as the porphyry bodies. Here also the porphyry occurs as small disconnected bodies. (3) On the McIntyre-MacDonald, Bennett, and Kingston claims the veins have no definite orientation. Here the porphyry mass is a long dike.

Examination of the gold-bearing quartz veins on the West Tree and White Rock properties shows that they were not all formed at the same time. There are two sets of veins—the main or long veins, already mentioned, and a number of short cross-veins perpendicular to the main veins. The former are the older and occur in fracture zones along which there has not been much movement. In places they show evidence of longitudinal compression, so that they are now wrinkled like an accordion, and the wall rocks are schisted perpendicular to the strike of the veins. In the open cut on the West Tree, the main vein has been faulted 20 feet along a cross-vein. Thus it can be seen that these vein systems are not identical in age, but the fact that both systems are gold bearing indicates that they are not separated by a great time gap.

From the above facts it can be seen that a series of forces were active in fracturing the Keewatin and Algoman rocks just prior to the injection of the quartz and gold. None of the shear zones are heavily schisted, nor are the throws of the faults large. The deformative forces were, therefore, not of great magnitude.

The rôle of the porphyry masses seems to have been that of forming a backbone, so that when strain was applied to the area deformation by flowage was hindered, or prevented, until the elastic limit was exceeded, when fracturing ensued.

The large porphyry dike gave a rigidity to the rock that caused short, radiating and branching fractures to be formed; in the vicinity of the small disconnected lenses the deformation and fracturing have been more intense, due to a lesser resistance.

It seems logical that, immediately following the intrusion of a large batholith, a series of minor adjustments would take place in the wall rocks. The Algoman granite, which encloses the West Shiningtree area on the south and west, could easily have caused the fracturing that occurred here, as well as supplying the porphyry and gold-bearing quartz as magmatic differentiates; it is believed that this is what actually did occur.

Gold values are reported from all the veins of this age that have been worked. Some of the veins carry considerable quantities of tourmaline; and others, pyrite. The former are indicative of high temperature deposits. Minor quantities of galena and chalcopyrite also occur.

The dikes of diabase have complicated the structure by cutting all the preceding formations, including the quartz veins. As can be seen from the map, no appreciable amount of movement took place along the fissures into which these dikes intruded. The accompanying illustration shows how sharply the veins have been cut by the diabase. These dikes are of no economic importance except in so far as they hinder mining of the quartz veins.

Faulting and the forming of quartz veins followed the intrusion of the diabase. This faulting is in an east-west line with a small amount of horizontal displacement. The quartz in these later fractures is not gold bearing, according to the prospectors who have examined them.

The importance of differentiating between the pre- and post-diabase quartz veins is thus emphasized. Because of the fact that the gold-bearing veins strike in many directions, their relation to the Matachewan diabase gives the only clue to their age. The clean cutting of the gold-bearing veins by the diabase,



Quartz veins in Keewatin greenstone cut off by Keweenawan diabase. The hammer is on the diabase with the handle parallel to the contact. These veins are on claim No. 2,566.

and the equally clean cutting of the diabase by the barren quartz veins is readily recognizable.

It is of interest to note that the high-grade ore from the West Tree mine came out of a cross-vein at its intersection with the most northerly of the two long main veins. On the Atlas property the same vein produced high-grade ore from near its junction with a branching vein. On the other main vein, the White Rock mine has operated a steam stamp-battery and amalgamation mill. Results were so encouraging that the property will reopen as soon as the power line from Gowganda is completed.

Shortage of power and sensationally rich ore pockets have resulted in a concentration of work on the bonanzas with sporadic attempts at evaluating the other veins. Consequently, the exhaustion of the high-grade ore has created the impression that the gold possibilities have also been exhausted, and the area has not received the amount of development, by legitimate mining interests, that it merits.

Bibliography

The following list includes much of the literature on the West Shiningtree area:—

W. H. Collins, Geol. Surv. Can., Sum. Rept., 1911, pp. 244-52; "Onaping Map Area," Geol. Surv. Can., Mem. No. 95, 1917.

L. H. Goodwin, "West Shiningtree Gold District," Eng. & Min. Jour., Vol. 108, pp. 261-64, Aug. 16, 1919.

P. E. Hopkins, "West Shiningtree Gold Area," Ont. Dept. Mines, Vol. XXIX, pt. 3, 1920; Vol. XXX, pt. 2, 1922, pp. 36-39.

W. R. Hodge, "West Shiningtree Gold District," Eng. & Min. Jour., Vol. 94, 1912, pp. 343-45.

R. E. Hore, "Wasapika Gold Area," Can. Min. Jour., Vol. 40, 1919, pp. 490-501; "Recent Developments in Wasapika Area," Can. Min. Jour., Vol. 40, 1919, pp. 677-78; "Some Notes on Ores and Rocks of Wasapika Gold Area," Can. Min. Jour., Vol. 40, 1919, pp. 749-50; "New Gold Field in Ontario," Min. & Sci. Press, Vol. 119, 1919, pp. 595-96.

R. B. Stewart, "West Shiningtree Gold District," Ont. Bur. Mines, Vol. XXI, pt. 1, 1912, pp. 271-77; Vol. XXII, pt. 1, 1913, pp. 233-37.

F. L. Finley, "Wasapika Section, West Shiningtree Gold Area," Ont. Dept. Mines, Vol. XXXV, pt. 6, 1926.

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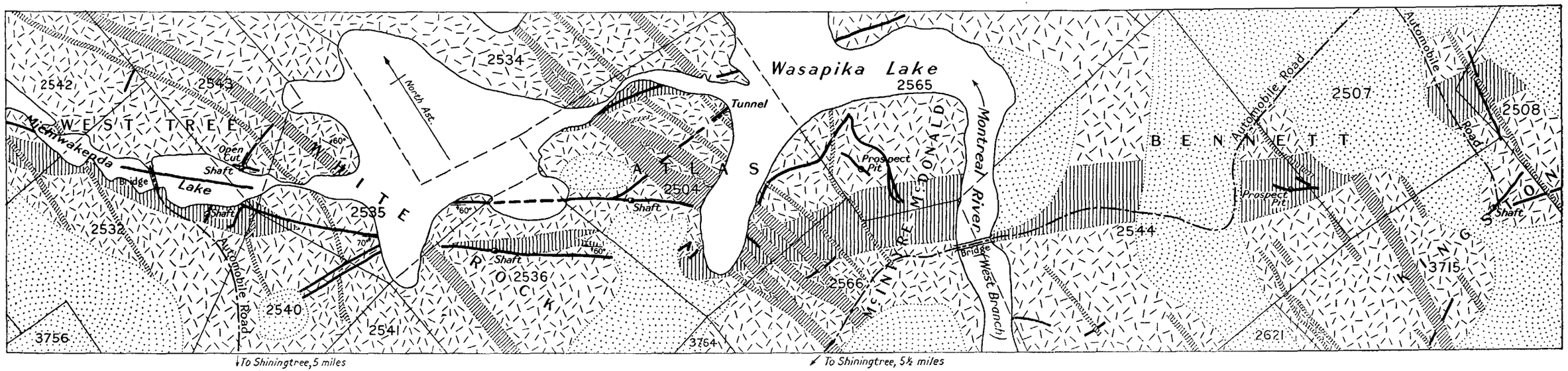
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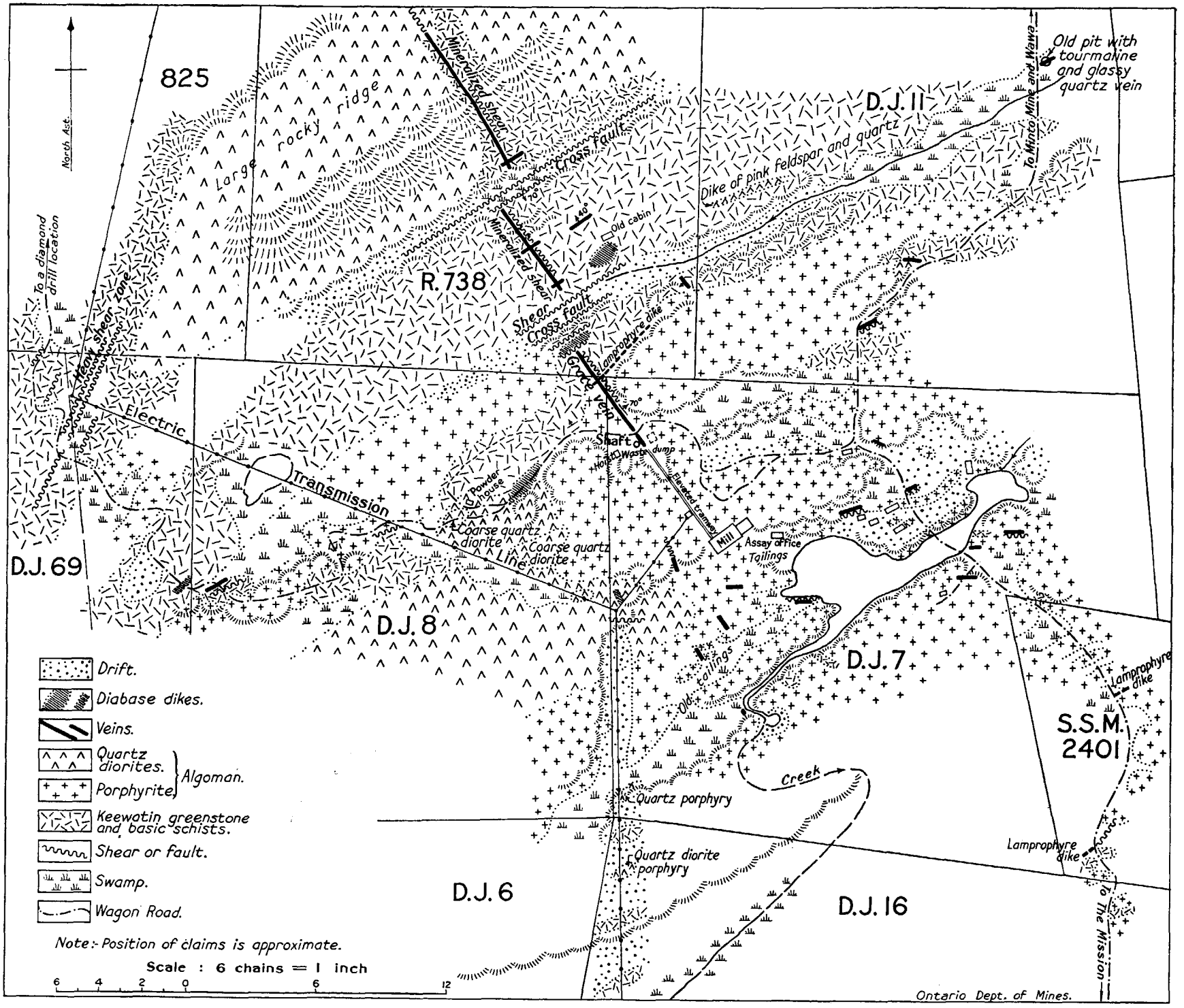
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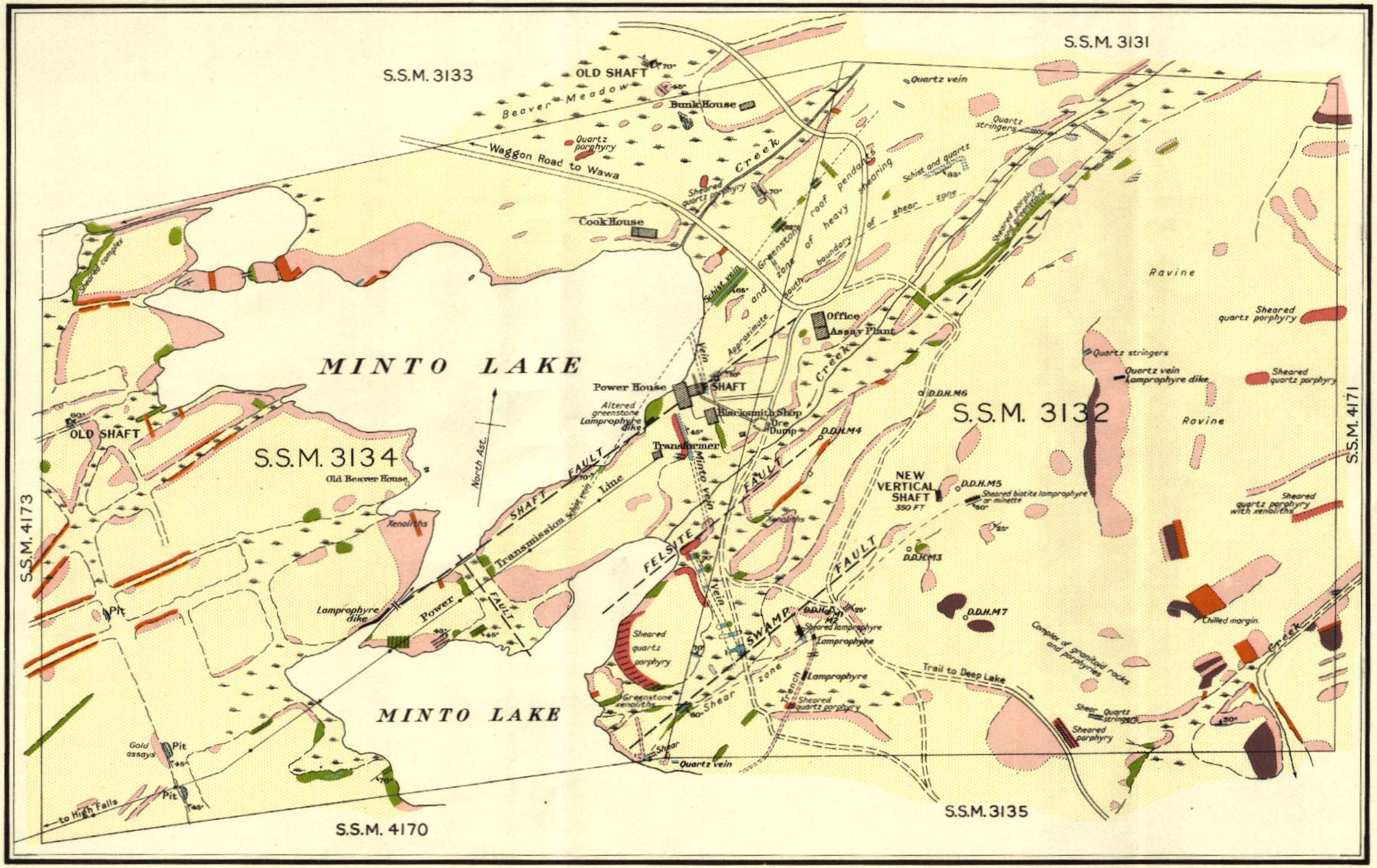


PART OF WASAPIKA SECTION, MACMURCHY TOWNSHIP, WEST SHININGTREE AREA, DISTRICT OF SUDBURY.



SKETCH MAP SHOWING GEOLOGY IN THE VICINITY OF THE GRACE MINE.

To accompany report by T. L. GLEDHILL *in Vol. XXXVI, Part 2, Ontario Department of Mines Annual Report 1927.*



LEGEND

Overburden.

PRE-CAMBRIAN

Keweenawan?

Diabase.

INTRUSIVE CONTACT

Algoman

Lamprophyre dikes.

Quartz veins.

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INTRUSIVE CONTACT

Keewatin

Chiefly greenstone.

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Shear.

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D.D.H. Diamond drill holes.

Base map from plan of Cooper Gold Mines, Ltd.

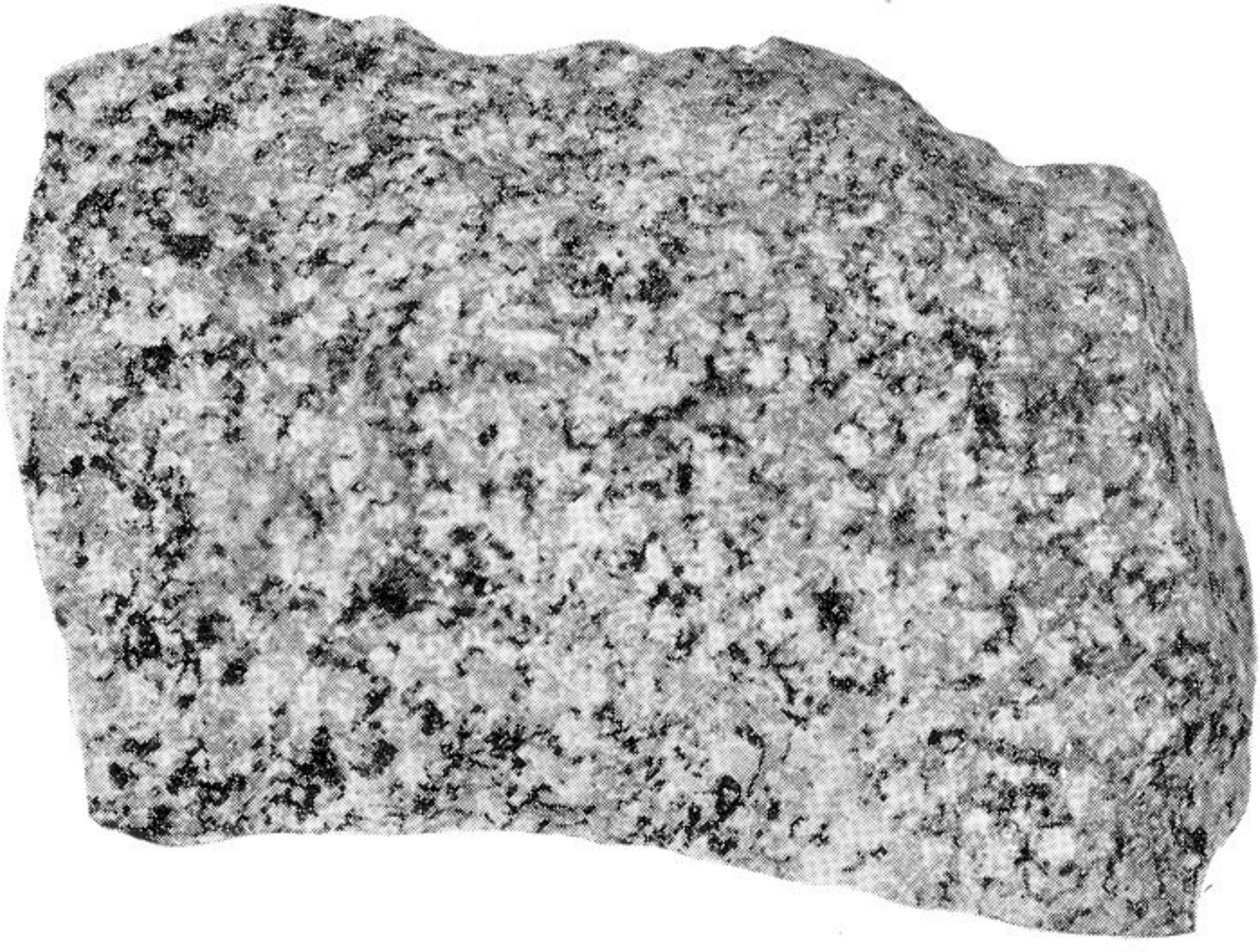
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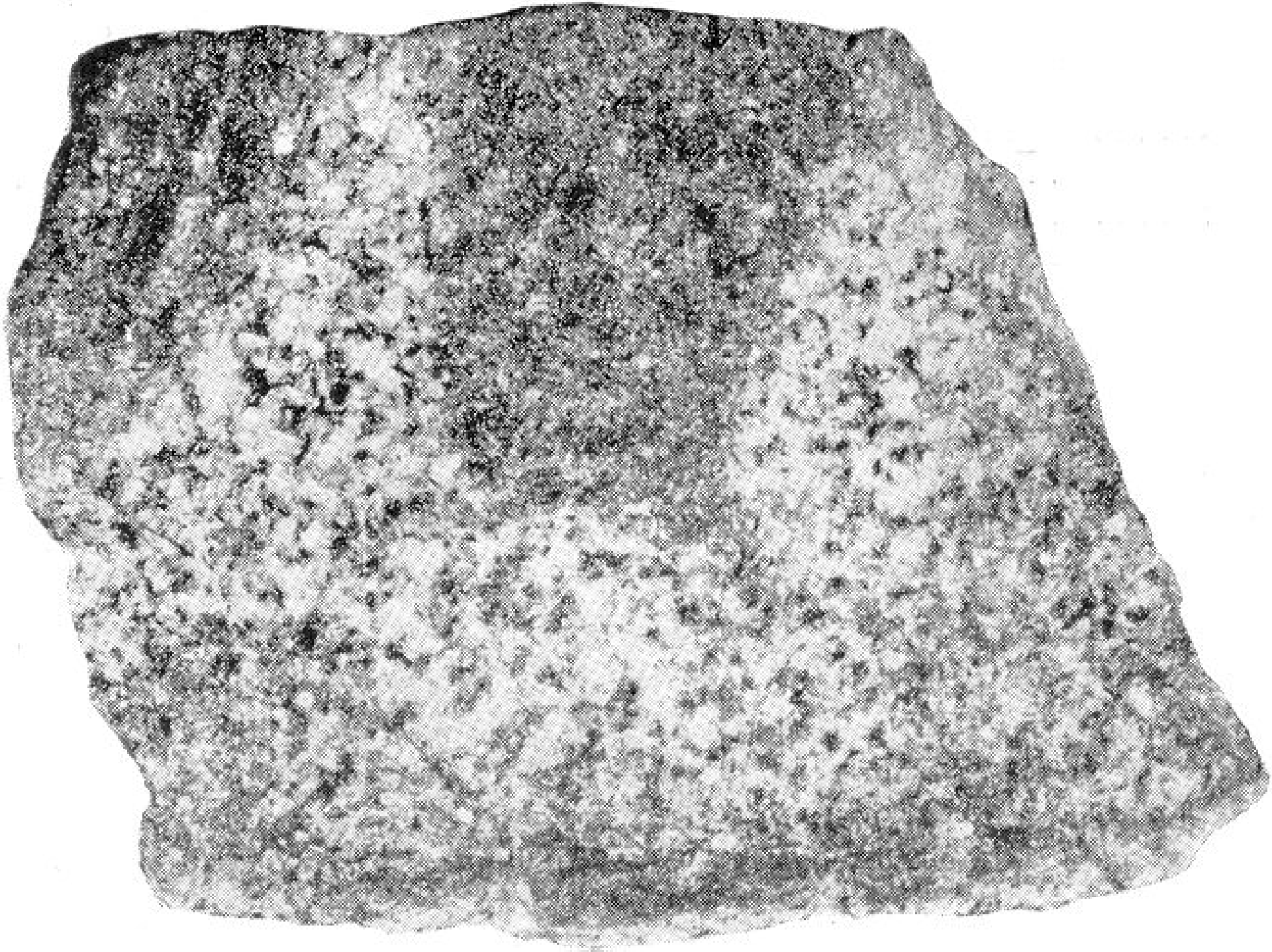
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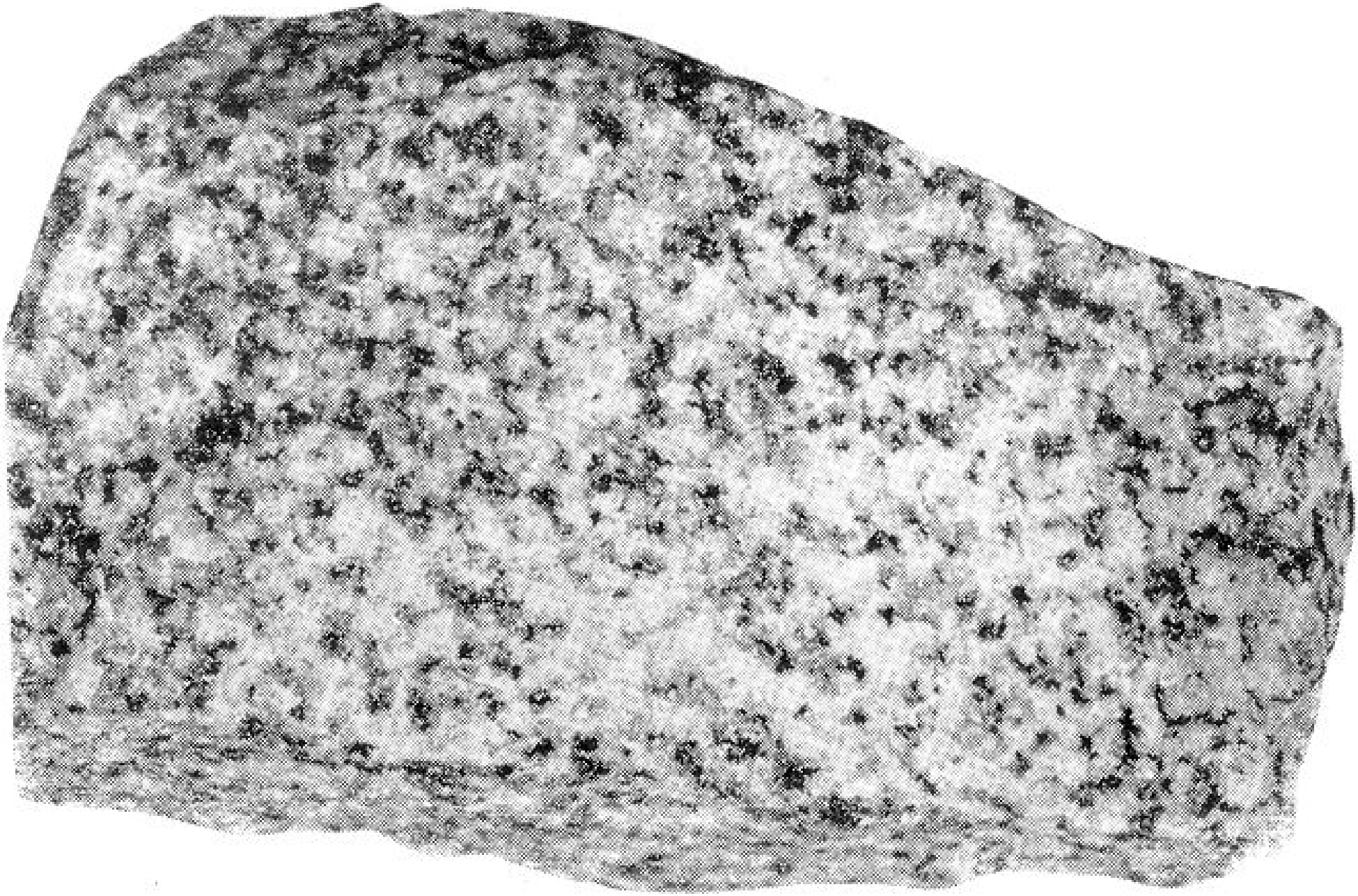
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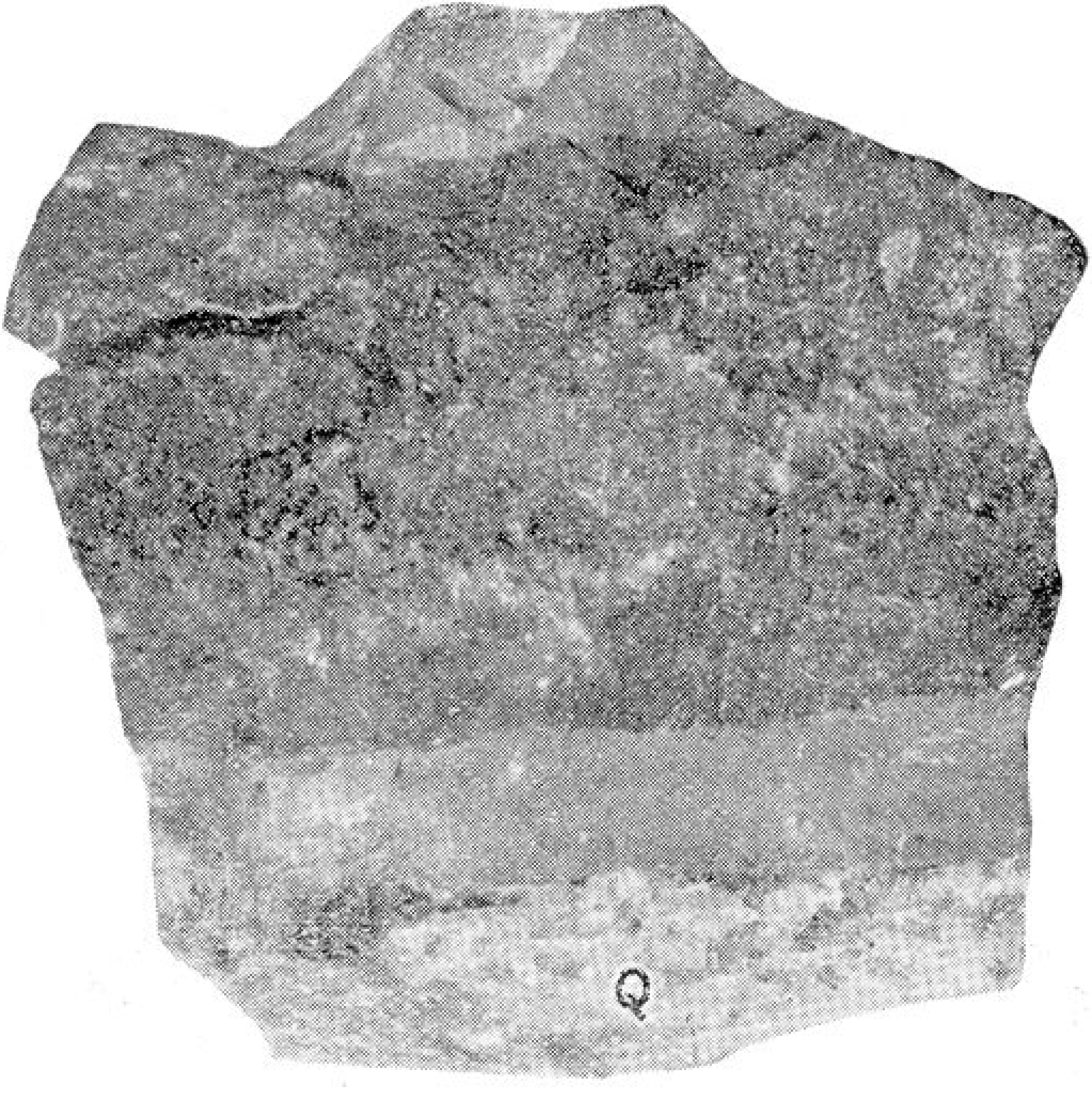
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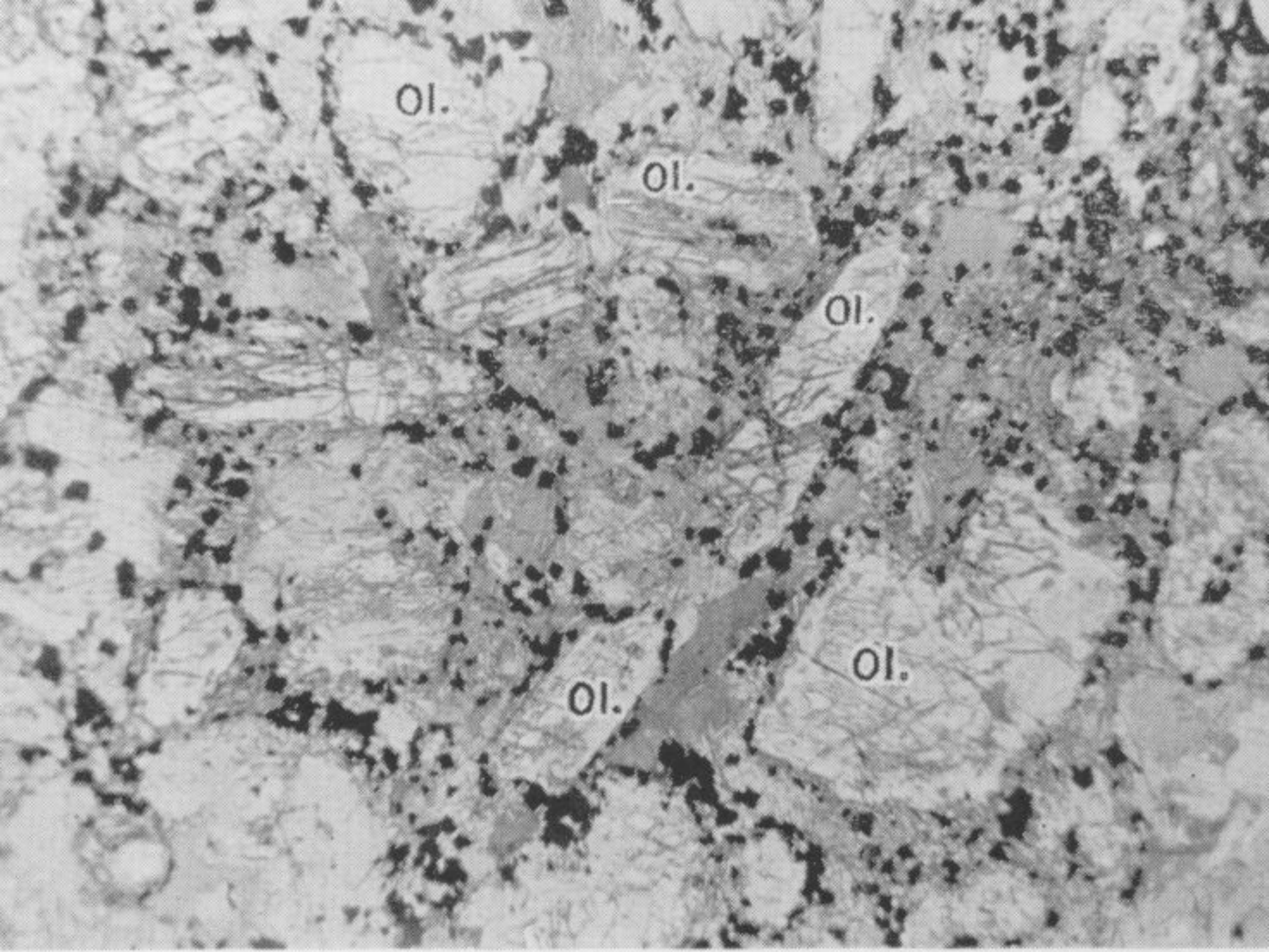




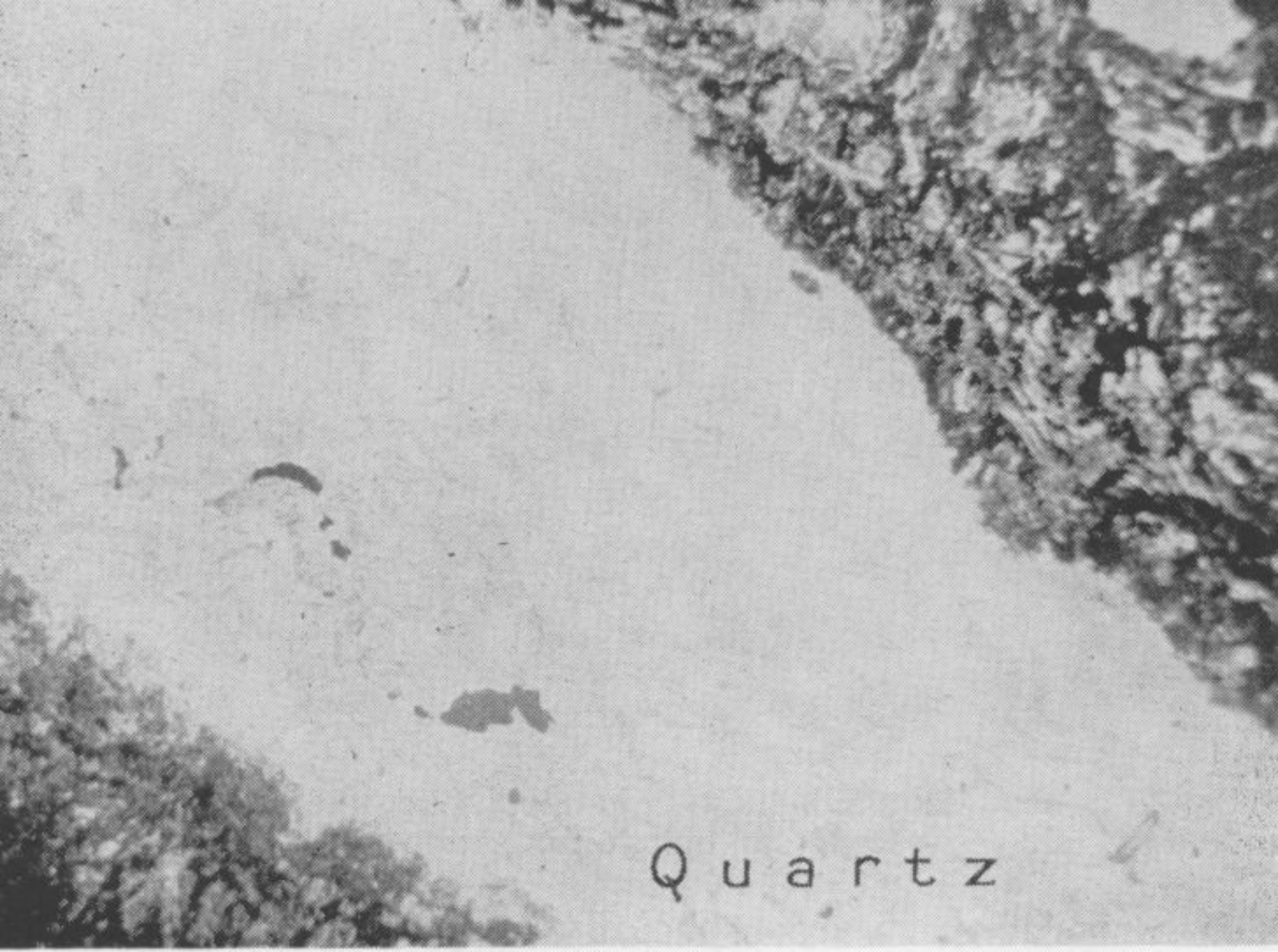



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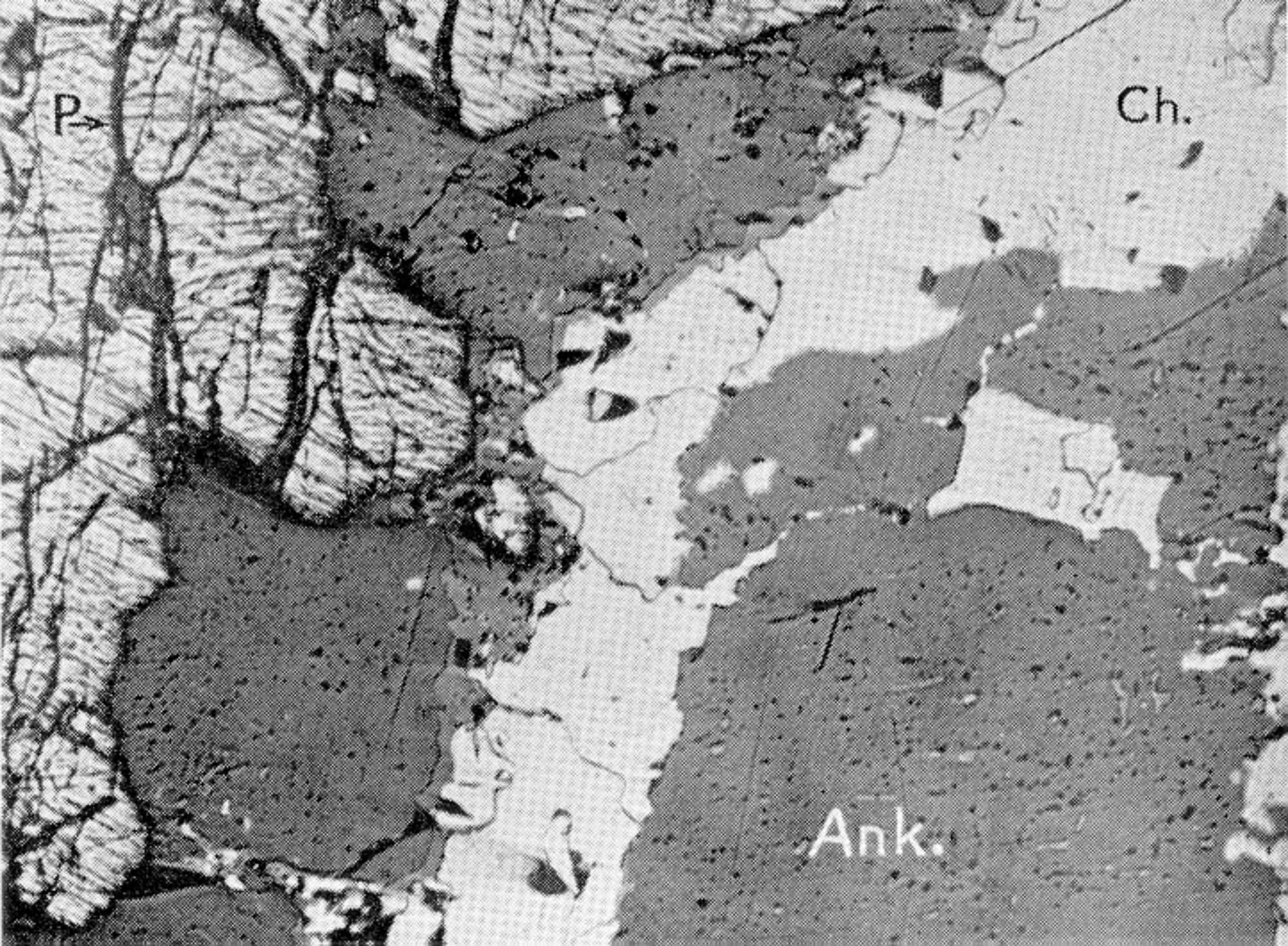

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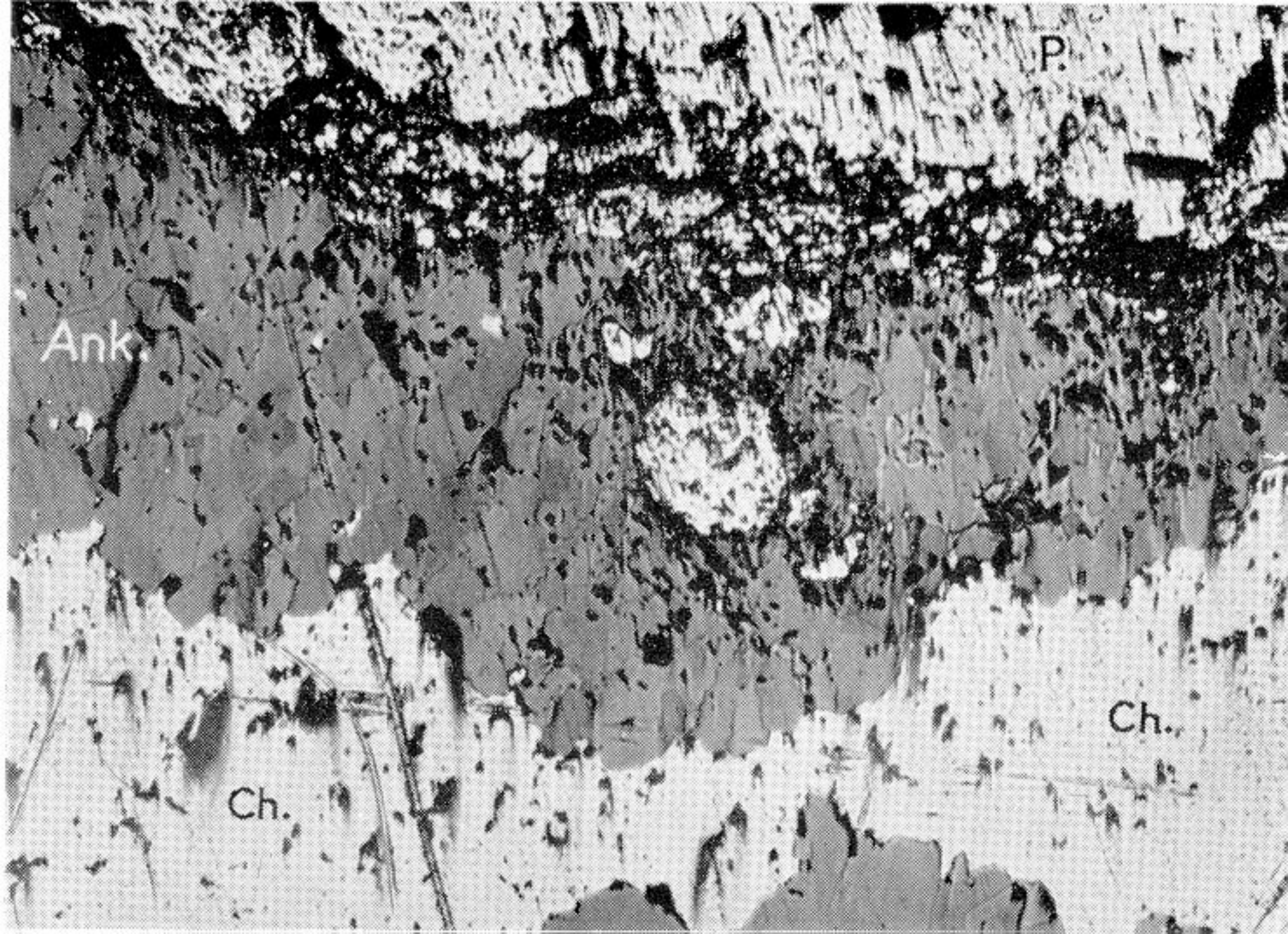

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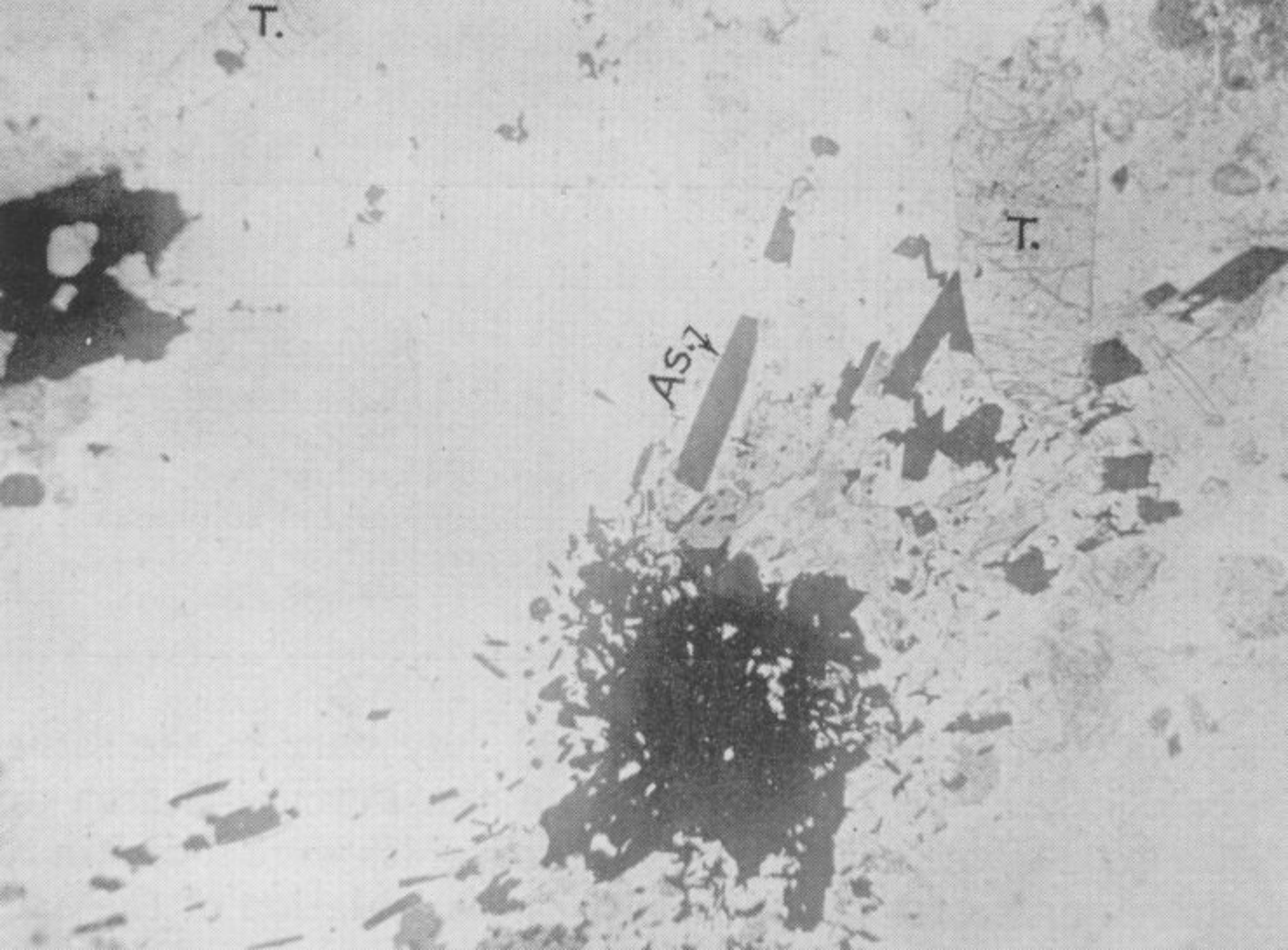


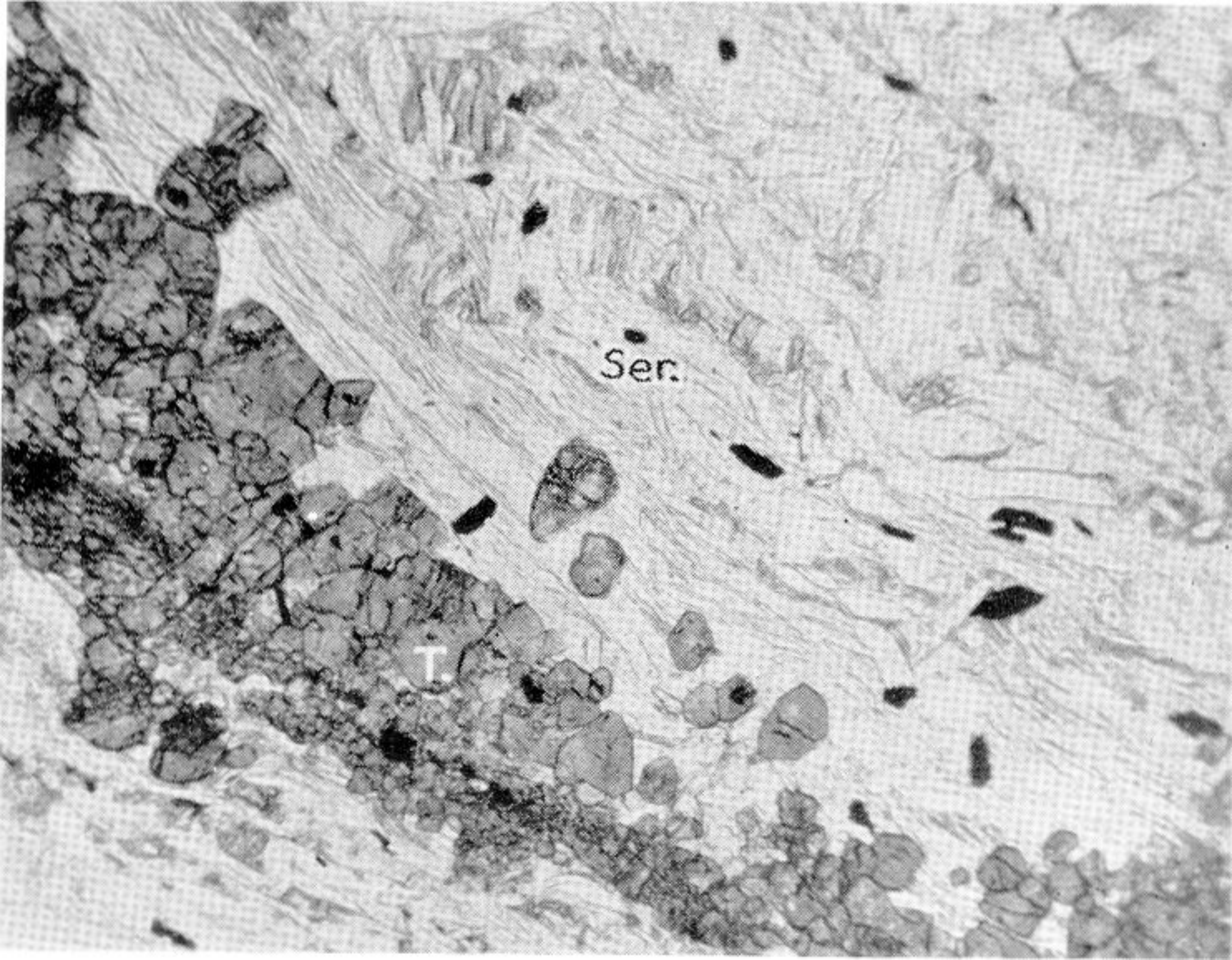

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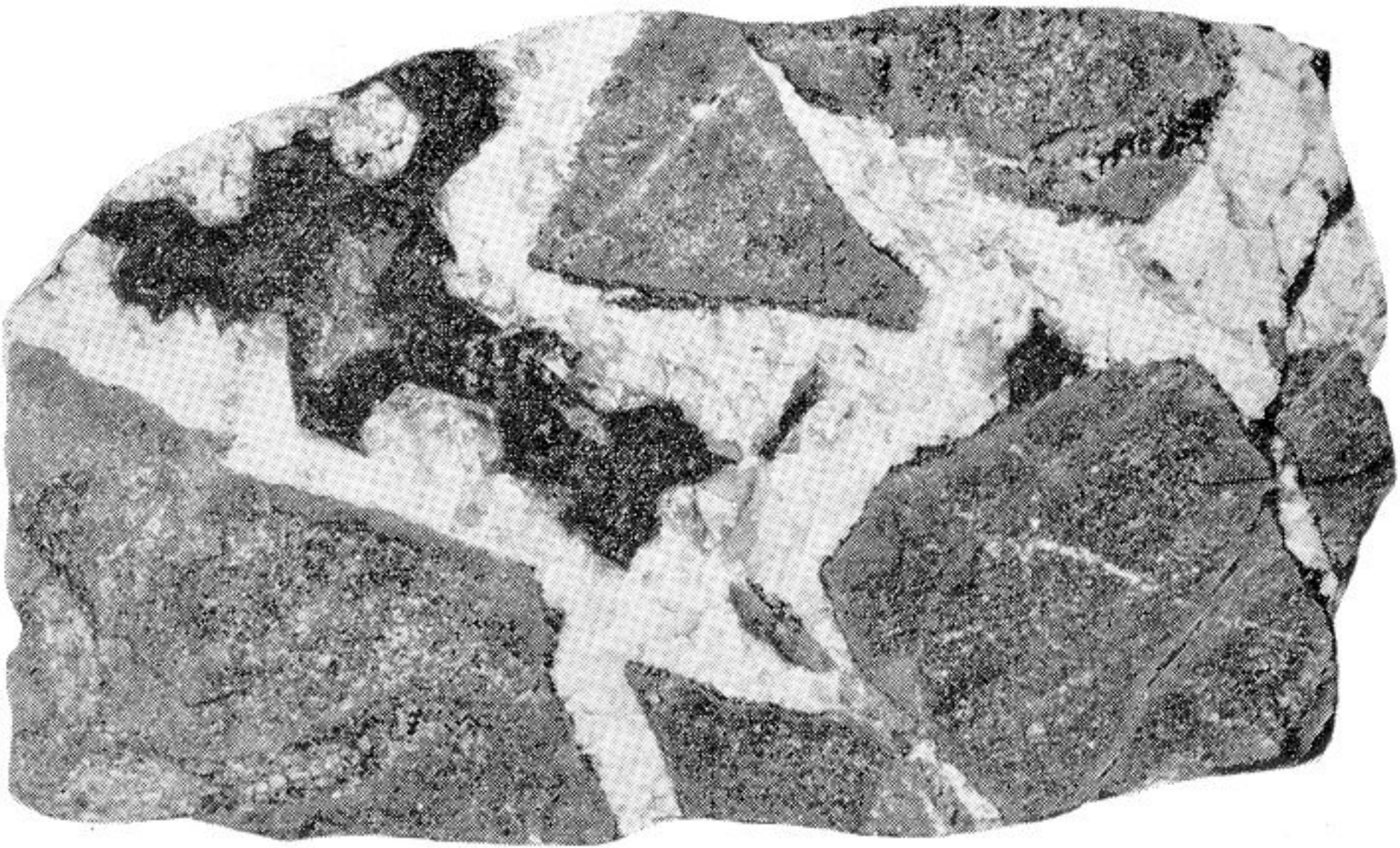

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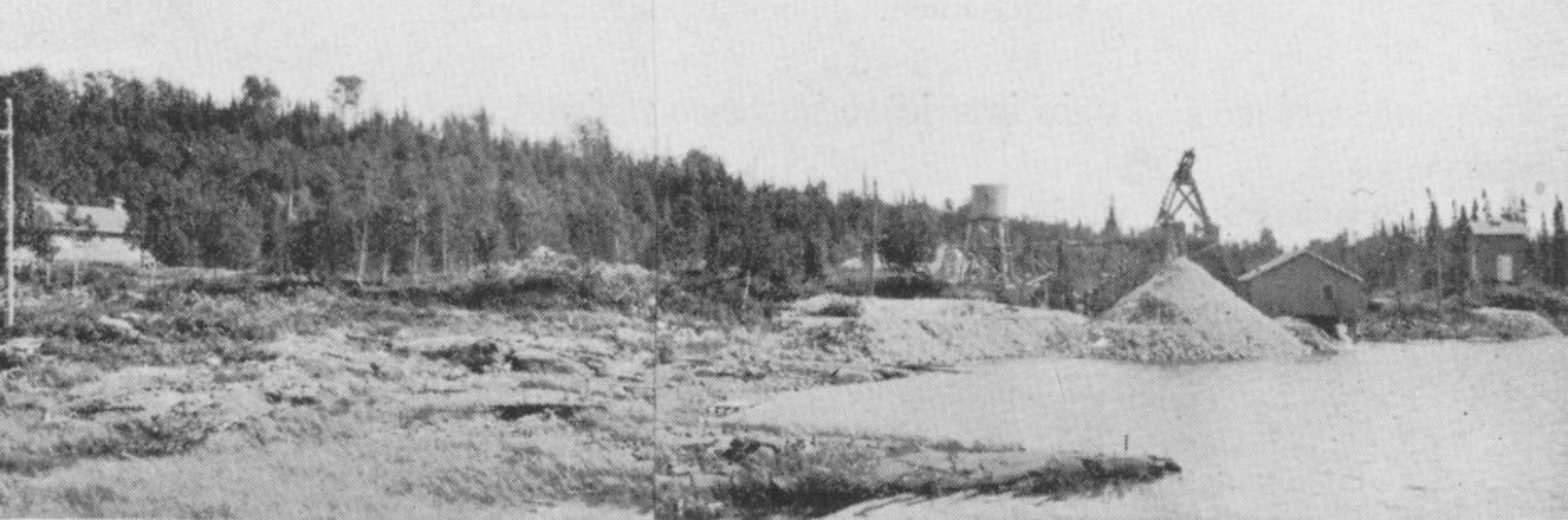

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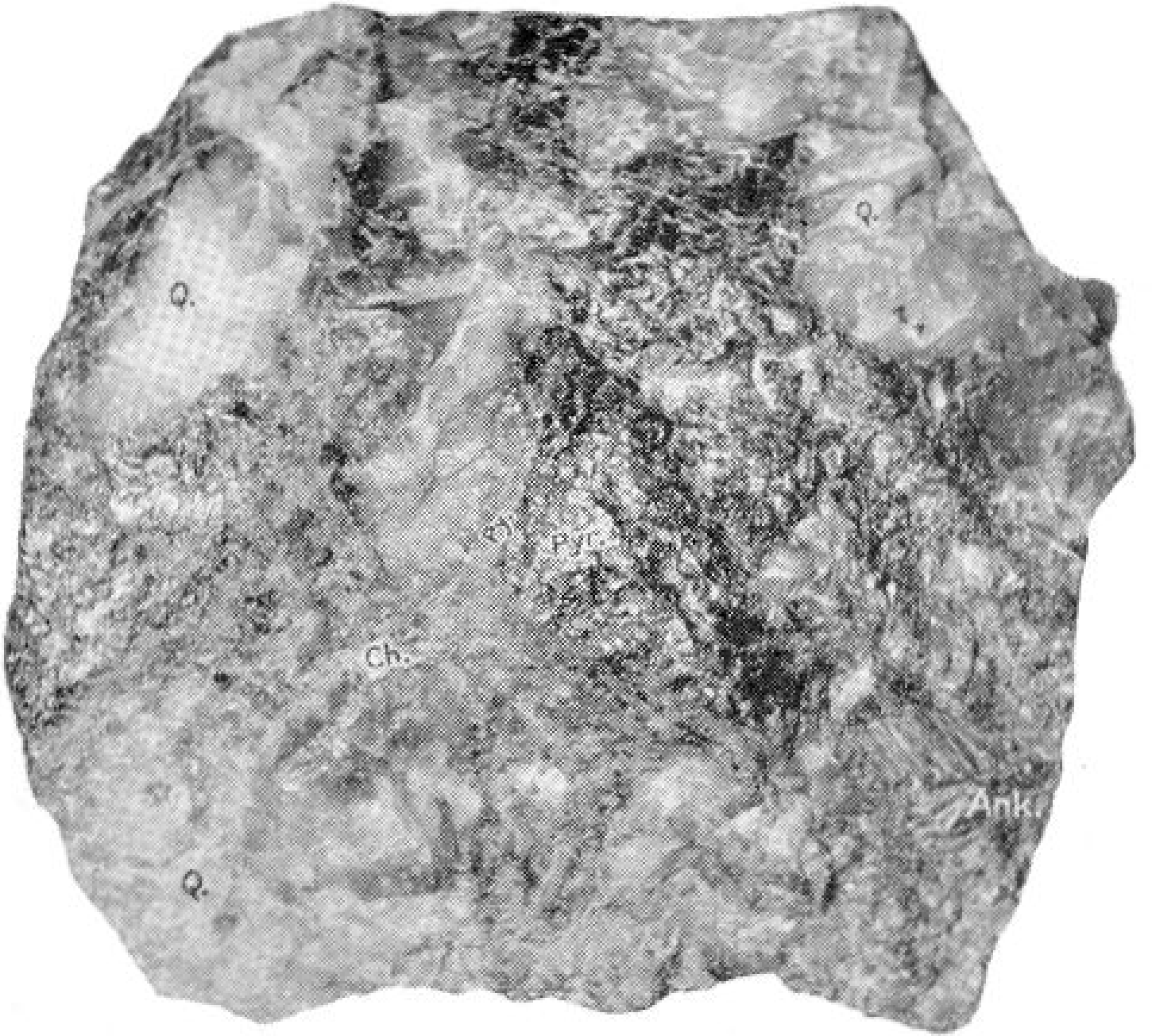


