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LETTER OF TRANSMISSION

TO THE HONOURABLE ALBERT MATTHEWS,
Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:—

The undersigned has the honour to transmit to you herewith, for presentation to the Legislative Assembly of the Province of Ontario, the Forty-seventh Annual Report, 1937, of the Department over which I have the honour to preside.

Respectfully submitted,

PAUL LEDUC,
Minister of Mines.

DEPARTMENT OF MINES,
Toronto, 1938.

INTRODUCTORY LETTER

TO THE HONOURABLE PAUL LEDUC,
Minister of Mines.

SIR,—The undersigned has the honour to submit the Forty-seventh Annual Report of the Department of Mines, issued in nine parts, as follows:—

PART I

Statistical Review of the Mineral Industry of Ontario for 1937, by A. C. Young.
List of Mines, Quarries, and Works, 1937.
Mines of Ontario in 1937, by D. G. Sinclair, W. O. Tower, J. B. Taylor, D. P. Douglass, A. S. Bayne, A. E. Cave, D. F. Cooper, E. B. Weir, A. R. Webster.
Mining Accidents in 1937, by D. G. Sinclair, W. O. Tower, J. B. Taylor, D. P. Douglass, A. S. Bayne, A. E. Cave, D. F. Cooper, E. B. Weir, A. R. Webster.
Classes for Prospectors, 1937-38, by W. D. Harding.

PART II

The Porcupine Area, with map No. 47a, by M. E. Hurst.

PART III

The Crow River Area, with map No. 47b, by Jas. E. Thomson.
The Uchi Lake Area, with map No. 47c, by Jas. E. Thomson.

PART IV

Geology of the Keefer-Eldorado Area, with map No. 47d, by W. D. Harding and L. G. Berry.

PART V

Natural Gas in 1937, by R. B. Harkness.
Petroleum in 1937, by R. B. Harkness.

PART VI

Geology of the Whitefish Bay Area, with map No. 47e, by N. H. Fraser.
Some Gold Deposits near Goldrock, Upper Manitou Lake, with map No. 47k, by Jas. E. Thomson.
Gold Discoveries at Rowan Lake, by Jas. E. Thomson.

PART VII

Geology of the Sandy Lake Area, with map No. 47f, by J. Satterly.
Geology of the North Spirit Lake Area, with map No. 47g, by J. D. Bateman.
Recent Developments in the Favourable Lake Area, by J. D. Bateman.

PART VIII

Geology of the South Onaman Area, with map No. 47h, by W. W. Moorhouse.

PART IX

Western Part of the Schreiber Area, with map No. 47j, by G. A. Harcourt.
Eastern Part of the Schreiber Area, with map No. 47j, by M. W. Bartley.

Only Part I is bound with the Sessional Papers of the Legislature. All parts, together with accompanying geological maps as indicated above by number and letter, are available on application to the Department.

Respectfully submitted,

H. C. RICKABY,
Deputy Minister of Mines.

DEPARTMENT OF MINES,
Toronto, 1938.



PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. PAUL LEDUC, *Minister of Mines*

H. C. RICKABY, *Deputy Minister*

FORTY-SEVENTH ANNUAL REPORT
OF THE
ONTARIO DEPARTMENT OF MINES
BEING
VOL. XLVII, PART I, 1938

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Statistical Review of the Mineral Industry of Ontario for 1937

By A. C. Young

GENERAL SUMMARY

Mineral Production

The value of Ontario's mineral production in 1937 has broken all records, being 24.6 per cent. greater than 1936, which was the previous high. From all sources, metallics, non-metallics, structural materials, and clay products, the grand total was \$230,173,459, as against \$184,670,390 in 1936. At the end of the year, the metal-mining industry gave no indication of any cessation in activity, nor did the non-metallic group. The seasonal decline in structural materials and clay products was normal.

The main features in metal mining were an expanding gold-mining industry, for which a steady market absorbed the entire production at an average of \$34.99 per ounce. The nickel-copper industry improved its statistical position, owing mainly to the demand for nickel by a large list of industries, in which widening uses for the metal in peace-time arts has been one of the outstanding developments in marketing during the past two decades. Nickel, for which the principal outlet prior to the Great War was armaments, is now more widely used for other purposes and is no longer dependent on war for prosperity. The silver-cobalt industry has continued to operate, though at a much smaller rate of production than formerly. The demand for cobalt has been consistent, and many small producers were active during the year.

Structural materials increased in production value, among which cement and sand and gravel were the most important. Reflecting the improvement in the building and construction industry, now gradually recovering from the depression, the output of brick and other clay products increased.

In the year under review, employment furnished by the mining industry reached an all-time high. From the beginning of the century until after the war, the nickel-copper industry and the silver-cobalt mines supplied the principal fields for employment. The silver-cobalt mines flourished from 1905 until about 1920, when they commenced their gradual decline. While employment in the nickel-copper mines was curtailed in the early post-war period, it expanded again until the world depression, 1929 to 1934, reduced the number of workers. Since that period, however, the growth in numbers employed has been marked. Gold-mining on the other hand was greatly depressed during the war period, owing to the increased costs of mining a commodity of fixed price. But with the more stable industrial and economic conditions which became apparent in the early twenties, employment increased steadily, and during the depression this industry has been outstanding in the measure of relief given to other areas, which supplied the industry with food, clothing, building materials, and supplies of all kinds. Owing to the widespread distribution of the ore deposits, many new towns have come into being, and not the least of the benefits derived has been the large volume of freight transported by the railways to these new areas.

The details of mineral statistics are shown by items and groups in the following three tables on pages 2, 3, and 4. More complete data for the more important minerals are given in the text.

SUMMARY OF MINERAL STATISTICS, 1937

| Product | Quantity ¹ | Value | Employees | Wages |
|---|-----------------------|----------------------|------------------|---------------------|
| METALLIC | | | | |
| Gold.....oz. | 2,587,094 | \$53,479,981 | 14,768 | \$24,910,604 |
| Exchange equalization..... | | 37,028,708 | | |
| Silver.....oz. | 4,701,865 | 2,093,764 | 293 | 326,526 |
| Copper in matte exported ².....lbs. | 12,992,992 | 1,299,299 | | |
| Copper, metallic and in concentrates, exported.....lbs. | 309,051,492 | 40,417,754 | | |
| Nickel in matte, in speiss, and in ore exported; metallic nickel; and nickel content of oxides and salts.....lbs. | 224,790,974 | 59,469,423 | *11,184 | *18,672,342 |
| Platinum metals.....oz. | 259,184 | 9,931,556 | | |
| Selenium.....lbs. | 116,695 | 201,884 | | |
| Tellurium.....lbs. | 6,651 | 11,506 | | |
| Bismuth.....lbs. | 5,711 | 5,654 | | |
| Cobalt in metal, oxides, salts, ores, and residues.....lbs. | 507,064 | 848,145 | *179 | *182,887 |
| Lead in concentrates exported.....lbs. | 29,849 | 1,525 | | |
| Chromite.....tons | 4,062 | 39,964 | 40 | 59,683 |
| Molybdenite, concentrates.....lbs. | 16,500 | 8,147 | 25 | 14,254 |
| Zinc.....lbs. | 120,011 | 5,883 | 54 | 45,902 |
| Total..... | | \$204,843,193 | 26,543 | \$44,212,198 |
| NON-METALLIC | | | | |
| Arsenic, white.....lbs. | 1,389,426 | \$41,032 | (⁵) | (⁵) |
| Asbestos.....tons | 1 | 250 | | |
| Diatomite.....tons | 38 | 1,868 | | |
| Feldspar, crude and ground.....tons | 9,061 | 72,610 | 29 | \$2,849 |
| Fluorspar.....tons | 150 | 2,550 | | |
| Graphite, crude and refined.....tons | | 125,343 | 47 | 30,509 |
| Gypsum.....tons | 53,780 | 233,895 | 182 | 197,630 |
| Mica.....lbs. | 798,271 | 9,137 | 3 | 1,450 |
| Mineral waters.....Imp. gals. | 26,700 | 889 | 193 | 122,300 |
| Natural gas.....M. cu. ft. | 10,746,334 | 6,588,798 | 1,058 | 1,243,928 |
| Nepheline syenite.....tons | | 121,481 | 60 | 39,193 |
| Peat.....tons | 930 | 4,923 | 17 | 1,800 |
| Petroleum, crude.....bbls. | 165,205 | 356,358 | 209 | 142,385 |
| Quartzite and quartz.....tons | 1,142,372 | 633,073 | 52 | 48,555 |
| Silica brick.....M | 818 | 59,980 | 22 | 20,536 |
| Salt.....tons | 407,701 | 1,539,599 | 274 | 292,644 |
| Sulphur ⁴.....tons | 14,009 | 140,090 | | |
| Talc.....tons | 12,457 | 123,301 | 41 | 31,194 |
| Total..... | | \$10,055,177 | 2,187 | \$2,174,973 |
| STRUCTURAL MATERIALS | | | | |
| Cement, Portland.....bbls. | 2,650,652 | \$3,657,067 | 371 | \$475,866 |
| Hydrated lime.....tons | 26,163 | 278,239 | 250 | 226,122 |
| Quicklime.....tons | 268,304 | 1,874,405 | | |
| Sand and gravel.....tons | 8,832,526 | 3,613,854 | 281 | 215,837 |
| Sand-lime products ⁷ | | 153,910 | 70 | 48,373 |
| Stone: limestone, marble, trap, granite, sandstone, slate.....tons | 4,277,601 | 3,663,769 | 1,178 | 961,760 |
| Total..... | | \$13,241,244 | 2,150 | \$1,927,958 |
| CLAY PRODUCTS | | | | |
| Brick, face.....No. | 40,196,009 | \$751,045 | | |
| Brick, common.....No. | 25,937,164 | 356,727 | | |
| Brick, fancy and ornamental.....No. | 55,180 | 2,972 | | |
| Brick, sewer.....No. | 175,359 | 2,777 | | |
| Tile, drain.....No. | 9,604,756 | 233,258 | 1,126 | \$752,667 |
| Tile, structural, roofing, and floor..... | | 276,813 | | |
| Sewer pipe, copings, flue-linings, etc..... | | 338,895 | | |
| Pottery..... | | 54,581 | | |
| Haydite and clay..... | | 16,777 | | |
| Total..... | | \$2,033,845 | 1,126 | \$752,667 |
| TOTAL..... | | \$230,173,459 | 32,006 | \$49,067,796 |

¹All tons in this table are 2,000 pounds.²Copper in matte valued at 10 cents per pound, and nickel at 18 cents.³Employees and wages for nickel-copper mines, smelters, and refineries include statistics of the Ontario Refining Company.⁴Employees and wages for silver-cobalt smelters and refineries.⁵Employees and wages included with figures for silver-cobalt smelters and refineries (⁴).⁶Tonnage given is sulphur content of sulphuric acid.⁷No deduction made for lime used in manufacturing.⁸Canadian funds.

COMPARATIVE VALUE OF MINERAL PRODUCTION, 1933-1937

| Product | 1933 | 1934 | 1935 | 1936 | 1937 |
|---------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| METALLIC | | | | | |
| Gold (Canadian value)..... | \$61,044,951 | \$72,808,688 | \$78,068,169 | \$83,308,179 | \$90,508,689 |
| Silver..... | 1,912,934 | 2,600,393 | 4,068,906 | 2,325,850 | 2,093,764 |
| Platinum metals..... | 1,501,233 | 6,187,992 | 5,407,392 | 7,802,997 | 9,931,556 |
| Cobalt ¹ | 597,752 | 592,497 | 512,705 | 803,580 | 848,145 |
| Nickel ² | 20,130,480 | 32,139,425 | 35,345,103 | 43,876,525 | 59,469,423 |
| Copper, metallic and in matte.. | 10,118,847 | 14,822,704 | 19,295,965 | 26,898,920 | 41,717,053 |
| Selenium..... | 53,745 | 91,286 | 144,697 | 188,151 | 201,884 |
| Tellurium..... | ..... | 25,599 | 28,550 | 18,049 | 11,506 |
| Lead, in ore..... | 692 | 525 | 706 | 682 | 1,525 |
| Bismuth..... | 3,731 | 3,444 | 6,796 | 3,516 | 5,654 |
| Chromite..... | ..... | 480 | 9,576 | 5,070 | 39,964 |
| Molybdenite..... | ..... | ..... | ..... | ..... | 8,147 |
| Zinc..... | ..... | ..... | ..... | ..... | 5,883 |
| Total..... | \$95,364,365 | \$129,273,033 | \$142,888,565 | \$165,231,519 | \$204,843,193 |
| NON-METALLIC | | | | | |
| Actinolite..... | ..... | \$365 | ..... | ..... | ..... |
| Arsenic, white..... | \$56,534 | 56,412 | \$75,326 | \$42,491 | \$41,032 |
| Asbestos..... | ..... | ..... | ..... | ..... | 250 |
| Barite..... | 60 | ..... | ..... | ..... | ..... |
| Diatomite..... | 1,298 | 1,920 | 4,600 | 2,000 | 1,868 |
| Feldspar, crude and ground... | 45,350 | 61,665 | 75,003 | 70,840 | 72,610 |
| Fluorspar..... | 1,064 | 2,100 | 900 | 900 | 2,550 |
| Graphite, crude and refined... | 16,145 | 64,998 | 78,500 | 88,812 | 125,343 |
| Gypsum..... | 112,319 | 141,389 | 164,807 | 182,783 | 233,895 |
| Mica..... | 9,371 | 9,059 | 7,144 | 11,433 | 9,137 |
| Mineral waters..... | 2,347 | 1,622 | 1,477 | 1,177 | 889 |
| Natural gas..... | 4,523,084 | 4,741,368 | 4,894,353 | 6,054,294 | 6,588,798 |
| Nepheline syenite..... | ..... | ..... | ..... | 37,426 | 121,481 |
| Peat fuel..... | 900 | 7,343 | 5,761 | 7,122 | 4,923 |
| Petroleum, crude..... | 253,486 | 299,874 | 346,156 | 348,767 | 356,358 |
| Phosphate..... | ..... | ..... | 60 | ..... | ..... |
| Quartzite and quartz..... | 86,146 | 134,572 | 111,074 | 216,037 | 633,073 |
| Silica brick..... | 7,351 | 14,730 | 22,976 | 26,715 | 59,980 |
| Salt..... | 1,755,087 | 1,734,196 | 1,698,500 | 1,557,078 | 1,539,599 |
| Sulphur ³ | 81,960 | 145,980 | 132,920 | 141,520 | 140,090 |
| Talc and soapstone..... | 142,134 | 135,978 | 138,161 | 143,701 | 123,301 |
| Total..... | \$7,094,636 | \$7,553,571 | \$7,766,657 | \$8,933,036 | \$10,055,177 |
| STRUCTURAL MATERIALS | | | | | |
| Cement, Portland..... | \$1,587,812 | \$2,403,590 | \$1,752,148 | \$2,180,895 | \$3,657,067 |
| Lime, hydrated and quicklime.. | 1,227,196 | 1,536,288 | 1,705,303 | 1,946,060 | 2,152,644 |
| Sand and gravel..... | 2,467,916 | 1,714,569 | 2,095,610 | 2,227,620 | 3,613,854 |
| Sand-lime products ⁴ | 69,785 | 146,009 | 138,555 | 178,868 | 153,910 |
| Stone: limestone, granite, etc.. | 983,268 | 1,965,507 | 1,863,892 | 2,396,376 | 3,661,511 |
| Slate..... | ..... | 600 | ..... | 2,080 | 2,258 |
| Total..... | \$6,335,977 | \$7,766,563 | \$7,555,508 | \$8,931,899 | \$13,241,244 |
| CLAY PRODUCTS | | | | | |
| Brick, face..... | \$351,292 | \$479,850 | \$545,231 | \$532,018 | \$751,045 |
| Brick, common..... | 163,338 | 227,276 | 275,835 | 367,642 | 356,727 |
| Brick, fancy and ornamental... | 387 | 835 | 728 | 1,295 | 2,972 |
| Brick, sewer..... | 3,683 | 5,992 | 970 | 6,723 | 2,777 |
| Tile, drain..... | 179,015 | 137,699 | 125,593 | 131,041 | 233,258 |
| Tile, structural, roofing, and floor | 74,064 | 120,981 | 168,128 | 238,885 | 276,813 |
| Sewer pipe, copings, flue-lin- | ..... | ..... | ..... | ..... | ..... |
| ings, etc..... | 185,138 | 226,005 | 196,647 | 235,238 | 338,895 |
| Pottery..... | 52,650 | 52,578 | 50,000 | 51,507 | 54,581 |
| Haydite and clay..... | 15,012 | 9,790 | 7,093 | 9,587 | 16,777 |
| Total..... | \$1,024,579 | \$1,261,006 | \$1,370,225 | \$1,573,936 | \$2,033,845 |
| GRAND TOTAL..... | \$109,819,557 | \$145,854,173 | \$159,580,955 | \$184,670,390 | \$230,173,459 |

¹Cobalt in oxide, metallic cobalt, and cobalt content of residues marketed.²Nickel in matte, oxide, and metallic nickel.³Value of sulphuric acid produced.⁴No deduction made for lime consumed in manufacturing. The figures for 1933 refer to sand-lime brick only.

The table following shows the aggregate value of metals from the time production began in Ontario and of other minerals beginning with 1891.

It should be noted in this table and the one following that since 1914 the province has been credited with the value of the pig iron made from domestic ore only. Credit is also given from Ontario iron ores exported or shipped to other provinces.

TOTAL MINERAL PRODUCTION

| Year | Exchange equalization or discount | Metallics | Non-metallics | Structural materials | Clay products | Total |
|--------------------------|-----------------------------------|-----------------|---------------|----------------------|---------------|-----------------|
| Before 1891 ¹ | | \$9,520,269 | | | | \$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 | | 4,480,452 | | 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 | | 44,109,769 | 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 | \$1,376,275 | 48,281,553 | 8,141,796 | 11,921,019 | 4,735,154 | 74,455,797 |
| 1921 | 1,359,636 | 28,777,581 | 6,636,217 | 13,967,386 | 5,183,125 | 55,923,945 |
| 1922 | 208,621 | 40,290,157 | 7,591,913 | 13,640,166 | 6,944,218 | 68,675,075 |
| 1923 | 280,196 | 44,076,660 | 8,511,786 | 13,139,757 | 6,269,140 | 72,277,539 |
| 1924 | 196,750 | 52,130,314 | 7,555,283 | 12,398,465 | 5,137,865 | 77,418,677 |
| 1925 | -2,838 | 62,495,472 | 7,488,034 | 12,451,174 | 5,148,626 | 87,580,468 |
| 1926 | -595 | 59,218,297 | 7,842,632 | 12,681,308 | 5,356,469 | 85,098,111 |
| 1927 | | 62,631,255 | 7,638,605 | 14,160,552 | 5,853,035 | 90,283,447 |
| 1928 | 2,811 | 71,267,003 | 7,822,641 | 14,815,814 | 6,177,664 | 100,085,933 |
| 1929 | 157,456 | 83,967,446 | 8,621,427 | 18,541,687 | 6,830,162 | 118,118,178 |
| 1930 | 36,703 | 83,356,365 | 8,492,263 | 16,571,626 | 5,221,214 | 113,678,171 |
| 1931 | 1,926,221 | 72,452,544 | 7,642,308 | 11,995,556 | 3,552,799 | 97,569,423 |
| 1932 | 6,134,157 | 63,997,017 | 7,361,897 | 7,295,917 | 1,690,505 | 86,479,493 |
| 1933 | 16,486,437 | 78,877,928 | 7,094,636 | 6,335,977 | 1,024,579 | 109,819,557 |
| 1934 | 29,287,439 | 99,985,594 | 7,553,571 | 7,766,563 | 1,261,006 | 145,854,173 |
| 1935 | 32,169,797 | 110,718,768 | 7,766,657 | 7,555,508 | 1,370,225 | 159,580,955 |
| 1936 | 34,139,923 | 131,091,593 | 8,933,036 | 8,931,899 | 1,573,936 | 184,670,390 |
| 1937 | 37,028,708 | 167,814,485 | 10,055,177 | 13,241,244 | 2,033,845 | 230,173,459 |
| Total.. | \$160,787,700 | \$1,908,430,891 | | \$694,750,443 | | \$2,763,969,034 |

¹Prior 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.

Metal Production

The total value of production by Ontario metal mines from the time of the earliest record to the end of 1937 amounted to \$2,069,218,591, or considerably over the two thousand million mark. The figures are indicative not only of the vast strides made by this section of the mining industry in recent years, but of the increasing importance of Ontario in the economy of the nations. The table below shows that apart from lead, zinc, and molybdenum this province possesses important quantities of those metals most desired by man.

METAL PRODUCTION TO DECEMBER 31, 1937

| Metal or product | To December 31, 1936 | 1937 | To December 31, 1937 |
|---|-------------------------|---------------|-------------------------|
| Gold..... | \$624,669,345 | \$53,479,981 | \$678,149,326 |
| Exchange equalization..... | 123,758,992 | 37,028,708 | 160,787,700 |
| Nickel, including nickel oxides and salts.. | 470,744,668 | 59,469,423 | 530,214,091 |
| Silver..... | 266,681,772 | 2,093,764 | 268,775,536 |
| Copper ¹ | 206,243,461 | 41,717,053 | 247,960,514 |
| Pig iron from domestic ore..... | 84,775,556 | ..... | 84,775,556 |
| Cobalt ² | 27,838,051 | 848,145 | 28,686,196 |
| Platinum metals..... | 44,204,573 | 9,931,556 | 54,136,129 |
| Iron ore ³ | 9,463,516 | ..... | 9,463,516 |
| Lead..... | 4,487,227 | 1,525 | 4,488,752 |
| Zinc, in ore and concentrates..... | 535,696 | 5,883 | 541,579 |
| Molybdenite..... | 210,015 | 8,147 | 218,162 |
| Bismuth..... | 165,215 | 5,654 | 170,869 |
| Selenium..... | 509,987 | 201,884 | 711,871 |
| Tellurium..... | 72,198 | 11,506 | 83,704 |
| Chromite..... | 15,126 | 39,964 | 55,090 |
| Total..... | \$1,864,375,398 | \$204,843,193 | \$2,069,218,591 |

¹Includes small quantities of copper sulphate.

²Includes metal, oxide, salts, and cobalt content of residues exported.

³Value of ore shipped out of the province.

Dividends.—During 1937 dividends were paid by 19 gold, 2 nickel-copper, and 2 silver-cobalt mining companies. Those included are the actively engaged or producing companies only. Investment or holding companies, of which there are several, have been excluded.

DIVIDENDS PAID BY METAL MINES TO DECEMBER 31, 1937

| Industry | To end of 1936 | 1937 | To end of 1937 |
|--------------------|----------------|--------------|----------------|
| Gold..... | \$235,345,814 | \$35,444,678 | \$270,790,492 |
| Nickel-copper..... | 197,600,733 | 35,736,054 | 233,336,787 |
| Silver-cobalt..... | 99,170,781 | 554,000 | 99,724,781 |
| Total..... | \$532,117,328 | \$71,734,732 | \$603,852,060 |

Metal Prices and Exchange

Quotations of metal prices and exchange for 1936 and 1937 are included here for reference. It will be noted that while silver has fallen in price from 45.127 cents per ounce to 44.881, copper has risen from 9.23 to 13.018 cents per pound. The improved copper prices have in part accounted for the increase in total value. The following figures were supplied by the Dominion Bureau of Statistics:—

| Month | Average exchange rate U.S. dollars in Canadian funds | £ Sterling in Canadian funds | Silver, cents per oz. | | Copper, cents per lb. | | Gold in Canadian dollars per fine oz. |
|-------------------------------------|--|------------------------------|-----------------------------|-------------------|-----------------------------|--------------------------|---------------------------------------|
| | | | New York market, U.S. funds | in Canadian funds | New York export, U.S. funds | London in Canadian funds | |
| 1936 | | | | | | | |
| January..... | 1.00046 | 4.9657 | 47.25 | 47.272 | 8.358 | 8.5986 | 35.06 |
| February..... | .9986 | 4.994 | 44.75 | 44.687 | 8.566 | 8.7981 | 35.18 |
| March..... | 1.0013 | 4.9783 | 44.75 | 44.808 | 8.708 | 8.9403 | 35.11 |
| April..... | 1.0047 | 4.9673 | 44.892 | 45.103 | 8.849 | 9.1210 | 35.15 |
| May..... | 1.0018 | 4.9798 | 44.869 | 44.95 | 8.819 | 9.079 | 35 |
| June..... | 1.0026 | 5.0328 | 44.75 | 44.866 | 8.79 | 9.0674 | 35.09 |
| July..... | 1.001 | 5.027 | 44.75 | 44.795 | 8.993 | 9.2524 | 34.91 |
| August..... | 1.0001 | 5.0265 | 44.75 | 44.755 | 9.297 | 9.5088 | 35 |
| September... | .9997 | 5.039 | 44.75 | 44.737 | 9.523 | 9.7331 | 34.99 |
| October..... | .9997 | 4.8972 | 44.75 | 44.737 | 9.669 | 9.9026 | 34.99 |
| November... | .9986 | 4.8817 | 45.431 | 45.367 | 10.349 | 10.5627 | 34.95 |
| December... | .9993 | 4.9042 | 45.352 | 45.32 | 10.835 | 11.0266 | 34.98 |
| Average ¹ (12 months)... | 1.000716 | 4.974325 | 45.087 | 45.127 | 9.23 | 9.4769 | 35.03 |
| 1937 | | | | | | | |
| January..... | 1 | 4.909 | 44.913 | 44.926 | 12.112 | 12.337 | 35.01 |
| February.... | 1 | 4.895 | 44.75 | 44.759 | 13.828 | 13.99 | 35.01 |
| March..... | .999 | 4.882 | 45.13 | 45.12 | 16.59 | 16.603 | 34.98 |
| April..... | .998 | 4.91 | 45.46 | 45.397 | 14.692 | 14.601 | 34.95 |
| May..... | .998 | 4.93 | 45.025 | 44.961 | 13.999 | 14.008 | 34.94 |
| June..... | 1.001 | 4.937 | 44.818 | 44.839 | 13.492 | 13.541 | 35.02 |
| July..... | 1.001 | 4.974 | 44.75 | 44.808 | 13.817 | 13.956 | 35.02 |
| August..... | 1.001 | 4.982 | 44.75 | 44.754 | 13.926 | 14.146 | 35 |
| September... | 1 | 4.952 | 44.75 | 44.752 | 12.984 | 13.014 | 35 |
| October..... | .999 | 4.954 | 44.75 | 44.74 | 11.207 | 11.169 | 35 |
| November... | .999 | 4.99 | 44.75 | 44.714 | 9.85 | 9.787 | 34.98 |
| December... | 1 | 4.998 | 44.75 | 44.769 | 9.714 | 9.793 | 34.93 |
| Average ¹ (12 months)... | 0.9998 | 4.9438 | 44.883 | 44.881 | 13.018 | 13.078 | 34.99 |

¹Computed from daily quotations.

Diamond-Drilling

In 1937 some 60 companies made returns respecting their drilling operations. The number of machines active was 370, in the operation of which 1,850 men were employed, who were paid \$2,721,540 in wages. The corresponding figures for 1936 were 217 drills, 1,457 wage-earners, and \$1,563,700 in wages. The figures by provinces are shown below, and it should be pointed out that the statistics for provinces other than Ontario may be more or less incomplete, as they refer to work done by Ontario firms only.

DIAMOND-DRILLING OPERATIONS, 1936 AND 1937

| Province | 1936 | | 1937 | |
|-----------------------------|-------|----------------------------|--------|----------------------------|
| | Holes | Core footage | Holes | Core footage |
| Ontario..... | 8,417 | 1,836,604 | 10,943 | 2,385,026 |
| Quebec..... | 994 | 216,904 | 3,050 | 833,651 |
| Manitoba..... | 353 | 73,391 | 337 | 74,713 |
| Saskatchewan and N.W.T..... | 82 | 18,407 | 255 | 62,883 |
| Total..... | 9,846 | 2,145,306 (406.5 miles) | 14,585 | 3,356,273 (635.6 miles) |

The total consumption of borts, ballas, and carbons in 1937 was 166,631.94 carats, as shown below:—

CONSUMPTION OF DIAMONDS BY REPORTING FIRMS, 1937

| Period | Borts | Ballas | Carbons |
|--|-------------------------|------------------|----------------------|
| | carats | carats | carats |
| Diamonds on hand December 31, 1936..... | 45,846.24 | 141.28 | 4,205.56 |
| Purchased in 1937..... | 172,030.40 | 442.08 | 1,901.97 |
| Diamonds on hand December 31, 1937..... deduct | 217,876.64 54,703.64 | 583.36 506.26 | 6,107.53 2,725.69 |
| Diamonds consumed (166,631.94 carats) in 1937... | 163,173.00 | 77.10 | 3,381.84 |

Prospecting

An index of activity is afforded by the following table:—

MINING CLAIMS RECORDED, 1907-1937

| Year | No. | Year | No. | Year | No. |
|-----------|--------|-----------|--------|-----------|--------|
| 1907..... | 13,996 | 1918..... | 1,534 | 1928..... | 15,046 |
| 1908..... | 4,634 | 1919..... | 2,918 | 1929..... | 8,207 |
| 1909..... | 9,746 | 1920..... | 2,160 | 1930..... | 3,886 |
| 1910..... | 5,792 | 1921..... | 2,459 | 1931..... | 5,779 |
| 1911..... | 9,001 | 1922..... | 5,686 | 1932..... | 4,945 |
| 1912..... | 3,104 | 1923..... | 6,092 | 1933..... | 8,077 |
| 1913..... | 4,320 | 1924..... | 5,222 | 1934..... | 16,888 |
| 1914..... | 1,913 | 1925..... | 4,751 | 1935..... | 9,460 |
| 1915..... | 2,519 | 1926..... | 13,496 | 1936..... | 17,280 |
| 1916..... | 2,470 | 1927..... | 15,554 | 1937..... | 15,292 |
| 1917..... | 1,936 | | | | |

METALLICS

Gold

General Summary

Gold from all sources in Ontario during 1937, which includes the metal recovered in the refining of nickel-copper mattes and blister copper, totalled 2,587,094 fine ounces, valued at \$90,508,689 in Canadian funds, as against 2,378,494 fine ounces, worth \$83,308,179 during the previous year. Of the 1937 output, 2,511,643.896 ounces were recovered by auriferous quartz mines and 75,450.122 from other sources.

The record for gold mines alone in 1937, including the value of the silver recovered in the crude gold bullion, was \$88,095,110 from 8,426,898 tons milled, as compared with \$80,951,954 from 7,747,413 tons in 1936. This represents an increase of 8.8 per cent. in value and 7.4 per cent. in ore milled. The average values per ton of ore treated were \$10.46 and \$10.45 for 1937 and 1936, respectively. Reference to the insert table facing page 18 will show that the principal gold areas have increased their production figures. The grade of ore by areas shows considerable fluctuation.

In the Porcupine belt, the average grade was \$9.13 per ton; Kirkland Lake belt, \$14.73; Matachewan area, \$3.91; Sudbury district, \$7.17; Algoma district, \$5.13; Thunder Bay district, \$14.30; Kenora and Rainy River districts, \$9.03; and Patricia Portion, \$8.58.

The production of gold ores in 1937, as shown in the insert table facing page 10, came from 74 properties, large and small. Of these, 44 can be considered as steadily in production the year round; the remaining 28 as carrying on part-time operations or shipping small lots of ore to smelters and refineries.

Sixty-three mills were in operation during 1937, having a total average daily capacity of 24,230 tons; 8 plants with rated capacities of 1,625 tons per day were under construction; 4 plants were being planned; and 21 smaller units were idle.

As a result of the expansion of the gold-mining industry in 1937, the payroll for producing mines alone rose from \$21,161,675 in 1936 to \$24,910,604 in 1937, an increase of 12.4 per cent.

Labour Statistics

The following figures summarize labour statistics for the gold-mining industry, as reported to the Ontario Department of Mines:—

AVERAGE YEARLY WAGE, GOLD-MINING INDUSTRY, 1936 AND 1937

| Area or district | 1936 | | | 1937 | | |
|---------------------------------------|---------------------|--------------|------------------------|---------------------|--------------|------------------------|
| | No. of wage-earners | Wages paid | Average wage per annum | No. of wage-earners | Wages paid | Average wage per annum |
| Porcupine belt..... | 6,504 | \$10,890,496 | \$1,674 | 7,043 | \$12,214,799 | \$1,734 |
| Kirkland Lake belt... | 4,133 | 6,483,744 | 1,569 | 4,633 | 7,629,648 | 1,646 |
| Matachewan and West Shiningtree..... | 384 | 388,454 | 1,012 | 350 | 629,741 | 1,799 |
| Sudbury district..... | 38 | 36,761 | 967 | 207 | 286,705 | 1,385 |
| Algoma district..... | 258 | 431,483 | 1,670 | 344 | 470,833 | 1,369 |
| Thunder Bay district.. | 883 | 1,290,872 | 1,462 | 955 | 1,569,761 | 1,644 |
| Patricia portion..... | 959 | 1,507,186 | 1,572 | 1,056 | 1,864,761 | 1,766 |
| Kenora and Rainy River districts..... | 165 | 169,440 | 1,027 | 171 | 244,357 | 1,429 |
| Operating but non-producing..... | 2,270 | 2,170,937 | 957 | 2,765 | 3,622,920 | 1,310 |
| Total..... | 15,594 | \$23,369,373 | \$1,500 | 17,524 | \$28,533,525 | \$1,628 |

¹Matachewan alone.

²Exclusive of West Shiningtree.

Mint Receipts from Ontario Mines

The table below shows the record over a five-year period of receipts of crude gold bullion from Ontario mines at the Royal Canadian Mint.

RECEIPTS OF CRUDE GOLD BULLION FROM ONTARIO MINES AT THE ROYAL CANADIAN MINT, OTTAWA, 1933-1937

| Year | Quantity | Precious metals | | Total value (standard) | Buying rate in Canada for New York funds ¹ |
|-----------|--------------|-----------------|-------------|------------------------|---|
| | | Gold | Silver | | |
| | crude ounces | fine ounces | fine ounces | | |
| 1933..... | 2,441,467 | 1,879,659 | 270,377 | 38,945,178 | 109.472 |
| 1934..... | 2,668,456 | 2,031,719 | 292,445 | 42,134,234 | .99 |
| 1935..... | 2,798,831 | 2,195,386 | 310,104 | 42,578,603 | 100.54 |
| 1936..... | 2,998,696 | 2,346,529 | 379,693 | 48,674,046 | 100.072 |
| 1937..... | 3,260,622 | 2,565,457 | 381,276 | 53,199,646 | 99.98 |

¹The average rate of premium on New York funds is based on the day to day record of current quotations. The Federal Department of Finance pays for gold in Canadian funds and reimburses producers by an amount equivalent to the exchange premium on New York funds. Export of gold is prohibited except under license. After April 19, 1933, when the United States forsook the gold standard, Canadian output was marketed in London.

Dividends and Production

The following tables show the dividends paid by the various gold-mining companies, the yearly dividends by areas, the total gold production from 1866 to 1937, the production by areas in 1937, and the annual production by mines in each area.

DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES TO DECEMBER 31, 1937

| Name of company | Date of incorporation | Authorized capital, \$ or shares | Capital stock issued, \$ or shares | Par value per share | Dividends and bonuses paid to end of 1936 | Dividends and bonuses paid during 1937 | Rate per cent., or per share 1937 | Total dividends and bonuses paid to Dec. 31, 1937 | Date when last dividend or bonus was paid |
|---|-----------------------|----------------------------------|------------------------------------|---------------------|---|--|-----------------------------------|---|---|
| Anglo-Huronian, Ltd. | Oct. 16, 1933 | 2,000,000 | 1,317,605 | No par | \$1,275,605.00 | \$300,000.00 | 20c. | \$1,575,605.00 | June 1, 1937 |
| Buffalo Ankerite Gold Mines, Ltd. | Oct. 5, 1932 | 1,000,000 | 701,679 | \$1.00 | 387,825.26 | 508,717.28 | 72.5c. | 896,542.54 | Nov. 15, 1937 |
| Central Patricia Gold Mines, Ltd. | April 20, 1931 | 2,500,000 | 2,500,000 | 1.00 | 200,000.00 | 300,000.00 | 12c. | 500,000.00 | Sept. 30, 1937 |
| Coniaurum Mines, Ltd. | July 4, 1924 | 6,000,000 | 2,730,447 | No par | 80,923.41 | 273,044.70 | 5c. | 353,968.11 | Dec. 30, 1937 |
| Dome Mines, Ltd. ¹ | Sept. 30, 1923 | 1,000,000 | 1,000,000 | No par | 29,244,519.15 | 4,380,003.00 | \$4.50 | 33,624,522.15 | Oct. 20, 1937 |
| Hollinger Consol. Gold Mines, Ltd. ² | May 25, 1916 | \$25,000,000 | \$24,600,000 | 5.00 | 82,830,400.00 | 5,412,000.00 | 22% | 88,242,400.00 | Dec. 31, 1937 |
| Howey Gold Mines, Ltd. | Mar. 12, 1926 | 5,000,000 | 5,000,000 | 1.00 | 350,000.00 | 200,000.00 | 4c. | 1,050,000.00 | Aug. 2, 1937 |
| Kirkland Lake Gold Mining Co., Ltd. | Nov. 19, 1915 | 5,500,000 | 5,326,699 | 1.00 | 631,322.04 | 479,402.91 | 9c. | 1,110,724.95 | Nov. 1, 1937 |
| Lake Shore Mines, Ltd. | Feb. 25, 1914 | 2,000,000 | 2,000,000 | 1.00 | 53,020,000.00 | 12,000,000.00 | 600% | 65,020,000.00 | Dec. 15, 1937 |
| Little Long Lac Gold Mines, Ltd. | Jan. 26, 1933 | 3,000,000 | 1,833,000 | No par | 549,900.00 | 733,200.00 | 40c. | 1,283,100.00 | Dec. 20, 1937 |
| Macassa Mines, Ltd. | April 12, 1926 | 3,000,000 | 2,678,068 | 1.00 | 929,823.80 | 535,613.60 | 20c. | 1,465,437.40 | Nov. 1, 1937 |
| McIntyre-Porcupine Mines, Ltd. | Mar. 16, 1911 | 4,000,000 | 3,990,000 | 5.00 | 17,277,162.43 | 1,596,000.00 | 40% | 18,873,162.43 | Dec. 1, 1937 |
| McKenzie Red Lake Gold Mines, Ltd. | Feb. 1, 1933 | 3,000,000 | 2,900,000 | 1.00 | 203,000.00 | 261,000.00 | 9c. | 464,000.00 | Dec. 15, 1937 |
| Northern Empire Mines Co., Ltd. ³ | July 28, 1932 | 500,500 | 341,500 | 1.00 | 170,500.00 | 170,750.00 | 50c. | 341,250.00 | Jan. 12, 1937 |
| Pickle Crow Gold Mines, Ltd. | Jan. 8, 1934 | 3,000,000 | 3,000,000 | 1.00 | 600,000.00 | 1,050,000.00 | 35c. | 1,650,000.00 | Dec. 31, 1937 |
| Porcupine Crown Mines, Ltd. | May 25, 1913 | 4,000,000 | 3,520,055 | 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. ⁴ | Jan. 6, 1914 | 2,000,000 | 1,850,000 | 1.00 | ..... | 824,875.00 | 25% | 3,497,470.00 | Dec. 31, 1937 |
| Sylvanite Gold Mines, Ltd. | June 13, 1913 | 3,300,000 | 3,299,500 | 1.00 | 2,672,595.00 | 2,403,572.00 | 50c. | 27,807,435.20 | Oct. 1, 1937 |
| Teck-Hughes Gold Mines, Ltd., The | Mar. 2, 1923 | 5,000,000 | 4,807,144 | 1.00 | 25,403,863.20 | 166,500.00 | 9c. | 610,500.00 | Nov. 22, 1937 |
| Toburn Gold Mines, Ltd. | Jan. 24, 1931 | 2,000,000 | 1,850,000 | 1.00 | 444,000.00 | ..... | ..... | 398,625.00 | Dec. 27, 1916 |
| Tough-Oakes Gold Mines, Ltd. | July 15, 1913 | \$3,000,000 | \$2,657,500 | 5.00 | 398,625.00 | ..... | ..... | 67,500.00 | April 15, 1927 |
| Vipond Consolidated Mines, Ltd. | July 17, 1922 | 2,500,000 | 2,250,000 | 1.00 | 67,500.00 | ..... | ..... | 21,106,250.00 | Oct. 1, 1937 |
| Wright-Hargreaves Mines, Ltd. | June 16, 1916 | 5,500,000 | 5,500,000 | No par | 17,256,250.00 | 3,850,000.00 | 70c. | ..... | ..... |
| Total | ..... | ..... | ..... | ..... | \$235,345,814.29 | \$35,444,678.49 | ..... | \$270,790,492.78 | ..... |

¹On April 22, 1922, the capital of Dome Mines Company, Limited, was reduced from \$5,000,000 to \$4,500,000, and \$476,667 (repayment of capital not included in above table) distributed to shareholders in addition to dividends paid to September 30, 1923, when the new company, Dome Mines, Limited, issued 1,000,000 no par value shares at \$7.00 per share. In 1936, the company had in trust 46,666 shares and during that year 20,000 of these were given in part payment for the Schumacher claims, leaving 26,666 shares.

²Hollinger Consolidated Gold Mines, Limited, is an amalgamation of the Acme Gold Mines, Limited; Millerton Gold Mines, Limited; and Hollinger Gold Mines, Limited. Dividends include \$4,170,000 paid by Hollinger to May 25, 1916, the date of consolidation; there is also included \$160,000 paid by Acme in 1915 to discharge a debt for capital borrowed.

³Capital stock increased 500 shares on December 28, 1935.

⁴The 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.

**YEARLY DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES IN
THE PORCUPINE BELT, 1912-1937**

| Year | Hollinger Consol. Gold Mines | Porcu- pine Crown Mines | Dome Mines | McIntyre- Porcupine Mines | Buffalo Ankerite Gold Mines | Anglo- Huron- ian | Miscel- laneous | Total |
|--------|------------------------------------|----------------------------------|---------------|---------------------------------|-----------------------------------|-------------------------|--------------------|----------------|
| | \$ | \$ | \$ | \$ | \$ | \$ | \$ | \$ |
| 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.. | 1,560,000 | 240,000 | 400,000.00 | | | | 112,000.00 | 2,212,000.00 |
| 1916.. | 3,286,000 | 240,000 | 800,000.00 | | | | | 4,326,000.00 |
| 1917.. | 738,000 | 120,000 | 300,000.00 | 541,542.45 | | | | 1,699,542.45 |
| 1918.. | 1,230,000 | | | 543,042.45 | | | | 1,773,042.45 |
| 1919.. | 1,722,000 | | | 364,028.30 | | | | 2,086,028.30 |
| 1920.. | 2,214,000 | | 416,886.00 | 546,042.45 | | | | 3,176,928.45 |
| 1921.. | 3,198,000 | | 478,947.75 | 546,042.45 | | | | 4,222,990.20 |
| 1922.. | 3,198,000 | | 715,000.50 | 546,042.45 | | | | 4,459,042.95 |
| 1923.. | 3,198,000 | | 1,430,001.00 | 548,542.45 | | | | 5,176,543.45 |
| 1924.. | 3,198,000 | | 1,906,668.00 | 774,125.00 | | | | 5,878,793.00 |
| 1925.. | 4,378,800 | | 1,906,668.00 | 798,000.00 | | | | 7,083,468.00 |
| 1926.. | 5,805,600 | | 1,906,668.00 | 798,000.00 | | | | 8,510,268.00 |
| 1927.. | 6,396,000 | | 1,191,667.50 | 798,000.00 | | | 267,500.00 | 8,453,167.50 |
| 1928.. | 5,412,000 | | 953,334.00 | 798,000.00 | | | | 7,163,334.00 |
| 1929.. | 3,198,000 | | 953,334.00 | 798,000.00 | | | | 4,949,334.00 |
| 1930.. | 3,444,000 | | 953,334.00 | 798,000.00 | | | | 5,195,334.00 |
| 1931.. | 3,444,000 | | 953,334.00 | 798,000.00 | | | | 5,195,334.00 |
| 1932.. | 3,690,000 | | 1,239,334.20 | 997,499.86 | | | 280,923.41 | 6,007,757.47 |
| 1933.. | 4,182,000 | | 1,716,001.20 | 1,496,254.57 | 42,571.29 | | | 7,436,827.06 |
| 1934.. | 6,888,000 | | 3,336,669.00 | 1,596,000.00 | 89,371.77 | 501,042 | | 12,411,082.77 |
| 1935.. | 4,428,000 | | 3,813,336.00 | 1,596,000.00 | 115,546.40 | 250,521 | | 10,203,403.40 |
| 1936.. | 5,412,000 | | 3,873,336.00 | 1,596,000.00 | 140,335.80 | 524,042 | | 11,545,713.80 |
| 1937.. | 5,412,000 | | 4,380,003.00 | 1,596,000.00 | 508,717.28 | 300,000 | 273,044.70 | 12,469,764.98 |
| Total. | 88,242,400 | 840,000 | 33,624,522.15 | 18,873,162.43 | 896,542.54 | 1,575,605 | 433,468.11 | 144,485,700.23 |

1Rea Consolidated Gold Mines. 2Vipond Consolidated Mines. 3Coniaurum Mines.

**YEARLY DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES IN
THE KIRKLAND LAKE AREA, 1915-1937**

| Year | Tough- Oakes Gold Mines | Toburn Gold Mines | Lake Shore Mines | Wright- Hargreaves Mines | Teck- Hughes Gold Mines | Sylvanite Gold Mines | Kirkland Lake Gold Mining Co. | Macassa Mines | Total |
|--------|-------------------------------|----------------------|------------------------|--------------------------------|-------------------------------|-------------------------|-------------------------------------|------------------|----------------|
| | \$ | \$ | \$ | \$ | \$ | \$ | \$ | \$ | \$ |
| 1915.. | 132,875 | | | | | | | | 132,875.00 |
| 1916.. | 265,750 | | | | | | | | 265,750.00 |
| 1917.. | | | | | | | | | |
| 1918.. | | | 100,000 | | | | | | 100,000.00 |
| 1919.. | | | 100,000 | | | | | | 100,000.00 |
| 1920.. | | | 80,000 | | | | | | 80,000.00 |
| 1921.. | | | 120,000 | | | | | | 120,000.00 |
| 1922.. | | | 80,000 | | 412,500.00 | | | | 492,500.00 |
| 1923.. | | | 160,000 | | 206,250.00 | | | | 366,250.00 |
| 1924.. | | | 380,000 | 203,250 | | | | | 586,250.00 |
| 1925.. | | | 600,000 | 550,000 | | | | | 1,150,000.00 |
| 1926.. | | | 1,000,000 | 893,750 | 474,714.40 | | | | 2,368,464.40 |
| 1927.. | | | 1,400,000 | 1,237,500 | 713,571.60 | | | | 3,351,071.60 |
| 1928.. | | | 2,000,000 | 825,000 | 2,860,286.40 | | | | 5,685,286.40 |
| 1929.. | | | 2,200,000 | | 2,866,286.40 | | | | 5,066,286.40 |
| 1930.. | | | 3,000,000 | | 2,872,286.40 | 65,990 | | | 5,938,276.40 |
| 1931.. | | | 4,800,000 | 825,000 | 3,118,143.60 | 131,980 | | | 8,875,123.60 |
| 1932.. | | | 6,000,000 | 962,500 | 2,884,286.40 | 164,975 | | | 10,011,761.40 |
| 1933.. | | | 6,000,000 | 1,512,500 | 2,884,286.40 | 164,975 | | | 10,561,761.40 |
| 1934.. | 148,000 | 7,000,000 | 3,025,000 | 2,643,929.20 | 824,875 | 157,173.69 | 131,403.40 | | 13,930,381.29 |
| 1935.. | 148,000 | 8,000,000 | 3,300,000 | 1,922,857.60 | 659,900 | 157,173.69 | 396,710.20 | | 14,584,641.49 |
| 1936.. | 148,000 | 10,000,000 | 3,300,000 | 2,163,214.80 | 659,900 | 316,974.66 | 401,710.20 | | 16,989,799.66 |
| 1937.. | 166,500 | 12,000,000 | 3,850,000 | 2,403,572.00 | 824,875 | 479,402.91 | 535,613.60 | | 20,259,963.51 |
| Total. | 398,625 | 610,500 | 55,020,000 | 21,106,250 | 27,807,435.20 | 3,497,470 | 1,110,724.95 | 1,465,437.40 | 121,016,442.55 |

**YEARLY DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES IN
NORTHWESTERN ONTARIO, 1934-1937**

| Year | Central Patricia Gold Mines | Howey Gold Mines | Little Long Lac Gold Mines | McKenzie Red Lake Gold Mines | Northern Empire Mines Co. | Pickle Crow Gold Mines | Total |
|---------|-----------------------------------|------------------------|----------------------------------|------------------------------------|---------------------------------|------------------------------|-------------|
| 1934.. | | \$500,000 | | | | | \$500,000 |
| 1935.. | | 250,000 | | | \$170,500 | | 420,500 |
| 1936.. | \$200,000 | 100,000 | \$549,900 | \$203,000 | | \$600,000 | 1,652,900 |
| 1937.. | 300,000 | 200,000 | 733,200 | 261,000 | 170,750 | 1,050,000 | 2,714,950 |
| Total.. | \$500,000 | \$1,050,000 | \$1,283,100 | \$464,000 | \$341,250 | \$1,650,000 | \$5,288,350 |

**YEARLY DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES
BY AREAS, 1912-1937**

| Year | Porcupine | Kirkland Lake | Northwestern Ontario | Total |
|------------|------------------|------------------|-------------------------|------------------|
| 1912..... | \$270,000.00 | | | \$270,000.00 |
| 1913..... | 1,170,000.00 | | | 1,170,000.00 |
| 1914..... | 1,410,000.00 | | | 1,410,000.00 |
| 1915..... | 2,212,000.00 | \$132,875.00 | | 2,344,875.00 |
| 1916..... | 4,326,000.00 | 265,750.00 | | 4,591,750.00 |
| 1917..... | 1,699,542.45 | | | 1,699,542.45 |
| 1918..... | 1,773,042.45 | 100,000.00 | | 1,873,042.45 |
| 1919..... | 2,086,028.30 | 100,000.00 | | 2,186,028.30 |
| 1920..... | 3,176,928.45 | 80,000.00 | | 3,256,928.45 |
| 1921..... | 4,222,990.20 | 120,000.00 | | 4,342,990.20 |
| 1922..... | 4,459,042.95 | 492,500.00 | | 4,951,542.95 |
| 1923..... | 5,176,543.45 | 366,250.00 | | 5,542,793.45 |
| 1924..... | 5,878,793.00 | 586,850.00 | | 6,465,643.00 |
| 1925..... | 7,083,468.00 | 1,150,000.00 | | 8,233,468.00 |
| 1926..... | 8,510,268.00 | 2,368,464.40 | | 10,878,732.40 |
| 1927..... | 8,453,167.50 | 3,351,071.60 | | 11,804,239.10 |
| 1928..... | 7,163,334.00 | 5,685,286.40 | | 12,848,620.40 |
| 1929..... | 4,949,334.00 | 5,066,286.40 | | 10,015,620.40 |
| 1930..... | 5,195,334.00 | 5,938,276.40 | | 11,133,610.40 |
| 1931..... | 5,195,334.00 | 8,875,123.60 | | 14,070,457.60 |
| 1932..... | 6,007,757.47 | 10,011,761.40 | | 16,019,518.87 |
| 1933..... | 7,436,827.06 | 10,561,761.40 | | 17,998,588.46 |
| 1934..... | 12,411,082.77 | 13,930,381.29 | \$500,000 | 26,841,464.06 |
| 1935..... | 10,203,403.40 | 14,584,641.49 | 420,500 | 25,208,544.89 |
| 1936..... | 11,545,713.80 | 16,989,799.66 | 1,652,900 | 30,188,413.46 |
| 1937..... | 12,469,764.98 | 20,259,963.51 | 2,714,950 | 35,444,678.49 |
| Total..... | \$144,485,700.23 | \$121,016,442.55 | \$5,288,350 | \$270,790,492.78 |

GOLD PRODUCTION, 1866-1937

(On the standard basis of \$20.671834 per ounce, or one dollar = 0.048375 ounces)

| Year | Total production, value | Porcupine belt | | Kirkland Lake belt | | N.W. Ontario ¹ | |
|---------------------------|-------------------------------|----------------|-----------|--------------------|-----------|---------------------------|-----------|
| | | Value | Per cent. | Value | Per cent. | Value | Per cent. |
| 1866-1891 ² .. | \$190,258 | | | | | | |
| 1892-1909 ² .. | 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 | \$86,316 | 1.9 | | |
| 1914..... | 5,544,979 | 5,206,006 | 93.8 | 114,154 | 2 | | |
| 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 | 89.5 | 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..... | 30,950,753 | 23,680,670 | 76.5 | 7,174,083 | 23.2 | | |
| 1927..... | 33,627,040 | 23,851,857 | 70.9 | 9,674,114 | 28.7 | | |
| 1928..... | 32,629,111 | 20,246,319 | 62 | 12,233,524 | 37.5 | | |
| 1929..... | 33,535,226 | 19,281,286 | 57.6 | 14,046,596 | 41.8 | \$22,988 | 0.07 |
| 1930..... | 35,886,558 | 17,758,842 | 49.6 | 17,172,770 | 47.9 | 461,730 | 1.3 |
| 1931..... | 43,117,615 | 19,891,521 | 46.2 | 21,734,729 | 50.4 | 1,007,756 | 2.3 |
| 1932..... | 47,284,621 | 21,422,117 | 45.2 | 23,782,313 | 50.3 | 1,607,831 | 3.4 |
| 1933..... | 44,558,514 | 21,624,617 | 48.5 | 20,817,277 | 46.7 | 1,352,017 | 3 |
| 1934..... | 43,521,249 | 19,634,097 | 45 | 20,424,716 | 46.9 | 2,214,385 | 5 |
| 1935..... | 45,898,372 | 20,021,622 | 43.6 | 19,597,809 | 42.7 | 4,851,950 | 1.5 |
| 1936..... | 49,168,253 | 21,154,555 | 43 | 19,951,731 | 40.5 | 6,545,127 | 1.3 |
| 1937..... | 53,479,981 | 23,163,296 | 43.3 | 20,660,377 | 38.6 | 8,096,616 | 15.1 |
| Total... | \$678,149,326 | \$412,063,020 | 60.7 | \$226,517,238 | 33.4 | | |

¹Recent production only. Gold output from 1866 to 1909, inclusive, came from Hastings

SOUTHEASTERN ONTARIO

PRODUCTION STATISTICS OF GOLD MINES, 1891-1937¹

(Value includes gold and silver, and exchange and equalization have been added since 1920)

| Mine | Year | Quantity | Value |
|---|-----------------------|----------|-----------|
| | | tons | |
| Atlas Arsenic..... | 1900, 1902, 1903..... | 6,114 | \$44,667 |
| Bannockburn..... | 1895..... | | 58 |
| Belmont. <i>See</i> Cordova. | | | |
| Big Dipper..... | 1907, 1909..... | 52 | 340 |
| Boerth..... | 1900..... | | 208 |
| Canadian Goldfields. <i>See</i> Deloro. | | | |
| Cleveland..... | 1908..... | 239 | 5,475 |
| Cobalt Frontenac..... | 1919, 1922..... | | 1,356 |
| Cook Land..... | 1901, 1902, 1904..... | 1,483 | 6,989 |
| | 1892, 1893..... | 560 | 5,450 |
| Cordova (Belmont)..... | 1898-1903..... | 70,185 | 289,517 |
| | 1912-1917..... | 16,194 | 45,426 |
| Craig..... | 1905, 1906..... | 1,850 | 5,760 |
| Crescent..... | 1891, 1892..... | 1,700 | 6,780 |
| Deloro (Canadian Goldfields)..... | 1897-1902..... | 39,143 | 213,973 |
| Gatling Pearce..... | 1893..... | | 1,918 |
| Gilmour..... | 1909, 1910..... | 550 | 3,669 |
| Golden Fleece. <i>See</i> Cobalt Frontenac. | | | |
| Ledyard..... | 1893, 1894..... | 55 | 236 |
| Little Doris..... | 1898..... | 400 | 2,500 |
| Sophia..... | 1900..... | 1,500 | 850 |
| Sovereign..... | 1900..... | 262 | 861 |
| Star of the East..... | 1905, 1907..... | 976 | 1,941 |
| Miscellaneous ² | 1937..... | | 238 |
| Total..... | | 141,263 | \$638,212 |

¹The Department has no records of any gold produced in Southeastern Ontario subsequent to 1922, with the exception of that recorded under "Miscellaneous."

²In 1937, a total of 6.795 fine ounces, worth \$238, was shipped to the Ontario Refining Company from Arden in Frontenac county by G. E. Fielding. This shipment could not be credited to any particular property.

Gold Mines of Larder Lake Area.—The Larder Lake area lies immediately east of the Kirkland Lake area and runs to the Quebec boundary. In 1937, the *Omega* was steadily operated at 450 tons per day. The *Raven River*, formerly the *Harris-Maxwell*, brought its 60-ton mill into production in December. *Kerr-Addison* was constructing the first unit of a 500-ton mill; and extensive development work was under way at the *Argonaut*, *Martin-Bird*, *Ferland*, *Barber-Larder*, and *Chesterville Larder*. Much surface-trenching on other properties was being done.

Gold Mines of Kirkland Lake Area.—The Kirkland Lake area embraces Teck and Lebel townships and parts of the townships on the east, north, and west. *Golden Gate (Lucky Cross)* started construction of a 100-ton mill. *Kirkland Lake Gold* improved its mill after important ore developments in the deeper sections of the mine. *Lake Shore* completed shaft No. 5 to the 3,575-foot level and was developing at 4,500 feet. *Wright-Hargreaves* was developing at 5,400 feet. Interesting developments in the sediments were reported by *Sylvanite*. *Toburn* built additions to its mill. *Kirkland Gold Rand* completed a winze to 1,450 feet in depth. The *Goodfish* (now owned by *Miles-Martin Kirkland Mines*) was being re-examined. To the east of the main belt, *Lakeside Kirkland (Queen Lebel)*, *Kirkroyale (Conroyal)*, *Upper Canada*, and *Ritchie* were active, while *Bidgood* and *Morris Kirkland* were milling at 125 and 90 tons per day, respectively.

LARDER LAKE GOLD AREA
ANNUAL PRODUCTION STATISTICS BY MINES, 1911-1937
(Value includes gold and silver, and exchange premium and equalization have been added since 1920)

| Year | Barry-Hollinger | | Argonaut ¹ | | Omega ² | | Telluride (Minaura) ³ | | Raven River | | Miscellaneous | | Total | |
|-------|-----------------|-----------|-----------------------|---------|--------------------|-----------|-------------------------------------|-------|----------------|--------|---------------|--------|---------|-----------|
| | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ |
| 1911 | | | | | | | | | | | | | 125 | 314 |
| 1912 | | | | | | | | | | | | | | |
| 1913 | | | 480 | 4,005 | | | | | | | | | 480 | 14,005 |
| 1914 | | | | 5,204 | | 10,000 | | | | | | | | 5,204 |
| 1915 | | | | | | | | | | | | | | |
| 1916 | | | | | | | | | | | | | | |
| 1917 | | | | | | | | | | | | | | |
| 1918 | 1,502 | 10,051 | | | | | | | | | | | 1,502 | 11,334 |
| 1919 | | | 735 | 2,631 | | | | | | | 1,283 | | 735 | 2,631 |
| 1920 | | | 4,637 | 29,888 | | | | | | | | | 4,637 | 29,888 |
| 1921 | | | | 549 | | | | | | | | | | 549 |
| 1922 | | | | | | | | | | | | | | |
| 1923 | | | 4,818 | 73,262 | | | | | | | | | 4,818 | 73,262 |
| 1924 | | | 24,178 | 152,072 | | | | | | | | | 24,178 | 152,072 |
| 1925 | 8,136 | 56,978 | 28,515 | 214,183 | | | | | | | | | 36,651 | 271,161 |
| 1926 | 13,680 | 86,263 | 35,081 | 143,387 | | | | | | | | | 48,761 | 229,550 |
| 1927 | 25,714 | 175,692 | 27,873 | 127,448 | 11,966 | 34,565 | | | | | 865 | | 65,592 | 338,900 |
| 1928 | 23,060 | 111,767 | 5,219 | 32,430 | 10,619 | 17,700 | | | | | 839 | | 43,275 | 174,681 |
| 1929 | 22,343 | 151,758 | | 9,959 | | | | | | | 84,377 | | 22,343 | 161,717 |
| 1930 | 31,725 | 217,835 | 13 | 1,891 | | | | | | | | | 31,738 | 219,726 |
| 1931 | 31,958 | 234,512 | | | | | 80 | 835 | | | | | 32,038 | 235,347 |
| 1932 | 34,977 | 181,585 | | | | | 24 | 468 | | | | | 35,001 | 182,053 |
| 1933 | 5,459 | 71,766 | | | | | | | | | | | 5,459 | 71,766 |
| 1934 | 33,445 | 152,076 | 12 | 1,872 | | | | | | | | | 33,457 | 153,948 |
| 1935 | 35,172 | 143,698 | 24 | 978 | | | | | | | | | 35,227 | 148,266 |
| 1936 | 570 | 8,311 | | | | | | | | | | | 114,472 | 470,507 |
| 1937 | | | | | | | | | | | | | 162,740 | 754,026 |
| Total | 267,741 | 1,602,292 | 131,585 | 799,759 | 296,754 | 1,264,784 | 126 | 1,341 | 2,425 | 12,731 | 4,598 | 19,800 | 703,229 | 3,700,707 |

¹The production shown for 1913 and 1914 was from La Mine D'Or Huronia, which has been known as the Argonaut since 1919. The values shown are exclusive of copper.

²Canadian Associated Goldfields (production of which is shown in the figures for 1927 and 1928) went into bankruptcy in 1928 and the property was acquired by Proprietary Mines, Limited, in 1930. In 1934, Canadian Reserve Mines, Limited, acquired the 3 Costello claims and the Raven Falls power plant from Proprietary and transferred them to Omega Gold Mines, Limited.

³Acquired on 99-year lease by Minaura Mines, Limited, from Smelters Corporation of Canada, Limited, in November, 1935.

⁴Reddick mine, which was bought by Associated Goldfields in 1914, and acquired from Proprietary Mines, Ltd., by Kerr-Addison Gold Mines, Ltd., in 1936.

⁵Associated Goldfields, which was acquired by Canadian Associated Goldfields in 1921. ⁶Patricia mine, afterwards called Barry-Hollinger.

⁷Miller Independence. ⁸Gold Hill. ⁹Britcana.

Gold Mines of Porcupine Belt.—The Porcupine belt starts west of Mountjoy on the Mattagami river and runs east to the T. and N. O. railway and beyond. The *Hollinger* commenced a large programme of alterations in the milling department, which included a complete new crushing plant. A unique departure was the construction of an 11,000-ton ore bin of hemispherical design. The crushed ore from the rolls is dropped through the top into a conical-shaped excavation below the ground level, from the hopper of which four belt conveyers transport it to the fine-grinding department. A boom with a chain-drag travelling around the periphery maintains a steady delivery of ore to the hoppers. The new shaft, No. 26, was completed to a depth of 3,950 feet. A new company, *Mace Gold Mines, Limited*, in which McIntyre-Porcupine has a large interest, acquired the *Vipond* mine, formerly controlled by *Anglo-Huronian* and *Inspiration Gold Mines*. A survey for an aerial tram line was made between the *Hollinger* and *Preston East Dome* in order that sand for back-filling might be supplied to the *Preston East Dome* and ore from the latter transported to the *Hollinger* mill in quantities up to a thousand tons per day. During the fall, *Paymaster Consolidated* commenced deepening No. 5 shaft from the 1,050- to the 2,500-foot level, which added 1,000 feet to the deepest level of the mine. *Buffalo Ankerite* sank a new working shaft to 2,000 feet, nearly 1,000 feet deeper than the present level. *Pamour* deepened its shaft to 1,600 feet, over which a new steel headframe was constructed. Towards the end of the year *Hallnor* commenced work on the foundations of a 250-ton mill. *Coniaurum* completed its shaft-sinking programme, in which an internal shaft was sunk to the 5,100-foot level. *Delnite* commenced milling operations in July. *Moneta*, in the short period of twelve months, brought its 200-ton mill into production, milling operations commencing in January, 1938. *Dome Mines* completed a large internal shaft to the 29th level and erected an executive office and recreation hall.