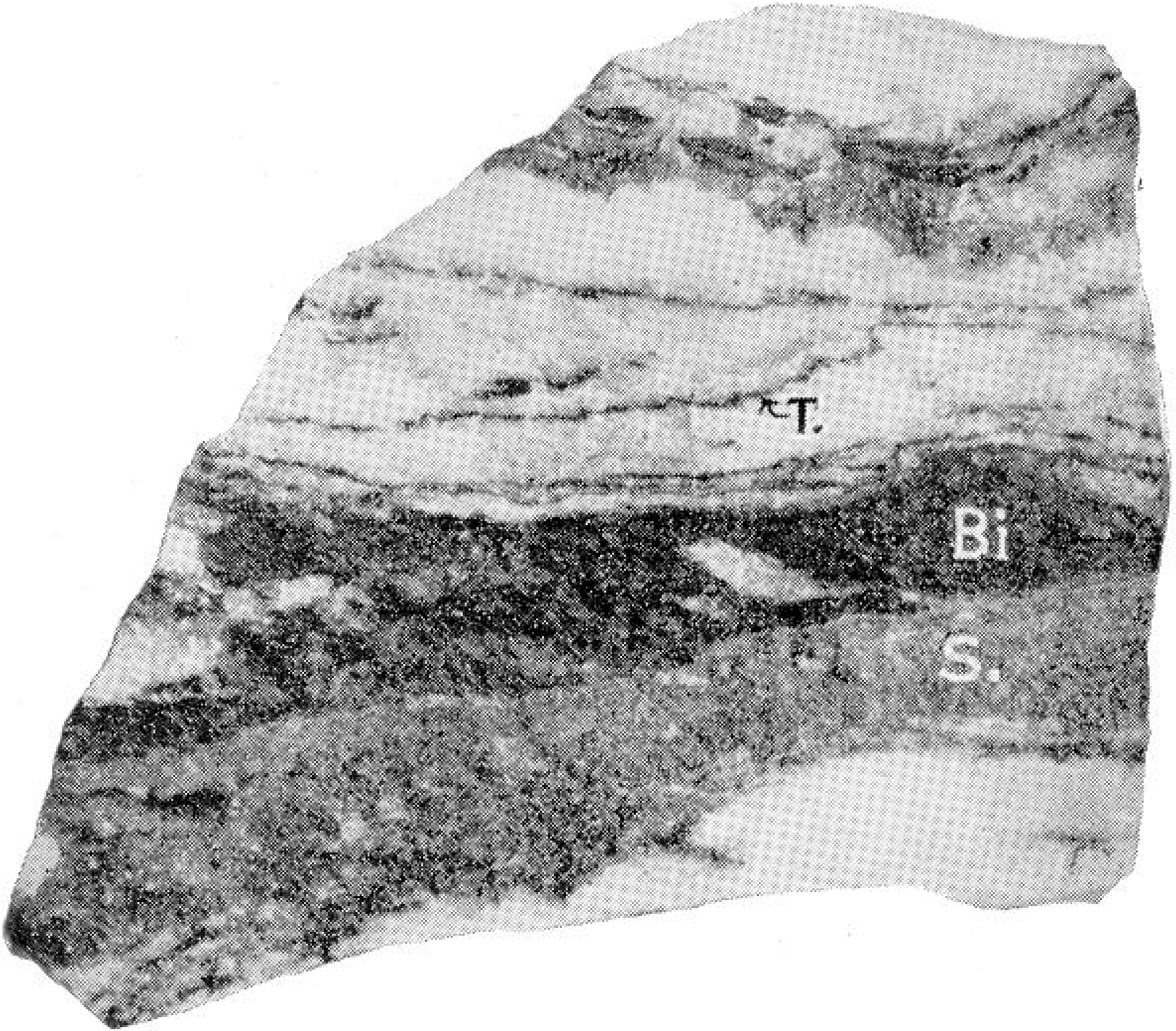




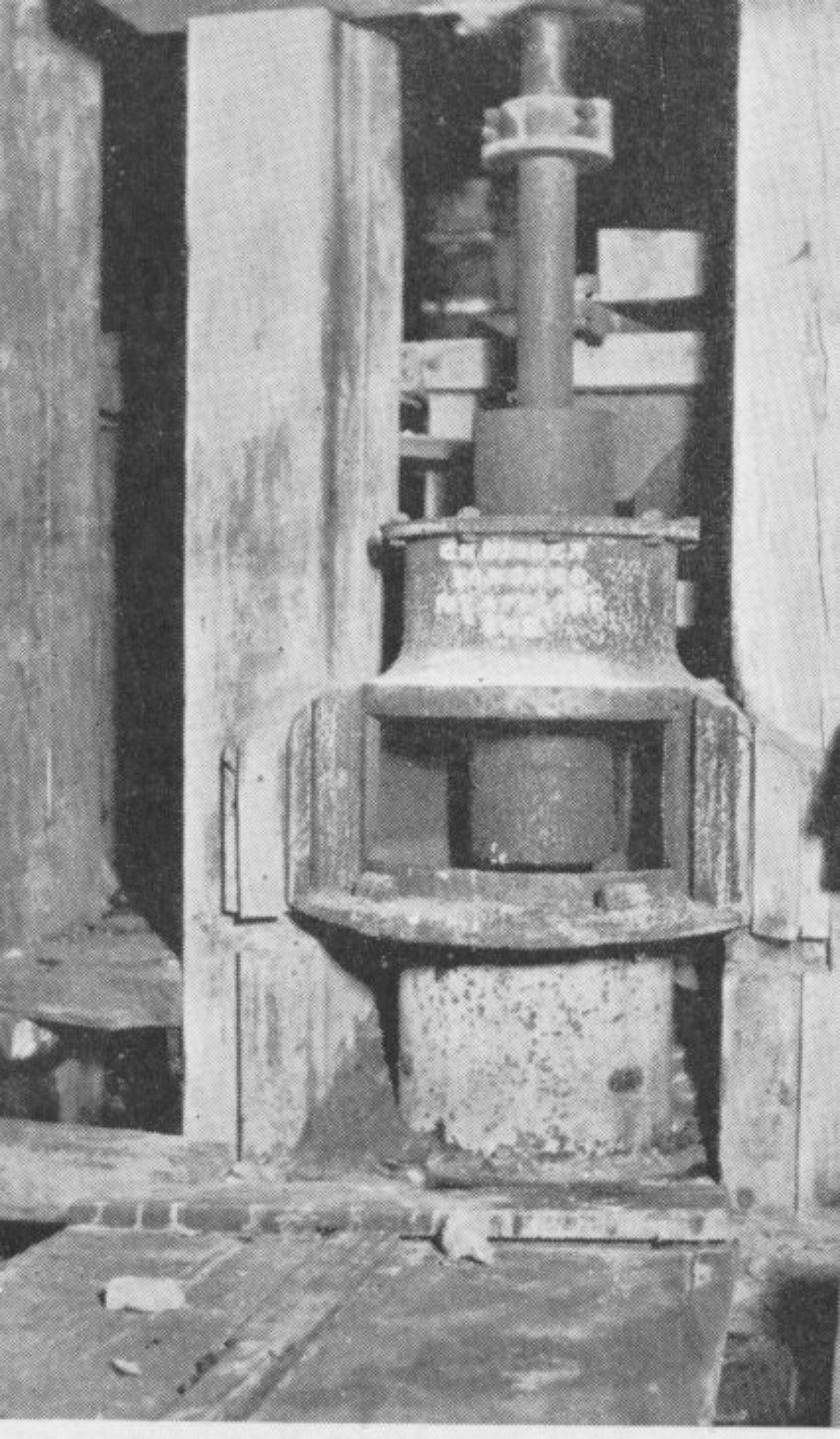


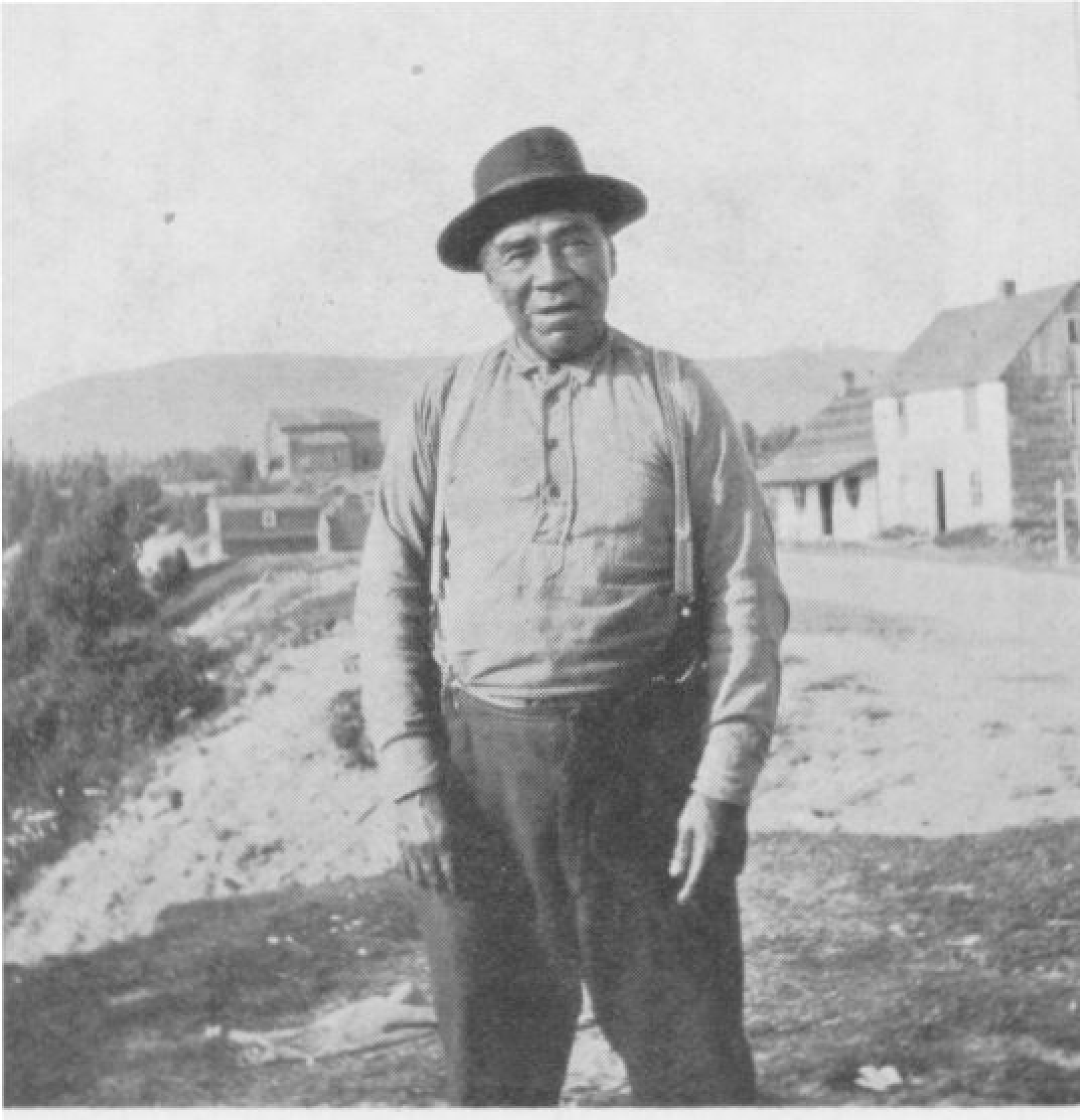



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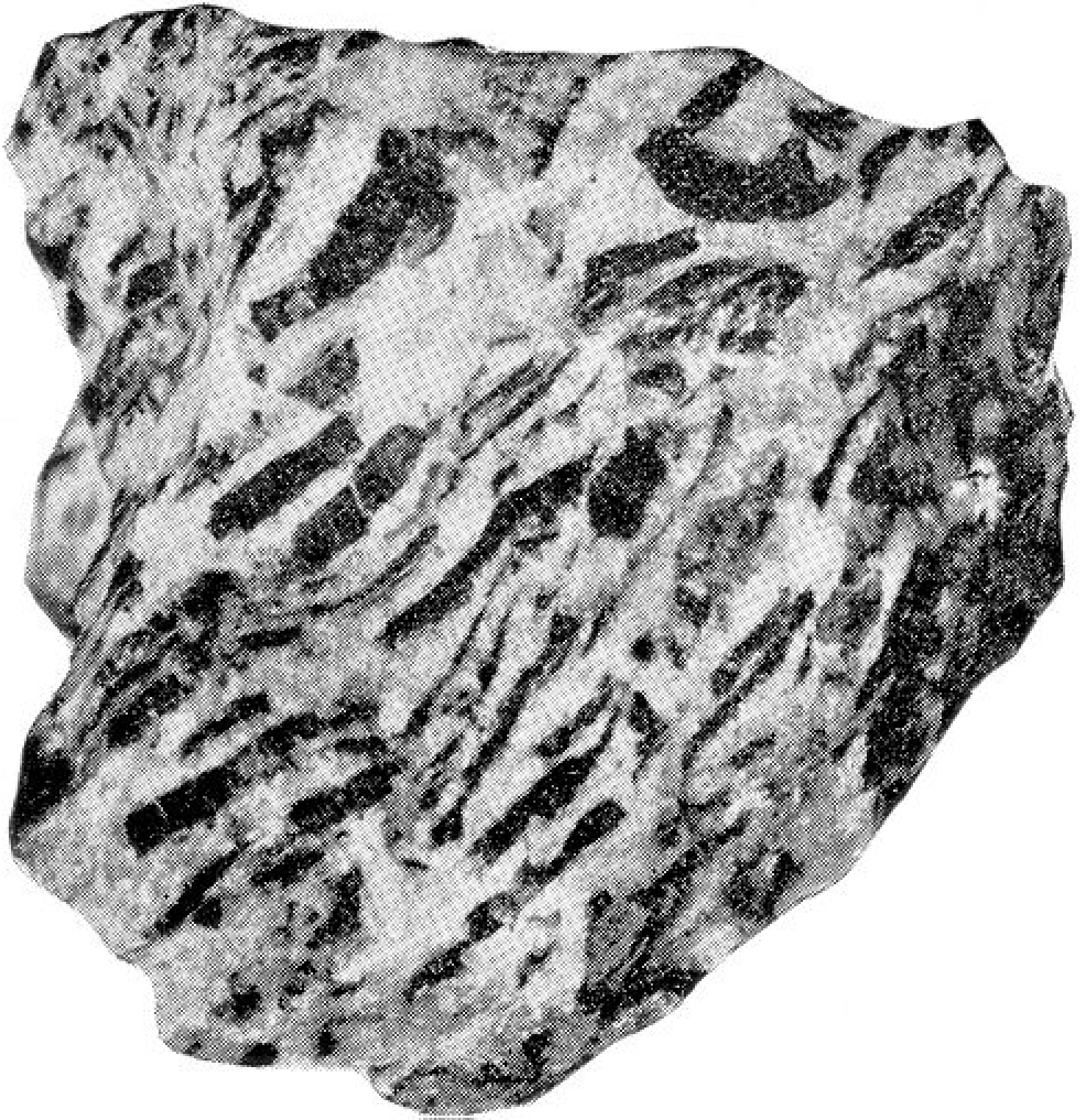


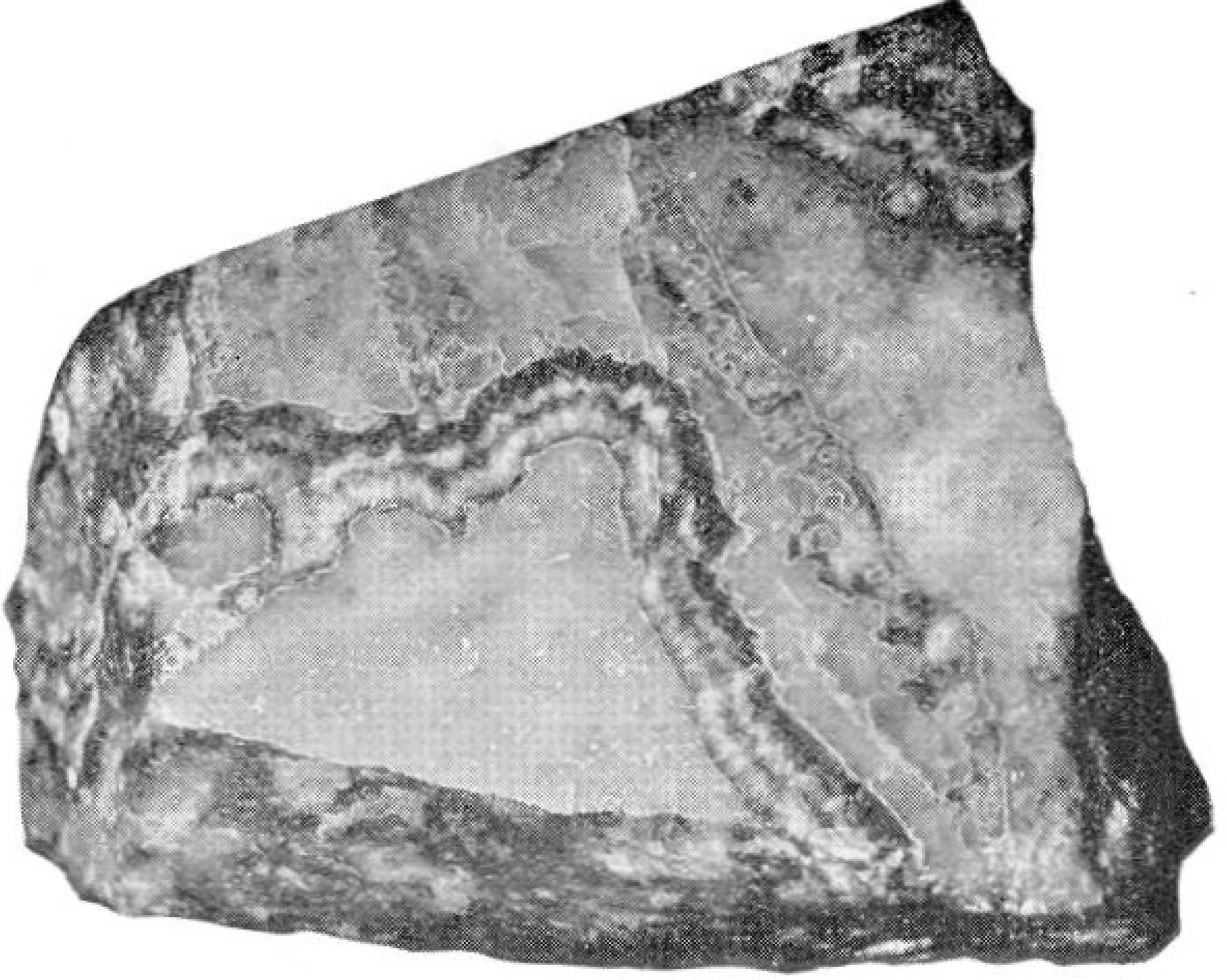


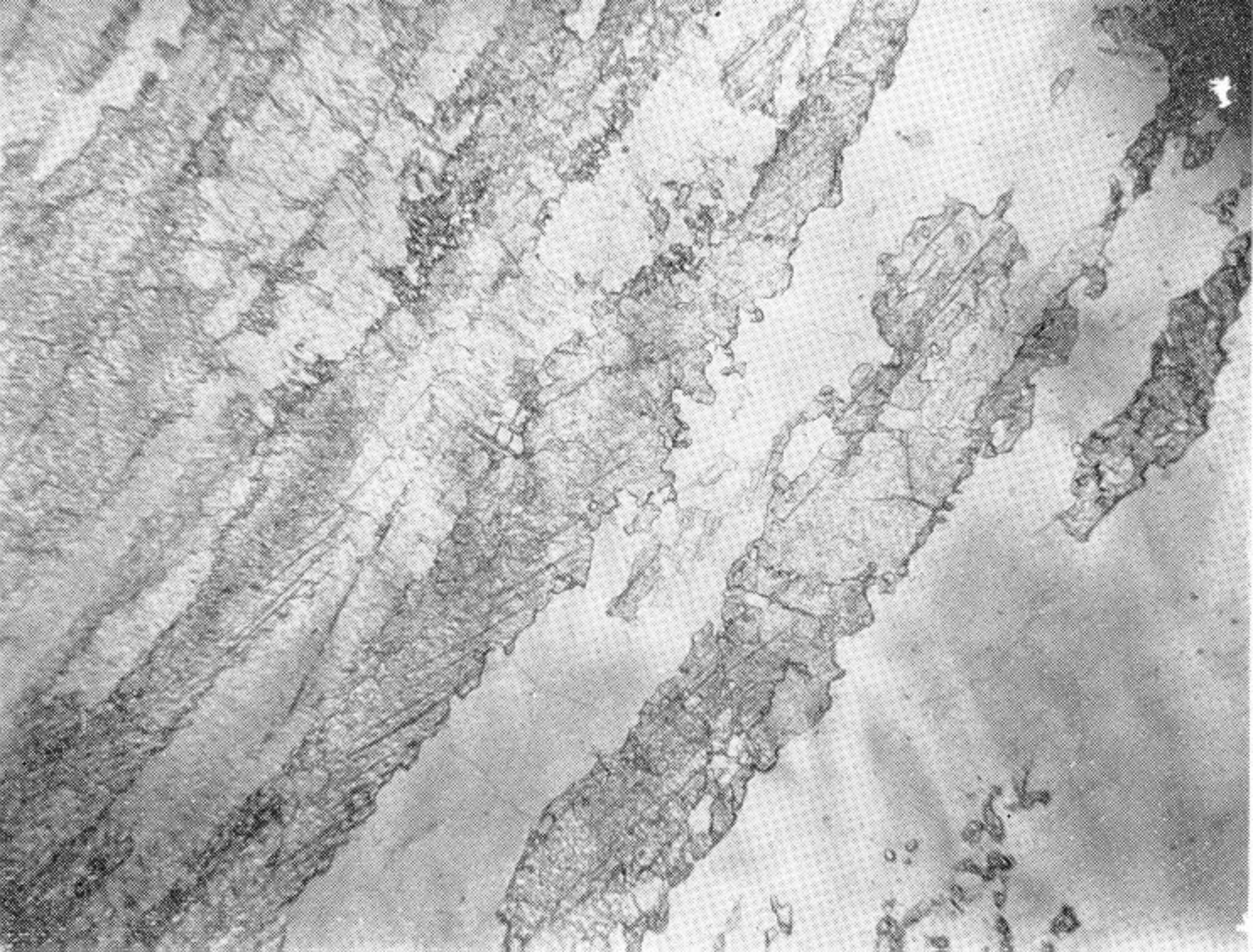




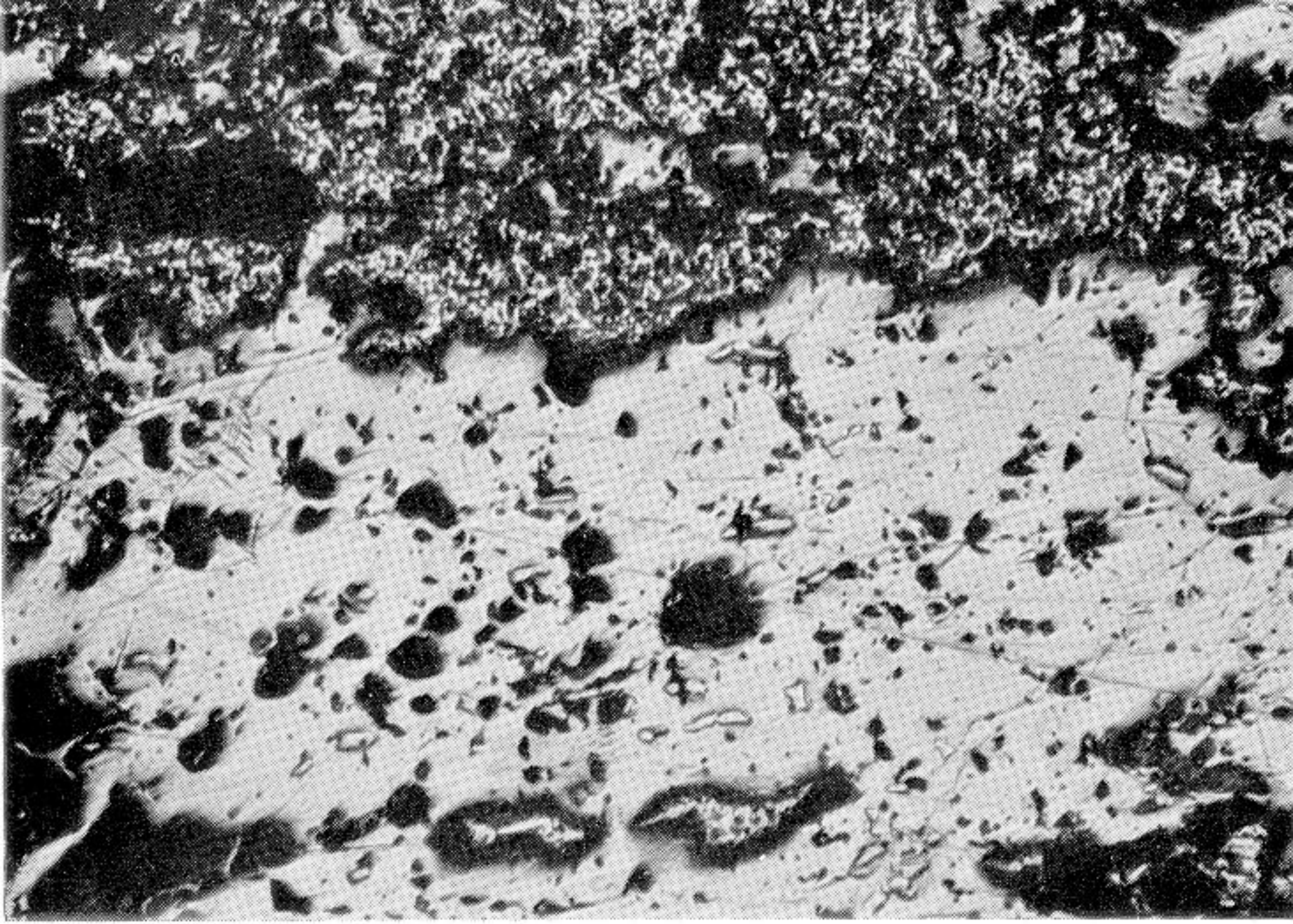




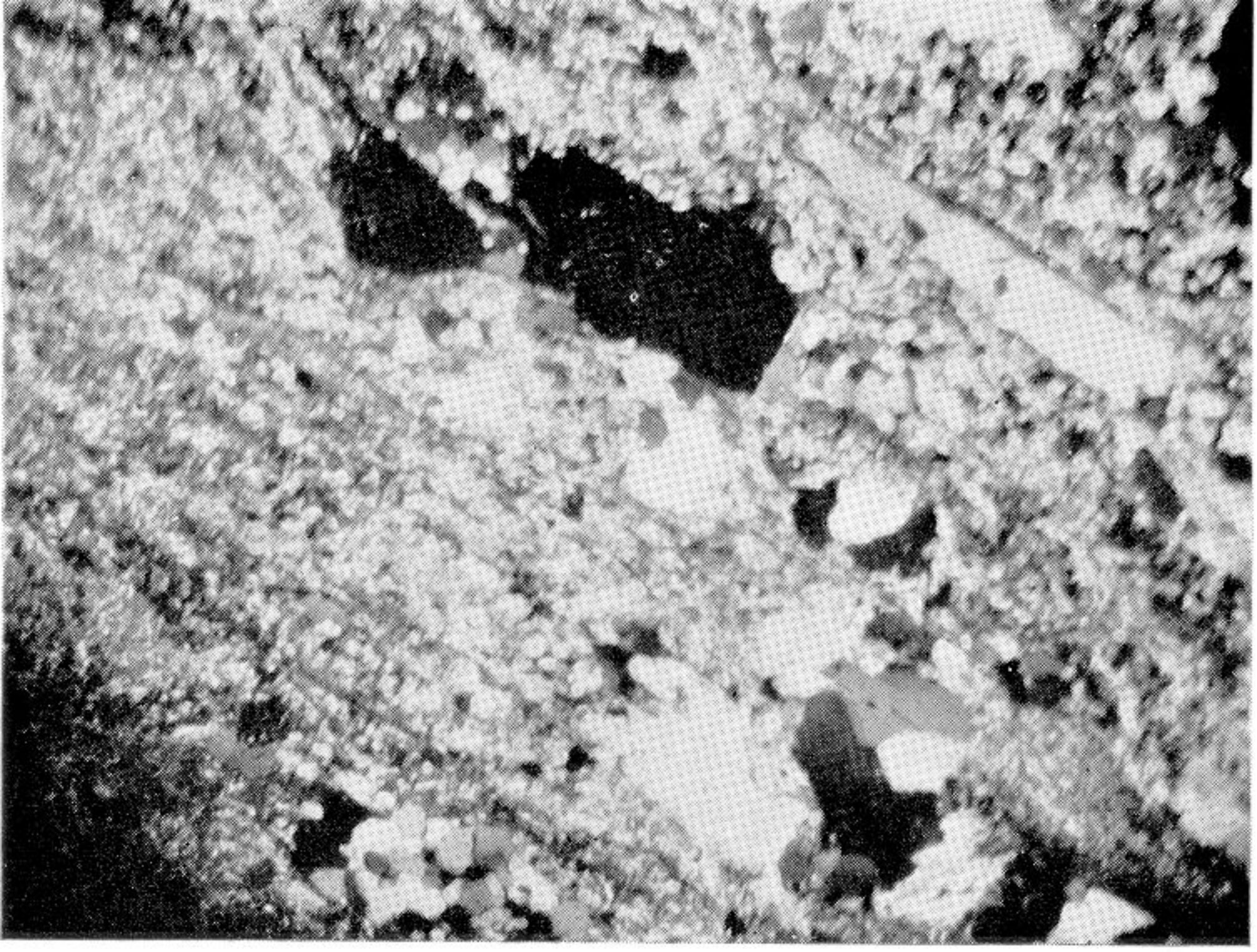
















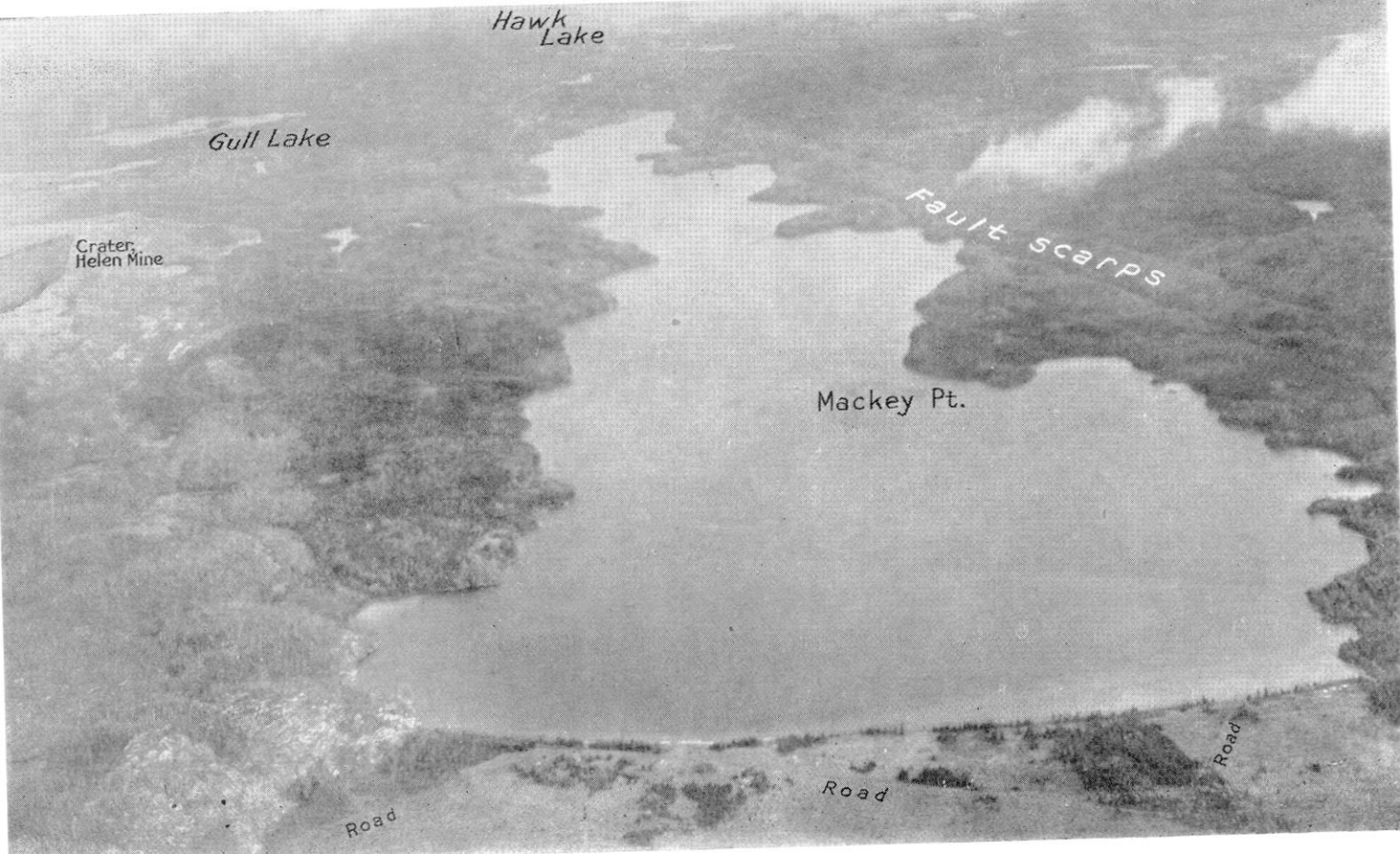











Hawk Lake
Gull Lake
Crater, Helen Mine
Fault scarps
Mackey Pt.
Road
Road
Road

ONTARIO

PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. CHAS. MCCREA, *Minister of Mines* THOS. W. GIBSON, *Deputy Minister*

THIRTY-SIXTH ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. XXXVI, PART III, 1927

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Gammon River Area and Rickaby Lake Schist Belt, District of Kenora (Patricia Portion), by Geoffrey Gilbert - - - 73-84

Woman and Narrow Lakes Area, District of Kenora (Patricia Portion), by J. W. Greig - - - - - - - - 85-110

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1928


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COLOURED GEOLOGICAL MAPS

(In pocket at back of report)

Map No. 36*d*—Red Lake Gold Area, District of Kenora. Scale, one mile to the inch.
Map No. 36*e*—Woman and Narrow Lakes Gold Area, District of Kenora. Scale, two miles to the inch.
Map No. 36*f*—Gammon River Area, District of Kenora. Scale, four miles to the inch.

Photo by Air Service, Department of National Defence, Canada.



Red lake, looking southeast from a point above Mackenzie island towards the outlet. Keg lake and Gullrock lake lie in the distance. The Howey Gold Mines and McIntyre claims lie in the burned area beyond the green point.

Geology of the Basin of Red Lake, District of Kenora
(Patricia Portion)

By E. L. Bruce and J. E. Hawley

INTRODUCTION

The discovery, in the vicinity of Red lake, of gold deposits that give promise of commercial value and the great amount of prospecting that has followed those discoveries, have made necessary a re-examination of the geology of the Red Lake basin and an extension of the boundaries of the original map to cover the whole area of basic rocks surrounding Red lake. This work was begun by J. E. Hawley in June, 1926, and was taken over by E. L. Bruce in the latter part of July. The large number of claim surveys made during the summer, the control base line, and the township boundaries make possible a more accurate mapping of the geological units than was possible on the previous map. Some other changes have also been made as the result of further study of the rock formations; but, on the whole, the main outlines of the succession and structure, as determined in 1923, have been found to be correct.

Acknowledgments

G. G. Suffel, A. C. Lee, and H. C. Laird were field assistants throughout the season and performed their work in a most satisfactory manner. Those engaged in prospecting or developing claims in the area gave much assistance in the prosecution of field work, and the writers wish to express their appreciation of assistance and hospitality to J. E. Hammell; D. G. H. Wright, in charge of development for the Dome Mines; S. Wookey, in charge of the McIntyre claims; Cunningham Dunlop, of the Dunlop Red Lake Syndicate; J. W. Tyrrell, and many others.

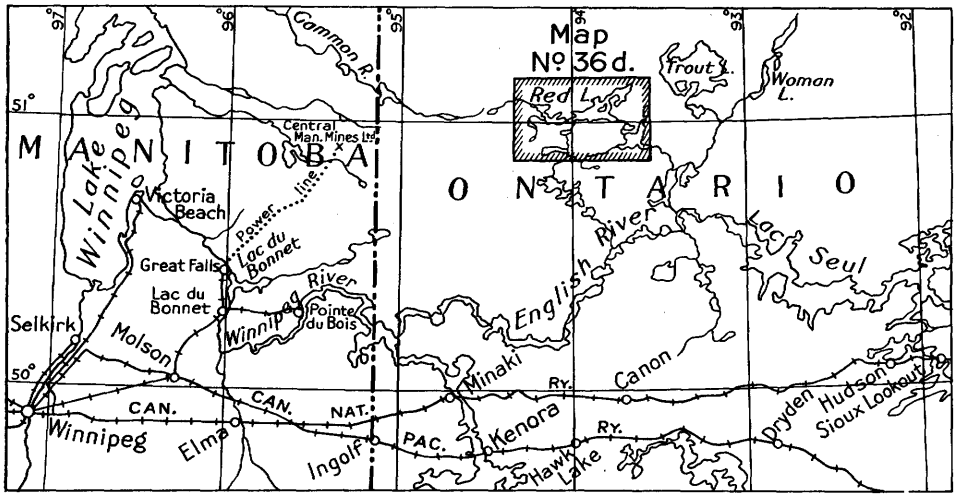
Position, Area, and Means of Access

Red lake lies in the district of Kenora (Patricia portion) about forty miles northwest of the outlet of Lac Seul. It has a total length of thirty-six miles and a width, from the northern extremity of Slate bay to the outlet, of eight miles. The area covered by the accompanying map, No. 36*d*, extends for some distance inland from the lake and has a length of 35 miles, and a width north and south of 22 miles. The 9th base line passes through the map area, and township boundaries have been surveyed on either side of the base. The map covers part of the township of Ranger, the northeast corner of which is at mile 24 on the base line; the townships of Dome, Balmer, and Todd, all of which lie in a tier just south of the base line; the township of Heyson, lying south of Dome township; and the townships of Bateman and McDonough lying north of the base line. In addition, it includes unsurveyed country outside of the blocked-out townships.

Hudson, a station on the Canadian National railway, is the starting point for power-boat lines which take travellers, without change, to Pine Ridge at the west end of Lac Seul; from there, smaller boats are used down the English river and up Chukuni river to Red lake. On English river, there are two short portages or one longer one, across which there is a wagon road. On Chukuni river, there

are four short portages in the part between Pakwash lake and Gullrock lake, expansions of the Chukuni river.

Two commercial air lines are operating: the Patricia Airways[1] from Sioux Lookout, a divisional point on the Canadian National railway, and the Western Canada Airways from Hudson. Sea-planes take passengers from the railway to Red lake in about an hour and a half. The journey by water requires two full days.



Key map showing position of the Red Lake area. Scale, 50 miles to the inch.

Previous Work

A post, known as Red Lake House, was established during the seventeenth century by the Hudson's Bay Company. Red lake is marked on Arrowsmith's map of 1795-1802, and Gullrock lake is shown as Prince of Wales lake. As it is located off the main travel routes of those days, none of the naturalist explorers of the great fur companies visited it; and it was not until 1893, when the late D. B. Dowling passed through the lake on his exploration from the English river to Berens river, that there is any mention of the geology or physical features of the region north of the English river. Prompted by Dowling's description of sedimentary rocks at Red lake, a geological party of the Ontario Department of Mines, working along the English river, visited Red lake in 1922, and the preliminary mapping of the basin was completed in 1923. The report, accompanied by a coloured geological map, formed a part of Part 4, Volume XXXIII, of the Ontario Department of Mines.

Summary

General Character of the Country

The country surrounding Red lake has typical pre-Cambrian topography. In the western part, the elevations have a linear arrangement controlled by the folding and by the intrusion of igneous masses parallel to the bedding of the sedimentary formations. The maximum difference of relief from the lake bottom to the tops of the ridges is 265 feet; some of the hills rise 125 feet above lake-level. In the eastern part, the irregularities of the consolidated rock floor

[1]Successors to Patricia Airways and Exploration Company, Limited.

are masked by beds of lake clays. The chief elevations in this part are a few hills of glacial debris which project through the clay. The pronounced ridge several miles east of Red lake is believed to mark the beach of the pre-glacial lake in which the clays were laid down.

The part of the basin in which the clays are found has a deep productive soil, is well drained, and should be a good agricultural area. The forest growth is large. Beyond the thick clay beds are isolated areas of soil in some of the valleys, and these valleys contain good timber. On the uplands the growth is small and scanty. Red pine grows in the Red lake basin, but is not abundant. Fish and game are plentiful. None of the falls or rapids on the river is large enough to supply any great amount of water power.

Table of Geological Formations

QUATERNARY	
RECENT:	Peat, beach deposits, river silts.
PLEISTOCENE:	Stratified lake clays, glacial deposits.
	Great unconformity
PRE-CAMBRIAN	
POST-TIMISKAMING: (Algoman)	Granite—quartz diorite and micropegmatite. Lamprophyre dikes; quartz diabase and diorite. Porphyritic granite, hybrid granite, amphibolite and associated gneisses. Granite porphyry. Quartz diorite porphyry. Quartz porphyry.
TIMISKAMING:	Slate, greywacké, arkose, and conglomerate.
POST-VOLCANIC DIORITE	
KEEWATIN:	Metamorphic derivatives of volcanic rocks. Iron formation. Volcanic ash rocks. Agglomerate and fragmental rocks. Rhyolites. Lavas of intermediate composition. Amygdaloidal basalt, greenstone, etc.

Economic Geology

The occurrence of greenstone, overlain by sediments of the Timiskaming type, and of porphyry and granite intrusive into these old rocks, provides conditions favourable to the occurrence of ore deposits. This succession first attracted close attention to the area and led to systematic prospecting of the rocks surrounding the smaller granite masses. The search has been rewarded by the location of gold occurrences which give every promise of sufficient size and value to make producing mines. No mineral, other than gold, yet shows any commercial possibilities. Silver-bearing galena veins were staked as far back as 1922, but they are small. In the serpentinized greenstone, stringers of asbestos of good grade have been seen, but in all cases they are too few in number to be worth developing. Massive talc is common in some parts of the greenstone series, but occurs with a large proportion of carbonates, quartz, and other impurities.

Topography and Drainage

The topography of the area differs from that of any other part of the pre-Cambrian only in local modifications of the typical surface of low relief. The linear character of some of the igneous intrusions is marked in the topography

by ridges, but these are not remarkably high or continuous. The most noticeable features of this kind in the vicinity of the lake are the ridges north of Slate bay, which rise to 125 feet, and the ridge at the mouth of Slate bay, which is scarcely 100 feet above lake-level and yet can be seen from long distances up the lake. At the west end of the lake, the mass of quartz porphyry along the west side of Pipestone bay forms a marked elevation. South from Red lake to the latitude of Medicine-stone lake, there is a gradual rise terminating in linear ridges, which rise from 200 to 250 feet above the general plain and which form sharp divides between Medicine-stone lake and the smaller lakes to the north. These higher ridges are held up in places by granitic dikes.

On the whole, however, the etching of the pre-Cambrian rocks has left but small areas noticeably above the general level, nor have the hollows been deeply incised, the greatest depth determined by soundings in Red lake being only 140 feet. This, taken with the greatest elevation, 125 feet for the ridge north of Slate bay, makes a maximum difference of relief of only 265 feet. As in most pre-Cambrian areas, however, this comparatively slight difference gives the impression of ruggedness due to the steep slopes of the ridges and the numerous cliff faces. It is only when actual elevations are plotted that the regularity of the profile is appreciated.

In part of the Red lake basin, even these comparatively small irregularities of the consolidated rock surfaces are to a great extent masked by unconsolidated glacial material: terminal moraine debris; later outwash sands, gravels, and clays; and recent organic accumulations in bogs and swamps. Towards the western part of the lake, the unconsolidated materials occupy only the hollows and valleys between rock ridges, so that consolidated rocks are well exposed and the area of such exposures is fairly large. To the east, the thickness of glacial and glacial lake deposits increases, and the area of pre-Cambrian formations exposed becomes correspondingly reduced, so that in the country inland few outcrops are to be found, these representing the tops of ridges or hills almost completely buried or the flanks of those hills where streams have washed away some of the mantle. Hence, although rocks may be abundantly exposed along the lake, many exposures are completely covered only a short distance back from the shore, and inland little but good clay soil with some muskeg and swamp may be seen.

In Heyson township, south of Red lake, many of the strike depressions owe their origin to shear zones, as exemplified on the Howey, McIntyre, and other claims where fracturing and schisting have made the rocks more susceptible to erosive forces. Some of these shear zones have been mineralized and afford promising places for prospecting, but many of them have been so deeply filled with sand and gravel as to be rendered inaccessible. Depressions with a more northerly strike cut across the eastward-trending ridges in several places, and are suggestive of north-south faults as pointed out by Wright.[1] South of Faulkenham lake, bare, relatively flat topped ridges afford an excellent view of the slightly lower country to the east, most of which has been burned over.

Eastward toward Trout lake, glacial lake deposits become still thicker, and the land surface gradually rises into a conspicuous ridge of gravel and sand, which lies about six miles east of Red lake and can be seen from some parts of the lake.

Red lake drains southward to the English river, and its waters are carried from there westward to Lake Winnipeg. It lies, however, well up to the divide that separates the English river from Berens and Bloodvein rivers, which flow directly westward into Lake Winnipeg. Hence, the drainage basin of Red lake is not large, and most of the streams which flow into the lake are small. No stream large enough for canoe navigation enters from the northwest. There is a

[1]D. G. H. Wright, Eng. & Min. Jour., Vol. 122, July 3, 1926.

canoe route said to lead westward to the Bloodvein river, but this route leaves the western part of Pipestone bay by a portage three-quarters of a mile long. At the west end of Trout bay, the stream that drains Douglas lake is fairly large, but over the high ridge along the south side of Trout bay there is a considerable fall, and a portage of over half a mile is necessary. A lake of some size, Hatchet lake, drains into the south end of Douglas lake from a considerably greater elevation. A navigable stream also enters Douglas lake at its northeast extremity, draining several small lakes for a distance of four miles to the south. The upper part of this stream consists of a series of narrow lakes connected by shallow, sluggish channels. Between West and Wolf narrows, a small stream enters, draining Suffel, Lee, and Laird lakes. Four short portages were cut around rapids in the portion between Suffel and Red lakes, and one between Suffel and Lee lakes. This course was opened to Medicine-stone lake by a short portage over a sharp ridge from the centre of Lee lake.

Just east of the Middle narrows, a third northward-flowing stream, heading in the Medicine-stone lakes, and flowing successively through two others, discharges into Red lake. Portages must be taken around six short rapids on this route, and the drop in elevation between Medicine-stone and Red lakes, 11 feet, is distributed rather evenly among all the rapids.

Two other small streams enter Red lake from the south and, though unimportant in size, afford an easy means of access to the country south of the lake. One of these, draining Russet (Ross) and Flat (Shoal) lakes, is choked with logs and brush for a mile and a half, and a portage is necessary. The other drains Faulkenham lake and passes through Snib (Bobs) and Coin (Gillies) lakes. Five portages, the longest of which is 43 chains, enable one to reach Faulkenham lake. In the past field season, a route from this stream by way of three small lakes to Russet lake was made by cutting four portages.

On the north shore near the Middle narrows are two small creeks; one drains a lake of some size, and the other rises in a swamp. Three creeks flow into Slate bay, but all are small.

The largest river entering Red lake is the Chukuni, which drains Little Vermilion lake and brings in a large volume of water from Pine lake and other lakes to the north. A broad but somewhat sluggish creek flowing into the north end of East bay was followed upward a short distance to the point where the trail eastward to Trout lake leaves it.

Natural Resources

Soil

Of the present and prospective resources of Red lake basin other than mineral resources, the soil which covers a large part of it so completely is probably the most important. This clay area is no doubt a continuation of the belt which extends along the river below Lac Seul.[1] The northeast margin of this agricultural area, according to Dowling,[2] is the sand and gravel ridge lying between Red lake and Trout lake. The west and south margins are extremely sinuous, depending upon the irregularity of the floor upon which the clay was deposited; the clay lands finger out along the depressions in the floor, and this edge is bordered by almost isolated areas of clay lying among the rock ridges. No doubt, too, many of the muskeg and swamp areas are underlain by clay of good quality. In the main area of clay, the drainage is good, little swamp or muskeg exists, and

[1]Ont. Dept. Mines, Vol. XXXIII, pt. 4, 1924, p. 2.
[2]D. B. Dowling, Geol. Surv. Can., Vol. VII, pt. F, p. 52.

the preparation of the land for agriculture should be a fairly easy matter. At present, the distance of this area from transportation prohibits settlement, and even the small number of Indians who make this their hunting ground practically desert it during the summer months and do not plant gardens. A splendid garden was formerly kept at the old Hudon's Bay Company's post.

Timber

The well-drained clay land supports a good growth of trees of all kinds that the climate permits. Poplar, spruce, and birch all grow to large size. Balsam is abundant, but small. Red pine, which grows rather abundantly along the English river, is nearly at the northern limit of its range at Red lake, but a number of good-sized trees of this species grow on the large islands south of Mackenzie island. The muskeg areas have the usual stunted growth of spruce and tamarac. Rock and sand ridges and sand plains support a growth of jackpine. Fire has not destroyed much timber, and the areas of brulé are not very extensive. An old burned area extends for eight miles southwest from the outlet of Red lake to the south of Faulkenham lake. Here many of the ridges have been swept clean, but the lower areas are covered with heavy windfalls. A recently burned area crossed by the trail from Red lake to Trout lake is probably the result of carelessness since the trail was opened; but so far as could be judged from the trail, no timber of any value was destroyed, as the trees were small jackpine that would never have reached any useful size. The very wet seasons of 1923 and 1926 prevented any large fires, but care will need to be exercised to preserve the valuable timber as prospecting continues.

Fish and Game

Fish are abundant in Red lake. Pickerel and pike can be obtained with a line at almost any time. Whitefish are taken by nets. Lake trout are found, and by deep fishing, fish of 40 pounds in weight have been taken. Suckers are the most abundant of all species, but are not used except for feeding dogs.

The larger game animals, moose and red deer, are numerous. During the early summer, deer may be seen feeding along grassy lake shores, and moose in the marshy bays. Woodland caribou are said to be found now and then, but none were seen during the survey of the lake. Bears are not numerous. The smaller animals are those usually found in such districts: lynx, rabbits, muskrats, mink, etc. Beavers were once fairly numerous judging from the old dams, cuttings, and houses, but they have apparently been nearly exterminated as new beaver cuttings were seen on only one of the creeks, southeast of Douglas lake. Muskrats, too, are likely to disappear completely. They are easily trapped, and the high prices paid during the last few seasons make it possible for the Indians to make sufficient for their needs by trapping muskrats, rather than those animals that require more labour and skill in the taking.

Ruffed grouse and spruce partridge are abundant, and ducks nest in large numbers in this area.

Water Powers

All of the streams draining into Red lake are so small that the volume of water is insufficient to produce much power, even if the fall is large, as on the stream from Douglas lake.

The rapids on Chukuni river, above Red lake, have no great descent or large volume of water. Below Gullrock lake there are four falls, but none of

these is important as a water-power site. In fact, the most convenient one, that just above Pakwash lake, is entirely drowned during high-water periods in the English river. Power sufficient for all purposes can be generated at Manitou falls on English river, 35 miles from Red lake.

GENERAL GEOLOGY

The consolidated rocks of this region are all pre-Cambrian in age. They are covered in part by a mantle of unconsolidated material, consisting of glacial debris, lake silts, and vegetable remains. The pre-Cambrian complex is made up of volcanic rocks and minor thicknesses of sediments interbedded with the flows, an old intrusive, a thick sedimentary group overlying the igneous rocks, and later intrusive rocks of various types. The dominantly volcanic group will be referred to as Keewatin and the sedimentary group as Timiskaming, although, as pointed out later, the correlation is only tentative.

Keewatin

The rocks grouped in this class differ considerably in appearance and in genesis but belong to the oldest formations in this area. As will appear from the descriptions, they are by no means all of the same age, and it is only because it is impossible accurately to determine age relations on account of severe metamorphism that these rocks are grouped together. In this ancient complex are included volcanic rocks both basic and acidic, carbonate rocks which are metamorphic in origin, a series of basic schists and semi-gneisses which have undergone such severe thermal metamorphism and granitic injection that all traces of their original textures are obliterated, and true sediments such as slaty rocks and iron formation. The continuity of the outcrops of the highly metamorphosed rocks with recognizable volcanic types justifies their grouping with the Keewatin.

VOLCANIC ROCKS

Volcanic rocks outcropping in the Red lake basin include nearly all the types which have been found elsewhere in Keewatin areas in Ontario. These grade in composition from rhyolites to basalts, though areally the latter are by far the most important, the acidic types being confined almost entirely to an area south of the eastern part of Red lake in Heyson township. Of the basic types, pillow and amygdaloidal lavas are typically developed. All, however, are much altered. In the following description the definite volcanic types will be dealt with first, and the less easily identified metamorphic derivatives, later.

Basic Lavas

Most of the basic lavas are now dense greenstones with the usual torsion cracks and irregular surface markings characteristic of these ancient flows. In most exposures, the ellipsoidal structure is not developed, nor were slaggy and scoriaceous lava tops commonly observed. Well-developed ellipsoids occur along the mainland south from the point south of island No. 137, in the bays west of the narrow channel between Mackenzie island and the west shore, along the shores of the bays north of the outlet, and on claims K. 1,483 and 1,484, and along the west side of the south end of East bay. South of Red lake, in the east bay of Flat lake, and east of Faulkenham lake, ellipsoidal markings are still evident in much altered greenstones.

A thin section from an exposure of ellipsoidal greenstones on the west side of the bay north of the Hudson's Bay Company's old post shows under the microscope only a mosaic of calcite with stringers of secondary quartz traversing the section. Ellipsoidal greenstone is cut by a porphyry mass in an exposure on the west side of East bay, one and a quarter miles from the south end. The greenstone is so fine grained that it requires a high degree of magnification to show the individual minerals in the thin section. Calcite and quartz seem to be present in large amounts; but as the grains are extremely small, the determination is not certain.

Amygdaloidal Basalt

Large exposures of amygdaloidal basalt occur on the Coniagas claims, K. 1,529 and 1,526, and on K.R.L. 8, all south of the eastern part of Red lake. The flows strike about N. 75° E. and have a vertical dip, exposing a width or thickness of approximately 800 feet. The thickness of individual flows could not be determined on account of the overburden. The rocks are dark-green in colour and are highly altered to chlorite and carbonates, being now essentially composed of secondary quartz, chlorite, epidote, and carbonates. Rounded and pipelike amygdules are filled for the most part with carbonates, of which calcite predominates. Weathered surfaces all show a typical pitted appearance where the softer carbonates have been removed from the amygdules. Amygdaloidal lavas have also been reported on claim K. 1,522 to the west.

Lavas of Intermediate Composition

Volcanic flows corresponding probably to andesites and dacites occur, interbedded with the more basic and more acidic types, to the south of Red lake on the Howey, McIntyre, and Dome claims. These are recognizable by their grey and black colours, which contrast with the green metabasalts. Occasional phenocrysts of quartz are visible in the more acidic dacites, and these porphyritic flows are with difficulty distinguished from fine-grained intrusive porphyries. All have been somewhat schisted and recrystallized, so that accurate determination of their original composition is now impossible.

Within the Keewatin area lying south of Red lake are several narrow bands of coarsely porphyritic andesite. Outcrops of these occur about half a mile south of Faulkenham lake. Contacts of this rock with adjacent greenstones were not visible. Their parallelism with the eastward-striking and vertically tilted flows, together with their extensive alteration, suggests a close age relation with the Keewatin.

In a hand specimen, the rock has a most striking appearance. Abundant elongated feldspars, more or less oriented in one direction, parallel to the strike of the formation, are set in a contrasting dark-green hornblendic groundmass. Under the microscope the large feldspar laths appear to be andesine. The groundmass consists almost entirely of mosaic quartz and fine fresh hornblende. In many cases the phenocrysts of andesine are almost completely surrounded by a fine mosaic of quartz and fresh albite, both of which are secondary. The interior of the feldspar is altered moderately to sericite, zoisite, and quartz. Though extensively recrystallized, the rock may still be recognized as an andesite porphyry.

Rhyolites

Interbedded with metabasalts and infolded with them are numerous grey rhyolitic flows, which are best developed on the claims of the Victoria Syndicate, K.R.L. 1,865, 1,866, 2,362, 2,363, and 2,364. Westward these may be traced for

about two miles; but west and south of Snib lake, they become so intermixed with more basic flows that no attempt has been made to map them separately.

The rhyolites present a dark grey to white surface, are extremely fine grained and hard, looking like hard grey quartzites, for which they might easily be mistaken. They occur in bands, usually fifteen to twenty feet thick. In some places they are finely banded, in others they are slightly porphyritic, with eyes of quartz showing as dark specks. On a fresh surface they vary from grey to almost black.

Under the microscope the rhyolites are wholly crystalline. Quartz in a fine mosaic pattern is by far the most prominent mineral and is interspersed with lenses of much finer quartz and probably feldspar. Feldspars in the fine groundmass are seldom recognizable, but a few larger crystals of albite occur as phenocrysts. The texture of the rocks is partly schistose. Biotite is fairly abundant and in all cases has a decided parallelism, curving around the plagioclase phenocrysts, which are themselves only partly oriented. Minor amounts of magnetite are associated with the biotite. Sericite and muscovite or bleached biotite are secondary minerals.

The following analysis shows the acid nature of these flows:—

	Per cent.
SiO_2	76.71
Al_2O_3	12.58
FeO	1.56
Fe_2O_3	1.14
TiO_2	.18
CaO	.33
MgO	trace
K_2O	4.22
Na_2O	3.32
H_2O	.31
	100.33

(Analysis by W. K. McNeill.)

The rhyolites provide a key, almost as useful as the sedimentary rocks, for unravelling the structure of the region, and they are about the only key where the latter are absent. On claim K.R.L. 1,866, the contact of a dense grey rhyolite and a fine green metabasalt or chlorite schist is folded, showing an eastward pitch of the rhyolite up to 45 degrees. This eastward plunge of interbedded rhyolites and greenstones explains their disappearance as surface outcrops eastward, where they would also be partly cut off by post-Keewatin diorite intrusions.

In the vicinity of the Porcupine area,[1] it has been shown that the rhyolites occupy a stratigraphic position above the bulk of the greenstones. No such relation has yet been determined for the acidic flows of the Red Lake area, though the few indications of tops of flows to the south of Red lake, and the structural section across the lake in the vicinity of the Howey Gold Mines, suggest that the rhyolites here lie also above the greenstones on the south flank of an anticline pitching east. Southward, however, more basic volcanics occur in which the structure is obscure.

The rhyolitic flows are intruded by a coarsely porphyritic granite or rhyolite with abundant phenocrysts of quartz and red feldspar, by small masses of a fresh blue quartz diorite porphyry, and by the much altered older diorite.

[1]Ont. Dept. Mines, Vol. XXXV, pt. 6, 1926.

Agglomerate and Fragmental Rocks

South of Red lake in Heyson township, many examples of fragmental rocks occur in both acidic and basic types of lavas. The former is well shown on the south line of claim K.R.L. 1,866. Here light-weathering, rounded to angular fragments of rhyolite and rhyolite porphyry occur in a dark-grey matrix. The whole is slightly schisted, and the fragments being drawn out merge with the darker groundmass. Still farther south, several small bands of fragmental rocks are found, in which both rhyolitic and basaltic or andesitic fragments are embedded in a chloritic and schistose matrix. In bulk these rocks are not important.

Volcanic Ash Beds

Finely bedded, light-grey and green tuffaceous rocks occur interbedded with andesitic flows immediately south of the Howey ore body. These have been encountered in diamond-drilling there. A small but typical outcrop lies immediately north of the quartz diorite intrusive on claim K. 1,379 of the McIntyre. These volcanic ash beds are recognized now chiefly by their fine bedding of light-grey and green bands and by their light colours indicative of an original acidic composition. They have been extensively altered and are composed almost entirely of secondary minerals such as sericite, chlorite, quartz, and carbonates.

IRON FORMATION

Typical banded iron formation occurs with the greenstone at several places. The iron formation itself is of very slight importance, but some of the exposures have been shown on the map in order to indicate the structure of the Keewatin complex. A band of interbedded silica and magnetite was found inland, south of Pipestone bay, and another northeast of the east end of Douglas lake. Small exposures occur along the south shore of Trout bay. A fairly large band of iron formation crosses East narrows, but it is intruded and broken up by a huge porphyry dike, so that no extension of it southwest was seen, although there is strong local attraction along the shore in that direction which may be due to inclusions of the iron formation in the porphyry.

On a small point at the east end of Snib lake, a narrow band of white and black, thinly bedded iron formation lies immediately to the south of what appears to be a basic fragmental and partly amygdaloidal basalt, which grades northward into more massive basalt. To the south of the iron formation and truncating some of the iron formation bands is massive medium-grained basalt. This relationship strongly suggests that the iron formation lies on the top of the basalt to the north and that the beds dip steeply south.

Other zones of highly siliceous, pyritiferous rocks with no marked bedding planes have been included as iron formation, although they are not of the typical variety. One lies inland about along the strike of the band just mentioned at East narrows. Another highly siliceous zone occurs on the mainland east of Mackenzie island. Well-banded, magnetite-bearing beds form the east shore of the channel for some distance east of Mackenzie island. These have been classed as iron formation, rather than with the later sediments, because they are associated with the siliceous band mentioned above and contain magnetite, which is not found abundantly in the later sediments.

East of Balmer (Jackfish) lake, large bands of iron formation outcrop on claims K.R.L. 955 and 956 and extend eastward. Southeast of Balmer lake, the exposures shown as sediments of Timiskaming age on map No. 33*e* are now placed with the iron formation.

North of Wolf narrows, a band of conglomerate is, in places, in contact with much contorted iron formation, and the abundant fragments of the latter included in the sediments give them an extremely rusty surface.

METAMORPHIC DERIVATIVES OF VOLCANIC ROCKS

Practically all of the basic volcanic rocks as mentioned above are now metamorphosed. Most common among these are the massive greenstones, which vary in character from place to place but are similar in being composed of secondary minerals, chiefly chlorite and minor amounts of serpentine, amphibole, or carbonates. These in many places retain original structures, such as ellipsoidal markings, and are easily recognized as basic volcanics. There are, however, other more severely altered rocks, the origin of which is less clear. These occupy relatively large areas and include rocks composed dominantly of



Fig. 1—Serpentine showing some calcite.
(Crossed nicols × 13.)
S = Serpentine. C = Carbonates.
Q = Quartz.

serpentine, carbonates, or mixtures of the two, and they seem to be the result of deep-seated hydrothermal alterations. Another group, consisting chiefly of amphibole rocks, hornblende and biotite schists and gneisses, seems the product rather of thermal and contact metamorphism, accompanied to some extent by granitic *lit par lit* injection. These owe their present textures and in part their composition to the widespread granitic intrusions of the area.

Serpentinous Rocks

Serpentine is found in many of the altered greenstones, but in some it forms the main mass of the rock. A description of some of the more important of these dominantly serpentinous rocks will indicate their character. A sample from an exposure on the mainland east of Mackenzie island consists entirely of light-green serpentine, and the original rock was evidently made up of only one mineral, possibly hornblende or pyroxene. Ellipsoids are developed on the weathered surface only a few chains south of this exposure and, with the

exception of the ellipsoidal markings, the rocks are similar in appearance. Along the east shore of East bay, the rocks are foliated. The most abundant type is greenish and purplish, or a mixture of green and purple grains. A series of sections from specimens along this shore show under the microscope variations from rock consisting of nothing but sheaves of serpentine to a variety containing about 50 per cent. serpentine and the rest calcite and mosaics of quartz lying between the fibres of serpentine or appearing as irregular areas in which the serpentine sheaves are included. A specimen from the west shore north of the narrows has the same texture, but the dark mineral in it is actinolite, showing pleochroism from green to yellowish-green to blue. Possibly it represents an intermediate stage in the alteration of the volcanic rock, whereas the rocks previously described have undergone further alteration of the actinolite to serpentine. The proximity of igneous intrusions may have had an influence in the production of actinolite. Similar actinolite and serpentine rocks occur at other places.

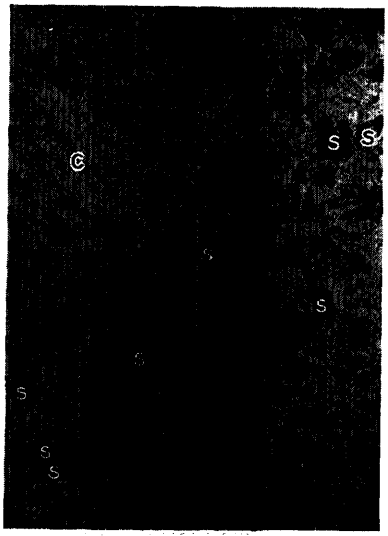


Fig. 2—Serpentine remnants in carbonates.
(Crossed nicols × 13.)
S = Serpentine. C = Carbonates.

Among the smaller islands southwest of Mackenzie island, the rocks are extremely schistose, the schists being grey or green. In the field, the grey schists were thought to be sericitic. A greyish massive rock was taken as an unfoliated representation of the grey schists. Under the microscope, it is found to consist of serpentine fibres and some carbonate. It seems likely, therefore, that the schists are high in carbonates and have resulted from the metamorphism of massive lavas, first altered to aggregates of serpentine and carbonates and later further changed into schists. Rocks consisting chiefly of talc occur at the narrows just south of Pipestone bay.

Massive serpentinous rocks, in some of which stringers of asbestos have formed, lie between Trout bay and Pipestone bay. The serpentine fibres are small and have a closely felted texture. A serpentine of somewhat different character was found along the shore southwest of island No. 228. Under the microscope, it is found to consist of polygonal areas of serpentine with tiny fibres arranged normal to the polygonal boundaries or to cracks (Fig. 1). Sur-

rounding and separating the polygonal forms are narrow zones consisting of quartz, which has a peculiar fibrous structure transverse to the stringers. Some of the serpentine areas have roughly the outlines of blocky hornblende crystals, and it may be that the original rock was a hornblendite now altered to serpentine and that during the alteration silica was set free and migrated outward to the margins of the crystals of hornblende and was deposited in the intercrystal spaces. Carbonate is abundant, and there seems to be a gradation from rocks of this type to those consisting chiefly of carbonates.

Carbonate Rocks

The carbonate rocks differ from the greenstones in appearance. They are rusty-weathering, greyish to buff rocks, many of which are sufficiently coarse in crystallization to show the cleavage planes of the carbonates. The surface in places retains the peculiar surface markings of the greenstones, and the space relations of high carbonate rocks and of greenstone show that one is derived from the other. Specimens to illustrate a gradation between the two were collected along the shore southwest of island No. 228. The serpentinous facies of the series is that described and illustrated above. The photomicrographs, Figs. 1 and 2, show stages in the alteration. Analyses of three samples have been made in order to trace the quantitative changes that may have taken place:—

	No. 1	No. 2	No. 3
	per cent.	per cent.	per cent.
SiO_2	56.6	44.1	52.1
FeO	5.2	5.4	4.5
Fe_2O_3	4.4	.5	3.7
Al_2O_3	4.6	12.1	4.2
CaO	9.6	2.6	1.0
Mgo	7.6	14.1	14.2
H_2O	5.4	6.5	3.9
Loss on ignition, H_2O deducted	6.3	12.8	16.5
Total	99.7	98.1	100.1

Analyst—W. Davis.

Specimen No. 1 was a typical greenstone with no apparent alteration to carbonate. In No. 2, carbonate could be recognized in the hand specimen, and in No. 3 the rock seemed to be chiefly carbonate. In the analyses, water was determined directly and was subtracted from the total loss on ignition; the difference is assumed to be chiefly CO_2, since other gases that might be present would be in proportions too small to affect the calculations and, in any case, would be compensated to some extent by a slight oxidation of the ferrous oxides.

The following are recast analyses:—

No. 1		No. 2			No. 3	
	per cent.		per cent.			per cent.
Quartz	41.10	Quartz	23.16		Quartz	46.44
Serpentine	12.93	Serpentine	15.61		Serpentine	1.70
Calcite	14.30	Calcite 4.62	28.26		Calcite 1.80	
Magnetite	5.10	Siderite 8.35			Siderite 5.92	27.12
Kaolin	2.58	Magnesite	15.29		Magnesite 19.40	
Epidote	9.19	Magnetite	.70		Hydromagnesite	9.10
Chlorite	13.68	Kaolin	30.44		Magnetite	2.55
Uncombined water	1.65				Kaolin	10.55
					Limonite	2.24
Total	99.53	Total	98.17		Total	99.73

Epidote calculated to a formula, $16CaO\ 9Al_2O_3\ 3Fe_2O_3\ 24SiO_2+4H_2O$
Chlorite calculated to a formula, $5MgO\ 5FeO\ 2Al_2O_3\ 6SiO_2+8H_2O$.

The recast compositions correspond fairly closely with the mode of the rocks except that hydromagnesite was not definitely recognized microscopically. The considerable difference in the quantity of quartz in No. 2 compared with No. 1 probably does not mean an actual loss of quartz during metamorphism. In No. 2 there has been a considerable addition of CO_2 from some source, so the proportion of quartz will be less. The increase again in No. 3 can be accounted for by the change of a large part of the kaolin to some other form, thus setting free part of its silica. A significant feature of the three compositions is the continuous change in the composition of the carbonate from a high calcium content to a high magnesium content. This may represent a continuous addition of magnesium and iron to the carbonates, due to the breaking down of the serpentine and chlorite rather than to any actual removal of calcium from the rock.

A comparison of analysis No. 3 with that of a rock that has undergone ordinary weathering shows marked differences. Surface alteration results in losses of constituents, such as the compounds of magnesium and calcium, with magnesium showing greater losses than calcium. In this case the losses are reversed. In weathering, alumina remains almost constant. In this alteration, alumina has apparently decreased. It is certain, too, that the carbonate in the greenstones, as shown by analysis No. 1, is not the product of surface carbonatization of the original lavas, since all greenstones have varying quantities of carbonate, a proportion quite independent of their depth below the surface. Furthermore, in the case of thick flows, there is no regular variation in the degree of carbonatization in various parts, which would be the case if the alteration to carbonate immediately followed extrusion and preceded the covering of one flow by the succeeding one.

Carbonate rocks are commonly found as marginal zones where quartz porphyry and granitic intrusions cut greenstone. In this relationship, the rock in contact with porphyry may be completely carbonatized, and only at some distance from the intrusive will typical greenstone be found. Where carbonate rocks occur with no porphyry actually in contact with them, it can be explained by carbonatization in greenstone immediately above unexposed porphyry masses. This relationship can be demonstrated where the tips of porphyry tongues are separated by a carbonate band. An excellent example of this is shown by the porphyry tongues north of Trout bay. Evidently then, if the porphyry causes the alteration of greenstone to carbonates, that process must be a deep-seated and not a surface one.

About Russet lake, highly carbonated and serpentinized rocks are abundant. These are similar to those described above. They retain in a few places ellipsoidal markings. The proximity of a large mass of medium-grained granite to the west of this lake, and the marked decrease in alteration of the Keewatin rocks eastward, away from the granite contact, also points to the deep-seated character of the alteration.

The volume relations of the greenstone and its carbonate derivative are of some economic importance. In most localities where such rocks have been studied, they are found to be traversed by a large number of quartz veins of varying sizes. In discussing the dolomite zones of Larder lake, where similar relationships to igneous intrusives occur and where gold has been found, Cooke[1] concludes that after the primary dolomitization of the schistose country rock by deposition of ankerite in the cleavage planes, fissuring took place, probably in relief of pressure set up by increase in volume consequent on the addition of so much carbonate.

[1]H. C. Cooke, Geol. Surv. Can., Mem. No. 131, p. 53.

It seems hardly possible that increase of volume could have opened up fissures now occupied by the quartz veins. Under the conditions of deep-seated metamorphism that have been assumed, it seems doubtful if any increase of volume would be possible. It is probable that the volume remained fairly constant during metamorphism and that during the cooling of the intrusive rocks there were reactions between the minerals of the greenstone and the vapours being exhaled from the cooling quartz porphyry. To the greenstone would be added carbon dioxide and water from the igneous mass, producing carbonates and kaolin. Meantime, there would be the absorption by the porphyry of alumina and iron. This hypothesis is borne out by the fact that plagioclase phenocrysts are more abundant near contacts. As a further indication of the probability of the constancy of volume, it will be seen that by taking the specific gravity of the calculated minerals in analyses Nos. 1 and 3, a given weight of greenstone will have 1.01 times the volume of the same weight of carbonate rock, a difference so slight as to be negligible, but on the side of diminution, rather than increase, of volume by metamorphism.

Rather, then, than fracturing due to increase of volume, it is likely that the fracturing was considerably later than the metamorphism and due to mechanical deformation, perhaps at the time of the granite invasion. There would be increase of volume at this period, but this would be quite independent of the changes taking place during metamorphism.[1]

Amphibole Rocks, Hornblende and Biotite Schists and Gneisses

Occurring in two separate elongated bands south of Red lake are schistose and very fine grained gneissic rocks, all of which are characterized by the presence of abundant hornblende and biotite. The smaller of these bands lies south of the Douglas lake granite and lenses out, disappearing into the granite to the west and south. The larger band forms a continuous belt, striking east for 20 miles from a short distance northwest of Medicine-stone lake.

That these dark, partly schistose and partly gneissic rocks are the highly metamorphosed equivalents of Keewatin and possible of some Timiskaming sediments, which have been wholly recrystallized by the thermal and contact effects of the engulfing granitic intrusions, is shown by their continuity with less altered phases of these rocks and by their prevailing basic composition. They present a most varied and interesting study of thermal and contact metamorphism, a detailed discussion of which will not be attempted here.

In the immediate vicinity of the granitic intrusions, particularly where the bands of basic rocks are narrow as at Hatchet lake, coarse-grained amphibole rocks are developed. These are usually black and contain, besides the large amphiboles, hornblende crystals as long as half an inch, and minor quantities of epidote, quartz, and secondary albite. Their texture is more igneous than schistose, but it seems clear from their gradation to finer greenstones away from the contacts, and their gradual transition into hornblendic granite, that they are the contact metamorphic equivalents of basic Keewatin rocks.

To the south of Faulkenham lake, the basic rocks bordering the granite intrusions are more typically hornblende schists and gneisses. Narrow bands of hornblende schist occur as lenses in the granitic rocks on the south shore of the lake. The size and continuity of the schists increase a short distance to the south, but on the whole this type of border is more characteristic of the granitic rocks lying south of the basic schists than of those to the north.

[1]W. Mead, Jour. Geol., Vol. 33, 1925, p. 685.

Sections made across the 20-mile tongue of basic schists and gneisses bring one constantly on rocks of slightly different colour, grain, and composition. All members of the series, however, are composed essentially of quartz, feldspars of varying composition, hornblende, biotite, magnetite, epidote, and titanite. Some are quite massive, others are finely banded. While the terms "schist" and "gneiss" denote the true textures, the abundance in many of non-platy minerals accompanies their lack of well-defined schistosity. Many of the gneisses might more properly be referred to as micro-gneisses on account of the fineness of their banding. All gradations between the latter and the rather massive schists may be found.

A peculiar greenish-grey rock on fresh fracture shows a definite parallel orientation of the minerals. Porphyroblasts of hornblende, also oriented, stand out like basic fragments in a schistose greywacké.

Microscopic examination of these rocks reveals their similarity. Quartz is arranged in a fine mosaic as, often, is albite. Hornblende, which may or may not be segregated in fine bands, varies in quantity from place to place. Epidote is occasionally present with the hornblende. Titanite appears as clusters in some, with magnetite or ilmenite, and many specimens have rather abundant small magnetite crystals distributed throughout. In a few cases, large basaltic hornblende crystals have been developed without any marked orientation. Their freshness suggests a secondary origin.

Interbanded with the dominant amphibole schists are a few biotite and hornblende-biotite schists. In these the biotite occurs as fine fresh flakes with a parallel arrangement. All the other minerals common to the hornblende schists are also present, as well as a few partly sericitized feldspars.

Toward the southern margin of the eastward-trending band of the metamorphic rocks, finely banded gneisses become more abundant. These are predominantly dark in colour and have alternating dark and light bands, a tenth of an inch or less in thickness. The dark bands consist chiefly of fine basaltic hornblende, epidote, chlorite, and minor amounts of fresh mosaic quartz and albite or andesine-oligoclase. In the lighter bands quartz predominates and feldspars are more abundant, consisting of microcline, orthoclase, and albite. Some highly sericitized feldspars are also present. Many of these rocks undoubtedly represent basic Keewatin schists, into the folia of which acidic constituents have been injected. Others may represent only recrystallized basic rocks in which the more acid constituents have been segregated into bands.

A narrow band of greenish rock lying between quartz porphyry intrusions along the west side of Pipestone bay is made up of fibrous actinolite with mosaics of quartz lying between the fibres. Along the northwest side of Slate bay, near the intrusion of granite porphyry, the greenstone consists of radiating fibres of actinolite.

The changes which have taken place in these basic rocks have apparently been accomplished largely by recrystallization, accompanied by certain gains and losses of constituents, determination of which has not been made. The agency bringing them about can only be referred to the heat and pressure attendant on the adjoining granitic intrusions. The almost complete absence of fissile schists suggests that shearing stresses were not sufficient to produce much differential movement, but that these stresses were present is indicated by the orientation of all the platy minerals.

Near the south shore of Medicine-stone lake, where the southern boundary of the metamorphics has been drawn, granitic and porphyritic dikes are abundant; and locally to the east, veritable networks of granitic and pegmatitic stringers

have soaked through the schists and gneisses. The gneisses pass southward from the basic types described above to more acidic types, mapped originally by Dowling as Laurentian gneiss and interpreted by him as probably highly altered schists.[1] The prevailing granitic composition of these has led to their classifica-

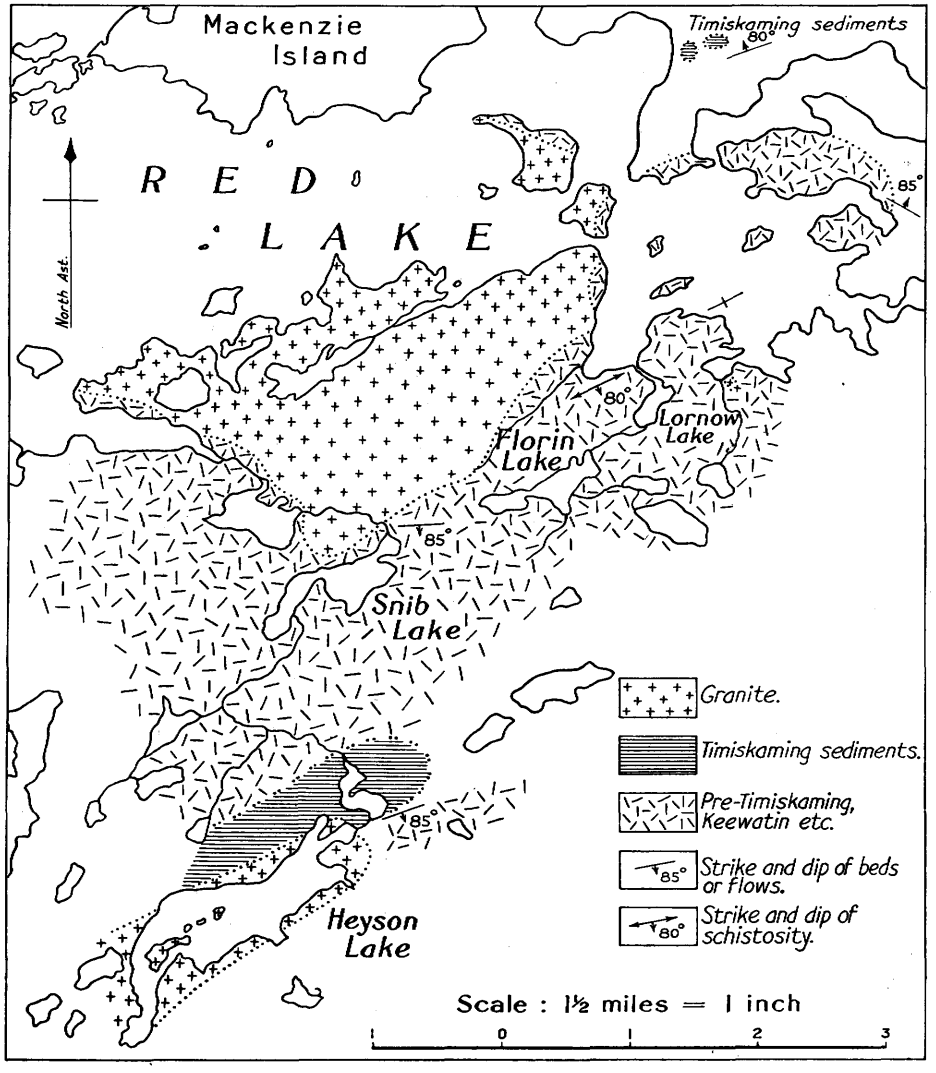


Fig. 3—Sketch showing the structure of the southeast part of Red lake as suggested by flow tops and sediments.

tion with the granites. Most of them are penetrated by numerous pure granite and pegmatite stringers and are obviously in part older than the granite, originating, as Dowling surmised, by the more complete alteration and injection of basic schists followed by dike intrusions as the granitic batholith ascended. An interesting relationship of this same kind exists between the basic schists of Hatchet lake and granitic gneisses lying along the same strike to the west.

[1]D. B. Dowling, Geol. Surv. Can., Vol. VII, pt. F, 1894, p. 40.

STRUCTURE OF THE KEEWATIN ROCKS

The structure of the Keewatin rocks in the Red Lake area is not readily discernible from these rocks themselves except, as has been mentioned above, where rhyolites and iron formation are present. Flow tops, such as occur in the Keewatin of the Porcupine area, are seldom evident, the metamorphism of the rocks having quite obliterated them in most cases.

A few instances of flow tops have been observed in the eastern part of the area, on the McIntyre claims and at the east end of Snib lake. At the latter point the flows dip steeply south, an anticline lying somewhere to the north. On the Noranda claims, K. 1,479 to 1,486, north of the outlet of the lake, trenches expose massive to schisted pillow lavas, striking N. 115° E. In several places suggestions of fragmental tops may be discerned in these, all of which occur on the north of the beds, indicating a syncline to the north and an anticline to the south. The southerly trend of the strike here may indicate that this horizon is near the nose of an anticline plunging eastward. If this structure is traced back to the west, along the regional strike of N. 65°-70° E., it becomes apparent that an anticline lies between this horizon and the one on Snib lake, the crest of which may fall near the south shore of Red lake.

Indications of the structure as revealed by the rhyolites show a decided easterly plunge to the isoclinal folds. The easterly extension of the folds appears to be cut off entirely by granites and granitic gneisses.[1]

Post-Volcanic Diorites

The rocky, burned country along the south shore of Red lake, west and south of the outlet, is in part occupied by a light-green-weathering, medium-grained diorite, which is clearly intrusive into the Keewatin volcanics, interrupting the latter along their strike and differing from them chiefly in being more massive and of coarser texture. In all cases the diorites are rather highly altered, though to a lesser degree than the Keewatin volcanics. In places they are somewhat schisted and have evidently undergone considerable shearing.

On the Howey, Nipissing, Coniagas, and Lang claims, as well as on the south boundary of Balmer township, the diorites are composed chiefly of feldspar with lesser amounts of ferromagnesian minerals, all of which have been altered to secondary minerals. To the west, on the Huronian Belt claims south of Coin lake, hornblende is a very abundant constituent. Thin sections of the diorite from several eastern localities show the presence of primary feldspars, ranging in composition from albite to andesine, and secondary minerals, sericite, zoisite, epidote, quartz, and varying amounts of carbonates, as well as some rutile, possibly residual from biotite, and titanite (Fig. 4). The quartz which is evident in a few hand specimens appears to be largely secondary, though some primary quartz may also be present. To the west the diorites have a darker-green appearance, due to the abundant hornblende with which are associated andesine feldspars and more titanite and ilmenite. Locally, fine feldspar laths are embedded in hornblende, but the rock as a whole lacks any marked ophitic texture. Zoisite, epidote, and chlorite are abundant alteration products of the hornblende and are sometimes mixed with the secondary sericite of the feldspars.

The diorite intrusives appear in some places to be dikes; in others, rounded bosses. Where of dike form they parallel more or less the strike of the volcanics. Their intrusive nature in the greenstones is excellently revealed in diamond-drill cores obtained south of the Howey ore body. Contacts of the two show the diorite

[1]D. B. Dowling, op. cit., map No. 576.

penetrating in fine tongues between the schist *laminae*. On the Howey claims at about the 500-foot level, a diorite dike, 200 feet wide, cuts the greenstones and is represented at the surface and to a depth of 150 feet by several narrow dikes (see insert facing page 18). This vertical change is characteristic of an ascending intrusive and suggests that the diorite intruded the volcanics after they had been folded to an almost vertical position, rather than as a sill while the flows were still more or less horizontal. The interruption of the greenstones by the rounded bodies of diorite suggests a similar conclusion, though the local schisting of the narrower bodies of diorite points to the fact that some folding took place after their intrusion.

So far none of these altered dioritic rocks have been found in contact with Timiskaming sediments. Their highly altered condition suggests a pre-Timiskaming age. Fresh hornblende diorite, however, has been found cutting sedimen-



Fig. 4—Diorite. (Crossed nicols × 15.)

tary rocks near Faulkenham lake, but this differs so in degree of alteration and is so close to the post-Timiskaming granitic intrusions that it has been interpreted as probably a differentiate from the younger granitic magma.

The age, then, of the older diorite intrusives must be left indefinite. If they are pre-Timiskaming, it would seem that an early period of folding took place in the Keewatin, followed by dioritic intrusions, and that the Timiskaming sediments were later laid down. No such great unconformity between the Timiskaming and Keewatin as this theory would require has yet been found in this area, although as shown below there is reason to suppose some unconformity does exist.

Timiskaming Sediments

Distribution and General Character

The sediments that have been grouped as Timiskaming in age lie in three main bands and a few other smaller bands whose structural relationships have not been worked out. One main band extends along the northwest side of Mackenzie island and across the islands west of it and terminates west of Wolf

narrows against the granite batholith at island No. 191. A large band lies north of the lake. At the west end it is cut off by the granite a short distance northeast of Pipestone bay. It extends across the south end of Slate bay, but its position northeastward is doubtful, due to the concealment of the consolidated formations beneath the glacial and post-glacial sands and clays. Sediments occur along the shores of a lake northwest of the Hudson's Bay Company's post, and a belt of sediments extends from the bay just north of the post northwestward across the peninsula and appears again on island No. 91, on the hook-shaped point beyond it, and still farther along on the northern mainland, where it disappears entirely beneath the overburden. Neither of these two latter belts is exactly in line with the main belt that crosses Slate bay. The types of rocks in this sedimentary series are conglomerate, greywacké, quartzite, and slate. No individual bed can be traced for any great distance, and in most cases the bedding is so indistinct that it is difficult to determine the dip and strike. The conglomerate beds are the most easily recognizable, but they are not continuous: Sections made inland only short distances apart may show conglomerate beds in one and none in adjacent traverses, in the positions where they might be expected to occur.

A narrow band of sedimentary rocks occurs also to the north of Faulkenham lake, south of Red lake. These disappear a short distance to the east, and west of Faulkenham lake are terminated by the large granite batholith. The sediments are chiefly impure quartzites, greywacké, and narrow slate lenses. No conglomerates seem to be present. The sediments are intruded on the south by granite and granite porphyry and, on the small lake northeast of Faulkenham lake, by narrow dikes of hornblende diabase.

Slate

Slate is well developed on some of the islands north of Mackenzie island, and the prominent exposures at the entrance to Slate bay give this arm of the lake its name. Ordinarily, the rock is soft and black with eminent fissility. Occasionally it is massive and more properly termed an argillite. Some of the slates are grey, but these are not common. Bedding is not well marked and in most exposures is so obscure that it cannot be recognized at all. The well-marked slaty cleavage and the bedding seem to be nearly parallel in most places, and the cleavage obscures the bedding planes. Under the microscope, the slates show a very fine texture with much material that is nearly opaque and quartz in grains, which are usually angular. In some specimens, the black material has begun to segregate into knots, evidently the beginning of the development of secondary phenocrysts. The determination of the opaque constituents and the cause of the black colour is impossible, but the material is probably clayey in character, with some carbonaceous colouring matter. The thickness of slate must be great; but in the absence of well-marked bedding, no estimate can be given. No doubt the thickness appears much greater than it actually is, on account of minor foldings and crumplings which cannot be definitely recognized.

Greywacké

Greywacké occurs with slate along the north side of Mackenzie island and on the smaller islands near it. Inland, through its greater resistance to erosion, greywacké is much more abundantly exposed than slate. It shows all gradations from slate to conglomerate, from fine-grained, dark-grey rocks, with tiny bits of quartz showing in the hand specimen, to light-grey, granular rocks with abundant quartz and feldspar recognizable. A specimen from one of the small islands west

of Mackenzie island has the characteristic greyish, granular appearance in the hand specimen and under the microscope is found to consist of angular to sub-angular fragments of quartz and feldspar set in a fine-grained matrix of the same minerals (Fig. 5). Some of the quartz porphyries, as mentioned later, have very much the same appearance, especially where sheared, but they have a much smaller proportion of quartz fragments.

The matrix of the greywacké when fine is dark-grey owing to the opacity of the constituents. In specimens with coarser matrix, the colour of the rock is much lighter; and these varieties are properly arkose.

Some of the greywackés are very massive and show no distinct bedding planes, especially inland where the surfaces are to some extent protected. In

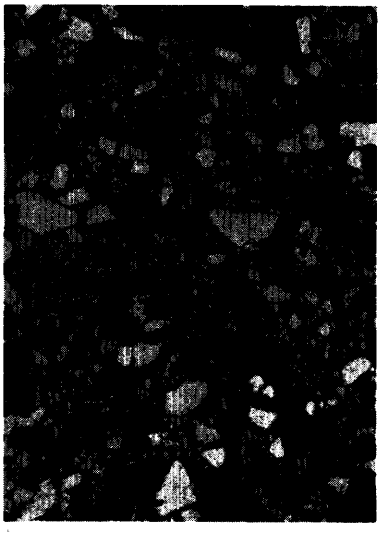


Fig. 5—Greywacké. Light-coloured fragments are mostly quartz. (Crossed nicols × 13.)

places, however, bedding is well marked, and these rocks afford the chief means of unravelling the structures of the sedimentary group. Alternating beds of light and dark grey greywacké have been well exposed by the burning of the forest near the west extremity of Mackenzie island. Well-banded and somewhat thicker beds outcrop on the east side of Mackenzie island near the narrow passage between that island and the mainland.

Shearing of beds of greywacké or arkose has produced foliated rocks consisting of quartz and sericite. These were fine grained originally, and the shearing action has apparently further fractured some of the grains, so that the resultant schist may be very fine grained with only quartz and sericite recognizable. Quartz porphyry subjected to the same dynamic metamorphism develops a rather similar schistose rock, as the porphyry has essentially the same mineral constitution as many of the sediments have (Fig. 6).

Impure Quartzite or Arkose

Impure quartzite or arkose has been found in a number of localities. Some of these rocks are very similar to the greywackés, differing chiefly in the colour of the constituent minerals. Some, however, have been found in localities where

sediments belonging to the Timiskaming series do not occur and may be quartz porphyry with an exceptional proportion of quartz. They may, however, be fragments of the sedimentary group caught up by the porphyry.

Remarkable rocks occur on island No. 191 where the sediments are cut off by the granite batholith. They are well banded in places, but the bands are very much contorted and the layers are of unequal hardness. Along the lake shore the action of the waves has etched the surface, so that the softer layers are cut in as much as an inch below the hard ones. The resistant layers are not continuous, but consist of nodules of hard quartzose material standing out above the softer material but still in a stratiform arrangement and evidently once parts of hard beds which the crumpling has broken up. The microscope shows that the soft beds are made up chiefly of carbonates with some introduced quartz

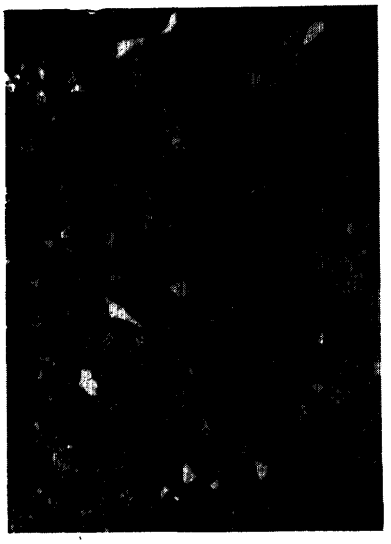


Fig. 6—Fractured quartz porphyry. Light-coloured fragments are quartz. (Crossed nicols × 13.)

and with enough rounded quartz grains to indicate that even the soft beds were impure quartzites originally. Other rocks on the same island have a very marked bedding, beds being as much as four feet in thickness separated by lighter-coloured layers, a quarter of an inch to one inch thick. Still a third variety is a massive purplish rock with biotite visible in the hand specimen. Under the microscope biotite is found to be plentiful, and the only other mineral is quartz in a closely interlocking mosaic. This rock has probably been formed by the contact action of the granite intrusion on the sediments, and the contorted quartz-carbonate rock mentioned above may also be, in part, a product of action of the intrusion.

The sediments lying north of Faulkenham lake contain many bands whose nature suggests an impure quartzite origin. These are brownish and very fine grained. Shearing and some recrystallization have in large part altered the rocks beyond recognition, but their dominant quartzose composition and occasional rounded feldspars serve as a means of identification. Thin sections show, besides the recrystallized mosaic quartz, small amounts of biotite, chlorite, zoisite, and

locally secondary fresh albite. In one the quartz grains have a yellow stain around the edges, typical of recrystallized iron-stained sands.

Fine slaty bands separating the quartzose rocks serve as a means of determining the attitude of the sediments.

Conglomerate

Conglomerate is not abundantly exposed along the lake shores; but inland across the northern band of sediments, many thick beds of conglomerate occur. Beds of conglomerate cross the entrance of Slate bay at the north side of the smaller bay that lies between Slate bay and the main lake. These beds are nearly vertical and strike N. 65° E. The section exposed is as follows, from southeast to northwest:—

Conglomerate	5 feet
Sandy arkose	1 foot
Conglomerate	4 feet
Arkose	4 inches
Conglomerate	2 feet
Arkose and quartzite	4 feet

The pebbles are of various sizes, the largest being four inches in diameter, and are ellipsoidal with the longer axes parallel to the bedding. The variety of pebbles is considerable, including granite porphyry, quartz, and some dark, greenstone-like varieties. No band that could be considered the continuation of this was found to the southwest; but in some of the inland sections northward from points southwest of the entrance to Slate bay, other conglomerate bands were seen. In all of these, granite or granite porphyry pebbles are abundant. A pebble from the Slate bay bed was examined microscopically and proved to be a typical but somewhat altered granite. Since all of the granitic rocks found in place are later than the sediments, the pebbles must have come from an older formation not yet recognized in this area, one entirely destroyed by later intrusions, or else from some older granite not represented here.

Conglomerate occurs with greywacké along the shore north of island No. 294. The pebbles are comparatively small, all being less than an inch in diameter. The matrix is dark grey. There are other occurrences along the south shore of the long bay north of Wolf narrows in which the pebbles are of well-banded, jaspery iron formation, and the matrix is heavily pyritized. Dowling describes this bed as follows:—

> In a bay just north of Wolf narrows, a band having the appearance of a conglomerate is found with occasional pebbles of red-banded jasper and others of light-yellowish quartzite, but the majority of the pebbles are of a dark purplish-grey to green with a matrix of the same colour. The thickness of the band is about ten feet, and the associated rock is of a greenish to grey colour in rather thin beds.[1]

In some trenches that have been dug across the southern part of the conglomeratic rocks, the conglomerate is seen to be composed of large subangular masses of iron formation with a small amount of iron-stained matrix between the fragments. The conglomerate is in contact with solid contorted iron formation. This explains the very rusty appearance of a large part of the outcrop.

These rocks are believed to be true conglomerates, but rocks very similar in appearance at East narrows have been formed by a quartz porphyry dike intruding a band of iron formation, the dike itself carrying fragments of the intruded rock. A rock of conglomeratic appearance occurs with the sediments on

[1]Op. cit., p. 47.

island No. 191. The fragments are packed closely together, so that there is very little matrix. Many of the pebbles are of greenstone, but the presence of some chert and quartz indicates that the rock is a true conglomerate, rather than a shear breccia as it at first appears to be.

Origin of Sedimentary Group

An hypothesis to explain the origin of this group of sediments must consider the following characteristics: All of the beds are lenticular; this is especially well shown by the strong conglomeratic layers. All of the beds are fragmental, although of varying degrees of fineness, from coarse boulder conglomerates to fine-grained slates. The great mass of greywacké is not well sorted, the minerals are not rounded, nor were they much decomposed before being enclosed in the present rock. Hence the removal of rock waste during the formation of the greywacké was largely mechanical, rather than chemical, and the material was not carried far. All of these facts are explained if it be supposed that the material was carried down from a high and recently elevated land mass by rapid rivers and was deposited as an outwash fan or delta.

Structure of Sediments

The determination of the structure of the area is complicated by the lenticular character of all of the beds and the lack of distinct bedding in most of them. In addition, igneous intrusions have disturbed, metamorphosed, and engulfed considerable parts of the older rocks. The deep covering of unconsolidated material which almost completely hides the pre-Cambrian rocks in the eastern part of the map-sheet is a still further handicap to a satisfactory interpretation.

All the older rocks are tilted to nearly vertical positions, and thus there is no possibility of using superposition in determining the top and bottom of the formations. There are three possible hypotheses: The two main belts of sediments may be actually two separate sedimentary horizons in a continuous succession; they may be the two limbs of a syncline; or they may have an anticlinal relation to the narrow belt of greenstone between them. Either of the latter two hypotheses would require, in beds which have persistent lateral characters, a symmetrical arrangement of rock types on either side of the axis. In these sediments, however, the lateral variation of the beds makes it impossible to rely on any such criterion. Few actual contacts of sediments and older rocks were observed, and the nearly vertical attitude made these of little value. Drag folds, which in many such cases serve to solve the major structures, fail on account of the indistinct bedding. The simplest hypothesis would be to consider all the sediments as of one age, either underlying the volcanics or overlying them. The latter is believed to be the correct solution and is based on the following evidence: Sedimentary beds can be traced along the north side of Mackenzie island almost continuously, although much disturbed by igneous intrusions; the northernmost band of greywacké cuts across the narrow neck of the island at the north, so that the northern peninsula consists of greenstone; the sedimentary beds continue eastward to island No. 36, where they curve southward with a dip to the west, and this is taken to be the axis of a synclinal trough plunging westward; the whole central part of the trough is occupied by the quartz porphyry and granite of Mackenzie island.

In the northern belt, sediments were found at the north end of Slate bay lying on greenstone in such relations that they are undoubtedly stratigraphically

above the greenstone. It seems, therefore, reasonable to assume that these sediments are also synclinal and that the slates on either side of the greenstone ridge at the entrance to Slate bay belong to the same bed that once formed a continuous arch over the ridge. The northern side of the north syncline has also been removed by igneous intrusions, and all of the beds are cut off east of Pipestone bay by the main granite mass.

The northeast end of the northern syncline is not satisfactorily worked out. Patches of sediment outcrop through the overburden in that direction, as will be seen by the map, but these are not exactly in line with the beds of the syncline. Neither are those that occur in the bay north of the old Hudson's Bay Company's post. From the distribution both of the sediments and of certain dikes of granite porphyry, it seems likely that north-south faults with a relative dislocation of the eastern beds to the north may partly explain the first of these difficulties. Faulting is assumed also to have affected the southern syncline. The westerly continuation does not show a sufficient width to account for all the beds which occur on Mackenzie island, even if no allowance whatever is made for the whole southern limb which is believed to have been destroyed by intrusions. Along the western part, a comparatively narrow band of quartz porphyry is all the intrusive rock exposed, and even this is not continuous. This difficulty can be solved if it be supposed that a fault at a small angle to the strike of the axis of the fold has shifted the southern part of the syncline westward. There is some field evidence that this may have happened, as many of the rocks appearing in the islands west of Mackenzie island are very schistose.

The structural relations of the narrow band of sedimentary rocks north of Faulkenham lake have not been worked out satisfactorily. The few indications of bedding and tops of beds, as indicated by gradations in coarseness of grain, show that the portion exposed lies on the northern limb of a syncline, the southern limb of which has been removed by a granite intrusion.

Age Relations

The relationship of the sedimentary to the volcanic group of rocks and the age of each are not as yet absolutely determined. The structure outlined in the preceding paragraphs requires that the sediments be younger than the volcanics, but the question arises whether or not there was a period of erosion after the cooling of the lavas and previous to the deposition of the first sediments. No basal conglomerate was found during the field work, nor in fact any conglomerate bed near the base of the sediments. The conglomeratic lenses occurring at various horizons are not continuous and are taken to represent merely accumulations of coarse debris in eddies of the streams from which the sediments were deposited. Nevertheless, some observations favour the theory that there was an erosion period. Pebbles in the conglomerate lenses are very similar in character to the underlying rocks—greenstone and iron formation. This criterion, however, must be accepted with considerable caution, as lithological similarity is not conclusive. This is shown in this series by the occurrence of comparatively fresh granite pebbles in the conglomerate, and yet all the granite which has been found in place in the area has intrusive relations to this sedimentary series.

A relationship that seems to show conclusively an unconformity between the two groups occurs at the north end of Slate bay where a small syncline of greywacké lies on greenstone. If the two were conformable, then the greenstone must necessarily be the top of a lava flow. On the contrary, the greenstone is coarse grained and shows none of the characteristics of a flow surface. Erosion must, therefore, have been acting upon the igneous rocks previous to the deposition of

the sediments for a time sufficiently long to destroy the characteristic lava surface or to cut down the surface to intrusive basic rocks of the oldest group.

From these two lines of evidence it has been concluded that the greenstone and associated rocks form a series lying unconformably below the sediments, but no estimate of the magnitude of the erosion interval can be formed from the meagre data available. Both series of rocks are intruded by the igneous rocks to be described later. The succession therefore is similar to successions worked out in other areas of pre-Cambrian rocks of similar character. Hence, it is suggested that the sediments be tentatively correlated with the Timiskaming.

Post-Timiskaming Intrusives

QUARTZ PORPHYRY

Distribution

An intrusive rock in which quartz phenocrysts predominate occupies large areas west of Pipestone bay, forms elongated belts south of Pipestone bay and in the northern part of Mackenzie island, and is exposed as isolated outcrops in the drift-covered area of the eastern part of the map-sheet. It is in rocks of this type that gold ores have been found on the Howey and McIntyre claims.

General Description

The quartz porphyry is a white-weathering, dense rock with great variation in the amount of quartz visible in the hand specimens. In places, practically no phenocrysts can be seen, and only a few feet away the rock may be crowded with quartz individuals. There is also a marked variation in the size of the grains. All are clear, and the smaller ones on fresh fractures appear black.

Under the microscope, the same variation in distribution and size of the porphyritic constituents is apparent.

In the typical quartz porphyry, such as that in the bald rocky point at the sharp bend in the channel between Trout bay and Pipestone bay, the microscope shows the rock to consist of a fine-grained groundmass of quartz, sericite, and probably feldspar, although in too small grains to be determined with certainty. The sericite, which forms about one-third of the whole, is in tiny foils lying between quartz grains. From this it seems likely that some at least of the quartz in the groundmass is secondary from the alteration of orthoclase, perhaps according to an equation such as the following:—

$$3\ (K_2O\ Al_2O_3\ 6SiO_2) + 2H_2O = 2H_2OK_2O\ 3Al_2O_3\ 6SiO_2 + 2K_2O + 12SiO_2$$

A small amount of light-brown biotite is also present. The phenocrysts are well-formed quartzoids, with only a few flecks of sericite marking the alteration of feldspars included in the growing phenocrysts. The large mass of rock that forms the elevated area west of Pipestone bay offers exceptional exposures for study of the character and relations of the quartz porphyry. It weathers light-grey, but freshly broken specimens are dark-grey and dense with conchoidal fracture. Some of the specimens under the microscope show no porphyritic character, but are fine-grained mosaics of quartz, microcline, and biotite, with sericite and some calcite as secondary products. In other places, the porphyritic texture is strikingly developed with large individuals of orthoclase in a fine-grained groundmass of quartz and tiny feldspar laths. Sericite in such rocks

occurs both in phenocrysts and groundmass. Other specimens from this area show still more variety in their mineralogy and have large individuals of orthoclase and acidic plagioclase, some of which have complex twinning by both the albite and pericline laws. The minerals of the groundmass are quartz, feldspar, biotite, chlorite, and sericite.

Along the steep rock surfaces facing the lake, the porphyry shows a jointing dipping northward at angles of 50 to 60 degrees. Paralleling this structure are narrow layers of greenstone. Thin sections of rocks at some of these contacts were taken to determine, if possible, the relationships. Greenstone from a band 25 feet in thickness lying between porphyry is made up chiefly of a fibrous amphibole pleochroic from yellowish-green to green.

A specimen of porphyry close to the contact on the north side consists of a very fine grained mosaic of quartz and feldspar with a few stringers of vein

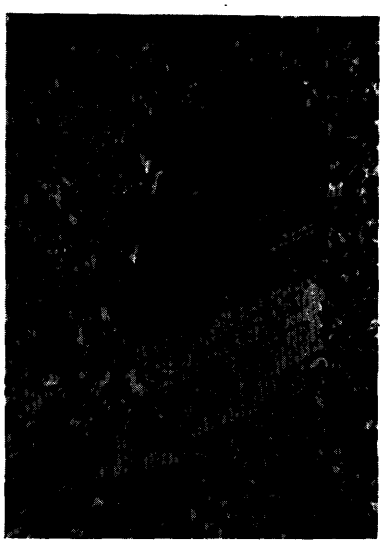


Fig. 7—Coarse quartz porphyry. Plagioclase showing albite. Carlsbad and pericline twins. (Crossed nicols × 13.)

quartz. A short distance away from the contact, the rock is coarser grained and decidedly porphyritic. On the south side, the rock is a very fine grained mosaic of quartz and feldspar with a somewhat foliated character from the development of fine flakes of biotite. In this sample no phenocrysts are present, whereas 300 feet farther south large phenocrysts are abundantly developed (Fig. 7).

The outcrops of quartz porphyry, near the mouth of Trout bay, offer a good opportunity to study the variation and relationships. There are all gradations from fine-grained, white-weathering rocks with no phenocrysts visible to the naked eye, to those in which the blebs of quartz are plainly visible. Under the microscope, the fine-grained varieties are found to be even-textured mosaics of quartz and feldspar; the porphyritic ones in most cases have both quartz and feldspar phenocrysts, commonly somewhat segregated into nests.

Analyses of several specimens of quartz porphyry have been made. Two of them are as follows: others will be given in the detailed descriptions of the Howey and McIntyre porphyries.

	No. 1	No. 2		No. 1	No. 2
	per cent.	per cent.		per cent.	per cent.
SiO_2	71.82	75.87	Quartz	52.42	46.87
Al_2O_3	14.78	15.50	Orthoclase	9.06	11.89
Fe_2O_3	.20	.81	Albite	5.97	13.10
FeO	3.75	.28	Anorthite	3.31	.....
MgO	1.65	.45	Sericite	13.20	19.90
			Biotite	.....	3.73
CaO	1.25	none	Chlorite	10.82	3.97
Na_2O	.71	1.55	Calcite	1.04	.....
K_2O	3.10	4.03	Magnesite	.95	.....
H_2O+	1.81	1.01	Siderite	1.43	.....
H_2O-	.04	.....	Diaspore	1.80	.....
CO_2	1.49	trace			
MnO	.07	trace			
Total	100.70	99.50	Total	100.12	99.46

Analysis and calculation by G. G. Suffel.

No. 1—Quartz porphyry from the north end of Mackenzie island. This sample, which contains abundant glassy phenocrysts of quartz, was taken from tongues of porphyry which intrude and alter greenstone. In the recast analysis, diaspore is assumed; it was not observed.

No. 2—Sample from a dike of porphyry, 30 feet in width, cutting greenstone on claim K. 300. This rock has apparently sustained a considerable loss of lime. In the recast analysis, sillimanite is assumed; it was not observed.

Specimens from other occurrences of quartz porphyry contain phenocrysts which have been fractured. Many of these fractured parts are surrounded by secondary minerals. In some, the fracturing has not been severe, and the outlines of the fractured phenocrysts can still be recognized. In others, the fragments are widely separated and scattered through the groundmass as angular particles (Fig. 6). Very commonly a brecciated structure shows on the weathered surface of the porphyry with oval, light-grey fragments set in a darker grey matrix. On fresh fractures, however, no differences can be detected between fragment and matrix. In places where the porphyry contains inclusions of greenstone, as well as the autoclastic texture, the rock resembles a sediment. The rather angular or elongated oval form of the inclusion, the identity of the porphyry fragments and the matrix, and the lack of any foreign pebbles are evidence that the rocks are not sediments but brecciated intrusives. Porphyry of this type forms prominent exposures on the northwest shore of the large bay east of the Hudson's Bay Company's new post and is remarkably well developed on island No. 52. On the northwest point of this island, a fragmental series is well exposed with an apparent textural variation in the various bands. In the coarser bands, however, it is noticeable that all of the fragments are porphyry; and on fresh fractures, fragments and matrix both look like quartz porphyry. The igneous character of the whole series is shown by the fact that from one of these fragmental bands a stringer, two inches in width, cuts transversely across the adjacent band of chloritic rock (Fig. 8). In thin sections, the main fragmental band exhibits a flow texture with large angular fragments of quartz, probably fractured phenocrysts, lying in sericite, the foils of which curve around the fragments. The rock from the tongue from this band is decidedly porphyritic

with phenocrysts of orthoclase and plagioclase in a fine-grained groundmass, which contains many nests of secondary quartz. At this same locality, other textural peculiarities are well shown at the east end of the island. The porphyry intrudes an ellipsoidal-weathering greenstone, and in places the rock is a typical quartz porphyry but has retained, on its surface, markings exactly like the ellipsoidal markings of the greenstone.

A somewhat different type of pseudo-conglomerate occurs on the north point of island No. 60. On a glaciated rock surface, greenstone and quartz porphyry are in contact. In the greenstone, there are inclusions of quartz porphyry with oval outlines, so that the surface appears conglomeratic. In the quartz porphyry which is sharply in contact with the greenstone, there are oval areas much less clearly outlined than in the greenstone and appearing like shadowy pebbles in the quartz porphyry. The contact and the pebble-like areas are as shown in Fig. 9. The microscopic characters of the masses of porphyry in the greenstone, of massive porphyry without the shadow-like inclusions, and of the porphyry with these inclusions vary only slightly. A sample from massive

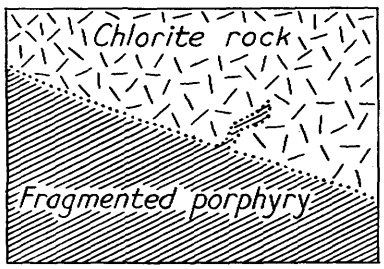


Fig. 8—Contact of porphyry and chlorite, island No. 52.

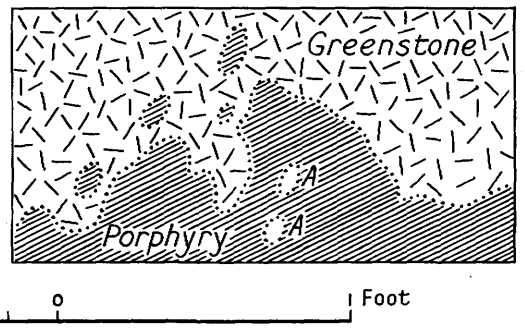


Fig. 9—Contact of porphyry and greenstone, island No. 60. A="Shadow" inclusions.

porphyry that looks homogeneous appears under the microscope faintly porphyritic with much altered, fairly large, but not well formed crystals of orthoclase and a few small quartz fragments, perhaps from fractured quartz phenocrysts. The fine-grained groundmass consists chiefly of sericite. A sample from one of the oval, pebble-like masses in the greenstone is decidedly porphyritic with phenocrysts of sericitized orthoclase, plagioclase in poorly formed crystals, and rounded quartz individuals. The groundmass is fine grained and contains abundant sericite. A specimen from the area showing faint oval outlines also is porphyritic, but the phenocrysts are plagioclase only. Neither quartz nor orthoclase occur in the first generation of crystallization. The groundmass contains sericite and carbonate, and certain areas of low transparency represent other alteration products. A possible explanation of this occurrence is that the oval areas are really cross-sections of pipelike tongues of porphyry, which came up along the schistosity of the greenstone, and that the oval areas occurring in the porphyry are similar pipes intruded as forerunners of the porphyry and later absorbed in the parent rock as its margin advanced into the greenstone. This hypothesis would explain the character of the porphyry which contains the oval shadows. That part of the rock mass would represent a part of the porphyry which had removed or assimilated a part of the greenstone. It would

thus have incorporated some basic material and hence would contain a somewhat more basic assemblage of minerals and plagioclase rather than orthoclase and quartz as the phenocrystic constituent.

On the north point of island No. 100 and on some other islands to the northwest, along the strike of the same band of porphyry, a remarkable banded structure is to be seen. The rock consists of yellowish-green, translucent, waxy layers about an inch in thickness, alternating with denser white layers of about the same thickness. Both types contain rounded phenocrysts sufficiently large to be easily visible to the naked eye, and under the microscope there are no essential differences in constituents or in texture. This dike intrudes a band of iron formation that does not appear at any point farther south. It may be possible that the dike has completely destroyed the band of iron formation and that the banded structure is merely a trace of the bedded character of the iron formation, left as a fossil structure indicating an original *lit par lit* injection by the igneous mass in the first stages of its assimilation of the older rock.

Alteration

In places where shearing action has been intense, the porphyry has taken on a remarkably regular schistose structure that makes it practically an igneous slate. Where the porphyry was originally somewhat heterogeneous, where certain zones had undergone some alteration previous to the shearing, or where there were inclusions of other rocks, a banded structure has resulted that resembles bedding. Especially where tongues of porphyry are injected as sills in slates, the porphyry may be easily mistaken for a siliceous sediment. The quartz eyes, however, remain clear and can usually be recognized in the sheared rock. Alteration has proceeded in some occurrences to the extreme of producing a sericite schist from the porphyry with the phenocrysts fractured and the fragments scattered through the groundmass. The resultant rock is difficult to recognize excepting by its field relations.

Contact alterations are not noticeable in the porphyry, but are chiefly indicated by the presence of some carbonate and perhaps by a variation in the phenocrysts, as noted above, from the normal orthoclase and quartz to plagioclase near the contact.

Relations

The gradation in texture and the disappearance of the phenocrysts along the contacts between quartz porphyry and greenstone were the first facts noted that seemed to indicate the intrusive nature of the porphyry. In the rock outcrops on the burned hills of the north shore of the bay that extends westward between Pipestone bay and Trout bay, the greenstone is cut by stringers of quartz porphyry and considerably metamorphosed by them. In other places the carbonate zones on both sides of porphyry tongues are further evidence of the intrusive relationship. Further details of the relation of porphyry to greenstone will be found in the later description of the porphyry on the Howey and McIntyre claims. Mention has been made previously of the manner in which porphyry dikes intrude, disturb, and metamorphose iron formation. Intrusive relations with the Timiskaming sediments are indicated by the relationships of the sediments on Mackenzie island to the porphyry which must have cut off the southern beds of the syncline. Porphyry was observed intruded between the layers of slates north of the Middle narrows; in most places it has the structure of sills in the sedimentary series and does not commonly cut across the bedding.

Quartz Porphyry of the Howey and McIntyre Claims

Description of the quartz porphyry of the Howey and McIntyre claims, in which auriferous quartz veins occur, calls for separate treatment because of its



View of surface trenches on the Howey ore body looking east from the McIntyre line.

importance in this respect and since it differs somewhat from the larger outcrops of quartz porphyry to the north and west. Its relation to the small granite mass



View of surface trenches on the Howey ore body looking west along the strike of the much fractured and sheared quartz porphyry.

to the northwest has not been established by field evidence, but it is correlated for the present with the other quartz porphyries of the area.

Several dike-shaped bodies of the porphyry occur on the Howey and McIntyre claims; the most important lies along the south line of claims K. 1,365

and 1,373. They differ slightly from place to place, both in coarseness of grain and in content and composition of phenocrysts. In general, they have a characteristic colour which varies from black where fresh to a light greenish-grey where altered and schisted. In the latter case, the porphyry has a decided waxy feel and appearance. It is usually very fine grained, and phenocrysts of quartz are discerned with difficulty. In the fresh rock they appear as tiny black eyes. East of the ore-bearing porphyry, the outcrops are of coarser grain and phenocrysts of quartz are readily distinguished in a hand specimen.

Microscopic examination of the finer fresh porphyry shows phenocrysts of quartz and albite. Locally the feldspar predominates over the quartz. Most of the phenocrysts have been fractured. The groundmass consists essentially of fine quartz, feldspars, and sericite. Clusters of magnetite grains are sometimes found associated with biotite flakes. Chlorite mixed with sericite is a minor constituent.

The freshest specimens obtained all have the feldspars altered to some extent to sericite and carbonates. Satisfactory comparison of the porphyry from different portions of the ore zone is rendered difficult by the differing degrees of alteration. Analyses of moderately fresh (No. 1), moderately fresh to partly altered (Nos. 2 and 3), and highly altered porphyry (No. 4) from the Howey claim are given below:—

	No. 1	No. 2	No. 3	No. 4	No. 5a	No. 5b
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
SiO_2	72.39	71.82	74.18	70.06	53.27	53.12
Al_2O_3	13.87	16.00	14.45	16.61	19.48	18.06
Fe_2O_3	1.45	.10	1.40	1.80	1.14	.44
FeO	1.13	.36	.96	.85	1.39	2.44
MgO	.46	.21	.37	.51	1.97	2.29
CaO	1.24	1.07	1.04	1.10	4.72	8.20
Na_2O	4.75	4.62	3.00	3.32	1.83	5.39
K_2O	2.79	2.14	2.52	3.22	5.38	1.52
H_2O	.43	1.27	1.14	1.34	1.68	.69
TiO_2	.64	.66	.37	.77	.76	.63
CO_2	.52	.36	.29	.67	4.65	5.87
FeS_2	.48	2.06	.51	trace	3.86	1.28
Total	100.15	100.31	100.23	100.26	100.13	99.93

(Analyses by W. K. McNeill.)

The mineral compositions calculated from the analyses are as follows:—

	No. 1	No. 2	No. 3
	per cent.	per cent.	per cent.
Quartz	31.93	35.01	45.00
Albite	40.30	39.15	25.39
Anorthite	2.89	3.03	3.33
Orthoclase	12.32	none	.83
Sericite	6.02	18.10	20.13
Chlorite	2.90	1.19	2.34
Calcite	1.18	.66	.82
Rutile	.64	.66	.37
Pyrite	.48	2.06	.51
Magnetite	.98	.97	.15
Fe_2O_3	.77[1]	none	.73[1]
Total	100.31	100.17	100.26

[1] Fe_2O_3 may be present in biotite.

The porphyry is characterized by its high content of soda feldspar and, in general composition, corresponds with a quartz keratophyre with which the Porcupine quartz porphyries have also been compared.[1] Nos. 2 and 3, with approximately the same degree of alteration, show a difference in quartz content, the latter being higher.

The analyses and calculated mineral composition of the fresher phases of this quartz porphyry differ somewhat from those given on page 28. This difference is most evident in the low content of soda in the latter, which may be due in part to hydrothermal alteration. There seems little doubt, however, that the Howey specimens of quartz porphyry are more alkaline. Both sets of analyses have examples of carbonated porphyry with relatively high ferrous oxide, magnesia, and lime.

The series of analyses bring out well the changes produced by hydrothermal alteration, which will be dealt with later. Analyses Nos. 5a and 5b are from a specimen showing the highly altered phase (No. 5a) and what was taken for a dark fresh phase (No. 5b). A thin section was made of the contact, which is poorly defined and recognizable only by the presence of biotite in the darker rock. Both phases are highly carbonated, and the low silica content may be in part a result of this, or it may reflect an original difference in composition of the porphyry, as will be seen by the following.

At several places in the porphyry exposed by trenches on the Howey and McIntyre claims, narrow, dark, schistose lenses may be found. These seldom exceed a few inches in width. Their length is irregular, and they are seldom traceable from one trench to the next. Most of them are mineralized with fine pyrite. Thin sections show them to be essentially biotite schists with abundant carbonate, minor amounts of fine quartz, and a little sericite. No primary minerals can be recognized. Thin sections of their contact with waxy porphyry suggest that they are intruded by the porphyry, which is closely welded to the schist. Tongues of porphyry project into the schist, and small clusters of biotite appear in the porphyry a short distance from the contact.

The origin of these micaceous bands is obscure. They were interpreted in the field as possibly lamprophyric dikes, but their lenticular character and their apparently pre-porphyry age is against this. They differ considerably from the Keewatin schists along the outer contact of the porphyry and from schistose greenstones which are included in the porphyry or lie between small intrusions of porphyry. These are all dominantly chloritic, and any contact action of the porphyry on the greenstone does not seem to have developed the biotite which is common to the bands under discussion. On the contrary hornblende is formed in some cases where inclusions are present or contact action has been great. Hence the argument that these dark bands are included Keewatin lenses receives little support. The other possibility, that these dark lenses are remnants of an intrusive which has preceded the intrusion of the porphyry is left open. It has been suggested[2] that most porphyries with well-formed phenocrysts may have been preceded by another intrusion to prepare the way. This magma may have been more basic originally or it may have been modified in composition during its intrusion. A dioritic quartz porphyry with abundant biotite occurs to the southeast and may be related to these biotite schists, though it is much more siliceous.

Hydrothermal Alteration.—Much of the quartz porphyry has been altered and schisted yielding rocks high in sericite, carbonate, and fine quartz. In

[1]A. G. Burrows, Ont. Dept. Mines, Vol. XXXIII, pt. 2, 1924.
[2]N. L. Bowen, personal communication.

general, the degree of alteration may be gauged by the change to a green waxy colour. Examination of specimens ranging from fresh to highly altered porphyry shows the gradual change in the mineral composition, which consists chiefly of the formation of sericite and carbonates at the expense of the feldspars, which in most specimens are fractured; as the alteration became more intense, these were converted to sericite and quartz or replaced by carbonates.

The changes which have been brought about chemically are best illustrated by means of a straight-line diagram (Fig. 10). Comparison of analyses Nos. 1 and 4 shows the apparent constancy of alumina, oxide of titanium, and potash. Relative to alumina, all other constituents except water and carbon dioxide have decreased; and of these soda shows the greatest loss, and more lime than magnesia is lost. Comparison is also made between Nos. 1 and 5a. This shows the

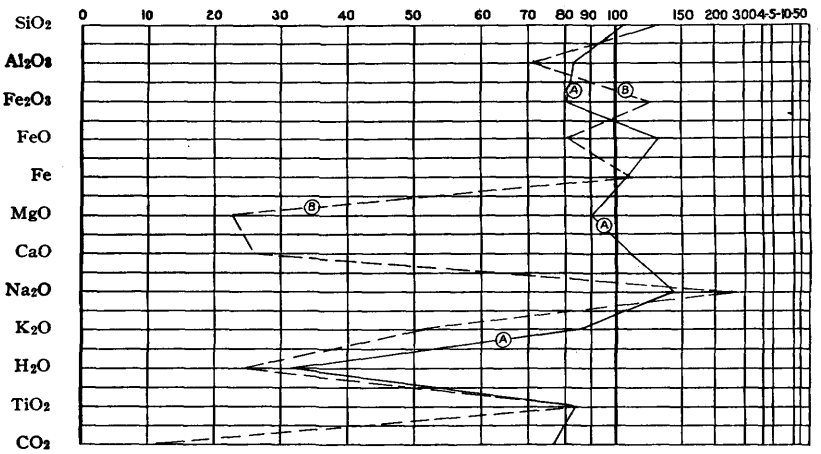


Fig. 10—Straight-line diagram showing relative gains and losses of constituents in hydrothermally altered quartz porphyry of Howey Gold Mines. (A) Comparison of analyses Nos. 1 and 4. (B) Comparison of analyses Nos. 1 and 5a. Points on diagram are obtained by dividing the grammes constituent in fresh rock by the grammes constituent in altered rock and multiplying the result by 100. The points indicate for each constituent the number of grammes of altered rock required to furnish the amount of that constituent originally present in 100 grammes of fresh rock.[1] Assuming any constituent constant, all points for other constituents to the right indicate a loss, and to the left, a gain.

characteristic loss of soda and gain of potash typical of hydrothermal alteration, but the marked gain of lime, magnesia, and carbon dioxide emphasizes the carbonate alteration. The high content of lime and magnesia is taken care of by the carbon dioxide. The time relations between the sericite and carbonate alteration are not discernible. The former is more widespread than the latter and, it is thought, occurred first.

The relation of the hydrothermally altered porphyry to quartz veins is well illustrated in some places where small veinlets of quartz cut fresh porphyry. Adjoining these veins the porphyry is altered to the typical waxy lustre, which fades out a few inches away from the vein. Elsewhere irregular zones of wax-coloured porphyry cannot be so related to the veins on the surface, but the irregular distribution of the quartz in a vertical direction may explain this. Where the veins are most abundant and closely spaced, the porphyry is invariably

[1]Leith and Mead, Metamorphic Geology, H. Holt & Co., 1915, p. 288.

much altered. The hydrothermal alteration then seems related to a period following the fracturing of the porphyry.

Intrusive Relations.—The Howey-McIntyre porphyry has been described by Wright[1] as a series of small masses ranging in width from a few feet to 75 feet, arranged *en échelon* to the north. The intrusions have been traced on the surface 1,000 feet east on the Howey and 250 feet west on the McIntyre, where they disappear into low swampy ground.[2] The general strike of the main body is N. 63° E., and the dip, as determined from diamond-drilling is about 82° S. The *en échelon* character is not clearly defined at the surface for lack of outcrops. At the west end, contacts, where exposed, parallel the schistose greenstones, striking more easterly and jogging northward at intervals, as illustrated in the insert facing page 58. In diamond-drill cores showing contacts of porphyry with Keewatin schist, the porphyry injects the schist in fine tongues, paralleling the schistosity.

From the manner in which the intrusions occur, it would seem that a structural control was exerted by the Keewatin schists. It is not clear, however, how greatly the Keewatin was folded prior to its being intruded, and it is evident from the fractured and locally schistose nature of the porphyry that folding and concomitant shearing followed its intrusion.

Cutting the porphyry in a few instances are lamprophyric dikes, some of which have been faulted during or after intrusion. In diamond-drill hole No. 16 of the Howey, a 1½-foot dolerite dike has been reported as clearly intrusive into the porphyry. On claim No. 1,379, a dark brown-weathering dioritic dike cuts across a dike of quartz porphyry. All of these are probably genetically related.

The relation of the quartz porphyry to the granite mass lying near by to the northwest is not determinable from the surface. The granite occupies the area approximately 30 chains west from the last outcrop of porphyry. The only logical correlation is to place the quartz porphyry with the other quartz porphyries of the area, that is as older than the granite.

QUARTZ DIORITE PORPHYRY

Intruding grey Keewatin rhyolites in the form of small lenticular masses is a striking quartz porphyry, differing considerably from the main quartz porphyry in appearance and composition, but corresponding with the latter in freshness and intrusive relations. The rock contains phenocrysts of bright-blue quartz set in a dark micaceous groundmass. It is best exposed on claims of the Victoria Syndicate, K.R.L. 1,864 and 1,865. The rock weathers reddish-grey and is relatively little altered.

Under the microscope, rounded phenocrysts of quartz are more abundant than lath-shaped feldspars. Graphic intergrowths of quartz and orthoclase are present in minor quantities. Biotite is a prominent constituent of the groundmass and gives the rock its dark aspect. Chlorite and magnetite are in part secondary after biotite. The plagioclase feldspar, according to extinction angles on bisectrix sections, is between andesine-oligoclase and oligoclase-andesine. This is in agreement with calculated plagioclase from the analysis, which shows a considerably lower tenor of soda and potash than the Howey quartz porphyry. The rock properly falls in the class of quartz diorites or tonalites, though its high quartz content, represented by the phenocrysts, makes it on the whole more acidic.

[1] D. G. H. Wright, Eng. Min. Jour., July, 1926.

[2] The eastward extension on the Howey claims was considerably extended during the summer of 1927. *See* page 57.

Chemical Composition	per cent.	Calculated Mineral Composition	per cent.
SiO_2	73.90	Quartz	47.00
Al_2O_3	12.00	Albite	20.67
Fe_2O_3	1.58	Anorthite	8.41
FeO	4.39	Orthoclase	3.66
MgO	1.25	Biotite	8.45
CaO	1.69	Magnetite	1.67
Na_2O	2.44	Ilmenite	1.60
K_2O	1.33	Chlorite	4.03
TiO_2	.84	Pyrite	.15
H_2O	.65	Kaolin (?)	5.29
CO_2	trace		
Total	100.22	Total	100.93

Analysis by W. K. McNeill.

This porphyry has been found intrusive into Keewatin greenstones and rhyolites only. Its freshness and composition relate it in age to the other quartz porphyries of the area.