Gold Mines of Matachewan Area.—The Matachewan area is probably the westerly extension of the Kirkland Lake break, and for convenience mines in the bordering West Shiningtree area are included. *Young-Davidson* was sinking below 460 feet, and *Matachewan Consolidated* was developing on the 650-foot level. Both these properties were actively milling throughout the period at 900 and 375 tons, respectively. Much prospecting activity was reported in this area.

Gold Mines of Sudbury District.—*Lebel Oro* completed the cyanide mill at their *Long Lake* property in March and operated throughout the year. *New Golden Rose*, situated in the Timagami Forest Reserve, completed its cyanide mill in July and deepened the shaft to 730 feet. The *Bousquet* closed down permanently in July and disposed of its milling plant. The *McMillan* closed down in April and sold its plant. The last two-mentioned mills were located south of Sudbury city. To the northwest, in the Gogama-Shiningtree area, there was little activity, but some development work was done on *Strathy Basin*, *Smith-Thorne*, *Bilmac*, *Lake Caswell*, and *Ronda*.

Gold Mines of Algoma District.—Algoma district includes three areas, the Michipicoten, Goudreau, and Oba. In the Michipicoten area, *L. B. United (Centennial)* suspended operations in May; the *Darwin* was closed down in December; *Parkhill* deepened its inclined shaft from 1,790 to 1,917 feet; *Minto* closed down the *Jubilee* mine in June; *Deep Lake*, operated by Canfield and Hocking until May, was sold to a syndicate; and mining work was done on the

MATACHEWAN GOLD AREA¹

ANNUAL PRODUCTION STATISTICS BY MINES, 1922 AND 1932-1937

(Value includes gold and silver, and exchange premium and equalization have been added since 1920)

| Year | Ashley | | Young-Davidson | | Matachewan Consolidated | | Atlas ² | | White Rock ³ | | Total | |
|------------|---------|-----------|----------------|-----------|-------------------------|-----------|--------------------|-----|-------------------------|-------|-----------|-----------|
| | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ |
| 1922..... | 6,805 | 70,142 | | | | | | | | 987 | | 987 |
| 1932..... | 37,975 | 495,364 | | | | | | | | | 6,805 | 70,142 |
| 1933..... | 43,532 | 456,830 | | | | | 12 | 201 | 17 | 419 | 38,004 | 495,984 |
| 1934..... | 47,366 | 440,531 | 51,842 | 134,511 | 4,680 | 23,568 | | | | | 100,054 | 614,909 |
| 1935..... | *21,958 | 158,533 | 229,793 | 713,380 | 48,382 | 356,818 | | | | | 325,521 | 1,510,729 |
| 1936..... | | | 301,163 | 892,713 | 55,797 | 425,259 | | | | | 378,918 | 1,476,505 |
| 1937..... | | | 337,556 | 1,127,247 | 132,754 | 709,607 | | | | | 470,310 | 1,836,854 |
| Total..... | 157,636 | 1,621,400 | 920,354 | 2,867,851 | 241,593 | 1,515,252 | 12 | 201 | 17 | 1,406 | 1,319,612 | 6,006,110 |

¹Includes West Shiningtree area (Atlas and White Rock mines). ²Acquired by Bilmac Gold Mines, Limited, in 1934. ³Clean-up material.SUDBURY DISTRICT¹

ANNUAL PRODUCTION STATISTICS OF GOLD MINES, 1897-1937

(Value includes gold and silver, and exchange premium and equalization have been added since 1920)

| Year | Crystal | | Gomak | | Halcrow-Swayze | | Long Lake ² | | New Golden Rose | | McMillan | | Shakespeare | | Bousquet | | Miscellaneous | | Total | |
|--------------------|---------|-------|-------|-------|----------------|-------|------------------------|---------|-----------------|---------|----------|---------|-------------|--------|----------|---------|---------------|-------|---------|-----------|
| | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ |
| Prior to 1911..... | 730 | 4,998 | | | | | 43,294 | 18,553 | | | | | 8,590 | 50,984 | | | | | 12,614 | 74,535 |
| 1911..... | | | | | | | 1,750 | 9,828 | | | | | | | | | | | 1,750 | 9,828 |
| 1913..... | | | | | | | 20,646 | 114,833 | | | | | | | | | | | 20,646 | 114,833 |
| 1914..... | | | | | | | 45,458 | 217,103 | | | | | | | | | | | 45,458 | 217,103 |
| 1915..... | | | | | | | 44,271 | 282,123 | | | | | | | | | | | 44,271 | 282,123 |
| 1916..... | | | | | | | 26,846 | 187,103 | | | | | | | | | | | 26,846 | 187,103 |
| 1932..... | | | | | | | | | | | | | | | | | | | 22 | 2,993 |
| 1934..... | | | | | | | 7 | 1,256 | | | 12,313 | 67,344 | | | | | | | 12,320 | 68,600 |
| 1935..... | | | | | | | | | | | 40,218 | 273,315 | | | | | | | 40,474 | 274,980 |
| 1936..... | | | 1,387 | 3,446 | | | | | | | | 3,139 | | | 9,168 | 74,030 | | | 10,555 | 80,615 |
| 1937..... | | | | | | | 23,687 | 150,422 | 16,811 | 135,541 | 7,608 | 26,874 | | | 7,961 | 88,910 | | | 56,067 | 401,747 |
| Total..... | 730 | 4,998 | 1,387 | 3,446 | 211 | 1,372 | 165,959 | 981,221 | 16,811 | 135,541 | 60,139 | 370,672 | 8,590 | 50,984 | 17,129 | 162,940 | 67 | 3,286 | 271,023 | 1,714,460 |

¹Exclusive of West Shiningtree area (Atlas and White Rock mines), which is included in the Matachewan gold area above.²Acquired by Lebel Oro Mines, Limited, in 1920.³1897, \$1,896 from 300 tons; 1898, \$1,602 from 160 tons; 1908, \$1,500 from 270 tons.⁴1905, \$37,963 from 4,550 tons; 1906, \$3,641; 1907, \$4,380 from 4,040 tons.⁵T. B. 69 (R. Downey).⁶Mac-Auer.

ALGOMA DISTRICT
ANNUAL PRODUCTION STATISTICS OF GOLD MINES, 1902-1937
(Value includes gold and silver, and exchange premium and equalization have been added since 1920)

| Year | Algoma Summit (McCarthy-Webb) | | Darwin (Grace ²) | | Deep Lake | | Minto and Jubilee ³ | | Parkhill | | Miscellaneous | | Total | |
|------------------|----------------------------------|--------|---------------------------------|---------|-----------|--------|-----------------------------------|-----------|----------|-----------|---------------|--------|---------|-----------|
| | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ | tons | \$ |
| Prior to 1910... | | | | | | | | | | | | | | |
| 1910... | | | 10,297 | 69,923 | | | | | | | 2,512 | 8,874 | 12,809 | 78,797 |
| 1911... | | | 60 | 2,020 | | | | | | | 1,600 | 5,020 | 1,660 | 7,040 |
| 1912... | | | | | | | | | | | | 627 | | 627 |
| 1923... | | | | | | | | | | | | | | 153 |
| 1925... | | | | | | | | | | | | | | 41 |
| 1926... | 415 | 1,847 | | | | | | | | | | | | 1,847 |
| 1929... | | | | | | | | | | | | | | 41 |
| 1930... | | | | | | | | | | | | | | 1,847 |
| 1931... | | | 750 | 588 | | | 1,074 | 2,559 | 33 | 2,057 | | | 415 | 2,057 |
| 1932... | 117 | 474 | | | | | 9,448 | 80,269 | | | | | 1,824 | 3,147 |
| 1933... | | | | | | | 18,765 | 185,171 | | | | | 18,530 | 155,812 |
| 1934... | | | | | | | 23,671 | 182,376 | | | | | 35,704 | 351,654 |
| 1935... | | | | | | | 22,189 | 169,301 | | | | | 35,296 | 429,238 |
| 1936... | 3,073 | 14,948 | 2,103 | 17,750 | | | 34,890 | 196,252 | | | 60 | 782 | 42,041 | 484,874 |
| 1937... | 11,064 | 41,613 | 17,598 | 231,401 | | | 39,385 | 150,596 | | | 7,946 | 29,027 | 66,015 | 604,425 |
| | | | 14,720 | 214,707 | | | 375 | 49,148 | | | 3,245 | 15,638 | 90,868 | 801,133 |
| | | | | | | | 15,577 | 35,325 | | | 1,576 | 10,930 | 113,390 | 586,133 |
| Total... | 14,669 | 58,882 | 45,528 | 536,583 | 2,790 | 56,149 | 164,999 | 1,001,849 | 125,454 | 1,670,158 | 16,939 | 98,777 | 418,585 | 3,506,978 |

¹Acquired by Algoma Mines, Limited, in 1934.

²Acquired by Darwin Gold Mines, Limited, in 1934. Operated by the Algoma Commercial Company in 1902 and 1903, who produced 6,097 tons of ore, from which \$48,708 was recovered; and by the Le Page Gold Mining Company from 1907 to 1910, who produced 4,260 tons, valued at \$23,235.

³Production shown from 1930 to 1933 was from the Minto; in 1934, 11,946 tons came from the Jubilee; from 1935 to 1937 the whole production was from the Jubilee. Both mines are now owned by Minto Gold Mines, Limited.

⁴Havilah (Ophir), Galbraith township, \$8,549 from 2,489 tons in 1893; Norwalk (Manxman), \$200 from 20 tons in 1904; Golden Reed, \$125 from 3 tons in 1908.

⁵Havilah (Ophir), \$3,808 from 800 tons; Norwalk (Manxman), \$1,212 from 800 tons.

⁶Havilah (Ophir), \$627.

⁷Soo Mining and Prospecting Syndicate.

⁸Van Sickle (S. B. Smith).

⁹S. B. Smith clean-up, \$11,224 from 1,282 tons; Shenango, \$354; Stanley, \$2,936 from 1,963 tons; G. L. White, \$1,124.

¹⁰Edwards, 1,573 tons, \$16,977; Shenango, \$720; Hiawatha (Louittit), 3 tons, \$624; Alden-Goudreau, \$988.

Stanley, Hillside, Murray-Algoma, and Regnery. The mill of the *Stanley* was also operated and concentrates were stored.

In the Goudreau area, the mills of the *Algold* and *Algoma Summit* operated for part time, as did the *Edwards*. *Cline Lake* commenced construction of a 250-ton cyanide mill.

Near Oba, *Shenango* and *Hiawatha* were active.

Gold Mines of Thunder Bay District.—The Long Lac-Beardmore area was most active in 1937, and the prospects are that 10 mines in this section will be producing gold in 1938. While the *Tashota* closed down in October, the *St. Anthony* resumed milling operations. The *Little Long Lac* increased its tonnage to 300 tons daily. *Bankfield* produced steadily at 130 tons, and *Northern Empire* at 175 tons. The *Leitch* mill was producing at 75 tons, and *Sturgeon River* milled 40 tons per day. The latter company electrified its equipment, and replaced the old amalgamation plant by a cyanide mill at the beginning of the year. At the end of the year, *Sand River*, adjoining *Leitch*, commenced producing with a 75-ton plant. *Hard Rock* was constructing a 200-ton mill, and *MacLeod-Cockshutt* had almost completed its 250-ton mill. The 100-ton flotation mill of *Tombill* was expected to commence operations early in 1938, the concentrates from which will be shipped to the mill of the *Northern Empire* at Empire. Both these properties are being operated by the Newmont Mining Corporation of New York. *Jellicoe Consolidated* installed a complete new electrically driven plant during the year. There was a small rush into Moss township in December, and a number of claims were staked.

Gold Mines of Patricia Portion of Kenora District.—In the Red Lake area, *Howey*, the lowest-cost gold producer in Ontario, treated approximately 1,200 tons per day, at a total operating cost of \$1.381 per ton. *Gold Eagle*, a newcomer among the producers, erected a 125-ton cyanide mill, which was completed in October. *McKenzie Red Lake* treated approximately 160 tons per day throughout the year; and *Red Lake Gold Shore* deepened its shaft to 850 feet and operated its 125-ton mill. Many other properties were active in the area: *Altura*, *Cochénour Willans*, *Cole*, *Faulkenham Lake*, *Lake Rowan* (on which an adit 624 feet long and 100 feet below the crest of Discovery hill was driven), *Madsen Red Lake* (about 8 miles west of the Howey, on which development to 500 feet was completed and plans made for a mill), *Margaret Red Lake*, *Paulore*, *Red Crest*, *Sanshaw*, *Skookum*, *Val D'Or* (*Starratt-Olsen*), and *Woco*. *Gleemar Gold* (*Bathurst*) also reported some development operations.

In the Woman Lake area, the *Hudson-Patricia* closed down; *J-M Consolidated* was active throughout the year, milling 100 tons per day.

The *Uchi*, 15 miles west of the J-M Consolidated, after erecting camps and installing a mining plant, deepened its shaft to 633 feet, from which three levels were run.

The *Argosy* on Casummit lake was operated throughout the year, and its 125-ton mill was active until January, 1938. It was reported that below the 600-foot level diamond-drills struck inflammable gas (methane), which contained helium.

In the Favourable-Sandy Lakes area, *Berens River* was active throughout the year.

In the Pickle-Crow area, *Central Patricia* continued with its 225-ton mill, while the shaft was deepened to 1,440 feet, and also operated the *Springer*

property about $3\frac{1}{2}$ miles to the east. *Pickle Crow* increased its milling capacity to 330 tons per day and deepened its shaft from 1,200 to 1,700 feet during the year. The shaft was enlarged to four compartments below the 1,200-foot level. This is one of the highest-grade gold mines in Ontario. Other properties carrying on development work around Pickle lake and eastward to Fort Hope were: *Albany River*, *Crowshore*, *Kaw-Crow Patricia*, *Gateway Patricia*, *Winoga*, *Fort Hope*, and *Winisk River*.

The most northerly development in gold-mining during 1937 was carried on by the *Sachigo River Exploration Company* at Sherman lake, which is near the Manitoba boundary and about 350 miles north of Sioux Lookout. Winter transportation over tractor roads from Ilford on the Hudson Bay branch of the Canadian National Railway was possible over a distance of 250 miles. The ore in No. 1 vein ran as high as 3.45 ounces per ton. Considerable underground work was done, and plans were made for a mill.

RAINY RIVER DISTRICT

PRODUCTION STATISTICS OF GOLD MINES, 1895-1937

(Value includes gold and silver, and exchange and equalization have been added since 1920)

| Mine | Year | Quantity | Value |
|-----------------------------------|-----------------------------|----------|-----------|
| | | tons | |
| Barker..... | 1898..... | 70 | \$490 |
| Central Canada ¹ | 1934..... | 350 | 742 |
| Elizabeth..... | 1912..... | 50 | 400 |
| Foley ² | 1897, 1898, 1933-1935..... | 5,553 | 51,403 |
| | 1934 (in concentrates)..... | 15 | 1,255 |
| Gold Winner..... | 1900..... | 15 | 70 |
| Golden Crescent (A.D. 2)..... | 1897..... | 192 | 1,543 |
| Golden Star..... | 1898-1901, 1934..... | 15,262 | 168,768 |
| Hammond Reef..... | 1897..... | 977 | 3,857 |
| Harold Lake..... | 1895, 1896..... | 1,131 | 11,236 |
| Independence (Bennett tp.)..... | 1898..... | 125 | 1,906 |
| Lucky Coon..... | 1899, 1935, 1936..... | 10 | 249 |
| Manitou..... | 1896..... | 12 | 413 |
| Olive..... | 1897-1900, 1937..... | 7,255 | 48,903 |
| Saundary ³ | 1934..... | 13 | 435 |
| Sawbill ⁴ | 1897-1899..... | 2,416 | 8,982 |
| W. E. Stone..... | 1919, 1920..... | 2 | 319 |
| Total..... | | 33,448 | \$300,971 |

¹Formerly the Walsh.

²Acquired in 1936 by Santa Fe Gold Mines, Limited.

³Formerly the Headlight or Swede Boy.

⁴Now owned by Upper Seine Gold Mines, Limited.

Gold Mines of Kenora and Rainy River Districts.—In the vicinity of the Lake of the Woods, *Kenricia* operated until December 8, when it closed down temporarily while plans for a mill were being completed; *Kenland* (now *Goldwood Mines*) reorganized its mechanical equipment, and *Wendigo* operated steadily and commenced a programme to deepen the shaft to 1,100 feet and enlarge its mining plant. *Kenora Prospectors and Miners*, *Duport*, and *Blue Star* were idle during the year. Work was actively carried on at the *Clark Gold*, which installed machinery and sank its shaft to 280 feet. To the east, *Minaki Mining and Development Company* did surface work on a deposit of solid iron pyrites reported to contain 46 per cent. sulphur, and *Straw Lake Beach* set up a mining plant and completed the shaft to 414 feet. *Big Master* also reported development work. Surface exploration was carried out on many properties, e.g. *Split Lake*, *Thor*, *Elora* (which remodelled the old *Laurentian* mill), *Selby Lake*, *Tecumseh*, *Alcona*, and others. The *Darkwater* closed down in October.

KENORA DISTRICT

PRODUCTION STATISTICS OF GOLD MINES, 1885-1937¹

(Value includes gold and silver, and exchange and equalization have been added since 1920)

| Mine | Year | Quantity | Value |
|--|--|------------------|-------------|
| | | tons | |
| Baden-Powell ² | 1902, 1905..... | 104 | \$1,273 |
| Big Master..... | 1902, 1903, 1905..... | 5,027 | 39,261 |
| Black Jack..... | 1893..... | 50 | 300 |
| Britannia..... | 1899..... | 20 | 110 |
| Cameron Island (Damascus) ³ | 1898, 1906, 1934, 1935, 1936.... | 1,287 | 163,871 |
| Camp Bay..... | 1904-1906..... | 7,717 | 7,531 |
| Cedar Island (Cornucopia) ⁴ | 1896, 1932, 1935, 1936..... | 17,050 | 174,146 |
| Champion (Bad)..... | 1900..... | ⁵ 100 | ..... |
| Clark..... | 1935..... | 87 | 1,250 |
| Combined..... | 1904..... | 37 | 220 |
| Cornucopia. See Cedar Island. | | | |
| Cross, J. G..... | 1937..... | | 107 |
| Crown Point..... | 1900..... | 150 | 900 |
| Duport. See Cameron Island. | | | |
| Darkwater..... | 1936, 1937..... | 13 | 1,086 |
| Elora ⁶ | 1936, 1937..... | 10,365 | 28,511 |
| Empire..... | 1908..... | 300 | 1,800 |
| Glass Reef..... | 1900..... | | 171 |
| Gold Hill..... | 1886, 1893..... | 220 | 19,610 |
| Gold Panner..... | 1900..... | 100 | 900 |
| Grace..... | 1902, 1907, 1908..... | 415 | 865 |
| Kenland. See Regina. | | | |
| Kenora Prospectors and Miners. See | | | |
| ■ Cedar Island and Mikado. | | | |
| Laurentian ⁸ | 1906-1909 ⁷ | 19,950 | 141,140 |
| Mikado ⁸ | 1896-1902, 1910, 1911, 1931.... | 57,813 | 421,070 |
| Minerva..... | 1885..... | 28 | 1,372 |
| Olympia..... | 1906, 1911, 1912..... | 1,148 | 3,564 |
| Ophir..... | 1893, 1894, 1900, 1911..... | 6,089 | 22,677 |
| Quarry Island..... | 1899..... | 176 | 1,063 |
| Regina ⁹ | 1895-1899, 1902, 1904, 1905, 1936 | 28,718 | 156,275 |
| Royal Sovereign..... | 1902..... | | 122 |
| Rush Bay (Golden Horn)..... | 1906, 1907..... | 350 | 560 |
| Sakoose (Golden Whale)..... | 1899-1901..... | 8,028 | 58,758 |
| Sultana..... | 1894-1902, 1904-1906..... | 77,436 | 428,638 |
| Sunbeam..... | 1904..... | 650 | 4,875 |
| Treasure..... | 1898..... | 34 | 529 |
| Twentieth Century..... | 1902, 1903..... | 8,688 | 43,586 |
| Vermilion Lake (Botham)..... | 1930, 1935..... | 43 | 575 |
| Wabigoon-Contact Bay ¹⁰ | 1905, ¹¹ 1916, ¹² 1917, ¹² 1918, ¹³ 1920, ¹⁴ 1923, ¹⁴ 1929..... | 1,839 | 7,936 |
| Wendigo..... | 1900, ¹⁵ 1936, 1937..... | 38,311 | 368,932 |
| Total..... | | 292,343 | \$2,103,584 |

¹In addition to the figures given and duplicating them in part, the following reduction plants carried on operations in Kenora, then called Rat Portage, and reported as follows: (1) Dominion Reduction Company (1895, 1897, 1900), 666 tons, \$5,298; (2) Ottawa Gold Milling and Mining Company (1898-1900), 5,153 tons, \$26,181; (3) Rat Portage Reduction Works (1900) milled 200 tons of Wendigo ore; no data of recovery made are available; (4) Keewatin Reduction Works (1900) milled 100 tons ore from Champion and 1,000 tons from Wendigo; no data of recovery made are available.

²Northern Lights Mines Company.

³Acquired by Duport Mining Company, Limited, in 1929.

⁴Acquired by Kenora Prospectors and Miners, Limited, in 1928. The mine was called Cornucopia prior to 1932.

⁵Reported milled in custom mill, no data.

⁶Elora Gold Mines, Limited, acquired the Laurentian mine in 1935.

⁷Operated by Imperial Gold Mines, Limited.

⁸Acquired by Kenora Prospectors and Miners, Limited, in 1928.

⁹Or Black Eagle; acquired by Kenland Gold Mines, Limited, in 1936, from Horseshoe Mines, Limited.

¹⁰Contact Bay Mines, Limited, was incorporated in 1918 and acquired the Roggon, Redeemer, and Bonanza claims; the name was changed to Wabigoon-Contact Bay Mines, Limited, in 1923; and in 1935 the property was acquired by Northern Mines, Incorporated.

¹¹Redeemer. ¹²Roggon. ¹³Redeemer (with the exception of 8 tons, valued at \$46, from Roggon). ¹⁴Bonanza. ¹⁵Some 1,200 tons milled in custom mill in 1900, but no statistics of values available.

Gold-Milling Plants

Gold milling increased in Ontario in 1937, not only in new construction but also by enlargement of existing mills. The average daily tonnage of all operating plants was 24,230 tons. During the period five new mills commenced operations for the first time as follows: Bankfield in June, New Golden Rose and Delnite in July, Gold Eagle in November, and Raven River in December. There were also milling operations by ten old plants which started again. Mills proposed include Preston East Dome, Kenricia, and Madsen Red Lake. The idle plants were mainly small sampling units of 5 to 25 tons daily capacity, but there were also included with these the Ardeen of 200 tons and Porcupine Peninsular of 150 tons.

DAILY TONNAGE OF GOLD-MILLING PLANTS AT ONTARIO MINES, 1937

| Area and mine | Operating ¹ | Under construction | Idle | Proposed |
|---|------------------------|--------------------|------|----------|
| LARDER LAKE AREA: | | | | |
| Kerr-Addison | | 500 | | |
| Omega | 439 | | | |
| Raven River | 52 | | | |
| KIRKLAND LAKE AREA: | | | | |
| Bidgood | 122 | | | |
| Golden Gate (Lucky Cross) | | | | 50 |
| Golden Summit | 15 | | | |
| Kirkland Lake Gold | 232 | | | |
| Lake Shore | 2,466 | | | |
| Macassa | 248 | | | |
| Mesabi (Bourkes) | 38 | | | |
| Morris Kirkland | 98 | | | |
| Sylvanite | 478 | | | |
| Teck-Hughes | 1,016 | | | |
| Toburn | 102 | | | |
| Wright-Hargreaves | 1,195 | | | |
| PORCUPINE BELT: | | | | |
| Amca | 75 | | | |
| Buffalo Ankerite (North and South mills) | 940 | | | |
| Canusa | | | 50 | |
| Coniaurum | 460 | | | |
| Delnite | 181 | | | |
| De Santis | | 100 | | |
| Dome | 1,500 | | | |
| Gillies Lake-Porcupine | 60 | | | |
| Hallnor | | 250 | | |
| Hollinger | 4,762 | | | |
| McIntyre-Porcupine | 2,384 | | | |
| McLaren-Porcupine | 15 | | | |
| Moneta | | 200 | | |
| Munro Croesus | | | 15 | |
| Naybob | 100 | | | |
| Northern Turnbull | | | 15 | |
| Pamour | 756 | | | |
| Paymaster Consolidated | 464 | | | |
| Porcupine Peninsular | | | 150 | |
| Porcupine United | | | 25 | |
| Preston East Dome | | | | 500 |
| Ross (Hollinger) | 86 | | | |
| Vimy | | | 50 | |
| Vipond (Mace) | 258 | | | |
| MATACHEWAN AND WEST SHININGTREE AREAS: | | | | |
| Churchill | | | 10 | |
| Matatchewan Consolidated | 363 | | | |
| Young-Davidson | 932 | | | |

DAILY TONNAGE OF GOLD-MILLING PLANTS AT ONTARIO MINES, 1937—Continued

| Area and mine | Operating ¹ | Under con- struction | Idle | Proposed |
|---|------------------------|----------------------------|------------|------------|
| SUDBURY DISTRICT: | | | | |
| Fox Lake..... | | | 25 | |
| Gomak..... | | | 35 | |
| Halcrow-Swayze..... | | | 25 | |
| Kenty..... | | | 5 | |
| Long Lake (Lebel Oro)..... | 93 | | | |
| McMillan..... | 150 | | | |
| New Golden Rose..... | 104 | | | |
| ALGOMA DISTRICT: | | | | |
| Algold..... | 50 | | | |
| Algoma Summit..... | 150 | | | |
| Centennial (Agawa)..... | | | 50 | |
| Cline Lake..... | | 250 | | |
| Darwin..... | 42 | | | |
| Deep Lake..... | 25 | | | |
| Edwards..... | 75 | | | |
| Minto..... | 100 | | | |
| Parkhill..... | 72 | | | |
| Shenango..... | 50 | | | |
| Stanley..... | 35 | | | |
| THUNDER BAY DISTRICT: | | | | |
| Ardeen..... | | | 200 | |
| Bankfield..... | 116 | | | |
| Empress..... | | | 50 | |
| Gold Range..... | | 25 | | |
| Hard Rock..... | | 200 | | |
| Harkness-Hays..... | | | 25 | |
| Leitch..... | 65 | | | |
| Little Long Lac..... | 288 | | | |
| MacLeod-Cockshutt..... | | 250 | | |
| J. Bruce McMartin (Sarmac)..... | | | 20 | |
| North Shores..... | 25 | | | |
| Northern Empire..... | 191 | | | |
| St. Anthony..... | 125 | | | |
| Sand River..... | 75 | | | |
| Schreiber Pyramid..... | 15 | | | |
| Sturgeon River..... | 65 | | | |
| Tashota..... | 52 | | | |
| Tombill..... | | 100 | | |
| KENORA AND RAINY RIVER DISTRICT: | | | | |
| Elora..... | 57 | | | |
| Golden Star..... | | | 5 | |
| Kenland..... | | | 60 | |
| Kenricia..... | | | | 100 |
| Olive..... | 10 | | | |
| Saundary..... | | | 5 | |
| Wendigo..... | 58 | | | |
| PATRICIA PORTION: | | | | |
| Argosy..... | 87 | | | |
| Bathurst (Car Lake)..... | | | 10 | |
| Central Patricia..... | 211 | | | |
| Gold Eagle..... | 82 | | | |
| Howey..... | 1,226 | | | |
| Hudson-Patricia..... | 50 | | | |
| J-M Consolidated..... | 93 | | | |
| McKenzie Red Lake..... | 158 | | | |
| Madsen Red Lake..... | | | | 250 |
| Pickle Crow..... | 268 | | | |
| Red Lake Gold Shore..... | 130 | | | |
| Sol D'Or..... | | | 10 | |
| Total..... | 24,230 | 1,625 | 840 | 900 |

¹Average operating rate for 1937.

The Price of Gold in Canada

The average monthly value of gold in Canadian funds in 1937 ranged from \$35.01 per ounce in January to \$35.05 in July and then declined gradually to \$34.93 in December. The average for the year was \$34.99. In 1936 the average was \$35.03, as against \$35.19 in 1935. The chart below gives an idea of the wide fluctuation in the prices for gold between 1931 and 1934.

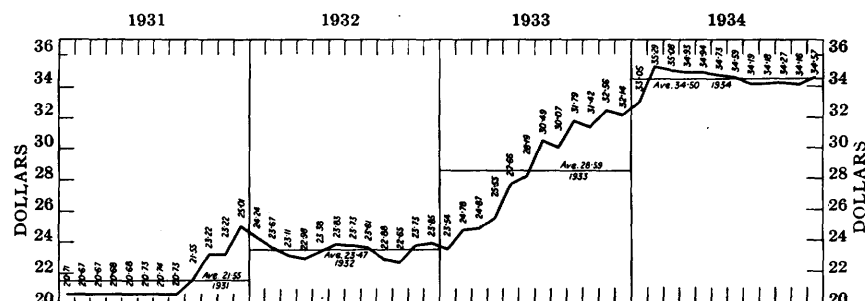


Chart of average monthly and yearly prices of gold in Canadian funds from 1931 to 1934, inclusive. No change in 1935, 1936, and 1937.

Exchange Equalization

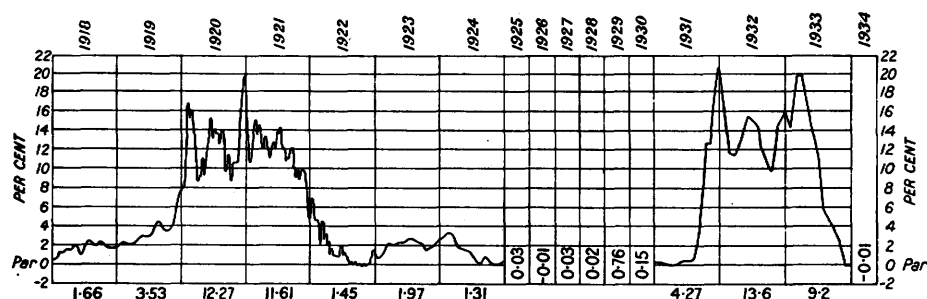
The figure for exchange equalization published for 1933, namely \$16,486,437, refers to the actual quantity of gold marketed during that period. Owing to the fact that in former years some mines reported only the exchange received during the calendar year and not exchange actually due on the year's gold shipments, some small corrections have been made on the following table for the years 1931 and 1932, as follows: \$81,728.42 received in 1933 should be credited to 1932, and \$113,088.91 should be deducted from 1932 and credited to 1931. In 1930, the exchange did not overlap with 1931.

EXCHANGE EQUALIZATION RECEIVED ON GOLD MARKETED BY ONTARIO PRODUCERS, 1920-1937

| Year | Porcupine | Kirkland Lake | Matachewan | N. W. Ontario | Other sources | Total |
|-------------------------|--------------|---------------|-------------|---------------|---------------|---------------|
| 1920..... | \$1,265,644 | \$110,354 | ..... | \$257 | ..... | \$1,376,275 |
| 1921..... | 1,238,211 | 121,425 | ..... | ..... | ..... | 1,359,636 |
| 1922..... | 189,022 | 19,591 | ..... | ..... | \$8 | 208,621 |
| 1923..... | 241,602 | 38,565 | ..... | 29 | ..... | 280,196 |
| 1924..... | 172,722 | 24,028 | ..... | ..... | ..... | 196,750 |
| 1925 ¹ | -2,607 | -231 | ..... | ..... | ..... | -2,838 |
| 1926 ¹..... | ..... | -595 | ..... | ..... | ..... | -595 |
| 1927..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 1928..... | ..... | 2,811 | ..... | ..... | ..... | 2,811 |
| 1929..... | 87,173 | 70,283 | ..... | ..... | ..... | 157,456 |
| 1930..... | 20,912 | 15,791 | ..... | ..... | ..... | 36,703 |
| 1931..... | 830,799 | 1,006,607 | ..... | 61,857 | 26,958 | 1,926,221 |
| 1932..... | 2,815,381 | 3,106,487 | ..... | 211,959 | 330 | 6,134,157 |
| 1933..... | 8,249,321 | 7,305,041 | \$143,866 | *495,335 | 292,874 | 16,486,437 |
| 1934..... | 13,275,684 | 13,694,400 | 246,491 | 1,235,995 | 834,869 | 29,287,439 |
| 1935..... | 14,043,630 | 13,718,813 | 620,177 | 2,784,979 | 1,002,198 | 32,169,797 |
| 1936..... | 14,684,038 | 13,860,383 | 602,989 | 3,938,110 | 1,054,406 | 34,139,926 |
| 1937..... | 16,041,591 | 14,300,102 | 749,249 | 4,856,995 | 1,080,771 | 37,028,708 |
| Total.. | \$73,153,143 | \$67,393,855 | \$2,362,772 | \$13,585,516 | \$4,292,414 | \$160,787,700 |

¹Discounts paid during years when Canadian funds were at a premium. Figures for the two ~~three~~ years have been deducted to arrive at the net totals.

*Includes \$26 from West Shiningtree.



Graph showing fluctuations of the buying rate in Canada for New York funds from 1918 to 1934, inclusive. The average yearly premium or discount rate is noted in percentage figures at the base of the chart. The exchange was practically at par during the past three years.

World Output

The figures for the output by the leading gold-producing countries from 1933 to 1937, inclusive, in the following table are those published by the American Bureau of Metal Statistics.

OUTPUT BY THE LEADING GOLD-PRODUCING COUNTRIES, 1933-1937¹
(One dollar = 0.048375 ounces)

| | 1933 | 1934 | 1935 | 1936 | *1937 |
|---|------------------|------------------|------------------|------------------|------------------|
| NORTH AMERICA: | fine ounces | fine ounces | fine ounces | fine ounces | fine ounces |
| United States ² | 2,536,913 | 2,916,373 | 3,618,843 | 4,295,648 | 4,753,104 |
| Canada..... | 2,949,309 | 2,972,074 | 3,284,890 | 3,748,028 | 4,090,621 |
| Mexico..... | 637,727 | 661,390 | 682,319 | 753,950 | 846,000 |
| Newfoundland..... | 15,689 | 12,000 | 12,700 | 16,000 | 25,000 |
| Total North America..... | 6,139,638 | 6,561,837 | 7,598,752 | 8,813,626 | 9,714,725 |
| CENTRAL AMERICA AND WEST INDIES. | 87,075 | 130,000 | 135,000 | 150,000 | *150,000 |
| SOUTH AMERICA: | | | | | |
| Chile..... | 147,392 | 237,656 | 265,938 | 248,793 | 315,552 |
| Brazil..... | 122,534 | 113,621 | 120,597 | 125,405 | 145,000 |
| Colombia..... | 298,242 | 344,140 | 328,991 | 389,491 | 442,222 |
| Ecuador..... | 60,667 | 66,427 | 71,512 | 78,685 | 70,000 |
| Peru..... | 96,781 | 98,861 | 110,950 | 152,391 | 160,800 |
| Guiana—British..... | 23,352 | 27,510 | 30,488 | 32,234 | *35,000 |
| —Dutch..... | 10,000 | 9,600 | 9,600 | 12,100 | 15,000 |
| —French..... | 42,456 | 47,454 | 47,390 | 45,557 | *50,000 |
| Venezuela..... | 95,720 | 109,053 | 112,390 | 109,996 | *125,000 |
| Other South America..... | 33,871 | 65,501 | 75,000 | 50,000 | *75,000 |
| Total South America..... | 931,015 | 1,119,823 | 1,172,856 | 1,244,652 | 1,433,574 |
| EUROPE: | | | | | |
| Czechoslovakia..... | 3,803 | 7,587 | 16,573 | 16,236 | *20,000 |
| France..... | 94,521 | 101,498 | 91,598 | 97,642 | *100,000 |
| Jugoslavia..... | 70,344 | 71,342 | 76,485 | 84,104 | 87,564 |
| Rumania..... | 142,585 | 111,496 | 144,675 | 150,746 | 172,183 |
| Russia and Siberia..... | 2,667,100 | 4,262,770 | 5,800,000 | 6,500,000 | *6,500,000 |
| Sweden..... | 288,643 | 246,687 | 180,554 | 158,339 | 160,000 |
| Other Europe..... | 19,186 | 18,500 | 15,000 | 25,000 | 35,000 |
| Total Europe..... | 3,286,182 | 4,819,880 | 6,324,885 | 7,032,067 | 7,074,747 |

¹From the Year Book of the American Bureau of Metal Statistics, 1937.

²The 1937 compilations contain some preliminary data, and conjectural figures (*) have been inserted where necessary.

³Production of the Philippine Islands is included with the United States.

OUTPUT BY THE LEADING GOLD-PRODUCING COUNTRIES, 1933-1937—*Continued*

(One dollar = 0.048375 ounces)

| | 1933 | 1934 | 1935 | 1936 | 1937 |
|--|--------------------|--------------------|--------------------|--------------------|--------------------|
| | <i>fine ounces</i> | <i>fine ounces</i> | <i>fine ounces</i> | <i>fine ounces</i> | <i>fine ounces</i> |
| OCEANIA: | | | | | |
| New South Wales..... | 29,252 | 36,123 | 50,102 | 60,739 | 68,607 |
| Queensland..... | 91,997 | 115,471 | 102,990 | 121,174 | 127,281 |
| Victoria..... | 58,183 | 70,275 | 87,600 | 113,940 | 145,799 |
| Western Australia..... | 637,207 | 651,338 | 649,049 | 846,208 | 1,000,642 |
| Tasmania..... | 6,673 | 5,622 | 8,343 | 17,600 | 20,277 |
| New Guinea..... | 150,000 | 184,505 | 184,009 | 221,000 | 204,000 |
| New Zealand..... | 161,755 | 160,248 | 165,277 | 164,575 | 190,300 |
| Other Oceania..... | 18,800 | 22,500 | 45,000 | 53,100 | 65,000 |
| Total Oceania..... | 1,153,867 | 1,246,082 | 1,292,370 | 1,598,336 | 1,821,906 |
| ASIA: | | | | | |
| British India..... | 336,108 | 322,143 | 327,653 | 333,386 | 332,000 |
| China..... | 150,000 | 152,400 | 155,000 | 200,000 | 210,000 |
| Chosen (Korea)..... | 369,982 | 399,560 | 472,927 | 540,000 | 600,000 |
| Netherlands India..... | 78,829 | 71,039 | 68,248 | 71,656 | *70,000 |
| Formosa..... | 20,962 | 33,629 | 37,230 | 40,000 | *50,000 |
| Japan..... | 441,387 | 486,976 | 589,020 | 714,855 | 720,000 |
| Other Asia..... | 50,000 | 86,700 | 75,000 | 92,000 | 95,000 |
| Total Asia..... | 1,447,268 | 1,552,447 | 1,725,078 | 1,991,897 | 2,077,000 |
| AFRICA: | | | | | |
| Belgian Congo..... | 283,144 | 337,382 | 376,155 | 402,487 | 417,950 |
| French West Africa..... | 68,737 | 97,706 | 121,000 | 114,422 | 140,000 |
| Madagascar..... | 13,374 | 15,979 | 15,464 | 15,200 | 16,000 |
| Rhodesia..... | 645,087 | 693,265 | 727,927 | 801,512 | 808,447 |
| British West Africa ⁴ | 338,110 | 384,268 | 428,550 | 499,474 | 620,000 |
| Tanganyika..... | 32,516 | 42,606 | 52,182 | 71,300 | 77,600 |
| Transvaal, Cape Colony, and Natal | 11,013,713 | 10,479,857 | 10,773,991 | 11,336,214 | 11,734,575 |
| Other Africa..... | 53,700 | 100,000 | 110,000 | 110,000 | 180,000 |
| Total Africa..... | 12,448,381 | 12,151,063 | 12,605,269 | 13,387,609 | 13,994,572 |
| TOTAL FOR WORLD..... | 25,493,426 | 27,581,132 | 30,854,210 | 34,218,187 | 36,266,524 |

⁴Including Gold Coast.

| | |
|---|-----------------------------------|
| Maximum Canadian production..... | 4,090,621 ounces in 1937 |
| Maximum Russian production..... | 7,300,000 ounces in 1936 and 1937 |
| Maximum U.S. production..... | 4,887,604 ounces in 1915 |
| Maximum Transvaal, Cape Colony, and Natal production..... | 11,734,575 ounces in 1937 |
| Maximum World production..... | 36,266,524 ounces in 1937 |

Nickel-Copper and Platinum Metals

Large increases in production by the two operating companies of the nickel-copper industry were noted in 1937. Ore treated at smelters and concentrators increased from 4,620,183 to 6,304,517 tons, or more than 36 per cent. in quantity, creating another record. Of the ore treated during the year, 1,525,759 tons were smelted direct, while 2,044,237 tons passed through the concentrator, from which 2,038,287 tons of concentrate were recovered. The table below shows the details of production. It will be observed that the output of metallic nickel, including the nickel content of other refinery products, rose from 51,930 to 73,650 tons, or more than 40 per cent.; blister copper moved up from 137,369 to 154,415 tons, or 12 per cent.; and other items showed corresponding gains.

NICKEL-COPPER MINING AND SMELTING, 1933-1937

| Item | 1933 | 1934 | 1935 | 1936 | 1937 |
|--|-----------|-----------|-----------|-----------|-----------|
| | tons | tons | tons | tons | tons |
| 1. Ore shipped..... | 1,533,887 | 2,903,310 | 3,608,437 | 4,634,434 | 6,318,907 |
| 2. Ore treated..... | 1,523,814 | 2,896,959 | 3,616,223 | 4,620,183 | 6,304,517 |
| 3. Copper in blister produced in Ontario.. | 60,398 | 95,826 | 119,720 | 137,369 | 154,415 |
| 4. Nickel produced in Ontario..... | 20,748 | 35,487 | 40,191 | 51,930 | 73,650 |
| 5. Matte exported ¹ | 43,315 | 46,755 | 46,371 | 50,644 | 58,673 |
| 6. Nickel content of matte exported ² | 25,811 | 28,771 | 28,949 | 32,787 | 38,663 |
| 7. Copper content of matte exported ² | 12,323 | 6,692 | 6,272 | 6,495 | 6,496 |

¹All matte was exported prior to 1918, when refining in Canada began at Port Colborne, Ont. The British America Nickel Corporation commenced refining operations at Deschênes, Que., in 1920, and closed down finally in July, 1924. Every year since 1934 and including that year, some thousands of tons were brought back to Canada for treatment. These have been deducted.

²In 1932, after the reorganization of the metallurgical practice, the Orford process, i.e. the separation of the matte into copper tops and nickel bottoms, was carried out at Copper Cliff.

Precious metals recovered in the refining departments of this industry have become important, e.g. the silver production is now greater than that from Cobalt. The annual gold recovered totals a million dollars in value, and the production of the metals of the platinum group has placed this province first among the producing countries of the world. In addition, selenium and tellurium are recovered as by-products in the copper refinery, and the waste converter gases are now used for the manufacture of sulphuric acid.

PRECIOUS METALS RECOVERED, 1933-1937

| | 1933 | 1934 | 1935 | 1936 | 1937 |
|--|-------------|-------------|-------------|-------------|-------------|
| | ounces | ounces | ounces | ounces | ounces |
| Platinum metals: | | | | | |
| Platinum..... | 24,746 | 116,177 | 105,335.28 | 131,551 | 139,355.50 |
| Palladium..... | | | 81,902.61 | 99,758 | 113,483.53 |
| Rhodium, ruthenium, osmium, and iridium..... | 31,009 | 83,932 | 2,869 | 3,913 | 6,345.07 |
| Total.....ounces | 55,755 | 200,109 | 190,106.89 | 235,222 | 259,184.10 |
| Value..... | \$1,501,233 | \$6,187,992 | \$5,407,392 | \$7,802,997 | \$9,931,556 |
| Gold.....ounces | 36,983 | 60,370 | 69,023.96 | 73,372 | 75,437.88 |
| Silver.....ounces | 1,026,370 | 1,882,293 | 2,243,746 | 2,484,568 | 2,364,010 |

During 1937, the International Nickel Company operated four mines: the Frood shipped 3,804,409 tons; Creighton, 1,283,046 tons; Levack, resuming shipments in May for the first time since 1929, produced 399,076 tons; and the Garson, 393,743 tons. At the Frood, mining was carried on between the 2,000-foot and 3,100-foot levels. Six new levels were opened from No. 5 shaft of the Creighton. New additions to the equipment were installed at the Levack. During the year, work was commenced at extending the concentrator to handle 4,000 to 5,000 tons of low-grade ore, which is to be obtained by open-pit mining at the Frood.

At the Falconbridge no additions were made to the plant, but No. 1 shaft was deepened to 2,100 feet, from which level development was started from both shafts. A new venture, Denison Nickel Mines, Limited, sank its shaft to 522 feet, opening up levels at 200 and 500 feet.

STATISTICAL SYNOPSIS OF THE NICKEL-COPPER INDUSTRY IN ONTARIO, 1935, 1936, AND 1937

| Year | No. of producing companies | No. of plants in Ontario | Capital invested ¹ | Dividends paid | Salaried employees | | Wage-earners | | Selling value of products ² | |
|-----------|----------------------------|--|-------------------------------|----------------|--------------------|---------------------------------|-------------------------|---------------------------------------|--|---|
| | | | | | No. | Salaries | No. | Wages | Kind | Value |
| 1935..... | 2..... | 4 mines ³ 3 smelters..... 2 refineries..... | \$107,648,331 | \$13,865,196 | 43 119 141 | \$143,776 439,726 352,876 | 3,449 2,548 1,197 | \$5,789,096 3,633,678 1,582,350 | Matte (exported)..... Metallic nickel..... Nickel oxide and salts..... Converter copper..... Gold (standard)..... Exchange..... Silver..... Platinum metals..... Selenium and tellurium..... | \$35,906,541 18,665,345 1,428,852 1,002,101 1,453,721 5,407,392 173,247 |
| Total.. | | | \$107,648,331 | \$13,865,196 | 303 | \$936,378 | 7,194 | \$11,005,124 | | \$64,035,199 |
| 1936..... | 3..... | 6 mines..... 3 smelters..... 2 refineries..... | \$108,824,797 | \$21,886,753 | 71 130 180 | \$220,130 467,466 449,138 | 4,344 3,212 1,568 | \$7,087,766 4,319,309 2,161,686 | Matte (exported)..... Metallic nickel..... Nickel oxide and salts..... Converter copper..... Gold (standard)..... Exchange..... Silver..... Platinum metals..... Selenium and tellurium..... | \$44,650,242 26,054,603 1,516,738 1,053,490 1,121,198 7,802,997 206,200 |
| Total.. | | | \$108,824,797 | \$21,886,753 | 381 | \$1,136,734 | 9,124 | \$13,568,761 | | \$82,405,468 |
| 1937..... | 2..... | 7 mines ⁴ 3 smelters..... 2 refineries..... | \$117,494,956 | \$35,736,054 | 76 148 203 | \$251,472 541,291 527,632 | 5,462 3,786 1,950 | \$9,919,558 5,793,241 2,972,137 | Matte (exported)..... Metallic nickel..... Nickel oxide and salts..... Converter copper..... Gold (standard)..... Exchange..... Silver..... Platinum metals..... Selenium and tellurium..... | \$60,713,374 40,388,817 1,559,439 1,080,132 1,061,000 9,931,556 213,390 |
| Total.. | | | \$117,494,956 | \$35,736,054 | 427 | \$1,320,395 | 11,198 | \$18,684,936 | | \$114,947,708 |

¹The capital invested is exclusive of value of mineral lands. In the report for 1929, Volume XXXIX, Part I, the capital shown includes the book value for mineral lands, or a total of \$74,077,808 for the lands.

²Figures do not include the output of the Ontario Refining Company.

³Includes Cuniptau.

⁴Includes Drury Nickel Mines, Limited, and Ontario Nickel Corporation, Limited, which were active but non-producing.

South Lorrain Township.—South Lorrain township had 6 producers: Belor-rain, Canadian Lorrain (now called Miller-Elliot), Frontier, Nipissing Lorrain,

Wettlaufer (now called Agnico), and Lorrain Consolidated. Toward the end of the year mining activity showed some revival in South Lorrain.

The Deloro Smelting and Refining Company, Limited, of Deloro, are the most important buyers of silver-cobalt ores in America. For silver ores they pay 98 per cent. of the silver contained at the ruling market price, subject to certain treatment and refining charges based on the tonnage and grade of ore.

The price paid for cobalt ores ranges from 45 to 75 cents per pound of cobalt contained, with an allowance for silver when the ore assays over 20 ounces to the ton. It is understood that these prices are sometimes bettered for particularly attractive ores.

The following table shows the total silver production for the years 1936 and 1937:—

SILVER PRODUCTION, 1936 AND 1937

| Source | 1936 | | 1937 | |
|---|-------------|-------------|-------------|-------------|
| | Fine ounces | Value | Fine ounces | Value |
| Sales of bullion by the reduction companies, smelters, and mines..... | 1,863,183 | \$829,960 | 1,527,149 | \$677,910 |
| Contained in silver-cobalt concentrates and residues exported from Canada.. | 186,362 | 74,588 | 62,865 | 23,597 |
| Estimated as recovered from concentrates treated in other provinces.... | 194,890 | 85,928 | 233,438 | 104,836 |
| In crude gold bullion..... | 489,351 | 214,176 | 514,403 | 226,421 |
| Recovered by nickel-copper refineries... | 2,484,568 | 1,121,198 | 2,364,010 | 1,061,000 |
| Total..... | 5,218,354 | \$2,325,850 | 4,701,865 | \$2,093,764 |

Formerly the Cobalt camp, with the Deloro Smelting and Refining Company being the only plant in North America capable of handling cobalt-arsenide ores, was the largest producer of cobalt metal and oxides in the world. The development of cobalt deposits in Africa and Australia during the past decade has, however, made available large quantities of the metal, which are refined in Germany and Belgium principally. The production from Ontario mines by camps in 1936 and 1937 was as follows:—

METAL CONTENT OF SILVER-COBALT ORES SHIPPED BY CAMPS, 1936 AND 1937

| Camp | 1936 | | | 1937 | | |
|--------------------|-----------------------|---------------------|-----------|-----------------------|---------------------|-----------|
| | Silver fine ounces | Cobalt ¹ | | Silver fine ounces | Cobalt ¹ | |
| | | lbs. | | | lbs. | |
| Cobalt..... | 1,504,095 | 579,430 | \$208,247 | 702,416 | 213,636 | \$97,046 |
| Gowganda..... | 640,099 | 24,724 | 187 | 522,483 | 21,258 | 917 |
| South Lorrain..... | 9,672 | 18,942 | 9,921 | 47,045 | 7,037 | 4,978 |
| Total..... | 2,153,866 | 623,096 | \$218,355 | 1,271,944 | 241,931 | \$102,941 |

¹Figures represent the quantities paid for by the smelter and values received by the mines.

The table on page 32 shows the silver content of ore and concentrates shipped by the mines during past years. These are not used in compiling the production figures because some of the material is invariably carried to a later period owing to the lag in smelting or milling. Production of silver and cobalt as shown in the table on page 2 and in the first table above is based on the smelter output as nearly as possible. It should also be pointed out that a considerable part of the cobalt shown in this table as shipped is not paid for because the ore is too low in grade and consequently no credit is given to the producers.

SHIPMENTS FROM SILVER MINES, SMELTERS, AND REFINERIES, 1904-1937

| Year | Bismuth | | Copper ¹ | | Lead ¹ | | Nickel ² | | Cobalt ³ | | Arsenic | | Silver | | Total |
|-------|---------|-----------|---------------------|-----------|-------------------|----------|---------------------|-------------|---------------------|--------------|---------|-------------|-------------|---------------|---------------|
| | tons | | tons | | tons | | tons | | tons | | tons | | cunco | | |
| 1904- | | | | | | | | | | | | | | | |
| 1913 | | | | | | | 3,699 | \$42,187 | 7,656 | \$1,471,529 | 29,517 | \$450,980 | 185,497,814 | \$98,284,986 | \$100,249,792 |
| 1914 | | | | | | | 90 | 28,978 | 351 | 590,406 | 2,030 | 116,624 | 25,162,841 | 12,765,461 | 13,601,469 |
| 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 | | | | | | | 155 | 125,071 | 337 | 1,138,190 | 2,592 | 608,483 | 19,401,893 | 16,121,013 | 18,021,597 |
| 1918 | | | | | | | 186 | 156,893 | 380 | 1,640,310 | 2,545 | 566,332 | 17,661,694 | 17,341,790 | 19,741,490 |
| 1919 | | | | | | | 276 | 188,418 | 298 | 1,019,479 | 2,834 | 485,360 | 11,214,317 | 12,738,994 | 14,474,523 |
| 1920 | | | | | | | 127 | 93,233 | 283 | 1,605,365 | 1,883 | 431,627 | 10,846,321 | 10,654,471 | 12,802,882 |
| 1921 | | | | | | | 10 | 7,665 | 126 | 616,235 | 1,491 | 233,763 | 8,261,931 | 5,564,594 | 6,457,031 |
| 1922 | | | | | | | 61 | 34,987 | 476 | 1,333,676 | 2,059 | 299,940 | 10,711,127 | 7,658,802 | 9,355,642 |
| 1923 | | | | | | | 42 | 19,321 | 380 | 1,803,872 | 2,579 | 582,794 | 10,377,846 | 6,877,367 | 9,151,445 |
| 1924 | | | | | | | 130 | 26,862 | 476 | 1,662,526 | 1,915 | 323,186 | 10,361,945 | 7,009,984 | 9,060,222 |
| 1925 | | | | | | | 290 | 116,347 | 558 | 2,328,517 | 1,078 | 113,325 | 9,614,881 | 6,700,129 | 9,295,791 |
| 1926 | | | | | | | 83 | 30,051 | 332 | 1,136,014 | 2,025 | 135,549 | 8,981,557 | 5,541,009 | 6,855,920 |
| 1927 | | | | | | | 100 | 52,829 | 440 | 1,764,534 | 2,481 | 197,668 | 8,883,829 | 4,970,194 | 6,989,480 |
| 1928 | | | | | | | 111 | 57,039 | 477 | 1,671,900 | 2,049 | 178,149 | 6,688,454 | 3,882,570 | 5,812,658 |
| 1929 | | | | | | | 115 | 63,167 | 464 | 1,801,915 | 1,871 | 154,887 | 7,970,540 | 4,239,980 | 6,286,727 |
| 1930 | | | | | | | 53 | 27,455 | 347 | 1,143,631 | 1,375 | 109,928 | 9,109,885 | 3,460,247 | 4,754,445 |
| 1931 | | | | | | | 47 | 31,650 | 261 | 651,179 | 1,788 | 135,170 | 5,415,655 | 1,546,888 | 2,376,386 |
| 1932 | | | | | | | 33 | 17,772 | 245 | 587,957 | 1,212 | 98,914 | 5,106,888 | 1,592,893 | 2,808,733 |
| 1933 | | | | | | | 71 | 41,780 | 200 | 576,465 | 734 | 56,534 | 3,939,990 | 1,387,749 | 2,069,703 |
| 1934 | | | | | | | 85 | 47,393 | 297 | 512,705 | 824 | 56,412 | 3,268,740 | 1,531,719 | 2,231,990 |
| 1935 | | | | | | | 118 | 65,794 | 341 | 592,497 | 1,279 | 75,326 | 3,625,143 | 2,326,447 | 2,990,568 |
| 1936 | | | | | | | 152 | 70,600 | 444 | 805,580 | 683 | 42,491 | 2,244,435 | 990,476 | 1,916,648 |
| 1937 | | | | | | | 82 | 55,348 | 253 | 848,145 | 695 | 41,032 | 1,823,452 | 806,343 | 1,764,104 |
| Total | 80 | \$159,047 | 931 | \$286,347 | 355 | \$31,855 | 6,230 | \$1,488,513 | 16,328 | \$28,490,902 | 72,189 | \$5,842,856 | 430,832,802 | \$258,573,207 | \$294,872,727 |

¹Copper and lead are recovered from certain silver ores and concentrates shipped to United States refineries.²Nickel metal and metallic contents of all nickel compounds.³Cobalt metal and metallic contents of all cobalt compounds, and cobalt contained in ores and speiss residues exported. In 1932, it includes 22,258 pounds worth \$10,024 from northwestern Ontario.⁴Prior to 1914 an estimate based on assays on ores. Since that date recoveries have been reported.⁵Includes 460 tons of speiss residues, worth \$153,116. ⁶Recoveries of bismuth from base bullion were not reported prior to 1923.

DIVIDENDS AND BONUSES PAID BY SILVER-MINING COMPANIES TO DECEMBER 31, 1937

| Name of company | Date of incorporation | Authorized capital | Capital stock issued | Par value per share | Dividends and bonuses paid to end of 1936 | Dividends and bonuses paid during 1937 | Total dividends and bonuses paid to Dec. 31, 1937 | Date last dividend paid |
|--|-----------------------|--------------------|----------------------|---------------------|---|--|---|-------------------------|
| Aladdin Cobalt Company, Ltd. | 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 |
| 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. | Jan. 20, 1922 | 2,000,000 | 2,000,000 | 1.00 | 18,027.00 | ..... | 18,027.00 | 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. ² | April 16, 1913 | 1,000,000 | 1,000,000 | 1.00 | 230,000.00 | ..... | 230,000.00 | April 1, 1915 |
| Cobalt Properties, Ltd. | Aug. 24, 1931 | 25,000 | 25,000 | 1.00 | 149,500.00 | ..... | 149,500.00 | Mar. 31, 1936 |
| Coniagas Mines, Ltd., The ³ | Nov. 24, 1906 | 4,000,000 | 4,000,000 | 5.00 | 11,840,000.00 | \$100,000.00 | 11,940,000.00 | Jan. 11, 1937 |
| McKinley-Darragh-Savage Mines of Cobalt, Ltd. ² | April 27, 1906 | 2,500,000 | 2,247,692 | 1.00 | 5,955,391.86 | ..... | 5,955,391.86 | Oct. 1, 1920 |
| Mining Corporation of Canada, Ltd. ³ | Nov. 23, 1916 | 8,300,250 | 8,300,250 | 5.00 | 7,573,937.47 | ..... | 7,573,937.47 | Dec. 19, 1929 |
| Buffalo Mines, Ltd., The ⁴ | April 27, 1906 | 500,000 | 150,000 | .50 | 2,787,000.00 | ..... | 2,787,000.00 | May 28, 1924 |
| City of Cobalt Mining Co., Ltd. ⁵ | Jan. 7, 1909 | 1,500,000 | 1,500,000 | 1.00 | 145,000.00 | ..... | 145,000.00 | April 15, 1920 |
| Cobalt Lake Mining Co., Ltd. ⁵ | 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. ⁵ | May 8, 1906 | 100,000 | 45,011 | 1.00 | 1,042,259.61 | ..... | 1,042,259.61 | Nov. 11, 1914 |
| Right of Way Mines, Ltd. ² | Sept. 11, 1909 | 2,000,000 | 1,685,500 | 1.00 | 252,825.00 | ..... | 252,825.00 | Mar. 17, 1917 |
| Cobalt Silver Queen, Ltd. | April 1, 1906 | 1,500,000 | 1,500,000 | 1.00 | 315,000.00 | ..... | 315,000.00 | Dec. 31, 1908 |
| 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. ¹ | 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 | 2,240,000.00 | 2,240,000.00 | Mar. 15, 1928 |
| Kerr Lake Mining Co., Ltd. | Aug. 9, 1905 | 40,000 | 40,000 | 100.00 | 10,521,000.00 | 10,521,000.00 | Oct. 13, 1927 |
| 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 |
| Nipissing Mining Co., Ltd. | Dec. 16, 1904 | 250,000 | 250,000 | 100.00 | 32,198,297.25 | 32,198,297.25 | Oct. 18, 1937 |
| Penn-Canadian Mines, Ltd. | 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. ¹¹ | July 13, 1906 | 500,000 | 499,518 | 1.00 | 324,643.93 | 324,643.93 | Oct. 1, 1909 |
| 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. ¹² | 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. ¹³ | May 30, 1906 | 2,000,000 | 1,000,000 | 1.00 | 1,211,998.50 | 1,211,998.50 | Jan. 2, 1919 |
| Wetlaufer 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 ¹⁴ | | | | | \$99,170,781.16 | \$99,170,781.16 | |

¹200,000 preferred shares, par \$1.00, redeemed April, 1925, and capital reduced from \$2,200,000 to \$2,000,000.

²Cash assets amounting to \$50,000 paid on April 27, 1917.

³Now owned by Cobalt Properties Limited.

⁴In 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, but 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; it is now owned by Cobalt Properties, Limited.

⁵Formerly owned and operated by Mining Corporation of Canada, Limited; sold to Cobalt Properties, Limited, in 1935.

⁶Succeeded Right of Way Mining Co., Ltd.; now owned by Cobalt Properties, Ltd.

⁷Name of company changed from Temiskaming and Hudson Bay in 1909.

⁸In addition a return of capital amounting to \$600,000 was made on July 3, 1919, to stockholders of the Kerr Lake Mines, Limited.

⁹Includes \$16,288,297.25 paid in dividends by the Nipissing Mines Company (the holding company) to the end of 1916.

¹⁰Paid out of capital \$40,491.15 on September 10, 1917, and an equal amount on April 24, 1918.

¹¹Succeeded by Right of Way Mines, Ltd.

¹²The capital stock of the company was increased on June 1, 1911, from \$1,000,000 to \$2,000,000.

¹³Does not include dividends by private companies such as M. J. O'Brien, Limited.

Since 1904, silver shipments as reported by operators were as follows:—

SILVER SHIPMENTS BY CAMPS, 1904-1937

| Year | Cobalt | Casey township | South Lorrain | Gow-ganda | Montreal R., Maple Mountain, etc. | Total | Average price per ounce (New York) |
|-----------|-------------|----------------|---------------|-------------|-----------------------------------|-------------|------------------------------------|
| | fine ounces | fine ounces | fine ounces | fine ounces | fine ounces | fine ounces | cents |
| 1904..... | 206,875 | | | | | 206,875 | 57.221 |
| 1905..... | 2,451,356 | | | | | 2,451,356 | 60.352 |
| 1906..... | 5,401,766 | | | | | 5,401,766 | 66.791 |
| 1907..... | 10,023,311 | | | | | 10,023,311 | 65.237 |
| 1908..... | 19,424,251 | 500 | 13,124 | | | 19,437,875 | 52.864 |
| 1909..... | 25,658,683 | 26,185 | 194,955 | | 18,002 | 25,897,825 | 51.502 |
| 1910..... | 29,849,981 | 92,544 | 221,133 | 471,688 | 9,835 | 30,645,181 | 53.486 |
| 1911..... | 29,989,893 | 114,789 | 933,912 | 468,687 | 510 | 31,507,791 | 53.340 |
| 1912..... | 28,605,940 | 253,824 | 834,119 | 549,976 | | 30,243,859 | 60.835 |
| 1913..... | 28,105,505 | 825,108 | 248,992 | 502,370 | | 29,681,975 | 57.791 |
| 1914..... | 24,155,699 | 499,643 | 108,199 | 399,300 | | 25,162,841 | 54.811 |
| 1915..... | 24,280,366 | 223,939 | | 242,229 | | 24,746,534 | 49.684 |
| 1916..... | 19,008,517 | 445,900 | 77,280 | 383,393 | | 19,915,090 | 65.661 |
| 1917..... | 18,327,258 | | 10,000 | 1,064,135 | | 19,401,893 | 81.417 |
| 1918..... | 16,807,407 | 143,901 | 72,188 | 638,198 | | 17,661,694 | 96.772 |
| 1919..... | 10,314,689 | 171,278 | 4,586 | 723,764 | | 11,214,317 | 111.122 |
| 1920..... | 10,402,249 | | 8,253 | 433,352 | 12,467 | 10,846,321 | 100.900 |
| 1921..... | 7,673,535 | 1,101 | 328,886 | 258,292 | 117 | 8,261,931 | 62.654 |
| 1922..... | 9,239,147 | 1,028 | 1,284,307 | 170,651 | 15,994 | 10,711,127 | 67.528 |
| 1923..... | 7,259,858 | | 2,955,646 | 160,761 | 1,581 | 10,377,846 | 64.873 |
| 1924..... | 6,704,787 | | 2,633,058 | 598,057 | | 9,935,902 | 66.781 |
| 1925..... | 6,252,115 | | 3,099,964 | 1,355,156 | | 10,707,235 | 69.065 |
| 1926..... | 6,262,249 | | 3,044,584 | 1,236,640 | | 10,543,473 | 62.107 |
| 1927..... | 4,482,543 | | 2,319,356 | 1,741,614 | | 8,543,513 | 56.370 |
| 1928..... | 3,934,020 | | 1,133,952 | 1,677,429 | | 6,745,401 | 58.176 |
| 1929..... | 4,823,529 | | 876,006 | 2,081,894 | | 7,781,429 | 52.993 |
| 1930..... | 5,329,335 | | 1,754,989 | 2,141,234 | 52 | 9,225,610 | 38.154 |
| 1931..... | 3,706,880 | | 594,360 | 1,697,242 | | 5,998,482 | 28.700 |
| 1932..... | 3,262,380 | | 22,144 | 1,374,780 | | 4,659,304 | 27.892 |
| 1933..... | 2,397,118 | | | 1,244,812 | | 3,641,930 | 34.727 |
| 1934..... | 1,990,073 | | | 1,039,565 | | 3,029,638 | 47.973 |
| 1935..... | 2,737,592 | | 36,585 | 829,195 | | 3,603,372 | 64.273 |
| 1936..... | 1,504,095 | | 9,672 | 640,099 | 2,200 | 2,156,066 | 45.087 |
| 1937..... | 1,062,559 | | 47,045 | 522,483 | | 1,632,087 | 44.883 |
| Total... | 383,635,561 | 2,799,740 | 22,867,295 | 24,647,496 | 50,758 | 432,000,850 | |

¹Includes 885 ounces from Silver Islet, Lake Superior.

²Silver Islet, Lake Superior.

³Nickel Hill Syndicate in the Sudbury area shipped silver-cobalt ore.

⁴Lily of the Valley mine, Thunder Bay district.

Iron Ore, Pig Iron, Steel, and Coke

As formerly, all ore treated by the three Ontario blast furnace establishments was imported, and in 1937 the total amounted to 1,064,341 long tons, as against 733,160 long tons in 1936. For the fifth year in succession the output of pig iron and steel in Ontario has shown increases. The total quantity of pig iron produced in 1937 was 592,800 long tons, which included basic 416,516, foundry 105,742, and malleable 70,544 tons. The average price for these varieties was \$26.83 per ton at Montreal, while the average price in American funds for imported iron ore (sales tax extra) was \$5.02 per long ton at lower lake ports, as against \$4.65 in the previous year.

IRON AND STEEL STATISTICS, 1933-1937

| Year | Foreign ore smelted | Limestone for flux | Coke | Pig iron produced | | Steel made | |
|-----------|---------------------|--------------------|------------|-------------------|-------------|------------|-------------|
| | | | | Quantity | Value | Quantity | Value |
| | long tons | short tons | short tons | long tons | | long tons | |
| 1933..... | 182,060 | 46,944 | 113,102 | 110,562 | \$2,066,049 | 258,841 | \$8,800,594 |
| 1934..... | 462,705 | 118,350 | 253,532 | 271,725 | 6,249,675 | 476,699 | 16,207,766 |
| 1935..... | 647,597 | 172,609 | 339,551 | 391,792 | 9,011,256 | 584,239 | 19,864,126 |
| 1936..... | 733,160 | 190,678 | 375,498 | 421,083 | 9,432,259 | 675,887 | 23,115,335 |
| 1937..... | 1,064,341 | 283,059 | 556,172 | 592,800 | 15,904,824 | 891,452 | 36,701,079 |

At Montreal No. 1 pig iron (2.25 to 2.75 per cent. silicon) was quoted at \$24.00 per long ton for January, \$25.00 for February, \$28.00 for March, April, and May, and \$27.00 for the following seven months. The average for the year was \$26.83. Malleable iron was the same. Steel billets also showed a rise in price at the end of the year, being quoted at \$42.00 for the last ten months of the year, \$36.00 in January, and \$38.00 in February.

PIG IRON, STEEL, AND FERRO- AND OTHER ALLOY PRODUCERS, 1937

| Company | Location |
|---|-------------------|
| Abrasive Company of Canada, Ltd. ^{1 2} | Hamilton. |
| Algoma Steel Corporation, Ltd. ^{3 4} | Sault Ste. Marie. |
| Atlas Steels, Ltd. ⁴ | Welland. |
| Burlington Steel Co., Ltd. ⁴ | Hamilton. |
| Canadian Carborundum Co., Ltd. ^{1 2} | Niagara Falls. |
| Canadian Electric Castings, Ltd. ⁴ | Orillia. |
| Canadian Furnace, Ltd. ^{3 3} | Niagara Falls. |
| Chromium Mining and Smelting Corporation, Ltd. ³ | Hamilton. |
| Dominion Foundries and Steel, Ltd. ⁴ | Hamilton. |
| Electro-Metallurgical Co. of Canada, Ltd. ³ | Welland. |
| Exolon Company, Ltd. ^{1 2} | Thorold. |
| Fahralloy Canada, Ltd. ⁴ | Orillia. |
| Ford Motor Co. ⁴ | Ford. |
| Lionite Abrasives, Ltd. ^{1 2} | Niagara Falls. |
| Norton Company ^{1 2} | Chippewa. |
| Steel Company of Canada, Ltd. ^{3 4} | Hamilton. |
| Welland Electric Steel Foundry ⁴ | Welland. |
| Wm. Kennedy and Sons, Ltd. ⁴ | Owen Sound. |

¹These firms produce ferro-silicon as a by-product in the manufacture of ferro-alumina.

²Ferro-alloys.

³Pig iron.

⁴Steel.

During the year the Algoma Steel Corporation at Sault Ste. Marie, the Steel Company of Canada at Hamilton, and Canadian Furnace, Limited, at Port Colborne were active.

IRON BLAST FURNACES IN OPERATION, 1937

| Company | Stacks operating | Furnaces | | Location |
|------------------------------------|------------------|---------------|--------------------|-------------------|
| | | No. of stacks | Daily capacity | |
| Algoma Steel Corporation, Ltd..... | 1 | 4 | long tons 1,600 | Sault Ste. Marie. |
| Canadian Furnace, Ltd..... | 1 | 1 | 350 | Port Colborne. |
| Steel Company of Canada, Ltd..... | 2 | 2 | 825 | Hamilton. |

Steel produced rose from 675,887 long tons in 1936 to 891,452 tons in 1937. The average selling price was \$41.17 per ton at Hamilton.

For the greater part of the time four furnaces with a total daily capacity of 1,625 tons were in blast, as follows: Steel Company of Canada at Hamilton

(two), Algoma Steel Corporation at Sault Ste. Marie, and Canadian Furnace, Limited, at Port Colborne.

During the summer Algoma Ore Properties, Limited, commenced rebuilding the surface equipment at the Helen iron mine in Michipicoten. Sampling of the Moose Mountain iron property near Sellwood was started by the M. A. Hanna Company of Cleveland.

Legislation passed by the Ontario Legislature has provided that a bounty of two cents per unit of iron will be paid for a period of ten years commencing January 1, 1939.

Ferro-Alloys

In 1937 eight plants reported a production of 63,675 long tons of various kinds of ferro-alloys, as against 61,173 tons in the previous year. The production of these materials during the past five years is shown in the following table:—

STATISTICS OF FERRO-ALLOYS PRODUCTION IN ONTARIO, 1933-1937

| Year | No. of producing companies | Quantity produced | Kind of material |
|-----------|----------------------------|-------------------|---|
| | | long tons | |
| 1933..... | 6 | 30,569 | Ferro-silicon, ferro-manganese, silicon spiegel, spiegeleisen, calcium manganese silicon, zirconium manganese silicon, calcium molybdate. |
| 1934..... | 7 | 32,932 | |
| 1935..... | 7 | 57,424 | |
| 1936..... | 8 | 61,173 | |
| 1937..... | 8 | 63,675 | |

Coke

The coking industry in Ontario is carried on by the large iron and steel metallurgical works and by chartered companies operating in the cities supplying artificial gas to householders and industries. The statistics shown in the following table are combined and show raw materials used and products made.

COKING INDUSTRY, 1937¹

| | Quantity | Cost at works |
|---|-------------------|---------------------|
| MATERIALS USED: | | |
| Coal..... tons | 2,066,105 | \$9,561,330 |
| Coke..... tons | 40,416 | 283,397 |
| Oil..... Imp. gals. | 3,565,473 | 270,694 |
| Absorbing and wash oil..... Imp. gals. | 86,937 | 10,014 |
| Caustic soda..... lbs. | 323,493 | 9,028 |
| Lime..... tons | 590 | 5,406 |
| Oxide for purification..... | | 22,947 |
| Sulphuric acid 66° Bé. purchased..... lbs. | 25,429,657 | 196,850 |
| All other materials..... | | 12,652 |
| Total..... | | \$10,372,318 |
| GAS MADE: | | |
| Retort coal gas..... | M cu. ft. | |
| | 4,268,346 | |
| Coke oven gas..... | 18,472,769 | |
| Carburetted water gas..... | 2,196,591 | |
| Oil gas and acetylene gas..... | | |
| Total..... | 24,937,706 | |
| GAS CONSUMED: | | |
| Sold..... | M cu. ft. | |
| | 8,493,068 | \$7,199,917 |
| Used in producing plants..... | 8,793,525 | 1,281,191 |
| Used in associated metallurgical works..... | 6,788,263 | 983,173 |
| Otherwise accounted for..... | 294,630 | 61,182 |
| Not accounted for..... | 750,532 | 457,088 |
| Total..... | 25,120,018 | \$9,982,551 |

¹Figures supplied by the Dominion Bureau of Statistics.

COKING INDUSTRY, 1937—Continued

| | Quantity | Cost at works |
|--|----------------------|------------------------|
| COKE AND BY-PRODUCTS MADE: | | |
| Coke, including breeze..... tons | 1,504,539 | \$11,522,965 |
| Tar..... Imp. gals. | 16,535,960 | 908,262 |
| Ammonia liquor..... lbs. NH ₃ | 1,618,661 | 16,187 |
| Ammonium sulphate..... lbs. | 32,959,617 | 365,708 |
| Benzol..... Imp. gals. | 2,014,716 | 429,563 |
| Light oils..... Imp. gals. | 2,026,591 | 325,307 |
| All other products..... | | 4,326 |
| Total..... | | \$13,572,318 |
| COKE SOLD AND USED, AND STOCKS: | | |
| | COKE tons | BREEZE tons |
| Used by reporting companies..... | 606,233 | 56,993 |
| Sold for domestic use..... | 566,535 | 9,552 |
| Other uses..... | 300,411 | 2,066 |
| On hand, December 31, 1935..... | 148,790 | 12,062 |

Coke statistics for the past five years, as collected by the Dominion Bureau of Statistics, are shown in the following table:—

COKE STATISTICS, 1933-1937

| | 1933 | 1934 | 1935 | 1936 | 1937 |
|------------------------------|------------------|------------------|------------------|------------------|------------------|
| | short tons | short tons | short tons | short tons | short tons |
| Production..... | 1,153,509 | 1,388,709 | 1,334,081 | 1,441,833 | 1,501,765 |
| Imports..... | 615,818 | 881,235 | 496,196 | 561,119 | 376,117 |
| Total..... | 1,769,327 | 2,269,944 | 1,830,277 | 2,002,952 | 1,877,882 |
| Deduct exports..... | | 54 | | 94 | 26 |
| Apparent consumption. | 1,769,327 | 2,269,890 | 1,830,277 | 2,002,858 | 1,877,856 |

Chromite

The chromium deposit owned and operated by the Chromium Mining and Smelting Corporation, Limited, some 26 miles south of Collins station on the Canadian National railway was active until August, when underground operations were suspended. Diamond-drilling was then done both from the surface and the lower levels of the mine, some 14,415 feet having been completed. Ore raised amounted to 7,672 tons, of which 4,062 tons, ranging from 13 to 30 per cent. Cr₂O₃ were shipped.

Molybdenite

There is at present only one producer of molybdenite concentrates in Ontario, the Phoenix Molybdenite Corporation, Limited, with mine and mill on the west half of lot 28, concession IV, Bagot township, Renfrew county. During 1937, the total shipment of concentrate was 16,500 pounds, valued at \$8,147, which found a market in England. There are a large number of occurrences of this mineral in Ontario, some of which produced considerable quantities of molybdenite during the war when prices were extremely high. Prospectors have been active recently both in prospecting and in developing molybdenite properties in Ontario.

Zinc

For the first time since 1930 production of zinc is recorded. The Lake Geneva Mining Company, Limited, operated its mine in Hess township from

March to the end of the year and the mill during August. Ore raised was 1,360 tons, of which 1,287 tons were concentrated, returning 60 tons of lead and 145 tons of zinc concentrate. The latter, which contained 143,204 pounds of zinc, was exported for treatment. Deducting 8 units per ton of material treated as smelter losses, the estimated recoverable zinc totalled 120,011 pounds, which at 4.902 cents was valued at \$5,883.

NON-METALLICS

The total value of the non-metallic minerals moved up from \$8,933,036 to \$10,055,177 or more than 11 per cent., which closely reflects the improvement in the industries dependent on this group. Of the seventeen mineral substances, gains were noted in the values of ten of them, among which the more important items were graphite, gypsum, natural gas, nepheline syenite, and quartz. Declines were observed in a few others, such as arsenic and salt, but in these cases the quantity output showed improvement. Talc was lower both in quantity and value, owing to the closing down of one of the two mines. On the whole the declines noted were small and mainly in the unimportant minerals.

Arsenic

Ontario production of white arsenic (As_2O_3) is recovered as a by-product in the smelting of silver-cobalt arsenide ores of Northern Ontario by the Deloro Smelting and Refining Company at Deloro. The output in 1937 amounted to 1,389,426 pounds, valued at \$41,032, as against 1,365,606 pounds, worth \$42,491, in 1936.

Asbestos

A shipment of one ton of asbestos, valued at \$250, was made by the Rahn Lake Mines Corporation from its property in Bannockburn township. During the year construction of a mill to treat this asbestos was commenced and was expected to operate in 1938, or early in 1939.

Diatomite

Complete figures of production of diatomite in 1937 were not available, and the estimate of 38 tons, valued at \$1,868, was compiled principally from letters received from examining engineers and verbal reports. Producing companies were Canadian Multi-Cell, Limited, at Martin's Siding; Muskoka Diatomite, Limited, near Gravenhurst; and J. Tynan, of Melissa.

Feldspar and Nepheline Syenite

While feldspar declined slightly in quantity and value during 1937, the production of nepheline syenite was considerably augmented. Nine producers of feldspar made shipments, and three companies shipped nepheline syenite. The production of feldspar was 9,061 tons worth \$72,610, of which \$18,934 represented the value added to spar ground in Ontario. Nepheline syenite was valued at \$121,481. The market for feldspar remained firm and the demand fairly steady. Nepheline syenite won its greatest market in glass manufacturing, for which the higher alumina content is an advantage.

The future of nepheline syenite in Ontario may in part be forecast by the following, taken from *Mineral Trade Notes*, January 20, 1938, published by the United States Bureau of Mines:—

Late in 1937 a mill at Rochester, N.Y., began grinding Canadian nepheline syenite for the American glass trade. Both Dings and Exolon machines have been used to remove magnetic particles, and the product carries only 0.06 to 0.09 per cent. Fe_2O_3 and averages 24.5 per cent. Al_2O_3 . The capacity is around 176 tons in 25 hours. Freight rates to consuming plants are figured in a milling-in-transit basis, but prices work out around \$14 to \$15.50 per ton, f.o.b., Rochester. Additional quantities of material are still ground for the American market at Lakefield, Ontario, near the mine, which is in Methuen township.

Owing to the growing demand for high-alumina feldspar and other silicates for container glass batches, some search has been made for domestic sources of nepheline. Occurrences in Arkansas have long been known, but all samples tested by the Eastern Experiment Station of the Bureau of Mines were too intimately mixed with iron minerals to permit making a concentrate acceptable to glass makers. A deposit at Beemerville, N.J., about 3 miles long and $\frac{1}{4}$ mile wide, looked much more promising, and upon preliminary examination material from Red Hill, N.H., looked even better, but the Bureau's laboratories were unable to get a reasonably iron-free product by mechanical means from such samples of either of these deposits as were tested.

Fluorspar

The output of fluorspar from Ontario deposits has been small in recent years. The production in 1937 was 150 tons, or double that of 1936, all of which was produced from the vicinity of Madoc in Hastings county. The demand for this mineral as a flux was sharper than usual, in part owing to the unsettled political conditions in Spain, which formerly supplied part of the Canadian consumption. Considerable interest was displayed by prospectors in this mineral during 1937.

Graphite

Ontario has only one active producer of graphite, the Black Donald Graphite Company, established in 1896. The mine is located about 15 miles from Calabogie. This deposit is the largest and richest so far known in Canada, the United States, or Mexico. The mine is served by a refinery, and the 1937 production was valued at \$125,343.

An interesting note on the marketing of this mineral appeared on page 19 of the January 20th issue of *Mineral Trade Notes*, published by the United States Bureau of Mines:—

There seems to be a good deal of misunderstanding as to the actual size of the graphite market. Here in the United States we use about 30,000 tons of graphite a year, but roughly half of this represents the relatively cheap amorphous grades and half the balance is coarsely crystalline flake or lump varieties that during recent years have been produced economically for the world markets only in Madagascar and Ceylon, respectively. After allowance for a substantial consumption of powdered artificial or manufactured graphite, the most that a prospective domestic producer could hope to sell would be about 5,000 tons, and even for this business he would have to overcome long-established buying habits. Undoubtedly many of the preferences for a particular brand of graphite for a particular use are rooted in prejudice, but so long as the cost of the graphite comprises a relatively small part of the price obtained for products into which it goes there is not much incentive to experiment in the hope of saving a few dollars a ton on graphite purchases.

Madagascar No. 1 flake sells in carload lots (minimum 25 tons) for \$90 to \$120 a ton. Second grade is a little cheaper. These prices are about the same as last year, except for a slight increase in freight, which now runs between 55 and 65 shillings a metric ton.

Ceylon soft carbon lump graphite, 90 per cent. carbon, is now worth \$50 to \$70 a ton. No. 1 Ceylon lump, formerly used extensively in crucible making, is rarely sold but can be quoted at about 6½ cents a pound, crude.

Gypsum

Two gypsum-producing companies were active in 1937, Gypsum Lime and Alabastine, Canada, Limited, with a plant at Caledonia, and the Canadian Gypsum Company, Limited, at Hagersville.

The tonnage of gypsum mined was 68,669, of which 62,157 tons were calcined. The major portion of this material is consumed in the company plants for the production of gypsum products, wall plaster, alabastine, etc. As com-

pared with the previous year the 1937 record showed a gain of almost 28 per cent. in value, reflecting improved building and construction conditions in the province. The figures were: total sold and used, 53,780 tons, valued at \$233,895, as against 40,191 tons, worth \$182,783, in 1936.

GYPSUM SALES, 1933-1937

| Grade | 1933 | 1934 | 1935 | 1936 | 1937 |
|---------------------------------|----------------|----------------|----------------|----------------|----------------|
| | tons | tons | tons | tons | tons |
| Crushed..... | 2,753 | 5,636 | 5,381 | 2,898 | 5,999 |
| Fine-ground..... | 795 | 376 | 187 | 295 | 285 |
| Calcined, sold..... | 165 | 226 | 121 | 287 | 224 |
| Calcined, used in products..... | 20,747 | 26,996 | 32,558 | 36,711 | 47,272 |
| Total sold or used..... | 24,460 | 33,234 | 38,247 | 40,191 | 53,780 |
| Total value..... | \$112,319 | \$141,389 | \$164,807 | \$182,783 | \$233,895 |
| No. of workers..... | ¹⁷⁹ | ¹⁶⁹ | ¹⁷⁷ | ¹⁸⁵ | ¹⁸² |
| Wages paid..... | \$46,782 | \$53,718 | \$99,137 | \$80,481 | \$197,630 |

¹Exclusive of wage-earners employed in the manufacturing division of the Caledonia plant.

²Includes all wage-earners.

Mica

Production of mica in Ontario during 1937 declined slightly. The total of 798,271 pounds valued at \$9,137 included rough-cobbed, 3,840 pounds, worth \$2,304; thumb-trimmed, 140,811 pounds, worth \$3,891; and 653,620 pounds of scrap, valued at \$2,942. There was a considerable falling off in scrap mica, most of which is exported to the United States. During the year exports of the smaller sizes of thumb-trimmed mica (1 by 1 inch) were larger than formerly. Manufacturers of electrical appliances in Canada offer a small market to Canadian producers.

SHIPMENTS OF MICA, 1935, 1936, AND 1937

| Grade | 1935 | | 1936 | | 1937 | |
|-----------------------------------|----------|---------|-----------|----------|----------|---------|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| | pounds | | pounds | | pounds | |
| Ground and rough..... | | | 7,960 | \$1,990 | 3,840 | \$2,304 |
| Thumb-trimmed..... | 10,852 | \$3,223 | 8,037 | 1,475 | 140,811 | 3,891 |
| Splittings and knife-trimmed..... | 2,734 | 1,738 | 9,446 | 3,243 | | |
| Scrap..... | 496,240 | 2,183 | 1,031,900 | 4,725 | 653,620 | 2,942 |
| Total..... | 509,826 | \$7,144 | 1,057,343 | \$11,433 | 798,271 | \$9,137 |

As the largest consumers are located in the United States, the following excerpt from *Mineral Trade Notes*, January 20, 1938, page 21, published by the United States Bureau of Mines, is of interest:—

Mica is marketed as (1) cut or uncut block, (2) sheet, (3) splittings, and (4) wet- or dry-ground mica, but the value depends upon the size of flat sheets into which it can be split and also upon whether it is clear or stained. The complexity of grading and classifying sheet mica is indicated by the fact that at least 100 distinct products can be classed as unmanufactured mica. Not only do the sheets vary enormously in size but for each size A.S.T.M. designation D 351-33T recognizes six different qualities ranging from clear to black-stained. To attempt to report prices of all these different grades (sizes) and classes (qualities) year after year would be an endless task and one that would yield little real information as to general course of prices. Until fairly recently the main demand was for large unflawed sheets, difficult to find and correspondingly expensive, but the modern trend has been toward using progressively smaller sizes, and such sizes accordingly have increased in price much more than the larger sizes. The bulk of the consumption

of electrical mica is in the form of splittings, or films only a thousandth of an inch thick and often only an inch or two in largest diameter. These are pasted together with shellac and moulded into plates of any desired size. Even where sheet mica still is to be used, the tendency is to use smaller sheets lapped and eyeletted together. At recent prices, for example, the mica frames used in a well-known toaster would cost \$50 to \$60 a thousand if made from a single piece compared with \$21 or \$22 when made from three pieces. More labour is required to stamp three pieces and then put them together, but within limits the extra labour cost is more than offset by the differences in price of large and small mica. Until after the World War about the only use for No. 6 mica was for fuse plugs, but now it is used in much larger quantities than all other sizes of sheet mica combined. Less than two decades ago this size, for fair-stained quality, cost only 10 or 15 cents a pound but by the close of 1936 it had advanced to 36 cents, and a further boost to 58 cents was made on January 1, 1938. Meanwhile, prices of larger mica have not risen in anything like the same proportion. The long-time trend has resulted in an advance of nearly fivefold for No. 6 mica, the smallest grade above punch and circle, whereas for grade No. 5, the next larger size, recently selling at 95 cents a pound, the advance was only a little over fourfold; on some of the largest sizes prices have barely doubled in the last 20 years. During 1937, however, the prices of domestic mica generally did not advance as far as those of imported mica, and as Europe and Japan ordinarily buy somewhat higher grades and at least as good qualities of mica for a given purpose, extraordinary demand outside of the United States tended more particularly to elevate prices for the medium to larger sizes last year. In consequence, some domestic punch and circle mica probably sold more cheaply in 1937 than during the preceding year.

The average prices for the different grades of mica calculated from the reports of Ontario producers in 1937 were as follows:—

| Size | Price per lb. | Size | Price per lb. |
|----------------------|---------------|---------------------|---------------|
| 1 by 1 inch..... | \$0.015 | 2¼ by 5 inches..... | \$0.65 |
| 1 by 2 inches..... | .10-.15 | 3 by 3 inches..... | .60 |
| 1 by 3 inches..... | .25 | 3 by 4 inches..... | .91 |
| 2 by 3 inches..... | .34-.40 | 3 by 5 inches..... | .93-.95 |
| 2 by 4 inches..... | .55-.60 | 4 by 6 inches..... | 1.12-1.25 |
| 2½ by 3¾ inches..... | .55 | | |

Scrap was sold for \$9 per short ton in 1937.

Mineral Waters

Mineral waters from Ontario wells were formerly produced in large quantities. Of late years the production has gradually declined, and in 1937 two producers reported sales of 26,700 Imperial gallons, valued at \$889.

Natural Gas and Petroleum

The Natural Gas Commissioner of Ontario supplied the following notes for 1937:—

Natural Gas

Natural gas production in 1937 amounted to 10,746,334 M cubic feet, valued at \$6,588,798. The production of 1937 shows an increase of 739,591 M cubic feet and \$534,504 over that of 1936. This increased production is due to the demands of the public for gas to heat houses and to the demands of industries for gas where a precise control of heat is necessary.

COMPARATIVE PRODUCTION AND VALUE OF NATURAL GAS, 1935, 1936, AND 1937

| Year | Production | Value | Increase | |
|-----------|------------|-------------|------------|-------------|
| | | | Production | Value |
| | M cu. ft. | | M cu. ft. | |
| 1935..... | 8,158,825 | \$4,938,084 | ..... | ..... |
| 1936..... | 10,006,743 | 6,054,294 | 1,847,918 | \$1,116,210 |
| 1937..... | 10,746,334 | 6,588,798 | 739,591 | 534,504 |

About half of this increase came from the Brownsville field in Dereham township, Oxford county, where gas was discovered in 1936 and turned into the pipe line on March 1, 1937. The remainder of the increase comes from the western fields, principally Dawn township and the Declute field in Raleigh township.

The increase in the number of consumers will not be great.

NATURAL GAS PRODUCTION IN ONTARIO BY FIELDS, 1937

| County | Field | Quantity |
|-----------------------------|-----------------------------|----------------------|
| | | M cu. ft. |
| Essex..... | Kingsville..... | 3,245,333 |
| Kent..... | Tilbury..... | 1,512,300 |
| | Declute..... | 636,552 |
| Lambton..... | Dover..... | 1,890,874 |
| | Dawn..... | 260,974 |
| Elgin..... | Oil Springs..... | 441,375 |
| Norfolk..... | Bayham..... | 1,784,257 |
| Lincoln..... | Norfolk..... | 298,493 |
| Haldimand..... | Lincoln..... | 112,482 |
| Wentworth..... | Haldimand..... | 2,763 |
| Welland..... | Wentworth..... | 486,931 |
| Brant..... | Welland..... | 14,000 |
| Bruce..... | Onondaga..... | 60,000 |
| Oxford..... | Amabel..... | |
| Wells in surface drift..... | Brownsville..... | |
| Private wells..... | Harwich and Howard tps..... | |
| Total produced..... | | 10,746,334 |
| Value..... | | \$6,588,798 |
| Imported mixed gas..... | | M cu. ft. 113,495 |
| Total distributed..... | | 10,859,829 |

Petroleum

Production of petroleum in 1937 shows a slight decline from 1936—some 290 barrels. Such slight variations in annual production may be due to extreme cold winters, spring floods, breakdowns, etc., and should not be interpreted as a change in the trend of production.

Three wells drilled in the old Fletcher oil field in Tilbury East appear as new production but cannot be considered as a discovery. Drilling continues in the Dover field where both oil and gas are produced.

OIL WELLS AND THEIR PRODUCTION, 1937

| Field | Wells | | | Wells drilled | | Production ¹ | | Gain or loss ² in 1937 | |
|-------------------------------|-----------|---------------|-----------|---------------|-----|-------------------------|----------|-----------------------------------|-------------|
| | Operating | Not operating | Abandoned | Producing | Dry | | | Gain | Loss |
| Petrolia and Enniskillen..... | 742 | 643 | 11 | 18 | 2 | bbls. 57,959 | gals. 28 | bbls. 2,058 | bbls. 1,132 |
| Oil Springs..... | 832 | 244 | 14 | | | 33,852 | 26 | | |
| Moore tp..... | 47 | 37 | | | | 2,253 | | | 947 |
| Sarnia tp..... | 48 | 45 | 5 | | | 444 | 20 | | 139 |
| Plympton tp..... | 27 | 3 | | | 2 | 236 | 22 | | 11 |
| Bothwell and Thamesville..... | 242 | 100 | 10 | 15 | 9 | 41,108 | 22 | 4,116 | |
| Dover tp..... | 3 | | | | | 10,498 | 17 | | 5,038 |
| Tilbury East tp..... | 1 | | 7 | | 2 | 2,471 | 6 | 1,346 | |
| Onondaga tp..... | 13 | 23 | | | | 728 | 17 | 466 | |
| Mosa tp..... | 92 | 31 | 8 | 3 | 2 | 8,685 | 32 | 504 | |
| Euphemia and Dawn tps..... | 29 | 99 | | | 1 | 5,889 | 29 | | 2,282 |
| Dunwich tp..... | 3 | 87 | 9 | | 1 | 303 | 8 | | 4 |
| Brooke tp..... | 3 | 7 | 4 | 2 | 3 | 772 | 31 | 773 | |
| Chatham tp..... | | | | | 3 | | | | |
| Bosanquet tp..... | | 2 | | | | | | | |
| Other fields..... | | | | | 3 | | | | |
| Total..... | 2,082 | 1,321 | 68 | 38 | 28 | 165,205 | 13 | 9,263 | 9,553 |

¹Information from the Imperial Oil Refineries, Limited.

²Net loss, 290 barrels.

²2 in Cockburn Island; 1 in Warwick township.

The steady increase in the production of petroleum since 1930 appears to be slowing up. The principal reduction is in Dawn and Dover townships, but this is due to cessation of drilling. The Bothwell field still shows a healthy increase in production. The rest of the fields are more or less stationary.

OIL PRODUCTION BY FIELDS, 1930-1937

| Field | 1930 | 1931 | 1932 | 1933 | 1934 | 1935 | 1936 | 1937 |
|--------------------------------|-----------|-----------|-----------|-----------|-----------|------------------|------------------|-----------|
| | bbls. | bbls. | bbls. | bbls. | bbls. | bbls. | bbls. | bbls. |
| Petrolia and Ennis-killen..... | 55,130 | 57,515 | 58,871 | 57,298 | 57,938 | 59,282 | 59,092 | 57,960 |
| Oil Springs..... | 29,160 | 30,792 | 31,438 | 32,343 | 29,863 | 31,646 | 31,795 | 33,853 |
| Moore tp..... | 1,576 | 3,739 | 3,272 | 2,192 | 2,963 | 3,263 | 3,200 | 2,253 |
| Sarnia tp..... | 1,149 | 1,466 | 1,227 | 2,181 | 825 | 870 | 584 | 445 |
| Plympton tp..... | 296 | 296 | 274 | 211 | 202 | 237 | 248 | 237 |
| Bothwell..... | 21,176 | 18,024 | 19,460 | 22,935 | 32,133 | 34,175 | 36,534 | 40,425 |
| Tilbury East tp.... | 149 | | | | | | | 2,471 |
| Dover tp..... | 457 | 891 | 453 | 763 | 558 | 13,117 | 15,536 | 10,498 |
| Raleigh tp..... | | | | 239 | 264 | 195 | 1,125 | |
| Onondaga tp..... | 231 | 34 | 543 | 946 | 601 | 431 | 262 | 728 |
| Mosa tp..... | 7,166 | 8,517 | 8,429 | 8,168 | 9,031 | 8,788 | 8,182 | 8,686 |
| Thamesville..... | 447 | 462 | 534 | 847 | 614 | 428 | 458 | 683 |
| Euphemia tp..... | | 121 | 496 | 510 | 189 | (¹) | (¹) | 425 |
| Dunwich tp..... | 365 | 507 | 285 | 346 | 283 | 408 | 307 | 303 |
| Brooke tp..... | | | | | 1,941 | 122 | | 773 |
| Dawn tp..... | | | 5,061 | 8,079 | 3,980 | 11,538 | 8,171 | 5,464 |
| Total..... | 117,302 | 122,364 | 130,343 | 136,058 | 141,385 | 165,040 | 165,494 | 165,205 |
| Value..... | \$235,746 | \$219,993 | \$247,468 | \$253,486 | \$299,874 | \$346,156 | \$348,767 | \$356,558 |
| Average price.. | \$2.00 | \$1.80 | \$1.89 | \$1.86 | \$2.12 | \$2.10 | \$2.11 | \$2.15 |

¹Included in Dawn township.

Peat

During the past year or two considerable interest in the peat bogs of Ontario has been noted. The names of operators and locations are given on page 72. The production by 4 operators during 1935 was 1,340 tons, valued at \$5,761; in 1936, some 7 producers reported sales of 1,573 tons, valued at \$7,572; and in 1937, the output was 930 tons, worth \$4,923.

Quartz, Quartzite, and Silica Products

The output of quartz, quartzite, and silica products showed a considerable gain in 1937 owing to the increased consumption of quartz as a flux in iron and nickel-copper smelting. Formerly these figures were not included in the statistics. Silica brick was also up in quantity and value. Production figures for the past five years follow:—

QUARTZ, QUARTZITE, AND SILICA BRICK, 1933-1937

| Year | Rock sold or used | | Silica brick sold or used | | Total value |
|-----------|-------------------|----------|---------------------------|---------|-------------|
| | Quantity | Value | Quantity | Value | |
| | tons | | M | | |
| 1933..... | 66,562 | \$86,146 | 183 | \$7,351 | \$93,497 |
| 1934..... | 89,838 | 134,572 | 369 | 14,730 | 149,302 |
| 1935..... | 83,034 | 120,005 | 493 | 22,976 | 142,981 |
| 1936..... | 884,585 | 216,037 | 471 | 26,715 | 242,752 |
| 1937..... | 1,142,372 | 633,073 | 818 | 59,980 | 693,053 |

Salt

Six companies produced salt or brine steadily in Ontario during the year, and one firm reported one shipment in January. For 1937, salt and the salt

equivalent of brine used in manufacturing totalled 407,701 tons valued at \$1,539,599, as against 350,044 tons, worth \$1,557,078, in 1936. While the quantity figures showed considerable improvement, there was a slight decline in value. The average selling value of vacuum fine salt per barrel of 280 pounds was stationary at \$1.31 throughout the year. In 1936, the price for this grade was \$1.45 from January to April, and \$1.31 throughout the remainder of the year. The figures for the past five years are shown in the following table.

SALT SOLD OR USED, 1933-1937

| Schedule | 1933 | 1934 | 1935 | 1936 | 1937 |
|------------------------------------|-------------|-------------|-------------|-------------|-----------|
| | tons | tons | tons | tons | tons |
| Table and dairy..... | 61,231 | 69,779 | 73,704 | 76,567 | 76,908 |
| Fine..... | 63,786 | 67,777 | 82,608 | 83,095 | 104,967 |
| Coarse..... | 14,086 | 14,730 | 17,997 | 23,188 | 17,540 |
| Land..... | 283 | 347 | 261 | 1,312 | 89 |
| Other grades ¹ | | | | | 3,048 |
| Total..... | 139,386 | 152,633 | 174,570 | 184,162 | 202,552 |
| Brine (salt equivalent)..... | 104,721 | 124,118 | 145,433 | 165,882 | 205,149 |
| Total sold or used..... | 244,107 | 276,751 | 320,003 | 350,044 | 407,701 |
| Value..... | \$1,755,087 | \$1,734,196 | \$1,698,508 | \$1,557,078 | 1,539,599 |
| Wage-earners ².....No. | 242 | 252 | 274 | 281 | 274 |
| Wages..... | \$261,214 | \$296,116 | \$309,354 | \$326,170 | \$292,644 |

¹Includes salt used on highways.

²Workers at the Sandwich salt and chemical works are included.

Sulphuric Acid

The sulphur content of the acid manufactured at Copper Cliff by Canadian Industries, Limited, from converted gases was estimated at 14,009 tons, valued at \$10 per ton. No pyrite ore was reported as shipped.

Talc

The talc industry in Ontario, which is located near Madoc in Hastings county, has been represented by two companies recently. The Geo. H. Gillespie Company, Limited, operated the Henderson mine and a milling plant at Madoc. The Canada Talc Company, Limited, operated the Connolly mine, which supplied its milling plant.

The fine grinding of talc was carried on by the Geo. H. Gillespie Company from 1906 until October 31, 1937, when it ceased operations. This was the first company to produce ground talc in Canada.

The total sales in 1937 were 12,457 tons, worth \$123,301, as against 14,561 tons, valued at \$143,701, in 1936. The chief markets were Canada, the United States, and Great Britain.

TALC STATISTICS, 1933-1937

| Year | Sales | | Wage-earners, mine and mill | Wages paid |
|-----------|----------|-----------|-----------------------------|------------|
| | Quantity | Value | | |
| | tons | | No. | |
| 1933..... | 15,114 | \$142,134 | 43 | \$31,813 |
| 1934..... | 13,934 | 135,978 | 47 | 33,796 |
| 1935..... | 13,710 | 138,161 | 31 | 23,864 |
| 1936..... | 14,562 | 143,701 | 34 | 26,370 |
| 1937..... | 12,457 | 123,301 | 41 | 31,194 |

STRUCTURAL MATERIALS

Building Permits

In 58 Canadian cities building permits in 1937 were valued at \$55,844,990, as against \$41,325,693 in 1936. Of this total 27 Ontario cities accounted for \$28,156,707, as noted in the following table abstracted from the *Annual Review of Building Permits in Canada in 1937*, issued by the Dominion Bureau of Statistics, Department of Trade and Commerce, Ottawa:—

BUILDING PERMITS, 1933-1937

| Year | Ontario cities | | Wholesale prices index ¹ | Toronto metropolitan area, ² value | Wages index 1913=100 ³ |
|-----------|----------------|-------------|-------------------------------------|---|-----------------------------------|
| | No. | Value | | | |
| 1933..... | 30 | \$9,116,743 | 78.3 | \$5,114,351 | 158 |
| 1934..... | 30 | 14,351,380 | 82.6 | 8,396,775 | 154.8 |
| 1935..... | 27 | 23,847,536 | 81.2 | 11,685,586 | 159.8 |
| 1936..... | 27 | 19,256,177 | 85.4 | 10,522,624 | 160.8 |
| 1937..... | 27 | 28,156,707 | 94.3 | 13,270,524 | 165.3 |

¹Applies to average index numbers for Canadian wholesale prices of building materials on the basis of 1926=100, as compiled by the Dominion Bureau of Statistics. In 1913 the index was 67, dropping to a low of 60.5 in 1915.

²Includes York and East York municipalities.

³Average index numbers of wages in Canadian building trades as compiled by the Federal Department of Labour on the basis of 1913=100.

Construction Contracts

The value of Canadian construction contracts awarded for 1937 reported by *McLean Building Review*, was \$224,056,700, as compared with \$162,588,000 in 1936. Ontario contracts in 1937 amounted to \$97,777,400, or 43.7 per cent. of the total.

VALUE OF CONSTRUCTION CONTRACTS, 1933-1937

| Classification | 1933 | 1934 | 1935 | 1936 | 1937 |
|------------------|--------------|--------------|--------------|--------------|--------------|
| Residential..... | \$12,653,800 | \$17,578,600 | \$20,646,500 | \$23,760,000 | \$28,081,500 |
| Business..... | 9,716,100 | 15,795,600 | 20,340,800 | 17,727,200 | 26,638,600 |
| Industrial..... | 4,699,700 | 4,305,200 | 3,645,000 | 7,207,400 | 17,932,600 |
| Engineering..... | 15,503,800 | 25,678,900 | 26,240,500 | 23,698,700 | 25,124,700 |
| Total..... | \$42,573,400 | \$63,358,300 | \$70,872,800 | \$72,393,300 | \$97,777,400 |

Cement

Ontario's production of cement came from two companies: the Canada Cement Company, with plants at Lakefield, Belleville, and Port Colborne, the first-mentioned being idle, and the St. Marys Cement Company, with a plant at St. Marys, which was in operation throughout the year.

PORTLAND CEMENT STATISTICS, 1933-1937

| Year | Operating plants | Sales | | |
|-----------|------------------|----------------------|-------------|--------------------------|
| | | Quantity | Value | Average price per barrel |
| | No. | barrels ¹ | | |
| 1933..... | 3 | 1,095,845 | \$1,587,812 | \$1.45 |
| 1934..... | 4 | 1,702,128 | 2,403,590 | 1.41 |
| 1935..... | 2 | 1,243,836 | 1,752,148 | 1.41 |
| 1936..... | 3 | 1,542,463 | 2,180,895 | 1.41 |
| 1937..... | 3 | 2,650,652 | 3,657,067 | 1.38 |

¹350 pounds.

Cement Products

In recent years the cement products industry in Ontario has assumed considerable importance. Since 1924 no data have been included in the tables of mineral production as the raw materials entering into the manufacture of these products have all been accounted for.

PRINCIPAL STATISTICS OF THE CEMENT PRODUCTS INDUSTRY, 1933-1937¹

| Year | No. of plants | Wage-earners, average No. | Salaries and wages | Cost of fuel and electricity | Capital invested | Value of products at works |
|-----------|---------------|---------------------------|--------------------|------------------------------|------------------|----------------------------|
| 1933..... | 48 | 245 | \$199,056 | \$19,008 | \$1,642,244 | \$550,185 |
| 1934..... | 54 | 251 | 274,045 | 24,394 | 1,784,166 | 687,176 |
| 1935..... | 57 | 268 | 299,170 | 21,090 | 1,635,243 | 774,589 |
| 1936..... | 59 | 387 | 371,300 | 28,242 | 1,677,657 | 1,100,315 |
| 1937..... | 66 | 529 | 523,100 | 37,069 | 2,136,477 | 2,018,530 |

¹Supplied by the Dominion Bureau of Statistics, Ottawa.

CEMENT PRODUCTS MANUFACTURE, 1936 AND 1937¹

| Materials used | 1936 | | 1937 | |
|--|----------|---------------|----------|---------------|
| | Quantity | Cost at works | Quantity | Cost at works |
| Portland cement..... bbls. | 85,569 | \$193,282 | 202,576 | \$457,181 |
| Quicklime..... bu. | 25 | 315 | 2 | 22 |
| Sand..... cu. yds. | 33,414 | 36,158 | 80,112 | 72,201 |
| Gravel..... cu. yds. | 25,769 | 18,442 | 47,051 | 60,576 |
| Crushed stone..... cu. yds. | 6,156 | 6,081 | 30,571 | 51,223 |
| Cinders..... cu. yds. | 21,821 | 15,696 | 24,429 | 18,886 |
| Boxes, crates, lumber, etc..... | | 12,553 | | 2,089 |
| Reinforcing steel..... tons | 498 | 31,182 | | 56,738 |
| Haydite..... cu. yds. | 11,415 | 22,831 | 18,793 | 37,586 |
| Other materials..... | | 124,843 | | 135,034 |
| Total..... | | \$461,383 | | \$891,536 |
| Products made | 1936 | | 1937 | |
| | Quantity | Selling value | Quantity | Selling Value |
| Artificial stone..... | | \$69,563 | | \$77,712 |
| Cinder blocks..... M | 1,444 | 161,318 | 1,706 | 190,275 |
| Cement bricks..... M | 1,570 | 40,527 | | 129,567 |
| Cement hollow building blocks..... M | | 237,896 | | 265,976 |
| Cement laundry tubs..... No. | | 106,342 | 3,908 | 29,650 |
| Cement posts, poles, etc..... | | 1,260 | | 1,260 |
| Cement sewer, culvert, and drain pipe..... | | 47,059 | | 228,150 |
| Cement stucco..... | | 7,480 | | |
| Burial vaults..... | | 19,940 | | 24,646 |
| Haydite blocks..... tons | 4,036 | 33,905 | 4,522 | 44,995 |
| Haydite roof slabs..... tons | 5,082 | 177,905 | 9,677 | 316,858 |
| Other products..... | | 196,911 | | 709,241 |
| Custom work and repairs..... | | 209 | | 200 |
| Total..... | | \$1,100,315 | | \$2,018,530 |

¹Statistics supplied by the Dominion Bureau of Statistics, Ottawa.

Lime

Lime is used quite extensively for chemical purposes in addition to being an ingredient of mortar and sand-lime brick. During 1937, 17 companies and individuals, operating 20 plants, reported sales that totalled 294,467 tons, valued at \$2,152,644, as against 246,593 tons, worth \$1,946,060, in 1936. Statistics for the last five years follow:—

LIME STATISTICS, 1933-1937

| Year | Lime marketed or used | | | | | | Fuel costs | Wage-earners | Wages |
|----------|-----------------------|-------------|---------------|-----------|-------------|---------------|------------|--------------|-----------|
| | Hydrated | | | Quicklime | | | | | |
| | Quantity | Total value | Value per ton | Quantity | Total value | Value per ton | | | |
| | tons | | | tons | | | | No. | |
| 1933.... | 19,733 | \$220,291 | \$11.16 | 126,460 | \$1,006,905 | \$7.96 | \$188,317 | 210 | \$111,637 |
| 1934.... | 22,281 | 249,038 | 11.18 | 168,760 | 1,287,250 | 7.63 | 173,951 | 187 | 116,020 |
| 1935.... | 23,514 | 227,97 | 9.66 | 198,338 | 1,478,106 | 7.45 | 324,295 | 210 | 147,397 |
| 1936.... | 26,650 | 271,209 | 10.17 | 219,943 | 1,674,851 | 7.61 | 394,058 | 231 | 182,250 |
| 1937.... | 26,163 | 278,239 | 10.63 | 268,304 | 1,874,405 | 6.98 | 465,644 | 250 | 226,122 |

Distribution of the quicklime and hydrated lime sold in 1937, as reported by the producing companies, was as follows:—

| Industrial consumption | Quicklime | | Hydrated lime | |
|--|-----------|-------------|---------------|-----------|
| | Quantity | Value | Quantity | Value |
| | tons | | tons | |
| Building trades: finishing and masons..... | 7,092 | \$52,462 | 14,346 | \$152,167 |
| Sand-lime brick..... | 6,144 | 41,151 | | |
| Agriculture..... | | | 1,234 | 12,282 |
| Chemical and metallurgical industries: | | | | |
| Smelters..... | 996 | 6,163 | 300 | 3,417 |
| Iron and steel..... | 14,702 | 102,925 | 35 | 368 |
| Gold-milling..... | 31,204 | 199,188 | 215 | 2,470 |
| Pulp and paper..... | 8,006 | 47,343 | 273 | 2,870 |
| Glass..... | 7,612 | 53,098 | | |
| Sugar..... | 4,035 | 43,434 | | |
| Tanneries..... | 3,076 | 21,012 | 378 | 4,025 |
| Fertilizers and insecticides..... | 1,195 | 8,787 | 70 | 715 |
| Dealers and others..... | 5,013 | 44,252 | 8,519 | 91,215 |
| Other chemicals ¹ | 179,229 | 1,254,590 | 793 | 8,710 |
| Total..... | 268,304 | \$1,874,405 | 26,163 | \$278,239 |

¹Uses for lime under this heading include the manufacture of alkali, acetate of lime, and calcium carbide, the last-mentioned being used largely for making cyanamid.

Mineral or Rock Wool

There are now four companies producing mineral or rock wool in Ontario: Spun Rock Wools, Limited, Thorold; Rock Wool Corporation of Canada, Limited, Brantford; Gypsum Lime and Alabastine, Canada, Limited, Paris; and Insulation Products, Limited, Todmorden and Hamilton. Of these companies, one, the last-mentioned, uses blast furnace slag, principally as a raw material with small additions of rock. The total rock consumed amounted to 7,875 tons, and sales of wool were 3,438 tons, valued at \$172,270. Workers totalled 85, to whom \$72,422 was paid in wages.

The statistics of production of rock wool have not been included in the main table, as the industry may be more properly classified as manufacturing. The crude material used has already been accounted for in the statistics for stone.

Sand and Gravel

The output of sand and gravel in 1937 was higher than in the previous year. In the statistics shown below, ballast consumed by railways is included for the first time in 1936, under other producers.

OUTPUT OF SAND AND GRAVEL, 1936 AND 1937

| Source | 1936 | | 1937 | |
|---|-----------|-------------|-----------|-------------|
| | Quantity | Value | Quantity | Value |
| | tons | | tons | |
| Private pit operators..... | 2,050,451 | \$639,913 | 2,674,255 | \$880,395 |
| Dredged from Great Lakes and rivers..... | 1,712,071 | 340,050 | 1,078,011 | 512,553 |
| Department of Northern Development..... | 618,750 | 129,950 | 2,168,750 | 1,037,500 |
| Department of Highways..... | 695,925 | 94,650 | | |
| Miscellaneous counties and townships..... | 1,510,487 | 755,244 | 2,119,101 | 1,059,550 |
| Estimate for other producers ¹ | 1,910,469 | 267,813 | 792,409 | 123,856 |
| Total..... | 8,498,153 | \$2,227,620 | 8,832,526 | \$3,613,854 |

¹Railway ballast.

Sand-Lime Products

The marketing of sand-lime products has been dull for a number of years. This is, in part, owing to a depressed construction industry, but competition of other products, such as cinder blocks and kindred materials, has cut into this trade considerably. Four companies were active in the Toronto metropolitan area, and in addition to brick produced sand-lime building blocks, ready mixed mortar, and plaster. These items have been included in the table "Summary of Mineral Statistics, 1937," on page 2, under the title "Sand-lime products." It should be pointed out that in the table on page 3 the figures for 1933 refer to sand-lime brick only. The selling value in 1937 was \$153,910, as against \$178,868 in the previous year.

Stone

Apart from the large number of quarries operated by the municipalities (counties and townships) and by contractors on behalf of the Ontario Highways Department, there were some 43 limestone, 6 sandstone, 11 granite and trap, 6 marble, and 2 slate quarries, or a total of 68 establishments active in 1937. Wage-earners employed totalled 1,178, who received \$961,760 in wages, or about \$818 each. This is accounted for by the seasonal nature of the industry. The majority of the quarries were operated for road metal, for which there is a regular demand in Ontario. As may be seen in the following table the industry is gradually improving.

OUTPUT OF STONE, 1935, 1936, AND 1937

| Variety | 1935 | | 1936 | | 1937 | |
|----------------|-----------|-------------|-----------|-------------|-----------|-------------|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| | tons | | tons | | tons | |
| Limestone..... | 2,063,882 | \$1,689,096 | 2,205,992 | \$1,773,764 | 3,582,176 | \$2,841,470 |
| Marble..... | 2,050 | 26,924 | 4,765 | 29,204 | 6,685 | 27,247 |
| Trap..... | 44,351 | 91,979 | 70,599 | 167,263 | 679,760 | 769,860 |
| Granite..... | 122 | 1,486 | 421,628 | 415,339 | | |
| Sandstone..... | 12,536 | 54,407 | 3,436 | 10,805 | 8,680 | 22,934 |
| Slate..... | | | 260 | 2,080 | 300 | 2,258 |
| Total..... | 2,122,941 | \$1,863,892 | 2,706,680 | \$2,398,456 | 4,277,601 | \$3,663,769 |

CLAY PRODUCTS

The value of clay products marketed for the last pre-war year, 1913, for the year of maximum output, 1922, and for the past five years is given below:—

VALUE OF CLAY PRODUCTS SOLD OR USED, 1913, 1922, AND 1933-37

| Product | 1913 | 1922 | 1933 | 1934 | 1935 | 1936 | 1937 |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Brick: | | | | | | | |
| Common and sewer | \$3,283,894 | \$2,614,120 | \$167,021 | \$227,276 | \$275,835 | \$374,365 | \$359,504 |
| Pressed, fancy, building tile, etc. | 1,162,860 | 2,899,205 | 425,743 | 607,658 | 715,057 | 772,198 | 1,030,830 |
| Pottery | 52,875 | 88,889 | 152,740 | 152,578 | 50,000 | 51,507 | 54,581 |
| Drain tile | 292,767 | 368,180 | 179,015 | 137,699 | 125,593 | 131,041 | 233,258 |
| Sewer pipe | 600,297 | 973,824 | 185,048 | 226,005 | 196,647 | 235,238 | 338,895 |
| Haydite and other products | | | 15,012 | 9,790 | 7,093 | 9,587 | 16,777 |
| Total | \$5,392,693 | \$6,944,218 | \$1,024,579 | \$1,261,006 | \$1,370,225 | \$1,573,936 | \$2,033,845 |

¹Includes fire-clay blocks and shapes worth \$90.

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

HEAVY CLAY PRODUCTS MARKETED, 1937

| Kind | Quantity | Value |
|---|------------|-------------|
| Brick: | | |
| Soft-mud process {face.....No. | 9,014,698 | \$157,160 |
| common.....No. | 9,148,991 | 120,731 |
| Stiff-mud (wire cut) process {face.....No. | 21,904,246 | 416,048 |
| common.....No. | 13,515,739 | 187,776 |
| Dry-press {face.....No. | 9,277,065 | 177,837 |
| common.....No. | 3,272,434 | 48,220 |
| Fancy or ornamental brick (including special shapes, embossed and enamelled brick).....No. | 55,180 | 2,972 |
| Sewer.....No. | 175,359 | 2,777 |
| Tile: | | |
| Structural (hollow blocks, including fireproofing and load- bearing tile).....tons | 32,864 | 262,988 |
| Roofing tile.....No. | 36,152 | 2,117 |
| Floor tile (quarries).....sq. ft. | 70,329 | 11,708 |
| Drain.....No. | 9,604,756 | 233,258 |
| Sewer pipe (including copings, flue linings, etc.)..... | | 338,895 |
| Pottery (flower pots), from domestic clay..... | | 54,581 |
| Haydite and other products..... | | 15,847 |
| Blue clay.....tons | 310 | 930 |
| Total value..... | | \$2,033,845 |

MISCELLANEOUS STATISTICS

Mining Company Incorporations

A summary of mining companies incorporated and licensed in Ontario from 1933 to 1937, inclusive, is given hereunder:—

MINING COMPANIES INCORPORATED AND LICENSED, 1933-1937

| Year | Incorporated | | | | Extra-provincial and mortmain companies licensed | |
|-----------|--------------|--------------------|--------------------|------------|--|-------------------------------|
| | No. | Nominal capital | "No par" companies | | No. | Capital for use in Ontario |
| | | | No. | Shares | | |
| 1933..... | 95 | \$158,365,000 | 21 | 23,165,000 | 8 | \$1,290,000 |
| 1934..... | 212 | 488,335,000 | 82 | 86,183,000 | 9 | 925,000 |
| 1935..... | 116 | 205,320,000 | 24 | 18,054,500 | 1 | 40,000 |
| 1936..... | 294 | 724,615,000 | 45 | 54,974,000 | | |
| 1937..... | 312 | 505,670,000 | 30 | 31,883,100 | | |

Of the 342 companies incorporated in 1937, 312 had specified capital only and 30 were companies having shares without nominal or par value.

MINING COMPANIES INCORPORATED IN ONTARIO IN 1937 HAVING SHARES
WITHOUT NOMINAL OR PAR VALUE

| Name of company | Head office | Date of incorporation | No. of shares |
|---|-------------------|-----------------------|---------------|
| Ackerman Gold Mines, Limited..... | Toronto..... | Sept. 14 | 3,000,000 |
| Caminex, Limited..... | Toronto..... | May 20 | 50,000 |
| Colborne Goudreau Explorations, Limited..... | Toronto..... | May 8 | 10,000 |
| Compass Gold Mines, Limited..... | Toronto..... | April 14 | 3,000,000 |
| Copthall Mining and Development Corporation, Limited..... | Toronto..... | April 13 | 40,000 |
| Decca Mines, Limited..... | Toronto..... | July 21 | 3,000,000 |
| Dickson-Sachigo Gold Mines, Limited..... | Toronto..... | Jan. 13 | 3,000,000 |
| Electronic Mineral Diviners, Limited..... | Toronto..... | Feb. 10 | 500,000 |
| Federal Supply and Drilling Company, Limited.... | Toronto..... | Feb. 11 | 30,000 |
| Gipsy Gold Mines, Limited..... | Sarnia..... | Mar. 25 | 250,000 |
| Industrial Ore Products, Limited..... | Toronto..... | April 21 | 2,000 |
| Kayrand, Limited..... | Toronto..... | Feb. 13 | 100 |
| Lauren-Sachigo Gold Mines, Limited..... | Toronto..... | Mar. 24 | 3,000,000 |
| McLaren, Campbell and Company, Limited..... | Toronto..... | Sept. 9 | 1,000 |
| McMeekan Gordon Lake (N.W.T.) Mines, Limited. | Toronto..... | May 6 | 60,000 |
| Maestro Silver Lead Mines, Limited..... | Toronto..... | Jan. 5 | 1,000,000 |
| Milflyn Sudbury Metals, Limited..... | Toronto..... | Feb. 12 | 400,000 |
| Milton Gold Mines, Limited..... | Toronto..... | Mar. 15 | 300,000 |
| Minaki Mining and Development Company, Limited | Kenora..... | May 31 | 300,000 |
| Ni-Cu Metals, Limited..... | Toronto..... | Feb. 22 | 400,000 |
| Nipco Holdings, Limited..... | Toronto..... | Feb. 25 | 40,000 |
| Northfield Mining Corporation, Limited..... | Toronto..... | Mar. 10 | 500,000 |
| Octo Long Lac Gold Mines, Limited..... | Sturgeon Falls... | Jan. 6 | 2,500,000 |
| Ojibway Gold Mines, Limited..... | Toronto..... | Sept. 1 | 300,000 |
| Ontigo Gold Mines, Limited..... | Toronto..... | Mar. 17 | 150,000 |
| Orpit Mines, Limited..... | Toronto..... | Jan. 26 | 4,000,000 |
| Pennaque Mining Corporation, Limited..... | Toronto..... | Mar. 5 | 3,000,000 |
| Sainsbury Exploration Company, Limited..... | Toronto..... | May 3 | 10,000 |
| Treaty Petroleum, Limited..... | Toronto..... | Nov. 22 | 3,000,000 |
| Waonga Lake Development Company, Limited.... | Toronto..... | Jan. 25 | 40,000 |
| Total (30 companies)..... | | | 31,883,100 |

ONTARIO COMPANIES WITH SPECIFIED CAPITAL INCORPORATED IN 1937

| Name of company | Head office | Date of incorporation | Capital |
|---|-------------------|-----------------------|-------------|
| Agawa Gold Mines, Limited..... | Toronto..... | Nov. 19 | \$3,000,000 |
| Akbar Gold Mines, Limited..... | Toronto..... | Nov. 19 | 3,000,000 |
| Akolax Placer Mines, Limited..... | Windsor..... | Mar. 25 | 40,000 |
| Alden-Goudreau Mines, Limited..... | Toronto..... | Feb. 5 | 3,000,000 |
| Alewco Gold Mines, Limited..... | Hamilton..... | May 5 | 50,000 |
| Alkenore-Buffalo Gold Mines, Limited..... | Toronto..... | Jan. 13 | 4,000,000 |
| Allison Base Metal Mines, Limited..... | Toronto..... | Aug. 13 | 50,000 |
| Alsbach Kirkland Gold Mines, Limited..... | New Liskeard..... | Feb. 11 | 3,000,000 |
| Andover Porcupine Gold Mines, Limited..... | Timmins..... | Mar. 17 | 3,000,000 |
| Anglo-American Gypsum Mining Syndicate, Limited | Hamilton..... | Sept. 18 | 35,000 |
| Anglo Sudbury Mining and Metals Corporation, Limited..... | Ottawa..... | June 18 | 3,000,000 |
| Ansel Lake Mines, Limited..... | Toronto..... | Mar. 4 | 3,000,000 |
| Arjon Gold Mines, Limited..... | Toronto..... | Mar. 5 | 3,000,000 |

ONTARIO COMPANIES WITH SPECIFIED CAPITAL INCORPORATED
IN 1937—Continued

| Name of company | Head office | Date of incorporation | Capital |
|--|--------------------|-----------------------|-------------|
| Armistice Gold Mines, Limited..... | Toronto..... | Jan. 18 | \$5,000,000 |
| Armour Lake Gold Mining Syndicate, Limited..... | Toronto..... | July 2 | 35,000 |
| Arnold Kirkland Gold Mining Syndicate, Limited..... | Toronto..... | July 21 | 35,000 |
| Ashmore Gold Mines, Limited..... | Toronto..... | Mar. 18 | 1,000,000 |
| Athone Mines (1937), Limited..... | Toronto..... | Mar. 3 | 5,000,000 |
| Auratus Mining Syndicate, Limited..... | Toronto..... | Sept. 2 | 35,000 |
| Aurocap Mining Syndicate, Limited..... | Toronto..... | Oct. 27 | 35,000 |
| Ausina Gold Mines, Limited..... | Dryden..... | Jan. 4 | 3,000,000 |
| Baghdad Gold Mines, Limited..... | Toronto..... | April 9 | 3,000,000 |
| Barber-Larder Gold Mines, Limited..... | Toronto..... | Feb. 4 | 3,000,000 |
| Barhill Mining Syndicate, Limited..... | Toronto..... | Oct. 27 | 35,000 |
| Bart Malartic Gold Mines, Limited..... | Toronto..... | Mar. 23 | 2,500,000 |
| Battle View Oils, Limited..... | Toronto..... | Feb. 15 | 3,000,00 |
| Beanland Mining Company, Limited..... | Kirkland Lake..... | July 23 | 2,500,000 |
| Bearpaw Lake Goudreau Mines, Limited..... | Toronto..... | Jan. 5 | 3,000,000 |
| Beaumetz Rouyn Mining Syndicate, Limited..... | Toronto..... | Dec. 1 | 35,000 |
| Ben-Arch Mines, Limited..... | Toronto..... | Dec. 1 | 50,000 |
| Bernice Lake Gold Mines, Limited..... | Toronto..... | May 7 | 50,000 |
| Bexhill Gold Mines, Limited..... | Toronto..... | Jan. 7 | 3,000,000 |
| Bigores Mining Syndicate, Limited..... | Toronto..... | July 30 | 35,000 |
| Biltore Porcupine Mining Syndicate, Limited..... | Timmins..... | June 24 | 35,000 |
| Bomar Mining Claims, Limited..... | Toronto..... | Mar. 18 | 40,000 |
| Boyden Red Lake Gold Mines, Limited..... | Toronto..... | Jan. 13 | 3,500,000 |
| British Columbia Lead and Zinc Mines, Limited..... | Toronto..... | Mar. 24 | 3,000,000 |
| Broadview Mines, Limited..... | Windsor..... | Mar. 24 | 10,000 |
| Brough Lake Molybdenite, Limited..... | Toronto..... | April 8 | 3,000,000 |
| Buffalo Drilling Company, Limited..... | Brantford..... | April 10 | 20,000 |
| Burlington Mining Syndicate, Limited..... | Toronto..... | June 1 | 35,000 |
| Burscott Mining Syndicate, Limited..... | Sudbury..... | Aug. 31 | 35,000 |
| Cache d'Or Gold Mines, Limited..... | Toronto..... | Oct. 26 | 3,000,000 |
| Caledonia Long Lac Mining Syndicate, Limited..... | Toronto..... | July 19 | 35,000 |
| Cal-Por Gold Mines, Limited..... | Toronto..... | Mar. 25 | 3,000,000 |
| Canada Talc, Limited..... | Madoc..... | Nov. 22 | 250,000 |
| Canadian Beryllium Mines and Alloys, Limited..... | Toronto..... | May 25 | 3,000,000 |
| Carleton Exploration Company, Limited..... | Toronto..... | May 3 | 40,000 |
| Carolina Gold Mines, Limited..... | Toronto..... | April 9 | 150,000 |
| Caryl Mining Corporation, Limited..... | Toronto..... | July 21 | 3,000,000 |
| Cathay Gold Mining Syndicate, Limited..... | Toronto..... | Sept. 1 | 35,000 |
| Channel Mining Syndicate, Limited..... | Toronto..... | Aug. 6 | 35,000 |
| Charles Long Lac Mining Syndicate, Limited..... | Toronto..... | Dec. 29 | 35,000 |
| Cheminis Gold Mines, Limited..... | Toronto..... | Mar. 16 | 3,000,000 |
| Chien D'Or Exploration, Limited..... | Toronto..... | June 24 | 300,000 |
| Childs Gold Mines, Limited..... | Toronto..... | June 23 | 100,000 |
| Chipman Mining Syndicate, Limited..... | Toronto..... | June 16 | 35,000 |
| Chris Malartic Gold Mines, Limited..... | Toronto..... | Mar. 18 | 3,000,000 |
| Claw Lake Gold Mines, Limited..... | Toronto..... | Jan. 22 | 3,000,000 |
| Clear Lake Gold Mines, Limited..... | Toronto..... | Mar. 30 | 3,000,000 |
| Coag Mining Syndicate, Limited..... | Toronto..... | Sept. 18 | 35,000 |
| Cobond Mining Syndicate, Limited..... | Toronto..... | June 23 | 35,000 |
| Codelor Mining Syndicate, Limited..... | Toronto..... | June 8 | 35,000 |
| Coldstream Mining Company, Limited..... | Toronto..... | Feb. 3 | 4,000,000 |
| Collart Red Lake Gold Mines, Limited..... | Toronto..... | Mar. 13 | 3,000,000 |
| Commercial Gold Mines, Limited..... | Toronto..... | June 30 | 3,000,000 |
| Connaught Lake Mines, Limited..... | Toronto..... | Mar. 15 | 3,000,000 |
| Conwo Gold Mines, Limited..... | Toronto..... | Nov. 10 | 3,000,000 |
| Cooper Mining Exploration Company, Limited..... | Toronto..... | Feb. 8 | 40,000 |
| Coronet Lochalsh Gold Mines, Limited..... | Hamilton..... | April 7 | 3,000,000 |
| Corson Gold Mines, Limited..... | Toronto..... | April 9 | 4,000,000 |
| Crosanada Exploration and Mining Company, Limited..... | Toronto..... | Jan. 22 | 200,000 |
| Crosby Larder Lake Mines, Limited..... | Toronto..... | Mar. 17 | 60,000 |
| Cyam Gold Mining Syndicate, Limited..... | Toronto..... | Sept. 7 | 35,000 |
| Damigo Mining Syndicate, Limited..... | Toronto..... | June 18 | 35,000 |