GRANITE PORPHYRY (HEYSON TOWNSHIP)

A rather striking rock with abundant medium-sized phenocrysts of red feldspar and bluish quartz set in a hard, grey, and very fine grained groundmass occurs in several places to the south of Red lake from Faulkenham lake to Keg lake. This granite porphyry lies adjacent to and along the strike of the granite salient occupying Faulkenham lake. To the east it occurs as small masses, lenticular in shape and elongated with the regional strike.

The rock varies slightly in composition from place to place. A specimen from the Victoria Syndicate claims contains many phenocrysts of quartz and plagioclase feldspar (albite to oligoclase). Orthoclase and microcline are also present. Quartz phenocrysts showing resorption are fractured in some cases, and in the fissures fine mosaic quartz has been developed. The groundmass contains chiefly quartz in fine grains and small plagioclase laths with minor amounts of biotite. Its texture is almost that of a rhyolite. At the east end of Faulkenham lake, the porphyry has essentially the same composition, except for the presence of iron oxides, pyrite, more biotite, and some epidote. The quartz in some specimens is highly stained with iron oxide, probably an alteration product from the sulphide.

The intrusive nature of these granite porphyries is shown by the following. On the Victoria Syndicate claims, rounded fragments of Keewatin green schist, as large as one foot in diameter, are present, lying well within it. The contact with adjacent rhyolites, while not sharp, may be traced across their strike. Some narrow lenses of green schist may also be found in the porphyry and have been interpreted as inclusions. Farther west, a short distance east of Faulkenham lake, sedimentary rocks related to the Timiskaming are interrupted along their strike by lenticular masses of the same porphyry. On the small point northwest of the outlet of Faulkenham lake, a contact of granite and porphyry may be distinguished with difficulty. The rocks there are somewhat iron stained, and their age relation cannot be determined, as no offshoots of one were found penetrating the other.

In a few places the granite porphyry is cut by narrow stringers and dikelets of a fairly fresh diorite. The diorite has been correlated with quartz diabase and a few other occurrences of fresh diorite which will be described below.

In view of the occurrence of granitic porphyritic rocks to the north of Red lake and of somewhat similar rocks to the south of Faulkenham lake, into which red granite has been intruded, the age of this granite porphyry is placed as pre-granite, rather than contemporaneous with the large granitic masses. It is clear that the intrusions occurred after the older rocks had been folded to very nearly their present attitude. Later movements are also indicated, following their intrusion, by the fractured character of the phenocrysts.

PORPHYRITIC GRANITE, HYBRID GRANITE, AMPHIBOLITE, AND GNEISS

Heterogeneous rocks form a large area northwest of Slate bay, lying between the syncline of sediments that crosses the south end of the bay and the granite to the north.

Somewhat similar rocks consisting in part of porphyritic granite, but more generally of hornblendic granites and gneisses, occur to the south of Red lake and immediately north of Medicine-stone lake, where they grade northward into highly altered hornblende and biotite schists and gneisses. These rocks are apparently similar to the porphyritic granite of the north shore of Red lake and are also cut by later red granite. The heterogeneous character of both groups, and particularly their gneissic portions, suggest a hybrid origin.

North Shore of Red Lake

General Character.—The porphyritic granite outcropping along the northwest shore of Slate bay and extending northwestward is extremely heterogeneous in character. In some places it is quite light in colour and granitic in appearance, in others it is a dark-grey, fine-grained rock recognizable only by the glistening cleavage faces of a few small feldspar crystals. Much of it is massive; in places a gneissoid structure is observable, especially in occurrences near the granite. The rock varies from granite to diorite in composition, and no single specimen can be taken as the type. The following description of some of the sections examined microscopically will serve to illustrate only some of the varieties found.

A thin section from a specimen from the northwest shore of Slate bay on claim K.R.L. 2,091 is a porphyry with large crystals of orthoclase, somewhat muddy by alteration to kaolin and sericite, some quartz lying between the feldspars as a mosaic of small grains, and a little green hornblende. This type, however, is not the common one in this locality, and the following specimens taken near the base line and in the northern part of the township of Fairlie just west of Slate bay are more representative of the formation as a whole. A specimen from an exposure along the base line, 40 chains west of Slate bay, is a granular, dark-grey, glistening rock, which in thin section appears porphyritic with phenocrysts of a plagioclase that is near andesine in composition. Many of the crystals show zonal growth, but since crystallization they have suffered some crushing and considerable alteration. Crystals of biotite are common and seem to replace some of the feldspars. The groundmass is fine grained but completely crystalline with quartz and feldspar as the most abundant constituents. Small grains of epidote are fairly common. Fifty chains almost directly south of the place where this specimen was obtained, a rock of somewhat similar appearance was found to have both orthoclase and plagioclase as phenocrysts but in other respects was quite similar to the one just described. Directly eastward, at a point sixteen chains west of Slate bay, the rock also contains both orthoclase and plagioclase as phenocrysts, but a little magnetite and chlorite are present, and pressure has resulted in a faintly gneissic arrangement of the biotite, the

foils of which curve around some of the phenocrysts. Two specimens from a traverse west from the west boundary of the township of McDonough, at 39 chains north of the one-mile post, show the variation that occurs in short distances in this rock. The first sample, taken 12 chains west of the boundary, is a light-grey rock that breaks with lustrous faces. It is a mosaic of quartz and plagioclase with a little orthoclase. There are a few areas with indistinct outlines that may be phenocrysts. Biotite is sparingly present. Five chains farther west, the rock is dark grey, finely crystalline, but with phenocrysts visible in the hand specimen. Under the microscope, it appears porphyritic with fresh-looking, but broken phenocrysts of andesine in a groundmass of quartz, feldspar, dark-brown biotite, and some granular epidote. Pyrite is sparsely disseminated, and some chlorite has been formed from the ferromagnesian minerals. The rock of the outcrop, four chains east of the No. 4 post of K.R.L. 2,300, is porphyritic but contains no great quantity of phenocrysts. Well-formed, blocky crystals of orthoclase and a fairly acidic plagioclase are set in a fine-grained crystalline groundmass. Some muscovite is present as an early crystallization product in the porphyry. There has been considerable alteration, and biotite foils are abundant even in the feldspar phenocrysts. Two specimens, one 13 chains, the other 16 chains south of No. 1 post of K.R.L. 2,304, are porphyritic with phenocrysts of quartz, orthoclase, and plagioclase. In the one from the more southerly outcrop, biotite is abundant. It is considerably less so in that from the northern outcrop. In both specimens the groundmass is fragmental-looking; and were it not for the phenocrysts, the rock might easily be thought to be a sediment. Biotite is commonly present in all of these rocks, but whether as a primary or, in part at least, a secondary mineral is not certain.

Rocks believed to belong to this group outcrop along the boundary line between the townships of McDonough and Bateman and were collected, during traverses made in 1923, in the northwest part of what is now the township of Bateman. The first outcrop along the boundary north of Red lake is at four miles, 60 chains. It is a white-weathering, granular rock, grey on fresh fractures, with bluish quartz and some feldspar recognizable in the hand specimen. In the thin section it appears equigranular and completely crystalline, with quartz and orthoclase as the chief constituents. There is some plagioclase. Muscovite is present and appears to be original. Biotite is abundant; epidote less so. This may be a non-porphyritic facies, perhaps a later dike or marginal part of the porphyry mass. Ten chains north of this exposure, the rock looks like a sediment and has a distinctly stratiform appearance. The thin section shows a gneissic structure with a mosaic of quartz and feldspar surrounded by biotite. The very distinct stratification may be the result of the inclusion of a block of sedimentary material which has been partially replaced by igneous matter. Seven chains farther north, the rock is porphyritic with small phenocrysts of orthoclase and plagioclase in a crystalline groundmass. Biotite is abundant and probably secondary.

A large exposure of a dark-grey, medium-grained igneous rock occurs on the south boundary of Balmer between 25 chains and 42 chains from the southeast corner of the township. This rock was classed in the field with that northwest of Slate bay. Microscopic examination shows the rock to be porphyritic with phenocrysts of plagioclase only. The groundmass contains abundant hornblende, pleochroic from green to yellow-green. The mineralogy of the rock is thus somewhat different from the typical porphyritic granite described previously, but it is thought not sufficiently so to make it impossible that both may belong to the same group. It resembles the rocks south of the lake.

Relations.—Porphyritic granite intrudes the sediments and greenstones in the vicinity of Slate bay. Certain definite dikes have been found in the sediments; and on K.R.L. 2,086 near No. 4 post, inclusions of greenstone were observed in the porphyry. Upon these few occurrences the relationship of the whole area depends, and even with these definite relations it is perhaps uncertain that all of the rocks included under this class are of the same age. The rock of the dikes is not exactly like that of the main mass, as the description, given later in discussing the relation to the quartz porphyry, will show.

The massive pink granite, to be described later, is clearly intrusive into the porphyritic granite and associated gneisses. The contact is not a gradational one, but sharp tongues of granite cut into the porphyry, which is commonly somewhat gneissic near the contact. That, however, is the only evidence of contact effects produced by the granite. It is possible that intense metamorphism took place at an early stage in the granite invasion and that much of the contact zone was later engulfed and removed by the intrusive.

The relationship between the porphyritic granite and the quartz porphyry has not been definitely determined. The two rocks are decidedly unlike in their typical development, but there are some dikes of such a constitution that it is impossible confidently to assign them to one or the other of the two rock types. For example, a dike intruding slate on the north shore of the channel between Mackenzie island and the northern mainland is a porphyry in which the phenocrysts are both quartz and feldspar. The feldspar has undergone considerable sericitization, but the twinning *lamellae* are still recognizable in some of the crystals, and from these the variety was determined as oligoclase-andesine. In other crystals no twinning can be recognized, possibly because of intense alteration, but probably because some were orthoclase. Most of the feldspars are blocky; a few are lath-shaped. The quartz phenocrysts are rounded and many of them are fractured, but the fragments are not scattered as is the case in many of the quartz porphyries. Dark-brown biotite occurs in aggregates and is probably secondary. A little original muscovite is present. The groundmass is fine grained but completely crystalline and consists apparently of quartz and feldspar. The chief secondary product is sericite, which occurs throughout both matrix and feldspar phenocrysts. This rock resembles the porphyritic granite in the presence of large numbers of plagioclase phenocrysts, but the quartz porphyry exhibits the same characteristic in many of its dikes. The presence of biotite is a second point of similarity, but it is much less common than in the typical porphyritic granite. Biotite occurs as well in typical quartz porphyry, especially at the west end of the lake, but the individuals are smaller and it is lighter coloured than the biotite in this dike and in the porphyritic granite. No epidote was observed in the dike. Mineralogically then, this particular rock seems to lie between typical quartz porphyry and typical porphyritic granite.

Origin.—Since this formation lies between the sediments of the Slate bay syncline and the great mass of granite to the northwest and resembles some of the highly crystalline varieties of greywacké in the sedimentary series, there seemed a possibility that it represents the highly altered margin of the sediments. Certain parts of it, in which the rock is a fine-grained mosaic of quartz and feldspar with no phenocrysts, may be absorbed portions of included sediments; but on the whole, it seems clear that there is a great mass of igneous rock of porphyritic habit, with feldspar as the phenocrystic mineral; biotite, perhaps in part, if not altogether secondary, and some epidote are the chief other constituents. This formation has undergone extremely severe alteration, which is expressed by the fracturing of the phenocrysts and by the rough to fairly perfect parallelism of the

biotite. In places it is shown by the thorough recrystallization of the groundmass into a mosaic of quartz and feldspar; some of the large clear crystals of feldspar may also be secondary. However, those showing zonal growth are evidently of the first period of crystallization and formed directly from a magma, the composition of which was changing rapidly. The presence of epidote in many specimens suggests the possibility of contact metamorphism, but that this has not been an important factor in the alteration of the rock is shown by the fact that, aside from a more marked gneissic structure, there is no great increase in the degree of metamorphism as the granite margin is approached. On the whole, then, the evidence shows that this formation is largely an intrusive mass which, under the close folding that has taken place in the area, has been altered into a quartz-feldspar-biotite gneiss. The heterogeneity of the formation is due to the digestion of intruded rocks without thorough mixing of the hybrid magma; the stratiform character of some outcrops may in part be due to inclusion and quiet but only partial assimilation of masses of sediments.

South of Red Lake

Within the long tongue of highly altered Keewatin shown on the map-sheet to the north of Medicine-stone lake, and adjoining this band on the south, are dikes and larger intrusions of a dark reddish-grey, fine-grained rock which varies greatly from place to place, but on the whole has a granitic and, in many places, porphyritic character.

Detailed description of these rocks would be essentially a repetition of that given for the north shore group. The same mineral constituents are present, as are similar variations in composition. The rocks are, if anything, more granitic in character. The outstanding difference is the greater abundance of hornblende and hornblende granite gneiss. Porphyritic phases, while present, are less prominent.

The gneissic types apparently grade into dark hornblende and biotite schists and gneisses, which have been described above as probably a part of the Keewatin. No sharp boundary can be drawn between these two groups. Where dominantly composed of basic minerals, they are classed as Keewatin, and where granitic as a part of the granite gneisses.

Where the rocks are less gneissic and more equigranular, they look much like impure quartzite. Thin sections of these show original orthoclase, microcline and acid plagioclase, quartz and hornblende or biotite, the hornblende being much more abundant than in the later granites. Fine, fresh, and apparently secondary albite may be present with recrystallized mosaic quartz.

On the north shore of Faulkenham lake, red granite has intruded Timiskaming sediments and removed a large portion of them, according to all structural indications. Towards the west end of this lake, dark granitic rocks, similar to the group under discussion, lie between the sediments and the granite. These are characterized by an abundance of green biotite, which in places makes up nearly 20 per cent. of the rock, reflecting perhaps the nature of the intruded sediments.

Many dark granitic porphyries, with a superabundance of hornblende or biotite or both, occur as dikes in the Keewatin or as small masses with the gneisses. On the divide between Medicine-stone and Lee lakes, one of these is essentially a quartz porphyry with a fine, greenish groundmass. Its relation to the adjoining granitic rocks was not determinable.

Intrusive Relations.—These granitoid rocks, like those of the north shore of Red lake, are all cut by pure red granite. In the vicinity of intrusions of the granite, narrow stringers of red granite and pegmatite cut across them. To the south of Flat lake, a contact between red granite and an impure granitic rock is exposed on the shore of a small lake. Here one rock is closely welded to the other; and were it not for a few stringers of red granite in the darker rock, it would be impossible to say which was the younger.

The relation of this group to the Keewatin is clearly shown by their occurrence as dikes in the highly altered green schists south of Flat lake. The occurrence of much hornblende gneiss in these rocks, particularly where they lie between highly altered Keewatin rocks and granite, suggests that they are simply a hybrid type developed during the granitic intrusive period by the partial assimilation of Keewatin schists engulfed by a granitic magma. These rocks, then, can be regarded as an early representative of the granitic intrusives. Later, pure red granite masses and dikes were intruded into them, in part replacing them. The welded character of the contacts suggests that the two were not greatly separated in time. They seem always to occur together.

Amphibolites or Hornblendites.—The fine-grained granitic gneisses are widespread in the vicinity of granite intrusions, but rocks of still another type occur, particularly in the southwestern portion of the map-sheet. These consist essentially of hornblende and very minute amounts of plagioclase-feldspar and quartz. The hornblende crystals attain diameters of as much as half an inch. The texture of the rocks is more igneous than schistose or gneissic, and they might for this reason be regarded as hornblendite differentiates from the granites. Against this, however, is the fact that they lie along the strike of Keewatin schists, with which they seem continuous. On Lee lake they are developed on the islands and near the north shore. A short distance to the north, they pass into chloritic and hornblendic schists, which are in places foliated and on the north of which lies the large granite batholith. Southward they pass into more granitic rocks with about 50 per cent. hornblende; the hornblende decreases farther south. All of these are cut in places by small granitic stringers, and it seems clear that they belong with the other granitic gneisses and impure porphyries described above. From their field relations, they are regarded as highly recrystallized basic rocks (Keewatin) resulting from the contact action of and partial digestion by the granitic intrusives.

Origin.—In summary, hybrid granitic rocks, in places characteristically porphyritic, seem to have been developed by the injection of granitic magma into older rocks and by the partial assimilation of these. Where the intruded rocks are sediments, greywackés, quartzites, and slates, the common basic mineral is biotite. Where the intruded rocks are Keewatin basic volcanics, hornblende is developed both in the intruded and intruding rock. No attempt has been made to prove conclusively this origin for the heterogeneous group of rocks herein described, since the time devoted in the field to this problem was not great and a more detailed study was not justified.

BASIC INTRUSIVES

Lamprophyre Dikes

Narrow, dark-coloured dikes occur in places. The greatest width of any of these is only a few feet, and they are, therefore, not large enough to appear on the map. An east-west dike of this character, a foot in width, cuts through the

quartz porphyry at the east end of island No. 52. Under the microscope the rock appears equigranular. Plagioclase and biotite are the chief constituents with pyroxene as a subordinate primary mineral. There are areas of calcite, and sericite foils are scattered through the section. This rock may be classed as a kersantite. A similar dike of about the same width cuts at a small angle across a quartz porphyry dike on claim K.R.L. 300. No thin section of this rock was examined.

These dikes for the most part cut quartz porphyry. They occur also in the greenstone areas, but the similarity in colouring of the two rocks makes them inconspicuous. A few have been found cutting rhyolites. In quartz porphyry and diorite, some of them have been faulted.

Quartz Diabase and Diorite

On the small point projecting westward in the lake immediately northeast of Faulkenham lake, narrow dikes and stringers of a dark-green, medium-grained diabase intrude banded Timiskaming sediments, chiefly quartzites. Along the margins of the diabase, contact breccias have been developed, fragments of quartzite lying in a dioritic matrix. Similar diabase occurs on the west shore of the same lake. The shape of the intrusives is lenticular, more or less paralleling the strike of the sediments, but in places cutting them.

Under the microscope the rock is found to consist largely of common hornblende in medium-sized crystals. Many of these show deformation by curving and broken cleavages. Portions of the hornblende are completely altered to chlorite, but for the most part the rock as a whole has undergone little alteration of this type. Brown biotite in small flakes and associated with a small quantity of magnetite or ilmenite make up the other basic constituents. Enclosed or partly enclosed by the larger hornblende crystals are smaller laths of plagioclase, probably andesine. Interstitial quartz and a small quantity of fine mosaic quartz, possible secondary, are also present. The rock may be called a quartz-hornblende diabase.

The age of the diabase can be placed only as post-Timiskaming. It seems probable that it is a basic differentiate of the nearby granites.

A very fresh diorite, which may be closely related to this diabase, occurs along the north side of island No. 120 in Red lake. It is a dark grey rock, which under the microscope is made up of plagioclase (andesine), green hornblende, a little biotite, and some magnetite.

GRANITE

Distribution

The volcanic and sedimentary rocks in the Red Lake area are completely surrounded by massive granite. In addition, two bosses of granite occur within the area of these rocks.

The largest mass of granite in the immediate vicinity of the lake extends from the south shore between Middle and West narrows southward to a long tongue of basic schists and gneisses near Medicine-stone lake and joins the main granite mass to the southwest. What appears to be a sharp salient of granite projects eastwards from the main mass from Flat to Faulkenham lakes. Outcrops could not be traced completely across the area between the two lakes, and the granite at Faulkenham lake may be still another small boss. The larger of the bosses mentioned above occupies the southern part of Mackenzie island and extends south to the north shore of Snib lake. In ground plan it is roughly

oval with the longer axis nearly east and west. The smaller occupies the curved point extending into East bay from the east shore almost opposite the narrow entrance to the bay. This boss may be actually continuous with the main granite mass to the east, but the scattered exposures that appear through the heavy drift cover are here interpreted to mean that it is a separate mass.

Lithological Character of Typical Granite

The rocks both from the great area of granites surrounding the older rocks and from the smaller granite masses within the area of older formations vary only within such limits as are to be expected in a great intrusive mass. The character of the granite exposed to the south of Red lake in an immense east-west belt across the middle of Pakwash lake and extending as bands across the English river, may be taken as typical of that southern area where granite is interbanded with the remnants of synclines of sedimentary gneisses. The granites are described as follows:—

> The granite of the upper parts of the batholith is strikingly porphyritic, with orthoclase phenocrysts a half inch or more in length. . . . A specimen of porphyritic granite from Oak lake consists of microcline, orthoclase, and biotite, all of which are but slightly altered. . . . In many of the smaller intrusive bodies, the granite is hybrid in character, with a mineral composition somewhat different from normal granite and commonly with a gneissoid structure inherited from the foliated rocks, which it has intruded. . . . A specimen from an exposure north of post 24 [Pakwash lake] shows under the microscope a granitic texture with orthoclase, plagioclase, quartz, and hornblende. At post 23, the specimen is gneissoid, and the minerals are orthoclase, acidic plagioclase, quartz, and biotite.[1]

Granite from the west boundary of the township of Bateman at 25 chains north of the 4-mile post is a fresh, bright, pink rock, which the microscope shows to be a holocrystalline granite containing microcline, quartz, orthoclase, and biotite as the chief mineral constituents. A peculiarity of this variety is the presence of some augite in well-formed crystals, which were the first to form as the rock consolidated. Biotite crystallized next. The secondary products, calcite and sericite, are not abundant.

Granite from the area northwest of Red lake is essentially similar to that south of the lake. In places, as along the portage northwest from Pipestone bay, a certain degree of foliation appears in some of the outcrops, but this seems to be local and perhaps is due to digested inclusions. Ordinarily the granite is massive. A microscopic examination of a specimen from the area northeast of Pipestone bay shows a typical hypidiomorphic texture, with orthoclase, quartz, microcline, biotite, and muscovite as the primary minerals. The quartz grains show strain shadows. The orthoclase is muddy and has developed some sericite. Chlorite has formed from some of the biotite.

Granite from the north shore of Tack (Contact) lake, the first north of the outlet of Medicine-stone lake, is medium grained and quite fresh. The mineral constituents are quartz, orthoclase, microcline, oligoclase-albite, biotite, and minor quantities of hornblende altering to chlorite and epidote. Apatite and magnetite are accessory minerals. Small amounts of vermiform intergrowths of quartz and orthoclase occur around the plagioclase feldspars.

A specimen from the same mass of granite, south of West narrows of Red lake, contains all of the above constituents save hornblende. Microcline is a more prominent feldspar here.

If differentiation has affected the granite, the small boss at East bay should show marked effects, since it is smaller than the Mackenzie island mass.

[1] E. L. Bruce, Geology of the Upper Part of the English River Valley, Ont. Dept. Mines, Vol. XXXIII, pt. 4, p. 8.

It is light-grey, with biotite as a visible dark constituent. Under the microscope it appears holocrystalline, with quartz containing tiny apatite crystals, orthoclase, microcline, plagioclase, and dark-brown biotite. The only evidence of differentiation is a marked zoning of the feldspars indicating a rapid change in composition of the magma during crystallization. The secondary products are the usual ones, kaolin and sericite. A chemical analysis of this rock gave the following result:—

Analysis		Calculation	
	per cent.		per cent.
SiO_2	68.47	Quartz	27.18
Al_2O_3	16.24	Orthoclase	4.90
Fe_2O_3	.28	Albite	39.98
FeO	2.49	Anorthite	8.34
MgO	.61	Biotite	11.63
CaO	2.48	Sericite	3.27
Na_2O	4.73	Calcite	1.43
K_2O	2.39	Kaolin	2.34
H_2O	.71	Chlorite	trace
CO_2	.63		
Total	99.03	Total	99.07

Analysis and calculation by G. G. Suffel.

From this the variety of the plagioclase is seen to be oligoclase. The replacement of some of the plagioclase by calcite is quite noticeable in the thin section, and some of the feldspar is turbid on account of the development of sericite and kaolin. The biotite is quite fresh. The low percentage of orthoclase places this rock in the class of granodiorites or quartz diorites, but the small amount of dark-coloured constituents is peculiar for a rock of that class. This is probably a further evidence of differentiation, the feldspars being chiefly soda lime varieties and the iron-magnesia minerals lacking. This rock is rather similar in composition to the quartz diorite that is described later.

The granite boss or cupola of Mackenzie island and the south shore of Red lake varies in colour from light-grey at the margins to red in the central parts, where it is essentially the same as the other granite masses. Near the south contact many lenses of altered greenstone have apparently been caught up in the intrusive and partly digested. The granite here is partly schisted. The change in colour towards the margin is probably related to these basic inclusions, though normal differentiation is not excluded. The feldspars of the marginal phase are more of the soda lime than of the alkaline type; but as sufficient specimens have not been obtained, a more complete study is impossible.

Quartz Diorite

On claim K. 1,379 of the McIntyre group, a short distance from the south contact of the Mackenzie island granite, there is a small lenticular mass of grey granitic rock intruding Keewatin greenstones and tuffs. This has undergone considerable shearing, but differs little from the neighbouring granite in this respect or in general colour and appearance. The rock is medium grained and slightly porphyritic, the phenocrysts of quartz and feldspar being the more prominent on account of shearing and recrystallization of some of the quartz and the presence of fine sericite. The feldspars consist chiefly of finely twinned andesine and minor quantities of microcline. Ferromagnesian minerals are not abundant and are now represented only by chlorite. Finely disseminated cubes

of pyrite and some magnetite are scattered throughout, and secondary calcite and other carbonates are present. The high plagioclase and low potash-feldspar content identify this rock as a quartz diorite.

At the eastern extremity of the quartz diorite appear two small lenses of grey sericite schist, which lens out upward as if intrusive. Their downward extent could not be determined. It was suggested in the field that these schistose lenses might be equivalent in age to the Howey quartz porphyry; if so their relations to the diorite would throw some light on their age.

Careful examination of these schistose lenses has failed to reveal any definite evidence for their origin. They may be simply highly altered tongues of the quartz diorite porphyry or inclusions of an acid igneous rock. The contact is serrated, minute tongues of schist extending upward an eighth to a half an inch into the diorite, a condition which may obtain whether the schist is intrusive or an inclusion. No chilled margin could be found, but this might not be expected as the schist lenses are very narrow. The schist itself is waxy and grey in colour and contains small, white, angular to lenticular particles about the size of a pea. It is much altered and rusty in places. Under the microscope it is composed essentially of fine sericite and quartz and has a pronounced augen structure, the eyes consisting of quartz and rusty carbonates. Magnetite and pyrite are finely disseminated throughout. Feldspars are few and can be barely recognized. They are chiefly plagioclase. Chlorite is also present in small quantities. The pea-sized particles, in thin section, stand out as rounded rusty aggregates of ferruginous carbonates, very fine quartz, a few feldspars, and abundant magnetite with minor quantities of chlorite. These appear to be inclusions in the schist, as fine tongues of sericite schist and pyrite penetrate the aggregates as if filling fractures. Their origin is not clear, as all the minerals are secondary. The high content of fine magnetite and carbonate suggests their derivation from carbonated greenstones. The schist as a whole may only be related to an acid igneous rock. Its degree of alteration is more severe than that of the quartz diorite or the Howey quartz porphyry. Arguments for placing its age before or after the quartz diorite are about balanced, since some intrusives are more highly altered and schistose than the intruded rocks. Further data on this perhaps critical occurrence will probably be obtained in the diamond-drilling of the McIntyre claims.

Granite Dikes

Narrow dikes of medium-grained granite, usually grey in colour, intrude Keewatin schists in the vicinity of the batholith lying south of Red lake. Many of these appear on the north shore near Wolf narrows. Several of fine grain intrude the highly altered schists and gneisses to the south of Shoal lake. On a small lake, 50 chains southeast of the east end of Douglas lake, a narrow granite dike intrudes greenstones and contains very abundant angular inclusions.

The point at the east end of Snib lake is held up by a grey granite dike of medium grain. This is probably closely connected with the granite boss near by.

At the southeast corner of claim K. 1,424 of the Red Lake Prospectors Syndicate, narrow dikes of grey granitic rocks cut Keewatin schists parallel to their strike. Some of these are of medium grain and contain phenocrysts of quartz and feldspar in a slightly finer groundmass. They differ in general appearance from the quartz porphyries and are probably more closely related to the granites. A specimen from one of these dikes is dark-grey on fresh fracture and contains abundant phenocrysts of both quartz and feldspar in a very fine groundmass. The rock has undergone considerable shearing, and under the

microscope the fractured phenocrysts lie in a fairly schistose, micaceous matrix of sericite, brown biotite, quartz, and some epidote. The feldspars have undergone little alteration. They consist chiefly of orthoclase and albite. Judging from the mineral composition, this rock may be related to quartz porphyry.

To the south of the same trench on claim K. 1,425, narrow, pink felsitic stringers with rather abundant pyrite penetrate green schists in a most intricate manner. Thin sections of these show them to be slightly porphyritic and of granitic composition, though quartz is not prominent. The feldspars are chiefly orthoclase and albite. Sericite, calcite, and chlorite are secondary minerals, the carbonates being most prominent. Their exact relation to the granite is not known.

An outcrop on claim K.R.L. 1962, northwest of Slate bay, consists of rock in which quartz is abundantly present. Under the microscope the quartz is seen to occur not as phenocrysts but with the irregular interstitial arrangement in which quartz is found in granites. In this rock, however, none of the other constituents of a granite occur. Sericite is the only other mineral present. This rock is interpreted as a binary granite in which the feldspar has been changed entirely into sericite. On K.R.L. 1,710, south of Pipestone bay, a similar dike occurs. The mineralogy is almost exactly similar, except that some chlorite is present. In both these dikes later fracturing has permitted the introduction of some pyrite, and in the latter the dike rock is penetrated by narrow quartz veins.

Micropegmatite

On the north boundary of claim K. 1,430 of the Red Lake Prospectors Syndicate, a small elongated body of medium-grained, greyish micropegmatite intrudes green Keewatin schists on the north and grey rhyolite and rhyolite porphyry on the south.

In thin section this rock consists almost entirely of micrographic intergrowths of quartz and orthoclase and smaller quantities of quartz intergrown with albite. Minor constituents are brown biotite, granular magnetite, and clusters of partly altered titanite, with which are associated many small grains of ilmenite. Secondary minerals consist of sericite and calcite, alteration products in part from feldspars. The intergrowths of quartz and feldspar commonly have a beautiful centric structure.

The relative freshness of this rock and its intrusive relations to the Keewatin volcanics associate it in age with the granitic intrusions of post-Timiskaming time. Reference to texts on igneous rocks brings out the fact that many of the described micropegmatites are related to the differentiation of basic intrusives, e.g., the Sudbury norite. In this case no large basic intrusives of this general age have yet been exposed, though some hornblendic diabase has been found. Another possibility is that the micropegmatite represents a further differentiation from the granitic magma, caused by the making over of basic inclusions, according to Bowen's reaction series.[1] Emmons[2] cites examples of basic inclusions causing the further differentiation of granite to pegmatite, but no definite evidence of such being the case here was found.

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[1]N. L. Bowen, Behaviour of Inclusions in Igneous Magmas, Jour. Geol., Vol. XXX, 1922, p. 513.

[2]R. C. Emmons, Concerning Inclusions in Igneous Magmas, Jour. Geol., Vol. XXXIV, p. 422-28.

Intrusive Relations of Granite

The manner in which the granitic magmas invaded the area of Keewatin rocks in the Red lake basin is well illustrated in parts of the area. In the section on granitic gneisses and porphyries, it has been shown that an early granitic magma invaded the basic volcanics and the later sediments, engulfing portions of them and being modified considerably in composition and texture. That the rise of this magma was essentially by stoping action is suggested by the occurrence within these granitic rocks of elongated bands of highly altered Keewatin rocks, many miles in length, which retain the regional strike and probably are virtually in place. One of these bands, which parallels Hatchet lake (south of Douglas lake), disappears westward into the hybrid granites and gneisses, its influence being marked by a gradual decrease of hornblende and hornblende gneiss to the west. This early magma, then, may be regarded as the "work" magma, in so far as it provided room for the later red granite.

Later, but probably soon afterwards, the purer granitic magma invaded the areas of previous granitic intrusion, displacing or removing in some way the earlier rocks. The time interval between the two may have been very short. These red granites in general have sharp contacts with the Keewatin and with the remnants of the hybrid granitic group. Where the red granite occurs in smaller masses, some stoping action is suggested by inclusions of Keewatin schists and the lowering of the acidity of the border phases of the intrusive. In such areas, the older hybrid types do not appear, and this may account for the necessity of fresh stoping action by the later granite.

Some discussion has arisen as to the nature of the Mackenzie island granite boss in view of its proximity to the Howey ore body. The dip of the contacts between granite and greenstone appears at the surface to be vertical, a fact which led Wright[1] to suggest that this granite was not a portion of a batholith but a small cupola or conduit for a laccolith above, which has long since been removed by erosion. There can be little doubt that this granite is connected with the larger batholiths of granite in the area. In this regard we may note what Daly[2] says:—

> Batholithic roofs often deviate systematically from the pure domical shape because of the presence of re-entrants composed of batholithic material. These projections of the igneous mass have been called "cupolas," from the analogous relation of an artificial cupola to the building of which it is a part. Many stocks are cupolas on batholiths.

From sections in the same text illustrating cupolas, it is clear that the term "cupola" may be applied here, but this does not imply that the contacts of the cupola, to the depth of the main batholith, will be much steeper than the average dip of batholithic walls. Daly[3] estimates the average angle of dip of the batholiths (below the edge of the roof) at well over 60 degrees. Using the lowest average, 60 degrees, the possible intersection of the granite cupola and quartz porphyry on the Howey-McIntyre claims would be at a depth of 4,000 feet; for a dip of 70 degrees for the granite, the intersection would be at 7,400 feet; and for a dip of 75 degrees, 13,200 feet. From the vertical dip of the granite at the surface, the steep dip of the adjoining rocks, and the dip of the porphyry (82° S.), it is quite evident that any intersection of granite and porphyry will be far below mining depths.

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[1] D. G. H. Wright, Eng. Min. Jour., July, 1926.

[2] R. A. Daly, Igneous Rocks and Their Origin, McGraw-Hill Co., 1914, pp. 101-2.

[3] Ibid, p. 103 *et seq.*

Pleistocene

Glacial Deposits

Deposits of purely glacial origin partially cover the surface in the western part of the map-sheet. Small ridges of till and sand are found quite commonly, especially on the southwest side of rock ridges. The glacial striae show a movement of the ice averaging about S. 30° W to S. 40° W., and the rock-protected accumulations of till tail out from the ridges in that direction. Irregular ridges and hills of sand with many boulders occur north of the long arm that connects with the main lake just west of Wolf narrows. These ridges are surrounded by sand plains, possibly formed by the outwash from the morainal material of the hills.

Glacial Lake Deposits

The most interesting and important of the unconsolidated deposits are stratified clays and sands that mantle the other deposits almost completely in the area east of Red lake. Similar deposits extend southward and have been described in a previous report.[1] They consist of regularly stratified clay, sandy clay, or sand. For the first three miles along the trail from Red lake to Trout lake, knolls of glacial material project here and there above flat, clay-covered country. Beyond that, spruce swamp extends for a mile and no doubt conceals clay land. From the east edge of the swamp, the country is open and the soil sandy. The surface is a plane sloping slightly upward to the east and terminated by a ridge of bouldery material that rises sharply to an elevation ten feet above the sandy slope. From the top of this ridge, a second tilted plane of sandy country extends for a quarter of a mile with a gentle rise to the east, and this in turn terminates at the foot of a second steep, 10-foot slope of boulders and sand. This forms the crest of the ridge that divides Trout lake and Red lake basins. The top is level for ten chains. The eastern slope drops sharply to swampy country, in which there is a small muskeg lake. Dowling gives the following description of these deposits:—

> The till is found rather sparingly spread over nearly the whole area, immediately on the surface of the harder rocks, and has been in turn covered, in some localities, by stratified sands and silts. A high ridge of sand, boulders, and well-rounded gravel is approximately the northern and eastern boundary of these silts. . . .
>
> The top of the ridge, south of Trout lake, is a series of closely placed narrow hills or parallel ridges, steep on the northern face and more gradually sloping to the south, averaging about 270 feet above Trout lake, or 1,575 feet above the sea. The material on the northern slope is sand and gravel with rounded boulders. Several steps or terraces are also noted, but they continue but short distances, and from the lake no such continuous line can be traced. On the surface of the ridge, large boulders are found, the crest being well covered with them, but they occupy a narrow belt only, as the slope to the south, though less abrupt than to the north, commences immediately. The general appearance of the ridge is not that of an ordinary land moraine, but suggests a moraine or accumulation along the front of an ice-sheet terminating in water of considerable depth, in which the debris has been somewhat evenly distributed.[2]

The features observed in the traverse eastward from Red lake to the crest of the ridge agree with the hypothesis, outlined above, of a lake, the northeast

[1]Geology of the Upper Part of the English River Valley, Ont. Dept. Mines, Vol. XXXIII, pt. 4, p. 9.

[2]D. B. Dowling, Geol. Surv. Can., Vol. VII, pt. F., pp. 51-52.

shore of which was formed by an ice-sheet from which morainal material was carried out and laid down as stratified sand near shore and stratified clay farther out. The ice front finally retreated, leaving the beach material standing as a ridge sloping steeply northward or northeastward where the ice had been and gently southwestward down the slightly inclined lake deposits lying in front of the old shore.

Relations

The relations between glacial deposits and glacial lake deposits are clearly shown in some of the trenching done on mining claims during 1926. On the Dunlop Red lake Syndicate claims, just north of Chukuni river, typical unsorted boulder clay covers the smoothed and striated rock surface to the depth of about two feet. Above the boulder clay are varying thicknesses of evenly banded clays, no doubt deposited as seasonal layers in the lake lying along the front of the stagnant ice mass. Similar occurrences are found in trenches of the Howey and McIntyre claims, where clays and sands lie above the till.

GEOLOGICAL HISTORY

The geological record of the Red Lake area begins with a period of great volcanic activity during which large quantities of basic lavas were poured out over a surface, no remnant of which has been recognized. It may be that the basal beds upon which these extrusions rest are sedimentary gneisses similar to those which occur along the English river, but there is no definite evidence as to the age of those gneisses, nor of their relation to the volcanic rocks. Hence it is impossible to form any conclusions as to the character of the old surface over which the lava floods advanced. Where the rocks now show ellipsoidal structures, it may be that the effusions were beneath water.

The rocks of this early period were not exclusively igneous. Here and there conditions were such that sedimentary beds consisting of thin *laminae* of fine-grained silica or jasper and magnetite were deposited. Volcanic ash and the fragmental material produced from the lavas by local erosion were laid down as clayey beds that now form thin layers of black slate in the old complex.

The next event in the geological succession in this area cannot be determined with absolute assurance. South of the lake the altered dioritic rocks, described on page 18, seem to have been intruded into the Keewatin rocks after the latter had undergone at least some deformation. The difficulty in fixing the age of this intrusion, however, makes it impossible to state with certainty that the intrusion of diorite preceded the deposition of the Timiskaming sediments. If degree of metamorphism may be taken as a criterion, the diorite is pre-Algoman in age. For the present it will be assumed that the diorite is older than the Timiskaming sediments, but it must be clearly understood that the evidence is not conclusive. Following a period of folding of the Keewatin lavas and associated sediments (iron formation chiefly), there was a deep-seated intrusion of diorite. There is absolutely no evidence as to whether any period of erosion separated the deposition and folding of the Keewatin and the intrusion of the diorite. It was, however, followed by erosion, chiefly by mechanical processes; that is, the rocks were broken up without very much chemical alteration of their mineral constituents, and the disintegrated material was removed from

neighbouring areas apparently by rather rapid streams and deposited in the Red Lake area as the great series of conglomerate, slate, and greywacké beds of the Timiskaming period.

After the induration of the sediments there were crustal disturbances and the intrusion of several simple or one or more complex igneous masses. The first of these were the quartz porphyry and other intrusives of the same period. The quartz porphyry entered as sills between the beds of the sediments and as cross-cutting masses. It perhaps engulfed some of the earlier rocks; in some cases, at least, the beds were already tilted and foliated previous to the porphyry invasions. Intrusions of massive granite followed or may have in part accompanied the folding of the sediments, and the granite engulfed some portions, at least, of all the previous rocks.

The massive granite is the latest pre-Cambrian rock, with the possible exception of the small lamprophyric dikes. Following its intrusion, the sculpturing of the elevated and closely folded rock areas began. Valleys cut by the streams that flowed down its flanks became deeper and wider until the igneous cores of these old mountains were exposed beneath the sediments. Given sufficient time the final product of such a process is a land surface with gentle slopes which bevel both hard and soft layers of rock. This is the character of the consolidated rock surface of this area, and to produce it must have required an immensely long period of time. Furthermore, it is believed that this surface was in practically its present condition before the beginning of the Paleozoic, as in many other areas where Paleozoic rocks rest upon a similar old complex, the surface which was buried beneath the Paleozoic rocks is similar to the surface where no Paleozoic has been found.

There is no definite evidence that other sediments were laid down over this bevelled surface, but it seems likely that the limestones of the James Bay region, those south of Lake Superior, and those west of Lake Winnipeg were once continuous across the pre-Cambrian shield. Any such rocks that may have been deposited have been completely removed by subsequent erosion, so that no consolidated rocks later than the pre-Cambrian granite have been found in this area. It is probable, even, that erosion not only removed the Paleozoic rocks but also attacked the pre-Cambrian basement to some extent.

The next great event that left a definite imprint of its influence on the geological record was the advance of the continental glacier. No great eroding effect can be attributed to the moving ice, but it did remove the decomposed material and polished the solid rock over which it passed. The net result was the transfer of a great deal of weathered and some ground-up rock and the accentuation of the relief by the scouring out of hollows where weathering had affected the rock deeply. When the ice retreated, there was left behind it great masses of unsorted morainal material heaped up as irregular hills and ridges.

During the slow retreat and occasional stagnation of the ice front, the large volume of water from the melting ice formed a lake or lakes ponded against the ice as a north and east boundary. In this lake were deposited stratified sand near the shores and stratified clays farther from the ice margin. These lake deposits in places completely cover the unstratified till of the glacial period. The clays show in their regular bedding the seasonal variation in flow of water from the melting ice, and from these *laminae* it is evident that the glacial lakes persisted for some time.

The final retreat of the ice-sheet left the beach deposits of the glacial lakes as ridges of gravel and boulders. Since that time, some rearrangement of the

glacial sands, clays, and gravels has been accomplished by modern lakes and streams, but on the whole these modifications have been slight.

ECONOMIC GEOLOGY

Search for minerals of economic importance in the Red lake basin goes back to the staking of claims, along the high ridge west of Slate bay, by an English syndicate in September, 1897. At that time the station of Dinorwic on the Canadian Pacific railway was the starting point from which this area was reached.[1]

In spite of the long distance from the railway, comfortable camps were established, the claims were surveyed, and a shaft was sunk on the property. The vein is rather irregular at the shaft, and apparently those in charge became discouraged and work was discontinued.

In the summer of 1922, a prospecting party from Manitoba located claims on the west short of East bay and did a little work on a galena-bearing quartz vein outcropping at the shore. Reports of this find and of the silver values contained in some of the samples led to further prospecting and the staking of the McManus claims near the outlet of Red lake. Gold was found in narrow veins on these properties in 1922 and 1923, but no vein of sufficient size to justify much expenditure in an area so far from transportation. Subsequent to the publication of the report of the Ontario Department of Mines for 1923, interest was revived and prospecting in the area south of the lake revealed the gold-bearing veins, reports of which led to a rush of prospectors to the lake in the winter of 1925-26 and to the staking of most of the surrounding country.

Gold Deposits

Gold has been found in some of the veins of the Red Lake area in sufficient concentration to warrant extensive development work, and the outlook for some properties developing into mines is very promising. Thorough prospecting has been done on comparatively few of the claims staked. If those properties that are being actively worked should develop into paying mines, there is no doubt that many other claims will be intensively examined with good chances for the discovery of other deposits, similar to those now known.

Gold has been found under somewhat varying conditions, although all types of deposits probably belong to the one period of mineralization. For purposes of description, these may be classed as follows:—

1. Quartz veins occurring in greenstone.
2. Carbonate zones.
3. Fractured zones containing quartz veins in quartz porphyry dikes.

Veins in Greenstone

Quartz veins are fairly common in the greenstone, but not all of these carry gold and many have only a small quantity. Some well-defined veins of fair widths have been opened up, but the large definite veins so far tested have been found to be nearly barren. Those in which gold has been found in quantity are narrow and usually taper out in comparatively short distances. Such veins commonly form a network in a fractured zone in the greenstone.

[1]The authors are indebted to J. W. Tyrrell for information concerning this early period of activity.

As yet, no locality has been found where the spacing of the veins is close enough to form ore, the large amount of barren rock so diluting the high gold values of the quartz that the average value of a width that could be mined would be below ore grade.

Veins of this structural type occur plentifully in all the greenstone areas of the map-sheet, but most of these containing more than traces of gold are in the neighbourhood of the quartz porphyry masses surrounding the granite boss of the central part of the lake. The actual outcropping of the granite is, of course, not necessarily important; for, if there be a genetic relationship between the granite and the gold occurrences, the quartz veins lying above as yet unexposed granite bosses would be quite as likely to carry gold as those at the same distance from the granite laterally. In fact they might be of better grade. Hence no quartz vein in the greenstone can be eliminated from consideration, although naturally those whose proximity to granite bosses is evident will be those to receive first consideration.

Although the auriferous veins in greenstone are commonly near intrusions of quartz porphyry, this association alone does not provide conditions for gold occurrences. Many veins in greenstone near porphyry carry only traces of gold, and from this fact it seems clear that the granite is a necessary factor for the deposition of the metal. It is probable that the porphyry merely prepared suitable fracture zones for the penetration of the gold-bearing solution at a later period. Although probably related genetically to the granite, there is no likelihood that these veins will be found to be cut off by the granite within any workable depth below the present surface. Gold deposition in the veins could not take place in the zone immediately surrounding the granite stock. In that region the temperatures at the time of intrusion must have been far above those at which gold could be deposited. Hence, those parts of the veins which are now exposed and which carry gold must be at some distance from the igneous mass from which the metal came. Decrease in values will not occur suddenly as the intrusive is approached; and any change in tenor of the vein will be so gradual that it may with certainty be stated that, if the surface values are sufficiently high to be mined with profit, values approximately the same will be found at any depths to which mining operations can be carried. This statement assumes the same conditions as to wall rock; for, should the fracture zone pass from greenstone to porphyry, the character of the fractures and of the mineralization in the two rocks might and probably would be different.

Carbonate Zones

Gold has been found in certain carbonate zones. These are similar in composition to those described in the section on General Geology. They consist of iron, magnesium, and calcium carbonate, which make up varying proportions of the whole rock. The rest is chiefly silica and various minor constituents. A partial analysis of a specimen from such a zone is as follows:—

	Per cent.
Insoluble (chiefly silica)	56.58
Iron carbonate	9.41
Calcium carbonate	16.90
Magnesium carbonate (by difference)	17.11
Total	100.00

The sample analysed appeared to be homogeneous. In practically all occurrences of carbonate rocks there is a considerable volume of the mass occupied

by quartz veins which cut through the carbonate. These vary in size from mere stringers to veins with widths of three to four inches. In the central part of a zone, with greenstone on both sides, the quartz veins have a reticulated arrangement. On the margins most of them are transverse to the walls. Gold occurs chiefly in the quartz veins, but specimens have been observed in which gold particles lie in apparently solid and homogeneous carbonate. Probably it entered from a quartz veinlet along some tiny crack in the carbonate. As is usually the case, the rough cellular surface, consisting chiefly of quartz and limonite, pans gold freely wherever the underlying rock is at all auriferous. The immense amount of concentration effected during this weathering is shown by the following assays from a typical weathered surface and from fairly fresh rock:—

Weathered	4.55 ounces of gold per ton
Fresh	0.1 " " "

The carbonate zones are believed to be metamorphic aureoles around quartz porphyry intrusions. Carbonate is found as an intermediate rock between quartz porphyry and greenstone. Carbonate which occurs in greenstone where no porphyry outcrops, is interpreted as the alteration product of the greenstone lying above as yet unexposed masses of quartz porphyry (see page 14).

As shown previously, the alteration from greenstone to carbonate probably takes place with some decrease in volume, and the shrinkage of this border zone produces fractures and so opens spaces for the introduction of the quartz veins. There may be some mechanical deformation as well, tending to the production of fractures; but carbonate rocks do not easily retain openings, and it is likely that most of the veins are closely connected with the alteration. The quartz veins, even if not originally gold-bearing, would be much more brittle than the carbonate and so, under any subsequent deformation, would be the part of the zone that would fracture and the part in which ore solutions would find space to deposit their burden. This sequence of events seems to be necessary for the production of any considerable gold content; for, as in the previous case, those zones which have been found to carry gold are in the area surrounding the granite bosses.

The underground extension of the carbonate bands is of prime importance, if any of them are to be considered as possible ore bodies. If those bands which occur between walls of greenstone are the alteration zones produced by the contact action of quartz porphyry on greenstone, the depth to the porphyry will not be great. A carbonate band will probably be found lying on each side of the porphyry which has produced the alteration. These bordering bands will, however, be each less than one-half the thickness of the carbonate zone above the porphyry, since the action of the igneous mass was less intense along its sides than at the top, owing to the concentration of vapours and gases in the upper part of the chamber. As the fracturing, however, is a function of the decrease in volume of the altered greenstone, it will persist to whatever depth the alteration may extend. Owing to the ascension of the contained gases of the porphyry towards its upper part, it is likely that the greater the depth the less intense will be the alteration; hence there will be some decrease in width of the zone downward. On the other hand, any fracturing that may be the result of deformation after the solidification of the quartz porphyry will be more marked in the porphyry than in the carbonate and hence more favourable

for deposition from any ore solutions that may come at any later time. In that case, the deposit would thus become one of the third type.

Fractured Zones in Quartz Porphyry

Up to the present this is the type of gold deposit of greatest promise in the Red Lake area. Certain porphyry dikes have undergone considerable fracturing. The fractures are irregular in disposition and may be at various angles to the walls of the dikes. They are filled with quartz in which are included gold, perhaps some gold tellurides, chalcopyrite, pyrite, galena, and sphalerite. The total amount of metallic minerals is never more than a very small proportion of the whole, and many quartz veins that have a high gold content contain no visible metallic constituents. In those dikes which are auriferous, the gold occurs almost exclusively in the quartz, the quartz porphyry itself being practically barren. It is evident that the fracturing was later than the consolidation of the porphyry, and the irregularity of distribution of the fractures is evidence that they were not produced by contraction of the dike as it cooled. The alternative, then, is to consider them as later effects due to outside disturbances and related, in most cases, to tensional forces produced by shearing. Since the unaltered porphyry is barren, the gold evidently also came from some outside source. The most competent factor to have produced both the fracturing and the mineralization is the granite, which is later in age than the porphyry, which is near the gold occurrences, and which, moreover, is the type of rock with which gold is commonly associated.

Fracture zones in the porphyry may not continue as fracture zones in the greenstone, since stresses that produce fracturing in the porphyry may develop a schistose structure in the greenstone. In some places the stresses were sufficiently intense to have produced from the porphyry a highly foliated sericite schist, and in such places the quartz veins are less abundant. The conditions that seem most likely to have obtained where there are gold-bearing zones are those of relatively gentle movements, perhaps produced by the doming of the older rocks by the upthrust of the granite bosses. This doming may be assumed to have caused a shearing movement, which in the brittle quartz porphyry dikes resulted in the formation of numerous fractures. In other localities, especially those near the main granite masses and probably also where the porphyry has been intensely altered hydrothermally, the lateral thrust of the intrusive granite has produced intense foliation in the dikes with less opportunity for the formation of fractures. If this hypothesis of gentle doming with resultant fracturing be correct, then it is likely that the main fracture zones may be confined to the brittle porphyry. Where the fracturing continues into the greenstone, the veins will be smaller; but there may be the compensating advantage of some deposition of gold in the wall rock. The possibility of the deposits being cut off in depth by the granite is one of the important points to be considered, and the inferences are practically the same as those drawn previously. No granite is known which is later than the ore deposits; and if the period of gold deposition was the closing period of the consolidation of the granite, then any part of a vein sufficiently far from the cooling granite to have high gold values deposited in it, will be sufficiently far that any possible depth of mining operations will not find appreciably lower values in the vein.

Silver-bearing Galena Veins

In a vein occurring on the west shore of East bay, north of the mouth of the bay, a quartz vein was discovered in 1922, carrying a considerable proportion of galena to quartz. The description in the first report on the Red Lake area was as follows:—

Silver-Lead Vein.—The vein containing silver-bearing galena discovered in July, 1922, is close to the western shore of East bay, half a mile north of the narrows. The vein is lenticular, strike N. 35° E. vertical. At the widest point seen it has a width of eighteen inches, from which maximum width it tapers to a stringer each way in a distance of fifteen to twenty feet. Somewhat north of the widest part, approximately one-half of the vein material is galena. The length of the part carrying this proportion is only a couple of feet and the width is one foot. Throughout most of the vein less than one-quarter of the total mineral content is galena. Samples were chipped across the vein at three places and assayed at the Provincial Assay Office with the following results:—

	Silver, oz. per ton	Lead, per cent.
1.	3.0	2.51
2.	14.1	8.75
3.	1.4	1.22

Assayer, W. K. McNeill.

Sample No. 1 was taken towards the north end of the lens, width sampled 1 foot.

Sample No. 2, 2 feet south of No. 1 at part of vein carrying greatest proportion of galena, width sampled 1 foot.

Sample No. 3 widest part of the vein exposed, width sampled 18 inches.

It is evident, from the assays, that the silver bears a fairly constant ratio to the percentage of lead present and hence is no doubt directly associated with the galena, and not in the form of native silver.

The vein occurs in greenstone and, aside from the larger proportion of galena that it carries, does not differ in character or association from the other quartz veins in the area.

It is probable that this occurrence belongs to the same period of mineralization as the gold-bearing quartz veins and that the granite boss immediately east of it may be the parent rock. The greater proportion of galena in the vein can be explained by the smaller size of the exposed granite mass; that is, the boss has been truncated nearer its apex, hence the galena-bearing vein probably is at a higher level and farther from the mineral-introducing granite than are those quartz veins of lower galena contact.

Talc

Talcose rocks occur fairly commonly, apparently as an advanced stage in the alteration of some of the highly magnesian greenstones. In most places the rocks are fine-grained aggregates of talc and other minerals, such as sericite, in varying proportions. These might be called soapstone. In a few localities veinlets of translucent green talc, as much as a quarter of an inch in thickness, were observed. These occur in carbonate rocks and possibly represent a still further alteration of the carbonates to talc. If so, there has been along certain fractures a silication of the carbonates; thus there must have been another stage of alteration begun, reversing the direction of the change to carbonate from serpentine, which was essentially a desilication. These reactions may be expressed by the following equation:—

$$3MgCO_3 + H_2O + 4SiO_2 = H_2O\ 3MgO\ 4SiO_2 + 3CO_2$$

The massive talcose rock probably formed as a direct secondary product from the basic Keewatin lavas. The reaction can be represented as follows:—

$$2(2H_2O\ 3MgO\ 2SiO_2) + 3CO_2 = H_2O\ 3MgO\ 4SiO_2 + 3MgCO_3 + 3H_2O$$

In this way talc would form at the same time as the carbonate rocks. The occurrences of the translucent veinlets of foliated talc are rare and perhaps indicate only a local excess of silica, which has reacted with the previously formed carbonate rocks. Wilson, in his report on the talc deposits of Canada,[1] mentions the occurrence of dolomite at Red lake. This might lead to the inference that foliated talc of high grade, such as that found in the sedimentary magnesian rocks of the Grenville area, could occur. As was shown in the report of 1924, the carbonate rocks are not sedimentary dolomites, but are themselves merely the product of the alteration of greenstone. The talc, therefore, will be chiefly of the massive soapstone type.

In places small masses of pyrite occur in the massive talc rock without any quartz veins, and in samples consisting partly of pyrite, partly of talc, gold assays $1.80 per ton. It is rather surprising to find such an occurrence in a rock so impervious and so difficult to fracture as this one is.

Asbestos

A few veinlets of asbestos of good quality have been found in the greenstone areas. Rarely these have a width of a quarter of an inch, with fine, silky, greenish fibres transverse to the walls. The occurrence is a natural one when basic rocks are altering to serpentine, but no concentration of these veinlets sufficient to give any promise of commercial possibilities has been found.

Howey Gold Mines and McIntyre-Porcupine Mines

Historical Summary

In the summer of 1925, the Howey brothers discovered what has since proved to be the most promising prospective mine or mines in the Red Lake area. The ore body is largely confined to a series of quartz porphyry intrusives, the known major portion of which lies on the claims of the Howey Gold Mines; the western part, of unknown length, is held by the McIntyre-Porcupine Mines, Limited. The original discovery lies along the south boundary of claims K. 1,365 and 1,373.

The Howey claims, nineteen in all, were optioned to the Dome Mines. An early account of this company's work on the property is contained in the statement of the general manager, H. P. De Pencier.[2]

> As a consideration for getting the option, the Dome paid $25,000, which money was spent on the property. . . . The work done consisted of some 28 trenches of various lengths from upwards of 200 feet down in length. . . . A large amount of sampling was done and the results show values in many places. The incomplete nature of trenching, though, does not permit of us joining up ore sections in various trenches and much more work will have to be done to prove up the deposit. The fact, however, that gold is found over a length on this property of at least 930 feet and at places 60 feet wide makes it necessary for us to further test the property.

It is also recorded that:—

> In addition to the $25,000 mentioned above, the Dome made a payment of $50,000, and was to pay $500,000, within two years for a 75 per cent. interest in a newly organized company called the Howey Gold Mines, Limited.

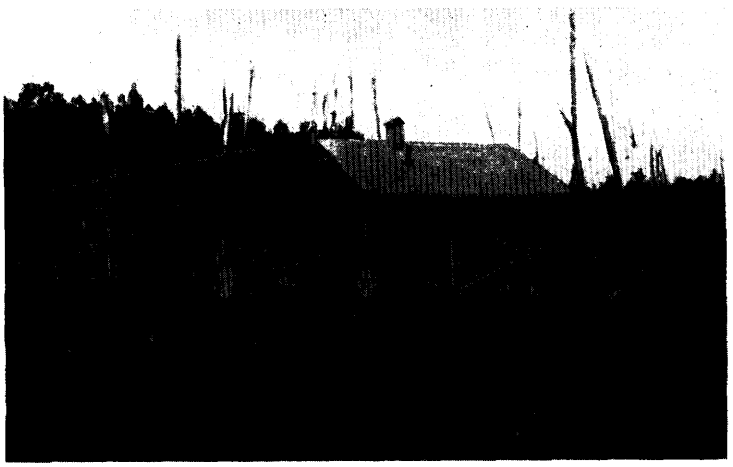
The Dome option, however, was eventually dropped after 18 holes had been drilled beneath the outcrop. Most of these holes penetrated to a depth of about 200 feet, a few reaching between 400 and 500 feet. In the reorganized company, Howey Gold Mines, Limited, J. E. Hammell is president; Horace G. Young, general manager; and R. T. Birks, secretary-treasurer.

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[1] M. E. Wilson, Talc Deposits of Canada, Geol. Surv. Can., Econ. Geology, Series No. 2.
[2] Ont. Dept. Mines, Bull. No. 56, pp. 5, 6.

The Howey Gold Mines, Limited, is capitalized at 5,000,000 shares (3,500,000 issued) with a par value of $1, the original Howey Red Lake Syndicate owning one-half. In the early part of 1927, arrangements were made to install a plant capable of mining to a depth of 1,000 feet, and plans at present are to sink a 3-compartment shaft to a depth of 500 feet and to open up extensive lateral works on four levels. A steam plant was installed in May, 1927.[1]

On the claims of the McIntyre-Porcupine Mines, much of the porphyry has been uncovered by trenching, though probably a larger part of it is deeply buried in low swampy ground. Diamond-drill holes have also



Assay plant erected by the Dome Mines on the Howey claims.

been bored beneath the porphyry along the strike of the surface exposures. The results of this drilling are not available at present.

Description of the Ore Body

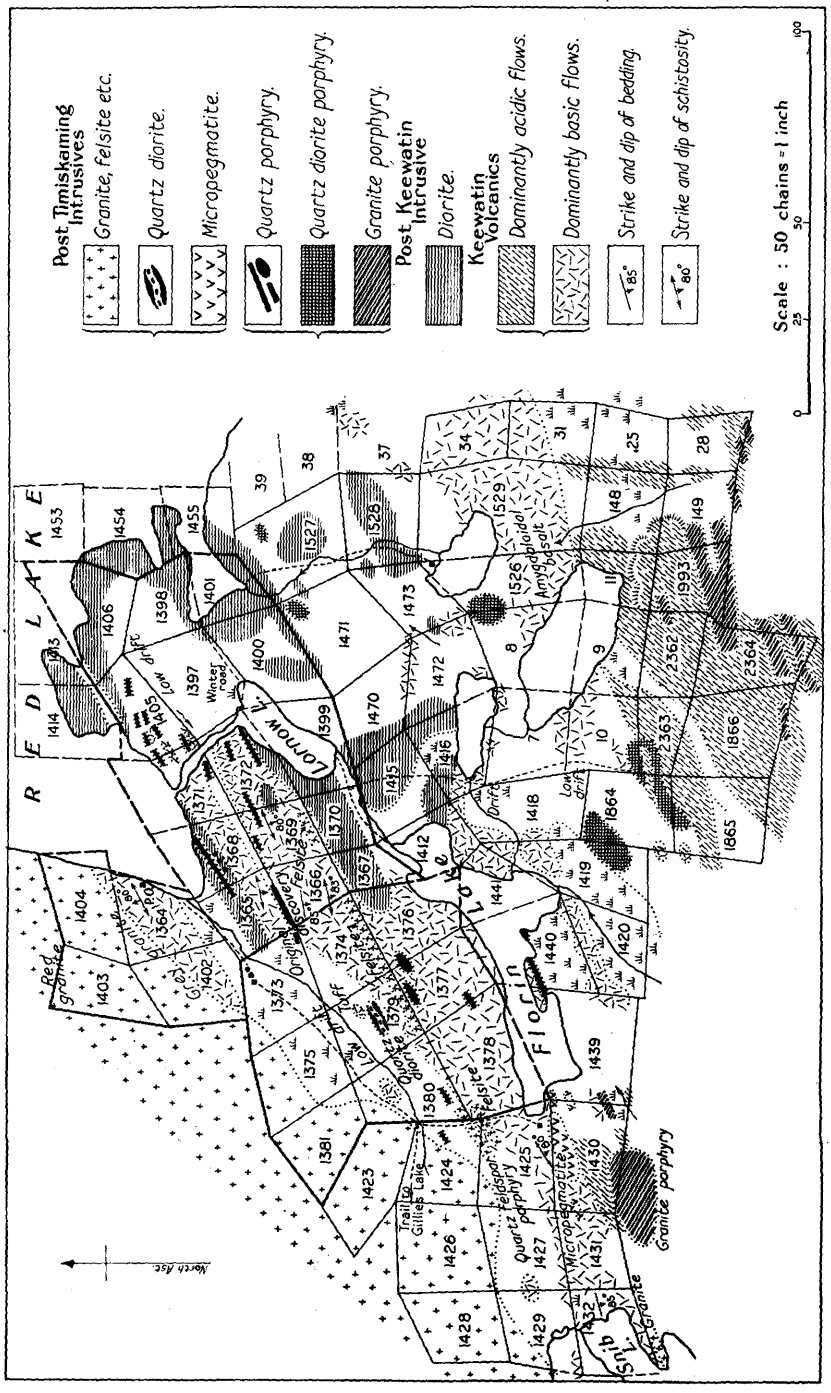
The ore body comprises portions of the quartz porphyry masses which intrude the Keewatin greenstones and old diorite of this area, *en échelon* fashion, since much of the porphyry is dissected in an intricate manner by abundant auriferous quartz veins, contains lenses of mineralized Keewatin schist, and where highly altered and mineralized, itself contains some gold. There are, however, portions of the porphyry which contain few veins and which cannot be classed as ore.

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[1]The following report of recent work has been supplied by the secretary of the company:—

The shaft in October, 1927, had reached its objective of 500 feet with a sump of 35 feet. Crosscutting from all four levels (125, 250, 375, and 500 feet) was in progress. The vein is about 25 feet north of the shaft at the surface, and it is expected that only about 40 feet of crosscutting will be required at the 500-foot level to reach this ore body. A 3-compartment shaft is in operation with regular hoisting equipment. It is the purpose to drift both ways along the vein on all four levels. During the season of 1927 considerable trenching has been done, extending the vein eastward another 800 feet and making a total length of 1,800 feet.