ONTARIO COMPANIES WITH SPECIFIED CAPITAL INCORPORATED
IN 1937—Continued

| Name of company | Head office | Date of incorporation | Capital |
|---|-------------------------|-----------------------|-----------|
| Davoo Mining Syndicate, Limited | Hamilton | July 8 | \$35,000 |
| Dayton-Porcupine Mines, Limited | Toronto | Feb. 9 | 4,000,000 |
| Delandore Mines, Limited | Toronto | Feb. 8 | 3,000,000 |
| Delosha Porcupine Mines, Limited | Toronto | Feb. 23 | 3,500,000 |
| Delwin Mines, Limited | Toronto | July 5 | 3,000,000 |
| Dereham Gas and Oil Company, Limited | Toronto | Mar. 15 | 100,000 |
| Devil's Lake Mining Syndicate, Limited | Toronto | Nov. 19 | 35,000 |
| Devon Gold Mines, Limited | Toronto | Oct. 4 | 3,000,000 |
| Dinwell Lac Gold Mines, Limited | Toronto | June 21 | 3,000,000 |
| Dodd Mining Syndicate, Limited | Toronto | Dec. 23 | 35,000 |
| Dorex Gold Mines, Limited | Toronto | Jan. 16 | 3,000,000 |
| D'Ormont Gold Mines, Limited | Toronto | Feb. 5 | 3,000,000 |
| Dothan Mining and Development Company, Limited | Toronto | Sept. 29 | 100,000 |
| Dransfield Mining Company, Limited | Toronto | April 8 | 5,000,000 |
| Duart Mines, Limited | Toronto | Jan. 5 | 3,000,000 |
| Dunford Rouyn Mines, Limited | Toronto | Feb. 16 | 3,000,000 |
| Dunmore Mining Syndicate, Limited | Toronto | Nov. 23 | 35,000 |
| Earnsey Gold Mines, Limited | Empire | Mar. 15 | 3,000,000 |
| Eddie Maloney and Associates, Limited | Toronto | April 2 | 100,000 |
| El Rio Oils (Canada), Limited | Toronto | Mar. 22 | 75,000 |
| Elsie Boston Lake Mines, Limited | Boston Creek | Aug. 26 | 1,000,000 |
| Emily Bay Gold Mining Syndicate, Limited | Toronto | Oct. 26 | 35,000 |
| Erin Kirkland Gold Mines, Limited | Cobalt | May 18 | 3,000,000 |
| Esmeralda Gold Mines, Limited | Toronto | Mar. 11 | 200,000 |
| Estand Mines, Limited | Haileybury | Feb. 24 | 3,000,000 |
| Eugene Mining Syndicate, Limited, The | Cooper | Oct. 29 | 35,000 |
| Farlinger Mining Syndicate, Limited | Sioux Lookout | Aug. 13 | 35,000 |
| Farmog Mining Syndicate, Limited | Toronto | July 9 | 35,000 |
| Fish Lake Gold Mining Syndicate, Limited | Toronto | Oct. 21 | 35,000 |
| Fondulac Mining Corporation, Limited | Toronto | Jan. 9 | 5,000,000 |
| Found Lake Gold Mines, Limited | Toronto | Feb. 27 | 5,000,000 |
| Fountain Falls Mining Syndicate, Limited, The | Haileybury | Aug. 20 | 35,000 |
| Fraser Alluvials Mining Syndicate, Limited | Toronto | July 27 | 35,000 |
| Galloway Gordon Lake (N.W.T.) Mining Syndicate, Limited | Toronto | June 7 | 35,000 |
| Gascon Long Lac Mines, Limited | Toronto | Jan. 14 | 3,000,000 |
| Giant Yellowknife Gold Mines, Limited | Toronto | Aug. 4 | 3,000,000 |
| Gibraltar Gold Mining Syndicate, Limited | Toronto | June 7 | 35,000 |
| Glamorgan Mining Syndicate, Limited | Toronto | Dec. 29 | 35,000 |
| Gleamar Gold Mines, Limited | Toronto | Feb. 25 | 3,000,000 |
| Gold Sponsors, Limited | Toronto | April 20 | 100,000 |
| Goldbanks Mines, Limited | London | June 11 | 3,000,000 |
| Gold-Bin Mines, Limited | Toronto | Feb. 4 | 2,000,000 |
| Goldlure Mining Syndicate, Limited | Toronto | June 26 | 35,000 |
| Gordon Lake Gold Mines, Limited | Toronto | April 7 | 40,000 |
| Gorham Gold Mining Syndicate, Limited | Port Arthur | Dec. 30 | 35,000 |
| Grace-Larder Gold Mines, Limited | Toronto | Oct. 5 | 3,000,000 |
| Guardian Gold Mines, Limited | Kirkland Lake | Feb. 3 | 3,000,000 |
| Harpers Malartic Gold Mines, Limited | Toronto | Feb. 12 | 2,500,000 |
| Hartford-McClure Gold Mines, Limited | Windsor | June 28 | 3,000,000 |
| Harway Mining Syndicate, Limited | Toronto | July 15 | 35,000 |
| Hayman Red Lake Mining Syndicate, Limited | Toronto | July 13 | 35,000 |
| Hialeah Gold and Metals | Fort William | Mar. 12 | 1,000,000 |
| Hill-Teider Mining Syndicate, Limited | Toronto | Oct. 4 | 35,000 |
| Hilliard Red Lake Mining Syndicate, Limited | Toronto | Aug. 5 | 35,000 |
| Hol-Lac Gold Mines, Limited | Timmins | Jan. 14 | 40,000 |
| Hopa-Tricia Gold Mines, Limited | Toronto | May 21 | 500,000 |
| Horuba Mining Syndicate, Limited | Toronto | July 9 | 35,000 |
| Howard Gold Mines, Limited | Toronto | Oct. 15 | 500,000 |
| Humboldt Gold Mines, Limited | Toronto | Jan. 13 | 50,000 |
| International Beryllium Mining Syndicate, Limited | Toronto | June 3 | 35,000 |
| Ivan-Larder Mines, Limited | Toronto | Feb. 10 | 3,000,000 |
| Jackpot Mining Syndicate, Limited | Toronto | June 23 | 35,000 |
| Jacola Mines, Limited | Toronto | Feb. 13 | 3,500,000 |

ONTARIO COMPANIES WITH SPECIFIED CAPITAL INCORPORATED
IN 1937—Continued

| Name of company | Head office | Date of incorporation | Capital |
|---|------------------|-----------------------|-----------|
| Jepson Lake Mining Syndicate, Limited | Shiningtree | Dec. 20 | \$35,000 |
| Joyce Gold Mining Syndicate, Limited | Toronto | Nov. 19 | 35,000 |
| Kamlac Gold Mines, Limited | Toronto | Oct. 19 | 3,000,000 |
| Kanasuta Gold Mines, Limited | Toronto | Mar. 1 | 3,000,000 |
| Karas Gold Mines, Limited | Toronto | Jan. 6 | 3,000,000 |
| Kashabowie Mining Syndicate, Limited | Port Arthur | Nov. 8 | 35,000 |
| Katemis Mining Syndicate, Limited | Toronto | Sept. 29 | 35,000 |
| Katherine Lead Mines, Limited | Toronto | Feb. 5 | 1,500,000 |
| Kay-Hays Mines, Limited | Toronto | July 2 | 3,000,000 |
| Kayorum Gold Mines, Limited | Timmins | Jan. 4 | 5,000,000 |
| Kayrand Mining and Development Company, Limited | Toronto | Nov. 24 | 3,000,000 |
| Kelson Red Lake Gold Mines, Limited | Toronto | June 15 | 3,000,000 |
| Kenbrae Gold Mines, Limited | Toronto | April 22 | 3,000,000 |
| Kengriff Mining Syndicate, Limited | Toronto | Sept. 9 | 35,000 |
| Kenisle Mining Company, Limited | Toronto | Nov. 12 | 300,000 |
| Kenora Nickel Mines, Limited | Toronto | Mar. 20 | 3,000,000 |
| Kerry Gold Mines, Limited | Toronto | Dec. 20 | 3,000,000 |
| Kir-Vit Mines, Limited | Toronto | Feb. 17 | 3,500,000 |
| Kickapoo Mining Syndicate, Limited | Sault Ste. Marie | Sept. 14 | 35,000 |
| Kinika Gold Mines, Limited | Toronto | Aug. 20 | 3,000,000 |
| Kirkroyale Gold Mines, Limited | Toronto | Mar. 2 | 3,500,000 |
| Kirkwest Mines, Limited | Toronto | Mar. 2 | 3,000,000 |
| Knutson Mining Corporation, Limited, The | Kirkland Lake | Jan. 4 | 3,000,000 |
| Korola-Larder Mines, Limited | Kirkland Lake | Mar. 1 | 3,500,000 |
| Krone Mining Syndicate, Limited | New Liskeard | Dec. 22 | 35,000 |
| Labmahon Porcupine Gold Mines, Limited | Haileybury | Jan. 4 | 3,000,000 |
| Laidlaw Malartic Gold Mines, Limited | Toronto | Mar. 6 | 3,000,000 |
| Lake Godin Gold Mining Syndicate, Limited | Chatham | Aug. 12 | 35,000 |
| Lammermoor Gold Mines, Limited | Timmins | June 22 | 40,000 |
| Lancaster Mining Syndicate, Limited | Toronto | June 8 | 35,000 |
| Lansdowne Minerals, Limited | Nashville | April 21 | 150,000 |
| Lar-Add Mines, Limited | Toronto | Feb. 19 | 3,000,000 |
| Lardego Gold Mines, Limited | Toronto | Feb. 1 | 5,000,000 |
| Lavalie Mines, Limited | Toronto | April 10 | 3,000,000 |
| Lawson Mines, Limited | Toronto | Jan. 20 | 5,000,000 |
| Lenore Kirkland Gold Mines, Limited | Toronto | April 14 | 3,000,000 |
| Lindy Long Lac Gold Mines, Limited | Toronto | Mar. 9 | 3,000,000 |
| Lochgold Mines, Limited | Toronto | Feb. 9 | 3,000,000 |
| London Porcupine Mining Syndicate, Limited | Toronto | Nov. 20 | 35,000 |
| Longbeard Gold Mining Syndicate, Limited | Toronto | June 7 | 35,000 |
| McCarney Gold Mining Syndicate, Limited | Kirkland Lake | July 26 | 35,000 |
| McCoy Molybdenite, Limited | Toronto | Mar. 27 | 2,000,000 |
| Mace Gold Mines, Limited | Toronto | Feb. 19 | 5,000,000 |
| McLean Gold Mining Syndicate, Limited | Toronto | Oct. 26 | 35,000 |
| McNeely Mines (1937), Limited | North Bay | June 1 | 1,000,000 |
| McVeigh Creek Mining Syndicate, Limited | Toronto | July 14 | 35,000 |
| Magic Mining Syndicate, Limited | Port Arthur | Aug. 30 | 35,000 |
| Magnetawan Feldspar Mining Syndicate, Limited | Burton tp. | Oct. 13 | 35,000 |
| Mangan Porcupine Gold Mines, Limited | Toronto | Aug. 25 | 100,000 |
| Mangan Porcupine Mining Syndicate, Limited | Toronto | July 8 | 35,000 |
| Maple Creek Rouyn Mining Syndicate, Limited | Toronto | Nov. 18 | 35,000 |
| Marador Gold Mines, Limited | Toronto | Mar. 23 | 4,000,000 |
| Marlborough Gas and Oil, Limited | Hamilton | June 19 | 250,000 |
| Marmora Minerals, Limited | Toronto | Feb. 18 | 3,000,000 |
| Mars Deloro Gold Mines, Limited | Toronto | June 7 | 3,000,000 |
| Maryland Red Lake Gold Mines, Limited | Toronto | Jan. 27 | 3,000,000 |
| Mather Mining Syndicate, Limited | Toronto | Oct. 6 | 35,000 |
| Mazinaw Base Metals, Limited | Toronto | Mar. 18 | 2,000,000 |
| Mervyn Malartic Gold Mines, Limited | Toronto | Jan. 28 | 3,000,000 |
| Mid-Nite-Sun Mining Syndicate, Limited | Toronto | June 1 | 35,000 |
| Midway Malartic Gold Mines, Limited | Toronto | Jan. 8 | 3,000,000 |
| Milesim Kirkland Mining Syndicate, Limited | Toronto | Aug. 6 | 35,000 |

ONTARIO COMPANIES WITH SPECIFIED CAPITAL INCORPORATED
IN 1937—Continued

| Name of company | Head office | Date of incorporation | Capital |
|--|--------------------|-----------------------|-----------|
| Minedel Mining and Development Company, Limited | Toronto..... | Sept. 24 | \$40,000 |
| Molydor Mines, Limited..... | Toronto..... | July 26 | 100,000 |
| Moncar Mining Company, Limited..... | Hamilton..... | May 27 | 50,000 |
| Montmorr Gold Mines, Limited..... | Toronto..... | Feb. 5 | 40,000 |
| Murray Diamond Drilling Company, Limited..... | Toronto..... | Dec. 22 | 40,000 |
| New Crystal-Comstock Gold Mines, Limited..... | Toronto..... | Aug. 17 | 3,000,000 |
| New Kirkland-Eastern Gold Mines, Limited, The.. | Toronto..... | Jan. 29 | 3,500,000 |
| New Rand-Ore Mines, Limited..... | Toronto..... | Mar. 12 | 3,500,000 |
| New Ribago Mines, Limited..... | Toronto..... | Feb. 25 | 4,000,000 |
| New Rouillard Gold Mines, Limited..... | Toronto..... | Feb. 10 | 3,500,000 |
| New Tillsonburg Oil and Gas Company, Limited... | Toronto..... | April 17 | 400,000 |
| New True Fissure Mining and Milling Company, Limited..... | Windsor..... | Mar. 24 | 1,750,000 |
| Nicopor Mines, Limited..... | Toronto..... | Aug. 13 | 100,000 |
| Ninety-nine Mining Syndicate, Limited..... | Toronto..... | Oct. 15 | 35,000 |
| Niparea Prospectors, Limited..... | Leaside..... | Jan. 23 | 40,000 |
| Nipmur Gold Mines, Limited..... | Leaside..... | Nov. 19 | 40,000 |
| Nytor Patricia Mines, Limited..... | Toronto..... | June 3 | 3,000,000 |
| Ora Donna Gold Mines, Limited..... | Toronto..... | Mar. 1 | 3,000,000 |
| Oriental Mining Syndicate, Limited..... | New Liskeard.... | Sept. 15 | 35,000 |
| Otter Lake Gold Mines, Limited..... | Toronto..... | Jan. 13 | 4,000,000 |
| Panamint Malartic Mines, Limited..... | Toronto..... | Feb. 17 | 3,000,000 |
| Parkhill Gold Mines (1937), Limited..... | Toronto..... | Jan. 4 | 3,000,000 |
| Patrilartic Gold Mines, Limited..... | Toronto..... | Feb. 6 | 3,000,000 |
| Pegleg Gold Mines, Limited..... | Toronto..... | May 3 | 40,000 |
| Pelangio-Larder Mines, Limited..... | Kirkland Lake.... | Jan. 29 | 3,500,000 |
| Pelican Long Lac Gold Mines, Limited..... | Toronto..... | Feb. 25 | 50,000 |
| Pennada Mining Syndicate, Limited..... | Toronto..... | Aug. 4 | 35,000 |
| Pentland Mining Syndicate, Limited..... | Toronto..... | June 11 | 35,000 |
| Philips Exploration and Mining Syndicate, Limited.. | Toronto..... | Sept. 21 | 35,000 |
| Picairium Gold Mines, Limited..... | Toronto..... | June 22 | 3,000,000 |
| Planet Gold Mines, Limited..... | Toronto..... | Jan. 27 | 2,000,000 |
| Raingold Mines, Limited..... | Toronto..... | Feb. 3 | 3,000,000 |
| Rem-Larder Mining Syndicate, Limited..... | Haileybury..... | Sept. 2 | 35,000 |
| Rickaby Lake Mining Syndicate, Limited..... | Schumacher..... | July 7 | 35,000 |
| Rinell Goudreau Mining Syndicate, Limited..... | Toronto..... | June 14 | 35,000 |
| Ritoria Mines, Limited..... | Toronto..... | Jan. 23 | 3,000,000 |
| Ritz Larder Mines, Limited..... | Kirkland Lake.... | May 8 | 3,000,000 |
| Roberta Gold Mines, Limited..... | Hamilton..... | Feb. 26 | 3,000,000 |
| Robson Mining Syndicate, Limited..... | Toronto..... | Sept. 29 | 35,000 |
| Roger Red Lake Gold Mines, Limited..... | Toronto..... | Feb. 12 | 3,000,000 |
| Roma Lake Gold Mines, Limited..... | Porcupine..... | Feb. 26 | 5,000,000 |
| Roy Kirkland Gold Mines, Limited..... | Toronto..... | Feb. 4 | 3,500,000 |
| Sac D'or Mining and Exploration, Limited..... | Toronto..... | Aug. 20 | 50,000 |
| Sagenak Mining Syndicate, Limited..... | Toronto..... | Sept. 3 | 35,000 |
| Santaleda Gold Mining Syndicate, Limited..... | Sault Ste. Marie.. | Sept. 14 | 35,000 |
| Sanymac Mining & Development Company, Limited | Toronto..... | Oct. 4 | 3,000,000 |
| Saugeen-Davidson Gold Mines, Limited..... | Southampton.... | May 13 | 3,000,000 |
| Sentry Gold Exploration Company, Limited..... | London..... | Feb. 10 | 10,000 |
| Seven Lucky Mining Syndicate, Limited..... | Toronto..... | June 2 | 35,000 |
| Shallow River Mines, Limited..... | Toronto..... | May 3 | 40,000 |
| Shaver-McGarry Gold Mines, Limited..... | McGarry tp..... | Feb. 16 | 3,000,000 |
| Sheldon-Larder Mines, Limited..... | Kirkland Lake.... | Mar. 20 | 3,000,000 |
| Sidaris Mining Syndicate, Limited..... | Ottawa..... | July 7 | 35,000 |
| Simcoe Carolina Gold Mining Syndicate, Limited... | Barrie..... | Nov. 6 | 35,000 |
| Sioux Gold Mines, Limited..... | Toronto..... | Feb. 2 | 3,000,000 |
| Skyunner Lake Gold Mines, Limited..... | Toronto..... | Mar. 4 | 3,000,000 |
| Standing Stone Gold Mines, Limited..... | Toronto..... | Feb. 10 | 3,000,000 |
| Stergold Mining Syndicate, Limited..... | Toronto..... | July 19 | 35,000 |
| Stevepax Mining Syndicate, Limited..... | Toronto..... | Sept. 28 | 35,000 |
| Stone-Larder Mining Syndicate, Limited..... | Toronto..... | Dec. 23 | 35,000 |
| Stormont Peat Development, Limited..... | Newington..... | Jan. 28 | 40,000 |
| Strolun Mining and Exploration Company, Limited.. | Toronto..... | June 10 | 40,000 |
| Stull-Sachigo Exploration Company, Limited..... | Toronto..... | Dec. 17 | 40,000 |

ONTARIO COMPANIES WITH SPECIFIED CAPITAL INCORPORATED
IN 1937—*Continued*

| Name of company | Head office | Date of incorporation | Capital |
|--|-------------------|-----------------------|---------------|
| Sudlac Gold Mines, Limited..... | Toronto..... | Jan. 7 | \$3,000,000 |
| Surface-Gold Mining Syndicate, Limited..... | Toronto..... | July 27 | 35,000 |
| Sweepstake Porcupine Mining Syndicate, Limited.. | Timmins..... | Dec. 3 | 35,000 |
| Sybarite Porcupine Mining Syndicate, Limited.... | Toronto..... | Sept. 2 | 35,000 |
| Tashaman Gold Mines, Limited..... | Toronto..... | Feb. 27 | 40,000 |
| Terra Nova Mining Syndicate, Limited..... | Englehart..... | Oct. 14 | 35,000 |
| Thib Gold Mines, Limited..... | Toronto..... | June 15 | 3,000,000 |
| Thomas Ogden Gold Mining Company, Limited.... | Timmins..... | Feb. 16 | 3,000,000 |
| Thornloe Porcupine Gold Mines, Limited..... | Toronto..... | Feb. 4 | 3,000,000 |
| Tionaga Gold Mines, Limited..... | Horwood tp..... | Nov. 19 | 300,000 |
| Tonden Porcupine Mining Syndicate, Limited..... | Toronto..... | Aug. 13 | 35,000 |
| Toriano Mines, Limited..... | Toronto..... | Mar. 1 | 3,000,000 |
| Triple Lake Porcupine Gold Mines, Limited..... | Timmins..... | Feb. 6 | 3,000,000 |
| Uchi Gold Mines, Limited..... | Toronto..... | Jan. 20 | 3,000,000 |
| Universal Exploration Company (1937), Limited... | Toronto..... | Jan. 22 | 2,500,000 |
| Upper Seine Gold Mines, Limited..... | Toronto..... | April 26 | 3,000,000 |
| Vaillant Gold Mining Syndicate, Limited..... | Timmins..... | Oct. 4 | 35,000 |
| Val-Malartic Gold Mines, Limited..... | Toronto..... | Feb. 5 | 3,000,000 |
| Vanlas Gold Mines, Limited..... | Toronto..... | Feb. 12 | 3,000,000 |
| Varson Gold Mines, Limited..... | Toronto..... | Jan. 25 | 3,000,000 |
| Verity Porcupine Gold Mines, Limited..... | Timmins..... | Feb. 8 | 3,000,000 |
| Vin Dur Porcupine Gold Mines, Limited..... | Timmins..... | Mar. 11 | 3,000,000 |
| Wakami Gold Mining Syndicate, Limited..... | Toronto..... | June 16 | 35,000 |
| Walker Patricia Gold Mines, Limited..... | Toronto..... | Feb. 22 | 3,000,000 |
| Wall-Malartic Mines, Limited..... | North Bay..... | Mar. 8 | 3,000,000 |
| Walsona Gold Mines, Limited..... | Toronto..... | Mar. 2 | 4,000,000 |
| Wanatchee Gold Mining Syndicate, Limited..... | Toronto..... | Sept. 18 | 35,000 |
| Washagami Mines, Limited..... | Toronto..... | Feb. 6 | 40,000 |
| Wawbeek Gold Mines, Limited..... | Toronto..... | June 16 | 3,000,000 |
| Welland-Kirk Mining Syndicate, Limited..... | Welland..... | June 14 | 35,000 |
| Wellmarco Larder Gold Mining Syndicate..... | Kirkland Lake.... | Nov. 29 | 35,000 |
| Westfield Mining Company, Limited..... | Toronto..... | Dec. 20 | 300,000 |
| Westport Porcupine Gold Mines, Limited..... | Timmins..... | Mar. 17 | 3,000,000 |
| West-Ricia Gold Mines, Limited..... | Toronto..... | Feb. 11 | 3,500,000 |
| Wheeler Fraction Mining Syndicate, Limited..... | Toronto..... | Dec. 15 | 35,000 |
| White Dove Mining Syndicate, Limited..... | Toronto..... | July 30 | 35,000 |
| Whitloch Gold Mines, Limited..... | Toronto..... | July 20 | 50,000 |
| Wilberforce Minerals, Limited..... | Toronto..... | Mar. 2 | 1,000,000 |
| Wild Goose Mines, Limited..... | Toronto..... | Feb. 6 | 3,000,000 |
| Wilray Holding and Exploration Company, Limited. | Toronto..... | Jan. 4 | 40,000 |
| Winisk River Mines, Limited..... | Toronto..... | Nov. 5 | 3,500,000 |
| Wisewill Gold Mines, Limited..... | Toronto..... | Mar. 15 | 3,000,000 |
| Woco Gold Developments, Limited..... | Toronto..... | Feb. 19 | 3,000,000 |
| Wolverine Mines, Limited..... | Toronto..... | May 3 | 3,000,000 |
| Yama Gold Mines, Limited..... | Toronto..... | Jan. 19 | 3,500,000 |
| Yearsley-Hill Mining Syndicate, Limited..... | Toronto..... | June 14 | 35,000 |
| Yield Gold Mining Syndicate, Limited..... | Kirkland Lake.... | July 7 | 35,000 |
| Zenith Molybdenite Corporation, Limited..... | Toronto..... | Feb. 3 | 3,000,000 |
| Zonic-Larder Mining Syndicate, Limited..... | Toronto..... | Sept. 10 | 35,000 |
| Total (312 companies)..... | ..... | ..... | \$505,670,000 |

Mining Revenue and Expenditures

The revenue of the Department of Mines for the fiscal year ending March 31, 1938, was \$2,277,179.74, as compared with \$2,187,620.60 in the previous year. Expenditures were \$364,678.05. Details of revenue follow:—

REVENUE, DEPARTMENT OF MINES, APRIL 1, 1937 TO MARCH 31, 1938

ORDINARY:

| | | | |
|--|--------------|--|----------------|
| Sand and gravel— | | | |
| Royalties..... | \$55,008.45 | | |
| Licenses..... | 1,745.00 | | |
| | | | \$56,753.45 |
| Casual fees..... | \$1,896.37 | | |
| Sale of record books, Unwrought Metal Sales Act..... | 27.15 | | |
| Gas leases..... | 6,370.00 | | |
| | | | 8,293.52 |
| Inspection cable testing fees..... | | | 7,642.01 |
| Assessment— | | | |
| Acreage tax..... | \$49,386.34 | | |
| Profit tax..... | 1,801,499.81 | | |
| Gas tax..... | 44,169.85 | | |
| | | | 1,895,056.00 |
| Chemical and assay—fees..... | | | 1,873.47 |
| Mining recorders—rentals— | | | |
| Mining leases..... | \$12,486.28 | | |
| Licenses of occupation..... | 8,258.62 | | |
| | | | 20,744.90 |
| Miners' licenses..... | | | 69,757.36 |
| Fees— | | | |
| Recording..... | \$119,376.13 | | |
| Miscellaneous..... | 7,306.15 | | |
| Map sales..... | 2,139.25 | | |
| | | | 128,821.53 |
| Draughtsman, North Bay | | | |
| Sale of maps..... | | | 684.55 |
| Natural Gas Commissioner—permits..... | \$2,181.31 | | |
| Temiskaming Testing Laboratories..... | 13,830.27 | | |
| Miscellaneous..... | 92.51 | | |
| | | | 16,104.09 |
| | | | \$2,205,730.88 |

CAPITAL:

| | |
|---|----------------|
| Mining recorders—mining land sales..... | 71,448.86 |
| Total revenue..... | \$2,277,179.74 |

The figures of monies derived from sales and leases, divided according to district, do not agree with corresponding items of the preceding revenue statement, which record collections of monies actually received during the fiscal year. Details are given in the following table:—

MINING LANDS SOLD AND LEASED FOR FISCAL YEAR ENDING MARCH 31, 1938

| District | Sales | | | Leases | | | Total sales and leases | | |
|------------------|-------|-----------|-------------|--------|-----------|------------|------------------------|-----------|-------------|
| | No. | Acres | Amount | No. | Acres | Amount | No. | Acres | Amount |
| Algoma..... | 45 | 1,800.03 | \$5,038.43 | 4 | 110.08 | \$110.08 | 49 | 1,910.11 | \$5,148.51 |
| Cochrane..... | 72 | 2,676.46 | 6,633.46 | | | | 72 | 2,676.46 | 6,633.46 |
| Kenora..... | 33 | 1,157.75 | 2,893.02 | | | | 33 | 1,157.75 | 2,893.02 |
| Nipissing..... | 1 | 37.12 | 111.38 | 4 | 171.42 | 110.11 | 5 | 208.54 | 221.49 |
| Patricia..... | 130 | 4,530.92 | 11,415.07 | | | | 130 | 4,530.92 | 11,415.07 |
| Rainy River..... | 6 | 258.80 | 717.50 | | | | 6 | 258.80 | 717.50 |
| Sudbury..... | 57 | 2,607.66 | 7,526.58 | 34 | 1,178.63 | 470.82 | 91 | 3,786.29 | 7,997.40 |
| Thunder Bay..... | 315 | 13,321.40 | 35,870.19 | 86 | 3,888.07 | 3,837.91 | 401 | 17,209.47 | 39,708.10 |
| Timiskaming..... | 117 | 4,258.62 | 10,683.65 | 129 | 5,362.72 | 4,271.17 | 246 | 9,621.34 | 14,954.82 |
| Elsewhere..... | 10 | 548.00 | 819.00 | 2 | 93.01 | 57.46 | 12 | 641.01 | 876.46 |
| Total..... | 786 | 31,196.76 | \$81,708.28 | 259 | 10,803.93 | \$8,857.55 | 1,045 | 42,000.69 | \$90,565.83 |

SUMMARY OF BUSINESS TRANSACTED IN THE SEVERAL MINING DIVISIONS DURING 1937

| Schedule item | Fort Frances | Sudbury | Porcu- pine | Larder Lake | Sault Ste. Marie | Port Arthur | Kowkash | Timis- kaming | Montreal River | Kenora | Red Lake | Total |
|---|-----------------|-------------|----------------|----------------|---------------------|----------------|------------|------------------|-------------------|-------------|-------------|--------------|
| 1. Letters received | 1,003 | 3,861 | 3,798 | 4,631 | 4,241 | 4,095 | 956 | 1,422 | 1,406 | 3,703 | 3,088 | 32,204 |
| 2. Letters written | 1,165 | 3,534 | 3,831 | 4,444 | 3,861 | 4,582 | 1,031 | 1,213 | 1,469 | 3,501 | 2,726 | 31,357 |
| 3. Miner's Licenses issued | 64 | 605 | 624 | 1,028 | 276 | 542 | 104 | 202 | 65 | 444 | 648 | 4,602 |
| 4. Miner's Licenses renewed | 147 | 733 | 769 | 1,423 | 413 | 945 | 89 | 493 | 240 | 467 | 875 | 6,594 |
| 5. Mining claims recorded ¹ | 292 | 1,814 | 1,720 | 3,567 | 1,023 | 1,983 | 143 | 512 | 292 | 1,161 | 1,600 | 14,107 |
| 6. Mining claims cancelled | 313 | 2,128 | 989 | 1,930 | 350 | 2,718 | 129 | 682 | 288 | 1,167 | 751 | 11,445 |
| 7. Agreements, transfers, etc., recorded .. | 203 | 1,166 | 1,981 | 2,339 | 831 | 2,298 | 136 | 412 | 218 | 1,214 | 1,278 | 12,076 |
| 8. Receipts for Miner's Licenses, Permits, Recording Fees, etc. | \$4,379.20 | \$24,753.25 | \$26,339.10 | \$46,834.10 | \$15,264.15 | \$35,457.65 | \$2,627.75 | \$8,062.75 | \$5,749.04 | \$18,446.05 | \$23,759.95 | \$211,672.99 |
| 9. Receipts as Purchase Money or Rental .. | \$733.30 | \$8,753.26 | \$6,105.59 | \$10,483.45 | \$6,009.69 | \$41,005.98 | \$590.71 | \$831.06 | \$6,812.20 | \$3,271.44 | \$10,518.04 | \$95,114.72 |
| 10. Total remitted to Department | \$5,112.50 | \$33,506.51 | \$32,444.6 | \$57,317.55 | \$21,273.84 | \$76,463.63 | \$3,218.46 | \$8,893.81 | \$12,561.24 | \$21,717.49 | \$34,277.99 | \$306,787.71 |
| 11. Claims of which surveyors' plans were filed | 9 | 69 | 89 | 514 | 77 | 396 | 10 | 5 | 123 | 41 | 366 | 1,699 |
| 12. Disputes entered ..... | ..... | 4 | 7 | 24 | 8 | 20 | ..... | 3 | 3 | 2 | 9 | 80 |
| 13. Disputed cases decided by Recorders .. | ..... | ..... | ..... | 8 | ..... | ..... | ..... | 1 | ..... | ..... | ..... | 9 |
| 14. Appeals to Mining Court ..... | ..... | ..... | ..... | 16 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 16 |
| 15. Extensions of time granted | 215 | 1,298 | 737 | 1,590 | 538 | 2,381 | 104 | 41 | 589 | 783 | 1,171 | 9,447 |
| 16. Certificates of Record granted | 6 | 94 | 122 | 182 | 60 | 428 | 12 | 10 | 134 | 45 | 130 | 1,223 |
| 17. Certificates of Performance of Work granted | 6 | 87 | 70 | 91 | 58 | 423 | 12 | 15 | 134 | 46 | 150 | 1,092 |
| 18. Claims for which papers were for- warded to the Department for issue of title | 6 | 87 | 61 | 107 | 58 | 386 | 12 | 9 | 127 | 43 | 114 | 1,010 |
| 19. Substitute Miner's Licenses issued .. | 2 | 7 | 10 | 32 | ..... | 27 | 2 | 4 | 3 | 11 | 5 | 103 |
| 20. Abstracts issued | 388 | 2,552 | 2,288 | 3,779 | 1,552 | 5,313 | 252 | 475 | 864 | 1,707 | 3,138 | 22,308 |
| 21. Blue-prints sold | 162 | 1,187 | 1,491 | 3,827 | 451 | 911 | 112 | 371 | 303 | 328 | 333 | 9,476 |

¹In addition, the claims recorded at the Department of Mines at Toronto were 1,185, making a total of 15,292 for the province, as compared with 3,886 in 1930, 5,779 in 1931, 4,945 in 1932, 8,077 in 1933, 16,888 in 1934, 9,440 in 1935, and 17,295 in 1936.

STATEMENT OF MONIES REMITTED BY MINING RECORDERS FOR THE FISCAL YEAR ENDING MARCH 31, 1938

| Mining division | Name of recorder | Address | Purchase price | Maps | Miscellaneous fees | Miner's licenses | Recording fees | Total |
|-----------------------|----------------------|-----------------------|----------------|------------|--------------------|------------------|----------------|--------------|
| Fort Frances..... | Alexander, J. A..... | Fort Frances..... | \$765.52 | \$66.25 | \$780.85 | \$791.00 | \$2,105.60 | \$4,509.22 |
| Kowkash..... | Story, M. A..... | Nakina..... | 107.50 | 23.50 | 63.25 | 762.00 | 1,044.00 | 2,000.25 |
| Montreal River..... | Sharp, W. C..... | Elk Lake..... | 247.25 | 67.75 | 299.00 | 1,296.00 | 3,560.50 | 5,470.50 |
| Porcupine..... | O'Rourke, M. F..... | Timmins..... | 4,935.73 | 287.75 | 717.95 | 4,801.00 | 11,777.90 | 22,520.33 |
| Larder Lake..... | Ginn, H. G..... | Swastika..... | 9,773.06 | 736.25 | 1,167.00 | 9,319.00 | 22,352.85 | 43,348.16 |
| Red Lake..... | Holland, H. E..... | Stoux Lookout..... | 6,115.03 | 78.00 | 825.10 | 5,004.00 | 11,087.70 | 23,109.83 |
| Sudbury..... | McArthur, T. A..... | Sudbury..... | 7,007.41 | 236.50 | 771.75 | 5,274.85 | 13,328.00 | 26,618.51 |
| Timiskaming..... | McAulay, N. J..... | Haileybury..... | 866.06 | 75.25 | 111.00 | 2,702.00 | 3,236.50 | 6,990.81 |
| Port Arthur..... | Bolduc, J. P..... | Port Arthur..... | 29,800.57 | 358.00 | 1,697.45 | 6,474.00 | 22,251.70 | 60,581.72 |
| Sault Ste. Marie..... | Miller, W. N..... | Sault Ste. Marie..... | 4,224.32 | 99.75 | 484.75 | 2,843.00 | 9,451.15 | 17,102.97 |
| Kenora..... | Smith, J. D. C..... | Kenora..... | 2,642.57 | 110.25 | 388.05 | 2,836.00 | 7,838.00 | 13,814.87 |
| Total..... | | | \$66,485.02 | \$2,139.25 | \$7,306.15 | \$42,102.85 | \$108,033.90 | \$226,067.17 |

MINING CLAIMS RECORDED IN THE SEVERAL MINING DIVISIONS, 1907 AND 1918-1937

| Mining division | 1907 | 1918 | 1919 | 1920 | 1921 | 1922 | 1923 | 1924 | 1925 | 1926 | 1927 | 1928 | 1929 | 1930 | 1931 | 1932 | 1933 | 1934 | 1935 | 1936 | 1937 |
|--------------------------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|-------|-------|-------|-------|-------|--------|-------|--------|--------|
| Coleman ¹ | 291 | | | | | | | | | | | | | | | | | | | | |
| Fort Frances..... | | 52 | 145 | 215 | 101 | 55 | 33 | 444 | 220 | 96 | 24 | 40 | 70 | 75 | 175 | 98 | 137 | 313 | 237 | 198 | 292 |
| Gowganda ² | | 48 | 31 | 25 | 53 | 168 | 150 | 77 | 229 | 935 | 140 | 520 | 348 | 194 | 109 | 203 | 329 | 933 | 874 | 1,773 | 1,161 |
| Kenora..... | | 2 | 9 | 31 | 3 | 148 | 206 | 438 | 150 | 28 | 250 | 368 | 319 | 12 | 56 | 40 | 84 | 231 | 84 | 153 | 143 |
| Kowkash..... | 3,813 | 423 | 1,015 | 712 | 918 | 2,344 | 1,736 | 1,219 | 890 | 1,532 | 3,141 | 1,781 | 891 | 424 | 628 | 790 | 1,730 | 2,611 | 1,258 | 1,982 | 3,567 |
| Larder Lake..... | 866 | 293 | 134 | 81 | 143 | 174 | 400 | 471 | 471 | 290 | 126 | 156 | 48 | 661 | 1,127 | 156 | 444 | 627 | 276 | 380 | 292 |
| Montreal River..... | 102 | 12 | 39 | 33 | | | | | | | | | | | | | | | | | |
| Parry Sound ³ | | 48 | 136 | 192 | 273 | 760 | 1,424 | 556 | 620 | 1,297 | 3,127 | 611 | 650 | 135 | 307 | 387 | 613 | 785 | 729 | 2,443 | 1,720 |
| Porcupine..... | | 66 | 171 | 108 | 120 | 296 | 222 | 300 | 494 | 1,278 | 982 | 1,269 | 691 | 338 | 609 | 475 | 900 | 6,842 | 1,815 | 3,420 | 1,983 |
| Port Arthur..... | 317 | | | | | | | | | 5,827 | 2,018 | 1,100 | 973 | 305 | 298 | 185 | 343 | 1,036 | 754 | 2,045 | 1,600 |
| Red Lake..... | | | | | | | | | | | | | | | | | | | | | |
| Sault Ste. Marie..... | 291 | 199 | 90 | 90 | 216 | 541 | 498 | 284 | 451 | 395 | 735 | 702 | 487 | 318 | 276 | 92 | 450 | 532 | 429 | 1,076 | 1,023 |
| Sudbury..... | 456 | 168 | 673 | 267 | 319 | 701 | 436 | 559 | 546 | 1,367 | 3,351 | 6,424 | 2,164 | 807 | 1,597 | 1,986 | 2,362 | 1,549 | 2,013 | 1,540 | 1,814 |
| Timiskaming..... | 7,860 | 184 | 244 | 329 | 159 | 328 | 971 | 735 | 634 | 438 | 875 | 499 | 346 | 202 | 78 | 63 | 256 | 688 | 290 | 745 | 512 |
| At Toronto..... | | 39 | 231 | 87 | 145 | 171 | 116 | 139 | 226 | 203 | 795 | 1,576 | 1,186 | 171 | 142 | 356 | 307 | 534 | 476 | 1,540 | 1,185 |
| Total..... | 13,996 | 1,534 | 2,918 | 2,160 | 2,459 | 5,686 | 6,092 | 5,222 | 4,751 | 13,496 | 15,564 | 15,046 | 8,207 | 3,886 | 5,779 | 4,945 | 8,077 | 16,888 | 9,440 | 17,295 | 15,292 |

¹Joined with Timiskaming since 1911.²Joined with Montreal River in 1936.³The office at Parry Sound was closed in 1921, and records are now kept at the Department of Mines, Toronto.

The following is a comparative statement of mining licenses and renewals issued, claims recorded, profit tax, and total revenue during the past five years:—

PROSPECTING ACTIVITY, PROFIT TAX, AND TOTAL REVENUE, 1933-1937

| Year | Calendar year | | | | | Fiscal year ¹ |
|------------|-----------------------------|--------------------------|-----------------------------|------------------------|--------------|--------------------------|
| | New miner's licenses issued | Miner's licenses renewed | Total licenses and renewals | Mining claims recorded | Profit tax | Total mining revenue |
| 1933 | 3,365 | 3,911 | 7,276 | 8,077 | \$679,731.07 | \$942,721.62 |
| 1934 | 7,409 | 4,757 | 12,166 | 16,888 | 1,073,824.46 | 1,487,886.94 |
| 1935 | 3,335 | 5,113 | 8,448 | 9,763 | 1,400,656.14 | 1,917,981.93 |
| 1936 | 7,170 | 5,961 | 13,131 | 17,295 | 1,563,680.99 | 2,187,620.60 |
| 1937 | 5,511 | 8,344 | 13,855 | 15,292 | 1,801,499.81 | 2,277,179.74 |

¹Up to and including 1934, the fiscal year was from November 1 of the previous year to October 31 of the year shown. The fiscal year now ends on March 31.

²Includes \$130,338.18 for the five months' period November 1, 1934, to March 31, 1935, and \$1,787,643.75 for the new fiscal year ending March 31, 1936.

Under *The Mining Tax 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. on profits up to \$1,000,000. On profits over \$1,000,000 and up to \$5,000,000, the tax is 5 per cent.; and on profits in excess of the latter amount, the rate is 6 per cent. A part of this money is returned to organized municipalities.

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 year 1937:—

DETAILS OF PROFIT TAX

GOLD:

| | | |
|--|-----------------------|--|
| Buffalo Ankerite Gold Mines, Limited | \$12,805.21 | |
| Central Patricia Gold Mines, Limited | 13,416.78 | |
| Coniaurum Mines, Limited | 105.09 | |
| Deep Lake Gold Mines Syndicate | 632.46 | |
| Dome Mines, Limited | 132,241.29 | |
| Duport Mining Company, Limited | 299.41 | |
| Hollinger Consolidated Gold Mines, Limited | 154,802.87 | |
| Kirkland Lake Gold Mining Company, Limited | 1,052.36 | |
| Lake Shore Mines, Limited | 318,770.57 | |
| Little Long Lac Gold Mines, Limited | 19,939.12 | |
| Macassa Mines, Limited | 8,229.81 | |
| McIntyre-Porcupine Mines, Limited | 99,159.77 | |
| McKenzie Red Lake Gold Mines, Limited | 7,685.56 | |
| Northern Empire Mines Company, Limited | 13,709.13 | |
| Parkhill Gold Mines (1937), Limited | 34.82 | |
| Pickle Crow Gold Mines, Limited | 26,928.61 | |
| Sylvanite Gold Mines, Limited | 12,420.54 | |
| Teck-Hughes Gold Mines, Limited | 58,434.69 | |
| Toburn Gold Mines, Limited | 3,646.09 | |
| Wright-Hargreaves Mines, Limited | 117,037.14 | |
| | <u>\$1,001,351.32</u> | |

SILVER:

| | | |
|---|-----------------|--|
| Beaver mine | \$106.28 | |
| Cobalt Properties, Limited | 51.96 | |
| Nipissing Mining Company, Limited | 872.61 | |
| | <u>1,030.85</u> | |

NICKEL-COPPER:

| | | |
|---|-------------------|--|
| Falconbridge Nickel Mines, Limited | \$17,381.32 | |
| International Nickel Company of Canada, Limited | 781,363.49 | |
| | <u>798,744.81</u> | |

COBALT AND NICKEL:

| | | |
|--|--------|--|
| R.P.M. Syndicate (lessees of Agaunico Cobalt Mines, Limited) | 372.83 | |
|--|--------|--|

Total

\$1,801,499.81

Temiskaming Testing Laboratories

This plant, located at Cobalt and equipped for sampling and assaying, has been operated by the Department since July, 1921, under the management of A. A. Cole, mining engineer, of the T. & N. O. Railway Commission.

COMPARATIVE FINANCIAL STATEMENT OF THE TEMISKAMING TESTING LABORATORIES, 1933-1937

| Year | Cash receipts | Earnings | Expenditures | Operating profit | Operating loss |
|-----------|---------------|------------|--------------|------------------|----------------|
| 1933..... | \$6,206.68 | \$6,508.49 | \$13,318.18 | ..... | \$6,809.69 |
| 1934..... | 9,816.20 | 11,359.81 | 12,762.68 | ..... | 1,402.87 |
| 1935..... | 15,149.00 | 15,405.80 | 15,212.83 | \$192.97 | ..... |
| 1936..... | 19,915.55 | 20,066.71 | 17,131.36 | 2,935.35 | ..... |
| 1937..... | 15,094.78 | 14,652.39 | 14,870.10 | ..... | 217.71 |

Provincial Assay Office

The Provincial Assay Office was established in Belleville by the Bureau (now Department) of Mines in 1898, as an aid in the development of the mineral resources of Ontario. W. F. Green, Provincial Assayer and Chemist, reports as follows for 1937:—

The large number of samples submitted to the Chemical Branch of the Department reflects the activity in prospecting in the province. Of these, 4,014 were done free, as provided by R.S.O., Chap. 45, Sec. 69. A total of 6,331 samples was received for investigation, and reports issued. These determinations may be classified as follows:—

COMPLETE ASSAY RETURNS, 1937

| Assay | Free assays under <i>The Mining Act</i> | General custom and Department work | Total |
|--------------------|---|------------------------------------|-------|
| Gold..... | 3,872 | 1,188 | 5,060 |
| Silver..... | 229 | 93 | 322 |
| Platinum..... | 16 | 16 | 32 |
| Copper..... | 185 | 163 | 348 |
| Lead..... | 51 | 44 | 95 |
| Zinc..... | 47 | 53 | 100 |
| Nickel..... | 110 | 115 | 225 |
| Cobalt..... | 25 | 7 | 32 |
| Iron..... | 29 | 14 | 43 |
| Molybdenum..... | 12 | 15 | 27 |
| Miscellaneous..... | 49 | 49 | 98 |
| Total..... | 4,625 | 1,757 | 6,382 |

In addition 132 samples were received by mail for identification and reports issued. A large number were brought directly to the laboratory; of these no record was kept. Complete analyses of 10 rocks were made for the geologists of the Department.

The work of this Branch was carried on with the assistance of T. E. Rothwell, assayer and chemist, and Robert Stewart and William Ley, laboratory assistants.

The schedules of charges for the Provincial Assay Office and Chemical Laboratory may be obtained on application. Minerals and rocks not requiring chemical analysis are identified free of charge. Tests on radio-activity are free.

Draughting Office, North Bay

As mining claims are recorded in each mining division, sketches and recording notices are forwarded by the recorders to the Draughting Office, North Bay, and the same practice applies when surveys are filed. Tracings are prepared from the data furnished and blue-prints supplied to the recorders and to the general public at a nominal charge. North Bay is a convenient centre, and considerable time for Northern Ontario residents is saved through the mails compared with former practice when blue-prints were prepared at Toronto. The office was established in February, 1920. It is now in charge of A. D. Williams.

LIST OF MINES, QUARRIES, AND WORKS, 1937 METALLICS

| COMPANY | MINE | MANAGER | MINE ADDRESS | HEAD OFFICE ADDRESS |
|---|-----------------------------|---------------------|--|---------------------------------------|
| CHROMIUM | | | | |
| Chromium Mining & Smelting Corp., Ltd. | Obonga Lake..... | H. H. Merritt.... | Collins..... | 700 Bank of Commerce Bldg., Hamilton. |
| GOLD ¹ | | | | |
| Ackerman Gold Mines, Ltd..... | Ackerman..... | J. M. Thompson.. | Marmora..... | Marmora. |
| Addington Mines, Ltd. (under control of Consolidated Mining and Smelting Co. of Canada, Ltd.).. | Addington or Rich Rock..... | J. E. Hawes..... | Flinton..... | 302 Bay St., Toronto. |
| Agawa Gold Mines, Ltd..... | Centennial..... | H. Buckles..... | Gold Park..... | 767 Yonge St., Toronto. |
| †Akbar Gold Mines, Ltd..... | Hillside..... | Geo. S. Gilbert.. | Wawa..... | 9 Toronto St., Toronto. |
| Albany River Mines, Ltd..... | Albany River..... | R. F. Mitchell.. | Pickle Crow..... | Haileybury. |
| †Alcona Mines, Ltd..... | Alcona..... | L. H. Biggar..... | Alcona..... | 803 Sterling Tower, Toronto. |
| *Algoma Mines, Ltd..... | Algoma..... | ..... | Goudreau..... | 45 Richmond St. W., Toronto. |
| *Algoma Summit Gold Mines, Ltd..... | Algoma Summit..... | ..... | Goudreau..... | 512 McKinnon Bldg., Toronto. |
| †Altura Gold Mines, Ltd..... | Altura..... | ..... | Red Lake..... | 67 Yonge St., Toronto. |
| *Amca Mines, Ltd..... | Amca..... | ..... | Matheson..... | 24 Jarvis St., Fort Erie North. |
| Aquarius Porcupine Gold Mines, Ltd..... | Aquarius..... | ..... | Shillington..... | 706 Concourse Bldg., Toronto. |
| †Arbade Gold Mines, Ltd..... | Arbade..... | ..... | Matagewan..... | 10 Adelaide St. E., Toronto. |
| †Arcadia Gold Mines, Ltd..... | Triplex..... | ..... | South Porcupine..... | 808 Federal Bldg., Toronto. |
| *Argosy Gold Mines, Ltd..... | Argosy..... | R. Massey Williams. | Casummit Lake..... | 44 Victoria St., Toronto. |
| Arjon Gold Mines, Ltd..... | Arjon..... | ..... | Larder Lake..... | 26 Adelaide St. W., Toronto. |
| Armistice Gold Mines, Ltd..... | Armistice..... | ..... | Larder Lake..... | 706 Concourse Bldg., Toronto. |
| Augite Porcupine Mines, Ltd..... | Augite..... | J. A. Mitchell.. | Timmins..... | 357 Bay St., Toronto. |
| *Bankfield Consolidated Mines, Ltd..... | Bankfield..... | J. W. MacKenzie. | Geraldton..... | 1006 Concourse Bldg., Toronto. |
| Barber-Larder Gold Mines, Ltd..... | Barber-Larder..... | R. S. Potter..... | Larder Lake..... | 372 Bay St., Toronto. |
| Beanland Mining Co., Ltd..... | Beanland..... | D. M. Briden..... | Timagami..... | Kirkland Lake. |
| Beaverhouse Lake Gold Mines, Ltd. (under control of Toburn Gold Mines). | Argonaut..... | M. W. Hotchkiss. | Kirkland Lake..... | Haileybury. |
| Berens River Mines, Ltd..... | Berens River..... | M. D. Banghart.. | Favourable Lake, Ont., c/o Wings, Ltd., Winnipeg, Man. | Empire. |

¹Companies whose mines were producing in 1937 are marked with an asterisk (*); those at whose mines operations had been suspended at the end of 1937 are marked with a dagger (†).

| | | | | |
|--|------------------------|-----------------|---------------------------------------|---|
| *Bidgood Kirkland Gold Mines, Ltd. | Bidgood | F. L. Smith | Kirkland Lake | Kirkland Lake |
| †Big Master Consolidated Gold Mines, Ltd. | Big Master | J. Woodcock | Shiningtree | 112 Yonge St., Toronto. |
| Bilmac Gold Mines, Ltd. | Bilmac | James Crookston | Jellicoe | 357 Bay St., Toronto. |
| Blue Jay Long Lac Gold Mines, Ltd. | (Little Long Lac area) | James Crookston | Schreiber | 203 Royal Bank Bldg., Toronto. |
| †Bolinver Mines and Investments, Ltd. | Bolinver | | Stead | Sudbury. |
| *†Bousquet Gold Mines, Ltd. | Bousquet | C. W. Workman | Willisville | 171 Yonge St., Toronto. |
| *†Bregold Mines, Ltd. | Brennan-Kenty | | Nezah | 34 King St. E., Toronto. |
| *†Britcana Gold Mines, Ltd. | Britcana | | Charlton | 80 King St. W., Toronto. |
| *†Buffalo Ankerite Gold Mines, Ltd. | Buffalo Ankerite | R. P. Kinkel | South Porcupine | 1750 Rand Bldg., Buffalo, N.Y. |
| *Central Patricia Gold Mines, Ltd. | Central Patricia | R. E. Barrett | Central Patricia | 85 Richmond St. W., Toronto. |
| †Central Porcupine Mines, Ltd. | Springer | | Schumacher | 25 King St. W., Toronto. |
| Chesterville Larder Lake Gold Mining Co., Ltd. | Central Porcupine | L. T. Postle | Larder Lake | 330 Bay St., Toronto. |
| Clark Gold Mines, Ltd. | Clark | R. S. Douglas | Dymont | 836 Dominion Sq. Bldg., Montreal, Que. |
| Cline Lake Gold Mines, Ltd. | Cline | A. H. Hinton | Lochalsh | 900 Victoria Bldg., Ottawa. |
| †Cochenour Willans Gold Mines, Ltd. | Cochenour Willans | J. T. Randall | McKenzie Island | 801 Dominion Bank Bldg., Toronto. |
| †Coin Lake Gold Mines, Ltd. | Coin Lake | | Red Lake | 357 Bay St., Toronto. |
| Cole Gold Mines, Ltd. | Cole | J. Y. Cole | Cole | |
| *Coniaurum Mines, Ltd. | Coniaurum | John Redington | Schumacher | 25 King St. W., Toronto. |
| Consolidated Mining and Smelting Co. of Canada, Ltd. ¹ | Cordova | C. A. Seaton | Cordova Mines | 215 St. James St. W., Montreal, Que. |
| Consolidated Mining and Smelting Co. of Canada, Ltd. (under option). | Hermiston-McCauley | E. D. O'Brien | Timagami | 215 St. James St. W., Montreal, Que. |
| Continental Kirkland Gold Mines, Ltd. (under direction of Toburn Gold Mines, Ltd.) | Ritchie | C. E. White | Kirkland Lake | Kirkland Lake. |
| *Cook Lake Gold Mines, Ltd. | Cook Lake | A. L. Kemp | Schreiber | 350 Bay St., Toronto. |
| †Crescent Kirkland Gold Mines, Ltd. | Crescent Kirkland | | Swastika | 156 Yonge St., Toronto. |
| †Darkwater Mines, Ltd. | Darkwater | | W. O. Junction, via Sioux Lookout. | 85 Richmond St. W., Toronto. |
| *Darwin Gold Mines, Ltd. | Darwin | M. H. Froberg | Gold Park | c/o Frank O. Tidy, trustee, 9 Toronto St., Toronto. |
| †Dawson-White Gold Mines, Ltd. | Dawson-White | | Savant Lake | 1116 Federal Bldg., Toronto. |
| *Deep Lake Gold Mines Syndicate | Deep Lake | A. M. George | Gold Park | 109 North Union St., Akron, Ohio. |
| *Delnite Mines, Ltd. | Delnite | Kenneth C. Gray | Timmins | 603 Royal Bank Bldg., Toronto. |
| Delwin Mines, Ltd. | Deloro-Wright | T. J. Wright | Timmins | 806 Dun Bldg., Buffalo, N.Y. |
| De Santis Porcupine Mines, Ltd. | De Santis | | Timmins | 42½ Second Ave., Timmins. |
| Devon Gold Mines, Ltd. | Coulson | H. Reinecke | Matheson | 1104 Northern Ontario Bldg., Toronto. |
| Digby Dome Mines Co., Ltd. | Digby Dome | | Timmins | 80 Richmond St. W., Toronto. |
| *Dome Mines, Ltd. | Dome | J. H. Stovel | South Porcupine | 36 Toronto St., Toronto. |
| Edgelaque Gold Mining Co., Ltd. | Edgelaque | P. B. Cameron | Tashota | Schumacher. |
| *Edwards Gold Mines, Ltd. | Edwards | F. M. Passow | Lochalsh | 302 Sterling Tower, Toronto. |

¹See also Addington Mines, Ltd.; Carron Gold Mines, Ltd.; and New Golden Rose Mines, Ltd.

| COMPANY | MINE | MANAGER | MINE ADDRESS | HEAD OFFICE ADDRESS |
|--|------------------------|--------------------|--------------------------|--------------------------------------|
| GOLD—Continued. | | | | |
| Electra Porcupine Gold Mines, Ltd. | Electra Porcupine | | Shillington. | 29 Melinda St., Toronto. |
| Elizabeth Gold Mining Co., Ltd. | Elizabeth | W. N. McClintock | Atikokan. | 156 Yonge St., Toronto. |
| *Elora Gold Mines, Ltd. | Elora | J. G. Harkness. | Goldrock, via Wabigoon | 603 Royal Bank Bldg., Toronto. |
| †Eva Lake Gold Mines, Ltd. | Eva Lake | | Beardmore. | 330 Bay St., Toronto. |
| Falcon Gold Mines, Ltd. | Falcon | | Wahnapitae. | 200 Bay St., Toronto. |
| †Faulkenham Lake Gold Mines, Ltd. | Faulkenham Lake | | Red Lake. | 702 Reford Bldg., Toronto. |
| Federal Kirkland Mining Co., Ltd. | Federal Kirkland | J. H. Botsford. | Kirkland Lake | 85 Richmond St. W., Toronto. |
| Fernland Gold Mines, Ltd. | Fernland | Howard J. Jewell. | Larder Lake. | 171 Yonge St., Toronto. |
| Frontier Red Lake Gold Mines, Ltd. | Frontier Red Lake | | Cole. | 701 National Bldg., Toronto. |
| Garrcon Mines, Ltd. (under control of Consolidated Mining and Smelting Co. of Canada, Ltd.). | Garrcon. | | Matheson. | 302 Bay St., Toronto. |
| *Gillies Lake-Porcupine Gold Mines, Ltd. | Gillies Lake-Porcupine | C. T. Penney | Timmins. | 9 Toronto St., Toronto. |
| †Glecnar Gold Mines, Ltd. | Bathurst | | Narrow Lake, via Hudson. | 330 Bay St., Toronto. |
| Glenora Gold Mines, Ltd. | Glenora | James Crowe. | Kirkland Lake | 1101 Federal Bldg., Toronto. |
| *Gold Eagle Gold Mines, Ltd. | Gold Eagle | H. P. Dickey | McKenzie Island | 85 Richmond St. W., Toronto. |
| Gold Rex Kirkland Mines, Limited. | Gold Rex Kirkland | Orser & Cashman. | Kirkland Lake | 11 King St. W., Toronto. |
| Golden Arm Mines, Ltd. | Golden Arm | W. S. Hall. | Cole. | 701 National Bldg., Toronto. |
| *Golden Gate Mining Co., Ltd. | Golden Gate | S. A. Pain | Swastika. | 66 King St. W., Toronto. |
| Golden Summit Mines, Ltd. | Golden Summit | W. J. Simpson. | Sesekinika. | 2374 Bloor St. W., Toronto. |
| Gomak Mines, Ltd. | Gomak | R. D. Jones | Gogama | 320 Bay St., Toronto. |
| Gordon-Lebel Mines, Ltd. | Gordon-Lebel | H. M. Butterfield. | Kirkland Lake | 67 Yonge St., Toronto. |
| Grenfell Goldfields, Ltd. | Grenfell | Owen Bennett. | Goldthorpe | 276 St. James St. W., Montreal, Que. |
| Guy-Guibord Gold Mines, Ltd. | Guy-Guibord | | Matheson | 706 Concourse Bldg., Toronto. |
| Hallnor Mines, Ltd. | Hallnor | A. L. Sharp. | Pamour. | Pamour. |
| Hammell, J. E. | McIntyre Red Lake | H. L. Edwards. | Red Lake | 25 King St. W., Toronto. |
| *Hard Rock Gold Mines, Ltd. | Hard Rock | J. C. Dumbille. | Geraldton | 603 Royal Bank Bldg., Toronto. |
| †Hiawatha Gold Mines, Ltd. | Hiawatha | P. W. Meahan. | Oba. | Oba. |
| †Hislop Gold Mines, Ltd. | Hislop | | Matheson. | 357 Bay St., Toronto. |
| *Hollinger Consolidated Gold Mines, Ltd. | *Hollinger | | Timmins. | |
| Hollinger Consolidated Gold Mines, Ltd. (under option). | *Ross | John Knox. | Ramore. | 602 Royal Bank Bldg., Toronto. |
| *Howey Gold Mines, Ltd. | Lang. | | Pamour. | |
| *†Hudson-Patricia Gold Mines, Ltd. | Smith-Thorne | | Tionaga. | 833 Federal Bldg., Toronto. |
| †Hugh-Pam Porcupine Mines, Ltd. | Howey | R. E. Sullivan. | Red Lake. | 112 Yonge St., Toronto. |
| | Hudson-Patricia | | Woman Lake. | 51 King St. W., Toronto. |
| | Hugh-Pam | | South Porcupine. | |

†See also Young-Davidson Mines, Ltd.

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| Hutchineau Gold Mines, Ltd. | Hutchineau | J. J. Harris | Geraldton | 330 Bay St., Toronto. |
| Hutchinson Lake Gold Mines, Ltd. | Hutchinson Lake | W. W. Beaton | Geraldton | 200 Bay St., Toronto. |
| Ivan-Larder Mines, Ltd. | Ivan-Larder | William Joyce | Larder Lake | 100 Adelaide St. W., Toronto. |
| Jellicoe Consolidated Gold Mines, Ltd. | Jellicoe | M. A. Twidale | Geraldton | 1101 Federal Bldg., Toronto. |
| *J-M Consolidated Gold Mines, Ltd. | J-M Consolidated | W. W. Westaway | Jackson Manion | 1116 Federal Bldg., Toronto. |
| Jowsey Denton Gold Mines, Ltd. | Jowsey Denton | | Timmins | 372 Bay St., Toronto. |
| Kenbrae Gold Mines, Ltd. | Kenbrae | | Kenora | 11 King St. W., Toronto. |
| Kendou Porcupine Mines, Ltd. | Kendou | | Shillington | 706 Concourse Bldg., Toronto. |
| Kenecho Gold Mines, Ltd. | Kenecho | Chas. Young | Kenora | 372 Bay St., Toronto. |
| Kenland Gold Mines, Ltd. | Kenland | | Kenora | 36 Toronto St., Toronto. |
| Kenogamis Gold Mines, Ltd. | Kenogamis | | Geraldton | 357 Bay St., Toronto. |
| Kenricia Gold Mines, Ltd. | Kenricia | D. A. Duff | Kenora | 25 King St. W., Toronto. |
| Kerr-Addison Gold Mines, Ltd. | Kerr-Addison | W. S. Row | Larder Lake | 38 King St. W., Toronto. |
| *Kerry Gold Mines, Ltd. | Ardeen | | Kashabowie | 36 Toronto St., Toronto. |
| *Kirana Kirkland Gold Mines, Ltd. | Kirana | | Kirkland Lake | 1009 Royal Bank Bldg., Toronto. |
| Kirkking Mines, Ltd. | Kirkking | | King Kirkland | 902 Kent Bldg., Toronto. |
| Kirkland Consolidated Mines, Ltd. | Kirkland Consolidated | Donald E. Sircla | Kirkland Lake | 702 Excelsior Life Bldg., Toronto. |
| Kirkland Gold Rand, Ltd. | Kirkland Gold Rand | H. S. Gerson | Kirkland Lake | Kirkland Lake |
| Kirkland-Hudson Bay Gold Mines, Ltd. | Kirkland-Hudson Bay | | Kirkland Lake | New Liskeard |
| *Kirkland Lake Gold Mining Co., Ltd. | Kirkland Lake Gold | P. J. Harris | Kirkland Lake | 1314 Metropolitan Bldg., Toronto. |
| *Kirkroyale Gold Mines, Ltd. | Conroyal | | King Kirkland | 409 Kent Bldg., Toronto. |
| Kir-Vit Mines, Ltd. | Kir-Vit | J. W. Robertson | Larder Lake | 702 Excelsior Life Bldg., Toronto. |
| Korola-Larder Mines, Ltd. | Korola-Larder | D. E. Sirola | Larder Lake | Kirkland Lake |
| Lafayette Long Lac Gold Mines, Ltd. | Lafayette Long Lac | P. Schnob | Port Arthur | 200 Bay St., Toronto. |
| *Lake Caswell Mines, Ltd. | Lake Caswell | | Shuntingtree | 1465 Yonge St., Toronto. |
| Lake Head Gold Mines, Ltd. | Lake Head | W. W. Beaton | Port Arthur | 200 Bay St., Toronto. |
| Lake Rowan Gold Mines, Ltd. | Lake Rowan | H. Lefebvre | Golden Arm | 1178 Phillips Place, Montreal, Que. |
| *Lake Shore Mines, Ltd. | Lake Shore | E. W. Todd | Kirkland Lake | Kirkland Lake |
| Lakeside-Kirkland Gold Mines, Ltd. | Lakeside-Kirkland | E. B. Knapp | Kirkland Lake | 106 Dunker Bldg., Kitchener. |
| Lansdowne Minerals, Ltd. | Lansdowne Minerals | | Sioux Lookout | 702 Central Bldg., Toronto. |
| Lar-Add Mines, Ltd. | Lar-Add | Harry E. Koza | Larder Lake | 1003 Northern Ontario Bldg., Toronto. |
| Lardego Gold Mines, Ltd. | Lardego | Ralph V. Darling | Larder Lake | 80 Richmond St. W., Toronto. |
| *Lebel Oro Mines, Ltd. | Long Lake | R. P. Teare | Box 156, Sudbury | 320 Bay St., Toronto. |
| *Leitch Gold Mines, Ltd. | Leitch | W. S. Hamilton | Beardmore | 320 Bay St., Toronto. |
| *Little Long Lac Gold Mines, Ltd. | Little Long Lac | A. A. Barton | Little Long Lac | 25 King St. W., Toronto. |
| Lucky Kirkland Gold Mines, Ltd. | Lucky Kirkland | S. L. Macdonald | Swastika | 159 Bay St., Toronto. |
| Luxor Red Lake Mines, Ltd. | Luxor Red Lake | | Red Lake | 705 National Bldg., Toronto. |
| Macandrew Red Lake Gold Mines, Ltd. | Macandrew Red Lake | | Red Lake | 100 Adelaide St. W., Toronto. |
| *Macassa Mines, Ltd. | Macassa | G. A. Howes | Kirkland Lake | 85 Richmond St. W., Toronto. |
| *Mace Gold Mines, Ltd. | Inspiration | W. R. Adams | Schumacher | 15 King St. W., Toronto. |
| MacFarlane Long Lac Gold Mines, Ltd. | Vipond | W. MacFarlane | Longlac | 710 Excelsior Life Bldg., Toronto. |
| McInnis-Kirkland Gold Mines, Ltd. | McInnis-Kirkland | P. A. McKee | Kirkland Lake | 11 King St. W., Toronto. |
| McIntyre-Porcupine Mines, Ltd. | McIntyre-Porcupine | R. J. Ennis | Schumacher | 15 King St. W., Toronto. |
| *McKenzie Red Lake Gold Mines, Ltd. | McKenzie Red Lake | J. L. Ramsell | McKenzie Island | 347 Bay St., Toronto. |

| COMPANY | MINE | MANAGER | MINE ADDRESS | HEAD OFFICE ADDRESS |
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| GOLD—Continued | | | | |
| Mackey Point Gold Mines, Ltd. | Mackey Point | R. G. Smith | Wawa | 266 St. James St. W., Montreal, Que. |
| *McLaren-Porcupine Gold Mines, Ltd. | McLaren-Porcupine | J. M. McLaren | South Porcupine | South Porcupine |
| MacLeod-Cockshutt Gold Mines, Ltd. | MacLeod-Cockshutt | A. A. Barton | Little Long Lac | 357 Bay St., Toronto |
| *McMillan Gold Mines, Ltd. | McMillan | | Footbanks | Sudbury |
| Madsen Red Lake Gold Mines, Ltd. | Madsen Red Lake | E. G. Crayston | Red Lake | 811 Bank of Hamilton Bldg., Toronto |
| †Magnet Consolidated Mines (1936), Ltd. | Magnet Consolidated | Arthur Kendall | Geraldton | 347 Bay St., Toronto |
| †Manitoba and Eastern Mines, Ltd. | Manitoba & Eastern | | Timagami | 36 Toronto St., Toronto |
| Manor Gold Mines, Ltd. | Manor | E. S. MacCarthy | Boston Creek | 320 Bay St., Toronto |
| Margaret Red Lake Mines, Ltd. | Margaret Red Lake | W. W. Mills | McKenzie Island | 356 Aberdeen Ave., Hamilton |
| Marquette Long Lac Gold Mines, Ltd. | Marquette Long Lac | P. Schnob | Port Arthur | 200 Bay St., Toronto |
| †Martin-Bird Gold Mines, Ltd. | Martin-Bird | D. M. MacPhail | Larder Lake | 200 Bay St., Toronto |
| *Matachewan Consolidated Mines, Ltd. | Matachewan Consolidated | G. W. Mitchell | Matachewan | 25 King St. W., Toronto |
| Matona Gold Mines, Ltd. | Matona | A. H. Smith | Shiningtree | 171 Yonge St., Toronto |
| Mattson Patricia Mining Co., Ltd. | Mattson Patricia | | Narrow Lake | 333 Main St., Winnipeg, Man. |
| May-Spiers Gold Mines, Ltd. | May-Spiers | | Cole | 36 Toronto St., Toronto |
| Melba Gold Mines, Ltd. | Melba | H. Brassaw | Bourkes | Bourkes |
| *Mesabi Gold Mines, Ltd. | Mesabi | H. F. Knutson | Bourkes | 80 King St. W., Toronto |
| †Mid-Kirk Gold Mines, Ltd. | Mid-Kirk | | Kirkland Lake | 80 Victoria St., Toronto |
| Miles-Martin Kirkland Mines, Ltd. | Goodfish | W. F. Gowans | Kirkland Lake | 302 Sterling Tower, Toronto |
| Millmac Mines, Ltd. | Millmac | | Wawa | 612 Queen St. E., Sault Ste. Marie |
| *Minaura Mines, Ltd. | Telluride | | Englehart | 72 Queen St. W., Toronto |
| *Minto Gold Mines, Ltd. | Jubilee | John Knox, Jr. | Wawa | Wawa |
| Moffatt-Hall Mining Co., Ltd. | Moffatt-Hall | | Kirkland Lake | 357 Bay St., Toronto |
| Moneta Porcupine Mines, Ltd. | Moneta | J. D. Barrington | Timmins | 67 Yonge St., Toronto |
| *Morris Kirkland Gold Mines, Ltd. | Morris Kirkland | O. R. Wray | King Kirkland | 156 Yonge St., Toronto |
| Mosher Long Lac Gold Mines, Ltd. | Mosher Long Lac | I. E. Mosher | Geraldton | 320 Bay St., Toronto |
| Munro Croesus Mines, Ltd. | Munro Croesus | J. E. Grant | Matheson | Box 431, Haileybury |
| †Murray-Algonia Mining Co., Ltd. | Murray-Algonia | | Hawk Junction | 18 Lansdowne Ave., Sault Ste. Marie |
| †N. A. Timmins Corporation (under option) | Caquette claims | | Longlac | 1010 Canada Cement Bldg., Montreal, Que. |
| Naybob Gold Mines, Ltd. | Naybob | R. V. Neily | Timmins | 711 Federal Bldg., Toronto |
| *New Golden Rose Mines, Ltd. (under direction of Consolidated Mining and Smelting Co. of Canada, Ltd.) | New Golden Rose or Afton | W. E. Aitchison | Glen Afton | 302 Bay St., Toronto |
| †North Huron Gold Mines, Ltd. | Havilah or Ophir | | Havilah | 372 Bay St., Toronto |
| *Northern Empire Mines Co., Ltd. | Northern Empire | Arthur Kendall | Empire | 14 Wall St., New York, N.Y. |
| O'Hara, Neil, and associates (partly owned and partly under option) | Bowhill, Beggs, Ollman, O'Hara and Edwards | Neil O'Hara | Heron Bay | |

| †Old Diamond Gold Mines, Ltd. | Old Diamond | | | Madoc | |
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| *Olive Gold Mines, Ltd. | Olive | | | Mine Centre | 74 King St. E., Toronto. |
| *Omega Gold Mines, Ltd. | Omega | | A. D. Campbell | Larder Lake | 372 Bay St., Toronto. |
| Ontigo Gold Mines, Ltd. | Ontigo | | B. G. Edward | Sachigo River | Larder Lake. |
| †Oremond Gold Mines, Ltd. | Oremond | | | Jellicoe | 347 Bay St., Toronto. |
| Oriole Mines, Ltd. | Oriole | | | Larder Lake | 45 Richmond St. W., Toronto. |
| Orpit Mines, Ltd. | Orpit | | | Timmins | 67 Yonge St., Toronto. |
| *Pamour Porcupine Mines, Ltd. | Pamour | | R. M. Macaulay | Pamour | 804 Royal Bank Bldg., Toronto. |
| *†Parkhill Gold Mines (1937), Ltd. | Parkhill | | | Gold Park | 388 St. James St. W., Montreal, Que. |
| Paulore Gold Mines, Ltd. | Paulore | | N. R. Morrison | Red Lake | 357 Bay St., Toronto. |
| *Paymaster Consolidated Mines, Ltd. | Paymaster Consolidated | | Chas. E. Cook | South Porcupine | South Porcupine. |
| Pelangio-Larder Mines, Ltd. | Pelangio-Larder | | R. Cripps | Cheminis | Box 967, Kirkland Lake. |
| Pelican Long Lac Gold Mines, Ltd. | Pelican Long Lac | | James Crookston | Jellicoe | 25 King St. W., Toronto. |
| Peters, Carl F. (under lease) | Ashley | | Carl F. Peters | Matachewan | 54 Wellington St. W., Toronto. |
| Picairium Gold Mines, Ltd. | Picairium | | R. V. Darling | Sioux Lookout | 80 Richmond St. W., Toronto. |
| *Pickle Crow Gold Mines, Ltd. | Pickle Crow | | A. G. Hattie | Pickle Crow | 25 King St. W., Toronto. |
| Planet Gold Mines, Ltd. | Planet | | D. S. Baird | Boston Creek | 903 Atlas Bldg., Toronto. |
| *Porcupine Lake Gold Mining Co., Ltd. | Porcupine Lake | | J. G. Sipprell | Porcupine | 112 Yonge St., Toronto. |
| Porcupine Triumph Gold Mines, Ltd. | Porcupine Triumph | | J. A. Thomas | South Porcupine | 811 Kent Bldg., Toronto. |
| Preston East Dome Mines, Ltd. | Preston East Dome | | D. J. Ludgate | Red Lake | 706 Concourse Bldg., Toronto. |
| Rajah Red Lake Gold Mines, Ltd. | Rajah Red Lake | | | Ramore | 710 Excelsior Life Bldg., Toronto. |
| Ramore Gold Mining Co., Ltd. | Ramore | | P. Johnson | Larder Lake | 305 C.P.R. Bldg., Toronto. |
| *Raven River Mines, Ltd. | Raven River | | C. Rutherford | Golden Arm | 67 Yonge St., Toronto. |
| Red Crest Gold Mines, Ltd. | Red Crest | | T. L. Lynch | Red Lake | 1178 Phillips Place, Montreal, Que. |
| *Red Lake Gold Shore Mines, Ltd. | Red Lake Gold Shore | | W. P. Mackle | Red Lake | 350 Bay St., Toronto. |
| †Redwood Gold Mines, Ltd. | Redwood | | | Red Lake | 80 Richmond St. W., Toronto. |
| Regnery, Walter | Regnery | | Walter Regnery | Hawk Junction | |
| Richgreen Gold Mines, Ltd. | Richgreen | | W. A. Elliott | Beardmore | 36 Toronto St., Toronto. |
| Richmac Gold Mines (1936), Ltd. | Richmac | | James E. Boyle | Red Lake | 372 Bay St., Toronto. |
| Richard Ramore Gold Mines, Ltd. | Richard Ramore | | H. Hollands-Hurst | Iroquois Falls | 100 Adelaide St. W., Toronto. |
| †Roger Red Lake Gold Mines, Ltd. | Roger Red Lake | | | Red Lake | 302 Sterling Tower, Toronto. |
| Ronda Gold Mines, Ltd. | Ronda | | J. R. Hughes | Shiningtree | 85 Richmond St. W., Toronto. |
| †Rouge D'Or Mines, Ltd. | Rouge D'Or | | John Gaudaur | Red Lake | 244 Bay St., Toronto. |
| Rowan Red Lake Gold Mines, Ltd. | Rowan Red Lake | | | Cole | 507 Place d'Armes, Montreal, Que. |
| Sachigo River Exploration Co., Ltd. | Sachigo River | | B. G. Edward | Sachigo River, via Gods Lake, Man. | 25 King St. W., Toronto. |
| *St. Anthony Gold Mines, Ltd. | St. Anthony | | B. D. Elderkin | Savant Lake | 159 Bay St., Toronto. |
| *Sand River Gold Mining Co., Ltd. | Sand River | | G. B. Tribble | Beardmore | 302 Bay St., Toronto. |
| †Sanshaw Mines, Ltd. | Sanshaw | | | Red Lake | 330 Bay St., Toronto. |
| †Sante Fe Gold Mines, Ltd. | Foley | | | Mine Centre | 38 King St. W., Toronto. |
| †Sarnac Gold Mining Corporation | J. Bruce McMartin | | | Jellicoe | 513 Aldred Bldg., Montreal, Que. |
| †Savant Sturgeon Gold Mines, Ltd. | Savant Sturgeon | | | Savant Lake | 314 Metropolitan Bldg., Toronto. |
| *†Schreiber Pyramid Gold Mines, Ltd. | Schreiber Pyramid | | | Schreiber | 372 Bay St., Toronto. |
| Security Gold Mines, Ltd. | Security | | Herbert Niepage | Dane | Uxbridge. |
| Selby Lake Mines, Ltd. | Selby Lake | | C. A. Billings | Goldrock, via Wabigoon | 10 Adelaide St. E., Toronto. |

| COMPANY | MINE | MANAGER | MINE ADDRESS | HEAD OFFICE ADDRESS |
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| GOLD—Continued | | | | |
| *Shenango Gold Mines, Ltd. | Shenango | ... | Oba | 67 Yonge St., Toronto. |
| †Skookum Gold Mines, Ltd. | Skookum | ... | Red Lake | 244 Bay St., Toronto. |
| †Sol D'Or Gold Mines, Ltd. | Sol D'Or | ... | Narrow Lake | 140 Wellington St., Ottawa. |
| Spirit Lake Gold Mines, Ltd. | Spirit Lake | V. E. C. Odium | Spirit Lake | 357 Bay St., Toronto. |
| †Split Lake Gold Mines, Ltd. | Split Lake | ... | Kenora | 67 Yonge St., Toronto. |
| †Spoonier Gold Mines, Ltd. | Oliver-Severn | ... | Empire | 67 Yonge St., Toronto. |
| *†Stanley Gold Mines, Ltd. | Stanley | ... | Wawa | Geo. R. Bacon & Co., trustees, 1410 Stanley Bldg., Montreal, Que. |
| †Strathly Basin Mines, Ltd. | Strathly Basin | ... | Gogama | 712 Federal Bldg., Toronto. |
| Straw Lake Beach Gold Mines, Ltd. | Straw Lake Beach | J. D. Tolman | Emo | 36 Toronto St., Toronto. |
| *Sturgeon River Gold Mines, Ltd. | Sturgeon River | T. D. Anderson | Nezah | 320 Bay St., Toronto. |
| †Supreme Gold Mines, Ltd. | Supreme | ... | Savant Lake | 44 Victoria St., Toronto. |
| Swastika Kirkland Gold Mines, Ltd. | Swastika Kirkland | J. J. Bradley | Swastika | Box 554, Ottawa. |
| *†Sylvanite Gold Mines, Ltd. | Sylvanite | C. E. Rodgers | Kirkland Lake | 603 Royal Bank Bldg., Toronto. |
| †Tashota Goldfields, Ltd. | Tashota | ... | Tashota | Tashota. |
| *†Teck-Hughes Gold Mines, Ltd. | Teck-Hughes | ... | Kirkland Lake | Kirkland Lake. |
| Tellaurum Gold Mines, Ltd. | Tellaurum | J. G. McMillan | Jellicoe | New Liskeard. |
| †Temiskaming Mining Co., Ltd. | (Tisdale tp.) | ... | South Porcupine | 15 King St. W., Toronto. |
| †Thesaurus Gold Mines, Ltd. | Thesaurus | ... | Matatchewan | 1302 Canada Permanent Bldg., Toronto. |
| *†Toburn Gold Mines, Ltd. | Toburn | M. W. Hotchkin | Kirkland Lake | 1809 Royal Bank Bldg., Toronto. |
| Tombill Gold Mines, Ltd. | Tombill | Arthur Kendall | Empire | 908 Royal Bank Bldg., Toronto. |
| Toronto Harker Mines, Ltd. | Toronto Harker | Keith MacLuer | Matheson | 67 Yonge St., Toronto. |
| Treasure Island Gold Mines, Ltd. | Treasure Island | I. A. Gervais | Low Bush | 80 Richmond St. W., Toronto. |
| Tyrantite Mines, Ltd. | Tyrantite | W. J. Trestrail | Gowganda | Gowganda. |
| Uchi Gold Mines, Ltd. | Uchi | R. H. Sturgess | Uchi Lake, via Hudson | 25 King St. W., Toronto. |
| Upper Canada Mines, Ltd. | Upper Canada | C. W. Tully | Kirkland Lake | 80 Richmond St. W., Toronto. |
| Upper Seine Gold Mines, Ltd. | Upper Seine | W. N. McClintock | Atikokan | 156 Yonge St., Toronto. |
| Val D'Or Mineral Holdings, Ltd. | Starratt-Olsen | A. G. Hattie | Red Lake | 25 King St. W., Toronto. |
| Valloc Gold Mines, Ltd. | Valloc | Ford Edwards | Wabigoon | 80 Richmond St. W., Toronto. |
| Virgo Larder Mines, Ltd. | Virgo | ... | Tashota | 706 Concourse Bldg., Toronto. |
| †Wascanna Mines, Ltd. | Tash-Orn | ... | Kenora | 67 Yonge St., Toronto. |
| *†Wendigo Gold Mines, Ltd. | Wendigo | G. G. Campbell | Longlac | 80 King St. W., Toronto. |
| †West-Side Long Lac Mines, Ltd. | West-Side Long Lac | H. N. Cockburn | Red Lake | 372 Bay St., Toronto. |
| Wilson Red Lake Gold Mines, Ltd. | Wilson Red Lake | ... | c/o Starratt's Airways, Hudson | 1116 Federal Bldg., Toronto. |
| Woco Gold Developments, Ltd. | Woco | G. W. Moore | ... | 80 Richmond St. W., Toronto. |

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| †Wright, W. H. | Wright-Hargreaves Mines, Ltd. | Wright-Hargreaves. | W. H. Wright. | Barrie. | Fort Erie North. |
| *Wright-Hargreaves Mines, Ltd. | | | M. W. Summerhayes. | Kirkland Lake. | |
| Yama Gold Mines, Ltd. | Young-Davidson Mines, Ltd. (under agreement with Hollinger Consolidated Gold Mines, Ltd.) | Yama. | R. R. Coutts. | Boston Creek. | 171 Yonge St., Toronto. |
| *Young-Shannon Gold Mines, Ltd. | Ypres Cadillac Mines, Ltd. | Young-Davidson. | H. North. | Matatchewan. | Matatchewan. |
| | | Martin. | | Gogama. | 1 Toronto St., Toronto. |
| | | Ypres Cadillac. | Harold G. Way. | Boston Creek. | 171 Yonge St., Toronto. |
| IRON | | | | | |
| Algoma Ore Properties, Ltd. | | Helen. | A. A. Richardson. | Helen Mine. | Sault Ste. Marie, Ont. |
| M. A. Hanna Co. | | Moose Mountain. | | | Iron River, Mich. |
| Minaki Mining and Development Co., Ltd. | | Minaki. | C. F. Gray. | Minaki. | c/o Popham and Benedickson, Kenora. |
| LEAD AND ZINC | | | | | |
| Consolidated Lead Mines, Ltd. | | Victoria. | | | 21 King St. W., Toronto. |
| Katherine Lead Mines, Ltd. | | Katherine. | | | 80 King St. W., Toronto. |
| Lake Geneva Mining Co., Ltd. | | Lake Geneva. | | Benny. | 941 Dominion Sq. Bldg., Montreal, Que. |
| MOLYBDENITE | | | | | |
| Phoenix Molybdenite Corporation, Ltd. | | Phoenix. | | Ashdad. | 620 Federal Bldg., Toronto. |
| NICKEL AND COPPER | | | | | |
| Denison Nickel Mines, Ltd. | | Denison. | Carl R. Boehm. | Worthington. | 217 Bay St., Toronto. |
| Drury Nickel Mines, Ltd. | | Drury. | Ernest Craig. | Worthington. | 44 Victoria St., Toronto. |
| Falconbridge Nickel Mines, Ltd. | | Falconbridge. | B. F. Crandall. | Falconbridge. | 25 King St. W., Toronto. |
| | | Creighton. | F. J. Rager. | Creighton. | |
| | | Frood. | J. B. Fyfe. | Frood. | 25 King St. W., Toronto. |
| International Nickel Co. of Canada, Ltd. | | Garson. | C. H. Stewart. | Garson. | |
| | | Levack. | | Levack. | |
| Ontario Nickel Corp., Ltd. | | Cuniptau. | Geo. M. Lee. | Goward. | 38 King St. W., Toronto. |

| COMPANY | MINE | MANAGER | MINE ADDRESS | HEAD OFFICE ADDRESS |
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| RADIUM | | | | |
| Canada Radium Mines, Ltd. (idle) | Canada Radium | Frank Austin | Cheddar | 288 Bay St., Toronto. |
| SILVER AND COBALT | | | | |
| Agnico Mines Syndicate | Wettlaufer | P. E. Cain | Cobalt | Haileybury. |
| Cane Silver Mines, Ltd. | Cane | F. L. Hutchinson | Cobalt | New Liskeard. |
| Cobalt Properties, Ltd. | Cobalt Properties | Arthur Brocklebank. | Cobalt | Cobalt. |
| Cobalt Silver Syndicate | Red Jacket | Ambrose Murphy | Cobalt | Cobalt. |
| Comet Leasing Co. (under lease) | Kerr Lake | James H. Price | Cobalt | Kirkland Lake. |
| Dean, J. C. | Silver Bar | J. C. Dean | Cobalt | |
| Dillabough, S. P. | Badger | S. P. Dillabough | Cobalt | |
| Fauteaux R., and Dworski, A. | Silver Cliff | R. Fauteaux | Cobalt | |
| Harrison-Hibbert Mines, Ltd. | Harrison-Hibbert | Robt. C. Harrison | Cobalt | 35 Gough Ave., Toronto. |
| La Rose-Rouyn Mines, Ltd. | Lawson University | George McKeown | Cobalt | 112 Yonge St., Toronto. |
| Lebovitz, M. | Belorain | M. Lebovitz | Cobalt | |
| Legriz, J. V. | Lorrain Consolidated | J. V. Legris | Cobalt | |
| McCready, W. E. | Columbus | W. E. McCready | Cobalt | |
| McGarry, J., Craig, G. W., and McGarry, A. | McGarry (claim 1,206) | J. McGarry | Cobalt | |
| Mackay, F. M. (under lease) | Waldman-Wyandoah | | Cobalt | |
| Martin, George (under lease) | Crown Reserve | | Cobalt | |
| Miller, H. G., and Associates | Provincial | George Martin | Cobalt | |
| M. J. O'Brien, Ltd. | Canadian Lorrain | H. G. Miller | Silver Centre | Cobalt. |
| Morgenthaler, A. G. | O'Brien (Cross Lake) | H. G. Kennedy | Cobalt | 140 Wellington St., Ottawa. |
| Murphy, Ambrose, and Landry, C. A. | Miller Lake O'Brien | H. G. Kennedy | O'Brien | |
| Nerlip Mines, Ltd. | Beaver | Rory Stewart | Cobalt | 2108 S. Second St., Philadelphia, Pa. |
| Nipissing Mining Co., Ltd. | Adanac | Rory Stewart | Cobalt | |
| Plouffe, J. H. (under lease) | Coniagas | Ambrose Murphy | Cobalt | |
| Price, C. W. (under lease) | Trethewey | A. B. Pilliner | Cobalt | 46 Wolverton Ave., Toronto. |
| Rowe, Alfred, and Stuckey, Charles | Nerlip | Hugh Park | Cobalt | Excelsior Life Bldg., Toronto. |
| Russell, Presse, and McCready Syndicate (under lease) | Nipissing Claim 105 | J. H. Flouffe | Cobalt | |
| | Watts | C. W. Price | Cobalt | |
| | Foster | Charles Stuckey | Cobalt | |
| | Frontier | Albert Presse | Cobalt | |
| | Aganico | | Cobalt | |
| | Reuthel | | Cobalt | |

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| Sandoe, Richard, and Moyle, H. | Teniskaming | Richard Sandoe | Cobalt | 66 King St. W., Toronto. |
| Silver Valley Mines, Ltd. | Silver Valley | E. N. Tabah | Elk Lake | |
| Sirola, Donald E. (under lease) | Colonial | Donald E. Sirola | Cobalt | |
| Smith, J. A., MacPherson, G. A., and Giffin, L. G. | Pittsburgh-Lorrain or Curry | L. G. Giffin | Cobalt | 244 Bay St., Toronto. |
| Taylor, W. D. | Rochester | W. D. Taylor | Cobalt | |
| Thornham, J. T. (under lease) | Nipissing Lorrain | J. T. Thornham | Cobalt | 1 Toronto St., Toronto. |
| Windsor-Cobalt Silvers, Limited | Windsor-Cobalt | A. D. McArthur | Cobalt | 276 St. James St. W., Montreal, Que. |
| York Bousquet Gold Mines, Ltd. | Cobnor | S. S. W. Cole | N. Cobalt | |

METALLURGICAL WORKS

| OPERATOR | WORKS | MANAGER | ADDRESS |
|--|------------------------------|-----------------|-------------------|
| Algoma Steel Corporation, Ltd. | Iron blast furnace | Jas. H. Bell | Sault Ste. Marie. |
| Canadian Furnace, Ltd. | Iron blast furnace | D. J. Higgon | Port Colborne. |
| Canadian Industries, Ltd. | Acid and chemical plant | E. H. Jordan | Copper Cliff. |
| Deloro Smelting and Refining Co., Ltd. | Silver-cobalt refinery | S. B. Wright | Deloro. |
| Falconbridge Nickel Mines, Ltd. | Nickel-copper smelter | M. J. Tamplin | Falconbridge. |
| | Nickel-copper smelter | P. F. MacDonald | Copper Cliff. |
| International Nickel Co. of Canada, Ltd. | Nickel-copper smelter | P. F. MacDonald | Coniston. |
| | Nickel refinery | H. W. Walter | Port Colborne. |
| Ontario Refining Co., Ltd. | Electrolytic copper refinery | F. Benard | Copper Cliff. |
| Steel Company of Canada, Ltd. | Iron blast furnace | H. S. Hilton | Hamilton. |

NON-METALLICS

| COMPANY | LOCATION | MANAGER | ADDRESS |
|--|------------------------------------|--------------|---|
| ACTINOLITE | | | |
| Actinolite Mining Co. | Kaladar, Elzevir tp., Hastings co. | | c/o A. P. Park, 1529 McGregor St., Montreal, Que. |
| ARSENIC | | | |
| Deloro Smelting and Refining Co., Ltd. | Deloro | S. B. Wright | 600 Victoria Bldg., Ottawa. |

| COMPANY | LOCATION | MANAGER | ADDRESS |
|---|--|-------------------|--|
| ASBESTOS | | | |
| Rahn Lake Mines Corp., Ltd. | Matatchewan | G. C. Rahn | 8½ Main St. W., North Bay. |
| BARITE | | | |
| Barytes Products, Ltd. | Lot 20, con. X, N. Burgess tp., Lanark co. (idle in 1937). | | c/o H. Perras, 4 Notre Dame St. W., Montreal, Que. |
| Glendinning, H. | Yarrow tp., Timiskaming dist. (idle in 1937). | | Dr. H. Glendinning, 387 Bloor St. E., Toronto. |
| BERYL | | | |
| Canadian Beryllium Mines and Alloys, Ltd. | Quadeville, Renfrew co. | D. Hein | 901 Royal Bank Building, Toronto. |
| DIATOMITE | | | |
| Canadian Multi-Cell, Ltd. | Martin's Siding | K. S. Rankin | Harbour Commission Bldg., Toronto. |
| Muskoka Diatomite, Ltd. | Cravenhurst | H. P. H. Brummell | 45 Richmond St. W., Toronto. |
| FELDSPAR | | | |
| Barr, W. J. | N. ½ lot 24, con. XVI, Fraser tp., Renfrew co. | W. J. Barr | Westmeath. |
| Bathurst Feldspar Mines, Ltd. | Bathurst tp., Lanark co. | T. H. Craig | 21 King St. E., Toronto. |
| Cameron, Wallace B. | S. ½ lot 15, con. V, Murchison tp., Nipissing dist. | | Madawaska. |
| Charette and Son, S. | Lot 1, con. III, Burwash tp., Sudbury dist. | S. Charette | Estaire P.O. |
| Craig, T. H. | W. ½ lot 12, con. IX, Bathurst tp., Lanark co. | T. H. Craig | 16 Victoria St., Perth. |
| Frontenac Floor and Wall Tile Co., Ltd. | Grinding plant, Kingston | | Box 178, Kingston. |
| Gunter, Judson A. | Sabine tp., Nipissing dist. | J. A. Gunter | Princes Lake. |
| Prince and Prince | Sabine tp., Nipissing dist. | A. M. Prince | Princes Lake. |
| Renfrew Minerals, Ltd. | Quadeville | | 901 Royal Bank Bldg., Toronto. |

FLUORSPAR

| | | | |
|--------------------------|--|-----------------------|--------|
| Stoklosar, Chas. A. | W. ½ lot 3, con. I, Madoc tp., Hastings co. | C. A. Stoklosar. | Madoc. |
|--------------------------|--|-----------------------|--------|

GRAPHITE

| | | | |
|--------------------------------------|--------------------------------|---------------------|------------|
| Black Donald Graphite Co., Ltd. | Brougham tp., Renfrew co. | W. B. Bunting. | Calabogie. |
|--------------------------------------|--------------------------------|---------------------|------------|

GYPSUM

| | | | |
|--|-------------------|----------------------|--------------|
| Canadian Gypsum Co., Ltd. | Hagersville. | W. E. Allen. | Hagersville. |
| Gypsum, Lime and Alabastine, Canada, Ltd. | Caledonia. | L. V. Robinson. | Caledonia. |

IRON PYRITES AND SULPHURIC ACID

| | | | |
|--------------------------------|-------------------------------------|-------|---------------------------------------|
| Canadian Industries, Ltd. | Acid plants, Copper Cliff. .... | ..... | Copper Cliff. |
| Canadian Pyrites, Ltd. | Flower Station (idle in 1937). .... | ..... | 1400 Guardian Bldg., Cleveland, Ohio. |

MICA

| | | | |
|--|---|----------------------|-------------------------|
| Bennett, H. V. .... | ..... | H. V. Bennett. | 6 Church St., Perth. |
| Haughian, Frank. | Lot 13, con. V, Bathurst tp., Lanark co. | Frank Haughian. | Perth. |
| Kent Bros. (buyers) .... | ..... | W. C. Kent. | 114 Gore St., Kingston. |
| Lee, W. W. | Buck lake; Bob's lake. | W. W. Lee. | Bedford Mills. |
| Loughborough Mining Co., Ltd. .... | ..... | ..... | Sydenham. |
| Thirty Island Lake Mica Co., Ltd. | Frontenac and Lanark counties. | S. H. Orser. | Verona. |

MINERAL WATERS

| | | | |
|---------------------------------|-------------------------|-----------------------|---------------------------------|
| Boyd, T. Russell. | Carlsbad Springs. | T. Russell Boyd. | Carlsbad Springs. |
| Charles Gurd and Co., Ltd. | Caledonia Springs. .... | ..... | 1016 Bleury St., Montreal, Que. |

NEPHELINE SYENITE

| | | | |
|-------------------------------|---|---------------|----------------------------------|
| Canadian Nepheline, Ltd. | Lot 14, con. IX, Methuen tp., Peterborough co. | M. Kidd. | Canada Permanent Bldg., Toronto. |
|-------------------------------|---|---------------|----------------------------------|

| COMPANY | LOCATION | MANAGER | ADDRESS |
|--|--|--------------------|---|
| PEAT | | | |
| Coronation Peat Co. | Con. IX, E. Luther tp., Dufferin co. | G. Wagler. | Lynwood. |
| Countryman, Gordon. | Lot 22, con. IX, Winchester tp., Dundas co. | G. Countryman. | Chesterville. |
| Hillsgreen Peat Works. | Lot 15, con. X, Hay tp., Huron co. | C. A. Robinson. | R.R. 1, Zurich. |
| Hodgkins and Son, H. L. | Con. IV, Wainfleet tp., Welland co. | H. L. Hodgkins. | R.R. 2, St. Ann's. |
| Industrial Compounds, Ltd. | Lots 19-21, con. IV, E. Luther tp., Dufferin co. | P. F. Stibbard. | 215 Crown Bldg., Toronto. |
| Leasa, Wm. | Lot 11, con. X, Ellice tp., Perth co. | Wm. Leasa. | Milverton. |
| McIntosh, G. A. | Lot 15, con. XI, N. Dumfries tp., Waterloo co. | G. A. McIntosh. | 40 Glasgow St., Guelph. |
| Northern Peat Co. | Lot 8, con. III, Mountjoy tp., Cochrane dist. | W. B. Brewer. | Timmins. |
| Runke and Sons, Geo. | Lot 55, German tract, Waterloo tp., Waterloo co. | Geo. Runke. | 115 Cameron St. N., Kitchener. |
| QUARTZ, QUARTZITE, AND SILICA BRICK | | | |
| Algoma Steel Corporation, Ltd. | Silica brick (quartz from Deroche tp.) | S. B. Wright. | Sault Ste. Marie. |
| Deloro Smelting and Refining Co., Ltd. | Deloro. | G. Willey. | 600 Victoria Bldg., Ottawa. |
| Dominion Mines and Quarries, Ltd. | Killarney. | E. Craig. | Canada Life Bldg., Toronto. |
| Falconbridge Nickel Mines, Ltd. | Falconbridge. | D. MacAskill. | Falconbridge. |
| International Nickel Co. of Canada, Ltd. | Carson tp., Sudbury dist. | G. S. Cowie. | Copper Cliff. |
| Wright and Co. | Deroche tp., Algoma dist. | | 960 Queen St., Sault Ste. Marie. |
| SALT | | | |
| Brunner Mond, Canada, Ltd. | Anderdon tp., Essex co. | C. K. MacFetridge. | Canadian Bank of Commerce Bldg., Toronto. |
| Canadian Industries, Ltd. | Sandwich. | | Box 1260, Montreal, Que. |
| Dominion Salt Co., Ltd. | Sarnia. | G. N. Dowker. | Sarnia. |
| Goderich Salt Co., Ltd. | Goderich. | B. S. Macdonald. | Goderich. |
| Walker Salt Corporation, Ltd. | Port Franks. | | Port Franks. |
| Warwick Pure Salt Co. | Warwick tp., Lambton co. | | R.R. 5, Watford. |
| Western Canada Flour Mills Co., Ltd. | Goderich. | | 287 MacPherson Ave., Toronto. |

TALC

| | | | |
|---------------------------------|---|----------------|--------|
| Canada Talc, Ltd..... | Con. XIV, Huntingdon tp., Hastings co.. | R. Taylor..... | Madoc. |
| Geo. H. Gillespie Co., Ltd..... | Huntingdon tp., Hastings co..... | ..... | Madoc. |

STRUCTURAL MATERIALS

| COMPANY | LOCATION | MANAGER | ADDRESS |
|--------------------------------|--------------------|---------------------|--|
| CEMENT | | | |
| Canada Cement Co., Ltd..... | Belleville..... | J. H. Legate..... | Canada Cement Bldg., Montreal, Que. 357 Bay St., Toronto. |
| St. Marys Cement Co., Ltd..... | Port Colborne..... | L. M. McDonald..... | |
| | Perth co..... | John G. Lind..... | |

LIME

| | | | |
|---|---|------------------------|---|
| Bell, Harry..... | N. ½ lot 23, con. XII, Sullivan tp., Grey co. | ..... | R.R. 4, Chesley. |
| Biederman, Albert G..... | Wilberforce tp., Renfrew co..... | ..... | R.R. 1, Golden Lake. |
| Brown's Lime Works..... | Owen Sound..... | Wm. Brown..... | 4th St. and 9th Ave., Owen Sound. |
| Brunner Mond, Canada, Ltd..... | Anderdon tp., Essex co..... | C. K. MacPetridge..... | Canadian Bank of Commerce Bldg., Toronto. |
| Cameron, W. M..... | Ramsay tp., Lanark co..... | ..... | Carleton Place. |
| Canada and Dominion Sugar Co., Ltd..... | Chatham..... | ..... | Chatham. |
| Canada Lime Company..... | Wallaceburg..... | ..... | Coboconk. |
| Canadian Gypsum Co., Ltd..... | Somerville tp., Victoria co..... | C. M. Petrie..... | 1221 Bay St., Toronto. |
| Chalmers Lime Works..... | McNab tp., Renfrew co..... | B. S. Barns..... | 689 7th St. W., Owen Sound |
| Dominion Rock Products, Ltd..... | Guelph..... | W. C. Moore..... | 941 Dominion Square Bldg., Montreal, Que. |
| Electro Metallurgical Co. of Canada, Ltd..... | Owen Sound..... | ..... | Canada Life Bldg., Toronto. |
| Gypsum, Lime and Alabastine, Canada, Ltd..... | Eganville..... | ..... | Paris. |
| Innerkip Lime and Stone Co., Ltd..... | Welland..... | C. E. Downing..... | Beachville. |
| | Beachville..... | ..... |  |
| | Hespeler..... | ..... |  |
| | Milton..... | ..... |  |
| | Beachville..... | ..... |  |

| COMPANY | LOCATION | MANAGER | ADDRESS |
|-------------------------------------|--|-------------------|---|
| LIME—Continued | | | |
| Jamieson Lime Co. | Renfrew | J. A. Jamieson | Renfrew. |
| North American Cyanamid Ltd. | Beachville | | Royal Bank Bldg., Toronto. |
| Rockwood Lime Co. | Eramosa tp., Wellington co. | | Rockwood. |
| Shane Lime and Charcoal Co., Ltd. | Fourth Chute | | Eganville. |
| STONE (GRANITE AND TRAP) | | | |
| Building Products, Ltd. | Verona and Mountain Grove | A. de Wolfe | Box 2529, Montreal, Que. |
| Canadian Dredge and Dock Co., Ltd. | Thunder Bay area | | Midland |
| Canadian Nepheline, Ltd. | Lot 14, con. IX, Methuen tp., Peterborough co. | M. Kidd | Canada Permanent Bldg., Toronto. |
| City of Fort William Corporation | Fort William | City Engineer | City Hall, Fort William. |
| Grenville Crushed Rock Co., Ltd. | Hawk Lake | W. H. Roberts | 917 Keefer Bldg., Montreal, Que. |
| Gunnerson, A. | Butler | | Butler. |
| Hewitson Construction Co., Ltd. | McIntyre tp., Thunder Bay dist. | | Walsh Block, Port Arthur. |
| Hydro-Electric Power Commission | Mann tp., Cochrane dist., and Patricia portion of Kenora dist. | D. Forgan | 620 University Ave., Toronto. |
| Mill Lake Stone Quarry | McDougall tp., Parry Sound dist. | J. B. Hall | Parry Sound |
| Ontario Rock Co., Ltd. | Con. IV and VI, Belmont and Methuen tps., Peterborough co. | H. L. Scott | 320 Bay St., Toronto. |
| Wm. Horne Granite Quarries | Butler | Wm. Horne | Butler, via Ignace. |
| STONE (LIMESTONE AND MARBLE) | | | |
| A. E. Jupp Construction Co., Ltd. | Campbellford | J. R. Bell | 170 Berkeley St., Toronto. |
| American Marble Co., Ltd. | Faraday tp., Hastings co. | E. A. Leury | 171 Yonge St., Toronto. |
| Bolender Bros. (White Star Mines) | Cardiff tp., Haliburton co. | P. H. Bolender | Haliburton. |
| Bonter Marble and Calcium Co., Ltd. | Dysart tp., Haliburton co. | | Marmora. |
| Bourgie, J. B. | Marmora tp., Hastings co. | | Embrun. |
| Brunner Mond, Canada, Ltd. | Con. VIII, Russell tp., Russell co. | C. K. MacFetridge | Canadian Bank of Commerce Bldg., Toronto. |
| Canada Cement Co., Ltd. | Anderdon tp., Essex co. | | Canada Cement Bldg., Montreal. |
| | Thurlow tp., Hastings co. | | |

| | | | |
|---|--|----------------------|--|
| Canada Crushed Stone Corporation, Ltd. | Dundas. | R. W. Cunningham. | Sun Life Bldg., Hamilton. |
| Code, W. H. | Hagersville. | G. Gilbertson. | Smith's Falls. |
| Coldwater Crushed Stone, Ltd. | Oso tp., Frontenac co. | R. Theodore. | Coldwater. |
| Connolly Marble Mosaic and Tile Co., Ltd. | Medonte tp., Simcoe co. | S. Gascho. | 316 Dupont St., Toronto. |
| Cook, J. S. | Amabel tp., Bruce co. | J. P. Howe. | Warton. |
| Corporation Town of Pembroke. | Pembroke. | | Pembroke. |
| Decewville Crushed Stone Co., Ltd. | Decewville. | | 52 Elgin St., Hamilton. |
| Edgar Irvine Co., Ltd., The. | Near Alexandria, Glengarry co. | | Alexandria. |
| Gypsum, Lime and Alabastine, Canada, Ltd. | Beachville. | T. F. Robinson. | |
| Hagersville Quarries, Ltd. | Hespeler. | J. J. Power. | Paris. |
| Haldimand Quarries and Construction, Ltd. | Milton. | R. S. Adams. | Hagersville. |
| Harvey, Harold. | Hagersville. | J. S. Beck. | Hagersville. |
| | Vernon, Howe island, Alexandria, Actino- | C. F. Anderson. | 56 Kensington Ave., Kingston. |
| | lite. | D. Dewar. | |
| Henniger, M. G. | N. Elmsley tp., Lanark co. | C. F. Henniger. | Jason Island, Smith's Falls. |
| Innerkip Quarries, Ltd. | E. Zorra tp., Oxford co. | J. A. Jamieson. | Fleet and Bathurst Sts., Toronto. |
| Jameson Lime Co. | Renfrew. | J. A. Jamieson. | Renfrew. |
| Kehoe, T. J. | Brechin. | S. Donaldson. | Brechin. |
| Kingston Penitentiary. | Portsmouth. | J. Barker. | Box 22, Kingston. |
| Kirkfield Crushed Stone, Ltd. | Kirkfield. | K. W. Peacock. | Fleet and Bathurst Sts., Toronto. |
| Lapierre, M. C. | Owen Sound. | R. M. Craig. | 1994 Ninth Ave., Owen Sound. |
| Limestone Products, Ltd. | Con. V, Orillia tp., Simcoe co. | T. A. McGinnis. | 1104 Hermant Bldg., Toronto. |
| Longford Quarries, Ltd. | Longford Mills. | A. J. Kennedy. | Sun Life Bldg., Hamilton. |
| McGinnis and O'Connor. | Collins Bay, Frontenac co. | Superintendent, Ont. | 412 King St., Kingston. |
| Noranda Mines, Ltd. | Haileybury. | Reformatory, Guelph | 804 Royal Bank Bldg., Toronto. |
| North American Cyanamid, Ltd. | Beachville. | John Pirson. | Royal Bank Bldg., Toronto. |
| Ontario Reformatory. | Guelph. | A. Michie. | Deputy Provincial Secretary, Parliament Bldgs., Toronto. |
| Pirson, John. | Hydro dump, Stamford tp., Welland co. | C. R. McInnes. | Stevensville. |
| Queenston Quarries, Ltd. | St. David's. | A. J. Prince. | 76 Sun Life Bldg., Toronto. |
| Rayner Construction, Ltd. | Coboconk. | R. J. Foster. | 29 Commercial St., Leaside. |
| Routley Construction Co., Ltd. | Rawdon tp., Hastings co. | Carl Burd. | 21 Dundas Sq., Toronto. |
| R. R. Foster and Sons, Ltd. | Portland tp., Frontenac co. | G. Walker. | 86 Spadina Ave., Ottawa. |
| Silvertone Black Marble Quarries, Ltd. | Merivale Rd., Nepean tp., Carleton co. | John Wehman. | 305 O'Connor St., Ottawa. |
| Stockloser, Karl. | Finch tp., Stormont co. | R. E. Law. | Madoc. |
| T. Sidney Kirby Co., Ltd., The. | Eldorado. | | 215 Sussex St., Ottawa. |
| Walker Bros. | Junction Gore. | | Thorold. |
| Wehman, John. | Stamford tp., Welland co. | | 23 Plum St., Kingston. |
| Welland Canals, Department of Transport. | Kingston tp., Frontenac co. | | St. Catharines. |
| Windmill Point Crushed Stone Co., Ltd. | Welland Canal. | | 225 Sterling Rd., Toronto. |
| | Port Colborne. | | |

| COMPANY | LOCATION | MANAGER | ADDRESS |
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| STONE (SANDSTONE) | | | |
| Campbell Sandstone Quarries, Ltd. Corner, Austin. Mountain Sandstone Quarry Norton, A. W. Sykes, Thomas. Terra Cotta Quarries. | Nepean tp., Carleton co. Caledon tp., Peel co. Esquesing tp., Halton co. Esquesing tp., Halton co. Glen Williams. Glen Williams. | A. Campbell. H. Logan. W. Sutcliffe. | 143 Main St., Westboro. Inglewood. Box 307, Georgetown. Limestone. Yonge St., Georgetown. Glen Williams. |
| STONE (SLATE) | | | |
| Canadian Slate Products, Ltd. Crespey Slate Products, Ltd. | Madoc. Madoc. | S. E. Sill. Arthur Andrews. | 11 King St. W., Toronto. Madoc. |
| SAND-LIME BRICK | | | |
| Hinde Bros. Toronto Brick Co., Ltd. York Sandstone Brick Co. Ltd. | Mount Dennis. Toronto. Toronto. | | 134 Northland Ave., Mount Dennis. 897 Bay St., Toronto. 447 Victoria Park Ave., Toronto. |
| SAND AND GRAVEL (LICENSED DREDGING OPERATORS) | | | |
| Canadian Dredge and Dock Co., Ltd. Cowley, Mrs. K. Hadley's Chatham, Ltd. J. P. Porter and Sons, Ltd. McLean and Sons, A. B. McNamara Construction Co., Ltd. National Sand and Material Co., Ltd. Pyke Salvage Co. Scott, Thos. J. Sterling Gravel and Supplies, Ltd. Tees Transit Co. United Towing and Salvage Co., Ltd. ¹ | Lake Superior. Thames river. Thames river. Lake Ontario. Lake Superior. Lake Simcoe. Lake Erie. St. Lawrence river. Lake Superior. Lake Erie. Niagara bar. Lake Superior. | | Midland. Chatham. 47 Wellington St., Chatham. 936 Dominion Square Bldg., Montreal, Que. Brock St., Sault Ste. Marie. 12 Industrial St., Leaside. 402 Harbour Bldg., Toronto. 506 Princess St., Kingston. 66 March St., Sault Ste. Marie. 2494 Sandwich St. E., Windsor. 16 New St., Hamilton. 635 Common St., Montreal, Que. |

¹Formerly Sincenne-McNaughton Tugs, Ltd.

SAND AND GRAVEL² (PIT OPERATIONS)

| | | |
|---|---|-----------------------------------|
| A. E. Jupp Construction Co., Ltd. | Mara tp., Ontario co. | 170 Berkeley St., Toronto. |
| Canadian Aggregates, Ltd. | Burford tp., Brant co. | 1968 Wyandotte St., Brantford. |
| Consolidated Sand and Gravel, Ltd. | Paris. | 402 Harbour Bldg., Toronto. |
| Waterford Sand and Gravel Co., Ltd. | Waterford. | |
| Curran and Briggs, Ltd. | Echo Bay, Dunsford, Bobcaygeon, Haliburton, Brockville. | 203 Manning Chambers, Toronto. |
| Dominion Concrete Co., Ltd. | Oxford and Augusta tps., Grenville co. | Prescott St., Kempville. |
| Donald, Andrew. | Dereham tp., Oxford co. | R.R. 1, Ingersoll. |
| Grandmaitre, D. | Rockcliffe village. | 19 Olmstead St., Ottawa. |
| Hinde Bros. | Mount Dennis. | 134 Northland Ave., Mount Dennis. |
| Hollinger Consol. Gold Mines, Ltd. | Tisdale tp., Cochrane dist. | Timmins. |
| Howard Sand and Gravel Co., Ltd. | E. Flamborough tp., Wentworth co. | Aldershot. |
| Hydro-Electric Power Commission of Ontario. | Mann tp., Cochrane dist.; Bain tp., Thunder Bay dist. | 620 University Ave., Toronto. |
| Rayner Construction, Ltd. | Powassan, Bracebridge, Geraldton. | 29 Commercial St., Leaside. |
| R. R. Foster and Sons, Ltd. | Nepean and Gloucester tps., Carleton co. | 86 Spadina Ave., Ottawa. |
| Spratt, J. H. | Gloucester tp., Carleton co. | Billing's Bridge. |
| | E. Wawanosh tp., Huron co. | |
| Towland Construction Co., Ltd. | Saugeen tp., Bruce co. | 294 Dundas St., London. |
| | London tp., Middlesex co. | |
| Wm. R. Barnes Co., Ltd. | Spring Vale, Watford, Brantford. | 243 Cumberland Ave., Hamilton. |
| Woollatt Fuel and Supply Co., Ltd. | Essex co. | 109 Ottawa St., Walkerville. |
| Yundt, William. | Ellice tp., Perth co. | 187 Cobourg St., Stratford. |

²Only owners producing 5,000 tons or over are listed.

CLAY PRODUCTS

| | | |
|----------------------------------|--|-------------------------------|
| Belle River Brick and Tile Co. | Lot 3, con. I, Rochester tp., Essex co. | Belle River. |
| Brampton Pressed Brick Co., Ltd. | Lot 9, Chinguacousy tp., Peel co. | Brampton. |
| Broadwell and Son, B. | Lot 12, con. IV, Gosfield S. tp., Essex co. | Kingsville. |
| Canadian Pressed Brick Co., Ltd. | Hamilton. | Kenilworth Ave. S., Hamilton. |
| Casemore and Son, R. | Keppel tp., Grey co. | Shallow Lake. |
| Chapman Bros. | Lot 2, con. II, East York tp., York co. | 145 Dawes Road, Toronto. |
| Construction Materials, Ltd. | Horner Ave., Etobicoke. | New Toronto. |
| Cooksville Co., Ltd. | Cooksville. | 46 Bloor St. W., Toronto. |
| Coults and Son, Geo. | Lot 21, con. III, Bosanquet tp., Lambton co. | Thedford. |
| Curtin, Frank, Estate of. | Lot 15, con. V, Ops tp., Victoria co. | R.R. 4, Lindsay. |
| Curtis Bros. | Lot 32, con. XII, Otonabee tp., Peterborough co. | Box 809, Peterborough. |
| Deller and Son, Albert. | Brownsville. | Brownsville. |
| | | Albert Deller. |

| COMPANY | LOCATION | MANAGER | ADDRESS |
|--|---|------------------|--|
| CLAY PRODUCTS—Continued | | | |
| Deller, Wm. H. | Lot 5, con. V, W. Nissouri tp., Middlesex co. | | Thorndale. |
| Deller Bros. | Lots 11, 12, con. III, N. Norwich tp., Oxford co. | Alfred Deller. | R.R. 2, Norwich. |
| Dochart Brick, Tile and Terra Cotta Works. | Arnprior. | Geo. E. Baker. | Arnprior. |
| Donaldson, T. G. | Lot 19, con. XIV, Culross tp., Bruce co. | | R.R. 1, Greenock. |
| Douglas, John R. | Lot 14, con. XII, Sombra tp., Lambton co. | J. R. Douglas. | Wilkesport. |
| Dover Brick and Tile Works. | Con. IX, Baldwin Rd., Dover tp., Kent co. | J. MacHardy. | 20 7th St., Chatham. |
| Elliott, Chas. | Lot 23, con. I, Turnberry tp., Huron co. | | Bluevale. |
| Elliott, James, Jr. | Korah tp., Algoma dist. | | 519 Wellington St. W., Sault Ste. Marie. |
| Elliott, Wm. | Lot 11, con. I, Culross tp., Bruce co. | | Glenannan. |
| Fletcher Brick and Tile. | Lot 1, con. VIII, Tilbury E. tp., Kent co. | T. H. Armstrong. | Fletcher. |
| Fort William Brick Co. | Fort William. | H. M. Piper. | 509 Victoria Ave., Fort William. |
| Foster Pottery Co. | Hamilton. | S. Foster. | Main St. W., Hamilton. |
| Fred W. Howlett and Sons, Ltd. | King St., Petrolia. | | Box 3, Petrolia. |
| Frid Brothers, Ltd. | Hamilton. | A. Frid. | Main W. & Machlin Sts., Hamilton. |
| Gomoll Brick and Tile Works. | Lot 15, con. X, S. Himsworth tp., Parry Sound dist. | | Powassan. |
| Grimsby Brick and Tile Co. | Lot 23, Clinton tp., Lincoln co. | R. Crawford. | Main St., Grimsby. |
| Hamilton Pressed Brick Co., Ltd. | Wentworth co. | | 211 Kensington Ave. S., Hamilton. |
| Harper Brick Works. | Greenwood Ave., Toronto. | | 348 Greenwood Ave., Toronto. |
| Hill, Aaron. | Essex co. | | Essex. |
| Hill, Albert W. | Lot 15, con. XIII, Tilbury E. tp., Kent co. | | R.R. 1, Coatsworth. |
| Hitch, D. A. | Ridgetown. | | Erie St. N., Ridgetown. |
| Hitch, Thos. | First Ave., St. Thomas. | | First Ave., St. Thomas. |
| Hodder and Sons, Mrs. J. H. | Lot 9, con. A, Dunwich tp., Elgin co. | | Dutton. |
| Huntsville Brick Works. | Lot 8, con. I, Chaffey tp., Muskoka dist. | C. H. Stevens. | Box 308, Huntsville. |
| Interprovincial Brick Co., Ltd. | Lots 1-46, Nassagaweya tp., Halton co. | W. E. Secker. | 46 Bloor St. W., Toronto. |
| Jackson Brick and Tile Yard. | Chinguacousy tp., Peel co. | W. Jackson. | 290 Rawdon St., Brantford. |
| Jameson Lime Co. | Brantford. | J. A. Jamieson. | Renfrew. |
| Janes, D. A. | Renfrew. | | Mount Brydges. |
| Jasperson Brick and Tile Co. | No. 2 Highway, Middlesex co. | | Kingsville. |
| Jervis, W. J. | Coatsworth. | | R.R. 3, Dorchester. |
| | Lot 13, con. B, N. Dorchester tp., Middlesex co. | | |
| Johnson, James, Estate of. | Stafford tp., Renfrew co. | L. G. Fraser. | Pembroke. |
| Koebel Bros. | Lot 7, con. II, Wellesley tp., Waterloo co. | C. Koebel. | Box 3, St. Clements. |
| Lindsay and Sons, Earl. | Lot 24, con. II, Chatham gore, Kent co. | G. C. Lindsay. | R.R. 2, Wallaceburg. |
| London Pottery Manufacturing Co. | Westminster tp., Middlesex co. | A. W. Ferguson. | 95 Rectory St., London. |

| | | | |
|--|--|------------------|--|
| McComb, Chester | Lot 17, con. XVI, London tp., Middlesex co. | | R.R. 2, London. |
| McCormick, Thomas L. | Lot 7, con. IV, Warwick tp., Lambton co. | | R.R. 5, Watford. |
| Milton Brick, Ltd. | Milton | | 1158 Bay St., Toronto. |
| Moulton, J. | Lot 32, con. IV, Greenock tp., Bruce co. | | R.R. 2, Holyrood. |
| Napanee Brick and Tile Works | Lot 13, con. VI, N. Fredericksburgh tp., Lennox and Addington co. | R. L. Chapman | R.R. 3, Napanee. |
| National Fire Proofing Co. of Canada, Ltd. | E. Flamborough tp., Wentworth co. | | 96 Bloor St. W., Toronto. |
| | Swansea | | |
| | Hamilton | | |
| National Sewer Pipe Co., Ltd. | Aldershot | R. H. New | Aldershot. |
| | Lots 1, 2, 4, con. I, and lots 1, 2, 3, con. II, E. Flamborough tp., Wentworth co. | | |
| New Liskeard Brick Works | New Liskeard | D. Dunn | Box 74, New Liskeard. |
| Ontario Brick and Tile Plant | Near Mimico | Thos. Gourlay | Dept. Prov. Secretary, Reformatories and Prisons Branch, Parliament Bldgs., Toronto. |
| O'Reilly, T. E. | Prescott highway, Nepean tp., Carleton co. | T. E. O'Reilly | 320 Bay St., Ottawa. |
| Ott Brick and Tile Mfg. Co., Ltd. | Kitchener | | 16 St. Andrew St., Kitchener. |
| Ottawa Brick and Terra Cotta Co., Ltd. | Billing's Bridge | | Billing's Bridge. |
| Owen Sound Brick Co., Ltd. | Sixth St. E., Owen Sound | | 928 Second Ave., Owen Sound. |
| Paxton, Fred R. | 70 Herrick St., St. Catharines | | 70 Herrick St., St. Catharines. |
| Phinn, Geo. A. | Westminster and London tps., Middlesex co. | | St. James Park P.O., London. |
| Phippen and Son | Dawes Road, E. York tp., York co. | H. W. Phippen | Dawes Road, East York. |
| Richardson and Son, J. | Kerwood | J. F. Richardson | Kerwood. |
| Rollins, D. W. | Lot 10, con. I, Thurlow tp., Hastings co. | | 136 Dundas St., Belleville. |
| Snelgrove, A. | Beaverton | | Beaverton. |
| Sproat and Sproat | Lot 6, con. IV, Tuckersmith tp., Huron co. | W. M. Sproat | R.R. 4, Seaforth. |
| Standard Brick Co., Ltd. | 500 Greenwood Ave., Toronto | G. J. Steele | 500 Greenwood Ave., Toronto. |
| Superior Brick and Tile Co., Ltd. | Lots 11, 12, Paipoonge tp., Thunder Bay | | 426 Victoria Ave., Fort William. |
| Thomson, Ralph | Lot 34, con. VIII, Grey tp., Huron co. | | Henfryn. |
| Thos. Godfrey and Co. | Beckwith tp., Lanark co. | | Carleton Place. |
| Tope Construction Co., The | Hamilton | | 677 Main St. W., Hamilton. |
| Toronto Brick Co., Ltd. | Milton | | |
| | Don Valley, Todmorden | | 897 Bay St., Toronto. |
| Wagstaff Brick and Tile Yard | 395 Greenwood Ave., Toronto | | |
| Wallace and Son, R. | Lot 5, con. XIV, Ops tp., Victoria co. | L. N. Wagstaff | R.R. 4, Lindsay. |
| | Lot 16, con. D, Widdfield tp., Nipissing dist. | | Toronto General Trusts Corp., 253 Bay St., Toronto. |
| Wein, Aaron | Lots 1, 2, 3, con. V, Stephen tp., Huron co. | | Crediton. |
| Weitzel, J. E. | Lot 33, con. IV, E. Zorra tp., Oxford co. | | R.R. 1., Tavistock. |
| Wright and Sons, Geo. | Lot 7, Tilbury W. tp., Essex co. | F. M. Wright | Comber. |

MINES OF ONTARIO IN 1937

By

Chief Inspector of Mines, D. G. Sinclair, Toronto; Inspectors, W. O. Tower, J. B. Taylor, D. P. Douglass, Kirkland Lake; A. S. Bayne, Port Arthur; A. E. Cave, Kenora; D. F. Cooper, Sudbury; E. B. Weir, Timmins; A. R. Webster, Toronto.

ASBESTOS

Rahn Lake Mines Corporation, Limited

Rahn Lake Mines Corporation, Limited, was incorporated in June, 1934, with an authorized capital of 3,000,000 shares of no par value, of which 1,437,399 have been issued. The officers and directors are: G. C. Rahn, president; J. M. Magenau, vice-president; H. C. J. Oehlecker, secretary-treasurer; O. R. McKerrow, assistant secretary-treasurer; E. W. King, R. H. Howell, R. Densmore, F. L. Gayder, and H. Philipson, directors. The head office is at 8½ Main Street West, North Bay. The mine address is Matachewan.

The property consists of 24 claims, 847.71 acres, in Montrose and Bannockburn townships, Matachewan area, district of Timiskaming, and was acquired from the Clover Leaf Mining Company, Limited, and the Empire Asbestos Mines Company.

During 1937 two frame mill buildings, one 30 by 48 feet and one 30 by 30 feet, were erected, and a 15- by 20-foot addition to the boiler-house was built. A considerable amount of plant equipment was installed. Stations were cut at a depth of 90 feet on No. 1 shaft, and 60 feet on No. 2 shaft. About 70 feet of drifting was done.

An average of 5 men was employed from March 9 to November 30 under the supervision of G. C. Rahn.

CHROMIUM

Chromium Mining and Smelting Corporation, Limited

The Chromium Mining and Smelting Corporation, Limited, has an authorized capitalization of 3,000,000 shares of no par value, of which 2,800,000 were outstanding as at December 31, 1937. The officers and directors are: Leo. H. Timmins, president; R. O. Denman, vice-president; N. W. Byrne, secretary; N. A. Timmins, J. A. McPhail, and F. J. Maw, directors. The head office is at Room 700, Bank of Commerce Building, Hamilton. The mine address is Collins.

The mine property consists of 11 patented and 36 unpatented claims, comprising about 1,900 acres, west of Obonga lake and about 26 miles south of Collins on the main line of the Canadian National Railways, district of Thunder Bay. The patented claim numbers are P. 6,208, P. 6,348-6,356, and P. 6,466. The unpatented claim numbers are T.B. 10,629, 10,657, 10,658, 10,820-10,822, 10,829-10,833, 10,840-10,842, 10,859-10,861, 10,880-10,885, 13,450, 13,451, 13,841-13,847, 14,742, 14,743, 18,762, 18,763, and 19,208.

Operations were continued at the Collins property throughout 1937. Underground operations were suspended in August and diamond-drilling was carried on: 14,415 feet from surface and 1,449 feet from the underground workings.