Surface samples in the mineralized zone are being taken across the vein every three feet. Some 5,000 samples have been taken for assay. Stripping, of course, has not been completed for the entire length of the vein, but sections at intervals have been uncovered where the overburden is not too heavy.



Geological sketch map of Howey, McIntyre, and adjoining claims. The Howey claims to the northeast and the McIntyre on the southwest are enclosed with heavy lines.

The porphyry masses have been described in the section on quartz porphyry. The plan of the main body (see insert facing page 58), is lenticular, with a width at the west end of approximately 100 feet, and at the east, of 30 feet. Vertical sections of the porphyry, compiled from drill-core data kindly supplied by the management of the Howey Gold Mines, Limited (see insert facing page 18), show

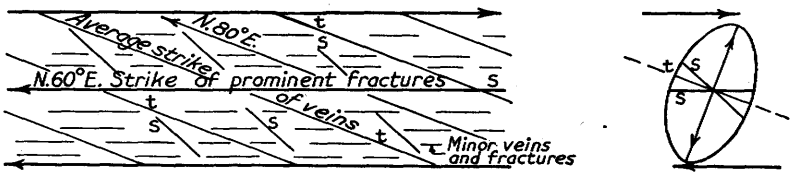


Fig. 11—Diagram showing relation of the veins and fracture systems of the Howey gold deposit to the strain ellipsoid. s = Planes of maximum shear. t = Tension fractures.

a widening at depth at the west end and a narrowing at depth to the east. They also show the intrusion of other quartz porphyry masses not exposed at the surface, some of which may yet be found to contain gold-bearing veins. The surface plan of the porphyry is somewhat similar in outline to a plan of the Homestake ore bodies, South Dakota, on the 300-foot level. These occur in schists with a lenticular and *en échelon* arrangement,[1] though the Homestake and the Howey bodies are comparable in this respect only.



Quartz vein on the Howey showing a "flat" and dragfolded character. The country rock is quartz porphyry.

The quartz veins, to which the gold is largely confined, seldom attain widths exceeding one foot. They vary greatly in length, lensing in and out, and in many places one vein is succeeded by another along the strike.

The vein systems appear at first sight to be decidedly complex, as are joint systems in any highly fractured rock. Careful study of their attitudes and their relation to unfilled fractures in the porphyry simplifies their apparent complexity and explains their origin. Details of the structure of the veins and fracture systems are shown on Fig. 11. The strike of most of the veins is at an

[1]W. H. Emmons, Principles of Economic Geology, 1918, p. 428.

angle of approximately 20°S. of that of the main porphyry mass, which trends at N. 63°E. Some veins strike with the porphyry, others lie at about N. 17°W., and minor ones have various other alignments. The most prominent fractures lie nearly parallel with the direction of the porphyry.

In general, the veins are lenticular sheets filling fractures, nearly vertical or dipping with the porphyry steeply south. Exceptions to this are found in "Z" trench, where a vein occupies a "flat" and is in part folded (see photograph on page 59). Veins with a ribbon structure are also present. These strike with the porphyry, have an approximate vertical dip, and are separated by fine ribbons of highly altered and schistose porphyry (see photograph above). An example of a vein with a dragfold shape is found in trench "I." This shows that the differential movement in the porphyry has caused the north side to move eastward, relative to the south side, regardless of whether the vein itself or a still unfilled fracture was folded.



Ribbon type of quartz veins on the Howey ore body.

With this clue as to the differential movement, the various sets of fractures and veins may be fitted to the strain ellipsoid,[1] as in Fig. 11. From the figure, it is clear that an east-west shearing movement would fracture the porphyry into the various sets recognized. It may be shown experimentally[2] that, in the shearing of a brittle mass, fractures related to tensional stresses and to shearing stresses develop rather systematically and that the time relations between either type may be reversed in different localities within a small radius. From Figs. 11 and 12, it may be seen that the dominant veins lie in fractures related to tensional stresses resulting from the movement. Minor veins occur along planes of maximum shearing, about parallel to the direction of differential movement and at slightly less than 90 degrees to this direction. The main fractures, unfilled with quartz and in many cases cutting both quartz and porphyry, are parallel to maximum shear planes, the set parallel to the direction of differential movement being best developed.

[1]C. K. Leith, Structural Geology, 1913.
[2]Op. cit.

The shearing, then, of the relatively brittle porphyry mass caused fractures of both tensional and shear origin. Into these, principally the former type, came quartz and various sulphides and, probably at the same time or preceding these, hot waters, which attacked the porphyry and altered it considerably. That the shearing movements were not short-lived, but rather long drawn out, is revealed by several facts.

Highly altered porphyry has been rendered schistose; and since hydrothermal alteration in many cases is related to the veins (see page 34), the hot waters accompanied or preceded the ore minerals into fractured porphyry and

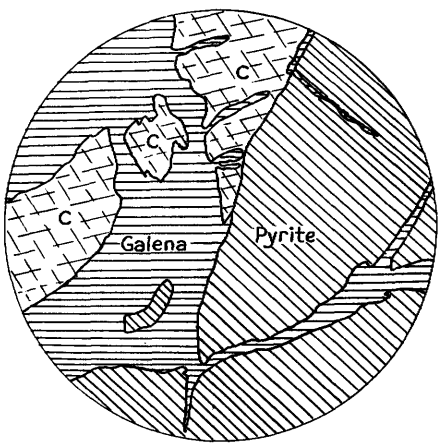


Fig. 12—Camera lucida drawing of Howey ore showing relation of galena to fractured pyrite and rusty-weathering carbonate (C), probably ankerite.

rendered it more susceptible to flowage under later shearing stresses. Many of the quartz veins have themselves been fractured and recrystallized. Some of them appear to have been drag-folded. Coarse pyrite in the quartz has been likewise greatly fractured and recemented by fine quartz and later sulphides and gold. The abundance of unfilled fractures in the porphyry, paralleling a plane of maximum shearing, also points to the continuation of shearing movements after the close of vein deposition.

Towards the west end of the porphyry mass, several quartz veins occur in narrow greenstone lenses, which are highly schistose and well mineralized. Some of these lenses may represent inclusions or unreplaced portions of the greenstone lying between smaller intrusive wedges of porphyry. The veins in these tend to follow the strike of the schists, which they in part replace. Where such veins cut both porphyry and green schist, gold is reported high in the schist, and galena and sphalerite are clearly more concentrated in the porphyry portions of the vein.

The vein minerals are dominantly quartz, with minor quantities of calcite, ankerite, scheelite, tourmaline, and feldspars, the last three being indicative of high temperatures and magmatic sources. The metallic minerals consist chiefly of pyrite and small amounts of galena, chalcopyrite, sphalerite, tetradymite (telluride of bismuth), and native gold. Gold and lead tellurides have

also been reported.[1] Wright has estimated that the mineralization in the quartz is about 2.5 per cent. In the adjoining porphyry, particularly where it is highly altered, pyrite occurs as finely disseminated cubes. The mineralization there may reach as high as one per cent.

Thin sections of the vein quartz show how most of it has been sheared and fractured. Between the larger wedges of quartz, fine mosaic quartz and, locally, sericite have developed. In several sections of such sheared quartz, fine gold occurs with the cementing minerals in the fractures (Fig. 14).

Pyrite in the veins occurs as fairly coarse grains and massive clusters. Almost always the coarser pyrite has been fractured. Deformed cubes of pyrite with slickensiding occur in schistose lenses of greenstone.

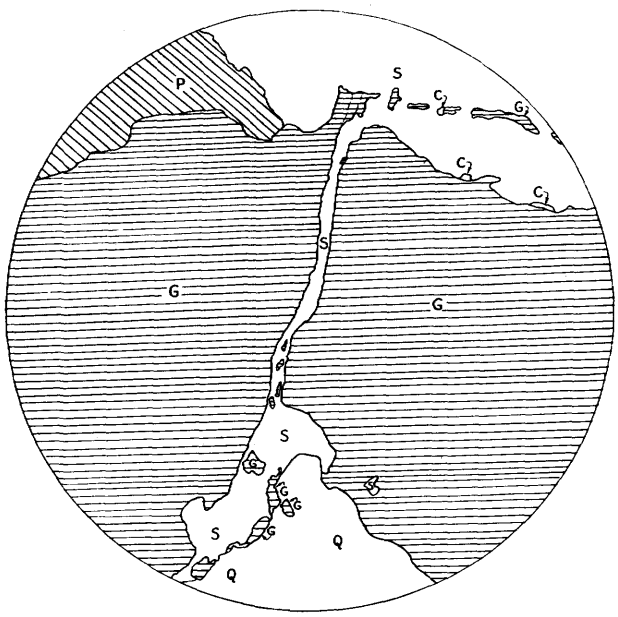


Fig. 13—Camera lucida drawing of Howey ore showing relation of sphalerite (S) and chalcopyrite (C) to galena (G) and pyrite (P). (× 30.)

Tourmaline occurs in quartz and in some schisted porphyry, where it is probably later than the porphyry. It is particularly well developed in highly fractured and recrystallized quartz and is closely associated with the pyrite. It may also be found following very definite fractures in the quartz and as a marginal replacement to the veins. Wright[1] has reported finding gold with the tourmaline.

Carbonates appear in small rhombs within the quartz and are associated with galena. Some pyrite occurs in the centre of calcite crystals, and gold has been found with these.

The galena is always in a very fine state of division. It occurs in quartz, in calcite, filling cleavage planes in the latter, and very definitely fills fractures in pyrite (Fig. 12). Associated with the galena are very fine particles of

[1]D. G. H. Wright, Eng. Min. Jour., July, 1926.

chalcopyrite. These are often related to the contacts of galena and sphalerite (Fig. 13). Chalcopyrite also occurs in fractures in quartz. Sphalerite of the resinous type is also found in fine crystals in the quartz veins and replaces

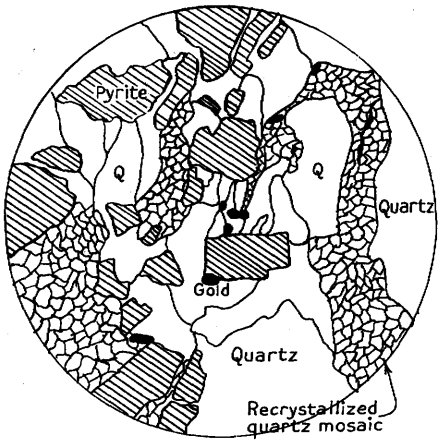


Fig. 14—Camera lucida drawing of Howey ore showing relation of gold (black) to pyrite and brecciated quartz.

sericitized porphyry along the fracture planes. It is closely associated with galena, and in most polished sections of ore is not distinguishable in age from this mineral. One section (Fig. 13) shows a stringer of sphalerite filling a fracture across galena. Associated with the sphalerite is some

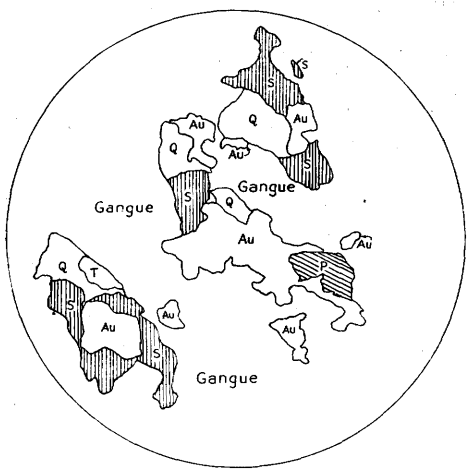


Fig. 15—Camera lucida drawing of Howey ore showing association of gold (Au) with sphalerite (S). (T) is a telluride, probably tetradymite. (× 30.)

pyrite in small cubes, possibly of a second generation, some chalcopyrite, and many fine specks of gold. A steel-grey mineral, corresponding closely with tetradymite in properties, is found in association with the sphalerite and quartz.

A telluride is also found in crushed quartz or in fractures in quartz. It is in very fine prisms, and native gold is generally associated with it.

Gold, as has been noted above, seems to be associated with almost all the other metallic and gangue minerals in the veins. It is never coarse. In polished surfaces of ore and thin sections, gold has been observed chiefly where the quartz is fractured and recrystallized (Fig. 14) and occasionally in unfractured quartz, which may be of a second generation. In some cases it occurs around fine cubes of pyrite, adjacent to it rather than in it (Fig. 14). It has been found with tellurides, of unknown composition, in fractures in quartz. A large quantity of gold is generally present with sphalerite and is in places related to the cleavage of this mineral (Fig. 15).

Paragenesis

The genesis of the gold ores of the Howey and McIntyre porphyries seems to have been as follows:—

Following the intrusions of quartz porphyry into Keewatin greenstones, extensive shearing stresses caused the development of fractures of both tensional and shearing type. The porphyry behaved as a brittle mass compared with the adjoining, already highly altered Keewatin rocks, which yielded by flowage. During this fracturing, solutions invaded the porphyry, altering it considerably and possibly mineralizing it to a great extent with fine sulphides. Closely related to these solutions in time came the vein-forming minerals, chiefly quartz and sulphides, which filled the open spaces and in part replaced highly altered porphyry. The shearing continued, and the quartz and pyrite were much fractured and recemented with fine quartz and later sulphides, galena, and then sphalerite. The gold in many cases seems to have been one of the last minerals deposited, though it is possible some gold was also brought in with the early sulphides. Wright has suggested that it may have been liberated from the sulphides on fracturing, but its close association with sphalerite does not favour this theory.

The fact that the porphyry behaved as a brittle mass, while the adjacent schists yielded by flowage, accounts for the relative scarcity of veins in the Keewatin wall rocks. Open spaces in the porphyry were apparently sufficient to take care of most of the vein material, and no large replacement bodies were formed at the level now exposed at the surface.

The presence of feldspars, tourmaline, and scheelite in the veins indicates the magmatic origin and high temperature formation of the original fracture filling. The localization of the veins in the porphyry might be explained by their derivation from the porphyry magma at depth, but this may be merely a coincidence, as their localization can be shown as directly related to the manner in which the porphyry yielded to stress. Looking for a source for the veins and ores, we find a probable later intrusion of granite near by. This granite has been considerably sheared and altered and contains in one place at least. near its southern margin, quartz stringers in which some gold has been found, This association, and the occurrence of other smaller gold deposits in the vicinity of the smaller granitic intrusions, suggests a genetic relation between the granite and the ores of the Howey-McIntyre deposit. The intrusions of these granites caused the only marked disturbances known to follow the intrusions of porphyry, so they may be considered not only as supplying the vein minerals, but also as preparing a place for their deposition.[1]

[1]During 1927 a gold-bearing vein was found in granite. This definitely disposes of the porphyry as the source of the gold unless two or more periods of gold deposition are assumed. *See also* page 66.

The relation of the ores to the granites rather than to the quartz porphyries is of great economic importance as it widens the possibilities of discovering other ore bodies and makes favourable the chances of following this particular deposit to good depths. The depth to which the fracturing in the porphyry may be expected to extend will depend partly on how competent it was at depth to withstand the shearing stresses, and partly on its degree of alteration there. Even should the fractures in which veins have been deposited give way at depth, it is most probable that their place would be taken by deposits of a replacement type of equal value.

Gold Values on the Deposit of Howey Gold Mines

Through the courtesy of the Howey Gold Mines, Limited, the results of the surface sampling compiled by A. G. Gillies, foreman in charge of preliminary operations for the Howey Red Lake Syndicate, and of the diamond-drilling compiled by the Dome Mines, Limited, have been available to the authors for study.

On the surface, excellent assays of gold are reported over widths ranging up to 66 feet and averaging nearly 20 feet for a length of 1,000 feet.[1]

Diamond-drilling has shown that the porphyry body at the west end widens slightly at depth and at the east narrows, as it does at the surface. Good assays have been obtained from the cores, particularly in the western half, indicating some continuity of gold at depth. These core assays, however, cannot be considered sufficiently representative to warrant any definite estimate of the total ore reserves being made at present. The irregular distribution of the auriferous quartz at the surface is probably duplicated at depth, and only mining operations will adequately test the property. Such work seems entirely justified from the data so far secured.

Other Working Properties

During the summer of 1926, some development work and intensive prospecting was done in the Red Lake area, but the discoveries reported from the Woman, Birch, and Narrow lakes areas, to some extent diverted the attention of prospectors from Red lake. There was a tendency on the part of many claimholders to wait for the results on the Howey and McIntyre properties before undertaking expenditures on their own claims. In many cases, too, individuals had staked claims in the hope of a quick sale and found themselves burdened with a large area, which they were quite unable to prospect properly. Some prospectors, and especially many of the mining and prospecting companies, had their claims surveyed in the latter part of the summer, satisfying in that way the requirements for the first year's assessment work. As a result, the amount of actual work put on the ground during the summer was not great. There have been few recent discoveries, but whether this was due to the lack of thorough work on many of the claims or to actual absence of promising veins, only future work will tell. The following is a brief review of some of the properties and a statement of the work done to the latter part of September, 1926. On those not mentioned and appearing on the map as surveyed claims, the assessment work may be assumed to have been fulfilled by survey.

Red Lake Prospectors Syndicate

The claims of this syndicate (K. 1,423-32 and 1,439-41) lie immediately to the south and west of the McIntyre and Howey claims. The northwestern

[1]See footnote on page 57.

half is occupied by the southern extension of the Mackenzie island granite boss, which cuts diagonally across the claims to the southwest.

Along the contact of the granite on claim K. 1,424, the rock is much schisted and altered. A few quartz stringers occur in the granite here and are reported to carry gold.

To the south of the granite is a deep, drift-filled depression and at the southeast corner of the same claim and a short distance to the south are several porphyritic dikes intruding green schists. The texture and granitic or dioritic composition of these relate them to the granite rather than to the earlier quartz porphyry. Some red felsitic stringers with porphyritic phases also penetrate dark Keewatin rocks. Several small quartz stringers have been found in the vicinity of these dikes, and in some of them native gold has been observed.

On claim K. 1,430 and on the southern part of K. 1,425, a lenticular intrusion of micropegmatite occurs. To the north of this is another depression, on the sides of which splashes of quartz may be found in green schists. This depression extends along Florin (Clara) lake and has been drilled by the Dome interests without yielding any satisfactory results. Several small porphyry dikes occur along the south shore of Florin lake, but no large quartz veins accompany them.

Considerable trenching and some drilling has been done on these claims, on which the Dome Mines held an option or working agreement.

Coniagas Mining Company

These claims (K. 1,526-29) lie a short distance south and east of the Howey claims. Considerable prospecting over them has revealed only small stringers of quartz, in which sulphides are sparsely disseminated. The northern part of the claims is occupied largely by much altered diorite, which intrudes Keewatin, and a few small intrusions of fresher quartz diorite. Barren quartz stringers are associated with these. A wide band of amygdaloidal lava extends across the central part, and to the south are rhyolitic flows.

Victoria Syndicate

The Victoria Syndicate holds a group of claims south of the Howey and one to the north on the lake shore. On none of these have any discoveries been made. A deep pit was sunk in a drift-filled depression, which occurs along the strike of a porphyry dike on the Howey claims, but apparently did not penetrate to the rock surface. On the southern claims are several small intrusions of quartz diorite porphyry, which has been correlated tentatively with the quartz porphyry. This porphyry has been somewhat sheared but not fractured, and no quartz veins are associated with it.

Lang

On claims K.R.L. 40-42, some trenching has shown a few glassy quartz veins in a highly altered diorite. This rock contains some quartz, but thin sections show that it is closely related in composition and degree of alteration to the older, pre-porphyry diorites of the region.

Noranda Mines, Limited

On the Noranda claims (K. 1,479 to 1,486) wide networks of trenches, 3,000 feet in all, have been cleared. These expose a few narrow quartz porphyry

dikes and a few narrow quartz stringers in basaltic flows of the Keewatin. There appears to be no mineralization with the quartz porphyry intrusions.

Huronian Belt

The Huronian Belt Company did exploration work on two groups of claims. One group lying north of Chukuni river in the township of Balmer is in a heavily drift covered area, and exposures are not abundant. Considerable trenching was done, and several porphyry dikes were uncovered, but no discovery of promising veins has been reported.

The other group comprises claims K. 1,408 to 1,411, to the south and west of Coin lake. Considerable trenching on these claims has uncovered a few small quartz veins with sparse sulphides. What appeared to be copper in very tiny foils was found in some of the surface quartz and was probably secondary. On claim K. 1,411, a narrow band of sericite schist occurs in greenstones and is highly impregnated with fine sulphides and magnetite. The rock is highly altered, consisting largely of sericite, some rusty carbonates, fine quartz, and a little chlorite and epidote. A few remnants of altered plagioclase may be recognized and identify the schist with an acid igneous rock, probably a porphyry.

The claims are almost entirely underlain by Keewatin basalts and intrusive altered diorites.

Chukuni Red Lake Syndicate

This syndicate holds a group of claims on the south bank of Chukuni river in the township of Balmer. The country is fairly high, but rock outcrops are not very numerous. Greenstone is intruded by granite porphyry dikes and masses. Some of these have been stripped for some distances, and in other places where no rock outcropped trenches have been dug down to solid rock. On claim K. 1,201, near the No. 4 post, a contact between the porphyry and the greenstone is exposed. Along the contact there is a lenticular vein ranging from six inches to a foot in width. It has been traced for a distance of 50 feet and strikes northwest. The gangue material is quartz, in which lie irregular lenses of calcite, the largest being a foot in length by eight inches in width. Similar lenses lie in the schistose greenstone near the vein. A little pyrite occurs in the quartz.

Dunlop Red Lake Syndicate

The claims (K.R.L. 118-47) belonging to this syndicate lie north of Chukuni river, west of Balmer creek. The claims are surveyed. Outcrops are not numerous, as will be seen from the map. Much deep trenching on the southern claims has exposed some large porphyry dikes. A fracture zone in greenstone shows a sparing mineralization, in which the chief metallic mineral is chalcopyrite.

Toronto Red Lake Syndicate

These claims (K.R.L. 109-117) lie immediately north of the Dunlop Red Lake Syndicate. On the hill west of Balmer creek at the outlet of Balmer lake, the rock is a dense grey felsite, which is probably a quartz porphyry. From the exposed knob at the top of the hill, trenches have been extended into the drift-covered area in all directions. One trench has been carried to the lake, a distance of about 300 feet.

Patricia Group

The Patricia claims (K.R.L. 100-108) lie west of Balmer lake. Across the northern claims there is a heavy band of iron formation, and much development work has been concentrated on some massive pyrrhotite which occurs in it. On K.R.L. 102, a band of iron formation has been exposed by trenches for six chains along its strike and for two chains in width. In some places, this is very dense and homogeneous; in others, it shows heavy banding with silica and some pyrite. The whole surface of the rock is heavily coated with iron oxides.

Beaumout

This group (K.R.L. 534-51) lies west of Balmer lake, between the Patricia and the Mesaba groups. A good deal of thorough prospecting has been done, and several promising-looking quartz porphyry dikes and quartz veins have been discovered. Unfortunately, so far, the gold assays have not been sufficiently high to claim any of these as ore bodies. Porphyry dikes have been stripped on the northeast corner of claim No. 550, and three prominent dikes averaging 25 feet in width and 40 to 50 feet apart, strike southeastward across No. 536 on to No. 547, where they disappear under the drift. Also on Nos. 540 and 545 other porphyry dikes have been opened up. Along the north side of the northern tier of claims is the continuation of the band of iron formation which occurs on K.R.L. 102.

K.R.L. 1,516 and 1,517

These claims lie between East bay and the main body of Red lake. In the northwest corner of No. 1,517 and the northeast corner of No. 1,516, a bluff of rock slopes down to swampy ground to the north and west and continues southward as a soil-covered ridge. The main ridge is in part massive greenstone, in part pillow lavas. The two types are interbedded and strike N. 70° E. At the foot of the bluff, a band of soft schistose talc rock has been exposed by trenching for a width of 10 feet. South of the talc rock, the greenstone shows some fracturing. Where an open cut has been made in the rock on claim No. 1,517, there are a great many tiny irregular cracks, which are filled with calcite; cutting across these are larger veins, some of which reach a width of half an inch. The latter consist of calcite along the edges and quartz in the centre. Pyrite occurs chiefly in the quartz vein filling or along the margins between the quartz and calcite. Sphalerite of a deep-purplish colour is found scattered through the fracture zone but is seldom in great amount, a lens two feet in length with a maximum width of two inches being the largest solid mass seen in place at the time the workings were visited. An interesting feature of the mineralization is the presence on some of the fracture planes of a thin coating of cobalt bloom, perhaps derived from a small quantity of cobalt in the pyrite.

In an open cut on No. 1,516, 200 feet west of the working on No. 1,517, the greenstone shows a series of roughly parallel larger fractures with tiny parallel transverse fractures connecting the large ones, so that the whole rock is a network of veinlets. The vein filling is calcite. A few quartz veins, with maximum widths of one inch, cut irregularly through the whole. Metallic minerals are very sparingly present in this part.

The fracture zone is roughly parallel to the banding of the rocks and occurs in a massive greyish-green rock, which is somewhat crystalline. It is probably of slightly different composition from the other bands of greenstone and perhaps somewhat more brittle, so that it has retained fractures.

The development work on these properties consists of a thorough stripping of part of the face of the hill and trenching southward in several places into the drift cover. Pits have been opened up in the most fractured part of the greenstone, just south of the band of talcose rock.

K.R.L. 1,022

This claim lies east of the channel between Mackenzie island and the mainland.

The rock is massive greenstone. Six chains south of the northern boundary of the claim, a band of carbonate rock, 45 feet in width, strikes northeast through a knoll of greenstone. The carbonate rock contains many small quartz stringers, in some of which tourmaline was observed. Gold can be found in the quartz and, in places, in what seems to be unfractured and fresh carbonate. Other metallic minerals are rare. The carbonate rock is sufficiently high in iron to produce a thick coating of rust over the surface of the dike, and naturally in this rusty material the native gold is most abundant. It is difficult, until pits have been sunk through the rusty rock surface, to estimate what the value of this deposit may be.

The work done on this claim and others adjoining it, belonging to the same owners, consists of extensive stripping of the outcrops and some shallow test pits. On claim K.R.L. 300, a large quartz porphyry dike has been uncovered. This is intruded by a narrow lamprophyre dike crossing it at a small angle. Neither dike has undergone much fracturing.

Dome Mines

In addition to work on the Howey claims during the period of the option, Dome Mines prospected other claims north of the Hudson's Bay store and also a group of claims staked for the Dome on the southwest side of the Mackenzie island boss of granite. On one of these latter claims, K.R.L. 1,540, gold was visible. On the right (east) bank of the creek flowing into the large bay crossed by the south boundary of Dome township, the rock rises in an almost continuous bluff across claim No. 1,540. An old burned area made prospecting somewhat difficult, but in spite of that all of the outcrops were carefully examined and the covered knolls were systematically trenched.

The rock is massive greenstone with only a few narrow porphyry dikes. The granite of the Mackenzie island boss lies approximately two miles to the northwest. Along the face of the bluff toward the creek valley, the greenstone has undergone some fracturing, and quartz veins three to four inches wide fill these fractures. The veins, however, are comparatively short, tapering out both ways, but other veins commence after an interval of some feet, usually with an offset between the ends. The whole is a sort of fracture zone, but it is very irregular, and the direction of its extension was doubtful at the time it was visited. In some of the quartz veins, gold occurs rather plentifully. It is practically the only mineral other than quartz in the veins.

As noted above, the only intrusive into the greenstone near the gold occurrence is a one-foot dike of quartz porphyry, which does not seem competent to have caused the fracturing, nor is the rock near it fractured to any greater extent than that farther away. It seems likely that, owing to some slight difference in various parts of the greenstone, one particular zone was more brittle than the others

and, during a slight doming action as the granite was intruded, spaces for the veins opened up and were filled by the gold-bearing solutions from the cooling magma.

Tyrrell Red Lake

Claims K.R.L. 2,081 to 2,098 are held by the Tyrrell Red Lake Syndicate, of which J. W. Tyrrell, D.L.S., of Hamilton, is president. These claims include the original staking mentioned on page 51. On these claims there are several isolated remnants of greenstone surrounded by porphyritic granite. In one of the greenstone masses, the old shaft was sunk. Stripping and trenching in the vicinity of the shaft shows the following conditions: Fifteen feet north of the shaft, the vein has a width of seven feet of sugary quartz in a coarse-grained chloritic rock. Pyrite occurs in the quartz and in the wall rock. The vein is nearly vertical and strikes S. 27° W. Thirty feet northward from the shaft, the width of quartz is fourteen feet. Ten feet north of the stripping, there is an old pit and two new pits, showing a width of only one and a half to two feet of quartz. At this point the vein swings slightly to the west of its average strike and is not traced farther; but 15 chains N. 10° W. from the shaft, other trenches show a quartz vein with widths of as much as 10 feet, striking S. 10° E. In this vein, also, there is some pyrite. The wall rock at this point is massive diorite or porphyritic granite. The vein, if it is a continuation of the one at the shaft, cuts across the porphyry greenstone contact. One hundred and twenty-five feet farther north, across a total width of 15 feet of country rock, four stringers of quartz have a total width of one foot. Other parallel stringers are more widely spaced, and one vein has a width of 14 inches of quartz.

One chain S. 10° E. from the shaft, a pit shows a two-foot vein of quartz, in which there is considerable pyrite. Farther south there are some lenses of quartz, but the vein is not continuously traceable on the surface in that direction.

In addition to the trenching and stripping that has been done on the vein at the old shaft, test pits have been sunk along the shore on a highly pyritized siliceous zone.

Martin

On claims west of the north end of Slate bay, deep trenches have been dug across a very acidic rock that outcrops to the east along the shore of Slate bay. The hand specimen contains considerable quartz that is visible to the naked eye. The microscope shows, however, that the rock is not a porphyry, but that the quartz is irregular in distribution having much the arrangement that the interstitial quartz in a granite has. In the rock, however, the feldspars, if they ever were present, have been so completely altered to sericite that no trace whatever of them remains, and the rock is entirely quartz and sericite. It is believed, however, that it was originally a binary granite. No other rock is in contact with the quartz-sericite rock, but it is probably a dike. Southward across the creek, greenstone outcrops. In the pits the rock shows some fracturing with the introduction of chalcopyrite. On the north side of the bay, an acidic igneous rock that has been stripped shows quartz veins that contain a little galena, pyrite, and chalcopyrite. The veins are irregular and have a maximum width of three inches.

Northern Mineral Areas

Most of the claims of Northern Mineral Areas on which work has been done are located on the south side of the long bay north of Wolf narrows. The rocks

of the central part of the divide between this bay and the main body of the lake consist of greenstone with some rather heavy bands of iron formation. Along the shore of the bay the rock is a coarse conglomerate formed chiefly of rounded or subangular fragments of iron formation. The matrix is composed of finer fragments, and the whole is heavily iron-stained. Much trenching has been done on the properties, chiefly on these iron-stained bands of fragmental rocks.

Foley Red Lake Syndicate

These claims lie west of the west end of Trout bay. Work has been done on a large quartz porphyry dike that extends northwestward from the end of Trout bay. This dike has been severely compressed and has developed an extremely evenly banded structure. In places the porphyry has altered to a highly foliated or crumpled sericite schist. In others, the schist is black, perhaps from the shearing of included basic rocks. Parallel to the banding, quartz lenses occur which have a width as great as a foot and a half and lengths of two to three feet. Smaller irregular quartz veins cut across the foliation. Pyrite occurs in both quartz and schist, but is not abundant.

Development work consists of extensive trenching across this dike with some shallow test pits. An attempt has been made to reach the south wall, but in that direction the clay overburden was found to be very deep.

Dupont

Along the west side of Pipestone bay, some sheared zones have been discovered in the great mass of quartz porphyry occurring there. In one of these zones a quartz vein, three inches wide at the water level, narrows to two inches a short distance from the lake and disappears beneath the soil in a hollow about 50 feet from the shore. Pyrite occurs in the quartz and as veinlets, both parallel to the quartz vein and cutting across it. In places these veinlets contain tiny vugs, which are filled with small pyritohedra of pyrite. Gold pans freely from the decomposed rock, but the unaltered material, both quartz porphyry and quartz, contains only small quantities of gold.

To the east of Pipestone bay, the original greenstone has been almost completely altered to secondary carbonates. Large masses of quartz porphyry occur to the east, and the porphyry on the west side of the bay may extend eastward a considerable distance beneath the lake. In this area of carbonate rock, there are many dikes of porphyry. Some of these have been stripped and opened up by test pits. The most promising one is three feet in width and cuts through a highly talcose carbonate rock. Along both walls of the dike are quartz veins which reach maximum widths of three inches. Both dike and walls are impregnated with pyrite.

Development work has also been done on the holdings of this group north of Pipestone bay near the main granite contact, but so far as known without any encouraging results.

Scott

On K.R.L. 1,719, south of Pipestone bay, a number of quartz veins have been exposed. At one place two quartz veins, each with a maximum width of 18 inches, strike north and south. They are separated by 15 feet of greenstone. At the south end both terminate abruptly as if faulted. Both quartz and greenstone wall rock carry pyrite abundantly. Fifty feet to the north, a northwesterly-striking series of veins have a total width of 15 feet. At the northeast side of the

zone, one vein of solid quartz has a width of three feet. Of the other 12 feet of the 15-foot zone, about one-half is quartz. The country rock is a coarse-grained, dioritic-looking type, possibly formed by the secondary development of crystals in the greenstone. Both quartz and wall rock are sparingly pyritized.

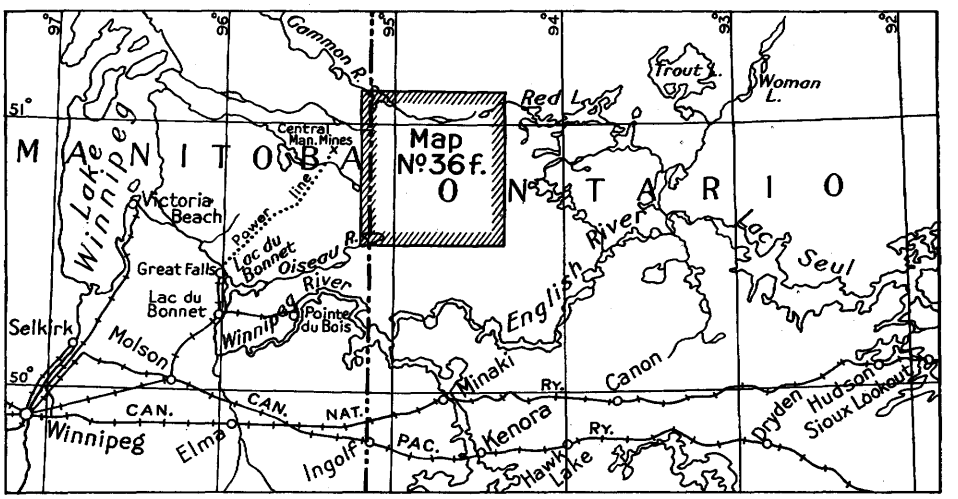
On K.R.L. 1,710, a large dike of acidic rock has been cross-trenched and stripped for some distance. It is similar in character to the dike west of the north end of Slate bay and consists of sericite, which is probably the result of the complete alteration of feldspar, and quartz, which still has the interstitial arrangement it had in the original granitic rock. In the dike are numerous veinlets of vitreous quartz with a maximum width of three inches. The veins contain little but quartz, but the rock of the dike is well sprinkled with pyrite, much of it in small, well-formed pyritohedra.

Gammon River Area and Rickaby Lake Schist Belt, District of Kenora (Patricia Portion)

By Geoffrey Gilbert

INTRODUCTION

The area dealt with in this report lies to the west and southwest of Red lake It is a roughly rectangular area extending from meridian 94° 20′ W. (the western edge of the Red Lake sheet) to the Manitoba border (95° 09′ 06″ W). The northern boundary is the Gammon river (known until recently as the south branch of the Bloodvein river), which heads almost due west of Red lake and flows westward. The southern boundary is a line joining Snowshoe lake, on the Manitoba border, with Sydney lake, at the head of the Sturgeon river.



Key map showing position of Gammon River area. Scale, 50 miles to the inch.

The field work on which the report is based was essentially a reconnaissance survey. A series of gold-bearing volcanic and sedimentary rocks, the Rice lake-Bulldog lake schist belt, covers a wide area just to the west of the Manitoba boundary and extends eastward into Ontario. The part immediately east of the border was mapped in 1912 by Moore[1] and in 1921 by Burwash.[2] In the spring of 1926 prospecting became active on the Ontario side, and a large number of claims were staked in the neighbourhood of Rickaby and Bee lakes. As the eastern end of the schist belt had not been defined, it seemed possible that it might extend for a considerable distance, and might even connect with the Red lake belt; or, at least, that an appreciable part of the intervening area might be underlain by schists. The writer was, therefore, instructed to make a reconnaissance of the region, giving special attention to the country around and east of Rickaby lake. This was done during the summer of 1926.

[1]E. S. Moore, Geol. Surv. Can., Sum. Rept., 1912, pp. 262-70.
[2]E. M. Burwash, Ont. Dept. Mines, Vol. XXXII, pt. 2, 1923.

The geology of the country near the border was known in some detail from the reports of Moore and Burwash, and from the later work of J. F. Wright[1] on the Manitoba side. The geology of the country farther east was unknown, but the topography had been accurately mapped by aerial surveys. The map accompanying this report is a reproduction, on a larger scale, of parts of the Pointe du Bois and Carroll Lake sheets of the Topographical Survey of Canada, with some corrections and with such additional information as could be obtained during the work.

The results, on the whole, were disappointing. The Rickaby lake belt was found to end within a few miles of the provincial border, and no other schist areas were discovered. The remainder of the territory is underlain by granite and gneiss; the reconnaissance was thorough enough to establish the fact that it can contain no schist belts large enough to be of any importance.

Acknowledgments

I am indebted to J. F. Wright, of the Geological Survey of Canada, for details of the route between Garner and Glenn lakes.

W. H. Hansen, of the University of Toronto, rendered excellent service as senior assistant. The junior assistants were W. B. Mather and F. Beamish of McMaster University.

Means of Access

There are several routes leading into the area. The Rickaby lake country is reached most easily from the southwest, by way of Lac du Bonnet and the Oiseau river. Starting from the town of Lac du Bonnet, on the Canadian Pacific railway, one can travel by motor boat down the lake to the mouth of Oiseau river (a distance of twenty miles) and up the river as far as the first falls, about five miles from the mouth and two miles above Bird River P.O. From this point travel is by canoe, along a very good route. The first portage is slightly over a mile in length, but a horse and sled are available for transporting supplies. Between this portage and the east end of Snowshoe lake, a distance of approximately forty miles, there are eleven short portages and lift-overs totalling 84 chains. For the first fifteen miles the river averages two to three chains in width, and the current is negligible. For the remainder of the distance it consists of a series of fair-sized lakes (Oiseau, Tulabi, Elbow, McGregor, and Snowshoe) connected by short stretches of river. To reach Rickaby or Bee lake, one leaves the Oiseau river just east of Snowshoe lake and crosses two portages (12 and 87 chains) into Wingiskus lake. To reach the eastern end of the schist belt, one continues up the Oiseau to Chase (Fishing) lake. In this upper stretch there are six portages totalling 30 chains.

Another route leaves railhead at Pointe du Bois, Man., goes eastward up the Winnipeg river for ten miles and then northward through Birse and Booster lakes to Oiseau lake, thence up the Oiseau river.

Rickaby lake can be reached from Lake Winnipeg by the Manigotagan or Wanipigow rivers. Farther north, another route from Lake Winnipeg leads up the Bloodvein and Gammon rivers to Carroll lake.

The map-area can be entered from the south by way of the Sturgeon river, which can be reached by various routes from Minaki or other points on the main line of the Canadian National railway.

[1]J. F. Wright, Geol. Surv. Can., Sum. Rept., 1922, pt. C, pp.45-82; Sum. Rept., 1923, pt. B, pp. 86-104.

Routes within the Area

Travel within the map area is facilitated by the enormous number of lakes. Practically every part of the region can be reached with comparative ease by canoe. A study of the map will always enable one to trace out a route without any large amount of overland travel; and where two lakes lie close together, there is usually a portage already cut. Further, in most places the bush is so light that even if no definite portage exists a canoe can be taken through with little effort.

There is a surveyed route along the northern edge of the map, connecting Carroll lake with Red lake. The western half of this route consists of a chain of large lakes (Carroll, Donald, Hammerhead, Gammon) which form the upper Gammon river. The eastern half contains several long portages and two bad stretches of narrow creek. Altogether, between Carroll lake and Pipestone bay, there are 23 portages totalling six miles.

There is, however, a much better and apparently newer route from Carroll lake to Red lake. This goes through Donald and Hammerhead lakes and then turns southeast, passing through Rostoul, Hansen, Glenn, Optic, Telescope, and Embryo lakes, which form a chain draining into Gammon river. This route enters Red lake via Douglas lake and Trout bay. It is about the same length as the other, but contains only 16 portages totalling two and a half miles.

A party going from Red lake to the Manitoba schist belt can take the route just referred to as far as Hansen lake, and then swing off to the southwest through Wrist (Wright), Welkin (Welcome), and Beamish lakes, reaching the provincial boundary at Garner lake. To reach the Ontario end of the belt, they should diverge from this latter route at Welkin lake, turning south into Aegean lake and descending the Oiseau river.

Haggart river forms a good north-south route a few miles east of the provincial border, and Talon river provides easy access to the southeastern part of the area. The only part of the entire region that offers any obstacles to canoe travel is the country south of Optic and Telescope lakes.

Drainage

The area is a part of the Nelson River basin, and all the streams within it flow eventually to Lake Winnipeg, but they do so by way of four different river systems. As might be expected in a region containing the headwaters of several rivers, the drainage pattern is complicated, with many small streams and no very large ones. An attempt has been made to indicate on the map the position of the various watersheds, but it will be understood that these are only approximations. Broadly speaking, the flow is outward in all directions from the centre of the map.

The greater part of the area drains north into the Gammon river, which forms the north boundary of the map and which flows westward into Manitoba, where it joins the Bloodvein. A few square miles around Indian House lake, in the northeast corner, drain directly into the Bloodvein.

Another small area near the northwest corner contains the headwaters of the Wanipigow, and a larger area along the provincial boundary drains into the Manigotagan. Both of these rivers flow almost due west into Lake Winnipeg.

The southern part of the map lies in the Winnipeg River basin, but this also can be subdivided. The southwest corner is drained by the Oiseau river, which joins the Winnipeg at Lac du Bonnet, while the southeast corner discharges into the Sturgeon, which flows south into the English, a tributary of the Winnipeg.

Finally, a very small area along the east edge drains into the English by way of Red lake and the Chukuni.

Physiography

The region exhibits the features characteristic of the Canadian shield. It is a well-developed peneplain, with little relief; few of the hills rise as much as a hundred feet above the nearest lakes. In detail the surface is irregular, low knolls or ridges alternating with small areas of drift or muskeg. In the schist belt, where rocks of different hardness lie in approximately parallel bands, the ridges and valleys are well defined; and this is also true of those areas of granite in which the gneissic structure is most pronounced. Where the granite is massive, the country is often conspicuously flat, with very low, rounded knobs of bare rock rising above shallow lakes or drift-filled basins.

The area contains an exceptionally large number of small lakes. Many of these are quite irregular in shape. Others are long and narrow, and in some part of the map these show a more or less definite tendency towards parallelism.

The lakes are, of course, of glacial origin. They are the result of the disorganization of the pre-glacial drainage systems, mainly by the blocking of valleys by drift. The reason for their abundance would appear to be the flatness of the pre-glacial topography. The surface over which the ice-sheet passed was a gently rolling one, a peneplain dissected only to a slight degree. The deposition of morainal material, therefore, caused the formation of many small lakes with complex shorelines and numerous islands. The long, narrow lakes, on the other hand, were formed by the blocking (and to a minor extent by the over-deepening) of pre-glacial linear valleys. These valleys, which are a well-known feature of the Canadian shield, are most frequently attributed to erosion along fault lines, and this is probably the explanation of some of the linear valleys in this area. Others, however, have a trend parallel to the gneissic banding of the granite and appear to have been formed by the erosion of the weaker belts of gneiss.

Timber

The most important trees are jackpine, spruce, poplar, and birch. On the rock ridges jackpine is almost the only species found and it grows abundantly, though usually only to small size, wherever it can find crevices in which to take root. In the muskegs scrub jackpine and spruce are found. On the drift-covered areas, and especially on the lower ground along the larger lakes, jackpine and poplar often attain considerable size. Balsam is fairly common, though much less so than spruce. White pine, red pine, and cedar are almost if not entirely absent.

As a rule the undergrowth is very light, a feature which makes bush travel comparatively easy. In some of the swampy areas alders and other shrubs are thick enough to impede progress, and in other places the scrub jackpine and spruce form troublesome thickets, but generally the trees are rather widely spaced. The large jackpines and poplars, widely spaced and free from underbrush, form beautiful natural parks, especially on some of the level drift-covered areas.

Game

Deer are abundant through most of the region and are often met, especially along the rivers. Moose are common, and several caribou were seen. Bears are

rather numerous. Other fur-bearing animals are reported to be fairly plentiful, and a certain amount of trapping is done. Beaver, however, seem to be very scarce; few signs of their work were observed, and scarcely any that appeared to be of recent date.

Pike abound in most of the lakes, and pickerel are usually obtainable. Most of the larger lakes are said to contain lake trout.

Ducks are plentiful on all the larger streams and many of the lakes. Spruce and birch partridge were seen fairly frequently, especially the former, but they are not as common here as in many other parts of Northern Ontario.

GEOLOGY

The general geology may be summarized in the following table:—

PLEISTOCENE:	Till
	Great unconformity
PRE-CAMBRIAN	
ALGOMAN (?):	Granite and granite gneiss
	Intrusive contact
KEEWATIN-TIMISKAMIAN (?):	Congomerate, greywacké, slate, iron formation, etc. Lava flows and pyroclastics.

Much the greater part of the map-area is underlain by granite. The only non-granite area is the southwest corner, which contains the Rickaby lake schist belt. The schists are undoubtedly older than the granite, and are intruded by it. The relations of the members of the schist series are uncertain, but it seems improbable that they can be separated into a lower volcanic series and an upper sedimentary series; that is to say, the terms Keewatin and Timiskamian, as ordinarily used, do not apply strictly to this region. They are inserted in the table simply to bring out the fact that the schists are older than the great granite complex by which they are surrounded.

Rickaby Lake Schist Belt

The Rickaby lake belt consists of a group of volcanic and sedimentary schists running nearly eastward from the provincial boundary. Its width at the boundary is about six miles, its length (in Ontario) about sixteen. Between Wingiskus lake and Chase lake, it is split into two unequal parts by an elliptical intrusion of granite. East of Midway (Lower Eagle) lake it again splits; the two forks become more and more granitized and die out altogether within a few miles. In fact the whole lower fork, from Chase lake east, is cut up by numerous dikes of granite, and the southeast contact as shown on the map is only an approximation. The northern fork is similarly intruded at its east end. Successive outcrops in this neighbourhood show alternations of normal schists, granitized schists, granite with inclusions, and fresh granite; and again the contact could be drawn only roughly.

The remaining contacts are defined, except in a drift-covered area just north of Chase lake. Along the northern boundary of the belt, the granite is usually very gneissic and the sediments are granitized to some degree, so that there is a transition zone in which it is difficult to tell whether one is dealing with a granite gneiss or a sedimentary gneiss. The granite in the small embayment east of Midway lake is also coarsely gneissic. The south contact is generally sharp, and the gneissic structure of the granite not pronounced.

The rocks of the belt fall roughly into three groups, as follows:—

1. A southern area of siliceous sediments.
2. A central area of basic and intermediate volcanics.
3. A northern area consisting chiefly of sediments, ranging from conglomerates to slates, but containing interbedded acidic pyroclastics and perhaps lava flows.

Southern Area

This consists essentially of the region south of the outlet of Wingiskus lake and south of the granite intrusion which splits the belt farther east. It is underlain by a rather uniform series of quartzose sediments, which are typically developed in the area west of Wingiskus lake. They are dark-grey, fine-grained siliceous rocks, obscurely bedded. In the coarser phases the quartz grains are sometimes recognizable; the finer phases are micaceous, sometimes passing into muscovite or biotite schists. Very little conglomerate was noted, and but little slate; the dominant type is a greywacké or impure quartzite.

The microscope shows the most typical specimens to be composed mainly of subangular quartz grains, with occasional grains of feldspar, magnetite, garnet, etc., in a matrix of brown biotite, sericite, and quartz. The rocks are undoubtedly derived from somewhat impure sandstones.

In the eastern part of the belt the rocks are similar, though a quartz-biotite schist is the commonest type. The change is probably due to the increasing degree of metamorphism by the granite rather than to any marked difference in the nature of the sediments themselves.

Central Area

The rocks mapped as volcanics form a band two or three miles wide in the neighbourhood of Rickaby lake and Odd and Ninety lakes, and the north bay of Wingiskus lake. Farther east, south of Eden lake, this band narrows and perhaps dies out altogether, but it widens again in the region east of Eagle lake. They are mainly a series of dark, heavy greenstones, showing considerable variations in structure and texture. They are generally massive, but frequently schistose and sometimes banded. The evidences that they are volcanic are usually obtainable, though not always obvious. Pillow structure was noted at one locality south of the east end of Bee lake. Amygdules are fairly common, and small phenocrysts often stand out on the weathered surfaces. Occasionally coarse phases occur with a texture which is definitely igneous, but these are rare.

Near the border, in the vicinity of Odd and Ninety lakes, the prevailing rocks are light-green, rather soft, with numerous small rounded feldspar phenocrysts. The specimens of this rock examined microscopically contained abundant feldspars, usually so much calcitized and saussuritized that their composition is difficult to determine, though most of them are certainly plagioclase. The groundmass is a fine-grained, murky intergrowth containing feldspar, some quartz, epidote, much calcite, and some kaolin-like material.

Farther east the rocks appear darker and more basic. Under the microscope they are seen to be composed of predominant amphibole in small needles with parallel orientation, intergrown with fine-grained quartz and feldspar, usually untwinned. The amphibole is generally green hornblende but sometimes a feathery variety with low bi-refringence. Calcite is usually plentiful. Chlorite, epidote, serpentine, and magnetite are the chief accessories. Biotite occurs in some specimens. The textures revealed by the microscope are not definitely

igneous. Whatever the original mineral composition of the rocks, they must have been thoroughly recrystallized. However, their general composition, and especially the occurrence of hornblende rather than biotite as the main dark-coloured mineral, corroborates the field evidence that the rocks are essentially andesites and basalts.

Northern Area

This contains a much greater variety of rocks than the other two. They are essentially clastic sediments of various kinds, from conglomerates to slates, with lesser amounts of volcanics.

The conglomerate is exposed most abundantly in the neighbourhood of Eden lake, but it is found also to the west on Bee lake, and to the east on Midway lake. The coarser phases contain pebbles, several inches in diameter, of granite, felsite, schist, quartz, etc., in a matrix of smaller quartz grains and biotite. In the finer phases the pebbles are chiefly quartz, and the rocks grade into normal quartzites. The quartzites in turn range from coarse-textured, highly siliceous rocks, in which the individual grains are readily distinguishable with the naked eye, to finer grained, dark, micaceous rocks resembling the greywackés of the southern area. Slates and phyllites were noted at several localities, chiefly around the east end of Eden lake. They are soft, usually dark-grey or purplish, with splintery fracture and fairly definite cleavage. Of two specimens examined microscopically, one was composed almost entirely of sericite and quartz; the other contained large amounts of chloritic material.

In addition to these easily identifiable sediments, there are large amounts of fine-grained, glassy-looking rocks whose origin is more doubtful. They are usually grey to black on fresh surfaces, sometimes greenish, with smooth fracture, and in most cases carry pinhead crystals of quartz and more rarely of feldspar. They weather very light. The weathered surfaces in many places show a definite banding suggestive of stratification; in other places they are quite massive. All of them are hard and obviously very siliceous. In some cases, rocks composed chiefly of such material contain abundant pebbles or fragments of felsite.

These fine-grained rocks are difficult to identify in the field. Any given exposure may be a quartzite, a volcanic agglomerate or ash, a rhyolite, or an intrusive quartz porphyry, and frequently a very detailed examination of its behaviour when traced both along and across the strike is necessary to settle the question. In all probability most of them are quartzose sediments. Nevertheless, specimens of many of the doubtful rocks, when examined microscopically, have a distinctly volcanic appearance. Feldspar crystals are usually present, sometimes sharp, sometimes rounded, sometimes fragmented, but nearly always suggesting phenocrysts rather than clastic grains. The fine-grained matrix of quartz, feldspar, epidote, and indistinguishable murky material often resembles a recrystallized glass. Even in the case of some of the pebble-bearing rocks, the groundmass has this igneous appearance; and they are, therefore, considered to be agglomerates. Some of the massive rocks may possibly be quartz porphyry intrusives, but none of them was definitely ascertained to be so; and the fact that they were observed only in this northern area, interbedded with sediments and pyroclastics, makes it more probable that they are flows.

Iron formation was noted at several places on Eden lake and at the east end of Bee lake, occurring in at least two distinct bands in the sedimentary rocks. One of these bands follows the north shore of Eden lake, appearing on one of the islands and on two points on the mainland. The magnetic disturbance

has been traced under the northwest bay, and the band outcrops just south of Macaroni creek (the short creek between Eden and Bee lakes) and appears again on a point on the north shore of Bee lake. The other band is visible at two or three places along the south shore of Eden lake. On the peninsula between Eden and Bee lakes, the compass aberration is very noticeable, and the band is reported to occur again west of the Wingiskus–Bee lake portage.

Where observed, this iron formation consists of slates and other indeterminate schists, usually rather contorted, carrying bands of ferruginous chert and of quartz-magnetite, with occasional narrow bands of high-grade, fine-grained magnetite. The usual width of the whole belt is from 20 to 50 feet. The high-grade portions are only a few inches wide; and, so far as observed, the formation is much too lean to be of any possible economic value, except perhaps in the distant future.

Structure

The structural relations, and hence the relative ages, of the various members of the schist complex were not determined with any certainty. As a rule the dips of the bedding and schistosity are vertical or nearly so. In the southern area the regional dip of the sediments is steeply to the north, and apparently they pass under the volcanics of the central area. This would suggest that the general structure is synclinal, with the sediments underlying the lavas. Such an interpretation, however, would imply that the sediments of the northern group correspond to those of the southern group; whereas in fact they are of a distinctly different type. The southern group is a rather uniform series of quartzites and greywackés, while the northern contains much greater amounts of other kinds of sediments. Perhaps the structure is essentially monoclinal, with the oldest rocks to the south.

Moore, in his original reconnaissance of the belt, divided the schists into two series. The older of these, the Rice Lake, was essentially volcanic; the younger, the Wanipigow, was essentially sedimentary. The more detailed work of J. F. Wright on the Manitoba portion of the belt has shown the relations to be more complex than was at first supposed. His final results, as yet unpublished, will probably throw much light on this question.

North of the main schist belt, a small band of volcanics crosses the provincial boundary between miles 95 and 96. East of the line this grows narrower and quickly dies out into a granite with basic inclusions. A somewhat similar small band is exposed on the creek just north of Reahil lake.

Algoman (?) Granite

Except for the Rickaby lake belt, the whole map-area is underlain by granite or granite gneiss. The granite in contact with the schists shows intrusive relations, and it is, therefore, classed doubtfully as Algoman, though it is by no means certain that it is all of one age.

The granite complex shows all the usual variations. The commonest phase is a moderately fine grained, slightly gneissic, grey or pinkish rock, composed of the feldspars, quartz, and subordinate biotite or muscovite. There are, however, all sorts of variations in texture, colour, and composition. In places quartz is entirely lacking, and hornblende sometimes replaces mica as the dominant ferromagnesian mineral. The gneissic banding may be well developed or it may be entirely absent. The strike of the gneisses varies greatly but most commonly lies between east and northeast.

In many parts of the area the granite contains inclusions, and locally they are sometimes very abundant. They are bands or blocks of a dark rock, in most cases biotite schist. They sometimes show typical *lit par lit* relations to the granite; more often they are simply angular or subangular fragments completely surrounded by granite. They are, without much doubt, the altered remnants of the roof under which the intrusive solidified. They weather more easily than the granite, and the rocks along the lake shores often show pits caused by the partial erosion of the blocks.

There are no areas of these rocks large enough to be mapped; and it would, in any case, be impossible to draw definite contacts. Even where the inclusions are largest and most abundant, an adjacent outcrop may show perfectly normal granite. They were noted at many places over practically the whole area, but they are perhaps most numerous in the southern and eastern parts. They are especially noticeable in a belt along Embryo and Telescope lake and in the region west and northwest of Kilburn lake.

In the area between Snowshoe lake and the main schist belt, there are two fairly well defined bands of this kind. They are composed of coarse granite gneiss and biotite schist in approximately equal amounts. One of these bands runs through the small lake just north of Snowshoe; the second runs through Johnston lake. Each of them parallels the main contact, but they are separated from the main belt and from each other by areas of normal granite. They are apparently pendants from an extension of the schist belt, which has been removed by erosion.

No evidence was secured to indicate that there was more than one period of granitic intrusion. The complex shows the differentiation characteristic of any large intrusive mass, and occasionally contains pegmatite dikes which are younger than the main body; but these may well be subordinate features of a single period of injection. Careful mapping of the schist inclusions and of the directions and degrees of development of the gneissic structures would undoubtedly throw light on this question, and perhaps reveal the existence of a number of distinct batholiths; but in a reconnaissance survey nothing of this sort could be attempted.

A noteworthy feature is the complete absence, throughout the region, of the diabase dikes which are so common in the eastern parts of the province.

Pleistocene

The whole region has been heavily glaciated by an ice-sheet moving in a general southwesterly direction. The hills consist in the main of rounded polished rock, in some plates bare or covered only by moss, in others carrying a thin veneer of glacial drift. The smaller basins between the hills are for the most part filled with drift, or else have been filled in since glacial times by the washing down of sand from the higher ground. They are usually badly drained and hence form swamp or muskeg. The lower ground is often deeply covered by drift, but there are few areas of any size without rock exposures. Aqueo-glacial action is not conspicuous. Small sand plains are fairly common, but no large clay areas were noted.

ECONOMIC GEOLOGY

Gold

The activities of prospectors in this area have been directed almost entirely to the discovery of deposits of gold. The part of the schist belt which lies in Manitoba has been prospected more or less actively for several years, and several groups of claims have been and are being developed with encouraging results. The first excitement on the Ontario side came during the winter of 1925-26, at the time of the Red lake rush. A discovery on Rickaby lake led to the location in February, 1926, of a group of claims along its south shore, and subsequently to the staking of a solid belt extending from Wingiskus lake to the provincial boundary in the neighbourhood of Odd and Ninety lakes. In the early summer the country farther east, along the same strike, received attention, and in particular the area around the east end of Eden lake was staked solid. In August another discovery just west of the boundary line was followed by the locating of a number of claims north of Ninety lake and west of Bee lake. The total number of claims recorded during the year in the Ontario part of the belt was approximately 236. Of these 61 were reported abandoned by the end of the year.

The total amount of stripping and development work done on the claims was not large, and the results in general were disappointing. The ground staked included various members of the schist complex. The earlier claims were mainly in greenstone. At many places stringers and short gash veins of quartz were exposed, but they were ordinarily entirely lacking in sulphides or other evidences of ore mineralization. The claims farther east were chiefly in sediments and the associated acidic volcanics. Certain beds or bands contained appreciable amounts of pyrite disseminated through a tight rock, and also small quartz veins or stringers, but so far as the writer is aware no major "breaks" nor important zones of mineralization were discovered. The assays of which the writer has any knowledge were rather uniformly low. The quartz specimens commonly ran nil or a few cents, and the occasional specimens which approached commercial grade were for the most part from unexpected places in the country rock.

These remarks should not be construed as a wholesale condemnation of the area. Owing to the limited amount of time available the writer's work was chiefly in the nature of a reconnaissance, and certainly not thoroûgh enough to warrant any such generalizations. The results so far have been mainly negative, but as already stated only a small amount of intensive prospecting has been done, and it is quite possible that important discoveries may yet be made.

The whole schist belt can of course be regarded as a region of possible ore deposits, and only a comparatively small part of it was staked during 1926. The southern sediments, apparently, were hardly looked at; and although the writer's field work disclosed no particular evidences of mineralization, it would seem that they are worth a more careful examination than they have yet received. It will be noted from the map that an elliptical intrusion of granite lies under and to the east of Wingiskus lake. In the area just west of this intrusion, between Wingiskus lake and the boundary, the sediments are cut here and there by granite dikes, and on theoretical grounds this might be expected to be favourable territory.

Another promising area, as yet unstaked, is the east end of the north fork of the belt, a mile or two east of Eagle lake. Here the rocks are much broken

up by small intrusions, and there seemed to be an unusual abundance of quartz stringers, while small amounts of sulphides were noted at a few places.

The following notes on particular properties make no pretense at completeness.

Anglo-Canadian

The "original discovery" on Rickaby lake was a discontinuous vein of practically pure, fine-grained quartz, with a maximum width of a few feet, apparently a band of silicified schist. This was exposed on the south shore of the lake and was exposed by stripping and test pits at several places near the shore farther east. Small amounts of sulphides were noted in some of these pits. The claims are reported to have been abandoned.

Minerals Finance Syndicate, Toronto

This syndicate has a group of 16 claims in the peninsula between Rickaby, Bee, and Wingiskus lakes, mainly in greenstones. Work on these claims during the summer of 1926 is said to have uncovered a vein of mineralized quartz and sulphides several feet in width. A galena-calcite vein is also reported. The writer had no opportunity to examine either of these veins. A trench near the south bay of Bee lake exposed banded magnetite and considerable quantities of pyrite. H. N. Darling was in charge of operations.

Edwards Claims

A syndicate led by G. M. Edwards of Toronto holds a block of about 30 claims around the east end of Eden lake, chiefly in sedimentary rocks of various kinds. When the writer visited these claims at the end of June, a small amount of trenching had been done a short distance east of the lake. This disclosed some lenses of quartz, carrying pyrite, lying in the contact between a narrow band of iron formation and a feldspar porphyry which appeared to be a dike.

Pioneer Mining and Exploration Company, Winnipeg

This company has nine claims near Hutch lake, to the southwest of Eden lake, in greenstone. P. W. Hutchinson was in charge of operations.

Newton Claims

W. S. Newton, of Winnipeg, has three claims on the narrow peninsula south of Macaroni creek, between Eden and Bee lakes. A narrow band of iron formation runs along the creek. South of this is a belt of rhyolitic rock, forming the backbone of the peninsula, and south of this a belt of conglomerate. He also holds a group of six claims between Eden and Kangaroo lakes. Trenching was in progress on each group, under the direction of Capt. N. Evans-Atkinson.

Winnipeg Syndicate

This syndicate holds six claims on the west shore of Midway lake, adjoining the Edwards group. The rocks are chiefly sedimentary, but a band which appears to be an altered porphyry runs in a general easterly direction across the claims. Prospecting had disclosed disseminated pyrite, small veinlets of pyrite, and stringers of quartz at several places. R. A. Black was in charge.

Iron Formation

As already stated, there are at least two bands of iron formation exposed in the neighbourhood of Eden lake, but these do not appear to be of economic interest.

Other Minerals

No other economic minerals are known within the limits of the map-area. To the southwest, on the Oiseau river, nickel-copper deposits have been found in the schists. More recently the discovery of important lithia-bearing pegmatites on the Winnipeg river, and reports of finds of cassiterite in this general region, have directed attention to the possibilities of the granite areas. Pegmatitic phases are observable at a good many places in the granites, and it is probable that in future they will receive more attention than they have in the past

Woman and Narrow Lakes Area, District of Kenora (Patricia Portion)

By J. W. Greig

Introduction

In the fall of 1925, an important gold discovery was made in the Red Lake area. This made it desirable to investigate the neighbouring schist area which lies to the east of Trout lake. The writer was instructed by Thos. W. Gibson, Deputy Minister of Mines, to make a geological exploration in that section.