The following table shows the amount of development work accomplished at the end of 1936, during 1937, and the total:—

| | Dec. 31, 1936 | 1937 | Total |
|---------------------|---------------|-------|-------|
| | feet | feet | feet |
| Shaft..... | 350 | ..... | 350 |
| 100-FOOT LEVEL: | | | |
| Shaft stations..... | 50 | ..... | 50 |
| Drifts..... | 801 | 222 | 1,023 |
| Crosscuts..... | 686 | ..... | 686 |
| Raises..... | 135 | ..... | 135 |
| 225-FOOT LEVEL: | | | |
| Shaft stations..... | 45 | ..... | 45 |
| Drifts..... | 966 | 249 | 1,215 |
| Crosscuts..... | 201 | ..... | 201 |
| Raises..... | 21 | 451 | 472 |
| 325-FOOT LEVEL: | | | |
| Shaft stations..... | 20 | ..... | 20 |
| Drifts..... | ..... | 925 | 925 |
| Crosscuts..... | ..... | 254 | 254 |
| Raises..... | ..... | 303 | 303 |

Additions to the mining plant during the year included a Canadian Ingersoll-Rand XVH, 600-cubic-foot compressor, driven by a 135 h.p. Ruston-Hornsby Diesel engine. A new powder magazine was erected on the property.

During the year there was an average of 38 men employed, of whom 18 were underground, under the direction of H. H. Merritt.

GOLD

Ackerman Gold Mines, Limited

Ackerman Gold Mines, Limited, was incorporated in September, 1937, with an authorized capital of 3,000,000 shares of \$1 par value, of which 1,300,004 have been issued. The officers and directors are: C. H. Ackerman, president; H. F. Hansell, Jr., vice-president; Geo. A. Becker, secretary-treasurer; B. R. Hepburn, Reginald Blomfield, and M. C. Henderson, directors. J. M. Thompson is mine manager. The head office and mine office are at Marmora. The property consists of 324 acres in the township of Marmora, county of Hastings.

The following frame buildings were constructed during 1937: power-house, blacksmith shop, office, dry-house, cookery, bunk-house, headframe, and store-room. A 4,400-gallon water-tank was also built.

The following new plant equipment was installed during the year: Canadian Ingersoll-Rand, 500-cubic-foot steam compressor; Canadian Ingersoll-Rand No. 34 steel sharpener and No. 7-F oil furnace; Mead Morrison 7- by 12-inch steam hoist and two 80 h.p. locomotive-type boilers; and a 10 k.w. light generator.

A 45-degree, 2-compartment shaft was sunk to an inclined depth of 170 feet. A level was established at this depth, and 40 feet of drifting and 12 feet of cross-cutting were done.

An average of 9 men was employed from September 10 to December 31.

Addington Mines, Limited

Addington Mines, Limited, was incorporated in February, 1936, with an authorized capital of 3,000,000 shares of \$1 par value, of which 2,453,094 have been issued. The officers and directors are: Noah Dymont, president; W. M. Archibald, vice-president; M. A. Wolfkill, secretary-treasurer; Stanley Day, E.

G. Montgomery, and Jas. E. Riley, directors. J. E. Hawes is mine manager. The head office is at 302 Bay Street, Toronto. The mine office is at Flinton.

The company owns the property known as the Addington or Rich Rock, in Kaladar township, Lennox and Addington county. Operations are carried on under the control of the Consolidated Mining and Smelting Company of Canada, Limited. An account of the work done during 1937 appears on page 106 of this report.

Agawa Gold Mines, Limited

Agawa Gold Mines, Limited, was incorporated in November, 1937, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: R. H. Halbert, president; Dr. E. Blanchard, vice-president; A. C. McLean, secretary-treasurer; Stuart Fleming and J. C. Allan, directors. The head office is at 767 Yonge Street, Toronto.

The property includes the Centennial mine, located in township 29, range 22, Michipicoten area, district of Algoma. It was formerly owned by L. B. United Mines, Limited, which was succeeded by Agawa Gold Mines, Limited, in November, 1937.

Work was continued by the former company at the Centennial mine until June, 1937. During this period 152 feet of drifting and some stoping were done on the 125-foot level. The mine was idle for the balance of the year.

The 50-ton amalgamation-flotation mill was operated during March, April, and May, 1937, and treated a total of 2,182 tons of ore.

An average of 22 men was employed during the period of operation. R. B. Adair and H. Buckles were successively in charge. The mine address is Gold Park.

Akbar Gold Mines, Limited

Akbar Gold Mines, Limited, was incorporated in November, 1937, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: Frank O. Tidy, president; C. B. Aylsworth, vice-president; J. D. Wilson, secretary-treasurer; W. D. Armstrong and A. G. Herr, directors. The head office is at 9 Toronto Street, Toronto.

The property was acquired from Hillside Mines, Limited, in bankruptcy. It is located in township 29, range 23, Michipicoten area, district of Algoma.

The former company continued work during 1937 until March. The property was idle for the balance of the year. When work was suspended the underground development consisted of an 827-foot adit and 100 feet of drifting.

An average of 13 men was employed during the period of operation under the direction of W. L. Taylor. The mine address is Wawa.

Albany River Mines, Limited

Albany River Mines, Limited, has an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,683,000 have been issued. The officers and directors are: J. W. Morrison, president; G. C. Lawrence, vice-president; R. D. Cumming, secretary-treasurer; W. H. Despard and E. H. Horne, directors. The head office is at Haileybury, and the mine address is Pickle Crow.

The property consists of a group of 8 claims, totalling 286 acres, located 2 miles east of the Pickle Crow mine, in the Pickle-Crow area, Patricia portion of Kenora district. Access to the mine is by airplane from Sioux Lookout or Hudson to Pickle Lake. The distance from Pickle Lake to the mine is 9 miles by road.

Surface exploration was carried on until 1933, when diamond-drilling was commenced and continued to the end of 1935.

In February, 1936, camp and plant buildings were erected and a sinking plant was installed. The camp and plant buildings include: bunk-house, cookery, general office and staff quarters, assay office, blacksmith shop, carpenter shop, warehouse, dry-house, powder-house, cap-house, thaw-house, and hoist- and power-house.

The equipment includes a 125 h.p. Eclipse steam boiler; a 500-cubic-foot Babcock-Wilcox-Goldie-McCulloch compressor, driven by a 100 h.p. Westinghouse induction motor; a 10- by 12-inch single split drum Jenckes steam hoist; a Canadian Ingersoll-Rand steel sharpener; and two 250 k.v.a. transformers.

The shaft is vertical, 7 by 17 feet, and has three compartments. Sinking commenced in April, 1936, and by the end of the year the shaft was 390 feet deep and levels had been established at 125, 250, and 375 feet.

Development was proceeded with until October, 1937, when shaft-sinking was resumed. Early in January, 1938, a depth of 652 feet had been reached and levels had been established at 500 and 625 feet.

The development work accomplished on the property is as follows:—

| | To Dec. 31, 1936 | 1937 | Total |
|-----------------|---------------------|-------|-------|
| | feet | feet | feet |
| 125-FOOT LEVEL: | | | |
| Drifts..... | 40 | 425 | 465 |
| Crosscuts..... | 80 | 370 | 450 |
| 250-FOOT LEVEL: | | | |
| Drifts..... | 150 | ..... | 150 |
| Crosscuts..... | 30 | ..... | 30 |
| 375-FOOT LEVEL: | | | |
| Drifts..... | 110 | 1,240 | 1,350 |
| Crosscuts..... | 100 | 370 | 470 |

During 1936 and 1937 the following diamond-drilling was done:—

| | |
|------------------|--------|
| | Feet |
| Surface..... | 18,063 |
| Underground..... | 4,943 |
| Total..... | 23,006 |

An average of 39 men was employed daily, of whom 16 were underground. Geo. S. Gilbert is mine manager.

Alcona Mines, Limited

Alcona Mines, Limited, was incorporated on July 24, 1936, with an authorized capitalization of 4,000,000 shares of \$1 par value, to take over the property of Alcona Gold Mines, Limited. The officers and directors are: Wm. H. Price, president; D. R. McLaughlin, vice-president; S. Taylor, secretary-treasurer; G. E. Farlinger, Dr. J. F. McQuay, D. G. H. Wright, and P. C. MacLaurin, directors. The head office is at 803 Sterling Tower, Toronto, and the mine address is Alcona.

The property consists of 9 patented and 6 unpatented claims, totalling 570 acres, located in the Sioux Lookout area, Kenora district, 4 miles west of Alcona on the Port Arthur-Superior Junction branch of the Canadian National Railways. The mine is reached from mileage 154 over a 2-mile road.

Previous operators were: Consolidated Mining and Smelting Company of Canada, Limited, who did considerable trenching and test-pitting; Atlas Exploration Company, Limited, who did stripping and sampling; and Alcona Gold Mines, Limited, who did considerable trenching and sank 5 diamond-drill holes, totalling 2,000 feet. Alcona Mines, Limited, started clearing a camp site about September 1, 1936. Camp and plant buildings were erected, as follows: office, warehouse, bunk-house, cookery, power-house and hoist-room, powder magazine, powder-thaw, and blacksmith shop. An assay office was added early in 1937.

The mining plant installed includes two 50 h.p. boilers purchased second-hand from Preston East Dome Mines, Limited; an 8- by 10-inch, single-drum, reversible Ingersoll-Rand hoist; a 528-cubic-foot, Ingersoll-Rand FR-1 compressor, and a No. 53 Gardner Denver steel-sharpener.

The sinking of a 3-compartment, vertical, 6- by 14-foot shaft was started in December, 1936, and continued to a depth of 325 feet. Levels were established at 180 and 305 feet, and lateral work was proceeded with. Operations ceased on May 31, 1937, and the development work completed at that time was as follows:—

| Level | Drifts | Crosscuts |
|---------------|-------------|-------------|
| 180-foot..... | feet 327 | feet 200 |
| 305-foot..... | 218 | 200 |
| Total..... | 545 | 400 |

The average number of men employed daily was 35, of whom 14 were underground. E. P. Sawyer was the resident engineer in charge.

Algold Mines, Limited

Algold Mines, Limited, was incorporated in February, 1934, with an authorized capitalization of 2,500,000 shares of no par value. The officers and directors are: W. R. Knox, president; J. G. Merrick, secretary; David Lieberman, treasurer; J. M. Macintosh, T. F. Daigle, and J. F. B. Loblaw, directors. The head office is at 45 Richmond Street West, Toronto. The mine address is Goudreau.

The property is located in township 28, range 26, Goudreau area, district of Algoma.

Operations were continued throughout 1937. The development work accomplished on the various levels during the year, and the total to the end of 1937, is as follows:—

| Level | Drifting | | Crosscutting | | Raising | |
|---------------|-------------|---------------|---------------|------------|------------|------------|
| | 1937 | Total | 1937 | Total | 1937 | Total |
| 100-foot..... | feet 203 | feet 1,273 | feet | feet 95 | feet 91 | feet 91 |
| 120-foot..... | ..... | 35 | ..... | ..... | ..... | ..... |
| 140-foot..... | 16 | 126 | ..... | 15 | 22 | 132 |
| 200-foot..... | 308 | 1,977 | ..... | 625 | 205 | 305 |
| 400-foot..... | ..... | 470 | ..... | 150 | ..... | ..... |
| Total..... | 527 | 3,881 | ..... | 885 | 318 | 528 |

The amalgamation mill was operated throughout the year, except during March and November. It milled a total of 11,064 tons, which was principally

obtained from the west ore body by undermining from surface into a raise from the 200-foot level.

An average of 34 men was employed under the direction of R. F. Mitchell.

Algoma Summit Gold Mines, Limited

Algoma Summit Gold Mines, Limited, was incorporated in May, 1934, with an authorized capitalization of 5,000,000 shares of \$1 par value. The officers and directors are: F. A. Brandt, president; J. J. Morch, vice-president; S. A. Lister, treasurer; E. O. Slingsby, secretary; S. D. Terry and R. A. Hutchison, directors. The head office is at 512 McKinnon Building, Toronto. The mine address is Goudreau.

The property is in township 49, Goudreau-Lochalsh area, district of Algoma, about 5 miles east of Goudreau.

Operations were continued throughout 1937. The 35-degree shaft was sunk an additional 119 feet to a total inclined depth of 417 feet. Some 630 feet of drifting, 653 feet of crosscutting, and 109 feet of raising was accomplished on the 172-foot level during the year. A total of 4,845 feet of diamond-drilling was done.

The old 50-ton amalgamation mill was operated until April, when the new 500-ton amalgamation-flotation mill was completed and put in operation. Mill feed for the new mill was obtained principally from a surface open pit until July, when the pit was abandoned in favour of stoping on the 172-foot level. A total of 62,813 tons of ore was hoisted, from which 44,869 tons was sorted and milled.

The equipment installed in the 500-ton mill included a 15- by 30-inch jaw crusher; a 4-foot Symons cone crusher, vibrating screen; a 6- by 10-foot Marcy ball mill; an Atkins classifier; a Denver 2-compartment jig; an 8- by 8-foot Denver conditioner; a 10-cell Denver Sub-A flotation unit; a 14- by 10-foot Denver thickener; a 4- by 3-foot Feinc filter; a 3½- by 5-foot Marcy regrind mill; a Wilfley table; and two 3- by 4-foot Denver amalgam barrels.

A 1,000-cubic-foot Ingersoll-Rand electric compressor was added to the mining plant in August.

An average of 89 men was employed. L. H. Biggar was manager from July to the end of the year.

Altura Gold Mines, Limited

Altura Gold Mines, Limited, was incorporated in November, 1936, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: F. R. Marshall, president; Jos. McDonough, vice-president; W. G. Hughson, secretary-treasurer; James Ryan and J. F. Comer, directors. The head office is at 811 Bank of Hamilton Building, 67 Yonge Street, Toronto. The mine address is Box 313, Red Lake.

The property consists of 15 claims in Fairlie township, in the Patricia portion of Kenora district, and is about 7 miles northwest of Red Lake, from which it is reached by water. The mine dock is about one mile from the camp. Surface work on these claims, formerly known as the Dupont-Futterer claims, commenced in August, 1936, and in November diamond-drilling was started. By the end of the year some 1,100 feet of diamond-drilling had been completed, and construction of camp and plant buildings was under way.

The camp buildings consist of a bunk-house, a cookery, an ice-house, and four residences. The plant buildings include hoist- and power-house, boiler-house, blacksmith shop, powder magazine, cap-house and office. The plant equipment comprises a 140 h.p. boiler, a single-drum Mead Morrison steam

hoist, a 350-cubic-foot Ingersoll-Rand compressor, and a Gardner Denver steel-sharpener.

The vertical, 7- by 12-foot, two-compartment shaft was collared in January, 1937, by hand. Sinking under power started April 20 and had reached the objective of 275 feet by July, with stations cut at 125 and 250 feet. About 400 feet of drifting and crosscutting was done on the 250-foot level.

Underground diamond-drilling amounted to 1,200 feet at the end of October. As the bottom of the ore shoot had been reached and no commercial values had been found, operations were suspended and the mining plant was removed.

An average of 32 men was employed daily, of whom 13 were underground, under the supervision of D. M. Belec.

Amca Mines, Limited

Amca Mines, Limited, incorporated May 14, 1937, has an authorized capital of 3,000,000 shares of \$1 par value. Shares issued to the end of 1937 total 1,828,471; of this number 1,683,808 are in escrow. The officers and directors of the company are: James W. Rudhard, president; Edmund D. Stevens, vice-president; Joseph R. Steele, treasurer; Joseph A. Dunn, secretary; G. H. Gilberts and C. Loomis, directors. The head office of the company is at 24 Jarvis Street, Fort Erie North.

The company owns 5 patented claims and 3 unpatented claims and has an option on 20 adjoining claims, all situated in Garrison township, Lightning River area, district of Cochrane, 33 miles, by road, east of the village of Matheson on the Temiskaming and Northern Ontario railway. The mine office address is Matheson.

The building of a 50-ton amalgamation mill on the property was completed about the end of February, 1937. The mill equipment includes crusher, ball mill, drag classifier, jigs, table and blankets, and amalgam barrel. A cyanide plant for the treatment of concentrates is contemplated. The amalgam mill was operated during March, 1937, and during this time bullion having an approximate value of \$1,400 was recovered. Mill feed was taken from an open cut having a maximum depth of about 18 feet. A 6- by 8-inch, tandem-drum, steam-operated crane hoist, manufactured by M. Beatty and Sons, was used for hoisting broken ore from the open cut. Mill power and compressed air supply were generated by a 150 h.p. boiler and steam-driven turbines and electric generator and by a 220-cubic-foot gasoline compressor.

Operations by Amca Mines, Limited, were suspended in March. Eight diamond-drill holes, having an aggregate depth of approximately 1,500 feet were drilled on the property by Hollinger Consolidated Gold Mines, Limited, during the summer of 1937.

Arbade Gold Mines, Limited

Arbade Gold Mines, Limited, was incorporated in June, 1933, with an authorized capitalization of 3,500,000 shares of \$1 par value, of which 2,569,564 had been issued at October 25, 1937. The officers and directors are: C. A. Floyd, president; H. H. Verge, vice-president; C. C. Floyd, secretary-treasurer; J. F. Kilawee and D. E. Sanderson, directors. The head office is at 10 Adelaide Street East, Toronto. The mine office is at Matachewan.

The property consists of 39 claims, approximately 2,000 acres, in Baden and Argyle townships, Matachewan area, district of Timiskaming.

During 1937 the vertical, 2-compartment shaft was sunk a further 178 feet

to a depth of 215 feet, and levels were established at the 123- and 200-foot horizons. About 56 feet of crosscutting was done.

An average of 30 men was employed for three months under the direction of C. A. Floyd.

Arcadia Gold Mines, Limited

Arcadia Gold Mines, Limited, which was incorporated in October, 1931, has an authorized capitalization of 3,500,000 shares of \$1 par value, all of which have been issued. The officers and directors are: Dr. A. Maréchal de Carteret, president; C. Price-Green, secretary-treasurer; G. A. Creveling, P. M. Macklin, A. P. Goldsmith, I. Feldeman, and A. R. Smith, directors. The head office is at 808 Federal Building, Toronto. The mine office address is South Porcupine.

On incorporation the company took over the property of Triplex Gold Mines, Limited, issuing one share of Arcadia for each two shares of Triplex. The property held consists of approximately 560 acres, located in the southeast corner of Shaw township and the adjoining townships of Carman and Langmuir, Porcupine area, district of Cochrane.

There are two shafts on the property. The old Tommy Burns shaft, inclined at approximately 70 degrees, follows a quartz vein known by the same name to a depth of about 83 feet. Some 30 feet of drifting has been done from the bottom of this shaft, which is near the south boundary of claim P. 8,300 in Shaw township. On the adjacent claim, P. 8,301, at a point roughly 250 feet to the southeast of the inclined shaft, a vertical 2-compartment shaft has been sunk to a depth of 100 feet, and from this shaft exploratory drifting and crosscutting amounting to approximately 600 feet have been done. Both shafts were pumped out in 1937, and the most promising disclosures were channel- and bulk-sampled. On completion of this work the mine was allowed to refill with water. Actual operations at the property in 1937 extended over about two and a half months. The old buildings were reconditioned during this time. Only temporary plant equipment was installed.

A. M. Bilsky was in charge of activities during the period of operation, employing an average of 14 men.

Argosy Gold Mines, Limited

Argosy Gold Mines, Limited, was incorporated in May, 1935, to succeed Casey Summit Gold Mines, Limited, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: F. L. Trethewey, president; J. B. Tyrrell, vice-president; L. Appleyard, secretary-treasurer; V. H. Emery, managing director; Fraser D. Reid and E. C. Fox, directors. The head office is at 1320 Metropolitan Building, 44 Victoria Street, Toronto, and the mine address is Casummit Lake.

The company holds 21 claims, comprising 987 acres, at Casummit lake, about 100 miles north of Sioux Lookout on the Canadian National railway, in the Patricia portion of Kenora district. The mine is most easily reached by airplane from Sioux Lookout. Freight is shipped by barge to Goldpines, via Lac Seul, and from there it is transported to the mine by airplane, or by tractor in winter.

The original work at the mine was done in 1931 by the Casey Mountain Operating Syndicate, which installed a second-hand mining plant, sank a 2-compartment vertical shaft to a depth of 85 feet, established a level at 75 feet, and did 140 feet of lateral work and 2,000 feet of diamond-drilling before operations were suspended.

Early in the fall of 1933 operations were resumed by the Casey Summit Gold Mines, Limited. The shaft was deepened to 325 feet, levels were established at 200 and 300 feet, and lateral work was started before December, 1934, when operations were again suspended. In May, 1935, the present company took over the property and assumed the liabilities of the former owners. Operations were resumed in June, 1935, and were carried on continuously until January 22, 1938, when the mine was again shut down.

During 1935 and 1936 the mining plant was enlarged, new buildings were erected, and the 50-ton amalgamation mill was replaced by a 125-ton cyanide-amalgamation mill.

Additions to the plant during 1937 include a Walker 8- by 10-inch, single split-drum reversible steam hoist and a 210 h.p. Polar Atlas Diesel engine direct-connected to a 160 k.v.a. Westinghouse generator.

Two cottages, a cap-house, and an extension to the cookery were built during the year.

The winze from the 300-foot level was sunk an additional 154 feet and the following development work was done during 1937:—

| Level | Crosscuts | Drifts | Raises |
|---------------|-----------|--------|--------|
| | feet | feet | feet |
| 75-foot..... | | 73 | ..... |
| 200-foot..... | | 30 | 247 |
| 300-foot..... | 107 | 62 | 21 |
| 400-foot..... | | | 11 |
| 600-foot..... | 110 | 40 | ..... |
| Total..... | 217 | 205 | 279 |

Some 2,739 feet of diamond-drilling was done from surface and 1,876 feet from underground. There were 26,210 tons of ore hoisted during 1937, and 31,021 tons milled, including ore from the dump.

During the year there was an average of 130 men employed daily, of whom 69 were underground and 17 in the mill. R. Massey Williams was mine manager.

Bankfield Consolidated Mines, Limited

Bankfield Consolidated Mines, Limited, succeeded Bankfield Gold Mines, Limited, on September 1, 1936, by an exchange of stock whereby the shareholders of Bankfield Gold Mines received two shares in the new company for three in the old. The authorized capitalization is 3,000,000 shares of \$1 par value, of which 2,564,904 have been issued and 39,096 shares are under option to be taken up at \$1 per share. The option expires December 31, 1938. The officers and directors are: C. D. H. MacAlpine, president; T. H. Stinson, vice-president; F. J. Bailes, secretary-treasurer; H. Hunter, assistant secretary; W. T. McEachern, D. M. Morin, J. H. C. Waite, and Jos. Errington, directors. The head office is at 1006 Concourse Building, Toronto. The mine address is Geraldton.

The property is located in Errington township, in the Magnet Lake section of the Little Long Lac area, district of Thunder Bay. It is reached by a 3-mile road from Kenwell on the Longlac-Port Arthur branch of the Canadian National Railways, or by a 5-mile automobile road from Geraldton. The claims on which operations are being carried on are T.B. 10,199, 10,201, 10,213, 10,214, and 10,225.

During the early part of 1937, hydro-electric power was brought to the property from the Cameron Falls-Little Long Lac line, and the entire plant was electrified, power being turned on at the property on February 15. The mining

plant now includes an Ingersoll-Rand, 800-cubic-foot compressor, driven by an English Electric 150 h.p., synchronous motor, and an Ingersoll-Rand 42- by 30-inch double-drum hoist, driven by an English Electric 75 h.p. induction motor. The old steam-driven Ingersoll-Rand 750-cubic-foot compressor has been converted to electric drive by the same type of motor as the new compressor, and an auxiliary power unit has been installed consisting of a General Electric 63 k.v.a., 550-volt, 50 k.w. alternator, driven by a 145 h.p. Sterling gas-primed oil engine.

On May 10 a new 100-ton amalgamation-cyanide mill was put into operation. Milling equipment includes a 20- by 10-inch Blake-type jaw crusher; a Dings 16-inch Bi-Polar magnet; a 3- by 6-foot Aero-Vibe screen; a No. 5 Newhouse crusher; a 5- by 14-foot ball mill in closed circuit with a 54-inch-high weir-type Akins classifier; two 28- by 12-foot tray thickeners; two 14- by 14-foot pre-aerating agitators; three 14- by 14-foot surge agitators following No. 2 thickener; two 8- by 12-foot Oliver filters; and a Merrill-Crowe de-aerating, decantation apparatus with a Perrin's press for precipitation. In the present milling operations 55 per cent. of the recovery is by amalgamation and 45 per cent. by cyanidation.

Production was maintained throughout the year, and during 1937 the mill treated 26,436 dry tons of ore, with a gross recovery of \$393,664.72. Ore for the mill was supplied from No. 101 cut-and-fill stope on the first level, No. 201 shrinkage stope on the second level, and No. 401 shrinkage stope on the third level. No. 101 stope was mined by resuing cut-and-fill, 2,000 tons of waste rock being broken from the footwall during the year for backfill.

Underground development was continued during 1937. A crosscut was commenced on the 525-foot level, to drive to a point about 2,000 feet north of the present workings to intersect the second indicated ore zone. In September a 3-compartment, vertical winze was commenced on the 525-foot level toward the western extremity of the workings to develop the ore dipping into the boundary workings from the property of Tombill Gold Mines, Limited, to the north. The winze is equipped with a new 36- by 24-inch double-drum Canadian Ingersoll-Rand hoist driven by a Westinghouse 75 h.p. induction motor. The following table shows the development work accomplished at the end of 1936, during 1937, and the total at the end of 1937.

| | To Dec. 31, 1936 | 1937 | Total |
|-------------------------|---------------------|---------|----------|
| | feet | feet | feet |
| Shaft..... | 551.5 | ..... | 551.5 |
| Stations and sumps..... | 228.37 | 373.24 | 601.61 |
| 150-FOOT LEVEL: | | | |
| Drifts..... | 1,567.38 | 5.5 | 1,572.88 |
| Crosscuts..... | 446.75 | ..... | 446.75 |
| Raises..... | 231.85 | 146.25 | 378.1 |
| Sublevelling..... | 498.09 | ..... | 498.09 |
| 275-FOOT LEVEL: | | | |
| Drifts..... | 1,061.93 | ..... | 1,061.93 |
| Crosscuts..... | 403.11 | ..... | 403.11 |
| Raises..... | 127.13 | ..... | 127.13 |
| Sublevelling..... | 297.98 | ..... | 297.98 |
| 400-FOOT SUBLEVEL: | | | |
| Drifts..... | 163.45 | ..... | 163.45 |
| Crosscuts..... | 29.62 | ..... | 29.62 |
| Raises..... | 180.92 | 45.58 | 226.5 |
| 525-FOOT LEVEL: | | | |
| Drifts..... | 2,764.4 | 457.45 | 3,221.85 |
| Crosscuts..... | 1,205.71 | 1,662.9 | 2,868.61 |
| Raises..... | 235.59 | ..... | 235.59 |

The following buildings were erected during 1937: mill, dry-house, school, one residence, powder magazine, extensions to warehouse and bunk-house, and two electrical substations.

During the year there was an average of 138 men employed, of whom 60 were underground and 7 in the mill. J. W. MacKenzie is mine superintendent, and Harry Johnston is mill superintendent.

Barber-Larder Gold Mines, Limited

Barber-Larder Gold Mines, Limited, was incorporated in February, 1937, with an authorized capital of 3,000,000 shares of \$1 par value, of which 1,920,005 have been issued. The officers and directors are: R. S. Potter, president and manager; Dr. A. F. Demary and Donald Lough, vice-presidents; D. R. Michener, secretary-treasurer; J. Walter Young and S. J. Bird, directors. The head office is at 372 Bay Street, Toronto. The mine address is Larder Lake.

The property consists of 8 claims, 480 acres, in the township of McGarry, Larder Lake area, district of Timiskaming. The following buildings were erected on the property during 1937: ice-house, root-house, two bunk-houses, cookery, office, core-house, and two residences.

About 19,000 feet of diamond-drilling was done from surface, and 100 feet of surface-trenching of an average depth of 10 feet was accomplished.

An average of 15 men was employed from March 1 to December 31.

Beanland Mining Company, Limited

Beanland Mining Company, Limited, was incorporated in July, 1937, with a capitalization of 2,500,000 shares of \$1 par value, of which 1,508,358 have been issued. The officers and directors are: A. J. Perron, president; M. G. Hunt, secretary; J. G. Black, assistant-secretary; Sydney Beanland and Edwin E. Pearlman, directors. The head office is at Kirkland Lake, and the mine office is at Timagami.

The property consists of 4 claims, approximately 200 acres, in Strathy township, Timagami area, district of Nipissing, formerly operated by the Goodfish Mining Company, Limited.

During 1937, 300 feet of surface-trenching, 2,112 feet of surface diamond-drilling, and 1,368 feet of underground diamond-drilling were done. A 3-compartment, vertical shaft, 6 by 16 feet, was sunk 355 feet, and levels were established at the 175- and 325-foot horizons. Some 957 feet of crosscutting, 1,354 feet of drifting, and 397 feet of raising were done.

An average of 28 men was employed during the year under the direction of D. M. Briden, superintendent.

Beaverhouse Lake Gold Mines, Limited

Beaverhouse Lake Gold Mines, Limited, was incorporated in June, 1935, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which, 1,500,005 have been issued. The officers and directors are: P. M. Fleming, president; James E. Grant, vice-president; C. F. Tuer, secretary; Napoleon Alarie, director. The head office is at Haileybury. The mine office is at Kirkland Lake.

The company acquired the property formerly operated by Argonaut Consolidated Gold Mines, Limited, consisting of 29 claims, 1,100 acres, in Gauthier and McVittie townships, Larder Lake area, district of Timiskaming. In 1937 Bunker Hill Extension Mines, Limited, took an option on a large block of treasury shares and is supplying funds for development work. Bunker Hill's option is in

turn optioned to the Premier Gold Mining Company, Limited. Operations are being carried on under the direction of Toburn Gold Mines, Limited.

The previous operators had sunk a shaft to a depth of 500 feet and a winze from the 500-foot level to a depth of 1,250 feet. A large amount of development work was also done, details of which appear in Department of Mines reports for the years 1920 to 1928. The property had been idle since 1927.

The present operators did 2,335 feet of surface-trenching and 4,983 feet of diamond-drilling from surface during 1937.

An average of 9 men was employed from May 1 to December 31. M. W. Hotchkin is manager.

Berens River Mines, Limited

Berens River Mines, Limited, was incorporated in July, 1936, with an authorized capitalization of 1,000,000 shares of \$1 par value, all of which have been issued. The company is a subsidiary of the Newmont Mining Corporation. The officers and directors are: H. De Witt Smith, president; John Dryborough, vice-president; A. W. Burt, secretary; Carroll Searls, assistant secretary; H. E. Dodge, treasurer; Gus Mrkvicka, assistant treasurer; E. D. Birchard and Fred M. Connell, directors. The head office is at Empire, and the mine address is Favourable Lake, Ont., care of Wings, Limited, Winnipeg, Man.

The property consists of 39 claims situated some $3\frac{1}{2}$ miles east of South Trout lake, which is 8 miles east of Favourable lake, in the Patricia portion of Kenora district. The mine is reached by airplane from Kenora, via Red Lake, or direct from Lac du Bonnet, in Manitoba. Freight is transported by airplane, and in winter by tractor, from Berens River, Man., a distance of 145 miles. A $3\frac{1}{2}$ -mile tractor road serves the mine from the dock on South Trout lake.

Equipment and supplies were flown to the mine from Berens River during September and October, 1936. The plant and camp buildings were erected, and the mining equipment was installed by January, 1937. The buildings erected include two frame bunk-houses, a log cabin, cookery, office and staff quarters, warehouse, shaft-house, power-house, blacksmith shop, sample-house, assay office, dry-house, powder magazine, cap-house and supply shed. A storehouse and a saw-mill were built at South Trout lake.

The mining plant includes a twin 200 h.p. Foster and Wheeler water-tube boiler, a 560-cubic-foot Canadian Ingersoll-Rand steam compressor, a 6- by 8-inch single split-drum steam hoist, and an Ingersoll-Rand No. 34 drill-sharpener.

Shaft-sinking commenced January 15, 1937, following surface exploration by trenching and diamond-drilling during 1936. By April 26 the 3-compartment, vertical shaft was 400 feet deep. At this point a flow of water was encountered and sinking was discontinued. The shaft was cemented to stop the flow of water, and levels were opened up at 250 and 375 feet. Sinking was resumed on September 17, and the shaft was deepened to 515 feet. Lateral work was proceeded with at the 500-foot horizon, and by the end of the year the development completed was as follows:—

| Level | Drifts | Crosscuts | Raises |
|---------------|--------|-----------|--------|
| | feet | feet | feet |
| 250-foot..... | 777 | 362 | 84 |
| 375-foot..... | 1,370 | 599 | 130 |
| 500-foot..... | 715 | 358 | |

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| DIAMOND-DRILLING | | Feet |
|------------------|--|--------|
| Surface..... | | 16,055 |
| Underground..... | | 13,027 |
| Total..... | | 29,082 |

The ore occurs in quartz lenses arranged *en échelon* in porphyry and andesite. The vein dips at 70 degrees and carries gold, silver, pyrite, and a lead-zinc complex. No native gold has been found.

An average of 70 men was employed daily during 1937, of whom 24 were underground. M. D. Banghart is in charge of operations, and B. R. Frisbee is the mine superintendent.

Bidgood Kirkland Gold Mines, Limited

Bidgood Kirkland Gold Mines, Limited, has an authorized capitalization of 4,000,000 shares of \$1 par value, of which 3,506,715 have been issued. The officers and directors are: W. J. Lawson, president; J. M. Macintosh, secretary-treasurer; W. Harrison, assistant secretary; A. E. Belcher, O. L. Knutson, Harry Koza, S. K. Learie, H. F. Parkinson, directors. F. L. Smith is mine manager. The head office and mine office are at Kirkland Lake. The executive office is at 350 Bay Street, Toronto.

The property consists of 23 claims, 753.5 acres, in Lebel township, Kirkland Lake area, district of Timiskaming.

The No. 2 or Main shaft, which is vertical, with 3 compartments, was sunk a further 66 feet during 1937. No. 2 winze, a duplicate of No. 2 shaft, was collared on the 775-foot level and sunk a further 415 feet; levels were established at 900, 1,025, and 1,150 feet. A total of 8,084 feet of underground diamond-drilling, 1,677 feet of crosscutting, 2,981 feet of drifting, and 817 feet of raising was done.

The mill operated during the year at an average capacity of 122 tons per day. An average of 157 men were employed during the year.

Big Master Consolidated Gold Mines, Limited

Big Master Consolidated Gold Mines, Limited, was incorporated in April, 1935, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,510,207 have been issued. The officers and directors are: W. R. Salter, president; F. A. Gaby, vice-president; J. A. Griffith, secretary-treasurer; J. C. Rogers, Dr. M. H. Lebel, Hon. W. D. Black, R. J. Jowsey, directors. The head office is at 112 Yonge Street, Toronto, and the mine address is Goldrock, via Wabigoon.

The company holds 57 claims, of which 5 are patented, including the old Big Master mine. The property is located near the north end of Upper Manitou lake, district of Kenora, and is about 27 miles south of Wabigoon on the Canadian Pacific railway. The mine can be reached from Wabigoon, via Wabigoon lake, and over a 6-mile road from the south end of the lake to Goldrock.

Previous operators sank a vertical, 2-compartment shaft to a depth of 270 feet and established three levels, on which a total of 1,888 feet of lateral work was done. About 5,000 tons of ore was mined from stopes and treated in a 10-ton stamp-mill.

In October, 1935, the property was reopened by Murwood Gold Mines, Limited, which during 1936 installed a mining plant, repaired the buildings and shaft timbers, and deepened the shaft to 350 feet. A station was cut at 350 feet, and 445 feet of drifting was done, as well as 85 feet on the second level. During

this period 980 feet of diamond-drilling was done underground and 3,564 feet from surface. The mine was shut down November 25, 1936.

Late in the year Murwood Gold Mines, Limited, surrendered its charter, and its assets were taken over by Lakman Gold Mines, Limited, which in turn relinquished its option on the Big Master property to the Big Master Consolidated Gold Mines, Limited, for 200,000 shares of that company's stock.

Surface diamond-drilling was carried on spasmodically during 1937. The mine is now shut down. H. Van de Kamer was in charge during the early part of 1937.

Bilmac Gold Mines, Limited

Bilmac Gold Mines, Limited, was incorporated in September, 1934, with an authorized capitalization of 2,000,000 shares of no par value. The officers and directors are: L. F. Hogarth, president; G. E. McVittie, vice-president; A. C. Laing, treasurer; W. R. Marchment, secretary; Jesse Bradford, director. The head office is at 357 Bay Street, Toronto. The property is located in Macmurchy township, West Shiningtree area, district of Sudbury.

Underground work was carried on from January to June, and surface work for the balance of the year. The development work accomplished on the various levels during the year, and the total to the end of 1937, was as follows:—

| Level | Drifting | | Crosscutting | | Raising | |
|----------------|----------|-------|--------------|-------|---------|-------|
| | 1937 | Total | 1937 | Total | 1937 | Total |
| | feet | feet | feet | feet | feet | feet |
| 65-foot | | 290 | | 20 | | 70 |
| 170-foot | 451 | 1,366 | 181 | 306 | | 12 |
| 410-foot | 629 | 1,275 | 68 | 591 | | 40 |
| Total | 1,080 | 2,931 | 249 | 917 | | 122 |

The plant included a 104 h.p. boiler, a 560-cubic-foot steam compressor, and a 9- by 8-inch Ingersoll-Rand hoist.

An average of 17 men was employed under the direction of E. W. Asselstine, who was succeeded after the end of the year by J. Woodcock. The mine address is Shiningtree.

Bolniver Mines and Investments, Limited

Bolniver Mines and Investments, Limited, was incorporated in October, 1936, with an authorized capitalization of 40,000 shares of \$1 par value. The officers and directors are: R. D. Parker, president; G. E. Buchanan, vice-president; and R. L. Beattie, secretary. The head office is at Sudbury. The property is located in Maclellan township, district of Sudbury, near Skead.

Underground work was continued until July and then suspended for the rest of the year. A total of 1,162 feet of drifting and 226 feet of crosscutting was done on the 165-foot level during 1937. Some 1,364 feet of diamond-drilling was also done.

The plant included a 600-cubic-foot Gardner Denver compressor driven by a 175 h.p. Caterpillar Diesel engine, and an 8½- by 10-inch Ottumwa air hoist.

An average of 17 men was employed during the period of operation. W. H. Smith was in charge.

Bousquet Gold Mines, Limited

Bousquet Gold Mines, Limited, was incorporated in November, 1920, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and

directors are: Lionel Brooke, president; Wm. B. McPherson, secretary; Globe Investments, Limited, treasurer; H. P. Snelgrove, director. The head office is at 171 Yonge Street, Toronto. The mine address was Willisville.

The property is located in township 11, district of Sudbury, 7 miles east of West River, on the Algoma Eastern railway.

Underground operations were continued until early in July, 1937, when all work ceased. The development work done during the year consisted of 110 feet of drifting on the 325-foot sublevel, 124 feet of drifting on the 350-foot sublevel, and 93 feet of raising on the 450-foot level. A total of 1,072 feet of diamond-drilling was done from underground. Stopping was done on the 150- and 300-foot levels and on the 325- and 350-foot sublevels. A total of 9,486 tons of ore was hoisted, from which 7,961 tons was sorted and milled in the 50-ton amalgamation-cyanide mill. The milling equipment was dismantled and sold to pay creditors.

An average of 54 men was employed under the direction of J. E. Jerome.

Brengold Mines, Limited

Brengold Mines, Limited, was incorporated in March, 1929, to succeed Casey Contact Gold Mines, Limited, on the basis of one new share for three shares of the old company. It has an authorized capitalization of 3,000,000 shares, of \$1 par value, of which 1,861,435 had been issued at December 11, 1937. The officers and directors are: F. W. Purdy, president; H. S. Conrad, vice-president; E. M. Hand, secretary-treasurer; Herbert Parker, director. The head office is at 34 King Street East, Toronto. The mine address is Nezhah.

The company carried on operations in 1936 on the Brennan-Kenty east group of 12 claims, located about 8½ miles northwest of Nezhah, Irwin township, in the Sturgeon River area, district of Thunder Bay. The claim numbers are: T.B. 13,561-13,569 and 14,001-14,003.

Underground development was suspended in December, 1936. From January 1 to April 22, 1937, 6 diamond-drill holes were drilled from the underground workings, totalling 1,001 feet. Surface diamond-drilling during the same period consisted of 3 holes totalling 1,206 feet. During the remainder of the year only surface prospecting and exploration work were carried on. Two men were employed under the direction of C. W. Workman.

The following table shows the amount of development work on the property to December 31, 1937:—

| | 100-foot level | 200-foot level | Total |
|----------------------------|----------------|----------------|-------|
| | feet | feet | feet |
| Shaft (2-compartment)..... | | | 225 |
| Station-cutting..... | 33 | 15 | 48 |
| Drifting..... | 437 | 687 | 1,124 |
| Crosscutting..... | 138 | 704 | 842 |
| Raising..... | 104 | 52 | 156 |
| Total..... | 712 | 1,458 | 2,395 |

Britcana Gold Mines, Limited

Britcana Gold Mines, Limited, was incorporated in November, 1936, with a capitalization of 3,000,000 shares of \$1 par value, of which 1,500,005 have been issued. The officers and directors are: R. D. Van Houten, president; A. C.

Pennington, secretary-treasurer; M. C. Cowan, director and mine manager; A. B. Babcock and J. L. Maude, directors. The head office is at 80 King Street West, Toronto. The mine address was Charlton.

The property comprises claims Nos. T. 24,001-24,003, 24,005-24,008, and 24,251-24,253, in Bryce township, Larder Lake area, district of Timiskaming, about 8 miles northwest of Charlton.

During 1936 considerable surface-trenching and diamond-drilling was done. The property was operated from January to May in 1937. During this time a cookery, bunk-house, office, stables, change-house, blacksmith shop, and compressor- and hoist-house were built. A 6- by 8-inch air hoist and a gasoline air compressor were installed. A 2-compartment shaft was sunk to a depth of 15 feet. When the property was visited in April, 30 men were employed. R. B. King was resident engineer.

Buffalo Ankerite Gold Mines, Limited

Buffalo Ankerite Gold Mines, Limited, which was incorporated in 1932, has an authorized capitalization of 1,000,000 shares of \$1 par value, of which 701,679 have been issued. The officers and directors are: E. G. Kinkel, president and managing director; Gustave R. Loesch, first vice-president; Jacob Betz, second vice-president; Geo. R. Feine, secretary; Clarence H. Leo, assistant secretary; Henry Kobler, treasurer; R. P. Kinkel, assistant treasurer and mine manager; Everett Bristol, Harry J. Carmichael, and Henry J. Tiedt, directors. The head office is at 1750 Rand Building, Buffalo, N. Y. The mine address is South Porcupine.

The company owns 15 claims in Deloro township, Porcupine area, district of Cochrane. The main group, on which the mine and plant are located, comprises 9 claims or 322 acres. Of the remaining 6 claims 5 are in one block. One claim of this group was purchased in 1937 at public sale. The company also holds controlling interests in McKay Lake Gold Mines, Limited, and Sheadore Gold Mines, Limited.

The following is taken from the report of the manager to the president for the fiscal year ending December 31, 1937:—

Production

The two mills treated 343,093 dry tons of ore yielding 80,892.926 ounces of gold with a value of \$2,832,512.73, an average recovery of \$8.256 per ton milled. The mine operating costs were \$4.061 per ton milled, or \$17.23 per ounce of gold recovered.

The North mill was increased during the year from a daily milling of 600 to 650 tons and the South mill from 300 to 350 tons. The production has increased exactly 50 per cent. over that of the year 1936. With the average of 1,000 tons objective reached, it is not contemplated to exceed this rate of tonnage until at least part of the new No. 5 shaft is completed. An intermediate objective of 2,300 feet is planned and requires the installation of equipment and the subsequent development work.

Milling

Added equipment and alterations were required to increase production, improve efficiency, supplant worn-out equipment or simplify operation, and to have spare equipment to overcome shut-down loss. Since the beginning of operations in 1932 the increase in the rated capacity of the North mill in tonnage is 260 per cent. and the South mill is 233 per cent. The running time of 97.42 per cent. for the North mill and 96.62 per cent. for the South mill is commendable.

The waste rock sorted out before crushing was 10,451 tons, or approximately 3 per cent. of the tons hoisted for milling, at a cost of \$0.0384 per ton milled. This corresponded to a proportional amount of increase in the grade of ore milled.

The following is a summary giving the average data on each ton milled, based on the total tonnage, and the total production of both mills:—

| | North mill | South mill | Total |
|--------------------------------|----------------|--------------|----------------|
| Tons milled | 227,818 | 115,275 | 343,093 |
| Tons milled daily | 624 | 316 | 940 |
| Heads (gold \$20.67) | \$5.419 | \$4.677 | \$5.170 |
| Tails (gold \$20.67) | \$0.295 | \$0.277 | \$0.289 |
| Recovery per ton | \$5.124 | \$4.400 | \$4.881 |
| Premium per ton | \$3.543 | \$3.042 | \$3.375 |
| Total recovery per ton | \$8.667 | \$7.442 | \$8.256 |
| Gold ounces per ton | 0.2475 | 0.2125 | 0.2358 |
| Recovery (gold \$20.67) | \$1,167,440.45 | \$507,267.28 | \$1,674,707.73 |
| Recovery (present value) | \$1,974,586.22 | \$857,926.51 | \$2,832,512.73 |
| Average ounces per month | 4,699.304 | 2,041.773 | 6,741.077 |

Mining, Development, and Exploration

All the working levels in both the North and South mines were systematically prospected by closely spaced diamond-drilling. This procedure will continue until all the ore possibilities are exhausted. The above campaign was so successful that, although there have been no new levels opened up during the year, the positive ore reserves both in tonnage and grade have been increased approximately 10 per cent.

The complex vein structures of the 1,050-foot North level was one of the most important reasons necessitating the change on this level of the mining method from shrinkage to horizontal cut-and-fill mining. The cut-and-fill method of mining has or will be adopted in certain areas in the upper levels, where mining by shrinkage stoping would give excessive dilution.

Considerable work was done salvaging floor pillars on the old 200- and 350-foot levels of the South mine; 20,300 tons of ore grading \$6.10 (present price) were taken out here.

In addition to holes on and above the 1,050-foot level, a number of exploration holes were drilled below the 1,050-foot level. A hole was put down vertically 1,544 feet at a point 100 feet east of the new No. 5 shaft location. It encountered no serpentine and was in hard rock all of the way. As previously stated, this hole gives every assurance that the new No. 5 shaft can be sunk to the 3,000-foot horizon without difficulty.

Data as obtained from two other diamond-drill holes from the 1,050-foot level to the 2,000-foot horizon give every evidence that the vein structure of the North ore body extends to this 2,000-foot horizon. One hole intersected veins at the 1,750-foot horizon which are directly beneath and similar to those veins developed north of the wide ore section on the 1,050-foot level. Extension of this hole into the footwall country rock for 400 feet precludes the possibility of serpentine coming in from the northeast area to the depth of shaft objective.

The other hole parallel to the average strike of the formation was drilled southeast to a vertical depth of 800 feet below the 1,050-foot level and remained in favourable formation for the entire length. This indicates the dip of the south mass of serpentine to be nearly vertical. Geological studies of the whole area from the surface to the 1,050-foot level have proved that the so-called serpentine is the alteration of a very basic flow and consequently conforms with the contours of the various flows which contain the vein structure and cannot prematurely cut off the ore bodies as an intrusive might.

Two holes were put down from the diamond-drill station north of the South winze on the 1,050-foot level. Both of these holes intersected No. 3 vein at approximately the 1,550-foot horizon. Both holes showed No. 3 vein to have a good width of mineable ore. Further drilling is being done in this area at present.

To facilitate mucking and tramming with the longer distances underground, one 3-ton and one 1-ton electric locomotive were added, also one mechanical loader and one scraping or slushing hoist.

| | |
|------------------------------------|-----------------|
| | Tons |
| Ore broken in stopes | 337,362 |
| Ore broken in development | 24,555 |
| Total ore broken | 361,917 |
| Cost of ore broken in stopes | \$0.952 per ton |

| | Feet | Cost per foot |
|------------------------|----------|---------------|
| Diamond-drilling | 30,374.5 | \$2.096 |
| Drifts | 5,252 | 15.493 |
| Crosscuts | 3,474.5 | 12.506 |
| Raises | 281 | 17.330 |
| Shafts | 600 | 143.035 |
| | cu. ft. | |
| Stations | 851 | ..... |

Drifting, crosscutting, and diamond-drilling for adjoining properties are not included. The cost of the shaft includes temporary headframe, concrete collar of shaft for permanent headframe, also all rock drills, hoisting-cable to the 1,000-foot level, and guide brackets, bolts, and nuts to the 2,000-foot level.

ORE BROKEN, HOISTED, AND TRANSFERRED BY LEVELS

| Levels | | Production ore broken | Development break | | Ore hoisted and transferred | Box assay (gold at \$20.67) |
|------------------|----------------|-----------------------|-------------------|--------|-----------------------------|-----------------------------|
| South mine | North mine | | Ore | Waste | | |
| | | tons | tons | tons | tons | |
| 170-foot.... | 200-foot.... | 10,418 | 3,312 | 1,063 | 12,990 | \$3.44 |
| 300-foot.... | 300-foot.... | 33,242 | 2,151 | 351 | 30,333 | 4.28 |
| 425-foot.... | 475-foot.... | 4,361 | ..... | 3,704 | 35,272 | 3.45 |
| 550-foot.... | 600-foot.... | 16,376 | 2,896 | 6,321 | 64,343 | 4.04 |
| 675-foot.... | 725-foot.... | 53,626 | 1,289 | 5,000 | 90,686 | 5.50 |
| 800-foot.... | 875-foot.... | 139,134 | 3,908 | 4,411 | 102,717 | 5.61 |
| 925-foot.... | ..... | 6,072 | 1,970 | 1,477 | 6,216 | 2.68 |
| 1,050-foot.... | 1,050-foot.... | 74,133 | 9,029 | 8,822 | 66,524 | 5.86 |
| No. 5 shaft..... |  | ..... | ..... | 11,941 | ..... | ..... |
| Total..... | | 337,362 | 24,555 | 43,090 | 409,081 | \$4.98 |

ORE RESERVES

| | Tons ¹ | Value per ton at \$20.67 | Total value at \$20.67 | Total value at \$35.00 |
|----------------------------|-------------------|--------------------------|------------------------|------------------------|
| Broken ore reserves..... | 165,305 | \$4.86 | \$803,766.00 | \$1,361,001.00 |
| Positive ore reserves..... | 756,886 | 5.82 | 4,404,042.00 | 7,457,276.00 |
| Total..... | 922,191 | \$5.65 | \$5,207,808.00 | \$8,818,277.00 |

¹Allowance for dilution calculated.

Broken and positive ore reserves calculated only above the 1,050-foot level indicate an increase or "found" ore of 465,235 tons, valued at \$4,403,946.65, an approximate increase of 60 per cent. in tonnage and value not reported as of January 1, 1937. The total present reserves show sufficient ore until the mine has developed below the 1,050-foot level.

Mine Operating Costs

The total mine operating costs are as follows:—

| | Total cost | Cost per ton milled |
|-----------------------------|----------------|---------------------|
| Exploration..... | \$65,029.71 | \$0.190 |
| Development..... | 143,534.79 | .418 |
| Mining..... | 733,938.30 | 2.139 |
| Milling..... | 284,863.03 | .830 |
| General expense (mine)..... | 166,044.22 | .484 |
| Total..... | \$1,393,410.05 | \$4.061 |

Comparative data for the years 1935, 1936, and 1937 are shown when both mines and mills were operating:—

| | 1935 | 1936 | Increase | Decrease | 1937 | Increase | Decrease |
|--------------------------------------|----------------|----------------|-----------|-----------|----------------|-----------|-----------|
| | | | per cent. | per cent. | | per cent. | per cent. |
| Tons milled..... | 218,763 | 271,736 | 24 | ..... | 343,093 | 26 | ..... |
| Total operating costs.... | \$970,895.68 | \$1,136,466.82 | 17 | ..... | \$1,393,410.05 | 22 | ..... |
| Total recovery..... | \$1,310,370.68 | \$1,888,828.96 | 44 | ..... | \$2,832,512.73 | 50 | ..... |
| Cost per ton milled..... | \$4.389 | \$4.182 | ..... | 4.7 | \$4.061 | ..... | 2.9 |
| Recovery per ton milled.. | \$5.990 | \$6.951 | 16 | ..... | \$8.256 | 19 | ..... |
| Ounces gold recovered per month..... | 3,098.9 | 4,489.7 | ..... | ..... | 6,741.1 | ..... | ..... |
| Cost per ounce produced.. | \$25.82 | \$21.09 | ..... | 18.3 | \$17.23 | ..... | 18.3 |

N.B.—Gold calculated at present value.

Construction and General

The principal work of the year has been the objective production of 1,000 tons per day and to complete the programme of 1936.

No. 5 Shaft.—Plans and purchase of equipment have been made for the new No. 5 shaft. Preparation of the foundations for the erection this spring of the 145-foot steel headframe, the hoist- and compressor-house, the required hoist and additional compressor were partially completed.

Following the final decision for the location of the No. 5 shaft and the starting of sinking operations in August, a great deal of auxiliary preparation had to be carried out. A 25-foot rock road for a length of 1,800 feet had to be built. An insulated conduit trestle was built for steam, air, and water lines. A temporary headframe, hoist-house, and change-house also had to be erected with necessary heating facilities for the severe winter. An additional cement mixer was purchased for use on the large amount of foundations.

Hydro-Electric Power System.—Change of incoming voltage from 12,000 volts to 26,400 required six transformers of a total capacity of 3,150 k.v.a. With the installation, new substations, control feeder breakers, and underground feeder cables were installed. The programme was continued throughout the mine, and the power lines, switches, motors, and protection thereof were also improved. The present load factor is 85 to 90 per cent.; the power factor, 90.3 per cent.; and the peak load indicates 2.76 horse-power per ton milled for the year.

North Mill and Crusher-House.—To facilitate crushing operations, an addition to the crusher-house, using primarily the present equipment, was completed by the end of the year. An improved bin for lime is to be introduced into the system at this point. A technical laboratory was constructed adjoining the mill for investigation of various problems. A 1,200-cubic-foot vacuum pump was installed to replace a small converted compressor now required for compressed air. A new Crowe vacuum pump replaced the old pump now repaired and used as a standby.

South Mill and Crusher-House.—The principal installation was a 32-foot thickener required to replace the old wooden thickener, which had to be overhauled. An addition for the thickener was built, gold presses relocated, and a clarifying filter installed in it. A centrifugal sand pump was installed for change in the mill flow using the new and overhauled thickeners. A 750-cubic-foot vacuum pump was installed.

Tailings Dam.—Forty-eight acres were created for tailings disposal of both mills. A canal was excavated along the south and west sides of this area by means of a used drag shovel purchased for this and other purposes. A 6-inch wood pipe line surrounds the top edge and with the aid of a sand pump will enable us to handle tailings economically for some years.

Buildings.—The large increase in assays necessitated building an addition to the assay office. Particular attention was paid to the ventilation in order to prevent any possibility of lead poisoning.

The machine shop was further increased in area to allow for the increased work and to place equipment purchased, namely a used bending rolls, milling machine, and auxiliary tool-grinding equipment. Space was also provided for the plate and welding shop in a separate room and a garage for the repair and housing of plant trucks.

An electrical and pipe shop was made from the alteration of the old dry. A new pipe-threading and cutting machine was installed.

A carpenter shop was made from the old South mechanical shops. A Universal saw, band saw, crosscut saw, jointer and planer and saw-sharpening machine were installed. This enables us to do a great deal of additional carpentry work and framing of the shaft timbers to be installed over the coming year.

A 30- by 60-foot school and recreation building was added to the old school, with a basement under the entire building, with all conveniences and recreation-rooms for employees. A small building was enclosed over the saw-mill. A storage shed was built to house many spare parts. Four residential houses were completed for the staff, and three others were sufficiently enclosed before the cold weather and will be completed by the carpenter's crew during the winter. A cookery kitchen addition was constructed of tile and equipped.

The roads and grounds of the mine were further improved during the year. A large truck was added to the equipment.

A picnic ground and bathing beach was established at McDonald lake on our property for the pleasure of our employees. A bath-house was constructed of salvage wood and old wooden lockers.

To insure a purer supply of water, the intake was extended 200 feet further into the lake and a chlorinating system installed. An auxiliary gasoline pump was also installed as a prevention against power breakdown and fire hazard.

The average number of men employed during 1937 was 541, of whom 331 were employed underground and 45 in the mills. E. C. Keeley is mine superintendent.

Central Patricia Gold Mines, Limited

Central Patricia Gold Mines, Limited, which was incorporated in 1931 to succeed Central Patricia Mines, Limited, has an authorized capitalization of 2,500,000 shares of \$1 par value, all of which have been issued. The officers and directors are: F. M. Connell, president; W. H. Connell, vice-president; Alan Cockeram, secretary-treasurer; C. R. Elliott, assistant secretary-treasurer; A. B. Mortimer, G. B. Webster, and L. Cohen, directors. The head office and the mine office are at Central Patricia, and the administrative office is at 85 Richmond Street West, Toronto.

The property consists of 137 claims, totalling 6,360 acres, including the Central Patricia mine and the Springer, or No. 2 Operation, in the Pickle-Crow area, in the Patricia portion of Kenora district. The mine is reached by airplane from Sioux Lookout or Hudson, on the main western line of the Canadian National Railways, to Pickle lake and thence 3 miles by road to the mine. Freight is transported by water from Hudson over Lac Seul, up the Root river, across a marine railway to Lake St. Joseph, and then to Doghole Bay. Central Patricia Gold Mines, Limited, in conjunction with Pickle Crow Gold Mines, Limited, incorporated the Lake St. Joseph Transportation Company, Limited, to operate the Root River Portages, the Root River Railway, and a new truck road from Doghole Bay to Pickle Crow mine, with short connecting roads to the Central Patricia and Springer mines. The Dominion and Provincial governments defrayed part of the cost.

The following is taken from the report of the mine manager for the year ending December 31, 1937:—

Production

The mill treated 77,119 tons of ore, from which 39,761 ounces of gold and 4,141 ounces of silver, valued at \$1,392,839.83, were recovered, the average recovery being 0.515 ounces gold, or \$18.06 per ton. The milling rate averaged 211 tons per day, compared with 164 tons per day during 1936.

Development

The shaft was deepened from 1,025 to 1,472 feet and three new levels established at 1,150, 1,300, and 1,450 feet. The three new levels were in the early stages of development at the year end, with the 1,150- and 1,300-foot drifting in ore.

Development work totalled 7,548 feet, compared with 5,246 feet during the preceding year. The total for this year was made up as follows:—

| | Feet |
|-------------------|---------|
| Drifting..... | 4,181.5 |
| Crosscutting..... | 1,309.5 |
| Raising..... | 2,057 |
| Total..... | 7,548 |

Since the completion of shaft-sinking, development work has been resumed in the western part of the mine on the 375-, 625-, and 875-foot levels.

Ore Reserves

Ore reserves increased from 112,198 tons at 0.50 ounces per ton to 204,453 tons at 0.53 ounce grade. The ore estimate as of December 31, 1937, was as follows:—

| | Tons | Grade |
|----------------------|---------|--------|
| | | ounces |
| Broken reserves..... | 6,093 | 0.60 |
| Developed ore..... | 188,858 | .53 |
| Pillar ore..... | 5,747 | .57 |
| Probable ore..... | 3,845 | .46 |
| Total..... | 204,543 | 0.53 |

Surface Exploration

During the summer months the programme of prospecting, trenching, and sampling the main property was continued.

Diamond-Drilling

| | |
|----------------------------------|--------|
| | Feet |
| Underground No. 1 Operation..... | 10,567 |
| Underground No. 2 Operation..... | 719 |
| Surface..... | 10,022 |
| Total..... | 21,308 |

Costs

A comparison of operating costs per ton milled with those of the previous year is as follows:—

| | 1936 | 1937 |
|---|---------|---------|
| Surface exploration..... | \$0.13 | \$0.27 |
| Underground exploration and development, including shaft..... | 2.66 | 2.33 |
| Mining..... | 2.40 | 2.17 |
| Milling..... | 2.47 | 2.05 |
| General expense at mine..... | .97 | .61 |
| Administration expense..... | .32 | .28 |
| | \$8.95 | \$7.71 |
| Allowance for Dominion and Provincial taxes..... | 1.09 | 1.06 |
| Depreciation and pre-production expense written off..... | 2.22 | 2.20 |
| Total..... | \$12.26 | \$10.97 |

Recovery remained constant at 97 to 98 per cent. calculated heads.

Additions to the plant during 1937 included a temporary hospital, retail store with refrigeration plant, fire hall, staff-house, bunk-house, powder magazine, lime storage building, pump-house, and crusher-house addition with new units, including a secondary crusher. Additions to the equipment included a 750-cubic-foot Belliss and Morcom compressor with a 150 h.p. synchronous motor; a 24- by 18-inch Ingersoll-Rand, single-drum electric hoist; a 5-hose fire pump and sprinkler system; and an auxiliary 125 k.v.a. generator, driven by a 125 h.p. Sterling gasoline engine. The 75 h.p. motor on the main hoist was replaced by one of 125 h.p. to increase the speed of the hoist from 600 to 900 feet per minute.

The average number of men employed daily was 183, divided as follows: surface and office, 61; construction, 12; underground, 97; mill, 13. R. E. Barrett is manager.

SPRINGER OR No. 2 OPERATION

The Springer, or No. 2 Operation, is located about 3½ miles east of the main shaft and is reached by the road between the Central Patricia and Pickle Crow mines. Operations at this property were resumed in November, 1936, after a shut-down of nearly a year.

The following is taken from the report of the mine manager for the year ending December 31, 1937:—

The shaft was deepened to 420 feet and two levels opened at 275 and 400 feet. Drifting on the vein in these levels showed results similar to those obtained under previous exploration of the 150-foot level. The vein as developed contains two shoots with a combined average length per level of 131 feet, and a total indicated tonnage, exclusive of pillars, of 8,326 tons of 0.97-ounce grade, calculated on a 36-inch mining width. Actual mining would show some dilution with a corresponding drop in grade. The shoots showed lengths and grades on the 400-foot level comparable to those on the 150-foot level.

The mine was closed temporarily in September after construction of a picking plant and ore bin preparatory to resumption of operations in the spring.

The development completed to September 9 was as follows:—

| Level | Crosscuts | Drifts | Raises |
|---------------|-----------|--------|--------|
| | feet | feet | feet |
| 150-foot..... | 393 | 896 | ..... |
| 275-foot..... | ..... | 436 | 187 |
| 400-foot..... | 56 | 543 | 67 |

Stopes were opened on all three levels, and 2,370 tons of ore was hoisted. About 150 tons were treated in the Central Patricia mill for testing, and no changes will be necessary in order to provide for the inclusion of the Springer ore in the mill feed.

Buildings erected on the property include a hoist- and power-house, black-smith shop, powder magazine, two bunk-houses, office, warehouse, and cookery. The mining plant includes a Flory double-drum hoist, driven by a 125 h.p. Westinghouse motor; one 750-cubic-foot Ingersoll-Rand compressor operated by a 150 h.p. Westinghouse motor and a 135 h.p. boiler.

The average number of men employed daily was 30, of whom 12 were underground. H. A. Graves was in charge of operations.

Central Porcupine Mines, Limited

Central Porcupine Mines, Limited, which was incorporated in December, 1933, has an authorized capitalization of 5,000,000 shares of \$1 par value, of which 3,595,118 have been issued. The officers and directors are: E. Ward Wright, president; C. D. H. MacAlpine, vice-president; Geo. G. Blackstock, secretary-treasurer; W. J. Hume and Jos. Montgomery, directors. The head office is at 25 King Street West, Toronto. The mine address is Schumacher.

The property consists of a group of 13 claims adjoining the south boundary of Coniaurum Mines, Limited, in the township of Tisdale, Porcupine area, district of Cochrane. No underground development, other than diamond-drilling, was done on the property in 1937. The development footage of crosscutting and line drive work done previous to 1937 amounts to 3,831 feet. This work was all done on the 1,000-foot level, working from the 1,000-foot level of the Coniaurum mine. Eight diamond-drill holes, having a total footage of 6,139 feet, were drilled from underground in 1937. Nine holes, having a total footage of 6,958 feet, were drilled from surface in the same period. Operations were suspended in September, 1937. Bruce Russell was mine superintendent during the period of operation.

Chesterville Larder Lake Gold Mining Company, Limited

Chesterville Larder Lake Gold Mining Company, Limited, was incorporated in March, 1907, with an authorized capital of 1,000,000 shares of \$1 par value. The capitalization was increased to 1,500,000 shares in August, 1937. At December 31, 1937, the number of shares issued amounted to 886,552. The officers and directors are: C. W. Casselman, president; J. T. Kearns, secretary-treasurer; L. J. Kearns, C. King, and W. H. Kippen, directors. The head office is at 330 Bay Street, Toronto. The mine address is Larder Lake.