The field work was carried out during the summer of 1926. As a base on which to plot the geology, there was available at the beginning of the season an aerial map[1] of the country as far north as Slate lake. The Topographic Survey, in conjunction with the Royal Canadian Air Force, was to continue the mapping to the north. In the early part of July, a sketch map compiled from preliminary photographs was supplied. This map, on a scale of approximately one mile to the inch, showed the route from Woman lake to Gull lake through Shabumeni and Birch lakes. On the 8th of August, a map was received which covered the area from Ross's line eastward to Springpole and Sesikinaga lakes and from Confederation (Clearwater) lake north to the southern part of Birch lake. This map,[2] which was compiled from plottings of oblique aerial photographs without the advantage of the control traverse, was used for the remainder of the season and found both accurate and complete. These maps, made from aerial surveys, because of the great amount of detail shown, especially in the country between the main waterways, are particularly adapted to the work of the geologist and the prospector. In doing detailed work the geologist can make much use of the photographs themselves in planning his inland sections; and if a map on a large scale is desired, it may be quickly constructed by running a skeleton traverse and filling in the detail by plotting the photographs.

During the summer the writer also received plans of a skeleton traverse of Woman and Shabumeni lakes, which was made for the Department of Lands and Forests by H. W. Sutcliffe, O.L.S. These were used to some extent in conjunction with the aerial photographs.

Thanks to the courtesy and co-operation of the Ontario Forestry Branch, the writer was able during the season to fly over the area. This was of considerable service, since it permitted the sketching of lakes and rivers where no map was available, and also aided in locating the granite areas. From the air it was found possible to distinguish between granite and schist in most cases. In burned, bare country this is, of course, much easier than in wooded country. The difficulty of distinguishing the rocks increases rapidly with the altitude, so that for this work it is desirable to fly as low as is consistent with safety. The opinions formed in the air were checked on the ground, so that the accompanying map shows only the results of ground work.

In the field work able assistance was rendered by G. D. Furse, A. G. Ballachey, and H. D. Ball. During a part of the season the party was split, so

[1]The Lac Seul sheet of the Topographic Survey of Canada.

[2]For a brief description of the methods, *see* J. W. Pierce, O.L.S., D.L.S., The Adaptation of Aerial Photographs to Surveys and Maps, Ann. Rept. Ont. Land Surveyors, 1925, pp. 168-79; *See also* Gerard H. Matthes, Oblique Aerial Surveying in Canada, Geog. Rev., Vol. XVI, 1926, pp. 568-82.



Looking southwest across the main body of Woman lake just north of the narrows. Woman river and Bear lake may be seen in the distance.

that a good deal of the mapping was done by Mr. Furse. The writer wishes to take this opportunity of thanking the many persons who in various ways aided in the work. He is particularly indebted to J. W. Pierce, O.L.S., D.L.S., of the Topographic Survey, chief of the party which ran the control traverse for the aerial survey; to J. C. Ruse, A. T. Cheeseman, F. J. Stevenson, and J. T. O'Gorman, of the Ontario Forestry Branch; to the officials of the Hudson's Bay Company; and to Geo. Swain.

Position and Means of Access

That part of the district of Kenora (Patricia portion) covered by this report lies to the north of Lac Seul (see key map, Fig. 1). The southern portion of the area drains into the English river, the waters of which reach Hudson bay by way of Lake Winnipeg and the Nelson river; the northern portion drains into the Albany river.

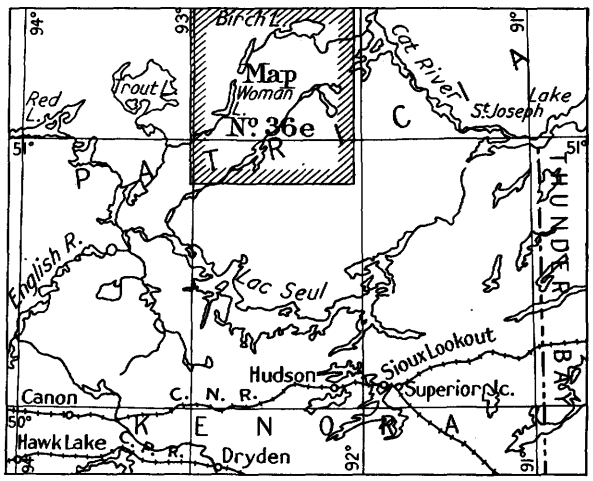


Fig. 1—Key map showing position of Woman and Narrow Lakes gold area. Scale, 50 miles to the inch.

The region is readily accessible from the Canadian National railway. Although there are canoe routes from several stations, almost the entire traffic enters by way of Hudson. Between this station and Pine Ridge, at the outlet of Lac Seul, a distance of roughly 110 miles, large motor boats can navigate. The only obstruction on this stretch is the Manitou rapid, down which such boats can run and up which they also run except at time of high water when, the current being too strong, they are winched up. Regular passenger and freight service between these points was commenced in the spring of 1926 and maintained until freeze-up. In passing it may be noted that there are two canoe routes from Hudson to Lac Seul post, by way of Canoe lake, which are much shorter than that which the motor boats take and also more sheltered.

From Pine Ridge, one has the choice of two water routes. One of these is down the English river to the mouth of the Chukuni, up the Chukuni to Pakwash (Shallow) lake, across Pakwash lake and Bruce or Little Pakwash lake to

the Trout Lake river, up this river to Woman river, which is followed up to Woman lake. Two short portages or one long one are necessary around the Ear falls at the outlet of Lac Seul. No further portages are necessary until Trout Lake river has been ascended about twelve miles, after which there are eight portages before Woman lake is reached.

During the past season the Hudson's Bay Company put a motor boat on the English river below Ear falls, and maintained a regular freight and passenger service between this point and Snake falls on the Chukuni river, a short distance above its mouth at the north end of Pakwash lake. Toward the end of the summer, they established a post on Woman lake and commenced a freight and passenger service between Snake falls and Woman lake by means of large canoes equipped with outboard motors.

There is another canoe route up the Wenasaga river, which flows into Lac Seul about two miles east of Pine Ridge. This is shorter to most parts of the area than the other and, although not so much used, is a good canoe route.

The area may also be reached by air. Throughout the past season the Patricia Airways and Exploration Company operated a Curtis Lark plane from Sioux Lookout, on the Canadian National railway, and maintained passenger, mail, and express services to all points in this and the neighbouring Red Lake area. Since the trip from the railway to Woman lake, which by water requires three days at best, may be made in less than two hours by plane, much time may be saved. During the past season this air service proved a real convenience in countless ways to those in the area.

Supplies may be purchased at Sioux Lookout or Hudson, where complete outfits may be obtained, at Pine Ridge where there are now several general stores carrying a fairly complete line of goods appropriate to the country, or even within the area at the Hudson's Bay Company's post at Woman lake, or at Swain Post on Swain lake.

Canoe Routes

The following are brief descriptions of some of the main routes in the area:—

Woman River.—The route from Lac Seul by way of the Woman river has already been sufficiently described. Outboard motors may be used on all parts of this route.

Wenasaga River.—The Wenasaga river is a good-sized stream almost to its headwaters and is in frequent use, so that the portages are all well cut out.

Uchi River from the Wenasaga River to Perrigo Lake.—From the Wenasaga river to Ben (Sucker) lake, the current is not strong. Above Ben lake to the portage to Fly lake, the river is narrow, has a good current, and meanders sharply in a sandy valley. In this stretch a motor could not be used to advantage in 1926. The river is deep, however, and if the logs which are in it were removed, it would be a good route even in low water. Leaving Ben lake there is a portage of 52 chains to avoid several falls and rapids, and between this point and the Fly lake portage there are three short rapids. Immediately above the Fly lake portage there is a 7-chain portage before entering Uchi lake. Two portages are required to reach the next small lake. A short creek drains Perrigo lake into this. None of the portages on this route are through swamp, and all are well cut out.

Uchi River to Confederation Lake.—This route is much used, and the two portages are consequently in good condition.

Confederation Lake to Swain Lake.—This route is much used and the portages are well cut out. The stream draining Washagomis lake is narrow with a good current, and an outboard motor may be used on it.

Woman Lake to Birch Lake.—From Woman lake the route is up a small, fast stream to Swain lake. No portaging is required, and outboard motors may be used. From Swain lake there is a choice of three routes: The first of these is by way of Shabumeni lake. A 58-chain portage leaves the lake at Swain Post. The first half is over muskeg, but poles have been laid; the rest is over high ground. Two short portages must be made on the Shabumeni river. Another route leaves Swain lake from the east end and leads to the southwest bay of Birch lake. There are two portages, of 60 and 70 chains, which lead to a small lake, which is drained by a creek into the bay. The route is down this creek, which has been cleaned out. In high water it is navigable, but not in low water. Another route from the east end of Swain lake leads to the south bay of Birch lake.

Shabumeni Lake to Shabu Lake.—This route is up the Shabumeni river. From Shabumeni lake to the first lake, the stream is broad, deep, and sluggish. A 7-chain portage must be taken at the outlet of this lake. Above the second lake, the stream is narrow with a good current and meanders sharply through willows and alders. There are two short portages on this stretch. A 23-chain portage then leads to a small lake, into which Shabu lake drains through a short creek.

Birch Lake River to Margaret Lake.—This route leaves Birch Lake river at the most southerly part of its course between Birch lake and Springpole lake, and leads up the small stream that drains Bertha (Boulder) lake. Three portages are necessary on this stream. The third leads to a small lake with swampy shores. This lake is connected by a narrow channel with the main body of Bertha lake, which is crossed to the southeast. A narrow channel almost filled with boulders enters the lake here. It widens at once to a muskeg channel, which leads to the next small lake. About a mile west this contracts to a channel about three chains wide, which leads to a second expansion. From the southwest part of the expansion, another narrow channel leads to the third expansion. A weedy muskeg creek enters here on the west side and is ascended to Bumpy lake, a 6-chain portage being made just at the lake. At high water, with a light canoe, a shorter, 3-chain portage may be made. The portage from this lake on the Albany river system to Cook lake on the English river system is 25 chains in length through jackpine. Two routes are available from Cook lake to the next below it. One is by a portage which leaves a small bay about the middle of the southeast shore. For 33 chains the portage is through moderately open spruce muskeg, which is soft even in the dry season; the rest is over a sand plain through jackpine. The portage leads to a muskeg lake, from which a muskeg creek drains to the lake below Cook lake. The creek was interrupted in 1926 by two small beaver dams, over which the loaded canoe could be eased. The other route is by a portage, about a third of a mile in length, from the outlet of the lake, thence down the stream to the next lake. The stream is small and has a fair current; since it flows in a sand plain, it meanders sharply and is shallow, so that at low water the canoe and load must be constantly lifted over the logs and shallower spots. The other route appears to be the more travelled. From this lake to Margaret lake, the stream is of good size. Four portages are necessary on this stretch, which makes ten in all from the Birch Lake river.

History and Earlier Reports

In the early days of the fur trade, posts were established on Red lake and Cat lake. Mackenzie's map[1] shows these posts, Red Lake House and Catt Lake House. The routes from Catt lake to Lake St. Joseph by way of the Catt Lake river, from Lake St. Joseph to Lake Sol, and also from Red lake through Lake Prince of Wales (Gullrock lake) and Lake Paquash to Lake Sol are likewise shown. The only feature shown in the country between these routes is a range of mountains running west of and parallel to the Catt Lake river. These trade routes have since remained as they were then.

The country is still much as it was in those early days. The building of the Grand Trunk Pacific provided an outlet from Lac Seul, and for some years now a little fishing has been done on that lake, but beyond that there was no change. The discovery of gold on Red lake in the fall of 1925 and the consequent rush, followed by the rush to Woman, Confederation, and Narrow lakes in the spring and summer of 1926, brought many prospectors into the area, and a small village sprang up about the old Hudson's Bay post at Pine Ridge; now called Goldpines post office.

A number of reports have been made on the area. In the summer of 1885, Thomas Fawcett, D.T.S., ran a line with transit and micrometer from the Canadian Pacific railway at Rat Portage (since renamed Kenora) to Osnaburgh House at the east end of Lake St. Joseph and then from Lake St. Joseph to Cat lake, up the Cat river. The season being far advanced and the freeze-up imminent, he returned by the most direct route, that of the Wenassaga river. His report gives a brief description of the route.[2]

In 1893, D. B. Dowling made a geological exploration, the eastern part of which included the western part of this area. His report[3] is accompanied by a geological map on a scale of eight miles to the inch. He made two traverses through the area, "from Shaboomene lake through Woman lake and down the Trout Lake river, and again from Trout lake eastward via a long narrow lake to Woman lake, and thence up stream to Clearwater lake, directly south upstream to Fly lake, and thence down by the Wenassaga river to Lac Seul."

In 1902, A. W. G. Wilson and J. F. E. Johnston made a reconnaissance traverse from Lac Seul to Cat lake by way of the Wenassaga river.

In 1904, Charles Camsell made a traverse along the east boundary of the schist area to Cat lake, and from Cat lake westward through Birch lake to Shabumeni lake.[4]

Wilson's report[5] was published in 1910, accompanied by map No. 1089 (9A), which was a compilation of the data, both topographic and geographic, then available.[6] The map also covers a large territory to the north and east of the section under consideration.

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[1]A map of America between latitudes 40° and 70° North and longitudes 45° and 180° West exhibiting Mackenzie's track from Montreal to Fort Chipweyan and from thence to the North Sea in 1789 and to the West Pacific Ocean in 1793. Accompanying Voyages from Montreal through the continent of North America to the Frozen and Pacific Oceans in 1789 and 1793, by Alexander Mackenzie, London, 1801.

[2]Ann. Rept., Dept. of the Interior, 1885, pt. II, pp. 30-38.

[3]Report on the Country in the Vicinity of Red Lake and Part of the Basin of Berens River, Keewatin, Geol. Surv. Can., Vol. VII, pt. F, 1894, pp. 5-54.

[4]Country around the Headwaters of the Severn River, Geol. Surv. Can., Vol. XVI, pt. A, 1904, pp. 143-52.

[5]Report on a Traverse through the Southern Part of the Northwest Territories from Lac Seul to Cat Lake in 1902, Geol. Surv. Can., Publication No. 1006.

[6]The reports of Dowling, Camsell, and Wilson were republished in Vol. XXI, pt. 2, Ont. Bur. Mines, 1912.

In 1919, E. M. Burwash made a geological reconnaissance of the Wenasaga river route to Gull lake; from there he ascended the Birch Lake river to Springpole lake, portaged into Birch lake, and after mapping a portion of that lake returned by way of Shabumeni and Woman lakes. His report[1] is accompanied by plans showing the geology of Whitemud lake, of the southwestern part of Birch lake, and of his route from Gull lake to Birch lake.

General Character of the Area

Travelling by aeroplane northward from Lac Seul over this area, one sees a level plain stretching out beneath. The monotony is broken here and there by lakes, by the different shades of green of the forest, and by occasional bare brulé patches, but never by hills. As the flight is continued farther north, the same level country is seen, but the number of lakes increases until the waters form a labyrinth of channels running aimlessly over the land, and it becomes difficult to determine to which lakes the various channels belong.

If one travels back over the same country by canoe it will be seen that, although the country is essentially level, the lake shores, especially where lakes are numerous, are usually rocky and that back from the lakes rounded rock hills are frequent. The country is also well wooded, so that it presents a pleasing and far from monotonous aspect.

The consolidated rock surface is a plane, in general nearly level, in detail quite irregular, having been carved into steep low hills and shallow valleys. The glaciers have left the surfaces smoothed and rounded and have scattered over them a thin covering of boulders, sand, and clay, which is covered again in places by reworked water-laid materials. This rock surface is slightly warped, sloping gently away from the height of land and to the southwest passing beneath a deposit of clays and silts until only a few rock hills protrude above the level of this mantle.

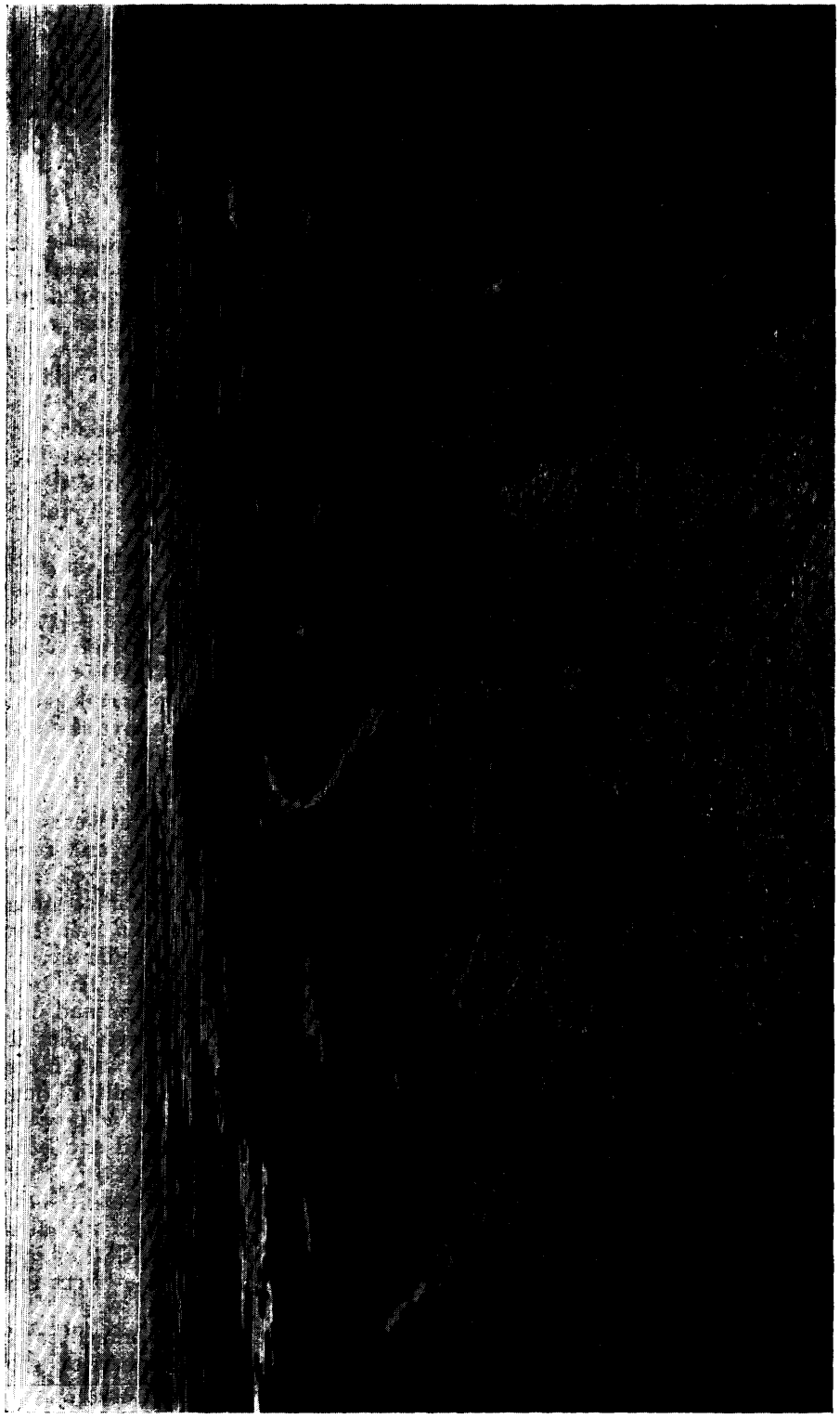
Forests

The greater part of the area has not been burned over in recent years and is consequently well wooded, with the exception of the muskegs and rocky places. Spruce, poplar, and jackpine or banksian pine are the principal trees; birch is also common. Canada balsam, or balsam fir, and balm of gilead, or balsam poplar, are less plentiful. White cedar and mountain ash, both small, are found along the lake shores throughout the area, but no cedar swamps were seen. Willows and alders commonly grow along the streams. The black ash is sparingly distributed. Everywhere through the muskegs, and here and there on old burned places, a great number of young and apparently healthy tamaracs are growing. Earlier reports speak of large tamaracs, and indeed there are numerous good-sized tamarac stubs, but these are practically all dead, having been killed by the depredations of the larch saw-fly, which a few years ago spread over the country. The northern limit of both the red and white pine appears to be at Lac Seul.

Generally speaking the timber is not big. There are large areas of spruce of pulpwood size; and small patches of good-sized trees are common, but no tracts were seen which were suitable for lumber. There is a good deal of jackpine on sand plains between Bertha and Perrigo lakes, but only the larger trees would be suitable for railway ties.

Blueberries grow well but are not well distributed, being confined to the burned areas. Raspberries, gooseberries, and high-bush cranberries grow

[1]A Geological Reconnaissance into Patricia, Ont. Dept. Mines, Vol. XXIX, 1920, pt. 1.



Narrow lake, looking west along the long narrow arm of the lake to Trout lake, which is seen in the distance.

throughout in favourable places. In the muskegs a few cranberries, *Vaccinium macrocarpon*, are found, but the most plentiful berry is the mountain cranberry, *Vaccinium Vitis-idaea*, which abounds in mossy places. Red cherries are common on the burned-over rocky hillsides.

Game

Although the country is largely free from burned areas, game is not abundant except in the southern section. Red deer are plentiful along the English river and in the southern clay-covered region, but are scarce in the rockier country to the north. Moose are occasionally encountered throughout the area, but more especially in the southern section. Woodland caribou were seen on Okanse lake and were reported on Woman and Shabumeni lakes. Ruffed grouse and spruce partridge are moderately plentiful, and many ducks nest in the area.

Pelts of the following animals form the furs shipped from the area: fox, mink, beaver, muskrat, otter, weasel (ermine), fisher, lynx, bear, wolf, skunk.

Fish

Many of the lakes are of the clearwater type in consequence of the small size of the muskeg area draining into them. Fly, Confederation, Washagomis, Perrigo, and some smaller lakes are of this type. The waters of Woman and Birch lakes are fairly clear. The water of other lakes is quite brown from organic matter. Fish abound in the clearer lakes and are found to a lesser extent in the others. Pickerel or doré, jackfish or pike, whitefish, and suckers are the most important. Lake trout are plentiful in Confederation lake and are also taken in Woman lake.

Agriculture and Water Powers

The agricultural possibilities of the area have been reported on by Burwash.[1] Briefly it may be said that there are no considerable tracts of land suitable for agriculture in the northern part of the area, but to the southwest there is a large section of bedded clays and silts. This is an easterly extension of the clay belt of the English River valley,[2] and will be farmed in the future. Snake lake marks the approximate north limit of this area. From here the boundary swings off to the southeast.

Burwash has also reported on the water powers of the area. The three largest sources are: the two falls on the Wenasaga river below Bluffy lake, with a drop of approximately 50 feet; the canyon on the Woman river below Snake lake, with a drop of 65 feet; and the three falls on the Trout Lake river, with a drop of 85 feet. He estimated the power available to be 1,025 horse-power, 530 horse-power, and 1,740 horse-power, respectively.

Topography and Surface Geology

The topography of this region is like that of many other parts of the pre-Cambrian shield which have been described. It is even flatter than usual. The highest hill measured was 160 feet above the level of the nearby lakes, and it is unlikely that there is a hill in the entire area which rises more than 200

[1] Op. cit.

[2] *See* E. L. Bruce, Geology of the Upper Part of the English River Valley and Geology of the Basin of Red Lake, District of Patricia, Ont. Dept. Mines, Vol. XXXIII, pt. 4, 1924.



Birch lake, looking south of east from near the centre of the lake toward Springpole lake.

feet above the neighbouring lakes. Rock forms the highest elevations; no large morainal hills were seen.

This topography is the result of the action of the continental glaciers on an already level country. The ice removed all the residual soil and overlying decomposed rock, and left a floor of fresh unweathered rock. Since the retreat of the ice, only a thin surface film has been affected by weathering. The rock floor as a whole is flat, but the surface is quite uneven. In the areas of schists and gneisses, it has been carved into long, low ridges and shallow valleys, which follow the strike of the rocks. In the more massive granite areas, the hills are more hummocky. The whole is rounded and smoothed and even polished, particularly on northeast slopes against which the ice advanced. The control of the structure over the erosion of the ice is reflected in lake shores, which in the rocky areas generally conform to the strike. This is well shown on the accompanying map, No. 36*e*. Commonly, in long narrow valleys extending in a direction not too far from that of the prevailing movement of the ice, grooves and striae are found to deviate notably from the general direction toward that of the valley, showing that here the structure exerted a control over the movement of the lower part of the ice.

The ice left a mantle of unassorted boulders, sand, and clay spread over the rock floor, thin or absent on the tops and northeast slopes of the hills, but thicker in more sheltered places. In some parts, this deposit becomes so great as to form low hills and completely bury the solid rock. Such an accumulation is seen on Shabumeni river and south of Shabu lake. It is probably the east edge of the morainal deposits noted by Dowling around Trout lake. Lying on this unassorted material there are also, in many places, water-laid deposits, clays, sands, or gravels. Thus along the Trout Lake river and the lower Wenasaga, there is a continuation of the clay belt of the English river. In the eastern part of the area, there are large tracts covered by sands, often interbedded with clay. Bedded deposits of small extent are found locally in hollows throughout the area. Frequently they are overlain by swamps or muskegs.

A glance at the map shows that lakes are unusually numerous. Many are in rock basins and are broken by numerous islands. Most of the lakes are held at their present level by rock barriers, over which the escaping water falls. Birch lake, the largest in the area, is an exception, the outlet being over boulders. The lakes are for the most part connected by streams in which reaches of sluggish water are interrupted by falls and short rapids. This, coupled with the large number of lakes, makes the area particularly easy of access by canoe.

Consolidated Rocks

The consolidated rocks of the area consist of a series of interbedded sediments and lavas, and possibly a younger sedimentary series. These have been folded into vertical attitudes, converted into schists, and otherwise metamorphosed. They are intruded by various small bodies of igneous rocks. This complex has been invaded by granite and since eroded to such a depth that the schist area of sediments and lavas floats, as it were, on a sea of granite.

The rocks are all pre-Cambrian in age, and the lavas and associated sediments probably early pre-Cambrian. They cannot from the nature of the case be definitely correlated with rocks of other areas, but tentatively the lavas and interbedded sediments may be considered the equivalent of the Keewatin.

There are numerous dikes, sills, and irregular bodies of igneous rock intrusive into the sediments and lavas. As a rule the relative ages of minor intrusives are not known. None of them were found cutting the granites.

The latest rocks are granites and quartz-feldspar porphyries. Although the various granite masses have different characteristics, they may possibly be all of one age. Some granite formed part of the surface before the upper sediments were laid down, since they contain granite pebbles; but they are themselves intruded by granite, and no granite was found which could be shown to be older than these sediments.

For the purpose of description, the area is arbitrarily divided into sections.

Narrow, Car (Caribou), and Shabu Lakes

North of the granite which lies to the southwest of Narrow lake, there is a band of rocks which, in part at least, is sedimentary. Northeast of these, there is a wide band of lavas in which pillow structures are frequent. All these rocks are green. Schisted zones occur, but for the most part the rocks are fairly massive. A microscopic examination of one of the pillow lavas outcropping on the north-south channel near the south part of the band shows it to consist of a fine-grained mass of felted, fibrous green amphibole and chlorite, a fine mosaic of quartz, and a few minute tattered remnants of feldspar. There is also considerable carbonate. With the exception of the feldspar remnants, the minerals are apparently all secondary. Many of the lavas resemble the pillow lava described below from another part of the lake. It is possible that there are some sediments included in the band.

To the northeast of the lavas, along the west side of the bay from which the portage to Woman lake leaves, there is a narrow band of sediments, which include conglomerate, made up almost entirely of pebbles, resembling the lavas, and rare pebbles of green schist and quartz, greywacké, or arkose; slates with much pyrite; and some lean, banded iron formation A fresh looking, light-green rock, about the colour of many of the lavas but showing distinct bedding, which outcrops on the west side of the bay, was found under the microscope to consist of subangular grains of alkaline feldspar and grains resembling the groundmass of the lavas and porphyries. This rock may have been derived from the lavas and porphyries by mechanical disintegration and with little transportation. It may be a sedimentary tuff. An exposure near the west side of this band on the south shore shows a gradation from coarse to fine grained toward the east. This is repeated in several beds and indicates that the top of the series is to the east.

Northeast of the sediments are more lavas. Outcrops showing excellent pillow structure occur across the north end of the bay. A sample from a pillow lava near the southwest edge of the band was examined microscopically. It shows laths of feldspar, probably albite, with a trachytic structure. The groundmass is fine grained and altered, consisting chiefly of chlorite and a fine mosaic of quartz, with possibly a little feldspar. There is much carbonate. The rock is of a somewhat lighter green than the average greenstone. There are large areas of rocks which resemble it closely, and it appears probable that rocks of this type are quantitatively the most important of the lavas in the vicinity of Narrow, Woman, and Confederation lakes. At the extreme southern part of this bay, feldspar porphyry occurs which resembles the lava in appearance but which shows no pillows. The large island in the middle of the bay is entirely of sediments.

Beyond the lavas, there are more sediments extending to Woman lake. They vary from coarse conglomerate to finely bedded rocks and, for the most part, are light green on the weathered surface. The boulders in the conglomerate are chiefly of dense, light-green lavas and of feldspar porphyry; there are no deep-seated igneous rocks represented. Many of the beds are of fairly well rounded pebbles, and as a rule there is considerable quartz in the matrix between the pebbles. A characteristic is the rapid change in the size of the grains from bed to bed; an exposure on the south side of the portage from Woman lake shows this well: Here within a few feet are conglomerate, gravel beds, and rock so finely bedded that 40 laminations were counted in one inch. A thin section of this rock shows it to consist of a fine-grained mosaic of quartz and a little alkaline feldspar, with a great deal of sericite uniformly distributed through it. These sediments are well exposed along the two small expansions of the Narrow Lake river.

The amount of overburden increases to the west and north. For this reason there are fewer exposures, and the geology is correspondingly less certain. Along the trail from Narrow lake to Car (Caribou) lake are numerous outcrops that appear to be lavas like those on Narrow lake. On Car lake there are well developed pillows, and on the two small lakes north of the main body of Narrow lake there are numerous exposures of light-green pillow lavas, frequently spherulitic. North of Car lake there is much swamp, with scattered outcrops of chloritic rocks, which occasionally show spherules and pillows. North of these, about one mile south of the next small lake, are some light-weathering, quartz-bearing rocks that look like rhyolites. To the east of the south end of this lake, there are more light-weathering rocks, which are in part fragmental. It was not determined whether these rocks were porphyries or sediments. A section of the groundmass examined microscopically might be either a sheared feldspar porphyry, with a little quartz in phenocrysts, or a sediment. It is now much altered and contains a good deal of sericite and carbonate.

Farther north as the granite is approached, there is considerable biotite and hornblende developed in the few rocks that outcrop.

Although the shores on the main body of Shabu lake are mostly boulders, there are quite a number of good outcrops, mostly sediments. On the southeast bay lean iron formation occurs, and inland northeast of it conglomerate like that to the east of Narrow lake. This conglomerate is intruded by fresh-looking, grey quartz-feldspar porphyry. South of Shabu lake, the schists are intruded by small masses of granite and porphyry. There is much drift over the rock, and numerous small hills composed largely of boulders from the granite to the north.

Woman Lake

Along the west side of the main body of Woman lake, the rocks are much contorted and schisted, many of them being sericitic and chloritic schists. It is difficult, and often impossible, to distinguish sediments from lavas. Strikes are not obtainable, as the bedding is usually obliterated and when visible is frequently contorted. The rocks are lavas and sediments that range from conglomerates to siliceous slates, with the metamorphosed derivatives of both. Breccias also occur, and it is frequently difficult to decide whether they are agglomerates or actually parts of flows. There are a number of intrusives. The rocks along the east side of the lake are much more massive, and some of the freshest-looking sediments in the whole area occur there. Toward the

southern part of the lake, the rock surface is lower and except in the granite areas is largely covered with soil.

Pillow lavas outcrop on the shores of the small bay at the northwest corner of the lake; along the west shore of the main body of the lake, medium-green lavas with some breccias and a little quartz porphyry continue to the bay into which the Narrow Lake river empties.

To the west of the chertlike rocks, north of the narrows, lie conglomerates. These are best exposed on the two peninsulas which jut out from the west shore and on the south side of the large island north of them. To the west of these, there is a band of feldspar porphyry, which on the east carries roughly spherical grains of quartz. The rock is a medium-green and shows the feldspar phenocrysts on the weathered surface. In thin section, the feldspar phenocrysts are seen to be near albite in composition, and the spherical quartz grains are seen to be composed of quartz mosaic probably filling vesicles in the original rock. To the west of the feldspar porphyry, there is a narrow band of sediments including arkose and conglomerate, and west of these dark greenstones with pillow structures, grading westward into coarser dioritic-looking rocks.

On the east side of the large island north of the band of cherty rocks, the rock, which is greenish-yellow, is a sericite schist, which has been partly silicified. In places it is quite definitely fragmental; as conglomerate lies immediately to the west, it is probably a sediment. On the east side of the large island next to the north, cross-bedding in the sediments indicates that the top of the beds is to the east.

Along the east side of the lake runs a band of sediments comprising conglomerate, arkose, greywacké, and slates. They are like the sediments east of Narrow lake. The pebbles in the conglomerate are almost all of dense, light-green lavas and feldspar porphyry; some of them are of feldspar-quartz porphyry and rare green schist and vein quartz. The arkose and some of the greywacké might be mistaken for quartz porphyry, especially when the quantity of quartz is small. The associated conglomerates and slates give the clue to their true nature in such cases. These sediments are separated from those to the east by a band of pillow lavas.

The rocks of the basement complex outcropping on the shores of the expansion south of the narrows are largely pillow lava and diorite. Lean, banded iron formation may be traced down the north bay, and what appears to be part of the same beds forms a gull rock in the middle of this expansion. This rock is referred to in older reports as Medicine rock. On one side there is a good deal of pyrite. Burwash had the material assayed and found not a trace of gold.

There are a number of intrusives along the west side of Woman lake; diorite grading to quartz diorite cuts the lavas and sediments on the mainland and on the southwest side of the large island three miles northwest of the narrows. A little to the south, a much altered granite porphyry occurs, resembling in many ways the altered porphyry sill of Confederation lake. Dark-green dikes are frequent. Lighter green, rusty-weathering dikes, now largely carbonate in well-developed rhombohedra, are also common.

Chertlike Rocks.—There are rocks in several parts of the area which appear in the field to be cherty. They vary from light-grey to almost black and in places are yellowish or reddish. They are dense and hard, breaking with a conchoidal fracture. The largest area of these cherty rocks, and the only one of importance, is that which lies to the west of the long narrow part of Woman lake

and extends northward along the islands into the main body of the lake; the boundary of this area as shown on the map is necessarily somewhat arbitrary.

As to their origin, it may be stated with considerable confidence that they are secondary, having been formed by replacement of the rocks which originally occupied this position. To the north of these rocks, and striking toward them, are sediments, conglomerate, arkose, and greywacké, made up chiefly of alkali feldspars and quartz and now greatly altered. On a small island north of the narrows, the rock, now all cherty, retains the shapes of pebbles, forming a bed which strikes in the same direction as the sediments to the north of the prolongation of the strike. This in itself is good evidence of the replacement of these sediments to form the chertlike rocks.

A few specimens were studied in the laboratory. Microscopic examination of material from a conglomerate to the west of the best developed of these rocks shows a very fine grained mosaic, mostly quartz, and some material of lower index of refraction and lower bi-refringence. Scattered thickly through this and giving a rude linear pattern are small sericite grains. Phenocrysts of quartz with typical shapes are the only original minerals left. There are areas of clear quartz mosaic that have the shape of feldspar phenocrysts, which they have evidently replaced. Numerous veins of quartz mosaic coarser than the groundmass cut across the section. The specimen is evidently a pebble of a feldspar-quartz porphyry. A sample of dark mottled variety shows in thin section a somewhat coarser mosaic than that mentioned above. There is little sericite, but there are patches which have a fair amount of fine-grained green mica. A few grains of quartz are evidently original. A specimen of light-grey, streaked rock shows an exceedingly fine grained mosaic. The darker streaks are almost entirely quartz and coarser grained than the remainder, which contains a great deal of the material with the lower index of refraction. The original minerals, with the exception of quartz, have entirely disappeared from these rocks, and the composition has evidently become much more siliceous.

Certainly then the chertlike rock is a replacement, and in part at least the original rock was a sediment. Whether or not it was entirely a sediment or in part a flow or sill cannot be stated.

Carbonate Rocks.—Carbonate rocks occur in several parts of the area. Some are secondary, others have the appearance of sediments. In areal extent, they are insignificant. The most important occurrence is in the narrows of Woman lake, where they lie to the west of the chertlike band of silicified rock. Scattered outcrops, which occur at the water's edge on both sides of the narrows, are characteristically dark-brown, almost black, on the weathered surface and are ribbed with contorted bands of silica, frequently in two directions. They appear conformable with the other rocks of the series, although the contact is irregular. Part of the silica, at least, must have been introduced, since the ribs are in two directions. On Shabu lake, at two places, lighter coloured rock was observed. Here the silica ribs are parallel to the strike of the sediments. This rock looks like many dolomites in the pre-Cambrian. At the entrance to the long west bay of Narrow lake, there are similar rocks exposed on both sides of the channel. They are not contorted and look like sediments. Immediately to the north are quite schistose ellipsoidal greenstones. Along the contact there is an unusually large amount of carbonate in these pillow lavas; in places they appear almost completely replaced.

Along the west side of Woman lake there are occasionally irregular, roughly oval shaped areas, a few feet in diameter, of carbonate ribbed with silica and

presenting an appearance almost identical with that of the carbonate rock at the narrows on Woman lake. A short distance south of the bay into which the Narrow Lake river empties, there are several small zones of carbonate cutting across the strike. These send out irregular veinlets into the surrounding rock. Fine-grained quartz stringers cut the wall and the carbonate zone and run across the strike of the zone. The weathered surface here looks like that at Woman lake narrows.

The rocks at the narrows on Woman lake, on Narrow lake, and on Shabu lake may well be sediments, but the resemblance of other occurrences that are certainly not sediments to that at the narrows makes a secondary origin for these not improbable. A decision on these rocks must await further work.

Confederation and Washagomis Lakes

To the east of Woman lake, in the neighbourhood of Washagomis and Confederation lakes, the rocks are mostly massive. All the rocks of Washagomis lake are lavas, varying somewhat in colour but always chloritic. The same may be said of the rocks on the small lake to the south. On the main body of Confederation lake, most of the rocks are also lavas, commonly having pillow structures. Many of these resemble the light-coloured greenstone described at Narrow lake; others are darker green. A series of dark-grey, dense rocks, showing a few small quartz grains, crosses the narrow channel which joins Lost bay to the main body of the lake. These continue to the north, and similar rocks were found near Okanse lake. Certain markings on the weathered surface suggest filled vesicles. In thin section, the rocks are seen to contain euhedral quartz phenocrysts and phenocrysts of graphically intergrown quartz and feldspar. Some feldspar laths occur in the groundmass. The dark colour is due to fine-grained secondary biotite and hornblende; they are probably rhyolites. On Lost bay more green pillow lavas occur and are the principal rocks. A band of conglomerate and associated finer grained sediments extends up the bay. As was the case on Narrow and Woman lakes, the pebbles show little variety. No deep-seated rocks are represented. Quartz porphyry pebbles are conspicuous here, in which respect this conglomerate differs from those on Woman and Narrow lakes.

Extending up the main body of Confederation lake is what appears to be a sill of granite porphyry. The rock varies in texture from almost granitic to fine grained and, as a rule, is distinctly green, due to chlorite, and shows quartz grains. It is usually schistose. Just north of the narrows, on a small island at the west side of the band, there is a good exposure, which shows it to be intrusive into a dioritic rock lying to the west of the porphyry. The rock here is coarse textured and fairly fresh. A thin section shows that it is characterized by a coarse intergrowth of quartz and feldspar. Microcline and plagioclase near albite are the feldspars present, and the rock is almost entirely composed of these minerals. There are a few alteration products and little carbonate. In sections from other parts of the mass, carbonate replaces the feldspar, and the structure tends toward a graphic intergrowth of quartz and carbonate. Chlorite is also present in small amounts. On the east of the large islands north of the narrows, the rock is finer grained and somewhat resembles a lava. This poprhyry is cut in several places by later fresh quartz-feldspar porphyry dikes and also by dark-green dikes. To the west of the porphyry band, there are coarse-grained dioritic rocks, the relation of which to the lavas was not determined.

Shabumeni Lake

Next the granite which lies to the west of Shabumeni lake, there is a band of dense, dark-grey, finely banded rocks which extend across the full width of the lake at the north. As the granite is approached, small pink feldspar crystals appear in these schists and gradually increase in size. Microscopically, the rocks are seen to consist of a fine mosaic of quartz and alkali feldspar, and small green hornblende crystals arranged parallel to each other in planes, giving the rock its banded appearance. Their origin is doubtful, but they appear, on the eastern side of the lake, to lie on the prolongation of a series of thin-bedded sediments to the south and may be the equivalent of those rocks, which are light-coloured on the weathered surface, thin bedded, and minutely crumpled. A thin section of a specimen shows it to be composed of a very fine grained groundmass of quartz and some feldspar, having fine-grained mica, sericite, and light-coloured biotite thickly distributed through it. The banded and crumpled appearance of the rock is due to the arrangement of the mica. The difference in mineral composition between these rocks is probably to be attributed to the granite intrusive. To the east of these rocks lie conglomerates. On the islands in the main body of the lake and on the south shore, chloritic pillow lavas are the principal rocks. Asciated with these in fairly well defined bands is a rock of a peculiar appearance. The weathered surface is grey and commonly covered with lighter coloured knobs more resistant than the rest. When the rock is broken, it is seen that the more resistant material has roughly the form of small, flattened, cigar-shaped bodies, which have their longer axes nearly vertical. A thin section shows that these bodies are composed of a fine-grained mosaic, largely quartz, evidently filling what once was a cavity. The groundmass is too altered to determine the nature of the original rock. On the portage to Woman lake, similar rocks show structures that look like pillows. It appears probable that these rocks were vesicular lavas. Dark-coloured quartz porphyry, also apparently a flow, forms high bluffs to the east of the portage.

Birch Lake River and Seagrave (Burnt Island) Lake

Along the Birch Lake river above Springpole lake, conglomerates and associated finer grained sediments outcrop in many places. At the west end of the 10-chain portage from the first expansion of the river, there is an excellent exposure of conglomerate. Most of the pebbles here are of dense, light-green lavas and feldspar porphyry, but there are also pebbles of granite, green schist, lean iron formation, and vein quartz. The associated sediments are mostly light coloured: arkose and greywacké.

If we go south from the granite across Seagrave (Burnt Island) lake and continue to the lake to the south of it we have a section, across the strike, of earlier to later strata. Along the north shore of the lake, there is a finely banded series of dark hornblende schists. On the large islands there is massive dioritic rock such as is commonly associated with greenstones and pillow lavas. Along the south shore of the bay which extends to the west and in the smaller bay to the south of this, pillow lavas are well exposed. South from the lake the proximity of granite is manifest by the altered condition of the schists. There are numerous small pink aplite dikes and some feldspar quartz porphyry dikes. Much fine-grained hornblende has been developed in these schists. Two-thirds of a mile south of the lake there is a band of conglomerate, about 10 chains wide, which is so much altered that it looks very little like the conglomerate seen on the Birch Lake river; yet it is almost certainly the same.

There are granite boulders here over two feet in diameter—the largest boulders seen in the conglomerates of the area. The rocks to the north and south of the conglomerate are too much altered in appearance to correlate them with the rocks to the west. Many exposures are well banded.

Bertha and Uchi Lakes

On Bertha lake the outcrops are poor. The rocks are largely recrystallized with much hornblende and mica. To the south they become coarse micaceous schists, and in places feldspar has formed in them until their schistose appearance is lost and they approach an igneous rock in appearance. Micaceous schists continue to the southwest along the chain of lakes which roughly parallels the granite contact as far as the granite mass of Perrigo lake. Small bodies of granite occasionally intrude these schists, and pegmatite dikes are common. The rock outcrops are infrequent, as the country is largely covered with sand. The granite which lies to the southeast is pegmatitic and contains frequent and large inclusions of mica schist.

To the west of the granite of Perrigo lake, the rocks are again less recrystallized. A narrow band of fine-grained sediments extends up Uchi lake, swinging abruptly to the north at the upper end of the lake. These continue to the west of the granite. At the northwest corner of Perrigo lake squeezed, pebbly rocks outcrop.

To the northwest of the sediments of Uchi lake, there lies a massive, medium-green rock occasionally showing fragments of lighter colour. These rocks are probably lavas. To the south, on Leg lake, dark-green chlorite schists occur, such as are frequently associated with pillow lavas.

Slate Lake

On the south shore of the most southerly bay of Slate lake there are outcrops of a series of dense fine-grained greywackés. Toward the south and east, they become coarser and more foliated with much biotite apparent. Considerable granitic material has been injected into them. On the south shore of Ben lake, west of Slate lake, similar dense greywackés outcrop and are probably the continuation of these rocks. The intervening country is heavily drift covered. North of the greywackés on Slate lake, there is a band of dark greenstones showing pillow structure. Toward the east these pillow lavas have a coarse texture with large hornblende crystals showing on the weathered surface. This is evidently a recrystallization phenomenon attributable to the granite. North of these lavas lie more greywackés and slates in a narrow band. Judging from the gradation in grain in the beds of the greywackés, the top is to the north.

North of the slates and greywackés and occupying most of the bay to the south of the main body of the lake is a series of conglomerates with interbedded arenaceous greywackés. These extend to the west and cross the main body of the lake near the west narrows, but the band is here much narrower. There is a greater variety of pebbles than in the conglomerates of Narrow, Woman, and Confederation lakes. A great number of the pebbles are of the types abundant in those conglomerates, that is feldspar porphyries and dense, light-green lavas. Thin sections show them to be rocks with phenocrysts of alkali feldspar and a groundmass usually trachytic in structure. Rarely the phenocrysts and feldspar laths of the groundmass become as basic as oligoclase. Granite porphyry pebbles showing, in thin section, an intimate intergrowth around the phenocrysts are also present. Pebbles of vein quartz and of lean banded iron formation are common.

There are also rather scarce pebbles of somewhat altered pink granite, both coarse and fine grained. The above pebbles are, except where the conglomerate is greatly squeezed, quite fresh in appearance. There are also pebbles of dark-green schist which were less resistant to the squeezing and are consequently much more flattened. Burwash reports pebbles of a grey slaty rock with rounded grains of feldspar and quartz grains in lesser amount, also pebbles of biotite-muscovite gneiss. These range in size from gravel to boulders a foot in diameter. The matrix is an arenaceous greywacké made up of angular grains of quartz and feldspar and a few grains of fine-textured rock. In some places mica and a little hornblende has been formed. In this connection it may be noted that the conglomerate is cut by a few narrow stringers of pink aplite, indicating the proximity of granite. The description above applies to the less schisted conglomerate. To the west of this bay it is much more squeezed, the pebbles being greatly drawn out and having their longer axes in the direction of the dip.

Although these beds have been called conglomerate, there is much variation from bed to bed. Many beds are entirely arenaceous; some are of pebbles the size of gravel, while others are of boulders as much as a foot in diameter. The most striking thing about these rocks is that in the otherwise uniformly arenaceous beds there are here and there large boulders. In this respect, as well as in the angularity of the grains and the composition of the greywacké and conglomerate, the rock resembles the Cobalt conglomerate of the great Huronian belt of sediments west of Lake Timiskaming[1] and north of lake Huron,[2] and also the conglomerate of the Sudbury series[3] and the Bruce conglomerate of the north shore of Lake Huron.[4]

North of this conglomerate there is a series of thin-bedded sediments, quartzites, greywackés, and slates, now largely converted to fissile schists, which occupies the main basin of the lake. North of this again is a chloritic series which toward the east becomes hornblendic. In places these rocks look like lavas, but no decisive evidence was found. Beyond these again, crossing the small expansion of the river immediately above the lake, there is another band of greywackés.

As far as could be seen, there is no angular unconformity between these various rocks, and if such exists it is small. All the rocks are replaced by carbonate.

Structure of the Schist Complex

Since the dips are almost vertical over most of the area, it would be necessary to determine the tops and bottoms of beds and flows over the whole area before the structure could be completely determined. The contacts of the granite are generally parallel to the strikes of the sediments. This, since the granite advanced from below, makes it probable that the schist complex has the general structure of a syncline, resting on the underlying granite. The strikes of the sediments show that this structure is not simple but complex, made up of many close folds.

Origin of the Sediments

The sediments of Narrow, Woman, and Confederation lakes have already been described. It is evident that the materials for these sediments were not produced by deep erosion, since only surface types are represented in the conglomer-

[1] *See* descriptions in numerous reports by the Ontario Department of Mines and the Geological Survey, especially W. G. Miller, Ont. Bur. Mines, Vol. XIX, pt. 2, 1913, and W. H. Collins, Geol. Surv. Can., Mem. No. 33.

[2] W. H. Collins, Geol. Surv. Can., Mem. No. 143.

[3] Ibid., p. 24.

[4] Ibid., pp. 45-46.

ates. Nor was the material carried far, since the grains are angular and the variety of pebbles small. The lavas and associated porphyries with which the sediments are interbanded are the same as those which furnished the material for the sediments. The size of the grains changes abruptly from bed to bed. The disintegration which produced the material for the sediments was rapid and entirely mechanical, for the feldspars are just as fresh as those of the rocks from which they came. Breccias of angular blocks of lava and undoubted flow breccias occur which, upon being formed, would be rapidly and easily disintegrated and carried away by water to be deposited in nearby basins, then covered by later flows. It is probable that this is the way these sediments originated. This is supported by the interbanding of the lavas and sediments as they were interbedded. The areal distribution of lavas and sediments can, of course, be explained by supposing all the bands of sediments to be synclines in a lower and earlier lava series. To decide definitely between these possibilities would require the complete determination of the structure. The shortness of the time available, together with the wooded nature of the country, rendered this impracticable. The first possibility appears to explain the known facts more satisfactorily than the second.

The sediments observed along the Birch Lake river and south of Seagrave lake, as well as the conglomerate of Slate lake, have a greater variety of pebbles than those discussed above. The conglomerate of the former locality resembles in its pebble composition that of the latter, which contains many pebbles of lavas and porphyries identical with those of the conglomerates of Narrow, Woman, and Confederation lakes. Granite pebbles also occur, although not plentifully. These sediments represent deeper erosion and probably were derived from a more extensive terrain than the others. It is also likely that they are younger than, though not necessarily unconformable with, the others. The angularity and freshness of the grains indicate that the disintegration which produced them was essentially mechanical and that they were not transported any great distance by wind or water.

The Birch Lake river sediments were not studied in thin section, so the matrix cannot be compared with that of the Slate lake conglomerate. No examples of isolated boulders in otherwise uniform and fine-grained beds were seen in the former sediments, but this does not preclude their occurrence, since the examination was hasty and very incomplete. Burwash has expressed the opinion that the conglomerate that occurs on Birch lake north of the portage from the upper end of Springpole lake is the same as that on Slate lake, and it seems probable that further work will show that the beds along the Birch Lake river are equivalent to the conglomerate on Slate lake.

It has already been stated that the Slate lake conglomerate resembles in several ways the Cobalt conglomerate as well as the Bruce conglomerate and the conglomerate in the Sudbury series. Regarding the origin of the Cobalt conglomerate, there has been much discussion, some of which is pertinent here.[1] Whether or not that conglomerate is due to continental glaciation, it seems at least clear that large boulders dropped into otherwise uniformly fine grained,

[1]A. P. Coleman, Am. Jour. Sci., Vol. XXIII, 1907, pp. 187-92; Bull. Geol. Soc. Amer., Vol. XIX, 1905, pp. 347-66; Jour. Geol., Vol. XVI, 1908, pp. 149-58.

W. H. Collins, Geol. Surv. Can., Mem. No. 33, 1913, pp. 55-58; Mem. No. 143, 1925, pp. 73-74.

W. G. Miller, Ont. Bur. Mines, Vol. XIV, pt. 2, 1905, p. 41; Vol. XVI, pt. 2, 1907, pp. 57-58; Vol. XIX, pt. 2, 1913, pp. 85-87.

M. E. Wilson, Geol. Surv. Can., Mem. No. 39, 1913, pp. 88-98.

water-laid sediments such as those on Slate lake require the agency of floating ice. This implies that the temperature in the remote days when that conglomerate was formed was not greatly different from that of Canada to-day.

Quartz-Feldspar Porphyry

The youngest rocks of the region are granites and porphyries, which intrude the earlier schists. The porphyries are light-grey on the weathered surface and darker on the fracture. They vary in texture. Nearly always quartz crystals can be distinguished, and in the case of the coarser ones glistening feldspar cleavages show. These rocks are usually fresh in appearance. They cut all the sediments and are consequently younger. They also cut the silicified rocks of Woman lake and are younger than the silicification. They intrude the altered granite porphyry of Confederation lake and appear younger than the alteration of that rock. They also cut the granite south of Woman and Confederation lakes.

A specimen from a dike on Rowe lake was examined microscopically. Abundant zoned phenocrysts of sodic plagioclase and some rounded quartz phenocrysts are set in a fine-grained matrix in which quartz and feldspar are plainly recognizable. The rock is little altered. This appears to be similar to the Algoman quartz-feldspar porphyry of the Porcupine area.[1]

These quartz-feldspar porphyries occur in almost all parts of the area. None were observed however in the micaceous schists along the pegmatitic granite on the east side of the area. To the south of Shabu lake, porphyry occurs as small irregular bosses. Dikes of porphyry are frequent along the south bay of Woman lake, along the south bay of Confederation lake, and in the country to the south of the lake. Several dikes occur on Rowe lake, and dikes cross the narrow channel joining Lost bay with the main body of Confederation lake. Along the east side of the granite on Found (Elbow) lake and south of this on Lost bay, similar porphyry dikes are found. Most of the porphyry dikes are too small to be shown on the map.

Granite

Granite practically surrounds the schist area, and several large and numerous small masses are found within it. The various masses of granite encountered differ from each other in many ways. It is outside the scope of this report to do more than mention a few of the more typical and prominent characteristics.

The large granite mass lying to the northwest and forming the boundary of the schist area from Shabu lake to Mink lake is porphyritic with large pink phenocrysts of feldspar, in some parts as much as three inches in length. The porphyritic character continues as far into the mass as the work was carried, four miles from the contact. Along the contact the granite becomes schistose with more biotite than in the main mass of the rock. The schistosity is parallel to the contact. Even here the rock has a porphyritic tendency. In places it grades rapidly into the schist in which pink feldspar crystals have been formed. In other places the contact is sharper.

The granite of Perrigo lake varies in appearance, but is always massive. Along the east and south shores of the small lake south of Perrigo lake, the granite is grey and porphyritic with good-sized crystals of white feldspar. On Perrigo lake it varies from this to a pink granite which, generally speaking, lies to the west. Both biotite and hornblende occur in the pink and in the grey granite.

[1]A. G. Burrows, Ont. Dept. Mines, Vol. XXXIII, pt. 2, 1924, pp. 30-36.

The granite of Springpole lake is distinctly gneissic along the contacts, small pink feldspar crystals arranged in lines giving it this appearance. Toward the south side of the lake, this gneissic nature is much less apparent and the rock becomes a coarse porphyritic granite resembling that to the west of Lake Shabumeni.

The granite mass, which is in contact with the schist at Bumpy lake and Margaret lake and extends to the south and east across the Wenasaga river, is characteristically very pegmatitic. Pegmatite dikes are common in the schists along this granite, and inclusions of mica schist are common in the granite.

The granite on Okanse lake and on Found lake is a pink to red hornblende granite, frequently with a great deal of hornblende, especially near the contacts.

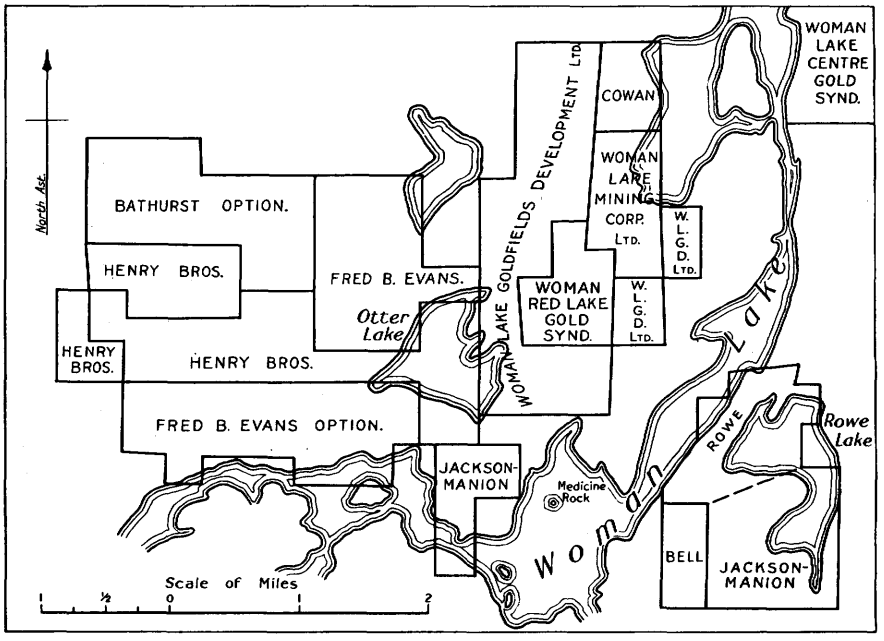


Fig. 2—Sketch showing approximate positions of groups of claims in the vicinity of the Jackson-Manion property.

The granite to the south of the area is variable, being frequently gneissic and again massive. Outcrops in this section are scattered.

Economic Geology

In the fall of 1925, the Howey brothers made an important gold discovery on Red lake. This led to a rush to that area during the following winter. As a natural consequence attention was directed to the neighbouring schist area to the east of Trout lake. In the spring and early summer of 1926, many prospectors visited this area, much ground was staked around Woman and Confederation lakes, and some discoveries of gold-bearing quartz veins were made. In June, discoveries on Narrow and Car lakes turned attention to that quarter.

The writer visited a number of prospects during the course of the field work. There follows a brief description of the more important of them.

It will be seen from these descriptions that much work must be done on even the most hopeful of the discoveries before it can be known whether or not it will make a mine. There is no doubt that there is gold in the country. The question is as to the size of the deposits and their number; it is encouraging to note that the geological features are similar to those in the productive camps of Ontario. In judging of the possibilities of the area, it must be borne in mind that although much of the country was staked in 1926 only a very little of it has been prospected, so that we may confidently look for more discoveries with further prospecting.

Rowe Lake

Jackson-Manion and Rowe.—This vein outcrops on the shore of Rowe lake and extends southward, swinging to the east along its strike. When the property was visited late in September, strippings had exposed the vein in a sufficient

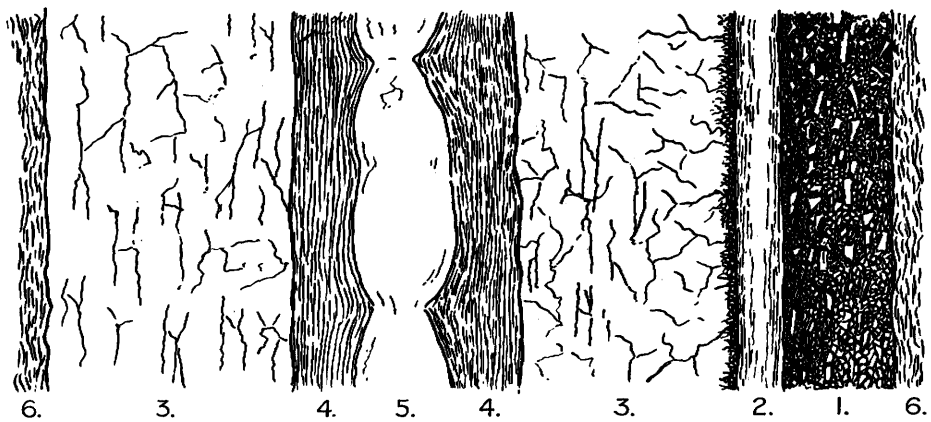


Fig. 3—Cross-section (approximately to scale) of Jackson-Manion vein near south end of stripping. (1) A very dark zone of much brecciated quartz cemented with later quartz carrying a great deal of tourmaline in minute crystals. (2) Quartz brecciated and cemented by later quartz with a little tourmaline. (3) Quartz cut by irregular, hairlike, dark stringers carrying tourmaline and fine sulphides. A little pyrite is visible, and native gold occurs here. There is a narrow, much brecciated selvage on the east which resembles (1). The dark stringers appeared in the field to carry some fine sulphides, although thin sections examined later showed only tourmaline needles along the walls of tiny quartz veins. Both the old and the new quartz is strained. (4) Schist enclosed in the vein, now largely carbonate and chlorite. (5) Quartz. The schist of the wall (6) is much replaced by carbonate; there is considerable pyrite in the schist, and a good deal of quartz has been introduced. Siderite is recognizable in the hand specimen, and it weathers out rapidly, leaving a rusty residue.

number of places to make it reasonably certain that this one vein runs from the outcrop on the lake southward for a little less than three-quarrers of a mile. Over most of the length it is narrow; but toward the south, stripping shows a width of from seven to twelve feet over a length of about a chain; about three chains farther south another stripping shows a width of probably 15 feet for about a chain's length. It then disappears under a swamp. On these two strippings, native gold may be seen in the vein. Running parallel to the vein and apparently continuous throughout its length, there is a light-weathering, much-sheared porphyry dike. Small lenses that resemble much-altered porphyry

occur in the vein places. The vein, where it disappears in the swamp at the south, is no great distance from the granite contact.

The Jackson-Manion claims are under option to Noah Timmins, president of the Hollinger mine. By means of diamond-drilling the veins are being tested at depth.

Confederation Lake

Heinie, Levesque and Rouillard.—On claims K.R.L. 4,134 and 4,089, on the northwest shore of Confederation lake, there is a narrow quartz vein in the altered granite porphyry sill, which has been exposed over a length of about 60 feet; the width ranges from seven to fifteen inches. The strike is 175° W., and the dip 55°W. The vein is well mineralized with sphalerite, pyrite, and chalcopyrite, and little galena is present. The wall rock is also mineralized. Fine-grained native gold is visible in many places in the vein. A green dike rock cuts the altered porphyry near the vein. The dike is rusty-weathering and in section is seen to contain a large proportion of carbonate; some fine chlorite, giving it the green colour; and a little fine-grained quartz, probably secondary. There are remnants of feldspar laths, apparently oligoclase-andesine, but owing to the alteration the determination is uncertain. A microscopic examination of the porphyry of the wall shows that the feldspars are sericitized and that a little carbonate has been introduced, but the rock is as fresh as other specimens from the islands of Confederation lake. On K.R.L. 4,089,stripping shows what appears to be a breccia due to a green dike intruding the porphyry. A piece of the porphyry from this breccia is much more altered, the feldspar in places being largely replaced by a mixture of carbonate and sericite. Other nearby strippings on these claims show a green rock, like the above-mentioned dike, with numerous small quartz veins in it. A thin section of this rock showed it to be almost entirely carbonate and chlorite. No original minerals could be distinguished.

Hill and Hogarth.—A short distance from the east shore of Lost bay and just south of Gill's base line, a vein outcrops. A forest fire during the summer of 1926 removed all vegetation from the rocks here so that they and the vein are well exposed. The rocks are pillow lavas and associated breccias. The vein is continuous, being traceable southward (strike average about 8 degrees) for a distance of 60 chains to a swamp, under which it disappears. It is narrow throughout, being a mere stringer at the north and having a maximum width of about four feet. Over most of its length it is minutely contorted, the banding showing this up distinctly, and is but sparingly mineralized. The walls and the schist, which is in some places included in the vein, are rusty-weathering, due to carbonate. There appears to be a little native gold in the vein.

The vein lies practically on the boundary between claims K.R.L. 4,502, 4,505, 4,583, and 4,585 to the west and K.R.L. 4,503, 4,506, 4,584, 4,586 to the east, the posts being on the vein.

Woman Lake

On the west shore of Woman lake immediately north of the narrows on claim K. 1,829 of the Woman Lake Centre Syndicate group, there is a narrow vein striking 170 degrees and dipping vertically. When the claim was visited in July, this vein had been stripped and opened in two places. In the more northerly of these, it was about five inches wide; a little south it becomes two parallel veins, a foot and a half apart. They pinch and swell, the widths ranging from four inches to a foot. The vein, which is banded, is mineralized with pyrite, sphalerite,

and chalcopyrite; some iron-rich carbonate is also present. A little fine native gold is visible in the vein. The wall rock is impregnated with fine sulphides and carbonate. Between the two veins at the southern opening, there is a light-green, rusty-weathering dike carrying abundant pyrite. A thin section shows that the dike is now largely carbonate. There is enough feldspar left in patches to show that before the introduction of the carbonate the dike was highly feldspathic. The feldspar was branching, resembling in section frost on a window-pane. The composition was not determinable. It is alkaline, probably a soda feldspar.

Narrow Lake

Dunkin.—In June, 1926, Thos. Dunkin made a discovery on Narrow lake that attracted much attention; it is situated on a narrow peninsula near the west end of the most westerly of the northern bays of the lake. The writer visited the place early in September. A few trenches had been made across the strike over a total length of about four chains. In each of these veins had been exposed, but the trenches were not sufficiently closely spaced to permit joining the veins or forming an idea of the amount of quartz. There are several veins roughly parallel. These are not uniform in width and may be a series of roughly parallel lenses. One of these, which was exposed over a length of about 21 feet and had a width of from three to five feet, showed a good deal of native gold.

The quartz of this vein is of a peculiar bluish colour. The vein is not solid but contains numerous vuglike cavities. In these, there are well-formed crystals of pyrite and a few poorly terminated quartz crystals. Native gold occurs on the walls of some of these cavities and fills tiny cracks extending from them into the quartz. A polished section showed no other mineral with the gold in the crack. A thin section of the quartz shows it to have been much crushed and, judging from the wavy extinction, to be under strain. Thin stringers of white mica cut across the quartz.

Three specimens from the country rock were examined microscopically. One of these, from a place between two veins some 70 feet west of the showing of gold-bearing quartz described above, was found to be completely altered. There is a good deal of chlorite and a little coarse carbonate scattered through a groundmass that is largely quartz, which has evidently been introduced. Irregularly distributed through the quartz there are irregular areas and lanes composed almost entirely of clear, fine-grained alkali feldspar. Another specimen taken a few feet to the north is an altered feldspar porphyry. There are abundant phenocrysts of a feldspar near albite in composition, and one small quartz phenocryst was found in the section. The rock is much altered and contains considerable chlorite and carbonate. A third specimen, from a pit about 12 feet north of the veins, is again a porphyry with feldspar near albite in the groundmass and as phenocrysts. As usual, there is considerable chlorite and carbonate. Quartz veins, with a small amount of carbonate in them, cut the rock. Unfortunately the small amount of rock exposed in the trenches prevents the determination of the geological relations here. These specimens resemble the early feldspar porphyries associated with the lavas. The wall rock of the vein in which the abundant native gold is found is more altered than those described above. It is now a rusty decomposed rock on the surface and evidently largely carbonate.

A small pit, several chains east of the discovery and south of the strike of these veins, also shows gold-bearing quartz.

Car Lake

Bathurst.—This discovery is a short distance west of the northwest bay of Car lake. It is reached by a trail from the small bay of Narrow lake north of the Dunkin discovery, which leads to the south end of Car lake. From here a canoe is used, or a foothpath on the west shore of the lake.

The discovery is what appears to be a broad lens of quartz about 45 feet by 20 feet. On the smoothed surface of and extending into the quartz, there are a number of showings of native gold, the largest of which is about an inch in diameter. These are in a linear arrangement extending over a length of about three feet. The quartz of this lens or dome is fine grained and sugary. Under the microscope it is a uniform-grained mosaic, which is quite unlike the quartz veins already described. Cutting across it are tiny stringers of white mica and chlorite. Feldspar was recognized in the hand specimen. Sulphides are scarce near the gold, but the edge of the lens is well mineralized. Pyrite, sphalerite high in iron, chalcopyrite, and galena were recognized.

When the claims were visited at the end of August, they were being actively prospected. This is made difficult by a heavy covering of drift and bedded sands, which mantles much of the rock. However, several small quartz veins had been found and a larger one, with a maximum width of about 30 feet. On account of the covering, it was not possible at that time to form an idea of the continuity of these veins. A well-mineralized schist zone had also been found a short distance south of the original discovery. The rock here is much decomposed and very rusty. Arsenopyrite and pyrite appear to be the dominant sulphides, although the decomposed nature of the surface makes the identification uncertain. Ancient pillow lavas form the country rock exposed in the neighbourhood of the veins. To the west, the lavas are intruded by massive biotite granite.

There are other veins and schist zones in the neighbourhood. To the north of Car lake a short distance east of the discovery, on a claim staked by C. G. Daimpre, there is a 9-foot quartz vein with a strike of 60 degrees. This is but slightly mineralized. At the northeast corner of the lake, there is a zone of schist, containing quartz stringers, with a strike of 70 degrees and a steep dip to north, which has been stripped, showing about 20 feet at the widest place.

Appendix

Table of Magnetic Declinations, June-July, 1926

(Determinations by J. W. Pierce, O.L.S., D.L.S.)

Station	Longitude	Latitude	Mean declination for day
Keigat lake	92° 08′	51° 24′	4° 34′ W.
Birch Lake river	92 16	51 24	4 44 E.
Shabumeni river	92 25	51 24	6 05 E.
Shabumeni river	92 31	51 25	4 23 E.
Shabumeni lake	92 37	51 20	4 24 E.
South end of portage	92 41	51 16	4 21 E.
Shabumeni lake	92 42	51 17	7 41 E.
Woman lake	92 45	51 10	5 08 E.
Woman lake	92 53	51 05	4 43 E.
Bear lake	92 58	51 03	4 10 E.

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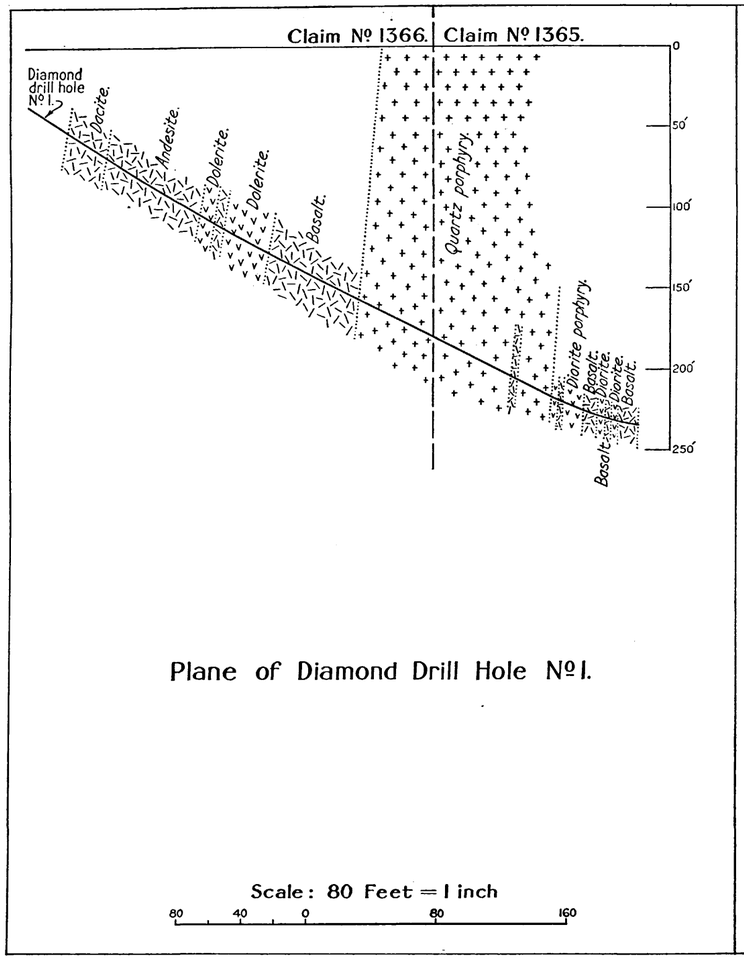
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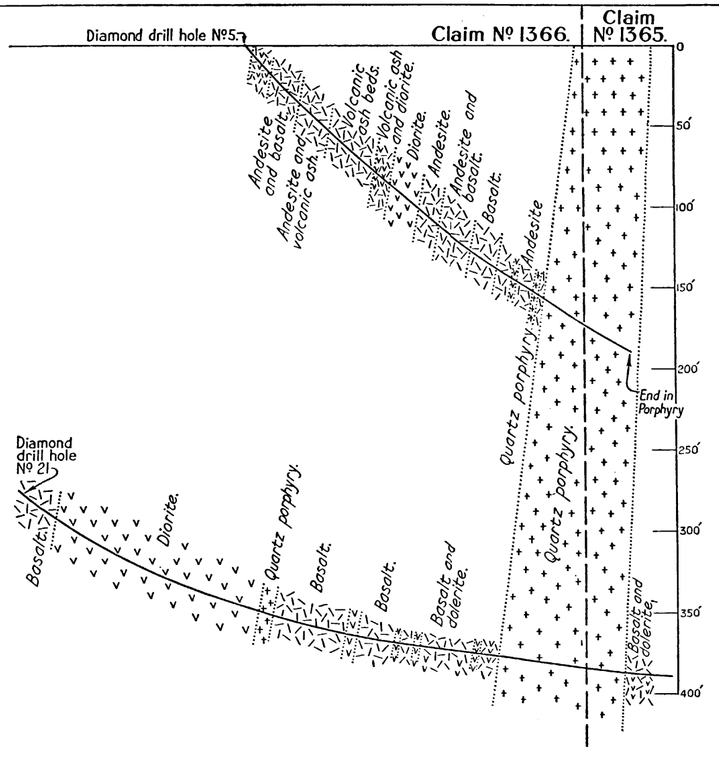
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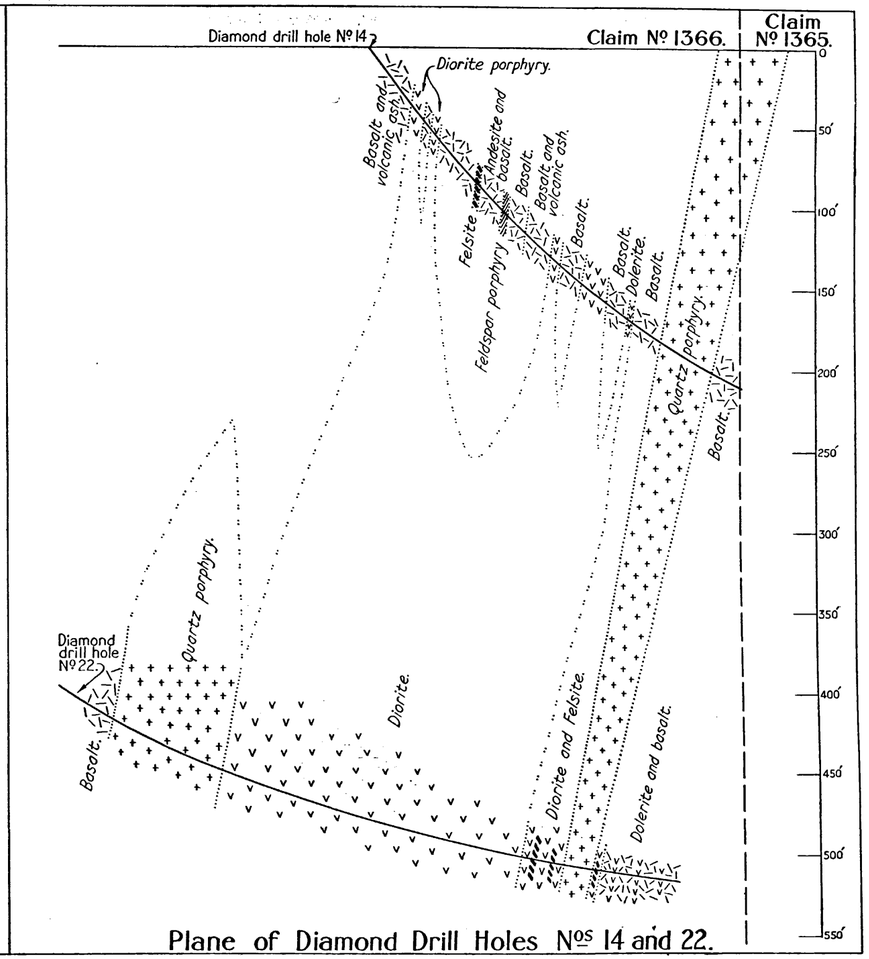
Plane of Diamond Drill Hole Nº 1.

Scale: 80 Feet = 1 inch

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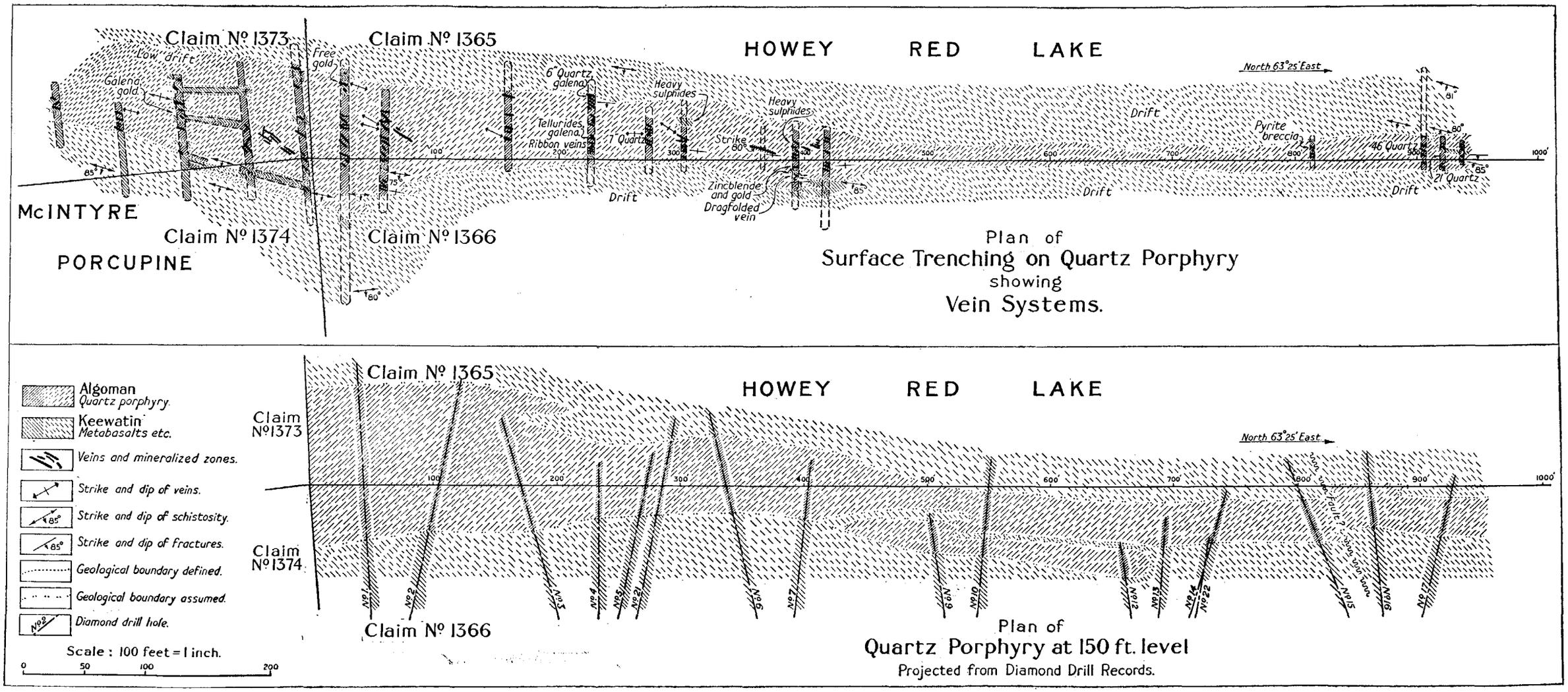


Plane of Diamond Drill Holes Nos 5 and 21.



Plane of Diamond Drill Holes Nos 14 and 22.

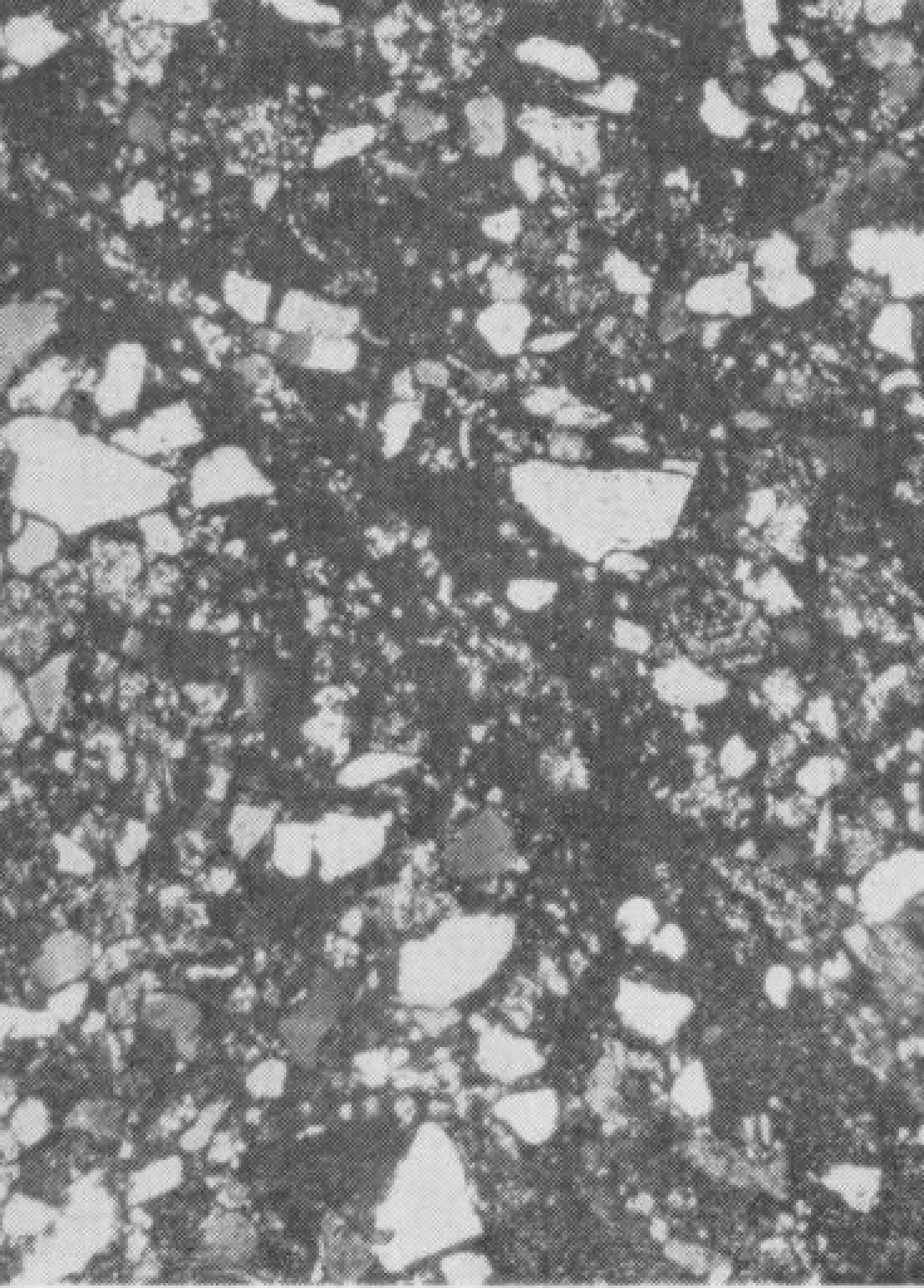
VERTICAL SECTIONS OF QUARTZ PORPHYRY ORE BODIES, HOWEY RED LAKE GOLD MINES.

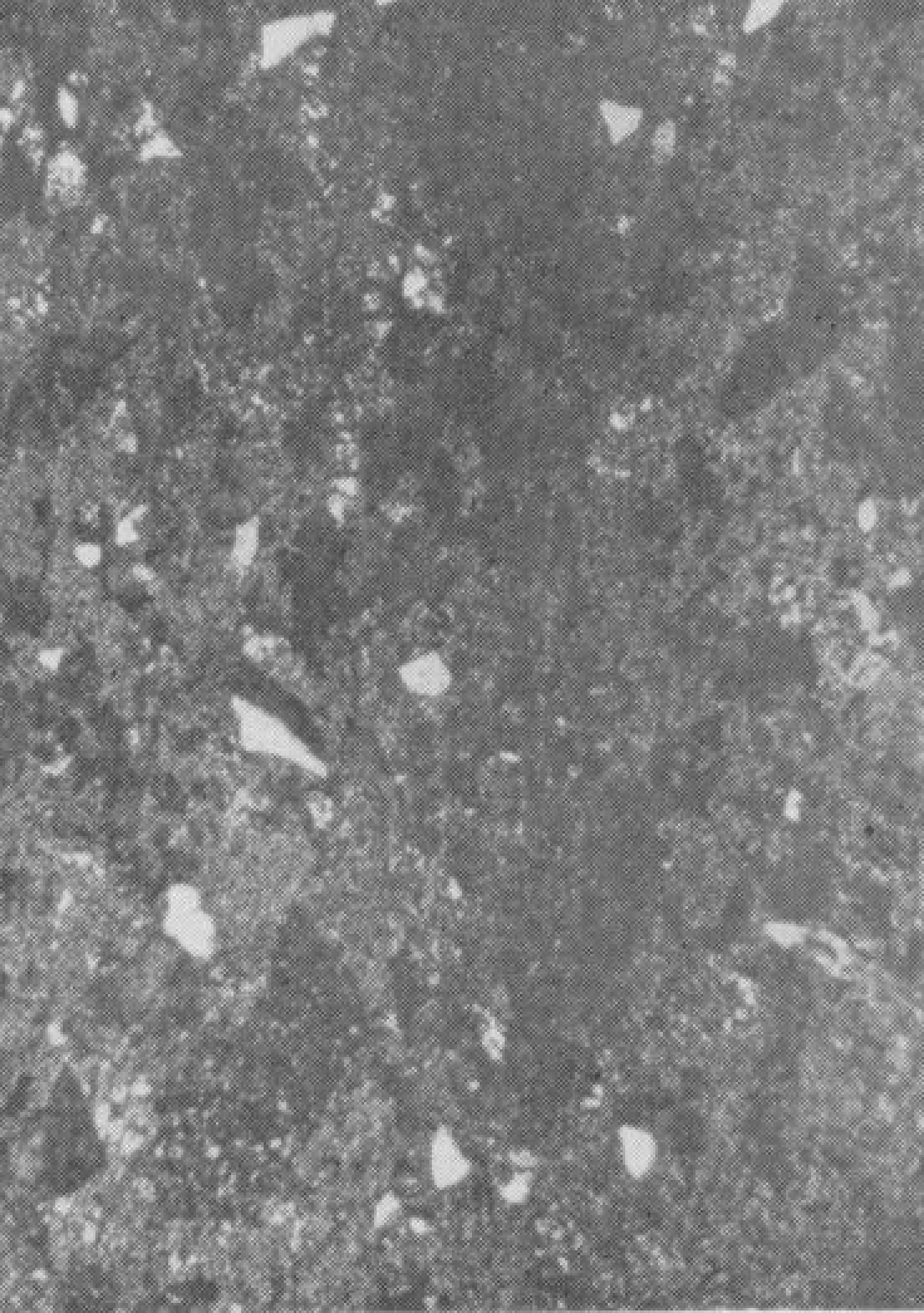

Claim Nº 1373
Claim Nº 1365
HOWEY RED LAKE
Low drift
Free gold
Galena gold
6" Quartz galena
Heavy sulphides
Tellurides galena Ribbon veins
7' Quartz
Heavy sulphides
Strike 80°
North 63°25' East
Drift
Pyrite breccia
46' Quartz
21' Quartz
Zincblende and gold
Dragfolded vein
McINTYRE
Claim Nº 1374
Claim Nº 1366
PORCUPINE
Plan of
Surface Trenching on Quartz Porphyry
showing
Vein Systems.
Algoman
Quartz porphyry.
Keewatin
Metabasalts etc.
Veins and mineralized zones.
Strike and dip of veins.
Strike and dip of schistosity.
Strike and dip of fractures.
Geological boundary defined.
Geological boundary assumed.
Diamond drill hole.
Scale : 100 feet = 1 inch.
Claim Nº 1373
Claim Nº 1374
Claim Nº 1365
Claim Nº 1366
HOWEY RED LAKE
North 63°25' East
Cross Fault?
Plan of
Quartz Porphyry at 150 ft. level
Projected from Diamond Drill Records.

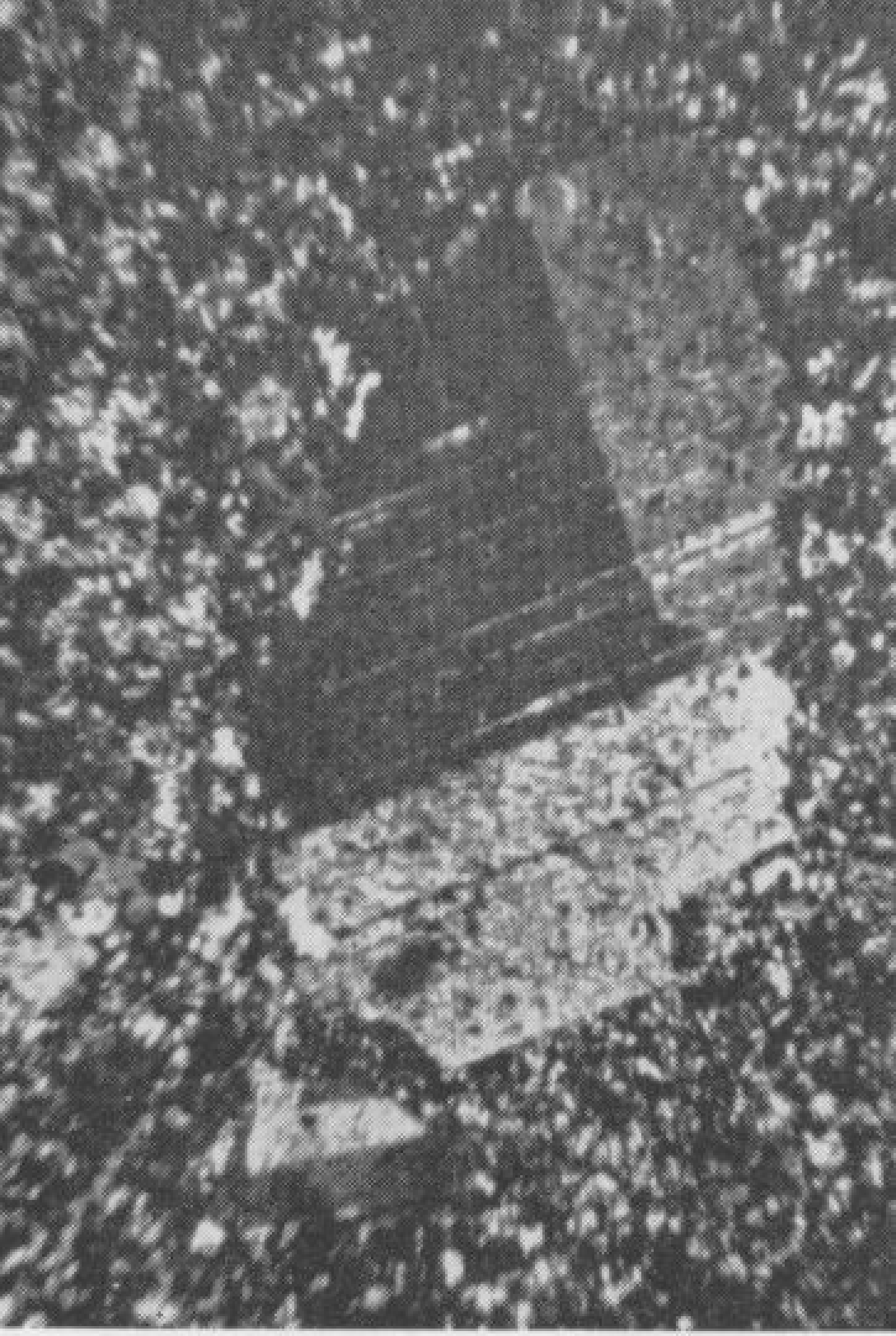

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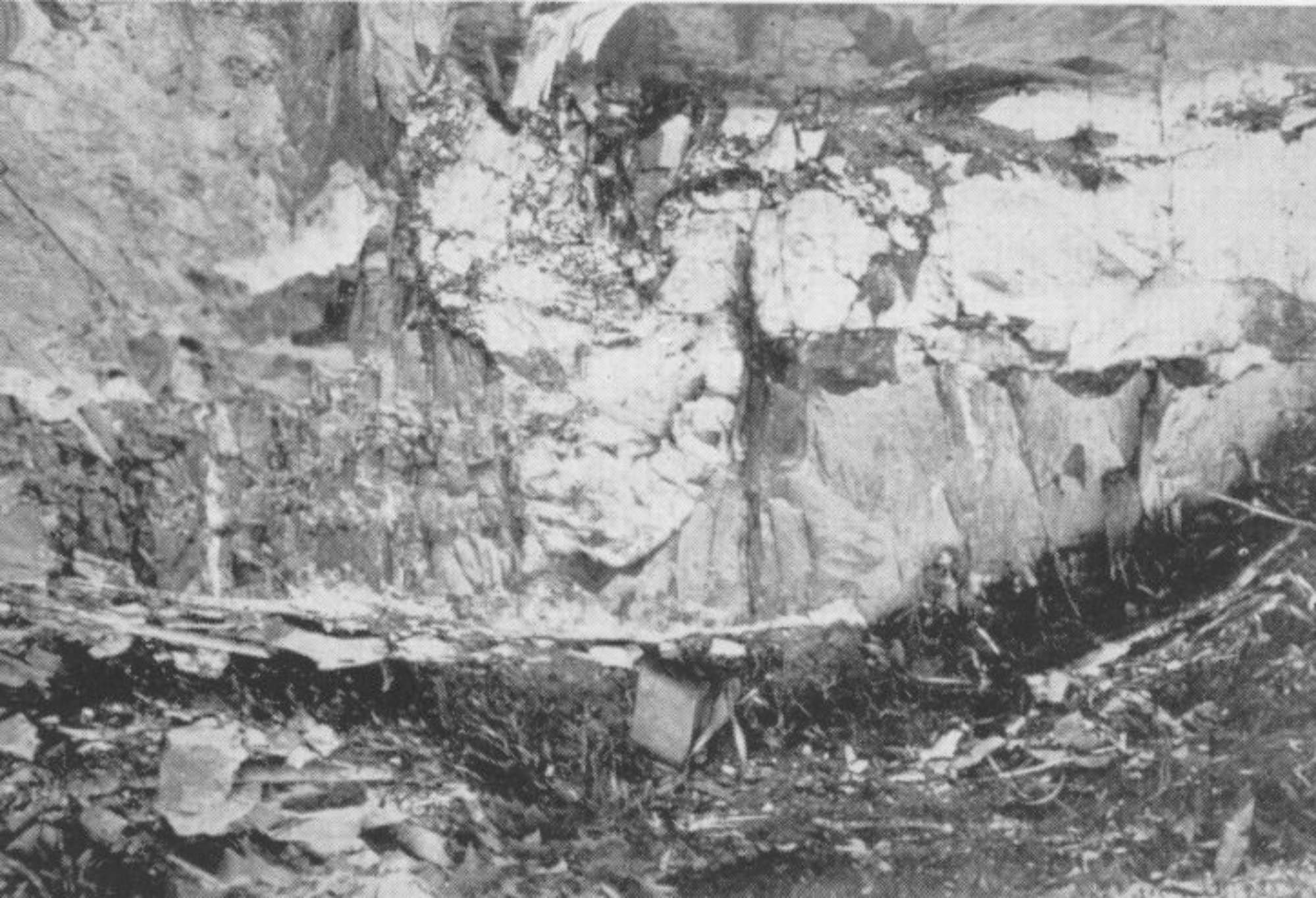















Rowe Lake
Woman Lake
Quartz Lake




Springpole
Lake



PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. CHAS. MCCREA, *Minister of Mines* THOS. GIBSON, *Deputy Minister*

THIRTY-SIXTH ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. XXXVI, PART IV, 1927

Natural Gas in 1926

AND

Petroleum in 1926

By

R. B. Harkness, Commissioner of Natural Gas

PRINTED BY ORDER OF
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NATURAL GAS IN 1926

By R. B. Harkness

General

The total production of natural gas in Ontario in 1926 was 7,776,496 thousand cubic feet with a value of $4,415,918. This is an increase of 507,837 thousand cubic feet over the 1925 production. The number of wells in operation is 2,126, and the number of producing wells drilled, 86. The total open flow of these was 13,996 thousand cubic feet. The comparison by fields is given below.

TABLE I—NATURAL GAS PRODUCTION BY FIELDS IN 1925 AND 1926

County	Field	1925	1926
		M cu. ft.	M cu. ft.
Essex	Kingsville	4,966,207	5,365,423
Kent	Tilbury		
	Dover	126,687	159,136
Lambton	Dawn	50,913	14,937
	Oil Springs		
Middlesex	Crumlin	2,030	.....
Elgin	Bayham	140,231	36,794
Lincoln	Lincoln		
Haldimand	Haldimand	1,544,348	1,782,950
Wentworth	Wentworth		
Norfolk	Norfolk		
Brant	Onondaga	979	12,275
Welland	Welland	294,843	276,259
Bruce	Amabel	650	650
Wells in surface drift	Howard and Sarnia	70,386	68,072
Private wells	.....	60,000	60,000
Total	.....	7,257,274	7,776,496

The winter of 1926-27 was milder than the average winter in the western peninsula of Ontario, consequently there was no excessive use of gas during short periods as in past winters. The demand was moderate but steady, and on the whole greater than last year; this was because during the mild weather gas heaters or grates would be lighted to warm up the houses and save the considerable amounts of coal which would be consumed in forcing the furnace fires. The use of coal instead of gas for central heating, supplemented by gas heaters or grates to increase the temperature in certain rooms, is becoming more general, particularly as the removal of hydrogen sulphide from the gas supplied from the Kent (Tilbury) field has made possible the use of grates and heaters. The gas companies have made a great effort to encourage the use of coal furnaces and the restriction of gas to the supplementary heaters. In past winters the large, centrally heated houses had much larger service lines than the average dwelling and consequently always had gas when very little or none at all would pass through the small service lines, but the use of the gas grate and the increase

in natural gas rates has caused the owners of most of these large buildings to use coal in their furnaces instead of gas. On the other hand some smaller houses are being heated entirely by gas under thermostatic control. One company has tried out a unit designed for use in a garage and reports it as successful, inexpensive, and economical.

The improvements in the gas fields and along the transmission lines has had its effect. The work of cleaning out the accumulated salt and paraffin from the gas wells in the Tilbury field by exploding a charge of dynamite in the bottom of the well, which was begun in 1924, is being continued and has brought to life many wells that were thought to be exhausted. Connecting all transmission lines at the point where the gas from the wells is purified has made the distribution of gas more flexible, and sudden demands from any quarter can be met more easily than in past years.

The educational work in the elimination of waste and the unnecessary use of gas in the household and the sale of improved stoves and other appliances has produced excellent results and, coupled with the intensive search for leaks in the pipe lines and distribution plants, has made available a great quantity of gas that in past years was wasted.

The use of gas for power purposes, for baking, and in fact for all industrial purposes is slightly on the increase; most of the requests for an increased allotment of gas is based on a business expansion which is in line with the general prosperity of the country. New permits granted are for the same purposes as in the past.

Considerable success has been attained in extending the present gas fields, especially in North Cayuga township, Haldimand county, and in Dawn township, Lambton county.

A study of soil corrosion in wrought-iron and steel pipe has led to the use of corrosion-arresting materials for coating and wrapping pipes that are buried underground.

Work of the Year

The work of the employees of the Department consisted mainly of inspections of wells being drilled or plugged, defective wells, low-pressure distributing plants and high-pressure mains, and checking the measurements of gas and the leakage of all pipe lines. A number of defunct gas companies left wells that required considerable attention and gas lines that were wasting their assets.

A number of inspections of the premises of free consumers were made following a complaint or a request for an allotment greater than was allowed under Order No. 26;[1] this inspection was extended to as many other premises affected by this order as time permitted.

Low-pressure plants inspected during the year were as follows:—

Aylmer (2)	Fenwick	Port Dover	Tilbury
Bridgeburg	Galt	Ridgeway	Thorold
Caledonia (2)	Hagersville	Simcoe	Woodstock
Courtright	Leamington (2)	St. Catharines	Windsor
Canfield	Niagara Falls	St. George	Welland
Dunnville	Pelham	Sombra	Wallaceburg
Essex	Paris	Sarnia	

[1]Ont. Dept. Mines, Vol. XXXV, pt. 5, p. 4.

The annual survey of the rock pressures and open flow of gas wells was undertaken during the summer months. Many of the small companies who had no one on their staffs experienced in the use of the open flow meter were instructed in its use. This meter and the pressure gauges were loaned to any one requiring them. The annual survey of the wells drilled into a gas horizon in the surface drift was made. This survey by the Department is the outcome of an agreement between a group of property owners residing between the towns of Ridgetown and Blenheim, who sell their surplus gas to the company that distributes gas in Ridgetown. The Commissioner of Natural Gas is named as an arbitrator between these owners, in order that each may be protected against the other allowing the pressure in his wells to decline to a point where water may enter and ruin the gas field. Under the agreement two of these wells were disconnected from the pipe line, and one was refused the privilege of selling gas.

A thorough inspection of all industries using gas was carried out, and many were found to be using more than was permitted. These cases were adjusted according to the needs of the industries, a new allotment being given where needed; this adjustment is necessary owing to the fluctuation in supply and demand in industry.

A few more samples of gas were collected and sent to the Mines Branch in Ottawa for analysis, particularly for their helium content.

One complaint of gas shortage was received from the village of Highgate; it was found that water had entered the pipes through a broken service line and frozen, thereby stopping the flow of gas. Temporary repairs relieved the situation.

Analysis of Gas Consumption

Tables II and III give details which show everything of interest concerning the gas consumed in Ontario. By comparing these tables with those published in previous years, the history of prices and quantity consumed can be traced from year to year. It will be found of interest to note the changes in the ratio of gas used to the price charged from year to year.

TABLE II—GAS CONSUMPTION IN TOWNS AND CITIES, 1926

Town or city	Population	No. of consumers		Quantity consumed, M cu. ft.			Distance from gas field	Net rate per M cu. ft.
		Pay	Free	Pay	Free	Industrial		
							miles	
Aylmer	2,300	681	....	32,925	.....	.....	16	$0.90–$1.10
Bartonville	300	49	....	2,102	.....	.....	18	.60
Belle River	800	162	....	17,921	.....	671	29	.55– .85
Belmont	350	60	....	749	.....	.....	9	.90
Binbrook	100	13	....	2,300	.....	.....	1	.25– .40
Blenheim	1,560	533	1	61,936	157	1,010	20	.50– .75
Brantford	30,190	3,351	5	89,736	1,853	7,775	140	.80
Bridgeburg and Fort Erie	4,221	955	5	33,579	3,279	.....	8	.70
Brigden	300	156	....	14,399	.....	1,711	30	.50– .75
Cainsville	400	53	....	2,756	.....	.....	4	.80
Caledonia	1,326	520	....	57,807	.....	.....	7	.60
Canfield	200	30	....	3,168	.....	.....	1	.40
Cayuga	752	207	1	22,525	62	438	6	.60
Chatham	15,600	3,550	....	533,046	.....	.....	22	.50– .75
Chippawa	1,100	121	....	3,635	.....	.....	5	.40– .70
Comber	608	144	....	16,590	.....	1,687	19	.50– .75
Cottam	300	84	....	10,901	.....	586	35	.40– .55
Courtland	400	45	....	2,839	.....	107	3	.60– .85
Courtright	441	123	1	14,090	200	140	49	.50– .75
Crystal Beach	252	69	....	4,053	.....	.....	1	.70
Delhi	750	246	....	20,013	.....	1,056	4	.60
Dorchester	360	96	....	7,972	.....	.....	95	.60– .75
Dresden and Tupperville	1,450	487	1	57,299	99	503	30	.50– .75
Dundas	5,000	1,016	2	36,930	565	1,174	172	.70
Dunnville	3,705	973	3	114,334	786	14,523	7	.40– .60
Dutton	825	243	3	28,744	106	701	52	.55– .70
Echo Place	200	122	....	6,466	.....	.....	3	.80
Eden	88	26	....	1,822	.....	.....	11	.60
Essex	1,600	473	1	66,266	114	4,758	33	.50– .85
Fairground	40	16	....	709	.....	.....	1	.60
Fenwick	164	86	....	5,444	.....	.....	18	.75
Fingal	460	46	1	4,424	82	992	71	.55– .70
Fisherville	72	54	....	6,668	.....	455	2	.45– .50
Fonthill	740	191	....	8,576	.....	.....	25	.95–1.20
Galt	13,222	974	1	42,389	242	4,615	147	.80
Grimsby	1,910	12	....	350	.....	.....	14	1.25
Hagersville	1,200	391	....	39,617	.....	.....	13½	.60
Hamilton	121,000	426	....	19,605	.....	412,030	47	.75–1.00
Hamilton West	.....	114	....	2,220	.....	.....	47	.75
Hepworth	330	20	....	650	.....	.....	1	.60
Highgate	410	118	1	14,283	119	.....	32	.50– .65
Ingersoll	5,000	949	1	52,181	284	1,166	100	.80
Jarvis	500	194	....	23,702	.....	.....	9	.60
Kingsville	3,500	711	1	113,113	298	3,396	30	.40– .55
Lake Shore	.....	293	....	6,789	.....	.....	16	.70
Lambeth	475	94	....	5,697	.....	.....	84	.60– .75
Leamington	4,200	1,387	....	222,541	.....	3,768	20	.50
Lyndoch	151	42	....	3,414	.....	1,756	2	.60
Mabee	82	10	....	757	.....	.....	1	.60
Merlin	350	154	1	19,973	306	1,283	2	.50– .75
Nelles	55	25	....	2,411	.....	444	1	.50
Niagara Falls	15,400	2,533	....	40,527	.....	.....	11	.75
Oil Springs	500	116	....	8,959	.....	.....	2	.75
Paris	4,345	472	1	18,798	192	1,523	109	.80
Petrolia	2,836	743	....	99,507	.....	.....	60	.55– .80
Port Burwell	700	241	....	17,595	.....	.....	3	.60
Port Colborne and Humberstone	5,500	1,501	....	78,756	.....	9,274	5	.60– .95
Port Dover	1,575	521	....	51,414	.....	632	1	.60
Port Rowan	640	254	....	19,843	.....	.....	1	.60
Ridgetown	2,000	640	1	75,025	308	665	28	.50– .75
Ridgeway	700	205	....	11,906	.....	.....	1	.70

TABLE II—GAS CONSUMPTION IN TOWNS AND CITIES, 1926—*Continued*

Town or city	Population	No. of consumers		Quantity consumed, M cu. ft.			Distance from gas field	Net rate per M cu. ft.
		Pay	Free	Pay	Free	Industrial		
							miles	
Rodney	676	237	1	27,505	124	490	40	$0.55–$0.70
Ruthven	438	47	....	7,438	.....	.....	25	.40– .55
St. Ann	90	29	....	1,076	.....	.....	7	.90
St. Catharines	22,000	3,896	3	199,517	674	7,741	35	.60– .75
St. George	569	111	....	4,699	.....	173	148	.80
St. Williams	319	99	....	6, 71	.....	836	1	.60
Sarnia	15,176	4,203	1	388,386	1,102	.....	69	.55– .80
Selkirk	585	135	1	13,176	96	2,592	1	.60
Shedden	409	83	....	7,705	.....	.....	63	.55– .70
Shetland	80	19	....	1,555	.....	.....	3	.40
Simcoe	4,000	1,493	3	201,514	421	14,224	20	.60
Smithville	332	170	....	6,571	.....	.....	6	.80
Sombra and Port Lambton	2,000	191	....	17,896	.....	625	45	.55– .80
Stevensville	423	31	....	1,915	.....	.....	1	.70
Straffordville	215	81	....	8,197	.....	224	6	.60
Tecumseh	1,200	238	....	28,111	.....	.....	50	.55– .80
Thorold	7,624	703	....	34,939	.....	.....	35	.60– .75
Tilbury	2,000	411	1	46,033	194	499	17	.50– .75
Tillsonburg	3,086	940	1	82,320	322	1,815	16	.60– .85
Vienna	284	78	1	4,914	48	54	1	.60– .80
Vittoria	260	74	....	5,650	.....	.....	3	.60
Wallaceburg	4,530	1,043	1	133,414	197	108,735	27	.50– .75
Wallacetown	254	50	1	4,648	23	622	60	.55– .70
Welland	8,646	2,181	1	88,922	236	.....	3	.70
Wellandport	141	30	1	608	250	.....	3	.70– .75
West Lorne	818	222	3	25,567	211	660	49	.55– .70
Wheatley	647	236	....	26,213	.....	1,039	12	.50– .65
Windsor (Border Cities)	60,625	9,129	1	1,067,394	279	13,930	44½	.55– .80
Woodstock	10,196	1,579	1	68,735	317	2,423	110	.80
Total	.....	55,860	52	4,796,328	13,546	635,521	.....	.....

TABLE III—GAS CONSUMPTION IN TOWNSHIPS, 1926

Township	Population	No. of consumers		Quantity consumed, M cu. ft.			Net rate per M cu. ft.
		Pay	Free	Pay	Free	Industrial	
ESSEX:							
Gosfield, North	2,190	125	4	15,966	543	.....	$0.40–$0.55
Gosfield, South	2,301	248	2	41,682	472	52,753	.40– .50
Maidstone	2,099	68	7	7,166	1,693	766	.55– .80
Rochester	1,951	194	7	18,811	2,197	1,133	.55– .80
Sandwich, South	1,423	78	.....	9,412	.....	757	.55– .80
Sandwich, West	2,764	12	.....	1,970	.....	.....	.55– .80
Sandwich, East	1,090	215	.....	25,723	.....	.....	.55– .80
Mersea	3,835	280	2	50,052	340	53,457	.40– .50
Tilbury, North	1,788	17	2	1,502	456	72	.50– .75
Tilbury, West	1,543	20	.....	1,455	.....	.....	.50– .75
LAMBTON:							
Enniskillen	2,666	68	.....	6,371	.....	986	.55– .80
Moore	3,215	318	.....	28,419	.....	2,346	.50– .75
Sombra	2,857	48	.....	5,130	.....	307	.50– .75
Sarnia	2,540	5	8	500	2,447	.....	.45
Euphemia	1,385	.....	8	.....	2,000	.....	.45
Dawn	2,317	37	4	4,251	1,115	.....	.40– .65
KENT:							
Raleigh	3,671	644	28	79,673	8,102	573	.40– .65
Tilbury, East	2,914	220	82	25,314	23,638	4,171	.40– .65
Romney	1,500	103	38	12,915	9,743	.....	.40– .65
Harwich	4,372	415	9	44,362	4,881	.....	.50– .65
Orford	1,870	21	3	3,742	296	.....	.50– .65
Howard	2,768	182	4	23,070	971	.....	.50– .65
Chatham	4,935	81	.....	9,776	.....	1,222	.50– .75
Camden	2,078	9	.....	669	.....	.....	.50– .75
Dover	3,606	382	1	48,648	146	1,515	.40– .65
ELGIN:							
Aldborough	2,837	27	1	2,958	408	.....	.55– .70
Dunwich	2,522	58	.....	6,191	.....	.....	.55– .70
Southwold	3,510	108	.....	9,720	.....	1,584	.55– .70
Malahide	2,953	49	3	2,009	412	.....	.80
Bayham	3,112	76	16	3,924	2,944	.....	.60– .80
MIDDLESEX:							
Westminster	6,122	127	.....	13,612	.....	.....	.60– .85
Dorchester, North	3,056	26	.....	1,693	.....	.....	.50– .85
NORFOLK:							
Middleton	2,037	5	6	476	1,013	.....	.60
Walsingham, South	1,781	7	7	896	1,227	.....	.60
Walsingham, North	1,424	5	4	667	664	.....	.60
Charlotteville	2,512	4	4	483	691	.....	.60
Windham	3,005	2	3	208	395	.....	.60
Woodhouse	1,964	161	13	15,952	2,201	.....	.60
Townsend	3,694	32	.....	3,813	.....	.....	.60
BRANT:							
Onondaga	1,017	53	16	3,241	3,006	.....	.50– .80
Dumfries, South	2,532	7	.....	445	.....	.....	.80
Brantford	7,220	7	.....	327	.....	.....	.80
Burford	3,833	2	.....	385	.....	.....	.80
OXFORD:							
Oxford, West	1,810	18	.....	1,571	.....	.....	.80
Oxford, East	1,724	10	.....	668	.....	.....	.80
HALDIMAND:							
Canborough	902	83	43	6,837	8,303	.....	.40– .60
Moulton	1,628	137	45	10,505	8,935	.....	.30– .60
Seneca	1,561	132	52	13,202	8,188	.....	.60
Cayuga, North	1,309	51	20	4,503	3,804	.....	.40– .60
Cayuga, South	509	60	19	4,079	3,656	.....	.60

TABLE III—GAS CONSUMPTION IN TOWNSHIPS, 1926—*Continued*

Township	Population	No. of consumers		Quantity consumed, M cu. ft.			Net rate per M cu. ft.
		Pay	Free	Pay	Free	Industrial	
HALDIMAND—*Continued*							
Rainham	1,690	150	28	13,036	4,882	541	$0.50–$0.60
Sherbrooke	277	51	11	4,346	1,772	.....	.50– .60
Dunn	796	123	11	9,970	2,780	.....	.60
Walpole	3,042	287	51	28,073	8,583	926	.45– .60
Oneida	1,287	66	11	6,733	2,154	.....	.40– .60
LINCOLN:							
Caistor	1,220	47	3	4,851	518	130	.60
Gainsborough	2,091	13	.....	391	.....	.....	.75
Grimsby	2,236						.75
Louth	2,548	9	.....	572	.....	.....	.75
Grantham	4,175	15	1	949	217	.....	.75
WELLAND:							
Wainfleet	2,357	119	37	6,822	6,872	.....	.40– .75
Humberstone	2,047	126	48	7,574	8,010	.....	.70– .80
Bertie	3,298	113	68	6,912	11,705	.....	.70
Pelham	2,359	57	7	3,608	1,922	.....	.75
Thorold	3,369	5	1	390	217	3,615	.85
Willoughby	865	29	29	1,735	4,916	.....	.70
Crowland	3,748	59	23	4,635	4,688	.....	.70– .80
Stamford	4,896	173	3	4,742	513	.....	.70
WENTWORTH:							
Binbrook	1,098	72	23	8,688	4,062	847	.50
Glanford	1,417	121	10	17,173	1,645	629	.50
Barton	7,658	1,087	2	86,917	250	16,561	.60– .75
Ancaster	4,524	53	.....	4,290	.....	.....	.70
Saltfleet	4,682	23	.....	1,842	.....	26	.60
Total	.....	7,835	828	799,193	170,548	144,917	.....

SUMMARY	M cu. ft.
Total distribution	6,560,053
Used by private well owners	74,000
Used by companies for all purposes	41,735
Leakage on transmission lines	534,324
Leakage in distribution plants	305,921
Leakage on rural lines	41,482
Leakage or loss on purchased gas	218,981
Total amount of gas produced	7,776,496

Leakage

Tables IV, V, and VI show the leakage that is measured from both high and low pressure pipe lines. The high-pressure lines have been put so far as possible under the heading of transmission lines, and the lower pressure under distributing lines, rural and urban. The urban distributing plants, however, carry a lower pressure than the rural lines.

The gas that passes through the majority of transmission lines in Welland, Haldimand, and Norfolk counties has never yet been measured, mainly on account of the small percentage of the pipe line that lies outside the gas field. It is possible to measure the gas through these lines after they pass outside the gas fields, and an inquiry is now being made into the practicability of doing so. If the unmeasured leakage were added, it would probably increase the leakage total by at least 25 per cent.

TABLE IV—LEAKAGE IN DISTRIBUTION PLANTS, 1926

Cities and towns	Company	Equivalent miles of 3-inch pipe in distribution plants	Volume received	Volume delivered	Leakage for year		Average No. of consumers	Leakage per consumer	Pressure distribution plants, ounces per per sq. in.
					Actual	Allowable			
			M cu. ft.	M cu. ft.	M cu. ft.	M cu. ft.		cu. ft.	
Belle River	Union Natural Gas Co	3.25	20 291	18,590	1,701	650	162	10,500	6
Belmont	Ontario Salt Co	.67	1,695	969	726	134	60	12,100	6
Blenheim	Union Natural Gas Co	11.1	68,391	60,233	8,158	2,225	523	15,306	5
Brantford	Brantford Gas Co	91.53	115,807	99,412	16,395	18,306	3,261	5,013	4–5
Brigden	Union Natural Gas Co	3.4	18,261	16,108	2,153	680	156	13,801	5
Chatham	Chatham Gas Co	54.5	548,023	533,046	14,977	10,900	3,650	4,103	5
Comber	Union Natural Gas Co	2.75	19,378	18 275	1,103	550	144	7,659	6
Courtright	Union Natural Gas Co	2.8	14,753	14,447	306	575	123	2,488	5
Dresden	Union Natural Gas Co	12	65,143	58,595	6,548	2,400	487	13,445	4
Dundas	Dominion Natural Gas Co	11.83	46,640	38,887	7,753	2,366	1,034	7,498	4–5
Dunnville	Dominion Natural Gas Co	13.17	128,721	117,815	10,906	2,634	984	11,083	5
Eden	Dominion Natural Gas Co	.48	1,986	1,940	46	96	48	958	5
Essex	Union Natural Gas Co	7.4	74,005	71,121	2,884	1,475	473	6,097	5
Fenwick	United Gas Companies	2.9	8,541	6,667	1,874	418	98	19,122	5–6
Galt	Dominion Natural Gas Co	30.59	53,540	47,289	6,251	6,118	1,008	6,201	4–5
Hagersville	Dominion Natural Gas Co	7.24	49,620	39,617	10,003	1,448	389	25,714	5–6
Ingersoll	Dominion Natural Gas Co	22.14	54,921	51,923	2,998	4,428	913	3,283	5
Kingsville	Southern Ontario Gas Co	14.59	125,057	115,425	9,632	2,918	737	13,069	5–6
Leamington	Corp. Town of Leamington	25.47	256,177	226,309	29,868	5,094	1,316	22,696	6–10
Merlin	Union Natural Gas Co	2.85	25,126	22,931	2,195	575	154	14,253	6
Paris	Dominion Natural Gas Co	13.54	27,115	20,697	6,418	2,708	487	13,178	5
Petrolia	Petrolia Utilities, Ltd	26.5	110,878	99,507	11,371	5,300	740	15,366	6
Port Burwell	Dominion Natural Gas Co	3.83	13,569	11,224	2,345	766	141	16,631	5
Ridgetown	Union Natural Gas Co	19.7	87,575	78,072	9,503	3,540	640	14,848	5
St. Catharines	United Gas Companies	52.98	214,351	206,873	7,478	10,596	3,914	1,911	4
St. George	Dominion Natural Gas Co	2.11	5,785	4,766	1,019	422	113	9,017	5
Sarnia	Union Natural Gas Co	90	451,874	389,475	62,399	18,000	4,200	14,857	5
Shedden and Fingal	Southern Ontario Gas Co	5.15	13,102	12,585	517	1,030	130	3,977	6–7
Simcoe	Dominion Natural Gas Co	29.26	212,723	209,810	2,913	5,852	1,702	1,124	4–5
Sombra	Union Natural Gas Co	2	9,344	9,192	152	400	86	1,767	5
Straffordville	Dominion Natural Gas Co	1.34	9,286	8,421	865	268	81	10,679	5–6
Thorold	United Gas Companies	10.97	39,523	34,939	4,584	2,194	752	6,096	5
Tilbury	Union Natural Gas Co	8.5	50,106	47,012	3,094	1,700	411	7,528	5
Vienna	Dominion Natural Gas Co	1.04	1,926	1,278	648	208	17	38,117	6
Wallaceburg	Wallaceburg Gas Co	22	147,361	139 030	8,331	4 400	1 047	7,957	6
Windsor	Windsor Gas Co	151.5	1,120,297	1,081 603	38 694	30 300	8,430	4,590	4
Woodstock	Dominion Natural Gas Co	47.81	80,596	71,483	9,113	9,562	1,579	5,771	4–5
Total					305,921				

TABLE V—LEAKAGE ON RURAL LINES, 1926

Township	Equivalent feet of 3-inch pipe in all rural lines	Volume received	Volume delivered	Leakage for year		Average No. of consumers	Leakage per consumer	Average pressure on pipe lines	
				Actual	Allowable			Low pressure	High pressure
		M cu. ft.	M cu. ft.				cu. ft.	ozs.	lbs.
Chatham	7,587	6,409	6,189	220	288	49	4,489	7	3
Dover	108,539	49,558	43,551	6,007	4,025	316	19 000	6	7
Enniskillen	7,541	9,142	7,783	1,359	284	40	33,975	7	6
Harwich	108,731	45,241	42,246	2,995	4,120	421	7,114	7	4½
Howard	16,403	11,691	11,407	284	620	92	3,087	7	4
Moore	21,972	16,704	15,011	1,693	832	200	8,465	6	4½
Raleigh	102,600	50,336	43,619	6,717	3,862	322	20,860	7	6½
Raleigh (Blake system)	67,531	27,428	12,560	14,868	2,588	127	117,071	14	20–40
Rochester	30,652	27,201	24,608	2,593	1,163	168	15,434	7	7
Sandwich, East	1,596	6,805	6,441	364	60	51	7,137	6	.....
Sandwich, South	4,089	3,488	3,379	109	156	32	3,406	8	10
Sandwich, West	2,508	3,687	3,631	56	96	35	1,600	7	.....
Sombra	3,042	1,023	900	123	116	16	7,687	6	.....
Tilbury, East	35,130	32,789	29,242	3,547	1,330	180	19,705	7	5½
Muirkirk line	4,963	1,824	1,277	547	188	22	24,864	8	.....
Total	420,284	293,326	251,844	41,482	19,728	2,071	.....	.....	.....

TABLE VI—LEAKAGE IN TRANSMISSION LINES, 1926

Transmission line	Size of pipe line	Equivalent miles of 3-in. pipe	Volume received	Volume delivered	Actual leakage	Average pressure on pipe lines
			M cu. ft.	M cu. ft.	M cu. ft.	lbs. per sq. in.
Dundas to Hamilton	6-inch	7.6	721,068	639,249	81,819	15
Gas field to Sarnia and Petrolia	6-, 8-, 10-, 12-in.	.....	1,169,228	1,108,828	60,400	40–80
Dunnville to St. Catharines	8-inch	57.1	247,548	217,844	29,704	40
Gas field to Kingsville	6-, 10-inch	84.5	1,120,571	1,038,642	81,929	50–80
Gas field to Hamilton	10-, 12-inch	626	989,936	898,158	91,778	50–110
Gas field to Chatham	8-inch	40.5	637,462	594,812	42,650	30–75
Gas field to Windsor	8-, 10-inch	227.8	1,500,465	1,378,431	122,034	30–120
Gas field to Ridgetown	6-inch	54	270,752	249,304	21,448	30–80
Gas field (Dunn Tp.) to Dunnville	4-inch	4.6	12,831	10,269	2,562	5–20
Total	.....	.....	.....	.....	534,324	.....

Gas Wells and Their Production

The number of gas wells reported in the year 1926 and the quantity of gas that these wells delivered is shown in Table VII. These quantities are arrived at by adding the measured leakage to the total sold to consumers; but, as stated previously, in the Norfolk, Haldimand, and Welland fields, the wells are scattered, and it is not practical to measure the gas until it is collected into a main pipe line. There is, therefore, probably a hundred miles of pipe line on which no leakage is measured. As this cannot be measured with any accuracy, it is not considered.

It will be noted that there is an increase in the production of the Tilbury field and the Haldimand-Norfolk field. This is due to a general increase in the business of the gas companies. The improvement in appliances and in general service has created a greater demand for gas.



The photograph shows the results of an explosion of natural gas in the cellar of the home of Mr. D. M. Lee, on the outskirts of the city of Paris. A leakage of gas from an outside source found its way up a drain-pipe into the cellar, and a match ignited it. The house was practically a total wreck, as can be seen in the photograph; the brick veneer was completely demolished; fortunately there were no serious casualties.

TABLE VII—GAS WELLS AND THEIR PRODUCTION, 1926

County	Township	No. of wells producing	No. of wells abandoned	Wells drilled			Production	Rock pressure, lbs. per sq. in.	Acres under lease	Rental paid
				No. dry	No. producing	Open flow				
						M cu. ft.	M cu. ft.			
Essex	Gosfield, South	14			4	354		295	1,110	$215
	Mersea	3						253	534	714
Kent	Romney	105	2		5	1,179	5,365,423	285	12,856	18,694
	Tilbury, East	135	2		2	267		257	12,770	23,572
	Raleigh	15	3					282	1,820	2,904
	Harwich							17		
	Howard							9		
	Dover	7			1	662	159,136	425	6,729	7,130
Lambton	Dawn	6		2	1	1,500	330	700	10,905	8,813
	Enniskillen	3					8,952	130	730	
	Euphemia	6					3,555			
	Sarnia	19					2,100	71	2,000	
Middlesex	Dorchester, North	3						54	200	
Elgin	Bayham	42	1				36,794	174		
	Malahide	2						237		
Norfolk	Houghton	3		1				365		
	Middleton	27	5	4	3	273		396		
	Walsingham, South	15			2	88		409		
	Walsingham, North	5	2	1				448		
	Windham	4						212		
	Charlotteville	16						270		
	Woodhouse	50	5	2	1	147		239		
Haldimand	Townsend	1		1				240		
	Walpole	154	1	1	9	1,145		224		
	Rainham	109	5	2	17	2,513		224		
	Cayuga, North	80	6	3	17			187		
	Cayuga, South	58	5		6		1,782,950	179		

	Oneida	25	3					130		
	Seneca	129	7					120	155,811	51,079
	Canborough	136	7	1				116		
	Dunn	20	1	3	7			173		
	Moulton	103	6					103		
	Sherbrooke	13	1					153		
Wentworth	Binbrook	46	3					70		
	Glanford	21	3					61		
	Ancaster			1						
Lincoln	Caistor	36			1	26		101		
	Gainsborough	2	1	2				121		
Welland	Wainfleet	41	1					121		
	Humberstone	94	2					60		
	Crowland	49	2		2	8	276,259	104		
	Willoughby	36						20		
	Bertie	89	3		1	8		87		
Brant	Brantford			1	1	5				
	Onondaga	30	1		1	9	12,275	87	500	200
	Tuscarora			1						
Bruce	Amabel	2					650	125	800	
Peel	Caledon	3						50	1,000	150
Perth	Logan			1						
Surface wells	Howard, Harwich, Sarnia	69		8	5	5,812	14,000[1] 49,731[2] 4,341	69		
Private wells[3]		300[4]					60,000[4]	300		
Total		2,126	78	35	86	13,996	7,776,496			

[1]This gas is not metered and therefore must be estimated. The wells are owned by private individuals, and the gas is used for their domestic purposes.

[2]This gas is sold to the Union Natural Gas Company, and it was used in Ridgetown and Sarnia.

[3]Principally Haldimand, Norfolk, and Welland counties.

[4]Estimated.

Licenses Issued in 1926

The Natural Gas Conservation Act, 1921, and the Well Drillers' Act, 1925, provide that all operations connected with natural gas and the drilling of oil wells shall be carried on under license. Tables VIII, IX, X, XI, and XII list the names of those to whom these licenses were issued in 1926.

TABLE VIII—OPERATORS LICENSED TO LEASE AND PROSPECT FOR NATURAL GAS, 1926

License No.	Name	Address
237	Blain, E. B.	684 Main St. E., Hamilton, Ont.
225	Central Development Co.	Chatham, Ont.
234	Colchester Oil and Gas Co.	Toronto, Ont.
222	Dominion Natural Gas Co.	518 Jackson Bldg., Buffalo, N.Y.
226	Fisherville Gas Co., Nos. 3 and 4	Fisherville, Ont.
235	Heitbohmer, F.	Stratford, Ont.
240	Hertell, H. W.	c/o Y. M.C.A.,Brantford, Ont.
229	Hoover and May	Selkirk, Ont.
223	Industrial Natural Gas Co.	St. Catharines, Ont.
239	McKillop, Wm.	Hepworth, Ont.
227	McQuillan, M. W.	Dunnville, Ont.
238	McWilliams, D. B.	Toronto, Ont.
219	Medina Natural Gas Co.	Chatham, Ont.
242	Newton, Roy	Petrolia, Ont.
228	Patterson, W. C.	Dunnville, Ont.
220	Peoples Oil and Gas Co.	Chatham, Ont.
233	Petrol Oil and Gas Co.	Toronto, Ont.
241	South Sarnia Properties, Ltd.	Sarnia, Ont.
221	Southern Ontario Gas Co.	518 Jackson Bldg., Buffalo, N.Y.
230	Union Natural Gas Co.	Chatham, Ont.
231	Union Natural Gas Co.	Chatham, Ont.
232	Union Natural Gas Co.	Chatham, Ont.