The property consists of three claims, H.F. 404-406, in McGarry township, Larder Lake area, district of Timiskaming.

A holding company, Kearns Properties, Limited, was formed, and the surface rights on claims H.F. 405 and 406 were leased to it. A townsite has been

laid out on these claims, and preparations are being made for providing housing for employees.

Beginning in February, 1937, and continuing until November, 11,529 feet of diamond-drilling was done on claim H.F. 404, and 3,119 feet on claims H.F. 405 and 406.

During the year the company built a powder magazine, an office, a dry, a steel-shop, a hoist- and compressor-building, and a boiler-house.

New plant equipment installed during the year included a 36- by 48-inch, double-drum hoist; a 1,000-cubic-foot compressor, a steel-sharpener and furnace, and a 20 h.p. boiler.

A 3-compartment shaft, 17 feet by 6 feet 9 inches, was sunk to a depth of 32 feet. Plans were made to sink to 330 feet and to drift at the 150- and 300-foot levels during 1938.

An average of 12 men was employed under the direction of L. T. Postle, mine manager, and Dr. W. F. James, consulting geologist.

Clark Gold Mines, Limited

Clark Gold Mines, Limited, was incorporated in October, 1934, with an authorized capitalization of 2,000,000 shares of \$1 par value. The officers and directors are: W. S. Lighthall, president; H. D. Roberts, vice-president; D. W. Blaise, secretary-treasurer; F. W. Hunt, F. W. Evans, G. L. Davis, Mrs. E. M. McLean, and G. Turner, directors. The head office is at 836 Dominion Square Building, Montreal, Que. The mine address is Dymont.

The property includes 14 unpatented and 1 patented claim, totalling 620 acres, located in the southwest corner of Melgund township, district of Kenora. The mine lies about 8 miles south of Dymont on the main western line of the Canadian Pacific Railway. A gravel road has been constructed from the Trans-Canada highway to the mine.

Early in 1937 a new mining plant was installed, a new headframe erected, and the shaft retimbered. During the year operations, which were carried on spasmodically, consisted mainly of surface diamond-drilling and shaft-sinking. At the end of the year the shaft was 280 feet deep, with levels at 68, 125, and 250 feet. Lateral work amounted to 32 feet of drifting on the 68-foot level, and 134 feet of drifting and 134 feet of crosscutting on the 125-foot level. Fifteen diamond-drill holes, totalling 4,500 feet, were drilled from surface.

When the mine was closed down at the end of the year plans were being made to erect a 25-ton mill. Buildings on the property include a bunk-house, cookery, office, power- and hoist-house, warehouse, blacksmith shop, powder magazine, cap-house, and three residences.

The mining equipment includes two 60 h.p. return tubular boilers; one 80 h.p. return tubular boiler; two Ingersoll-Sargent straight-line compressors, having a combined capacity of 800 cubic feet; and a 9- by 10-inch Mead Morrison double-drum steam hoist.

During the periods of operation an average of 30 men was employed, of whom 12 were underground. R. S. Douglas was manager.

Cline Lake Gold Mines, Limited

Cline Lake Gold Mines, Limited, was incorporated in August, 1936, with an authorized capitalization of 2,000,000 shares of \$1 par value. The officers and directors are: J. A. O'Brien, president; J. G. Dickenson, vice-president; J. N. Rougvie, secretary; P. A. Dymont and Harold Dymont, directors. The head

office is at 900 Victoria Building, Ottawa. The property is located in township 48, Goudreau area, district of Algoma.

Following the installation of an electrical mining plant and a 95-foot steel headframe, sinking with power was started on March 31, 1937, in the 3-compartment vertical shaft, in which hand-steel sinking had been suspended at a depth of 35 feet. It was completed to a total depth of 522 feet, and levels were established at 125, 250, 400, and 500 feet. By the end of the year 38 feet of cross-cutting had been accomplished on the 125-foot level, 250 feet on the 250-foot level, 37 feet on the 400-foot level, and 58 feet on the 500-foot level. A total of 19,935 feet of diamond-drilling was done during the year.

The plant included a 1,080-cubic-foot Ingersoll-Rand electric compressor and an Ingersoll-Rand double-drum electric hoist. Buildings constructed during the year consisted of an office, hoist-compressor building, boiler-house, change-house, machine shop, carpenter shop, storehouse, blacksmith shop, oil-house, assay office, explosives magazines, and eleven dwellings.

The construction of a 200-ton cyanide mill was started in the fall; by the end of the year the crusher building had been framed and closed in and the concrete foundation and part of the steel work for the mill building had been completed.

An average of 97 men was employed during the year under the direction of A. H. Hinton. The mine address is Lochalsh.

Cochenour Willans Gold Mines, Limited

Cochenour Willans Gold Mines, Limited, was incorporated in 1936 with an authorized capital of 3,000,000 shares of \$1 par value. The officers and directors are: W. M. Cochenour, president; A. Mackenzie, vice-president; G. M. Huycke, secretary-treasurer; G. E. Atwood and S. G. Gibson, directors. The head office is at 801 Dominion Bank Building, Toronto, and the mine address is McKenzie Island, Red Lake.

The property consists of 13 claims, comprising 550 acres, in Dome township, Red Lake area, Patricia portion of Kenora district. The mine may be reached from Red Lake by boat.

In 1934 the property was optioned from the Cochenour Willans Syndicate by Hollinger Consolidated Gold Mines, Limited, who sank a 3-compartment vertical shaft 174 feet and did 750 feet of drifting and 1,150 feet of crosscutting on the 150-foot level. The Hollinger relinquished its option in 1935, after which operations were suspended. The present company acquired the property from the syndicate.

Operations under the present company were resumed in April, 1936, and 700 feet of diamond-drilling on surface and 2,500 feet on the 150-foot level were done before operations ceased. Underground work was resumed in August, 1936, and continued to the end of the year. The shaft was deepened to 324 feet and a second level was established at 275 feet.

During 1937 development work was done on both levels. Six veins in all have been located, but values are erratic. Underground operations continued until the end of July, at which time it was decided to discontinue development and concentrate on a diamond-drilling programme. At the end of the year, 4,211 feet of diamond-drilling had been accomplished underground.

The following table shows the development work completed at December 31, 1936, and August, 1937:—

| | To Dec. 31, 1936 | 1937 | Total |
|-----------------|---------------------|---------------|-------------|
| Shaft..... | feet 324 | feet | feet 324 |
| 150-FOOT LEVEL: | | | |
| Drifts..... | 750 | ..... | 750 |
| Crosscuts..... | 1,530 | 64 | 1,594 |
| Raises..... | ..... | 392 | 392 |
| 275-FOOT LEVEL: | | | |
| Drifts..... | 490 | ..... | 490 |
| Crosscuts..... | ..... | 996 | 996 |

During July an electric plant was installed. The former mining plant consisted of a 60 h.p. boiler, an Ingersoll-Rand single-drum, 6- by 8-inch reversible steam hoist, and a 310-cubic-foot oil-driven portable compressor. The new equipment installed includes a 1,385-cubic-foot Ingersoll-Rand X.B.H.E.2 compressor, driven by a 250 h.p. General Electric motor; an Ingersoll-Rand double-drum, 36- by 25-inch hoist, driven by a 75 h.p. General Electric motor; and three 300 k.v.a. and two 100 k.v.a. transformers.

The surface buildings include a power-house, hoist-room, dry-house, powder magazine, cap-house, bunk-house, cookery, office, and manager's residence. New buildings erected were an electrical shop and power- and hoist-house.

An average of 42 men was employed daily, 20 of whom were underground. J. T. Randall was the resident engineer.

Cole Gold Mines, Limited

Cole Gold Mines, Limited, was incorporated in November, 1933, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers are: John Y. Cole, president and treasurer; Wm. Exton, Jr., vice-president; Cecily Cole, secretary. The executive office and mine office are both at Cole.

The property consists of 57 patented claims, totalling 2,500 acres, located on the southwestern shore of Pipestone bay in Red lake, some 30 miles west of the town of Red Lake in Ball township, in the Patricia portion of Kenora district.

Development to the end of 1937 is given in the following table:—

| Level | Feet |
|---------------|-------|
| 200-foot..... | 2,000 |
| 300-foot..... | 900 |
| 400-foot..... | 250 |
| 500-foot..... | 2,600 |

Diamond-drilling to the end of 1937 amounted to 5,000 feet, 1,400 feet of which was done during that year.

The camp buildings consist of a power- and hoist-house, pipe-house, bunk-house, cookery, office, powder magazine, cap-house, and a manager's residence built during 1937.

The mining plant includes a 70 h.p. locomotive-type boiler, a 250-cubic-foot Ingersoll-Rand compressor, and an 8- by 10-inch reversible, single-drum Jenckes steam hoist.

Ten men were employed daily under the direction of John Y. Cole as manager.

Coniaurum Mines, Limited

Coniaurum Mines, Limited, was incorporated in July, 1924, with an authorized capitalization of 6,000,000 shares of no par value. The capitalization

was reduced to 3,000,000 shares in 1937 by the cancellation of 3,000,000 unissued shares. The issued shares number 2,730,447. The officers and directors of the company are: Thayer Lindsley, president; A. L. Bishop, vice-president; H. Whittingham, secretary-treasurer; H. S. Munroe, H. Lindsley, Alex. Longwell, and T. H. Rea, directors. John Redington is mine manager. The head office of the company is at 25 King Street West, Toronto. The mine address is Schumacher.

The mine property consists of 19 claims, containing 760 acres, adjoining the McIntyre-Porcupine mine, in the township of Tisdale, Porcupine area, district of Cochrane. The company also holds three additional claims in the same township. The following statement by the president is taken from the company's annual report for the year ending December 31, 1937:—

During 1937 a substantial holding was acquired in Ridgely Gold Mines, Limited, whose claims lie immediately east of your property, under a contract whereby your company may in due course assume control of Ridgely. This ground is thought to possess attractive possibilities in depth, owing to the plunge of the structure. Since the end of the year a small participation has been taken in new exploration work to be carried on by Hoyle Gold Mines, Limited.

The following table shows the lateral development work accomplished, by levels, in 1937:—

| Level | Cross-cutting | Drifting | Raising | Diamond-drilling |
|-----------------|---------------|----------|---------|------------------|
| | feet | feet | feet | feet |
| Surface..... | | | | 8,270 |
| 400-foot..... | 1,141 | 284 | | 1,397 |
| 500-foot..... | | | | 1,281 |
| 700-foot..... | 394 | | | 1,822 |
| 770-foot..... | 119 | 57 | 143 | |
| 1,000-foot..... | 84 | 170 | | 3,029 |
| 1,250-foot..... | 63 | 169 | 30 | |
| 2,000-foot..... | | | | 3,296 |
| 2,750-foot..... | 111 | 89 | 454 | 352 |
| 3,000-foot..... | 110 | 55 | | 392 |
| 3,250-foot..... | 1,048 | 1,030 | 522 | 4,041 |
| 3,500-foot..... | 1,037 | 671 | 629 | 7,619 |
| 3,750-foot..... | | 755 | 321 | 1,620 |
| 4,000-foot..... | 101 | 1,990 | 1,131 | 4,038 |
| 4,250-foot..... | 286 | 177 | 54 | 324 |
| 4,500-foot..... | 450 | 251 | | 2,072 |
| 4,750-foot..... | | | | 926 |
| 5,000-foot..... | 1,211 | | | 2,696 |
| Total..... | 6,155 | 5,698 | 3,284 | 43,175 |

The following is an extract from the report of the mine manager for the year ending December 31, 1937:—

Development and Exploration

Exploration has been carried on in various parts of the mine. No. 2 winze has been the centre of a large development campaign, and since July this section has been the point of intensive activity. Levels are established at 250-foot intervals from the 3,000- to the 5,000-foot level, but only on the 4,000-foot level has work progressed sufficiently to produce significant results. On this level, considering the comparatively small footage driven, namely 2,091 feet, the ore developments have far exceeded those of any previous level. The ore here developed is believed to be pitching to the east, corresponding to the pitch angle of the porphyry masses, and it will be several months before the corresponding areas on the lower levels can be fully explored. Development of the levels tributary to No. 2 winze will be intensified during 1938. The Bishop subshaft has reached a depth of 1,111 feet below the 3,500-foot level with stations cut at 250-foot intervals. Sinking was temporarily stopped here in July to enable a greater programme of development in No. 2 winze. The total footage of all classes of exploration has exceeded any year in the mine's history.

Considerable diamond-drilling has been done on some favourable outcrops on the surface, as well as various places underground, to gain geological information and to determine the location of ore bodies.

On the 3,000-foot level it was necessary to make a large excavation for the accommodation of a new permanent hoist and rope raise for the winze.

SUMMARY OF DEVELOPMENT

| | Feet |
|------------------------|--------|
| Sinking | 1,039 |
| Drifting | 5,698 |
| Crosscutting | 6,155 |
| Raising | 3,284 |
| Diamond-drilling | 43,175 |

The footage driven in ore was 3,173 feet, with an average value of 5.5 pennyweights per ton over a width of 5.3 feet. Raising in ore 1,732 feet over a width of 5 feet averages assay values of 5.2 pennyweights per ton.

Broken Ore Reserves

The mining methods have been changed on the lower levels from shrinkage stoping to cut-and-fill. For this reason the broken reserves have been reduced 19,790 tons.

The broken ore reserves at the end of 1937 were 151,885 tons at 5 pennyweights per ton. Last year's reserves were 171,675 tons at 5.2 pennyweights.

Milling

During the year the mill treated 166,980 tons of ore with an average recovery of \$8.757 per ton, extracting 95.19 per cent. of the gold content, operating 362.9 days, or 99.4 per cent. of possible running time. It is anticipated that the 1938 tonnage milled will be somewhat greater than that of 1937.

New Equipment and Improvements to Buildings

During the year a much needed new modern dry was built of steel, concrete, and tile construction with space to accommodate 440 men. In addition to this a new tandem double-drum hoist, drums 6 feet in diameter, hoisting speed 1,000 feet per minute, was put into operation in July to service No. 2 winze from the 3,000- to the 5,000-foot levels, with two combination 3-ton skips and cages. There was also one new cottage erected to accommodate a member of the staff.

One extra tray has been added to the Dorr thickener to facilitate an increased tonnage, as well as improvements to the main belt-conveyer from the rock house to the mill.

The average number of men employed during the year was 380, of whom 269 were underground and 25 in the mill.

Consolidated Mining and Smelting Company of Canada, Limited

The Consolidated Mining and Smelting Company of Canada, Limited, which was incorporated in January, 1906, has an authorized capitalization of \$20,000,000 divided into 4,000,000 shares of \$5 par value. The officers and directors are: Jas. J. Warren, president; Sir E. W. Beatty, vice-president; S. G. Blaylock, vice-president and general manager; Jas. E. Riley, secretary-treasurer; Henry Joseph, R. H. McMaster, Sir Herbert Holt, Hon. R. R. Bruce, L. A. Campbell, Thayer Lindsley, F. Gordon Osler, R. S. McLaughlin, Sir Chas. Gordon, and W. N. Tilley, directors. The head office is at 215 St. James Street West, Montreal, Que. An office is maintained at 302 Bay Street, Toronto.

Addington Mine

The Addington mine, also known as the Rich Rock, in Kaladar township, Lennox and Addington county, is owned by Addington Mines, Limited, and operated under the control of the Consolidated Mining and Smelting Company of Canada, Limited. The property consists of 496 acres in lots 24 and 25, concession VI. A reference to the organization of Addington Mines, Limited, appears on page 81 of this report.

During 1937 the shaft was sunk a further 43 feet to an inclined depth of 535 feet and a level was established at 500 feet. Lateral work amounted to 11,241 feet of crosscutting and 3,381 feet of drifting. Some 20 feet of raising was done.

The mine operated during the year with an average force of 47 men, under the supervision of J. E. Hawes, manager.

Cordova Mine

The Consolidated Mining and Smelting Company of Canada owns and operates the Cordova mine on the east half of lot 20, concession I, Belmont township, Peterborough county.

During 1937 the following work was done: diamond-drilling underground, 4,409 feet; crosscutting, 1,304 feet; drifting, 4,585 feet; raising, 289 feet.

An average force of 65 men was employed under the supervision of C. A. Seaton, superintendent.

Garrcon Property

Operations at the Garrcon property, in Garrison township, district of Cochrane, were continued during 1938 under the direction of the Consolidated Mining and Smelting Company of Canada.

A shaft, inclined at 62 degrees, has been sunk on the property to a depth of 260.5 feet. Only 4.5 feet of sinking was done in 1937. Levels have been opened at vertical depths of 100 and 200 feet below the collar. The following table shows the footage of lateral development work done on these levels since the commencement of operations:—

| Level | 1935 | 1936 | 1937 | Total |
|-----------------|-------|-------|-------|-------|
| | feet | feet | feet | feet |
| 100-FOOT LEVEL: | | | | |
| Crosscuts..... | 236 | 89 | ..... | 325 |
| Drifts..... | 236 | 75 | ..... | 311 |
| 200-FOOT LEVEL: | | | | |
| Crosscuts..... | 476 | 1,050 | 518 | 2,045 |
| Drifts..... | 57 | 529 | 1,024 | 1,610 |
| Total..... | 1,005 | 1,743 | 1,542 | 4,291 |

Diamond-drilling in 1937 amounted to 21 holes, 5,070 feet, from surface, and 33 holes, 5,905 feet, from underground.

The average number of men employed during the year was 22. R. Jure was superintendent of mining operations. All work was suspended at the end of the year.

A list of the officers and directors of Garrcon Mines, Limited, appears on page 124 of this report.

Hermiston-McCauley Property

The Hermiston-McCauley property, situated in Strathy township, district of Nipissing, consists of 2 claims, 104.34 acres, held under option.

Work was carried on throughout 1937. New equipment included a Mead Morrison double-drum hoist, a 100 h.p. Caterpillar Diesel engine, and a 360-cubic-foot Gardner Denver compressor.

The vertical, 3-compartment shaft was sunk a further 137 feet to a total depth of 184 feet. A level was established at 150 feet, and 803 feet of cross-cutting and 2,373 feet of drifting were done. Diamond-drilling from underground amounted to 3,067 feet, and some 300 feet of surface-trenching was done.

An average of 33 men was employed during the year. A. S. Hudson was succeeded as manager by E. D. O'Brien. The mine address is Timagami.

New Golden Rose Mine

The property owned by New Golden Rose Mines, Limited, in Afton township, Timagami Forest Reserve, district of Sudbury, is operated under the direction of the Consolidated Mining and Smelting Company of Canada, Limited, and includes the property formerly known as the Afton mine. A list of the officers and directors of the company appears on page 180 of this report.

Operations were carried on throughout 1937. The 3-compartment vertical shaft was sunk an additional 247 feet to a total depth of 735 feet, and levels were established at 591 and 716 feet.

The development work accomplished on the various levels during the year, and the total to the end of 1937, was as follows:—

| Level | Drifting | | Crosscutting | | Raising | |
|---------------------------|----------|-------|--------------|-------|---------|-------|
| | 1937 | Total | 1937 | Total | 1937 | Total |
| | feet | feet | feet | feet | feet | feet |
| 66-foot (adit) | 9 | 9 | ..... | 323 | ..... | ..... |
| 216-foot | 134 | 172 | 60 | 330 | 75 | 75 |
| 316-foot (sublevel) | 30 | 30 | ..... | ..... | ..... | ..... |
| 341-foot | 440 | 1,442 | 10 | 564 | 253 | 313 |
| 396-foot (sublevel) | 277 | 323 | 81 | 95 | 16 | 16 |
| 466-foot | 316 | 1,249 | 138 | 559 | 76 | 276 |
| 591-foot ..... | ..... | ..... | 155 | 155 | ..... | ..... |
| 716-foot ..... | ..... | ..... | 217 | 217 | ..... | ..... |
| Total | 1,206 | 3,225 | 661 | 2,243 | 420 | 680 |

Stoping was done on the 216-, 341-, and 466-foot levels, and also on the 396-foot sublevel. A total of 2,620 feet of diamond-drilling was done in 1937, of which 1,560 feet was from underground.

The 100-ton cyanide mill was completed, and put in operation on July 23, 1937. It handled a total of 16,811 tons up to the end of the year.

A 158 h.p. Ruston-Hornsby Diesel engine driving a 750-cubic-foot Belliss and Morcom compressor was added to the plant.

An average of 149 men was employed during the year. D. C. McKechnie is manager, and W. E. Aitchison is mine superintendent. The mine address is Glen Afton.

Ritchie Mine

The Ritchie property, consisting of 17 acres in Gauthier township, Kirkland Lake area, district of Timiskaming, is held under option from Ritchie Gold Mines, Limited.

Operations at the property were discontinued in December, 1936, and the mine was allowed to fill with water. Early in January, 1937, operations were resumed. The mine was dewatered, and crosscutting and diamond-drilling were proceeded with until November, when the mine was again shut down.

During the 10 months of operation an average of 28 men was employed. C. E. White was manager. The mine office address was Kirkland Lake.

Continental Kirkland Gold Mines, Limited

Continental Kirkland Gold Mines, Limited, was incorporated in December, 1927, with an authorized capital of 5,000,000 shares of \$1 par value, of which 2,990,156 have been issued. The officers and directors are: H. A. Guess, president; R. F. Goodwin, vice-president; G. A. Brockington, secretary; J. C. Emison, treasurer; E. C. Corson and C. Earl, assistant treasurers; F. G. Hamrick, comp-

troller; A. W. Holmsted and C. W. Bell, directors. The head office and mine office are at Kirkland Lake. Further details regarding the formation of the company will be found in the account of Toburn Gold Mines, Limited, on page 219 of this report.

The property consists of 27 claims, 1,047 acres, in Lebel township, Kirkland Lake area, district of Timiskaming.

Operations commenced on March 1, 1937, and continued throughout the year. The No. 1 shaft, which had been sunk to a depth of 800 feet by previous operators, was dewatered and the underground workings were examined. Some 375 feet of crosscutting, 238 feet of drifting, and 2,055 feet of underground diamond-drilling were accomplished.

New buildings constructed during the year included an outdoor substation, change-house, boiler-house, powder magazine, and an addition to the hoist- and compressor-building.

New plant equipment includes a 36- by 34-inch, double-induction, single-drum hoist; a 200 h.p. motor for the compressor; a 60 h.p. motor for the hoist; a 65 h.p. heating boiler; two 200 k.v.a. transformers; two No. 5 Ingersoll-Rand steel-sharpeners; a Holman hot milling machine; a water-tank and 30 h.p. pump; and a 3 h.p. motor for the lake pump.

An average of 26 men was employed under the direction of M. W. Hotchkin, mine manager.

Cook Lake Gold Mines, Limited

Cook Lake Gold Mines, Limited, which was incorporated in October, 1936, has an authorized capitalization of 2,000,000 shares of \$1 par value, of which 1,464,405 shares had been issued at November, 1937. The officers and directors are: C. H. Palmer, Jr., president; H. G. Donley, secretary; W. H. Stanley, G. G. Barber, and E. J. McKenna, directors. The head office is at 350 Bay Street, Toronto. The mine address is Schreiber.

The property consists of 17 unpatented claims, comprising about 800 acres, and is situated about 4 miles north of Schreiber on the main line of the Canadian Pacific Railway, in the district of Thunder Bay. The claim numbers are: T.B. 12,881-12,886, 12,878, 12,879, 13,126-13,129, 13,177-13,179, and 18,889.

The tunnel operations commenced in October, 1936, on claim T.B. 13,179 were continued during 1937. This tunnel was extended for 410 feet, crosscutting the veins outcropping on the crest of the hill. From this tunnel 200 feet of drifting was done on the veins. In addition, considerable trenching was done on surface, and several bulk samples, totalling 32 tons, were taken from the veins and shipped to the Little Long Lac mine for test treatment.

Late in the year, the sinking of a 2-compartment, vertical shaft was commenced. The shaft had reached a depth of 115 feet at the end of the year. It is reported that the present object is to sink to 135 feet and establish the first level at 125 feet.

Mining plant equipment includes a Gardner Denver 445-cubic-foot compressor, driven by a 138 h.p. Caterpillar Diesel; a 10 h.p. boiler; and a small steam hoist.

Buildings erected during 1937 included power-house, blacksmith shop, boiler-house, hoist-room, warehouse, stable, office, bunk-house, and cookery.

There was an average of about 12 men employed under the direction of A. L. Kemp.

The Cook Lake Gold Mines, Limited, has two subsidiary companies: Nicopor Mines, Limited, and Molydor Mines, Limited.

Crescent Kirkland Gold Mines, Limited

Crescent Kirkland Gold Mines, Limited, was incorporated in August, 1936, with an authorized capital of 3,000,000 shares of \$1 par value, of which 2,100,000 have been issued. The officers and directors are: W. B. Robb, president; G. W. Morris and H. A. Newman, vice-presidents; E. E. Meadows, secretary-treasurer; E. M. Murphy and A. C. De Spirt, directors. The head office is at 156 Yonge Street, Toronto. The mine office during the period of operation was at Swastika.

The property consists of 10 claims and a fraction in Teck and Otto townships, Kirkland Lake area, district of Timiskaming.

Underground operations were carried on from January 1 to May 15, 1937, during which time 1,512 feet of drifting, 1,866 feet of diamond-drilling underground, and 1,784 feet from surface were done. All operations ceased on June 30.

An average of 26 men was employed for six months. J. Baker succeeded H. A. Gauthier as superintendent.

Darkwater Mines, Limited

Darkwater Mines, Limited, was incorporated in October, 1935, by Robb-Montbray Mines, Limited, to acquire and operate a group of 41 claims, known as the Beidelman claims, located at the south end of Sturgeon lake, district of Kenora, approximately 43 miles southeast of Sioux Lookout and 13 miles from W. O. Junction on the Port Arthur-Sioux Lookout branch of the Canadian National Railways. The authorized capitalization is 1,500,000 shares of \$1 par value, of which 1,200,005 had been issued at December 31, 1937.

The officers and directors are: R. A. Bryce, president; T. O. Lyall, vice-president; L. Soliague, secretary-treasurer; C. C. Calvin, S. B. Playfair, and J. C. Beidelman, directors. The head office is at 85 Richmond Street West, Toronto. The mine address is W. O. Junction, via Sioux Lookout.

Underground operations were continued in 1937. The 3-compartment, vertical shaft was completed to a depth of 424 feet, and a third level was established at 375 feet. Considerable encouragement was received in the lateral development on the 125-foot level, but developments on the two lower levels gave rather discouraging results and operations were suspended in October, 1937. When the property shut down, underground development work amounted to 4,516 feet of drifting and crosscutting and 371 feet of raising.

During the period of operations there was an average of 48 men employed, of whom 27 were underground, under the direction of C. C. Huston.

Darwin Gold Mines, Limited

Darwin Gold Mines, Limited, was incorporated in August, 1934, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors were: Geo. C. Royce, president; David Gross, R. A. Darwin and H. Riley, directors. Corporation Management and Executives, Limited, was secretary-treasurer. The property is located in township 29, range 23, Michipicoten area, district of Algoma.

Work was continued in 1937 until early in December, when the company went into bankruptcy, with Frank O. Tidy, 9 Toronto Street, Toronto, as trustee.

During 1937 a 2-compartment, 45-degree winze was sunk 180 feet on the incline from the 800-foot level, and a ninth level was established at the 900-foot horizon. The development work accomplished on the various levels during the year, and the total to the end of 1937, was as follows:—

| Level | Drifting | | Crosscutting | | Raising | |
|------------|----------|--------|--------------|-------|---------|-------|
| | 1937 | Total | 1937 | Total | 1937 | Total |
| 2nd..... | feet | feet | feet | feet | feet | feet |
| 3rd..... | 102 | 640 | 113 | 1,006 | 9 | 50 |
| 4th..... | | 1,632 | | 591 | | 641 |
| 5th..... | | 1,264 | | 209 | | 1,238 |
| 6th..... | 244 | 1,992 | | 62 | 26 | 540 |
| 7th..... | 116 | 1,876 | | 146 | 185 | 499 |
| 8th..... | 350 | 1,376 | 157 | 571 | 434 | 509 |
| 9th..... | 689 | 689 | 37 | 37 | 184 | 184 |
| Total..... | 1,501 | 10,426 | 307 | 2,722 | 838 | 4,017 |

During 1937, 14,604 tons of ore were hoisted and 14,720 tons were treated in the 50-ton mill. An average of 72 men was employed under the direction of M. H. Froberg. The mine address is Gold Park.

The assets of the company were acquired by Baroda Gold Mines, Limited, in February, 1938.

Dawson-White Gold Mines, Limited

Dawson-White Gold Mines, Limited, was incorporated in November, 1936 with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,375,005 shares have been issued. The officers and directors are: Jas. E. Day, president; H. E. Martin, vice-president; F. L. Heard, secretary-treasurer; M. L. Quillinan, Alexander McDougall, and H. R. Pickens, directors. The head office is at 1116 Federal Building, Toronto. The mine address is Savant Lake.

The property consists of 9 patented claims and 3 unpatented claims on the northeast shore of North bay, Sturgeon lake. It is located about 6 miles southeast of Savant Lake station on the main line of the Canadian National Railways district of Thunder Bay. The claim numbers are: T.B. 6,977-6,982, H.W. 696-698, and T.B. 23,224-23,226. Claim T.B. 6,980 is the location of the old Dawson-White mine, which was operated in 1900 and 1901 by the Sturgeon Lake Mining Company, at which time, a 70-degree inclined shaft was sunk to a depth of 70 feet and about 50 feet of crosscutting and 30 feet of drifting was done at this horizon. The open cut was also worked north of the shaft, and a 10-stamp amalgamation mill was installed. Some exploration work was again done in 1911 by the English River Gold Mining Company, but was not continued long after this time.

The present company commenced operations in February, 1937. Camps, including a bunk-house, cookery, office and warehouse, were built, and in the spring 28 diamond-drill holes were put down, totalling 6,000 feet.

On May 23 the sinking of a 2-compartment, vertical shaft was commenced about 140 feet northeast of the old workings.

The mining plant included two 70 h.p. boilers; an Ingersoll-Rand straight-line, 600-cubic-foot steam compressor; and an Ingersoll-Rand double-drum, 8- by 6-inch steam hoist. A new headframe, blacksmith shop, cap-house, and powder magazine were erected.

Sinking under power was commenced on June 11, and the shaft was sunk to a depth of 220 feet, with 80 feet of crosscutting, 190 feet of drifting, and 30 feet of raising on the 100-foot level, and 85 feet of drifting on the 200-foot level.

It was reported that underground exploration gave encouraging results, but owing to lack of finances operations were suspended on September 29, and the

company was declared bankrupt on November 19, 1937. An option on the balance of the treasury stock was then given to raise \$30,000. The sum of \$10,000 was paid on the \$23,000 debts, and a mortgage of \$20,000 was given to the trustee in bankruptcy. The bankruptcy order was then annulled.

During the period of operations there were 16 men employed, of whom 8 were underground, under the direction of D. M. McLarty.

Deep Lake Gold Mines Syndicate

Deep Lake Gold Mines Syndicate acquired the Deep Lake mine from J. C. Canfield and W. H. Hocking in March, 1937. The syndicate manager is Ellis B. Gill, and the executive office is at 109 North Union Street, Akron, Ohio. The property is located in township 29, range 23, Michipicoten area, district of Algoma.

The property was operated by Canfield and Hocking during January and February, 1937, during which period they milled a total of 375 tons of ore from stoping on the 100-foot level. The syndicate commenced operations in May and continued for the rest of the year, accomplishing 435 feet of drifting and 60 feet of crosscutting on the 100-foot level. The 2-compartment, 33-degree shaft was sunk an additional 40 feet to a total depth of 155 feet on the incline. The mill was not operated by the syndicate in 1937.

An average of 8 men was employed under the direction of A. M. George. The mine address is Gold Park.

Delnite Mines, Limited

Delnite Mines, Limited, which was incorporated in November, 1934, has an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: E. L. Koons, president; W. L. Marcy, vice-president; C. L. Ingham, treasurer; W. V. Moot, managing director; Harry Yates, Jas. Savage, and Jas. E. Day, directors. W. S. Walton is secretary. The head office address is 603 Royal Bank Building, Toronto. The mine address is Timmins.

The company holdings consist of a block of 5 claims in Deloro township, Porcupine area, district of Cochrane, three miles southeast of the town of Timmins.

The property has been developed through two shafts located 800 feet apart. No. 1 shaft is 391 feet and No. 2 shaft 1,032 feet in depth. The shafts are connected by crosscuts on the 250- and 375-foot levels. Mine levels are uniformly spaced at 125, 250, 375, 500, 625, 750, 875, and 1,000 feet. The first level, developed entirely from No. 1 shaft, is not directly connected with the No. 2 shaft. No development work was done on this level during 1937.

The following is taken from the manager's report for the fiscal year ending March 31, 1938:—

Milling operations commenced on June 1, with mill feed coming mainly from the surface ore dump. From June to November, approximately 50 per cent. of the mill feed was from the ore dump. Mill feed from December to March was all from underground.

In the first part of the year, No. 2 shaft was being sunk, and work underground at No. 1 shaft consisted almost entirely of stope preparation. No. 2 shaft was completed to a vertical depth of 1,032.5 feet in the latter part of June, with five new levels at the 500-, 625-, 750-, 875-, and 1,000-foot elevations. With the completion of No. 2 shaft, development work was started on the five new levels, and a more active stoping programme was started on the upper levels. No. 1 shaft was not used during the winter months.

Production

The mill was started on a daily tonnage of about 125 tons. This rate was gradually stepped up to slightly over 200 tons per day. In the first half of March the tonnage was again increased to 225 tons per day.

During the ten months in which the mill was in operation, 57,689 tons were milled, producing 10,545.019 troy ounces of gold and 977.46 troy ounces of silver, which realized \$369,678.75. Extraction for the year averaged 91.4 per cent. Average recovery was \$6.408 per ton.

Mining

Underground work consisted in general of stoping on the 250- and 375-foot levels, the completion of No. 2 shaft, and development work on the new levels.

SUMMARY OF ORE AND WASTE HOISTED

| | No. 1 shaft | No. 2 shaft |
|-------------------------------------|--------------------|---------------------|
| | tons | tons |
| Development..... | 271 | 12,156 |
| Stopes (including back stopes)..... | 1,552 | 30,171 |
| Total ore hoisted..... | ¹ 1,823 | ² 42,327 |
| Waste hoisted..... | 764 | ³ 7,559 |
| Total hoisted..... | 2,587 | 49,886 |

¹To surface dump.

²To mill.

³Shaft waste not included.

ORE TO MILL

| | |
|----------------------------|--------|
| | Tons |
| No. 2 shaft..... | 42,327 |
| Ore from surface dump..... | 15,533 |
| Total to mill bins..... | 57,860 |

Broken Ore Reserves

Broken ore reserves are 20,504 tons underground and 3,000 tons (estimated) on the surface ore dump. Average value of broken ore underground is 3.36 pennyweights.

Development

A summary of development and exploration work for the fiscal year ending March 31, 1938, and prior thereto, is as follows:—

| | To Mar. 31, 1937 | Fiscal year ending Mar. 31, 1938 | Total |
|------------------------|---------------------|--|------------------|
| | feet | feet | feet |
| Drifting..... | 5,701.5 | 3,200 | 8,901.5 |
| Crosscutting..... | 3,678.5 | 1,879.5 | 5,558 |
| Sublevel drifting..... | 90 | 41 | 131 |
| Raising..... | 1,509 | 71 | 1,580 |
| Shaft-sinking..... | 1,053 | 370.5 | 1,423.5 |
| Shaft stations..... | 244 | 55 | 299 |
| Ore-pass raising..... | | 52.5 | 52.5 |
| Total..... | 12,276 | 5,669.5 | 17,945.5 |
| Diamond-drilling..... | 22,262 | | 22,262 |
| Sumps..... | | cu. ft. 1,220 | cu. ft. 1,220 |

Of the 3,200 feet of drifting, 2,133 feet (66.5 per cent.) was in ore, with an average grade of 3.97 pennyweights over 6.26 feet. In arriving at this average grade, all assays over 0.5 ounces were cut to 0.5 ounces. No diamond-drilling was done during the year.

Costs

Costs have been calculated on a per-ton-milled basis, from June 1, and do not include work done prior to that date.

| | Total cost | Cost per ton milled |
|---|---------------------|---------------------|
| OPERATING COSTS: | | |
| Development and exploration..... | \$67,303.40 | \$1.167 |
| Mining..... | 117,614.85 | 2.039 |
| Milling..... | 67,503.64 | 1.170 |
| General charges (mine) after deducting sundry revenue.... | 27,076.38 | .469 |
| Buffalo office expense, including legal fees..... | 9,026.97 | .157 |
| Bullion marketing expense, including Mint refining and handling charges..... | 4,983.50 | .086 |
| Total..... | \$293,508.74 | \$5.088 |
| OTHER COSTS: | | |
| Interest on notes and debentures, including debenture discount and expense written off..... | \$35,923.92 | \$0.622 |
| Depreciation expense..... | 33,746.50 | .585 |
| Preliminary development (written off)..... | 28,844.50 | .500 |
| Reserve for Ontario mining and corporation tax..... | 2,050.00 | .036 |
| Total..... | \$100,564.92 | \$1.743 |
| Total costs..... | \$394,073.66 | \$6.831 |

General Plant and Mill Construction

The mill and crusher-house construction started during the previous year was completed and the following construction work was accomplished: A steel shop was erected and a second sharpener purchased and put into operation; A refinery was built and equipped. A lime shed was erected. The steel shop, transformer-house, and dry-house from No. 1 shaft were moved to the No. 2 shaft site and refitted as a storehouse, cap-house, and mechanics' office and electrical shop. The bunk-houses were repaired and divided into rooms. Three new staff-houses were built. A 10-inch water line, with power and telephone line, was put in to Reid lake, a distance of about 2¼ miles. A pump-house was built and pump and necessary transformers and electrical apparatus installed. A motor-driven auxiliary power unit was constructed. A 500-gallon-per-minute fire-pump was set up. A fire hall with hose-cart and hose was built and equipped. A second furnace was placed in the assay office. New roads were built where necessary, and considerable clearing was done. Surface pipe lines were rebuilt and the system enlarged. In addition to the above, many smaller jobs were completed.

The following notes on the new milling plant are of interest. The mine bin has a total capacity of 400 tons. The crushing plant consists of a 15- by 24-inch jaw crusher followed by a 7-inch Newhouse in series with an Allis-Chalmers double-deck screen. The mill bin has a capacity of 600 tons. Grinding is done in a 6- by 10-foot Marcy ball mill in closed circuit with a Dorr classifier. The remainder of the circuit consists of a thickener, 4 agitators, and 2 Oliver filters. One agitator is placed ahead of the thickener in the circuit. The thickener in turn is followed by three agitators, with one filter placed between the first and second agitators following the thickener. The second filter follows the last agitator.

The average number of men employed in 1937 was 134. Kenneth C. Gray is manager.

Delwin Mines, Limited

Delwin Mines, Limited, which was incorporated July 5, 1937, taking over the assets of the Deloro-Wright Syndicate, has an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,000,005 have been issued. The officers and directors of the company are: C. Howard Lambert, president; C. B. Haskins, vice-president; H. E. Goetzmann, secretary-treasurer; J. H. Greenberg and M. Campbell, directors. The head office of the company is at 806 Dun Building, Buffalo, N. Y. The company also has an office at 607 Reford Building, Toronto. The mine address is Timmins.

The company owns fifteen claims, located in the southern part of Deloro township, Porcupine area, district of Cochrane. All the claims were patented in 1936.

Very little work was done on the property in 1937. Underground work was carried on only during the month of January. A crosscut was started from the 135-foot shaft at a depth of 125 feet and was driven a distance of 55 feet. The mine was then allowed to fill with water. Diamond-drilling was started in October and was continued to the end of the year, by which time 8 holes were completed. The total footage of drilling in these holes amounted to about 4,000 feet.

The average number of men employed during 1937 was 5. T. J. Wright is mine manager.

De Santis Porcupine Mines, Limited

When the De Santis Porcupine Gold Mining Company, Limited, reorganized in 1935, the name of the company was changed to De Santis Porcupine Mines, Limited, and the capitalization was reduced from 4,000,000 to 3,000,000 shares of \$1 par value each, shareholders receiving one new share for each two old shares held. At the end of 1937 the number of shares issued was 2,158,829. The head office of the company is at 42½ Second Avenue, Timmins. The officers and directors are: Theodore Pomeroy, president; Jos. V. Friel, vice-president; G. Giustini, secretary-treasurer; Peter De Santis, Frank Prest, and Q. A. Shaw McKean, directors.

The company holds 9 claims in Ogden township and 8 in Turnbull township, Porcupine area, district of Cochrane. Mining activities have been centred on the former group for a number of years. There are two shafts on this property. No. 1 is 200 feet deep, and No. 2 is 544 feet deep.

No. 2 shaft was sunk 124 feet during 1937 to open up the 575-foot level. The collar of No. 2 shaft is 36 feet lower than the collar of No. 1. Levels are shown as the depth below the collar of No. 1 shaft.

The following summary shows the amount of development work done during 1937, and the total to the end of the year:—

| Level | Drifting | | Crosscutting | | Raising | |
|---------------|----------|-------|--------------|-------|---------|-------|
| | 1937 | Total | 1937 | Total | 1937 | Total |
| | feet | feet | feet | feet | feet | feet |
| 90-foot..... | | 165 | | 205 | | |
| 200-foot..... | | 1,480 | | 1,325 | | 48 |
| 325-foot..... | 951 | 1,101 | 357 | 477 | 125 | 125 |
| 450-foot..... | 870 | 870 | 345 | 410 | 68 | 68 |
| 575-foot..... | 513 | 513 | 258 | 258 | 15 | 15 |
| Total..... | 2,334 | 3,129 | 960 | 2,675 | 208 | 256 |

Ninety diamond-drill holes, totalling 9,958 feet, have been drilled from underground.

Foundations for a mill were laid late in the fall of 1937, but lack of funds caused this work, as well as the underground work, to be suspended on October 7. The mine has been kept pumped out.

G. McCracken was superintendent of operations during the year. The average number of men employed was 33.

Devon Gold Mines, Limited

Devon Gold Mines, Limited, which was incorporated in October, 1937, has an authorized capitalization of 3,000,000 shares of \$1 par value. At the end of 1937, 900,010 shares were outstanding; of this latter number 900,000 are pooled. The company took over the assets and liabilities of Coulson Consolidated Gold Mines, Limited, on the basis of one share of the new company for three of the old. The officers and directors are: A. M. Beatty, president; H. C. Crow, vice-president; L. V. Sutton, G. E. Hill, J. B. Lind, and G. S. Haines, directors. A. Ritchie is secretary-treasurer. The head office is at 1,104 Northern Ontario Building, Toronto.

The company holds 10 patented claims situated in Coulson and Beatty townships, district of Cochrane, 13 miles, by road, northeast of Matheson.

There are two shafts on the property: The No. 1 or North shaft, 450 feet in depth, has not been pumped out recently; the No. 2 or South shaft is 570 feet in depth. Lateral work has been carried on from this shaft on levels at 160, 300, 425, and 550 feet. A winze 130 feet in depth was sunk during 1937 from the 550-foot level, and from it a level was opened at 650 feet. A total of about 2,950 feet of crosscutting and 5,200 feet of drifting has been done on these levels.

The mine plant was improved during 1937 by the addition of a new Canadian Ingersoll-Rand, Class P.S.R., 9- by 8-inch, double-drum hoist. This is operated by a 60 h.p. boiler. The mine machinery is operated by a Ruston-Hornsby V.X.C., three-cylinder Diesel engine, driving a 550-cubic-foot compressor.

The average number of men employed during the year was 31. H. Reinecke is manager. The mine address is Matheson.

Dome Mines, Limited

Dome Mines, Limited, has an authorized capitalization of 1,000,000 shares of no par value, all of which have been issued. Of the issued shares 26,666 are held in trust for the company, and the dividends on these are returned to the treasury.

The officers and directors of the company are: Jules S. Bache, president and treasurer; G. C. Miller, first vice-president; Morton F. Stern, second vice-president; J. H. Stovel, third vice-president; Alex. Fasken, secretary; E. P. Goetz, assistant treasurer and assistant secretary; C. C. Calvin, assistant secretary; John B. Robinson, assistant secretary; Dwight B. Lee, George H. Harris, Frank E. Maulson, Simon N. Stein, and J. G. Baragwanath, directors. The president's office is at 42 Broadway, New York. The secretary's office is at 36 Toronto Street, Toronto. The mine office, mine, and plant are at South Porcupine, in the townships of Tisdale and Whitney, Porcupine area, district of Cochrane. The property consists of 52 patented claims containing 2,085 acres.

The following is an extract from the president's report to the shareholders for the year ending December 31, 1937:—

The net excess of current assets (bonds and shares at market price) over current liabilities (including dividends payable January 20 and April 20, 1938, \$1,946,668), is the sum of \$5,432,529.96. The dividends paid in October, 1937, and declared for January and April, 1938, i.e. \$2,920,002, exceed the dividends paid in October, 1936, and in January and April, 1937, by \$1,460,001.

The following is taken from the report of the general manager for the year ending December 31, 1937:—

During the year 691,900 tons of rock was hoisted, of which 576,300 tons was ore, which was treated in the mill, and 115,600 tons was waste, which was brought to the surface and dumped into the open pit. In addition to the waste brought to the surface, 26,705 tons of waste was trammed directly to old stopes.

The 576,300 tons of ore milled yielded bullion containing 213,403.188 ounces of gold, the yield being 0.3703 ounces, or 7.406 pennyweights per ton.

All values of ore, etc., will be expressed in pennyweights throughout this report. One pennyweight equals one-twentieth of an ounce, Troy weight.

The following statement gives particulars of revenue and expenditure for the year under review:—

OPERATING STATEMENT

For the year ended December 31, 1937

EARNINGS:

Bullion production..... \$7,484,436.23

OPERATING AND MAINTENANCE EXPENDITURE:

| | |
|---|---------------------|
| Development and exploration..... | \$922,687.23 |
| Mining, including hoisting..... | 867,842.77 |
| Crushing and conveying..... | 109,826.38 |
| Milling..... | 530,103.03 |
| Bullion expense..... | 10,029.52 |
| Mint charges..... | 87,474.54 |
| Fire protection..... | 5,914.23 |
| Warehouse expense..... | 14,001.77 |
| Auditing expense..... | 3,056.00 |
| Administrative expense: | |
| Mine office..... | 143,963.66 |
| Executive office..... | 64,320.12 |
| Registrar and transfer fees and expenses..... | 17,258.64 |
| Municipal taxes..... | 25,049.61 |
| Insurance..... | 15,980.49 |
| Ontario corporations capital tax..... | 8,254.56 |
| | <u>2,825,762.55</u> |

NET OPERATING PROFIT FOR THE YEAR..... \$4,658,673.68

As indicated in the foregoing records, all of the production came from above the 15th level. During the year the upper levels and old workings were again combed over for possible ore. This resulted in the winning of considerable ore, which was not shown on our ore reserves.

The Ankerite vein-systems produced 100,059 tons of ore of an average grade of 6.910 pennyweights per ton. The mining on these veins was done above the 10th level. As work is continued on these veins their importance becomes more and more evident.

The Schumacher area produced 103,467 tons of an average grade of 9.678 pennyweights per ton. Ore from this area has now returned in profits approximately three-quarters of the purchase price.

The balance of the mine produced 372,774 tons of an average grade of 7.189 pennyweights per ton. Stopes not drawn on during the year contain 296,057 tons of broken ore.

Development

The following table sets forth details of the development work accomplished during the year:—

SUMMARY OF DEVELOPMENT BY LEVELS FOR THE YEAR 1937

| Level | Sta- tions | Sta- tion slab | Drifts | Cross- cuts | Drift and crosscut slab | Raises | Winzes | No. 6 shaft | No. 6 shaft slab | Deep- ening No. 3 shaft | Box- holes | Raise, winze, and box hole slab | Total | Dia- mond drill- ing |
|---------------------|---------------|----------------------|--------|----------------|----------------------------------|--------|--------|----------------|------------------------|----------------------------------|---------------|--|--------|-------------------------------|
| | feet | feet | feet | feet | feet | feet | feet | feet | feet | feet | feet | feet | feet | feet |
| 3rd..... | | | | | 21 | | | | | | | | 21 | |
| 5th..... | | | 401 | 264 | 151 | | | | | | 158 | 2 | 976 | 159.5 |
| 6th..... | | | 495 | 653 | 179 | 120 | | | | | 74 | 17 | 1,538 | 2,410.5 |
| 7th..... | | | 1,898 | 463 | 435 | 398 | | | | | 1,345 | 426 | 4,965 | 4,680 |
| 8th..... | | | 1,121 | 574 | 273 | 198 | | | | | 770 | 40 | 2,976 | 3,289 |
| 9th..... | | | 95 | | 11 | 196 | | | | | 125 | 25 | 452 | 2,540.5 |
| 10th..... | | | 356 | 854 | 159 | 307 | | | | | 159 | 38 | 1,873 | 4,165 |
| 11th..... | | | 730 | 24 | 117 | 225 | 41 | | | | 888 | 165 | 2,190 | 2,410 |
| 12th..... | | | 687 | 122 | 78 | 389 | | | | | 1,524 | 336 | 3,136 | 585 |
| 13th..... | | | 547 | 16 | 122 | | | | | | 454 | 10 | 1,149 | 3,444 |
| 14th..... | | | 911 | 581 | 418 | 192 | 15 | | | | 307 | 105 | 2,529 | 2,702.5 |
| 15th..... | | | | | | 40 | | | | | | 5 | 45 | 2,904 |
| 16th..... | | | 191 | 28 | 99 | 36 | | | | | | 1 | 355 | |
| No. 3 shaft..... | | | | | | 157 | 22 | | | 265 | | 8 | 452 | |
| No. 6 shaft..... | 1174 | 87 | | | 33 | 197 | 36 | 1,257 | 12 | | | 37 | 1,833 | |
| 17th..... | 15 | | | | | | | | | | | | 15 | |
| 18th..... | 31 | 50 | 1,631 | 88 | 68 | 447 | 17 | | | | | 12 | 2,344 | |
| 23rd..... | | | 16 | 43 | 8 | 88 | 4 | | | | | | 160 | |
| 24th..... | | | 152 | 44 | 2 | 310 | | | | | | 16 | 524 | |
| 25th..... | | | 264 | 47 | 2 | 313 | 17 | | | | | | 643 | 2,356 |
| 26th..... | | | 508 | 47 | 64 | 307 | | | | | | | 926 | |
| 27th..... | | | 495 | 74 | 29 | 395 | | | | | | 5 | 998 | 934 |
| 28th..... | | | 123 | | | | | | | | | | 123 | |
| 29th..... | | | 102 | | | 21 | | | | | | 3 | 126 | |
| Total. | 220 | 137 | 10,723 | 3,922 | 2,269 | 4,336 | 152 | 1,257 | 12 | 265 | 5,804 | 1,252 | 30,349 | 32,580 |

¹Seven stations.

The foregoing table shows the location of the 30,349 feet of development work accomplished. Most of the work done on the 16th level and below was in connection with the sinking of No. 6 shaft and the deepening of No. 3 shaft, and the providing of ore and waste handling facilities required for these shafts. This accounted for 8,390 feet of the development work and will be discussed in detail later in this report. Diamond-drilling completed during the year amounted to 32,580 feet.

No. 6 Internal Shaft

Work on this project was continuous throughout the year. The actual sinking of the shaft was completed on July 31, the final depth being 2,062 feet below its collar. This corresponds to a depth below the surface of 4,061 feet. The work done during the year in furthering this project amounted to a total of 5,897 feet, of which 1,257 feet was shaft-sinking.

Since the completion of the sinking, work has gone forward in preparing the shaft for the handling of ore and waste. The skip hoist has been installed, and both it and the man cage-hoist are in satisfactory operation. The loading pocket at the 29th level, which will handle all the ore and waste from this shaft, has been installed and is now in operation. The driving of ore and waste passes to connect the various levels to this loading station is proceeding satisfactorily. A crusher station is to be established at the 29th level, and the connection to this is now being driven. It is not anticipated that active development of the area to be served by this shaft will be under way before the end of 1938.

No. 3 Shaft

In order to improve the facilities for handling ore and waste through No. 3 shaft, and incidentally to provide two levels below the 16th level, the deepening of this shaft to a point below the 18th level was undertaken. The crusher now at the 8th level will be moved to the 16th level, and the crusher now at the 12th level will be moved to the 29th level of No. 6 shaft.

The shaft was deepened 265 feet or to a depth of 2,440 feet below the surface. This work was done without interfering with the normal operation of the shaft. Before this new section is put into operation, a crusher station on the 16th level and a loading pocket below the crusher station will be established and ore and waste passes will be driven from the 15th to the 14th level and from the 13th to the 12th level. This will permit ore and waste to be loaded from one point.

The work done in furthering this project amounted to 2,493 feet, of which 265 feet was shaft-sinking and 1,464 feet represented a connection from No. 5 winze to the 18th level of the shaft. This drift will serve as the main development drift from No. 3 shaft.

Ore Production

During the year the mine produced 576,300 tons of ore, which averaged 7.5873 pennyweights per ton. The stopes produced 488,500 tons, averaging 8.21 pennyweights per ton; and development work produced 87,800 tons, averaging 4.14 pennyweights per ton.

Ore Reserves

The ore reserves are estimated at 2,625,000 tons, an increase of 75,000 tons over last year. The reserves include 792,000 tons of broken ore and also include all the unbroken ore below the 23rd level, which totals 455,000 tons. Last year 300,000 tons of this was not taken into the reserves, but with the completion of No. 6 shaft it is felt that this tonnage should now be included.

The following table gives the percentage of the ore reserves in the various parts of the mine:—

| | Per cent. |
|----------------------------|-----------|
| Ankerite veins..... | 14.4 |
| Schumacher area..... | 18 |
| Area below 23rd level..... | 18.2 |
| Balance of mine..... | 49.4 |

Mill

The following are the milling results from a total of 576,300 tons treated:—

| | Value per ton | Extraction per cent. |
|--------------------------------|------------------|-------------------------|
| Average grade ore treated..... | 7.5873 | ..... |
| Recovery..... | 7.406 | 97.61 |

The drop in the percentage recovery is directly attributed to the increase in the proportion of Ankerite ore milled, this ore being more difficult to treat than the general run of the mine ore.

Sigma Mines (Quebec), Limited

This property is now on a self-sustaining basis and has been since the mill started operations on March 17, 1937. The mill was designed to treat from 300 to 350 tons per day, but the tonnage handled was gradually and steadily increased until in the latter part of July it was brought to 500 tons daily and it has been maintained at that tonnage since.

On account of what is known as Bill No. 5 of the Quebec Legislature it became necessary to operate under a Quebec charter. A Quebec charter was acquired, and all properties and rights were transferred to the new company, Sigma Mines (Quebec), Limited, and the charter of Sigma Mines, Limited, was surrendered. In making this change the cash surplus of \$30,000 which had been acquired by Sigma Mines, Limited, was distributed as a dividend. The new company was capitalized at 1,000,000 shares, par value \$1.00, and one share of the new company was given for every three held in the old company.

Capital Expenditure

The details of changes in capital assets for 1937 are as follows:—

| | Increase | Decrease |
|---|---------------------|--------------------|
| MINE BUILDINGS, MACHINERY, AND EQUIPMENT: | | |
| Extension to steel-sharpening shop..... | \$503.87 | |
| No. 6 shaft machinery and equipment..... | 35,061.02 | |
| REDUCTION BUILDINGS, MACHINERY, AND EQUIPMENT: | | |
| Three wooden Pachuca tanks..... | 11,328.46 | |
| Pipe line from mill to tailings dam..... | 7,529.05 | |
| Pump-house at tailings dam..... | 2,325.07 | |
| Written off: | | |
| 6 Steel Pachuca tanks..... | | \$8,777.00 |
| Pump-house at tailings dam..... | | 920.99 |
| POWER BUILDINGS, MACHINERY AND EQUIPMENT: | | |
| Additions during the year..... | 4,766.94 | |
| SHOP BUILDINGS, MACHINERY, AND EQUIPMENT: | | |
| Shaper..... | 2,523.98 | |
| Welding set..... | 1,193.00 | |
| Written off: | | |
| Shaper..... | | 1,411.80 |
| Welding set..... | | 2,145.00 |
| CAMP AND GENERAL BUILDINGS AND EQUIPMENT: | | |
| New office building and recreation hall..... | 69,317.47 | |
| 4 double dwellings..... | 18,440.69 | |
| Basements and furnaces, 4 double dwellings..... | 8,031.33 | |
| Additions to dwellings..... | 2,904.48 | |
| Septic tank..... | 2,409.67 | |
| 3 hydrant-houses..... | 1,266.03 | |
| Light truck..... | 788.00 | |
| Truck..... | 1,584.00 | |
| Snow plough..... | 778.24 | |
| Written off: | | |
| Old recreation hall..... | | 7,531.86 |
| Fire hall and garage..... | | 2,719.80 |
| Camp equipment..... | | 900.00 |
| Light truck..... | | 871.00 |
| Truck..... | | 1,411.00 |
| WATER SUPPLY SYSTEM, MACHINERY, AND EQUIPMENT: | | |
| Additions during year..... | 4,863.05 | |
| WRITTEN OFF PLANT..... | \$175,614.35 | \$26,688.45 |
| NET INCREASE..... | \$148,925.90 | |

Costs

The expenditure on mining was \$867,842.77, or \$1.51 per ton milled. The expenditure on development was \$922,687.23, or \$1.60 per ton milled. Approximately 50 cents per ton of this was chargeable directly to No. 6 shaft. Ore and waste passes and other development in connection with No. 6 shaft were charged into general development.

The operating charges for the year were \$4.903 per ton, as compared to \$4.486 the year previous. Two factors which are responsible for the greater part of this increase may be mentioned. The first is the higher wage scale granted late in 1936. The second, amounting to 15.2 cents per ton, is due to a change in book-keeping. This is concerned with the Mint charges. Previously our production was arrived at by deducting Mint charges directly from gross bullion values. Now gross bullion value is reported as production and the Mint charges are included with operating charges. The costs should show a decided drop in 1938 as the major expenses in connection with No. 6 and No. 3 shafts are pretty well over.

General

The shareholders may be interested in the following information: The plant of the Dome Mines is located about two miles from South Porcupine, a village of about 4,500 population. About two-thirds of our employees live in South Porcupine and many of these own their homes there. A good bus service is available between the two points.

The balance of the employees live on the property in company houses. Most of the staff and the principal foremen live in houses close to the plant, while over eighty families are living in Dome Extension village, about one-third mile from the plant. In all, the company owns 123 houses, which are rented at reasonable rates. Most of these are serviced by household water, but drinking water is obtained from wells, which are carefully protected and the water from which is regularly tested. The single men living on the property are taken care of in a bunk-house and club-house.

A store building is provided by the company, but this is run independently by the Consumers Co-operative Society and this serves the needs of the Dome community for groceries and meats.

School facilities are excellent. These are handled by the usual trustee boards elected by the ratepayers. A 5-room brick school, located on the property, serves the needs of the 160 public-school pupils. The school authorities provide bus service to take the high-school pupils to and from the high school in South Porcupine.

Dome employees actively engage in the following sports: hockey, football, baseball, softball, curling, and skeet-shooting. The company has provided a football field, tennis courts, a curling rink, an outdoor skating rink, and a recreation hall, all of which are controlled and operated by employee associations.

In addition to the school facilities noted, organized sport is provided for the children of employees in hockey, football, and tennis. Boy Scout and Girl Guide organizations are encouraged, and more important than the above, nearly every son of an employee who has become old enough and has tried for work with the company has been given employment. At the present moment we have about sixty sons of employees on our pay-roll.

The company employed an average of 826 men in 1937, of whom 486 were employed underground and 64 in the mill. J. H. Stovel is general manager, and Robt. E. Dye is assistant mine manager.

Edgelake Gold Mining Company, Limited

The Edgelake Gold Mining Company, Limited, which was incorporated in September, 1934, has an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: P. B. Cameron, president; J. A. Picotte, vice-president; J. M. Forbes, secretary; K. G. Cameron, treasurer; Robert McKinnon and H. Turcotte, directors. The executive office address is Box 128, Schumacher. The mine address is Tashota.

The property consists of 10 claims, approximately 400 acres, surrounding the west end of Tashota lake, 1½ miles north of Tashota station on the trans-continental line of the Canadian National Railways, district of Thunder Bay.

No underground work was done at this property during 1937. Buildings erected during the year consisted of a bunk-house and mill- and crusher-house, the latter to house the 25-ton amalgamation mill purchased in 1936.

During the year there was an average of 3 men employed, under the direction of P. B. Cameron, president of the company.

Edwards Gold Mines, Limited

Edwards Gold Mines, Limited, has an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: H. C. Orton, president; E. A. Fitz, vice-president; W. A. Johnston, T. B. Schmidt, S. F. Weiser, O. G. Schrup, and Frank Gillson, directors. The head office is at 302 Sterling Tower, Toronto. The property is located in township 48, Goudreau area, district of Algoma.

Underground operations were continued until October, 1937, when work ceased for the rest of the year. Open stoping was done on all three levels, from which a total of 1,573 tons was obtained and treated in the 75-ton amalgamation mill. A total of 2,500 feet of diamond-drilling was done.

An average of 31 men was employed, of whom 14 were underground. J. A. Roussac and F. M. Passow were successively in charge of operations. The mine address is Lochalsh.

At the end of 1937 application was made to surrender the company's charter and incorporate Edwards Consolidated, Limited.

Elizabeth Gold Mining Company, Limited

The Elizabeth Gold Mining Company, Limited, which was incorporated in February, 1936, to succeed the Elizabeth Gold Syndicate, has an authorized capitalization of 2,000,000 shares of \$1 par value, of which 1,106,230 had been issued at December 31, 1937. The officers and directors are: Wm. L. Doyle, president; C. D. Cummings, vice-president; W. L. Anderson, secretary-treasurer; C. A. Mills, A. L. Eskelson, Wm. Kerber, T. B. Jones, and P. A. Porter, Jr., directors. The head office is at 156 Yonge Street, Toronto. The mine address is Atikokan.

The property includes 480 acres of unpatented claims and 373 acres of patented claims, on which is situated the old Elizabeth mine. It is located about 3 miles north of the Fort Frances branch of the Canadian National Railways, about 4 miles northwest of Atikokan, district of Rainy River.

No underground work was carried on at this property during 1937. Operations were confined to surface work and diamond-drilling, which totalled 161 feet.

There were 2 men employed on the property. W. N. McClintock was in charge.

Elora Gold Mines, Limited

Elora Gold Mines, Limited, was incorporated in August, 1935, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,066,505 had been issued at December, 1937. The officers and directors are: P. C. Finlay, president; O. M. Partridge, secretary-treasurer; W. S. Morlock, J. Ingram, W. J. McDonough, P. F. Osler, E. W. T. Gill, directors. The head office is at 603 Royal Bank Building, Toronto, and the mine address is Goldrock, via Wabigoon.

The property consists of 10 claims, including the old Laurentian and Keating mines, located on the northeast shore of Trafalgar bay, Upper Manitou lake, in the district of Kenora. The property is 27 miles south of Wabigoon on the main line of the Canadian Pacific Railway and is reached by water over Wabigoon lake, or by airplane from Dryden.

The old Laurentian mine has been operated since 1900 by such companies as Laurentian Gold Mines, Limited; Great Golconda Gold Mines, Limited; Imperial Gold Mines, Limited; and Anthony Blum Gold Mines, Limited. In 1908 a 20-stamp amalgamation mill was installed, and before the property was closed down in 1909 some \$155,000 in gold was produced. Towards the end of 1936, the present company opened up the Jubilee vein, which had been discovered in a 300-foot crosscut from the Laurentian shaft, then over 400 feet deep. The old stamp mill was overhauled and a 330 h.p. Ruston-Hornsby Diesel engine was installed to drive the mill machinery. During the last three months of 1936, the mill treated 1,365 tons of ore as a bulk sample obtained from an open cut on the Jubilee vein outcrop. Following this bulk-sampling a vertical, 3-compartment shaft was located 50 feet west of the vein and sinking commenced on December 18, 1936. The shaft was completed to a depth of 175 feet early in 1937, a level was established at 162 feet, and 191 feet of crosscutting was done. One small stope was subsequently opened up and mined by shrinkage. The ore was hoisted

and trucked to the mill. There were 8,887 tons of ore milled, with a recovery of 473 ounces of gold. Operations were continued until the beginning of October. Diamond-drilling on the property amounted to 4,275 feet, all from surface.

New equipment includes two 70 h.p. return tubular boilers; a 400-cubic-foot Gardner Denver compressor, driven by a 127 h.p. Caterpillar Diesel; and an 8- by 6-inch, single split-drum, reversible Jenckes hoist.