TABLE IX—OPERATORS LICENSED TO DRILL OR BORE FOR NATURAL GAS, 1926

License No.	Name	Address
206	Barr, R. L.	Sarnia, Ont.
194	Featherstone, C. W.	Dunnville, Ont.
195	Featherstone, C. W.	Dunnville, Ont.
196	Featherstone, C. W.	Dunnville, Ont.
197	Featherstone, C. W.	Dunnville, Ont.
198	Featherstone, C. W.	Dunnville, Ont.
192	Hoover, A. E.	Selkirk, Ont.
193	Hoover, A. E.	Selkirk, Ont.
181	Industrial Natural Gas Co.	St. Catharines, Ont.
199	Jasperson, B.	Kingsville, Ont.
201	Kiser Bros.	Chatham, Ont.
202	Kiser Bros.	Chatham, Ont.
189	Lauer, D.	Tillsonburg, Ont.
185	McCutcheon, T. J.	Dunnville, Ont.
186	McCutcheon, T. J.	Dunnville, Ont.
187	McCutcheon, T. J.	Dunnville, Ont.
188	McCutcheon, T. J.	Dunnville, Ont.
190	McLister, J. J.	Dunnville, Ont.
203	McKillop, Wm.	Hepworth, Ont.
182	Snively, F. L.	90 Melrose Ave., Hamilton, Ont.
183	Snively, F. L.	90 Melrose Ave., Hamilton, Ont.
184	Snively, F. L.	90 Melrose Ave., Hamilton, Ont.
205	Smith, Luke	Oakville, Ont.
200	Spence and Stratton	7607 Second Blvd., Detroit, Mich.
207	South Sarnia Properties, Ltd.	Sarnia, Ont.
191	Union Natural Gas Co.	Chatham, Ont.

TABLE X—OPERATORS LICENSED TO PRODUCE NATURAL GAS, 1926

License No.	Name	Address
355	Attercliffe Gas Co	Wellandport, Ont.
338	Azoff Gas Co	c/o Scott McNinch, Canboro', Ont.
356	Bennett, J. B	Ridgetown, Ont.
343	Bertie Natural Gas Co	Ridgeway, Ont.
351	Canboro Gas and Oil Co	Selkirk, Ont.
334	Coleman, J. A	Wellandport, Ont.
341	Dominion Natural Gas Co	518 Jackson Bldg., Buffalo, N.Y.
332	Dunn Natural Gas Co	Dunnville, Ont.
346	Erie Gas and Oil Syndicate	Fisherville, Ont.
342	Fisherville Gas Co., Nos. 1, 3, and 4	Fisherville, Ont.
337	Industrial Natural Gas Co	St. Catharines, Ont.
333	Jasperson, B	Kingsville, Ont.
335	Medina Natural Gas Co	Chatham, Ont.
357	Midfield Natural Gas Co	Hamilton, Ont.
354	Niece, Hosea, and Son	Lowbanks, Ont.
344	Oil Springs Oil and Gas Co	Oil Springs, Ont.
350	Patterson, W. C	Jamestown, N.Y.
348	Petrol Oil and Gas Co	Toronto, Ont.
336	Pilkington Bros	Thorold, Ont.
353	Nelles Corners Syndicate	J. O. Schweyer, R.R. 2, Hagersville. Ont.
340	Southern Ontario Gas Co	518 Jackson Bldg., Buffalo, N.Y.
358	Sterling Natural Gas Co	Port Colborne ,Ont.
352	Sundy Gas Co	Dunnville, Ont.
349	Union Natural Gas Co	Chatham, Ont.
339	United Gas Companies	St. Catharines, Ont.
345	Yager, J. J	Selkirk, Ont.

TABLE XI—OPERATORS LICENSED TO DISTRIBUTE NATURAL GAS, 1926

License No.	Name	Address
285	Bertie Natural Gas Co	Ridgeway, Ont.
275	Brantford Gas Co	Brantford, Ont.
282	Canfield Natural Gas Co	Canfield, Ont.
281	Central Pipe Line Co	Chatham, Ont.
280	Chatham Gas Co	Chatham, Ont.
274	Coleman, J. A	Wellandport, Ont.
276	Dominion Natural Gas Co	518 Jackson Bldg., Buffalo, N.Y.
271	Dunn Natural Gas Co	Dunnville, Ont.
286	Fisherville Gas Co., Nos. 1 and 3	Fisherville, Ont.
288	Fonthill-Ridgeville Gas Co	Hamilton, Ont.
272	Industrial Natural Gas Co	Thorold, Ont.
283	Leamington Corporation	Leamington, Ont.
278	Manufacturers Gas Co	Hamilton, Ont.
289	Midfield Natural Gas Co	Hamilton, Ont.
284	Oil Springs Oil and Gas Co	Oil Springs, Ont.
270	Petrolia Utilities, Ltd	Petrolia, Ont.
277	Southern Ontario Gas Co	518 Jackson Bldg., Buffalo, N.Y.
290	Sterling Natural Gas Co	Port Colborne, Ont.
287	Union Natural Gas Co	Chatham, Ont.
273	United Gas Companies	St. Catharines, Ont.
279	Windsor Gas Co	Windsor, Ont.

TABLE XII—OPERATORS LICENSED TO OPERATE PIPE LINES, 1926

License No.	Name	Address
58	Central Pipe Line Co	Chatham, Ont.
60	Dominion Natural Gas Co	518 Jackson Bldg., Buffalo, N.Y.
59	Southern Ontario Gas Co	518 Jackson Bldg., Buffalo, N.Y.
62	Union Natural Gas Co	Chatham, Ont.
61	United Gas Companies	St. Catharines, Ont.

Logs of Wells

The following logs of oil and gas wells drilled in Ontario in 1926 are given on the pages following. They show the formation, total depth, and occurrences of gas, oil, and water as reported by the drillers.

These logs are on file in the office of the Natural Gas Commissioner, and they give the length of casing used as well as other information regarding the texture of formations. In many cases samples of drill cuttings are available to the public. The source of the information for the logs that follow is the company or the person whose name appears at the top of each log.

Abbreviations

Tp.	Township.
Con.	Concession.
Pt.	Part.
N. ½	North half.
E. ½	East half.
W. ½	West half.
S. ½	South half.
NE. ¼	Northeast quarter.
SE. ¼	Southeast quarter.
20 E. ½	East half of lot 20.
T.R.	Talbot Road.
S.T.R.	South of the Talbot Road.
N.T.R.	North of the Talbot Toad.
E.S.C.R.	East of Stoney Creek Road.
S.S.C.R.	South of Stoney Creek Road.
N.D.R.	North of Dundas Road.
N.F.R.	North of Forks Road.
S.F.R.	South of Forks Road.
R.R.	River Range.
E.F.C.	East of Fairchild Creek.

Brant County

Log No. 1.—Robert Devereaux, Brantford
Lot D, Brantford Highway, Brantford tp.

Completed May 19, 1926.
Open flow: 2,000 cu. ft.

Formation	Thickness, ft.
Surface	125
Brown line	50
Niagara	225
Grey shale	30
Clinton	20
Red Medina	25
Blue shale	45
White Medina	16
Red shale	50
Total depth	586

Gas at 530 feet.

Log No. 2.—Robert Devereaux, Brantford
Lot D, Brantford Highway, Brantford tp.

Completed March 19, 1926.
Open flow: 5,000 cu. ft.

Formation	Thickness, ft.
Surface	125
Salina	50
Guelph-Niagara	225
Rochester	30
Clinton	20
Cabot Head	20
Grimsby	10
Manitoulin	40
Whirlpool	16
Queenston	70
Total depth	606

Gas at 530 feet.

Log No. 3.—Dominion Natural Gas Co., Buffalo, N.Y.
Lot 12, con. III, E.F.C., Onondaga tp.

Completed January 2, 1927.
Open flow: 8,000 cu. ft.
Rock pressure: 155 lbs.

Formation	Thickness, ft.
Surface	96
White lime	49
Niagara	225
Grey shale	40
Clinton	25
Red Medina	25
Blue shale	45
White Medina	20
Red shale	40
Total depth	565

Log No. 4.—Petrol Oil and Gas Co., Toronto
Lot 13, con. III, Tuscarora tp.

Completed October 27, 1926.
Open flow: 1,584 cu. ft.

Formation	Thickness, ft.
Surface	6
Clay	70
Gravel	6
Shale	18
Grey lime	171
Niagara	264
Cabot Head shale	49
Green shale	6
Clinton	12
Red Medina	21
Grey shale	43
White Medina	12
Red shale	597
Grey shale	720
Utica	155
Trenton	677
Potsdam	54
Granite	..
Total depth	2,881

Gas at top of Clinton, 602 feet.

LOT NO. 5.—SENATOR E. MICHENER, TORONTO
Lot 13, con. III, Tuscarora tp.

Completed February 12, 1926.

Formation	Thickness, ft.
Surface	82
Guelph and Niagara	453
Rochester	55
Clinton	12
Cabot Head shale	21
Grey shale	43
Whirlpool sandstone	12
Queenston	324
Total depth	1,002

Gas at 590 feet.

Essex County

LOG NO. 6.—ORLEY SMITH, KINGSVILLE
Lot 7 E. ½, N.F.R., Gosfield S. tp.

Completed October 9, 1926.
Open flow: 75,000 cu. ft.
Rock pressure: 345 lbs.
6¼-in. casing, approximately 5 feet.
Gas at 635, 840, 850, 875, and 935 feet.

LOG NO. 7.—BON JASPERSON, KINGSVILLE
Lot 7 E. ½, con. I, Gosfield S. tp.

Completed June 22, 1926.
Open flow: 69,000 cu. ft.
Rock pressure: 300 lbs.
6¼-in. casing, approximately 5 feet.
Gas at 640 and 848 feet.

LOG NO. 8.—BON JASPERSON, KINGSVILLE
Lot 7 W. ½, con. I, Gosfield S. tp.

Completed February 25, 1926.
Open flow: 50,000 cu. ft.
6¼-in. casing, approximately 5 feet.
Gas at 680, 700, 725, and 880 feet.

LOG NO. 9.—BON JASPERSON, KINGSVILLE
Lot 7, S.F.R., Gosfield S. tp.

Completed August 11, 1926.
Open flow: 60,000 cu. ft.
6¼-in. casing, approximately 5 feet.
Gas at 650, 840, and 855 feet.

Haldimand County

LOG NO. 10.—DOMINION NATURAL GAS CO., BUFFALO, N.Y.
Lots 6 and 7, Dockstaeder tract, Canborough tp.

Completed October 13, 1926.
Dry hole.

Formation	Thickness, ft.
Surface	105
Lime and shale	180
Niagara	220
Shale	57
Clinton	27
Red Medina	42
Grey shale	58
White Medina	12
Red shale	5
Total depth	706

LOG NO. 11.—DOMINION NATURAL GAS CO., BRANTFORD
Lot 25, con. I, S.T.R., Cayuga N. tp.

Completed May 11, 1926.
Open flow: 750,000 cu. ft.
Rock pressure: 290 lbs.

Formation	Thickness, ft.
Surface	37
Lime and shale	243
Niagara	235
Shale	50
Clinton	19
Total depth	584

Gas at 570 feet.

LOG NO. 12.—DOMINION NATURAL GAS CO., BRANTFORD
Lot 26, con. I, S.T.R., Cayuga N. tp.

Completed August 10, 1926.
Open flow: 60,000 cu. ft.
Rock pressure: 317 lbs.

Formation	Thickness, ft.
Surface	45
Lime and shale	242
Niagara	235
Shale	45
Clinton	32
Red Medina	40
Grey shale	55
White Medina	17
Red shale	6
Total depth	717

Gas at 579 and 621 feet.

LOG NO. 13.—DOMINION NATURAL GAS CO., BRANTFORD
Lot 14, con. II, S.T.R., Cayuga N. tp.

Completed August 12, 1926.

Formation	Thickness, ft.
Surface	40
Lime and shale	245
Niagara	220
Shale	62
Clinton	29
Red Medina	36
Grey shale	68
White Medina	12
Red shale	10
Total depth	722

LOG NO. 14.—DOMINION NATURAL GAS CO., BRANTFORD
Lot 7, con. III, Cayuga N. tp.

Completed May 7, 1926.
Open flow: 29,000 cu. ft.
Rock pressure: 352 lbs.

Formation	Thickness, ft.
Surface	70
Lime and shale	220
Niagara	210
Shale	66
Clinton	25
Red Medina	42
Grey shale	57
White Medina	13
Red shale	6
Total depth	709

Gas at 575 and 616 feet.

Log No. 15.—Dominion Natural Gas Co., Brantford

Lot 13, con. II, S.T.R., Cayuga N. tp.

Completed July 6, 1926.
Dry hole.

Formation	Thickness, ft.
Surface	70
Lime and shale	225
Niagara	225
Shale	60
Clinton	26
Red Medina	43
Grey shale	59
White Medina	12
Red shale	4
Total depth	724

Log No. 16.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 5, con. III, Cayuga N. tp.

Completed December 16, 1926.
Dry hole.

Formation	Thickness, ft.
Surface	55
Lime and shale	210
Niagara	220
Shale	50
Clinton	30
Red Medina	43
Shale	58
White Medina	12
Big red shale	11
Total depth	689

Log No. 17.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 27, con. I, S.T.R., Cayuga N. tp.

Completed October 11, 1926.
Open flow: 204,000 cu. ft.
Rock pressure: 365 lbs.

Formation	Thickness, ft.
Surface	43
Lime and shale	242
Niagara	235
Shale	48
Clinton	32
Red Medina	40
Grey shale	52
White Medina	14
Red shale	5
Total depth	711

Gas at 598 and 620 feet.

Log No. 18.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 27, con. I, S.T.R., Cayuga N. tp.

Completed July 12, 1926.
Open flow: 230,000 cu. ft.
Rock pressure: 317 lbs.

Formation	Thickness, ft.
Surface	45
Lime and shale	240
Niagara	235
Shale	47
Clinton	32
Red Medina	40
Grey shale	55
White Medina	16
Red shale	5
Total depth	715

Gas at 576 feet.

Log No. 19.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 27, con. I, S.T.R., Cayuga N. tp.

Completed November 10, 1926.
Open flow: 80,000 cu. ft.
Rock pressure: 330 lbs.

Formation	Thickness, ft.
Surface	38
Lime and shale	262
Niagara	230
Shale	48
Clinton	30
Red Medina	40
Shale	52
White Medina	12
Big red shale	3
Total depth	715

Gas at 585 feet.

Log No. 20.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 28, con. I, S.T.R., Cayuga N. tp.

Completed December 6, 1926.
Dry hole.

Formation	Thickness, ft.
Surface	44
Lime and shale	241
Niagara	225
Shale	46
Clinton	30
Red Medina	40
Grey shale	48
White Medina	12
Big red shale	1
Total depth	687

Log No. 21.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 24, con. I, S.T.R., Cayuga N. tp.

Completed September 8, 1926.
Open flow: 34,000 cu. ft.
Rock pressure: 307 lbs.

Formation	Thickness, ft.
Surface	60
Lime and shale	230
Niagara	235
Shale	50
Clinton	32
Red Medina	40
Grey shale	52
White Medina	14
Red shale	3
Total depth	716

Gas at 604 feet.

Log No. 22.—A. Mehlenbacher, Cayuga.

Lot 37 S. ½, S.E. cor., con. II, S.T.R., Cayuga N. tp.

Completed February 12, 1926.
Open flow: 59,000 cu. ft.
Rock pressure: 370 lbs.

Formation	Thickness, ft.
Surface	22
Lime and shale	356
Niagara	280
Shale	40
Clinton	20
Red Medina	35
Grey shale	55
White Medina	20
Total depth	828

Gas in Clinton and Red Medina.

LOG NO. 23.—DOMINION NATURAL GAS CO., DUNNVILLE

Lot 25, con. I, S.T.R., Cayuga N. tp.

Completed June 11, 1926.
Open flow: 116,000 cu. ft.

Formation	Thickness, ft.
Surface	43
Lime and shale	244
Niagara	235
Shale	50
Clinton	32
Red Medina	40
Grey shale	52
White Medina	13
Red shale	4
Total depth	713

Gas at 601 feet.

LOG NO. 24.—SOUTH CAYUGA GAS AND OIL SYNDICATE, CAYUGA

Lot 24 S. ½, Fradenburg tract, Cayuga S. tp.

Completed December 7, 1926.
Open flow: 33,000 cu. ft.
Rock pressure: 235 lbs.

Formation	Thickness, ft.
Surface	88
Lime and shale	317
Niagara	206
Shale	55
Clinton	35
Red Medina	38
Grey shale	55
White Medina	15
Red shale	3
Total depth	812

Gas at 671 and 731 feet.

LOG NO. 25.—SOUTH CAYUGA GAS AND OIL SYNDICATE

Lot 23 E. pt., Fradenburg tract, Cayuga S. tp.

Completed September 27, 1926.
Open flow: 45,000 cu. ft.
Rock pressure: 232 lbs.

Formation	Thickness, ft.
Surface	88
Lime and shale	310
Niagara	194
Shale	50
Clinton	35
Red Medina	45
Grey shale	60
White Medina	18
Red shale	3
Total depth	803

Gas at 650 and 697 feet.

LOG NO. 26.—SOUTH CAYUGA GAS AND OIL SYNDICATE, CAYUGA

Lot 23 E. centre, Fradenburg tract, Cayuga S. tp.

Completed September 1, 1926.
Open flow: 74,000 cu. ft.
Rock pressure: 230 lbs.

Formation	Thickness, ft.
Surface	80
Lime and shale	312
Niagara	211
Shale	40
Clinton	32
Red Medina	40
Grey shale	55
White Medina	10
Red shale	5
Total depth	785

Gas at 650 and 675 feet

LOG NO. 27.—SOUTH CAYUGA GAS AND OIL SYNDICATE, CAYUGA

Lot 24 N.W. ¼, Fradenburg tract, Cayuga S. tp.

Completed July 30, 1926.
Open flow: 27,000 cu. ft.
Rock pressure: 230 lbs.

Formation	Thickness, ft.
Surface	87
Lime and shale	313
Niagara	211
Shale	42
Clinton	32
Red Medina	35
Grey shale	67
White Medina	18
Total depth	805

Gas in Red Medina.

LOG NO. 28.—A. E. MEADOWS AND SON, CAYUGA

Lot 25 N. ½, con. IV, Cayuga S. tp.

Completed June 19, 1926.
Open flow: 25,000 cu. ft.
Rock pressure: 225 lbs.

Formation	Thickness, ft.
Surface	40
Gravel	67
Lime and shale	243
Niagara	260
Shale	66
Clinton	33
Red Medina	38
Grey shale	53
White Medina	22
Total depth	822

Gas in Clinton and Red Medina.

LOG NO. 29.—DOMINION NATURAL GAS CO., BRANTFORD

Lot 1, con. V, Rainham tp.

Completed July 31, 1926.
Open flow: 272,000 cu. ft.

Formation	Thickness, ft.
Surface	11
Flint	90
Lime and shale	374
Niagara	250
Shale	40
Clinton	30
Red Medina	35
Shale	56
White Medina	12
Big red shale	5
Total depth	903

Gas at 785 and 806 feet.

LOG NO. 30.—DOMINION NATURAL GAS CO., BRANTFORD

Lot 4, con. IV, Rainham tp.

Completed July 21, 1926.
Open flow: 55,000 cu. ft.
Rock pressure: 410 lbs.

Formation	Thickness, ft.
Surface	14
Flint	71
Lime and shale	370
Niagara	240
Shale	63
Clinton	25
Red Medina	35
Shale	55
White Medina	19
Big red shale	17
Total depth	909

Gas at 760 and 797 feet.

Log No. 31.—Dominion Natural Gas Co., Brantford

Lot 5, con. IV, Rainham tp.

Completed December 10, 1926.
Open flow: 252,000 cu. ft.
Rock pressure: 390 lbs.

Formation	Thickness, ft.
Surface	11
Flint	90
Lime and shale	368
Niagara	250
Shale	45
Clinton	27
Red Medina	35
Shale	60
White Medina	15
Red shale	35
Total depth	936

Gas at 774, 801, and 894 feet.

Log No. 32.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 4, con. IV, Rainham tp.

Completed September 3, 1926.
Open flow: 89,000 cu. ft.
Rock pressure: 410 lbs.

Formation	Thickness, ft.
Surface	9
Flint	72
Lime and shale	375
Niagara	237
Shale	61
Clinton	25
Red Medina	40
Shale	50
White Medina	21
Red shale	33
Total depth	923

Gas at 756, 799, and 880 feet.

Log No. 33.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 2, con. V, Rainham tp.

Completed October 9, 1926.
Open flow: 440,000 cu. ft.
Rock pressure: 430 lbs.

Formation	Thickness, ft.
Surface	10
Flint	79
Lime and shale	371
Niagara	236
Shale	65
Clinton	25
Red Medina	36
Shale	56
White Medina	22
Red shale	9
Total depth	909

Gas at 765, 795, and 806 feet.

Log No. 34.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 2, con. V, Rainham tp.

Completed January 6, 1926.
Open flow: 280,000 cu. ft.
Rock pressure: 420 lbs.

Formation	Thickness, ft.
Surface	9
Flint	91
Lime and shale	362
Niagara	228
Shale	65
Clinton	30
Red Medina	35
Shale	60
White Medina	20
Red shale	52
Total depth	952

Gas at 775, 785, and 898 feet.

Log No. 35.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 1, con. V, Rainham tp.

Completed October 29, 1926.
Open flow: 185,000 cu. ft.
Rock pressure: 455 lbs.

Formation	Thickness, ft.
Surface	14
Flint	80
Lime and shale	377
Niagara	250
Shale	45
Clinton	27
Red Medina	37
Shale	60
White Medina	15
Shale	7
Total depth	912

Log No. 36.—Dominion Natural Gas Co., Buffalo, N.Y.

Lots 1 and 2, con. V, Rainham tp.

Completed November 22, 1926.
Dry hole.

Formation	Thickness, ft.
Surface	14
Flint	72
Lime and shale	371
Niagara	243
Shale	61
Clinton	25
Red Medina	40
Shale	52
White Medina	17
Shale	11
Total depth	906

Log No. 37.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 2, con. V, Rainham tp.

Completed April 19, 1926.
Open flow: 17,000 cu. ft.

Formation	Thickness, ft.
Surface	19
Flint	90
Lime and shale	368
Niagara	236
Shale	60
Clinton	29
Red Medina	35
Shale	58
White Medina	20
Red shale	2
Total depth	917

Gas at 822 and 854 feet.

Log No. 38.—Dominion Natural Gas Co., Dunnville

Lot 3, con. IV, Rainham tp.

Completed June 12, 1926.
Open flow: 272,000 cu. ft.
Rock pressure: 430 lbs.

Formation	Thickness, ft.
Surface	2
Flint	83
Lime and shale	372
Niagara	240
Shale	62
Clinton	25
Red Medina	35
White shale	55
White Medina	20
Red shale	11
Total depth	905

Gas at 752, 779, and 793 feet.

LOG NO. 39.—RAINHAM GAS AND OIL SYNDICATE, FISHERVILLE

Lot 5 SW. ¼, con. III, Rainham tp.

Completed May 14, 1926.
Open flow: 23,000 cu. ft.
Rock pressure: 415 lbs.

Formation	Thickness, ft.
Surface	34
Flint	86
Lime and shale	420
Niagara	200
Shale	55
Clinton	28
Red Medina	36
Grey shale	55
White Medina	12
Red shale	10
Total depth	936

Gas in Clinton and Red Medina.

LOG NO. 40.—RAINHAM GAS AND OIL SYNDICATE, FISHERVILLE

Lot 4 SE. ¼, con. III, Rainham tp.

Completed July 7, 1926.
Open flow: 132,000 cu. ft.
Rock pressure: 420 lbs.

Formation	Thickness, ft.
Surface	11
Flint	130
Lime and shale	379
Niagara	200
Shale	50
Clinton	30
Red Medina	35
Grey shale	57
White Medina	12
Total depth	904

Gas in Clinton and Red Medina.

LOG NO. 41.—RAINHAM GAS AND OIL SYNDICATE, FISHERVILLE

Lot 4 SE. ½, con. III, Rainham tp.

Completed August 24, 1926.
Open flow: 140,000 cu. ft.
Rock pressure: 425 lbs.

Formation	Thickness, ft.
Surface	9
Flint	130
Lime and shale	361
Niagara	175
Shale	85
Clinton	30
Red Medina	40
Grey shale	65
White Medina	13
Total depth	908

Gas in Clinton and Red Medina.

LOG NO. 42.—RAINHAM GAS AND OIL SYNDICATE, FISHERVILLE

Lot 7 S. ½, con. V, Rainham tp.

Completed March 4, 1926.
Dry hole.

Formation	Thickness, ft.
Surface	16
Flint	104
Lime and shale	465
Niagara	110
Shale	45
Clinton	30
Red Medina	40
Grey shale	67
White Medina	3
Total depth	880

LOG NO. 43.—RAINHAM GAS AND OIL SYNDICATE, FISHERVILLE

Lot 2 E. ½ of S. ½, con. III, Rainham tp.

Completed October 20, 1926.
Open flow: 46,000 cu. ft.
Rock pressure: 410 lbs.

Formation	Thickness, ft.
Surface	20
Flint	140
Lime and shale	355
Niagara	227
Shale	45
Clinton	25
Red Medina	40
Grey shale	48
White Medina	12
Red shale	6
Total depth	918

Gas in Clinton and Red Medina.

LOG NO. 44.—RAINHAM GAS AND OIL SYNDICATE, FISHERVILLE

Lot 3 S. ½, con. III, Rainham tp.

Completed September 22, 1926.
Open flow: 138,000 cu. ft.
Rock pressure: 425 lbs.

Formation	Thickness, ft.
Surface	11
Flint	135
Lime and shale	354
Niagara	215
Shale	45
Clinton	25
Red Medina	40
Grey shale	68
White Medina	12
Total depth	905

Gas in Clinton and Red Medina.

LOG NO. 45.—RAINHAM GAS AND OIL SYNDICATE, FISHERVILLE

Lot 3 N. ½, con. II, Rainham tp.

Completed November 24, 1926.
Open flow: 78,000 cu. ft.
Rock pressure: 410 lbs.

Formation	Thickness, ft.
Surface	15
Flint	140
Lime and shale	355
Niagara	220
Shale	45
Clinton	25
Red Medina	40
Grey shale	69
White Medina	12
Red shale	6
Total depth	927

Gas in Clinton and Red Medina.

LOG NO. 46.—RAINHAM GAS AND OIL SYNDICATE, FISHERVILLE

Lot 6 S. ½, con. III, Rainham tp.

Completed April 7, 1926.
Open flow: 58,000 cu. ft.
Rock pressure: 350 lbs.

Formation	Thickness, ft.
Surface	38
Flint	92
Lime and shale	420
Niagara	170
Shale	50
Clinton	30
Red Medina	35
Grey shale	70
White Medina	12
Red shale	3
Total depth	920

Gas in Clinton and Red Medina.

LOG No. 47.—DOMINION NATURAL GAS CO., BRANTFORD

Lot 15, con. VIII, Walpole tp.

Completed December 17, 1926.
Open flow: 25,000 cu. ft.
Rock pressure: 408 lbs.

Formation	Thickness, ft.
Surface	13
Flint	68
Lime and shale	366
Niagara	299
Shale	40
Clinton	28
Red Medina	29
Shale	56
White Medina	12
Shale	4
Total depth	915

Gas at 801 and 819 feet.

LOG No. 48.—DOMINION NATURAL GAS CO., BRANTFORD

Lot 24, con. VI, Walpole tp.

Completed September 21, 1926.
Open flow: 82,000 cu. ft.
Rock pressure: 445 lbs.

Formation	Thickness, ft.
Surface	14
Flint	93
Lime and shale	384
Niagara	255
Shale	25
Clinton	25
Red Medina	35
Shale	52
White Medina	12
Red shale	5
Total depth	900

Gas at 789, 812, and 823 feet.

LOG No. 49.—DOMINION NATURAL GAS CO., BRANTFORD

Lot 13, con. VIII, Walpole tp.

Completed May 19, 1926.
Open flow: 65,000 cu. ft.
Rock pressure: 390 lbs.

Formation	Thickness, ft.
Surface	5
Flint	85
Lime and shale	368
Niagara	299
Shale	21
Clinton	28
Red Medina	30
Shale	56
White Medina	18
Red shale	2
Total depth	912

Gas at 788 feet.

LOG No. 50.—DOMINION NATURAL GAS CO., BRANTFORD

Lot 17, con. VIII, Walpole tp.

Completed February 12, 1926.
Open flow: 21,000 cu. ft.
Rock pressure: 808 lbs.

Formation	Thickness, ft.
Surface	18
Flint	68
Lime and shale	389
Niagara	293
Shale	28
Clinton	25
Red Medina	30
Shale	54
White Medina	12
Red shale	4
Total depth	921

Gas at 808 feet.

LOG No. 51.—DOMINION NATURAL GAS CO., BRANTFORD

Lot 8 SW. ¼ con. VIII, Walpole tp.

Completed July 3, 1926.
Open flow: 314,000 cu. ft.
Rock pressure: 493 lbs.

Formation	Thickness, ft.
Surface	14
Flint	70
Lime and shale	370
Niagara	286
Shale	44
Clinton	27
Red Medina	25
Blue shale	58
White Medina	20
Red shale	43
Total depth	957

Gas at 801 and 822 feet.

LOG No. 52.—DOMINION NATURAL GAS CO., BRANTFORD

Lots 23 and 24, con. VI, Walpole tp.

Completed February 11, 1926.
Open flow: 221,000 cu. ft.
Rock pressure: 445 lbs.

Formation	Thickness, ft.
Surface	12
Flint	86
Lime and shale	372
Niagara	250
Shale	55
Clinton	30
Red Medina	30
Blue shale	58
White Medina	12
Red shale	5
Total depth	910

Gas in Clinton and Red Medina.

LOG No. 53.—DOMINION NATURAL GAS CO., BRANTFORD

Lot 24, con. V, Walpole tp.

Completed April 22, 1926.
Open flow: 332,000 cu. ft.
Rock pressure: 440 lbs.

Formation	Thickness, ft.
Surface	16
Flint	95
Lime and shale	365
Niagara	250
Shale	50
Clinton	27
Red Medina	35
Blue shale	56
White Medina	13
Red shale	6
Total depth	913

Gas at 790 and 821 feet.

LOG No. 54.—DOMINION NATURAL GAS CO., BUFFALO, N.Y.

Lot 24, con. V, Walpole tp.

Completed June 16, 1926.
Open flow: 60,000 cu. ft.
Rock pressure: 490 lbs.

Formation	Thickness, ft.
Surface	19
Flint	100
Lime and shale	370
Niagara	250
Shale	40
Clinton	27
Red Medina	35
Blue shale	60
White Medina	15
Red shale	7
Total depth	923

Gas at 824 feet.

LOG NO. 55.—DOMINION NATURAL GAS CO., BUFFALO, N.Y.
Lot 12, con. VIII, Walpole tp.

Completed October 16, 1926.
Open flow: 25,000 cu. ft.
Rock pressure: 385 lbs.

Formation	Thickness, ft.
Surface	11
Flint	71
Lime and shale	373
Niagara	322
Shale	23
Clinton	27
Red Medina	25
Shale	40
White Medina	17
Red shale	2
Total depth	911

Gas at 818 feet.

LOG NO. 56.—DOMINION NATURAL GAS CO., BUFFALO, N.Y.
Lot 13 NW, ¼, con. VIII, Walpole tp.

Completed August 20, 1926.
Dry hole.

Formation	Thickness, ft.
Surface	12
Flint	66
Lime and shale	378
Niagara	295
Shale	25
Clinton	28
Red Medina	30
Shale	60
White Medina	12
Red shale	3
Total depth	909

Kent County

LOG NO. 57.—UNION NATURAL GAS CO., CHATHAM
Lot 24, con. IX, Dawn tp.

Completed December 13, 1926.
Open flow: 1,500,000 cu. ft.

Formation	Thickness, ft.
Surface	63
Shale	92
Soap	5
Shale	105
Soap	125
Lime shells	20
Soap	45
Big brown lime	495
Sharp sand	100
Brown lime	160
Blue lime	70
Brown lime	297
Total depth	1,577

Gas at 1,562 to 1,572 feet.

LOG NO. 58.—UNION NATURAL GAS CO., CHATHAM
Lot 26, con. V, Dawn tp.

Completed September 10, 1926.
Dry hole.

Formation	Thickness, ft.
Clay	64
Black shale	111
Soap and lime shells	225
Grey lime	50
Light brown lime	485
Dark brown lime	145
Formation—*Continued*	
Lime with gypsum	55
Dark brown lime	75
Blue shale	40
Light brown lime	55
Salt	200
Brown lime	200
Light lime	5
Hard dark brown lime	50
Brown lime	20
Shaly lime	25
Grey lime	43
Brown lime	102
Grey shale	35
Shaly lime	10
Brown shale	5
Lime	15
Red and brown shale	50
Shaly lime	10
Grey lime	40
Grey shale	15
Red shale	6
Total depth	2,136

Gas at 1,655 feet.

LOG NO. 59.—UNION NATURAL GAS CO., CHATHAM
Lot 22, con. VIII, Dawn tp.

Completed July 23, 1926.
Dry hole.

Formation	Thickness, ft.
Surface	58
Lime shells and soap	327
Big lime	335
Sharp sand and lime	300
Hard grey lime	140
Grey lime with gypsum	35
Blue lime	100
Brown lime with hard shells	200
Light brown lime	50
Salt	155
Brown lime	225
Black shale	25
Sandy brown lime	20
Blue lime and gypsum	15
Light brown lime	15
Light brown lime and shale	5
Light brown lime	20
Blue lime	70
Grey shale and shells	40
Grey shale	5
Red shale	15
Blue shale	7
Lime	3
Grey shale and lime shells	70
Grey lime	35
Shaly lime	5
Red shale	2
Total depth	2,277

LOG NO. 60.—UNION NATURAL GAS CO., CHATHAM
Lot 2, con. III, Dover W. tp.

Completed May 17, 1926.

Formation	Thickness, ft.
Clay and gravel	80
Soap and shells	175
Big lime	1,668
Gypsum	958
Green shale	20
Lime shell	8
Red shale	102
Grey lime	55
Red and blue shales	222
Blue lime	50
Blue shale	331
Brown shale	85
Trenton	249
Total depth	4,003

Gas at 2,803, 2,806, and 2,860 feet.

Log No. 61.—Southern Ontario Gas Co., Buffalo, N.Y.
Lot 193, con. I, Romney tp.

Completed December 7, 1926.
Open flow: 97,000 cu. ft.
Rock pressure: 460 lbs.

Formation	Thickness, ft.
Surface	170
Quick sand	32
Soap	52
Dark grey lime	76
Light grey lime	180
Sharp sand	100
Water sand	160
Brown lime	275
Light grey lime	155
Dark grey lime	165
Total depth	1,365

Gas at 1,220, 1,330, and 1,346 feet.

Log No. 62.—Southern Ontario Gas Co., Buffalo, N.Y.
Lot 192, con. I, Romney tp.

Completed July 27, 1926.
Open flow: 271,000 cu. ft.
Rock pressure: 460 lbs.

Formation	Thickness, ft.
Surface	176
Gravel and shale	15
Soap stone	37
Grey lime	132
Brown lime	240
Water sand	170
Brown lime	70
Grey lime	535
Total depth	1,375

Gas at 1,235, 1,275, and 1,353 feet.

Log No. 63.—Southern Ontario Gas Co., Buffalo, N.Y.
Lot 193, S.T.R., Romney tp.

Completed October 5, 1926.
Open flow: 313,000 cu. ft.
Rock pressure: 460 lbs.

Formation	Thickness, ft.
Drift clay	185
Gravel	5
Soap stone	42
Brown lime	228
Grey lime	150
Sharp sand	20
Water sand	145
Grey lime	580
Total depth	1,355

Gas at 175, 1,220, 1,254, and 1,335 feet.

Log No. 64.—Southern Ontario Gas Co., Buffalo, N.Y.
Lot 194, S.T.R., Romney tp.

Completed November 12, 1926.
Open flow: 382,000 cu. ft.
Rock pressure: 460 lbs.

Formation	Thickness, ft.
Drift clay	170
Gravel	25
Soap stone	45
Light grey lime	300
Sharp sand	90
Light grey lime	155
Grey lime	566
Total depth	1,351

Gas at 1,216, 1,253, 1,323, and 1,336 feet.

Log No. 65.—Southern Ontario Gas Co., Brantford
Con. II, Gore A, Romney tp.

Completed June 2, 1926.
Open flow: 42,000 cu. ft.
Rock pressure: 250 lbs.

Formation	Thickness, ft.
Surface	134
Grey lime	176
Dark lime	90
Sharp sand	200
Water sand	50
Brown lime	55
Grey lime	70
Brown lime	25
Grey lime	120
Grey and brown lime	70
Grey lime	388
Total depth	1,378

Gas at 1,205, 1,345, and 1,365 feet.
Surface gas at 175 feet.

Log No. 66.—Southern Ontario Gas Co., Brantford
Lot 2, con. XV, Tilbury E. tp.

Completed July 10, 1926.
Open flow: 215,000 cu. ft.
Rock pressure: 235 lbs.

Formation	Thickness, ft.
Drift clay	150
Brown shale	23
Soapstone	142
Light grey lime	225
Dark grey lime	60
Sharp sand	120
Water sand	80
Dark grey lime	260
Blue lime	120
Light grey lime	182
Total depth	1,262

Gas at 1,254, 1,310, and 1,345 feet.

Log No. 67.—Union Natural Gas Co., Chatham
Lot 175, T.R., Tilbury E. tp.

Completed October 29, 1926.

Formation	Thickness, ft.
Surface	175
Lime shell	5
Soap	73
Light brown lime	787
Sharp sand	560
Dark brown lime	195
Light brown lime	145
Total depth	1,940

Gas at 1,235, 1,335, and 1,375 feet.

Lambton County

Log No. 68.—Senator Michener, Toronto
Lot 1 W. ½, con. X, Brook tp.

Completed April 3, 1926.

Formation	Thickness, ft.
Surface	56
Shale	90
Top rock	50
Top soap	120
Middle lime	30
Lower soap	55
Lower lime	107
Total depth	508

LOG NO. 69.—SOUTH SARNIA PROPERTIES, LIMITED, SARNIA

Block 107, Indian Reserve, Sarnia tp.

Completed June 12, 1926.

Formation	Thickness, ft.
Surface	104
Sand	11
Total depth	115

LOG NO. 70.—GEORGE STEEL, SARNIA

Lot 6, con. III, Sarnia tp.

Completed October, 1926.

Formation	Thickness, ft.
Surface	100
Top rock	45
Top soap	120
Middle lime	18
Lower soap	45
Lower lime	65
Total depth	393

Norfolk County

LOG NO. 71.—MEDINA NATURAL GAS CO., CHATHAM

Lot 13 W.½, con. I, Houghton

Completed April 21, 1926.
Dry hole.

Formation	Thickness, ft.
Surface	288
Lime	172
Flint	160
Lime	60
Shale	390
Niagara	228
Shale	55
Clinton	24
Red Medina	15
Shale	76
White Medina	12
Red shale	6
Total depth	1,486

Gas in Clinton.

LOG NO. 72.—DOMINION NATURAL GAS CO., BRANTFORD

Lot 33, con. III, Middleton tp.

Completed June 22, 1926.
Dry hole.

Formation	Thickness, ft.
Surface	223
Grey and brown lime	152
Flint	60
Sharp sand	90
Lime and shale	380
Niagara	235
Grey shale	40
Clinton	27
Red Medina	5
Red and blue shale	83
White Medina	8
Red shale	5
Total depth	1,308

Gas at 1,205 feet.

LOG NO. 73.—DOMINION NATURAL GAS CO., BRANTFORD

Lot 17, con. III, S.T.R., Middleton tp.

Completed April 23, 1926.
Open flow: 94,000 cu. ft.
Rock pressure: 550 lbs.

Formation	Thickness, ft.
Surface	231
Lime and shale	154
Flint	135
Lime and shale	328
Grey lime	119
Niagara lime	212
Shale	59
Clinton	21
Red shale	43
Total depth	1,302

Gas at 1,248 feet.

LOG NO. 74.—DOMINION NATURAL GAS CO., BUFFALO, N.Y.

Lot 23 N.½, con. III, S.T.R., Middleton tp.

Completed September 25, 1926.
Open flow: 7,000 cu. ft.

Formation	Thickness, ft.
Surface	225
Brown and grey lime	150
Flint	125
Lime and slate	450
Niagara	200
Slate	45
Clinton	24
Red Medina	18
Slate	54
White Medina	24
Red shale	10
Total depth	1,325

Gas at 1,195 feet.

LOG NO. 75.—DOMINION NATURAL GAS CO., BUFFALO, N.Y.

Lot 39, con. II, Middleton tp.

Completed December 29, 1926.
Open flow: 12,000 cu. ft.

Formation	Thickness, ft.
Surface	215
Brown lime	145
Flint	465
Niagara	275
Slate	65
Clinton	21
Red Medina	5
Grey shale	83
White Medina	6
Red shale	10
Total depth	1,290

Gas at 1,175 feet.

LOG NO. 76.—DOMINION NATURAL GAS CO., BUFFALO, N.Y.

Lot 25, con. IV, S.T.R., Middleton tp.

Completed June 28, 1926.
Dry hole.

Formation	Thickness, ft.
Surface	231
Lime and shale	154
Flint	125
Lime and shale	453
Niagara	202
Shale	55
Clinton	20
Shale	63
Total depth	1,303

Log No. 77.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 29, con. III, Middleton tp.

Completed November 5, 1926.
Open flow: 37,000 cu. ft.
Rock pressure: 560 lbs.

Formation	Thickness, ft.
Surface	234
Flint and sharp sand	151
Flint	150
Lime and slate	230
Black lime	145
Niagara	240
Shale	53
Clinton	22
Blue shale	43
Total depth	1,268

Gas at 1,214 feet.

Log No. 78.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 30, con. III, S.T.R., Middleton tp.

Completed September 8, 1926.
Open flow: 142,000 cu. ft.
Rock pressure: 560 lbs.

Formation	Thickness, ft.
Surface	220
Lime	152
Flint	148
Lime and shale	380
Niagara	240
Shale	50
Clinton	26
Blue shale	49
Total depth	1,265

Gas at 1,201 and 1,216 feet.

Log No. 79.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 15, con. XIV, Townsend tp.

Completed July 28, 1926.
Open flow: 6,000 cu. ft.

Formation	Thickness, ft.
Surface	62
Flint	95
Lime and shale	390
Niagara	251
Black lime	50
Shale	25
Clinton	38
Red Medina	33
Grey shale	50
White Medina	7
Red shale	6
Total depth	1,007

Log No. 80.—Dominion Natural Gas Co., Brantford

Lot 14, con. A, Walsingham S. tp.

Completed May 8, 1926.
Open flow: 29,000 cu. ft.
Rock pressure: 510 lbs.

Formation	Thickness, ft.
Surface	277
Lime	183
Flint	100
Sharp sand	40
Lime and shale	370
Niagara	253
Shale	49
Clinton	27
Red Medina	33
Grey shale	8
Total depth	1,340

Gas at 1,297 feet.

Log No. 81.—Dominion Natural Gas Co., Brantford

Lots 9 and 10, con. 9, S. Big Creek, Walsingham S. tp.

Completed February 19, 1926.
Open flow: 59,000 cu. ft.
Rock pressure: 530 lbs.

Formation	Thickness, ft.
Surface	305
Lime	185
Flint	100
Sand	30
Lime and shale	380
Niagara	254
Shale	64
Clinton	29
Red Medina	46
Shale	5
Total depth	1,397

Gas at 1,330, 1,357, and 1,366 feet.

Log No. 82.—Dominion Natural Gas Co., Brantford

Lot 19 S.W. ¼, con. XIV, Walsingham N. tp.

Completed March 24, 1926.
Dry hole.

Formation	Thickness, ft.
Surface	207
Grey and brown shale	258
Flint	150
Lime and shale	375
Niagara	160
Grey shale	55
Clinton	25
Red and blue shale	89
White Medina	9
Red shale	6
Total depth	1,334

Log. No. 83.—Dominion Natural Gas Co., Brantford

Lot 16, con. VI, Woodhouse tp.

Completed September 22, 1926.
Open flow: 6,000 cu. ft.

Formation	Thickness, ft.
Surface	55
Flint	90
Lime and shale	370
Niagara	260
Black lime	33
Shale	51
Clinton	25
Red Medina	25
Grey shale	64
White Medina	12
Red shale	6
Total depth	991

Gas at 874 feet.

Log No. 84.—Dominion Natural Gas Co., Buffalo, N.Y.

Lot 14, con. VI, Woodhouse tp.

Completed November 15, 1926.
Open flow: 142,000 cu. ft.
Rock pressure: 460 lbs.

Formation	Thickness, ft.
Surface	80
Flint	100
Lime and shale	376
Niagara	250
Black lime	50
Shale	30
Clinton	24

LOG. NO. 84—*Continued*

Formation	Thickness, ft.
Red Medina	40
Grey shale	48
White Medina	12
Red shale	30
Total depth	1,040

Gas at 888, 901, and 1,006 feet.

LOG NO. 85.—DOMINION NATURAL GAS CO., BUFFALO, N.Y.

Lot 12, con. VI, Woodhouse tp.

Completed December 28, 1926.
Open flow: 7,000 cu. ft.

Formation	Thickness, ft.
Surface	86
Flint	84
Lime and shale	370
Niagara	310
Shale	42
Clinton	25
Red Medina	40
Grey shale	53
White Medina	15
Red shale	2
Total depth	1,027

Gas at 907 feet.

Welland County

LOG NO. 86.—PROVINCIAL NATURAL GAS CO., NIAGARA FALLS

Lot 7, Broken front, Crowland tp.

Completed November 15, 1926.
Open flow: 8,400 cu. ft.
Rock pressure: 200 lbs.

Formation	Thickness, ft.
Top of Clinton	317
Top of Red Medina	347
Top of White Medina	432
Thickness of White Medin	12
Pocket of red shale	56
Depth of well	500

LOG NO. 87.—PROVINCIAL NATURAL GAS CO., NIAGARA FALLS

Lot 6, Broken front, Crowland tp.

Completed November 17, 1926.
Open flow: 8,000 cu. ft.
Rock pressure: 200 lbs.

Formation	Thickness, ft.
Top of Clinton	310
Top of Red Medina	342
Top of White Medina	425
Thickness of White Medina	13
Pocket of red shale	45
Depth of well	483



Section of Onondaga limestone, three-quarters natural size, in the quarry of the St. Marys Cement Company at St. Marys, Ont. A seepage of oil was observed and traced to this band of porous limestone in the face of the quarry. Only the granular or more porous part of the limestone is impregnated, possibly on account of the fact that the oil moving toward the surface loses some of the more volatile portions and the more viscous residue can find its way only into the larger pores.

PETROLEUM IN 1926

By R. B. Harkness

General

The quantity of oil produced in Ontario during the year 1926 was 136,971 barrels, and the value $376,822; this is less than for the year 1925 by 7,268 barrels, but an increase in value of $7,668, owing to the increased price of crude oil.

The decline in production is not quite so serious as it was in the year 1925, owing chiefly to the production from the wells drilled at Thamesville; but the increased price also stimulated operation. Plugging off the oil in the Dover and Romney gas wells seriously reduced the production. There is no apparent hope of improving the production of oil from the present fields unless some radical change is made in the methods now in use. Some effort in this direction has been made in past years by a group headed by the Petroleum Reclamation Company. H. B. Smith of Oak Avenue, Windsor, tried out a patented method of heating the fluid in the well electrically; he reports a small increase in the oil production, but it was not sufficient to pay the cost of operation. The salts in the underground water proved to be a great handicap, as they damaged the insulation on cables. The cost of upkeep made the experiment prohibitive, and there was no assurance that the increased production would be maintained. The patentee claimed that the heated fluid would circulate through the rock, but there was no lateral circulation apparent.

The Oil Producers Association at Petrolia investigated the possibility of using a flood of water containing certain chemicals that were known to wash the oil from rock; this has been a success in the Bradford oil field in New York state but has never been tried in Ontario. No doubt it would improve the flow of oil temporarily, although it might be a doubtful benefit;[1] for if mining were ever resorted to, great volumes of water would have to be removed.

Each spring brings a water menace to the oil-field operations. The casing in the older wells is invariably thin, and the pressure of flood water is sufficient to cause the casing to collapse or move the packer from its seat and allow a flood of water to enter the oil field. This water may come from any one of fifty wells, and only by perseverance and co-operation on the part of the operators are leaks found and the ingress of water stopped. Flooding was particularly serious in the spring of 1926, and one leak affected five properties.

A comparison of Table I in this report with the same table for last year shows that exploratory work is keeping up to the past year and that the wells abandoned are ten less than in 1925.

[1]Ont. Dept. Mines, Vol. XXXV, pt. 5, p. 52.

In the report of petroleum production for the year 1925, an attempt was made to show that more oil could be produced from these fields by sinking shafts and draining the oil into tunnels. Considerable interest was aroused at the time; but the quantity of oil underground was unknown and the results obtained in other fields were so various that no one has yet done the necessary preliminary work to obtain evidence to support this theory. The character of the rock container is of vital importance, and unless it is known, the quantity of oil underground cannot be determined. A band of oil-impregnated rock from the same horizon in the Onondaga limestone as that in which the oil is found in Lambton county, was discovered in a quarry of the St. Marys Cement Company at St. Marys, Ont. This sample appears to be similar in every detail to the rock which contains the oil in Lambton.

The Ranney Oil Mining Company of New York is testing the Bothwell oil field with a diamond-drill, but no reports have been given out regarding the results. Three holes are being drilled.

TABLE I—OIL WELLS AND THEIR PRODUCTION, 1926

Field	Wells			Wells drilled		Production[1]		Gain or loss in 1926		Average production per well per year
	Operating	Not operating	Abandoned	Producing	Dry			Gain	Loss	
						bbls.	gals.	bbls.	bbls.	bbls.
Petrolia and Enniskillen	1,102	1,001	80	2	....	55,485	3	2,320[2]	.....	50.3
Oil Springs	1,097	85	46	....	....	38,349	34	.....	786	34
Moore tp	84	29	5	....	....	2,437	27	.....	5,758[2]	29.2
Sarnia tp	103	30	19	....	1	1,889	27	.....	16	18.3
Plympton tp	23	20	3	3	3	1,046	28	.....	378	45.4
Bothwell	249	44	.....	....	....	25,382	3	.....	860	101.9
Dover West tp	2	.....	2	....	....	958	27	.....	1,999	479
Raleigh tp	.....	15	7	....	....	676	13	676	.....	.....
Onondaga tp	8	25	.....	....	....	361	6	100	.....	361
Mosa tp	77	21	.....	2	....	7,868	1	.....	529	102.1
Thamesville	6	.....	.....	4	5	2,376	8	2,087	.....	198
Euphemia tp	.....	117	.....	....	....	.....	....	.....	39	.....
Dunwich tp	.....	100	.....	....	....	139	12	.....	861	1
Dawn tp	.....	40	.....	....	....	.....	....	.....	.....	.....
Romney tp	.....	.....	1	....	....	.....	....	.....	1,235	.....
Brooke tp	1	1	.....	....	1	.....	....	.....	.....	.....
Belle River	.....	25	.....	....	....	.....	....	.....	.....	.....
Other fields[3]	.....	.....	.....	....	2	.....	....	.....	.....	.....
Total	2,752	1,553	163	11	12	136,971	14	5,183	12,451	.....
								Net loss 7,268		

[1]Production figures are furnished by the Imperial Oil Company, which purchases 99 per cent. of the output of Canadian wells. They state the value to be $376,822.

[2]The gain in the Petrolia field, and the excessive loss in the Moore field, is explained by the adjustment in book records. A collecting station that handles most of the oil from the Petrolia field happens to be in Moore township, hence a gain in Moore township in 1925, and a loss in 1926 in the readjustment.

[3]One in Logan township and one in Adelaide township.

TABLE II—OIL PRODUCED IN ONTARIO BY FIELDS, 1919 TO 1926

Field	1919	1920	1921	1922	1923	1924	1925	1926
	bbls.	bbls.	bbls.	bbls.	bbls.	bbls.	bbls.	bbls.
Petrolia and Enniskillen	70,087	65,082	68,484	64,935	64,159	60,916	53,166	55,485
Oil Springs	45,245	39,388	40,967	43,214	39,090	41,320	39,137	38,349
Moore tp	4,029	7,036	7,536	7,275	4,790	4,483	8,195	2,438
Sarnia tp	4,259	3,495	4,069	3,224	2,387	2,068	1,905	1,890
Plympton tp	560	531	481	695	872	525	1,424	1,047
Bothwell	29,425	25,563	26,877	25,681	27,665	26,700	26,243	25,382
Tilbury East tp	1,660	623	1,003	127	1,950	.....	.....	.....
Dover West tp	16,705	12,171	7,473	5,482	5,618	3,898	2,957	959
Raleigh tp	.....		3,320	663	302	783	887	676
Onondaga tp	197	341	566	489	237	456	261	361
Mosa tp	45,860	24,063	10,764	11,959	10,319	8,862	8,397	7,868
Thamesville	801	1,131	1,319	384	567	.....	289	2,376
Euphemia tp	.....	.....	.....	.....	.....	.....	39	.....
Dunwich tp	1,272	837	.....	387	594	1,351	1,001	139
Dawn tp	.....	.....	.....	217	.....	.....	.....	.....
Romney tp	.....	.....	.....	.....	849	2,955	1,235	.....
Total	220,100	181,750	172,859	164,732	159,399	154,317	144,249	136,971
Value	$632,789	$724,145	$466,716	$466,587	$395,300	$390,423	$369,154	$376,822
Average price	$2.87½	$3.98½	$2.68½	$2.65	$2.47	$2.51¼	$2.56	$2.73

Price of Crude Petroleum

The following prices are published through the kindness of the Imperia Oil Company of Sarnia and show the fluctuations in the market price of oil in Ontario. The prices follow those of the United States very closely, as the price of imported oil controls the market. The variation of the prices as between fields is due to the specific gravity of the oil. The lighter oil, or that containing most gasoline, commands the highest price.

1926	Fluctuation	Price
January 1	.....	$2.38
February 1	Increase 30 cents	2.63
May 17	Increase 40 cents	2.88
November 17	Decrease 12 cents	2.61
December 31	Decrease 2 cents	2.61

The price of crude petroleum from the Oil Springs is 7 cents higher than the above prices. The price of oil from the remainder of the fields, where most of the production is secured, is the same as Petrolia crude; some of the smaller fields have a slightly lower quality, and the price paid for it is a few cents less than Petrolia crude.

Exploratory Work

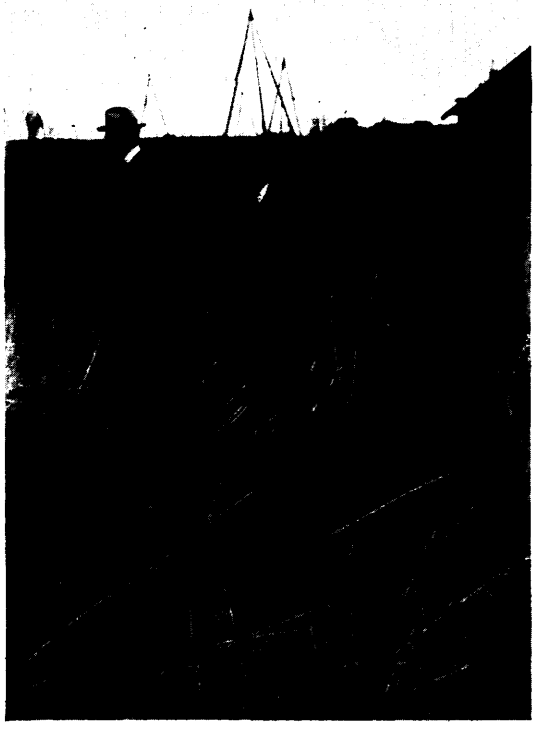
The year 1926 has not seen any great activity in exploration work, and the results of the deep wells begun in 1925 have been discouraging.

The well on lot 20, concession III, Logan township, drilled into the pre-Cambrian, was a dry hole; so also was the well drilled on lot 13, concession III, Tuscarora township. A small gas well was completed at Bond lake, lot 64,

concession I, Whitchurch township, but water troubles at about the gas horizon in the Trenton limestone have given it a temporary set-back.

The University of Toronto has started a well in lot 4, concession I, Caledon township, in the hope of expanding the helium-bearing gas field.

In Lambton county, Dr. Blain has had some success in the vicinity of Aberarder, Plympton township, so also has Samuel Lucas in lot 18, concession IV, Plympton. The Enniskillen, Mosa, and Thamesville fields have each had a few new wells drilled with the greatest success at Thamesville. A well was drilled in lot 16, concession II, Adelaide, and on lot 15, concession II, Metcalfe.



Site of original oil well at Oil Springs, drilled in 1861 and now filled in. The well, about 4 feet square, was dug 65 feet to the top of the rock and then drilled to a depth of about 225 feet. John Scott, veteran inspector, is facing the camera.

A well has been started on St. Joseph's island in Lake Huron, but is closed down during the winter months. This well is about a hundred miles distant from the nearest well (Manitoulin island). The formations to be penetrated are much the same as on Manitoulin, and oil may be found in the Trenton limestone.

Refining Operations

Four refineries were in operation in Ontario in 1926; one was closed down during the year, and one new plant (McColl Bros.) commenced operations at the first of the year. This is solely a cracking plant, turning out gasoline, kerosene, and a distillate used as fuel oil. It is modern in every way.

PETROLEUM REFINERIES, 1926

Company	Location of refinery	Head office address	Days operated
British American Oil Co., Ltd.	Foot of Cherry St., Toronto	Royal Bank Bldg., Toronto	365
Canadian Oil Companies, Ltd.	Petrolia	Excelsior Life Bldg., Toronto	300
Great Lakes Oil Co., Ltd	Wallaceburg	Wallaceburg	Not operating, 1926
Imperial Oil Refineries, Ltd.	Sarnia	Sarnia	365
McColl Bros	Foot of Cherry St., Toronto	114 Don Esplanade, Toronto	304

Table III gives a comparative summary of the operations in Ontario refineries for the years 1922-26, inclusive. These products added to the imported refined products, Table IV, represent the consumption of petroleum products in Ontario, a total of approximately $37,000,000 at retail prices. These tables are prepared from information furnished by the Dominion Bureau of Statistics, Ottawa.

TABLE III—PETROLEUM REFINING OPERATIONS, 1922-26

Schedule	Unit of measure	1922	1923	1924	1925	1926
Canadian crude produced	Gallons	5,756,602	5,598,985	5,401,102	5,024,770	4,693,999
	Value	$466,587	$395,301	$390,424	$367,524	$376,822
Imported crude distilled	Gallons	152,888,816	138,527,971	151,381,481	161,895,295	183,347,749
	Value	$13,834,118	$11,141,952	$11,575,058	$13,056,823	$16,940,505
Canadian crude distilled	Gallons	5,612,645	5,837,827	5,123,683	4,859,148	5,017,500
	Value	$462,346	$450,467	$394,398	$358,245	$422,159
Percentage of total		3.54	4.04	3.27	2.92	2.66
PRODUCTS:						
Illuminating oil	Gallons	36,650,134	33,175,063	28,816,322	18,677,629	8,088,787
	Selling value	$4,077,350	$3,758,185	$3,055,188	$2,222,569	$1,268,377
Lubricating oil	Gallons	14,556,150	11,584,423	12,011,116	13,297,275	16,025,753
	Selling value	$2,558,278	$2,107,530	$2,009,732	$2,364,320	$3,540,786
Benzine, naphtha and gasoline	Gallons	59,223,186	50,884,894	61,493,214	73,083,022	84,936,377
	Selling value	$13,920,089	$8,739,670	$9,392,837	$11,032,134	$14,983,322
Still gas	M cu. ft		374,687	524,737	431,713	630,325
	Value		$131,745	$172,555	$167,869	$256,935
Gas and fuel oil	Gallons	34,508,790	35,727,265	36,702,043	46,064,129	1,196,661
	Selling value	$2,510,427	$2,367,050	$2,494,858	$2,947,378	$3,182,770
Paraffin wax and candles	Lbs	12,063,768	10,484,436	9,112,143	15,502,029	9,858,490
	Selling value	$329,147	$484,416	$551,434	$734,322	$648,303
Tar and grease	Lbs	8,186,013	10,612,588	10,325,835	9,301,674	11,260,882
	Selling value	$265,150	$222,675	$187,544	$177,474	$221,826
Acid oil	Gallons		1,126,370	1,350,450	1,858,176	711,970
	Value		$62,006	$61,748	$85,761	$35,823
Acid and petroleum coke	Short tons	38,016[1]	31,505[1]	36,200[1]	31,501[1]	45,774[1]
	Value	$263,034	$249,425	$226,005	$212,085	$265,481
Miscellaneous	Value			$29,261	$1,596	$2,978
Total value of refined products		$23,923,475	$18,122,702	$18,181,162	$19,945,508	$24,404,801
Employees	Average No.	1,393	1,515	1,603	2,165	2,241
	Wages	$2,018,765	$2,265,307	$2,453,082	$2,702,034	$2,876,150
Capital invested					$4,300,000	$5,836,357

NOTE.—Gallons refer to Imperial gallons.
[1]These years, the British American Oil Co. undoubtedly reported their coke in pounds instead of tons.

Petroleum and Refined Products Imported

Table IV shows the quantity and value of crude oil and its refined products imported into Ontario during the years 1925 and 1926. It is practically all imported from the United States. The information is furnished by the Dominion Bureau of Statistics, Ottawa.

TABLE IV—PETROLEUM AND REFINED PRODUCTS IMPORTED IN 1925 AND 1926

	1925		1926	
	Imperial gallons	Value	Imperial gallons	Value
CRUDE PETROLEUM:				
Gas oils between 0.775 and 0.8235 specific gravity	12,803	$2,482	30,723	$6,769
Petroleum 0.790 specific gravity or heavier for refining	184,632,857	11,274,102	184,595,902	12,228,044
Total	184,645,650	$11,276,584	184,626,625	$12,234,813
REFINED PETROLEUM:				
Gasoline lighter than 0.725 specific gravity (casing head gasoline)	34,679,524	$5,035,236	30,237,083	$4,197,210
Gasoline heavier than 0.725 specific gravity	10,436,435	1,436,065	7,344,583	1,064,787
Kerosene and other illuminating oils	2,908,759	249,011	2,260,129	251,048
Lubricating and other oils	4,124,186	1,254,658	5,040,924	1,522,662
Fuel oil 0.8235 specific gravity and heavier	(1)	(1)	8,295,190	603,735
Total	52,148,904	$7,974,970	53,177,913	$7,639,442
PETROLEUM PRODUCTS:				
Axle grease.....lbs.	2,231,926	$138,669	2,742,347	$164,504
Vaseline, toilet and medicinal petroleum	.....	128,291	.....	106,883
Paraffin wax.....lbs.	1,279,225	101,979	2,004,585	136,552
Paraffin wax candles.....lbs.	142,923	30,307	236,986	50,867
Other petroleum products.....gals.	883,267	160,431	1,143,428	213,265
Total	.....	$559,677	.....	$672,071
Total value	.....	$19,811,231	.....	$20,546,326

[1] Included in petroleum for refining.

Total net value of petroleum and refined products imported in 1926	$20,546,326
Duty paid on the above in 1926, calculated on the existing tariff schedule	1,300,794
Sales tax at 4 per cent	821,853
Freight, approximately	6,724,160
Total value delivered in Ontario	$29,393,133

A comparison of this total with the value of the products of our Ontario refineries shows that over 34 per cent. of refined petroleum products consumed in Ontario or passing through Ontario is imported, but this compared with the years 1924 and 1925 shows the effect of an additional refinery in Ontario. There was a reduction of 7,534,289 gallons of gasoline in the imports. It is apparent that there is room for still more refineries in Ontario.

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