During the period of operation an average of 48 men was employed daily, of whom 14 were underground and 9 in the mill. J. G. Harkness was manager.

Eva Lake Gold Mines, Limited

Eva Lake Gold Mines, Limited, was incorporated in September, 1936, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: Maxwell Rogers, president; Harry Davidson, vice-president; E. J. S. Wallwork, secretary-treasurer; A. A. Kamins, general manager and director. The head office is at 330 Bay Street, Toronto. The mine address is Beardmore.

The company has an option on five claims immediately adjoining the west boundary of the property of the Northern Empire Mines Company, Limited, at Empire, on the Longlac-Port Arthur branch of the Canadian National Railways. Claim numbers are T.B. 10,338, 10,339, 10,374, 4,841, and 4,842.

Surface exploration was carried on during 1936, and on May 15, 1937, underground operations were commenced with the driving of an adit, crosscutting into the south side of the hill on claim T.B. 10,374, immediately west of the Northern Empire property. The adit was driven N. 15° W. for a distance of 232 feet and intersected some quartz stringers about 155 feet from the collar, on which 110 feet of drifting was done east and west from the crosscut adit. Operations were suspended on August 7.

Plant equipment consists of an Ingersoll-Rand, 310-cubic-foot, gasoline-driven, portable compressor.

Surface buildings include a power-house, blacksmith shop, warehouse and dry, office, magazine and cap-house.

During the period of operation there was an average of 11 men employed under the direction of H. A. Wickham.

Faulkenham Lake Gold Mines, Limited

Faulkenham Lake Gold Mines, Limited, was incorporated in July, 1936, with an authorized capitalization of 3,500,000 shares of \$1 par value. The officers and directors are: Colin A. Campbell, president; T. W. Dean, vice-president; W. M. Gordon, secretary-treasurer; E. K. Twombly and F. P. Davis, directors. The head office is at 702 Reford Building, Toronto, and the mine address is Red Lake.

The company holds two groups of claims, one consisting of 18 claims, totalling 726 acres, in Baird township; and the other of 14 claims, totalling 585 acres, in Ball township, Red Lake area, Patricia portion of Kenora district. The property is reached from Red Lake by airplane or by tractor road.

To date only surface exploration and diamond-drilling has been done on the claims in Ball township. Work on the Baird township group started in April, 1936, and some 3,000 feet of diamond-drilling was done during the summer, which gave sufficient encouragement to warrant underground development. During the fall camp and plant buildings were put up, a headframe was erected, and the mining plant was installed. The buildings include a cookery, bunk-house,

2-storey office and warehouse, assay office, boiler-house, blacksmith shop, dry, powder magazine, and manager's residence. The mining plant includes a 120 h.p. locomotive; a 70 h.p. Scotch marine boiler and a 25 h.p. vertical boiler; a 550-cubic-foot Ingersoll-Rand compressor; an 8- by 6-inch Ingersoll-Rand single-drum hoist; and an Ingersoll-Rand steel-sharpener.

A 2-compartment, vertical shaft was commenced on January 28 and continued to a depth of 344 feet, with levels established at 125, 225, and 325 feet. The development completed at October 22, when operations were suspended, was as follows:—

| Level | Drifts | Crosscuts |
|---------------|--------|-----------|
| | feet | feet |
| 125-foot..... | 620 | 274 |
| 225-foot..... | | 42 |
| 325-foot..... | 509 | 138 |

Diamond-drilling was given as:—

| | No. of holes | Feet |
|-----------------------------------|--------------|-------|
| Surface: | | |
| Ball tp. group..... | 15 | 1,884 |
| Baird tp. group..... | 20 | 2,935 |
| Underground, Baird tp. group..... | 31 | 1,445 |

The average number of men employed daily was 22, of whom 9 were underground. A. H. Honsberger was manager.

Federal Kirkland Mining Company, Limited

The Federal Kirkland Mining Company, Limited, was incorporated in September, 1927, with an authorized capitalization of 4,000,000 shares of \$1 par value, of which 3,540,508 have been issued. The officers and directors are: Jas. E. Day, president; F. L. Heard, secretary-treasurer; R. R. Brown, Jas. Savage, Gordon F. Summers, T. R. Buchanan, S. J. Bird, and J. M. Macintosh, directors. J. H. Botsford is mine manager. The head office is at 85 Richmond Street West, Toronto. The mine address is Kirkland Lake.

The property consists of 10 claims, 280 acres, in Teck township, Kirkland Lake area, district of Timiskaming.

The 1937 operations consisted of dewatering the 740-foot shaft and doing 50 feet of surface-trenching and 9,328 feet of surface diamond-drilling.

A frame hoist-room, 28 by 16 feet, was built. The following plant equipment was installed: a Mead Morrison 7- by 10-inch hoist, a Gardner Denver 360-cubic-foot compressor, and a model D.13,000, 128 h.p. Caterpillar Diesel engine.

An average crew of 3 men was employed during the year.

Fernland Gold Mines, Limited

Fernland Gold Mines, Limited, was incorporated in May, 1936, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: G. P. Campbell, president; Geo. Tough, vice-president; Wm. B. McPherson, secretary-treasurer; Wm. J. Hussey and Howard J. Jewell, directors. The head office is at 171 Yonge Street, Toronto. The mine address is Larder Lake.

The property consists of 12 claims in McVittie township, Larder Lake area, district of Timiskaming. Surface work and diamond-drilling operations were carried on during the year. In December the sinking of a 3-compartment shaft was begun.

An average force of 20 men was employed during the year, under the management of Howard J. Jewell.

Garrcon Mines, Limited

Garrcon Mines, Limited, was incorporated on May 11, 1936, with an authorized capitalization of 3,000,000 shares of \$1 par value. At the end of 1937 shares issued and fully paid for numbered 2,100,005. The head office of the company is at 302 Bay Street, Toronto. The officers and directors are: W. M. Archibald, president; E. G. Montgomery, vice-president; J. E. Robinson, secretary-treasurer; J. McKenzie, L. A. Lillico, and Jas. E. Riley, directors. The mine address is Matheson.

The holdings of the company comprise 9 claims in Garrison township, district of Cochrane, 33 miles by road east of the village of Matheson on the T. and N. O. railway.

Operations are carried on under the direction of the Consolidated Mining and Smelting Company of Canada. A report of the work done on the property appears on page 107 of this report.

Gillies Lake-Porcupine Gold Mines, Limited

Gillies Lake-Porcupine Gold Mines, Limited, was incorporated in 1933, with an authorized capitalization of 2,000,000 shares of \$1 par value. In May, 1937, the capitalization was increased to 2,750,000 shares of \$1 par value. At December 31, 1937, the number of shares issued amounted to 2,199,900. The officers and directors at the end of the year were: F. O. Tidy, president and treasurer; R. M. Stanley, vice-president; Samuel B. Darlich, secretary; A. R. Sproule, John Corcoran, Wm. J. Kam, B. N. Hyman, Dr. H. H. Moore, and D. Bogue, directors. The last-named director resigned early in January, 1938. The head office is at 9 Toronto Street, Toronto. The mine address is Timmins.

The property, consisting of 6 claims, is situated in the township of Tisdale, Porcupine area, district of Cochrane. The town of Timmins recently extended its boundaries, which now take in the mine plant and shaft.

The Gillies Lake shaft is 947 feet in depth, with levels at depths of 100, 300, 500, 800, and 925 feet. There is one sublevel at 600 feet, which is reached by an inclined winze from the 500-foot level. A raise driven from the 800-foot level makes a second connection with this sublevel.

DEVELOPMENT WORK

| | To December 31, 1936 | 1937 | Total |
|------------------------|-------------------------|-------|-------|
| | feet | feet | feet |
| Shaft-sinking | 947 | ..... | 947 |
| Winzes, west | 40 | ..... | 40 |
| Winzes, east | 129 | ..... | 129 |
| Crosscutting | 4,173 | 1,308 | 5,481 |
| Drifting | 3,625 | 788 | 4,413 |
| Raising | 647 | 588 | 1,235 |
| Diamond-drilling | ¹ 3,612 | 4,054 | 7,666 |

¹Does not include diamond-drilling done by former companies.

The 50-ton cyanide mill was operated for part of the year. Both milling and mining operations, with the exception of diamond-drilling, were suspended in October. During the year the mill treated 16,910.63 tons of ore, yielding a gross production of \$132,380.56.

The average number of men employed during the year was 56. C. T. Penney is mine manager.

Gleemar Gold Mines, Limited

In July, 1936, the shareholders of Bathurst Gold Mines, Limited, entered into an agreement with a private syndicate, known as the Car Lake Syndicate and consisting of Hon. T. G. Murphy, L. T. Martin, John Gleeson, T. A. Beaumont, and Andrew Pelton, all of Ottawa, to take a working option on their property. In February, 1937, Gleemar Gold Mines, Limited, was incorporated with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,000,007 have been issued. The Bathurst shareholders were to receive one Gleemar share for each four Bathurst shares. The officers and directors are: John Gleeson, president; D. G. Ross, vice-president; John A. Miller, secretary-treasurer; L. T. Martin, Hon. T. G. Murphy, and S. M. Mackay, directors. The head office is at 330 Bay Street, Toronto, and the mine address is Narrow Lake, via Hudson.

The property includes the Bathurst mine in Skinner township, Woman Lake area, Patricia portion of Kenora district.

Gold was discovered on this property in 1926. Surface exploration followed, and a mining plant and a 10-ton Tremaine stamp mill were installed. A vertical 2-compartment shaft was sunk 420 feet, levels were established at 200 and 300 feet, and some 1,109 feet of crosscutting and 2,046 feet of drifting were done before operations were suspended at the end of 1929.

In July, 1936, the Car Lake Syndicate dewatered the mine and carried on operations until December. Development during this period consisted of 30 feet of crosscutting, 131 feet of drifting, and 52 feet of raising, all on the 200-foot level. The mill was overhauled, and some 320 tons of ore obtained from development and from the surface dump were treated. Recovery amounted to 120 ounces of gold bullion valued at \$2,917. With the exception of the operation of the pumps, work was suspended on December 22 pending the formation of a new company.

Underground operations were resumed on March 13, 1937, following the formation of Gleemar Gold Mines, Limited, and continued until June 14. During this period some 200 feet of drifting and 100 feet of crosscutting were done on the 300-foot level. The mill was not operated.

The average number of men employed daily during the operating period was 18. The late K. B. Heisey was in charge of operations.

Glenora Gold Mines, Limited

Glenora Gold Mines, Limited, was incorporated in June, 1933, with a capitalization of 4,500,000 shares of \$1 par value, of which 3,900,000 have been issued. The officers and directors are: T. J. Day, president; S. G. Tobin, vice-president; A. T. McCabe, secretary; J. A. McFayden, treasurer; O. B. Rigby, Forbes Geddes, and G. M. Wilton, directors. The head office is at 1101 Federal Building, Toronto. The mine office is at Kirkland Lake.

The property consists of 6 patented claims, 230 acres, in Lebel township, Kirkland Lake area, district of Timiskaming.

Operations during 1937 were carried on from January to July 31. Underground development work consisted of 1,655 feet of drifting and 80 feet of raising for drill-stations. Some 4,924 feet of underground diamond-drilling and 694 feet from surface were accomplished.

An average force of 18 men was employed under the supervision of James Crowe, manager.

Gold Eagle Gold Mines, Limited

Gold Eagle Gold Mines, Limited, was incorporated in February, 1934, with an authorized capitalization of 3,000,000 shares of \$1 par value, 2,631,339 of which have been issued. The officers and directors are: Walter F. Stafford, president and managing director; Wm. S. Rogers, vice-president; Bruce P. Davis, secretary; Millard C. Dorntge, treasurer; Reg. Halladay and Wm. Kelly, directors. R. W. Brigstocke is the consulting engineer. The head office is at 85 Richmond Street West, Toronto. The mine address is McKenzie Island.

The company holds 25 claims, consisting of about 800 acres, adjoining McKenzie Red Lake Gold Mines on the south and west, on Mackenzie island in Red lake, Dome township, Patricia portion of Kenora district. The mine is reached by airplane from Winnipeg, Kenora, or Sioux Lookout.

Following incorporation, diamond-drilling was carried on which picked up the extension of the shear zone of McKenzie Red Lake mine, and in September, 1934, the sinking of a 3-compartment vertical shaft was commenced. The objective depth of 525 feet was reached in April, 1935. Levels were established at 125, 250, 325, and 500 feet. Operations were suspended in September, owing to lack of funds, but were resumed again in December and continued until June, 1937, when underground work ceased pending the construction of a 125-ton cyanide mill. The mill was completed and commenced operating in October, 1937.

The development work accomplished on the various levels during the year, and the total to the end of 1937, are as follows:—

| Level | Drifting | | Crosscutting | | Raising | |
|---------------|----------|-------|--------------|-------|---------|-------|
| | 1937 | Total | 1937 | Total | 1937 | Total |
| | feet | feet | feet | feet | feet | feet |
| 125-foot..... | 66 | 681 | ..... | 135 | 199 | 199 |
| 250-foot..... | 5 | 848 | ..... | 145 | 397 | 397 |
| 375-foot..... | 319 | 1,222 | 20 | 132 | 243 | 386 |
| 500-foot..... | 523 | 2,435 | 96 | 1,861 | 359 | 463 |
| Total..... | 913 | 5,186 | 116 | 2,273 | 1,198 | 1,445 |

Diamond-drilling completed to the end of 1937 consisted of 16 holes from surface, totalling 4,936 feet, and 40 holes from underground, totalling 7,244 feet.

Ore for the mill is obtained from the surface dump and from 9 stopes as follows:—

| Level | No. of stopes | Type of stope |
|---------------|---------------|-----------------|
| 125-foot..... | 1 | Open underhand. |
| 250-foot..... | 2 | Open overhand. |
| 375-foot..... | 2 | Open overhand. |
| 500-foot..... | 4 | Open overhand. |

| PRODUCTION | |
|--------------------------|-------------|
| Tons of ore hoisted..... | 9,921 |
| Tons sorted..... | 1,486 |
| Tons milled..... | 8,435 |
| Recovery value..... | \$73,083.46 |
| Percentage recovery..... | .98 |

The mill equipment includes four 14- by 16-foot Dorr agitators, two 28- by 12-foot Dorr thickeners, a 24-inch Perrin filter press, a 48-inch Akins classifier, an 8- by 10-foot Oliver filter, a 20- by 10-inch Allis-Chalmers Blake-type jaw crusher, a 3- by 6-foot Allis-Chalmers double-decked vibrating screen, a 5-inch Allis-Chalmers gyratory crusher, a 6- by 8-foot Allis-Chalmers ball mill, a 650-cubic-foot Babcock-Wilcox vacuum pump, and a 320-cubic-foot Babcock-Wilcox compressor.

Surface construction during 1937 consisted of a mill building to house a 125-ton unit; a crusher house, 109 by 15 feet; a conveyer ramp, 206 feet long, between the crusher house and the mill; a refinery; dry-house; office and warehouse; and an addition to the blacksmith shop.

The plant equipment includes a 1,100-cubic-foot Belliss and Morcom double-stage compressor, driven by a 225 h.p. General Electric motor; a 450-cubic-foot Ingersoll-Sargent steam-driven compressor; a Fullerton, Hodgart and Barclay double-drum hoist, driven by a 125 h.p. motor; 2 Goldie-McCulloch H.R.T. boilers, 75 h.p. each; a 10- by 12-inch Marsh single-drum, steam-driven hoist; and an Ingersoll-Rand steel-sharpener and oil furnace.

During the latter part of the year an average of 80 men was employed daily, of whom 45 were underground, 11 in the mill, and 24 on surface. H. P. Dickey is manager, having succeeded F. M. Passow in February, 1937.

Golden Gate Mining Company, Limited

The Golden Gate Mining Company, Limited, was incorporated in July, 1934, with an authorized capital of 3,000,000 shares of \$1 par value. The officers and directors are: Dr. T. B. Armstrong, president; C. H. Kemp, secretary-treasurer; W. J. Lawson, P. Turner, F. Rosar, and T. M. Mungovan, directors. The head office is at 66 King Street West, Toronto. The mine office is at Swastika. The property consists of 6 claims in Teck township, Kirkland Lake area, district of Timiskaming.

The mine was operated throughout 1937. A new 3-compartment shaft, known as No. 2, was begun at the 350-foot level and was raised to surface and sunk to a depth of 600 feet. A new level was established at 475 feet, and a station was cut at 600 feet. Lateral work consisted of 518 feet of drifting and 264 feet of crosscutting; 90 feet of development raise was driven. Some 2,540 feet of diamond-drilling was done from underground.

New construction work included a hoist-room, headframe, dry-house, and blacksmith shop. Foundations for a mill were commenced.

A hydro-electric transmission line, 4 miles long, was built and the mining plant was electrified. A 24- by 36-inch double-drum electric hoist and an 830-cubic-foot compressor were installed.

An average force of 30 men was employed under the supervision of S. A. Pain, mine manager.

Golden Summit Mines, Limited

Golden Summit Mines, Limited, was incorporated in March, 1924, with a capitalization of 2,500,000 shares of \$1 par value. The officers and directors are: W. J. Simpson, president and managing director; Ben Kerr, vice-president;

Gordon Belyea, secretary-treasurer; Fred. A. Brandt, J. M. Calder, T. G. Miller, and S. A. Lister, directors. The head office is at 2374 Bloor Street West, Toronto. The mine office is at Sese kinika.

The property consists of 11 claims, 460 acres, in Grenfell and Maisonneville townships, Kirkland Lake area, district of Timiskaming.

Operations were carried on from January to June, 1937. Development work consisted of 210 feet of drifting and crosscutting on the 250-foot level and 240 feet of crosscutting on the 375-foot level. About 60 feet of raising was done from the 125-foot level. From a clean-up of the small test-mill a mint return of \$156.36 in gold was received. An average of 20 men was employed during the period of operation. W. Brunner was mine superintendent.

Gomak Mines, Limited

Gomak Mines, Limited, was incorporated in December, 1933. The authorized capitalization was increased from 1,000,000 to 4,000,000 shares of \$1 par value during 1937. The officers and directors are: C. N. Haldenby, president; Dr. W. H. Wright, vice-president; F. O. Gallagher, secretary-treasurer; Mrs. W. M. Clyde and R. M. West, directors. The head office is at 320 Bay Street, Toronto. The mine address is Gogama. The property is located in Chester township, Three Duck Lakes area, district of Sudbury.

The only work accomplished during 1937 was 621 feet of diamond-drilling. An average of 7 men was employed under the direction of R. D. Jones.

Hallnor Mines, Limited

Hallnor Mines, Limited, was incorporated in April, 1936, with an authorized capitalization of 2,000,000 shares of \$1 par value. At the end of 1937 the number of shares issued was 1,625,005. The officers and directors are: J. Y. Murdoch, president; T. N. Hay, secretary-treasurer; Leo H. Timmins, F. M. Connell, and E. Hibbert, directors. The head office and mine office are at Pamour.

The property consists of 160 acres, in the north half of lot 7, concession V, Whitney township, Porcupine area, district of Cochrane, adjoining the west boundary of Pamour Porcupine Mines, Limited.

The sinking of a 3-compartment shaft was begun in June, 1936. The following table shows the amount of development work done through this shaft up to the end of 1937:—

| | To Dec. 31, 1936 | 1937 | Total |
|-------------------|---------------------|---------------|---------------|
| Shaft..... | feet 591 | feet 194.5 | feet 785.5 |
| 211-FOOT LEVEL: | | | |
| Drifts..... | | 987 | 987 |
| Crosscuts..... | | 1,114 | 1,114 |
| Raises..... | | 157.5 | 157.5 |
| 361-FOOT LEVEL: | | | |
| Drifts..... | 100 | 2,855 | 2,955 |
| Crosscuts..... | | 1,365 | 1,365 |
| Raises..... | | 52 | 52 |
| 561-FOOT LEVEL: | | | |
| Drifts..... | 103 | 2,971 | 3,074 |
| Crosscuts..... | | 1,474 | 1,474 |
| Raises..... | | 66.5 | 66.5 |
| DIAMOND-DRILLING: | | | |
| Surface..... | 11,615 | | 11,615 |
| Underground..... | | 8,889 | 8,889 |

¹/₄9 holes.

During 1937 a 1,500-cubic-foot Ingersoll-Rand angle compound compressor with a 300 h.p. motor was added to plant equipment. A 300-gallon Mather and Platt electric pump was installed underground. A manager's residence, two 4-room duplexes, and a bunk-house, 24 by 36 feet, were new additions during 1937.

The average number of men employed during the year was 100. A. L. Sharp is manager.

J. E. Hammell

The McIntyre Red Lake claims, adjoining the Howey mine, in the Red Lake area, Patricia portion of Kenora district, were bought by J. E. Hammell, 25 King Street West, Toronto. The mine address is Box 320, Red Lake.

The property consists of 9 claims, totalling 389 acres, and the work completed to the end of 1937 consists of 860 feet of trenching and 26,442 feet of diamond-drilling. One frame building was erected.

Preparations are now being made to sink two shafts. One will be a 3-compartment shaft, 525 feet deep, with four levels, on the east side of the property. The second shaft, located 2,000 feet to the west of the first one, will also have three compartments and will be sunk to a depth of 200 feet.

H. L. Edwards is manager.

Hard Rock Gold Mines, Limited

Hard Rock Gold Mines, Limited, which was incorporated in January, 1934, has an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,990,074 had been issued at December 31, 1937. The officers and directors are: T. H. Rea, president; G. W. Rayner, vice-president and managing director; W. S. Walton, secretary-treasurer; A. B. Gordon and H. R. Aird, directors. The head office is at 603 Royal Bank Building, Toronto. The mine address is Geraldton.

The property, totalling about 827 acres, consists of claims T.B. 9,981-9,992 and 14,484-14,486 in Ashmore township, Little Long Lac area, district of Thunder Bay. It is accessible by automobile road from the town of Geraldton, about 4½ miles north of the property on the Longlac-Port Arthur branch of the Canadian National Railways. Ashmore Gold Mines, Limited, with a capitalization of 1,000,000 shares of \$1 par value, was formed in 1937 for the purpose of acquiring five claims, T.B. 10,666, 10,667, 10,669-10,671, adjoining the Hard Rock property on the southeast. Hard Rock Gold Mines, Limited, owns 449,995 shares of Ashmore.

Toward the end of the year construction of a 200-ton cyanide mill was completed, and it was planned to commence production on the first day of 1938. Mill equipment includes an 18- by 24-inch jaw crusher; a 4- by 8-foot, double-deck vibrating screen; a No. 7 Newhouse crusher; a 7- by 9-foot ball mill in closed circuit with a 12- by 18-inch, 2-compartment Denver jig; a 6- by 25-foot Dorr rake classifier; three 18- by 20-foot agitators; two 24- by 16-foot tray-type thickeners; and two 10- by 12-foot drum filters. The hutch product from the jig in the ball-mill classifier circuit is returned to the ball-mill feed. Jig tails continue through the cyanide circuit with the classifier overflow.

During 1937 there was an average of 157 men employed, of whom 61 were underground. J. C. Dumbrille is manager and R. G. McKelvey is mine superintendent.

Underground work was continued throughout 1937. The following table shows the underground work accomplished previous to 1937, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|--------------------------------------|---------------------|-------|--------|
| | feet | feet | feet |
| No. 1 shaft | 475 | ..... | 475 |
| 200-FOOT LEVEL: | | | |
| Drifts | 1,108 | ..... | 1,108 |
| Crosscuts | 511 | ..... | 511 |
| 325-FOOT LEVEL: | | | |
| Drifts | 949 | ..... | 949 |
| Crosscuts | 442 | ..... | 442 |
| Raises | 55 | ..... | 55 |
| 450-FOOT LEVEL: | | | |
| Drifts | 1,894 | 149 | 2,043 |
| Crosscuts | 548 | 50 | 598 |
| Raises | 10 | 64 | 74 |
| Winze | 141 | ..... | 141 |
| 575-FOOT LEVEL: | | | |
| Drifts ..... | ..... | 636 | 636 |
| Crosscuts ..... | ..... | 102 | 102 |
| No. 2 shaft | 177 | 329 | 506 |
| 150-FOOT LEVEL: | | | |
| Drifts | 1,408 | 2,518 | 3,926 |
| Crosscuts | 834 | 1,077 | 1,911 |
| Raises ..... | ..... | 688 | 688 |
| 250-FOOT LEVEL: | | | |
| Drifts ..... | ..... | 2,381 | 2,381 |
| Crosscuts ..... | ..... | 1,011 | 1,011 |
| Raises ..... | ..... | 595 | 595 |
| 360-FOOT LEVEL: | | | |
| Drifts ..... | ..... | 817 | 817 |
| Crosscuts ..... | ..... | 305 | 305 |
| Raises ..... | ..... | 155 | 155 |
| 475-FOOT LEVEL: | | | |
| Drifts ..... | ..... | 1,757 | 1,757 |
| Crosscuts ..... | ..... | 654 | 654 |
| Diamond-drilling (underground) ..... | ..... | ..... | 14,159 |

The following is an extract from the mine manager's report of operations as at October 31, 1937:—

Development and Exploration

After formation of the company in January, 1934, diamond-drilling from the surface was carried on until August of the same year. This drilling, mainly concentrated around the original discovery made by W. W. Smith, near the centre of the property (the present No. 1 shaft area) gave very encouraging results.

In August, 1934, a programme of underground work was decided on and erection of a sinking plant started. Sinking of No. 1 shaft was commenced in December of the same year, and during the next two years it was carried to the 450-foot level. The 200-, 325-, and 450-foot levels were opened up, and a small amount of work done on the 575-foot level through a winze from the 450-foot level.

While this work was in progress, further surface work was done, mainly in the "Porphyry hill" section. This area responded well to trenching, sampling, and diamond-drilling, and work was curtailed in the No. 1 shaft area to allow the sinking of No. 2 shaft for exploration of the encouraging surface showings.

No. 2 shaft, which was started in September, 1936, is now down to the 475-foot level, which level coincides with the 450-foot level at No. 1 shaft. The 150-, 250-, and 350-foot levels have been opened up through this shaft.

By July, 1937, the underground results were such that in the opinion of the directors and management, the erection of a mill was justified, and this plant is now under construction. We expect to be in production early in the new year.

No. 1 Shaft.—The veins in this area are distinct quartz veins in sedimentary rocks and carry visible gold in practically all commercial areas. Good continuity of the ore shoots is indicated, and the tests made on the ore show a high percentage of extraction with simple milling procedure. The length of strike opened up in this area is about 900 feet except for the 450-foot level, which was driven westward 1,100 feet toward the No. 2 shaft. At the end of this drive some good values were found in porphyry.

As reported on November 12, 1936, this work opened up a possible ore length of 430 feet on the 200-foot level and 630 feet on the 325-foot level, with an average estimated grade of \$7.00 per

ton over good mining width. The 450-foot level showed 4 ore shoots, of a total length of 620 feet, averaging \$9.30 per ton over a width of 6.5 feet. There are other sections of the vein, not included in these estimates, which may produce considerable ore on further work. The 575-foot level was driven only until the downward continuation of the ore structure was proved.

No. 2 Shaft.—There are three types of ore developed in this area. Ore associated with and within the porphyry, known as the No. 1 vein system, is free-milling and shows spectacular concentrations of visible gold in many places. Ore in the iron formation, north of the main porphyry mass, known as the No. 2 vein system, is of a heavy sulphide type. Then there is a body of ore at the west end of the property which combines the characteristics of both types.

The No. 1 vein system outcrops on surface and can be traced to the 475-foot level. The No. 2 vein system is not outcropping at surface due to heavy overburden, but has been traced from within 30 feet of the surface to the 475-foot level. Structural conditions at the bottom level show no changes from the upper levels.

150-Foot Level.—The No. 1 vein system showed as various shoots of ore consisting of narrow, high-grade stringers in porphyry. These shoots have a total ore length of 348 feet of an average value of \$13.70 per ton over a width of 4.7 feet. The No. 2 vein system showed a composite ore length, in several shoots, of 535 feet, averaging \$13.40 per ton over a width of 5.7 feet. In addition, the ore body mentioned above lying near the west boundary, which outcrops at the surface with a length of approximately 150 feet and a width of about 20 feet, has been developed on a sublevel, 50 feet above the 150-foot level with a length of 110 feet, a width of 3.5 feet, and averaging \$17.20 per ton.

250-Foot Level.—The No. 1 vein has a total ore length opened up of 1,000 feet, averaging \$16.45 per ton over a width of 5.4 feet. The west face of this vein is still in rich ore. The No. 2 vein is only partially developed, the ore length, at present, being 155 feet, averaging \$17.80 per ton over a width of 6 feet. Continuity of the ore in both these vein systems between the first and second level has been established by raises.

350-Foot Level.—Ore values in the No. 1 vein system have been encountered, and there is a short shoot of ore in the No. 2 vein system, but not enough work has been done to determine ore lengths.

475-Foot Level.—The No. 1 vein has been located as a strong shearing in the porphyry with some gold concentrations, but only a small amount of drifting has been done on this shearing. The No. 2 vein system has been exposed in a crosscut and shows as good values and width where intersected as on any of the upper levels. A connecting drift to No. 1 shaft workings is being driven eastward at this horizon and has a distance of 530 feet to go. This drive is helping considerably in solving geological problems, and some promising diamond-drilling has been done from this drift.

General

The work done to date, in my opinion, indicates that there are other sections of the property which warrant intensive exploration, there being many indications that parallel, and supplementary ore bodies may be located from the present workings. For example diamond-drilling from the 150- and 250-foot levels of No. 2 shaft has indicated that an important mineralized zone lies about 300 feet north of the present workings, and a crosscut is now being driven to investigate the values there. Also values have been intersected south of the workings in a diamond-drill hole 600 feet east of No. 2 shaft at the 475-foot level. In addition to these chances of new ore, diamond-drilling from surface, 2,000 feet east of the No. 1 shaft, disclosed very interesting values in favourable formation. The working out of structural details during mining, should enable us to solve the problem of locating more ore in an economical manner.

Ore Reserves

We estimate that above the 300-foot horizon at the No. 2 shaft there is available 100,000 tons of ore of an average value of \$14.00 per ton, and at No. 1 shaft 70,000 tons of ore of \$8.00 per ton. The milling grade will depend on mining methods and the most economical schedule of ore extraction.

Plant and Construction

Prior to February, 1937, Diesel power, supplemented by steam, was used in development. Electrical power from the Hydro-Electric Power Commission's Nipigon plant has been in use since February, and complete electrical equipment is in process of installation.

At No. 1 shaft we have a steam hoist capable of working to 1,000 feet and a 100 h.p. steam boiler. At No. 2 shaft, the electric hoist is capable of hoisting from 1,000 feet, and two compressors can supply in excess of 1,600 cubic feet of air. A 150 h.p. Diesel engine drives a generator to supply stand-by power in case of power interruptions. This equipment is housed in a fireproof powerhouse. Underground pumps and equipment are all installed and in use.

A new mine office and warehouse has been erected and other necessary buildings are under construction. Ample housing for the staff has been erected and is now in use.

To secure a satisfactory water supply, it has been necessary to lay a half-mile of pipe line to the south arm of Kenogamisis lake.

Hiawatha Gold Mines, Limited

Hiawatha Gold Mines, Limited, was incorporated in September, 1936, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: H. M. Porteous, president; J. M. Charpentier, vice-president; J. Lanning, secretary-treasurer; Hans F. Wreidt and F. A. Enders, directors. The head office and mine office are at Oba. A business office is maintained at 404 McKinnon Building, Toronto.

The property is located in Lizar township, district of Algoma, about 30 miles southwest of Oba by river and lake.

During 1937 surface work and diamond-drilling were carried on until August, when the sinking of a 3-compartment vertical shaft was started. At the end of the year the shaft had reached a depth of 260 feet, and sinking was still in progress. A station had been cut at 150 feet. A total of 12,734 feet of diamond-drilling was done during the year.

The plant included a 650-cubic-foot Ingersoll-Rand compressor, driven by a 150 h.p. Dominion-Crossley Diesel engine; an 8- by 6-inch Ingersoll-Rand double-drum air hoist; and a 65 h.p. boiler. Buildings erected included a hoist-compressor house, change-house, assay office, and blacksmith shop.

An average of 26 men was employed during the year. J. Lanning, J. C. Houston, and P. W. Meahan were successively in charge of operations.

Hislop Gold Mines, Limited

Hislop Gold Mines, Limited, was incorporated in December, 1927, with an authorized capitalization of 3,000,000 shares of \$1 par value. In June, 1935, the capitalization was increased to 5,000,000 shares of \$1 par value. At the end of 1937 the number of shares issued was 2,857,240. The officers and directors are: H. J. Martin, president; W. C. Kruger, vice-president; A. S. Patterson, secretary-treasurer; Alex. Smith and W. G. Price, directors. The head office is at Room 503, 357 Bay Street, Toronto. The mine address is Matheson.

The company owns 383 acres in the township of Hislop and 91 acres, immediately adjoining on the east, in Guibord township, Ramore area, district of Cochrane.

Operations on the Hislop property were carried on from February 1 to September 29, 1937. No. 2 shaft was sunk to a depth of 170 feet, and a level was established at 150 feet. About 290 feet of drifting was done on this level, and 10 drill stations were slashed out. Diamond-drilling from the level totalled 2,501 feet, and that from surface amounted to 1,870 feet.

A bunk-house, cookery addition, power-house, steel-shop, and headframe were erected, and a small plant was installed.

An average of 9 men was employed during the period of operation. H. W. Burch was in charge of the property during this time.

Hollinger Consolidated Gold Mines, Limited

Hollinger Consolidated Gold Mines, Limited, has an authorized capitalization of 5,000,000 shares of \$5 par value. At December 31, 1937, outstanding shares numbered 4,920,000. The officers of the company are: Jules R. Timmins, president; John B. Holden, vice-president and treasurer; P. C. Finlay, secretary. The directors are: Jules R. Timmins, W. L. McDougald, Leo H. Timmins, Wilson Bell, James Y. Murdoch, Allen A. McMartin, John I. Rankin, N. A. Timmins, and John B. McMartin. John Knox is general manager, and A. H.

Wohlrab is assistant manager. The mine office and head office of the company are at Timmins. The general office is at 602 Royal Bank Building, Toronto.

The main property, operated by the company, is located in the township of Tisdale, Porcupine area, district of Cochrane, and includes part of the ground underlying the town of Timmins. The company has numerous other holdings and interests. It owns and operates the Ross mine in Hislop township, district of Cochrane, and controls and operates Young Davidson Mines, Limited, in Powell township, district of Timiskaming.

The following is taken from the report of the general manager for the year ending December 31, 1937:—

PROFIT AND LOSS STATEMENT

for the year ending December 31, 1937

SOURCES OF 1937 INCOME:

| | | |
|---|-----------------|-----------------|
| Gold and silver produced..... | \$14,877,897.85 | |
| Interest on investments and other income..... | 198,915.88 | |
| | | \$15,076,813.73 |

DISPOSAL OF 1937 INCOME:

| | | |
|-----------------------------|----------------|--------------|
| Milling charges..... | \$1,131,016.67 | |
| Mining charges..... | 5,972,040.41 | |
| Marketing bullion..... | 165,409.59 | |
| Workmen's compensation..... | 129,485.83 | |
| Silicosis assessment..... | 208,880.28 | |
| General charges..... | 708,318.50 | |
| | | 8,315,151.28 |

\$6,761,662.45

DEDUCT:

Taxes—

| | | |
|--|--------------|--------------|
| Dominion of Canada income tax..... | \$649,683.58 | |
| Province of Ontario: | | |
| Corporation tax..... | 45,963.68 | |
| Mining profits tax..... | 154,802.87 | |
| Royalties: | | |
| Town of Timmins..... | 52,461.49 | |
| Township of Tisdale..... | 9,981.53 | |
| Municipal: | | |
| Town of Timmins..... | 73,969.76 | |
| Township of Tisdale..... | 3,558.62 | |
| Miscellaneous..... | 47.75 | |
| Dominion, provincial, and municipal, reserved for..... | 10,000.00 | |
| | | 1,000,469.28 |

Net profit from operations before depreciation.... \$5,761,193.17

Depreciation:

| | | |
|---|--------------|------------|
| Plant..... | \$165,423.81 | |
| Investments in other companies and properties written down..... | 6,582.07 | |
| Expenditures on properties abandoned..... | 401,706.13 | |
| | | 573,712.01 |

NET PROFIT FROM OPERATIONS CARRIED TO SURPLUS ACCOUNT..... \$5,187,481.16

SURPLUS ACCOUNT

| | |
|---|-----------------|
| BALANCE BROUGHT FORWARD, JANUARY 1, 1937..... | \$6,311,258.92 |
| NET PROFITS FROM OPERATIONS..... | 5,187,481.16 |
| NET PROFITS FROM THE SALE OF SECURITIES AND OTHER ASSETS..... | 95,828.80 |
| | \$11,594,568.88 |
| PAID OUT IN DIVIDENDS..... | 5,412,000.00 |
| BALANCE CARRIED FORWARD, DECEMBER 31, 1937..... | \$6,182,568.88 |

BULLION STATEMENT

INVENTORY, JANUARY 1, 1937:

| | | |
|---------------------------------|--------------|------------|
| Gold in process (\$20.67)..... | \$235,310.12 | |
| Premium on gold in process..... | 155,718.61 | |
| Silver bullion on hand..... | 2,818.30 | |
| | | 393,847.03 |

GROSS VALUES PRODUCED IN 1937:

| | | |
|--------------------|-----------------|------------------------|
| Ore milled..... | \$15,457,746.61 | |
| Tailings loss..... | 579,848.76 | |
| | | 14,877,897.85 |
| | | <u>\$15,271,744.88</u> |

INVENTORY, DECEMBER 31, 1937:

| | | |
|---------------------------------|--------------|------------|
| Gold in process (\$20.67)..... | \$216,120.60 | |
| Premium on gold in process..... | 145,245.88 | |
| Silver bullion on hand..... | 452.98 | |
| | | 361,819.46 |

BULLION SHIPPED DURING 1937..... 14,909,925.42

\$15,271,744.88

YEARLY AVERAGE COSTS

| Account | Sundries | Labour | Stores | Total | Per ton ore milled |
|--|--------------|----------------|----------------|----------------|--------------------|
| General miscellaneous charges and administration..... | | \$303,975.43 | \$129,989.60 | \$433,965.03 | \$0.2524 |
| Surface services..... | | 56,694.79 | 35,289.33 | 91,984.12 | .0535 |
| Insurance, fire..... | \$45,057.64 | | | 45,057.64 | .0262 |
| Insurance—group, sickness and accident, and medical..... | | 137,311.71 | | 137,311.71 | .0799 |
| Marketing bullion..... | 165,409.59 | | | 165,409.59 | .0962 |
| Workmen's compensation..... | | 129,485.83 | | 129,485.83 | .0753 |
| Silicosis assessment..... | | 208,880.28 | | 208,880.28 | .1215 |
| Milling charges..... | | 503,291.43 | 627,725.24 | 1,131,016.67 | .6579 |
| Mining charges..... | | 4,371,198.65 | 1,600,841.76 | 5,972,040.41 | 3.4737 |
| Total charges..... | \$210,467.23 | \$5,710,838.12 | \$2,393,845.93 | \$8,315,151.28 | \$4.8366 |

Employees

The average number of men employed during the year has been 2,904, distributed as follows:—

MINERS:

| | |
|------------------|-------|
| Exploration..... | 33 |
| Development..... | 389 |
| Production..... | 1,499 |

MECHANICS:

| | |
|------------------|-----|
| Operation..... | 128 |
| Maintenance..... | 222 |

GENERAL:

| | |
|-----------------------|-----|
| Mill and refinery.... | 223 |
| Technical..... | 98 |
| Clerical..... | 42 |
| Miscellaneous..... | 183 |
| Outside properties.. | 87 |

Total..... 1,921

Total..... 350

Total..... 633

The Mill

The milling results were as follows:—

| | | |
|------------------------------|-----------------|-----------------|
| Ore milled..... | tons | 1,719,199 |
| Average value per ton..... | | \$8.99 |
| Gross value..... | \$15,457,746.61 | |
| Deduct loss in tailings..... | 579,848.76 | |
| Net value recovered..... | | \$14,877,897.85 |

| | |
|--|------------|
| Average tons per day..... | 4,762 |
| Per cent. of possible time run..... | 85.5 |
| Tons per 100 per cent. running time..... | 5,570 |
| Solution precipitated per ton ore..... | tons 1.03 |
| Value per ton tailings..... | \$0.34 |
| Cyanide consumed per ton of ore..... | lbs. 0.499 |
| Zinc consumed per ton of ore..... | lbs. 0.044 |
| Zinc consumed per ton of solution..... | lbs. 0.042 |
| Lime consumed per ton of ore..... | lbs. 2.162 |
| Lead acetate per ton of ore..... | lbs. 0.01 |
| Average value of solution..... | \$8.42 |
| Average value received per ounce of gold sold..... | \$34.98 |

Ore Reserves

Our ore reserves on December 31, 1937, consisted of 7,260,091 tons, of a total value of \$49,779,926.00, having an average value of 0.3319 ounces, or \$6.86 per ton. These figures com-

pare with 7,257,257 tons, of a total value of \$51,027,123, having an average value of 0.3401 ounces, or \$7.03 per ton, at the end of 1936.

In the calculations dealing with ore reserves, the price of gold at \$20.67 per ounce has been taken as the basis of value, and the same minimum ore grade, namely \$4.00, as used in former years, continued.

Hollinger Mill

The new ore bin and grinding plant mentioned in the last annual report have been completed and are now operating satisfactorily. The new bin has a capacity of 11,000 tons of ore, which gives us sufficient storage above daily requirements to make week-end operation much more efficient than formerly. While the grinding unit has been in regular operation only a short time, the results to date indicate that the anticipated benefits will be realized.

Hollinger Mine

During the year 38.3 per cent. of the ore milled came from above the 800-foot level. While the previous annual report indicated the probability that all the major ore had been discovered above the 800-foot level, the recovery of sills from the upper workings shows a higher percentage of ore extracted from this zone than in the former reports.

As referred to in the last report, development work has been undertaken below the 3,950-foot level during the year, and the main drives and crosscuts are reaching the position of the ore zones. Results to date have been up to our expectations, but this work has not progressed sufficiently to make any statements as to ore reserves. Consequently, nothing from this area has been taken into our estimates.

There is a slight increase in tonnage of ore in reserve over the previous year with a decrease in value of approximately \$1,247,000. This is accounted for by the fact that the ore developed in the upper levels is of a lower grade than our former average. The grade of ore milled during the year was \$8.99, as compared with \$8.61 during 1936, based on \$35.00 gold. This increase in grade milled is solely attributable to cleaner mining, resulting in less waste being mixed with the ore.

Work on the new shaft mentioned in the last annual report was commenced early in the year, the shaft now being completed to the 1,100-foot level. This section has been completed by raising from existing drifts. Below the 1,100-foot level the shaft will be sunk in the regular manner to the 1,850-foot level, where we will again encounter a raised portion above the 2,000-foot level. A small amount of stoping has been commenced below the 2,750-foot level.

Young-Davidson Mine

The operations have been satisfactory during the year. Some 337,556 tons were milled, being an average of 930 tons per day, with a recovery of \$3.34, based on \$35 gold. We have applied \$318,615.26 realized from operations on account of our advances. During the year 66,200 tons came from underground operations. There are approximately 46,000 tons of broken ore in stopes above the 260-foot level.

Ross Mine, Hislop Township

There have been no new ore discoveries during the year, but there are some interesting diamond-drill intersections, towards which development drifts are now being driven.

As mentioned in a previous report, there are two ore zones, known as the Easterly, from which all production up to the present time has been obtained, and the Westerly, which is lower in grade and with quite different ore characteristics. It would now seem that a portion of this west ore body can be profitably mined and, with this in view, the mill is being enlarged and the necessary alterations being made to treat this extra tonnage. A small amount of copper gold concentrate will be removed and shipped to the smelter at Noranda.

Some 31,336 tons of ore, yielding \$11.22 per ton, based on \$35 gold, were milled during the year, the total profit being \$162,890.80.

General

The employees, under the name of the Hollinger Employees' Medical Services Association, developed a medical plan whereby each employee and his family, by contributing \$2.65 each four weeks, receive all necessary medical and surgical attention, hospitalization and nursing, with the right to select their own doctor from among practically all members of the medical profession in the Porcupine camp. We believe that this plan will result in much benefit to all the employees. There was, as might be expected, a great deal of service required, which had been deferred on account of the cost, so that the original sum contributed was insufficient to cover the needs. To tide over this period your directors made a temporary grant of \$1.00 per employee to be added to the \$2.65, and with this aid we are pleased to say that the plan is developing in a most satisfactory manner. Non-occupational sickness and accident insurance was also put in force covering each employee to the amount of \$15.00 per week for a period of thirteen weeks.

Lang Property

The Lang property, consisting of 3 claims in lot 2, concession VI, Whitney township, Porcupine area, district of Cochrane, adjoins the Pamour Porcupine property on the east. It was optioned by Hollinger Consolidated Gold Mines, Limited, in 1935. During that year diamond-drilling from surface, amounting to

21,262 feet, was done on these claims and others adjacent to the east. In 1936 some 2,907 feet of diamond-drilling from surface was done. In the spring of 1936 a 2-compartment shaft was started and was sunk to a depth of 259 feet; a level was established at 220 feet, and 417 feet of crosscutting and 587 feet of drifting were done. In 1937 about 392 feet of crosscutting, 963 feet of drifting, 30 feet of raising, and 2,759 feet of diamond-drilling from underground were done.

In May, 1937, the option was terminated and the mining plant was removed. During the period of active underground operation 25 men were employed under the direction of W. H. Hansen.

Smith-Thorne Mine

Work was continued during 1937 at the Smith-Thorne property at Horwood lake, district of Sudbury, until May 15, when the option was dropped.

The development work accomplished during this period consisted of 315 feet of drifting on the 200-foot level. A total of 4,205 feet of diamond-drilling was also done.

An average of 20 men was employed during the period of operation under the direction of E. M. Ward.

Howey Gold Mines, Limited

Howey Gold Mines, Limited, was incorporated in March, 1926, with an authorized capitalization of 5,000,000 shares of \$1 par value, all of which have been issued. The officers and directors are: R. T. Birks, president; W. S. Cherry, vice-president; H. C. McCloskey, secretary-treasurer; B. E. Martin, assistant secretary-treasurer; G. A. La Bine, and John A. Northway, directors. F. D. Reid and E. Futterer are general managers. The executive office is at 833 Federal Building, Toronto, and the head office and mine office are at Red Lake.

The company's holdings, consisting of 41 claims, lie along both sides of the boundary between Dome and Heyson townships, at the southeast corner of Red lake, in the Patricia portion of Kenora district. The greater part of the town of Red Lake is built on Howey property.

Red Lake is reached by airplane daily from Hudson, Kenora, or Winnipeg. Freight is transported from Hudson, via the Lac Seul water route.

The following table shows the amount of development work to the end of 1936 and during 1937, by levels:—

| Level | Drifts | | Crosscuts | | Raises | |
|-----------------|---------------------|-------|---------------------|-------|---------------------|-------|
| | To Dec. 31, 1936 | 1937 | To Dec. 31, 1936 | 1937 | To Dec. 31, 1936 | 1937 |
| | feet | feet | feet | feet | feet | feet |
| 125-foot..... | 1,889 | ..... | 996 | ..... | 820 | 114 |
| 250-foot..... | 1,918 | ..... | 987 | ..... | 815 | ..... |
| 375-foot..... | 2,620 | 605 | 1,091 | ..... | 881 | ..... |
| 500-foot..... | 2,514 | ..... | 2,709 | ..... | 694 | ..... |
| 625-foot..... | 810 | ..... | 478 | ..... | 432 | ..... |
| 750-foot..... | 1,526 | 371 | 972 | ..... | 1,068 | 25 |
| 875-foot..... | 1,864 | 63 | 687 | ..... | 1,336 | 52 |
| 1,000-foot..... | 2,940 | ..... | 771 | 29 | 2,122 | 157 |
| 1,050-foot..... | ..... | ..... | ..... | ..... | 62 | ..... |
| 1,175-foot..... | 1,740 | ..... | 312 | ..... | 994 | 435 |
| 1,265-foot..... | 1,251 | 408 | 588 | 106 | 325 | 92 |
| 1,315-foot..... | 1,215 | ..... | 177 | ..... | 1,230 | 149 |
| 1,500-foot..... | 818 | ..... | 138 | ..... | ..... | ..... |
| 1,700-foot..... | 459 | ..... | 68 | ..... | ..... | ..... |
| 1,850-foot..... | ..... | ..... | 14 | ..... | ..... | ..... |
| 2,000-foot..... | 1,391 | ..... | 88 | ..... | ..... | ..... |

There were no additions to the plant equipment or buildings during the year 1937.

The following is taken from the report of the general managers for the year ending December 31, 1937:—

ANALYSIS OF COSTS

| | 1937 (535,949 tons) | | 1936 (528,528 tons) | | 1935 (484,966 tons) | |
|---|------------------------|--------------------------------|------------------------|--------------------------------|------------------------|--------------------------------|
| | Total cost | Cost per ton milled and sorted | Total cost | Cost per ton milled and sorted | Total cost | Cost per ton milled and sorted |
| Mine operation..... | \$384,364.34 | \$0.717 | \$426,564.87 | \$0.807 | \$467,385.23 | \$0.963 |
| Surface exploration.. | 3,487.15 | .007 | 6,824.72 | .013 | 4,326.53 | .009 |
| Crushing and conveying..... | 38,472.19 | .072 | 38,141.88 | .072 | 40,294.21 | .083 |
| Ore sorting..... | 17,147.41 | .032 | 14,922.50 | .028 | 14,200.53 | .029 |
| Milling..... | 203,576.49 | .380 | 207,781.84 | .393 | 217,786.10 | .450 |
| General expense..... | 62,356.02 | .116 | 56,741.30 | .108 | 67,451.02 | .139 |
| Total plant cost. | \$709,403.60 | \$1.324 | \$750,977.11 | \$1.421 | \$811,443.62 | \$1.673 |
| Toronto office salaries and general expense | 30,624.35 | .057 | 28,895.00 | .055 | 32,762.26 | .068 |
| Interest and exchange | | | | | 33.50 | |
| Total operating expense before depreciation, Dominion and provincial taxes, and pre-operating charges.. | \$740,027.95 | \$1.381 | \$779,872.11 | \$1.476 | \$844,239.38 | \$1.741 |
| Dominion and provincial taxes..... | 13,559.76 | .025 | 29,273.69 | .056 | 39,472.01 | .081 |
| Depreciation (on 10 per cent. basis).... | 137,118.96 | .256 | 136,751.88 | .258 | 135,705.24 | .280 |
| Pre-operating charges | 107,189.80 | .200 | 105,705.60 | .200 | 96,993.20 | .200 |
| Outside exploration.. | 9,187.00 | .017 | | | | |
| Total cost..... | \$1,007,083.47 | \$1.879 | \$1,051,603.28 | \$1.990 | \$1,116,409.83 | \$2.302 |

EARNINGS STATEMENT

| | 1937 | 1936 | 1935 |
|---|----------------|----------------|----------------|
| Total receipts from sale of gold and silver..... | \$1,084,590.64 | \$1,239,134.33 | \$1,319,764.26 |
| Total operating cost, including Toronto office expense. | 740,027.95 | 779,872.11 | 844,239.38 |
| Operating profit..... | \$344,562.69 | \$459,262.22 | \$475,524.88 |

SUMMARY OF WORK ACCOMPLISHED

| | 1937 | 1936 | 1935 |
|---|----------|---------|---------|
| Drifts, crosscuts, raises, etc..... feet | 3,446.46 | 2,731 | 5,143.8 |
| Shafts and winzes..... feet | | 423.5 | 249 |
| Shaft-stations, slashing, etc..... cu. yds. | | 170.6 | 52 |
| Diamond-drilling (underground)..... feet | 6,257 | 5,255 | 4,185 |
| Diamond-drilling (outside exploration)..... feet | 1,600 | 2,341 | 1,514 |
| Box-holes..... feet | 212.5 | 410.5 | 442 |
| Ore broken..... tons | 414,834 | 648,812 | 650,156 |
| Low-grade material discarded by sorting..... tons | 88,605 | 89,884 | 82,746 |
| Milled after sorting..... tons | 447,344 | 438,644 | 402,220 |
| Broken reserves in stopes (January 1, 1938)..... tons | 446,628 | 568,742 | 456,958 |

MISCELLANEOUS OPERATING DATA¹

| | 1937 | 1936 | 1935 | Total from start of operations |
|--|----------------|----------------|----------------|--------------------------------|
| Tonnage milled and sorted | 535,949 | 528,528 | 484,966 | 3,042,690 |
| Tonnage discarded by sorting | 88,605 | 89,884 | 82,746 | 460,754 |
| Tonnage milled | 447,344 | 438,644 | 402,220 | 2,581,936 |
| Value per ton hoisted | \$1.30 | \$1.52 | \$1.76 | \$2.31 |
| Value per ton material discarded by sorting | \$0.21 | \$0.21 | \$0.21 | \$0.284 |
| Value per ton of ore milled | \$1.51 | \$1.79 | \$2.08 | \$2.66 |
| Tailing loss per ton milled | \$0.065 | \$0.101 | \$0.127 | \$0.177 |
| Loss per ton of ore hoisted (in milling and sorting) | \$0.089 | \$0.119 | \$0.141 | \$0.193 |
| Net percentage recovery per ton of ore hoisted | 93.3 | 92.4 | 92.1 | 91.6 |
| Total net recovery of gold and silver ² .. | \$1,084,590.64 | \$1,239,134.33 | \$1,319,764.26 | \$9,039,680.78 |

¹All values are figured on gold at \$20.67 per ounce.

²Includes premium paid by the Government.

Due to the great extent of the potential mining areas in the provinces of Ontario and Quebec, and in order to more thoroughly cover these areas, your company has associated itself with Coniagas Mines, Limited, and the Cyril Knight Prospecting Company, Limited, in a systematic survey and search for new properties. As a result of this association, a great deal of valuable information was secured at a minimum of expense. Two properties were optioned and explored by diamond-drilling. Results, however, were unfavourable.

Also in association with Anglo-Huronian, Limited, your company has become interested in two mining properties in the Yellowknife River section of the North West Territories. Owing to unavoidable delays, possession of these properties was not secured until December, 1937. During 1938 they will be thoroughly explored.

Exploration

The 375-foot level drift was advanced 605 feet east, and the dike systematically explored over this length by diamond-drilling. A hole 125 feet long was drilled from the west end of the 1,175-foot drift at an angle of 45 degrees towards the west property boundary. The 1,265-foot grizzly level was driven to within 145 feet of the west boundary. A total length of 1,340 feet along the strike of the dike on the 2,000-foot level was explored by drifting and diamond-drilling. No ore was found in any of this work.

All favourable areas have been systematically explored and to date results have been uniformly negative. Diamond-drilling, however, on the 2,000-foot level is still being carried on, but if no ore is located by this work, future operations will be of a salvaging nature.

Ore Reserves

The broken ore reserve in the mine as of December 31, 1937, amounted to 446,628 tons, compared to 568,742 tons the previous year. The unbroken reserve was 563,518 tons, making a total reserve of 1,010,146 tons. Approximately 50,000 tons of ore, which had not previously been included in the ore reserves, were broken from the north wall of the 1,000-foot stope. In addition to this, another 100,000 tons of better than average grade ore will probably be recovered from permanent pillars.

General

The value of the ore hoisted for the year 1937 was \$2.20 (gold at \$35.00) as compared to \$2.57 per ton the previous year. The average operating cost for the year 1937 was \$1.381 per ton, compared to \$1.476 per ton the previous year, a reduction of 9.5 cents per ton of ore hoisted. Unless new ore is found in the work now being carried on a further reduction in operating costs can be expected.

The average number of men employed daily was 200, distributed as follows: surface, 32; mine, 122; mill, 46. R. E. Sullivan, formerly mill superintendent, succeeded E. Futterer as general superintendent in charge of the property.

Hudson-Patricia Gold Mines, Limited

Hudson-Patricia Gold Mines, Limited, was incorporated in April, 1934, succeeding Metals Development, Limited, with an authorized capitalization of

2,500,000 shares of \$1 par value. In December, 1935, the capitalization was increased to 3,500,000 shares, of which 3,499,719 have been issued. The officers and directors are: Dr. M. H. Lebel, president; W. R. Salter, vice-president; M. F. Blue, secretary-treasurer; P. A. Lavallee, managing director; B. R. Hepburn, Dr. J. L. A. Tetreault, C. H. Ackerman, and A. J. H. St. Denis, directors. The head office is at 112 Yonge Street, Toronto, and the mine address is Woman Lake, via Hudson.

The property consists of 26 patented claims, comprising 1,060 acres, in the townships of Goodall and Dent, in the Woman Lake area, Patricia portion of Kenora district. The mine is reached by airplane from Hudson or Sioux Lookout.

Operations were suspended during 1937 except for a short period in January, during which a clean-up was made. A recovery of \$10,176 was reported during this period. The ore treated was from a shrinkage stope on the 211-foot level.

About 55 men were employed, and J. M. Thompson was the manager.

Hugh-Pam Porcupine Mines, Limited

Hugh-Pam Porcupine Mines, Limited, was incorporated in December, 1935 with an authorized capitalization of 3,000,000 shares of \$1 par value. At the end of 1937 there were 2,316,947 shares outstanding. The office of president was vacant at the end of 1937. The other officers and directors are as follows: J. J. Gray, vice-president; R. W. Armstrong, secretary-treasurer; W. G. Armstrong, H. M. Anderson, and Geo. H. Bourne, directors. The head office is at 51 King Street West, Toronto. The mine address is South Porcupine.

The company holds 15 claims, approximately 600 acres, in Whitney township, Porcupine area, district of Cochrane.

There are two shafts on the property, both of which are about 200 feet in depth. The workings from these two shafts were pumped out and sampled in 1936. No underground work was done in 1937. The only work done during the year consisted of diamond-drilling amounting to 16,000 feet. Operations were suspended in September.

Three or four men were employed during the months of operation. D. C. Leggett was superintendent.

Hutchison Lake Gold Mines, Limited

Hutchison Lake Gold Mines, Limited was incorporated in June, 1935, as Hutchinson Lake Gold Mines, Limited, the name being changed later. The authorized capitalization is 3,000,000 shares of \$1 par value. The officers and directors are: H. H. Van Wart, president; G. U. Papineau, vice-president; W. G. Chapman, secretary-treasurer; W. W. Beaton, W. J. Ryan, and S. C. McLaughlin, directors. The head office is at 200 Bay Street, Toronto. The mine address is Geraldton.

The property consists of 19 claims in Fulford township, Little Long Lac area, 4 miles north of Geraldton, on the Longlac-Port Arthur branch of the Canadian National Railways, district of Thunder Bay.

Plant equipment includes a Gardner Denver 325-cubic-foot compressor, driven by a 128 h.p. Caterpillar Diesel engine; a double-drum Mead Morrison 8-by 10-inch steam hoist, and a 100 h.p. boiler.

Surface buildings include power-house, hoist-room, boiler-house, blacksmith shop, office, dry-house, shaft-house, warehouse, assay office, magazine, cap-house, bunk-house, cookery, and staff-house.

The 3-compartment, vertical shaft, which had been commenced in December, 1936, was sunk to a depth of 250 feet, and levels were established at 125 and 250 feet. Development work accomplished during 1937 was as follows: 752 feet of drifting, 587 feet of crosscutting, and 141 of raising on the 125-foot level; 806 feet of drifting, 694 feet of crosscutting, and 77 feet of raising on the 250-foot level. Diamond-drilling amounted to 441 feet from surface and 378 feet from underground.

During the year an average of 35 men was employed, of whom 14 were underground. W. W. Beaton is mine manager.

Jellicoe Consolidated Gold Mines, Limited

Jellicoe Consolidated Gold Mines, Limited, was incorporated on January 15, 1936, with an authorized capitalization of 5,000,000 shares of \$1 par value. At December 31, 1937, 3,475,005 shares were outstanding, with 1,455,000 shares pooled and 1,524,995 in the treasury. The officers and directors are: Hon. W. A. Gordon, president; S. G. Tobin, vice-president; S. J. Kidder, managing director; T. J. Day, secretary-treasurer; G. G. Blackstock and W. T. McEachern, directors. The head office is at 1101 Federal Building, Toronto. The mine address is Geraldton.

The property consists of 54 patented claims, adjoining the Bankfield and Tombill properties on the west, in Lindsley and Errington townships, Little Long Lac area, district of Thunder Bay. It is reached by a 7-mile automobile road from Geraldton on the Longlac-Port Arthur branch of the Canadian National Railways.

Commencing in June, 1936, an extensive diamond-drilling campaign was conducted on 9 of the claims, and a total of 14,408 feet of diamond-drilling was done. Drilling was continued in the early part of 1937, and on March 25 the sinking of a vertical 3-compartment shaft, 7 by 17 feet, was commenced by hand on claim T.B. 12,149. Plant and camp buildings were erected, a mining plant was installed, hydro-electric power was brought to the property, and on July 12 shaft-sinking under power was commenced. Underground work was continued throughout the year, at the end of which the following development had been accomplished:—

| | |
|---------------------|---------------|
| Shaft-sinking | Feet 536.5 |
| 225-FOOT LEVEL: | |
| Drifting | 269 |
| Crosscutting | 157 |
| 350-FOOT LEVEL: | |
| Drifting | 273.6 |
| Crosscutting | 182.5 |
| 500-FOOT LEVEL: | |
| Drifting | 205 |
| Crosscutting | 175 |

Plant equipment includes a Canadian Ingersoll-Rand XVHE-2, 1,000-cubic-foot compressor, driven by an English Electric 200 h.p. unity power-factor synchronous motor, and a Canadian Ingersoll-Rand double-drum hoist, driven by an English Electric 75 h.p. induction motor.

Surface buildings include power-house and hoist-room, blacksmith shop and machine shop, warehouse, dry-house, powder-house, cap-house, assay office, staff-house, office, stable, bunk-house, and cookery.

At the end of the year there were 49 men employed, of whom 24 were underground, under the direction of M. A. Twidale.

J-M Consolidated Gold Mines, Limited

J-M Consolidated Gold Mines, Limited, was incorporated in February, 1932, and has an authorized capitalization of 3,500,000 shares of \$1 par value, of which 3,499,966 have been issued. The officers and directors are: J. E. Day, president; Charles Taylor, vice-president; T. J. Day, secretary-treasurer; F. L. Hutchinson, W. A. Taylor, J. McFetrick, and D. M. Thomson, directors. The head office is at 1116 Federal Building, Toronto. The mine address is Jackson Manion.

The property includes 44 claims, totalling 1,892 acres, located in Dent and Mitchell townships, Woman Lake area, Patricia portion of Kenora district. The mine is reached by water from Hudson, through Lac Seul, Pakwash lake, Trout Lake river, and Woman river, to Woman lake, or by airplane from Hudson or Sioux Lookout, on the main western line of the Canadian National Railways.

The property continued operating throughout 1937, and the following table shows the development done to December 31, 1936, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|---------------------------|---------------------|-------|-------|
| | feet | feet | feet |
| 125-FOOT LEVEL: | | | |
| Drifts..... | 1,043 | ..... | 1,043 |
| Crosscuts..... | 241 | ..... | 241 |
| Raises..... | 200 | 218 | 418 |
| 250-FOOT SUBLEVEL: | | | |
| Drifts..... | 219 | 67 | 286 |
| Crosscuts..... | ..... | 53 | 53 |
| Raises..... | ..... | 59 | 59 |
| 250-FOOT LEVEL: | | | |
| Drifts..... | 1,290 | ..... | 1,290 |
| Crosscuts..... | 311 | ..... | 311 |
| Raises..... | 210 | 145 | 355 |
| 375-FOOT LEVEL: | | | |
| Drifts..... | 976 | ..... | 976 |
| Crosscuts..... | 243 | ..... | 243 |
| Raises..... | 119 | ..... | 119 |
| 485-FOOT LEVEL: | | | |
| Drifts..... | 245 | ..... | 245 |
| Crosscuts..... | 26 | ..... | 26 |
| 625-FOOT LEVEL: | | | |
| Drifts..... | 445 | 408 | 853 |
| Crosscuts..... | 43 | 21 | 64 |

The mill operated continuously during 1937 and treated 100 tons per day. The production was as follows:—

| | | |
|--------------------------|--------|----------|
| Waste hoisted..... | tons | 1,706 |
| Ore hoisted..... | tons | 31,898 |
| Waste sorted..... | tons | 673 |
| Ore milled..... | tons | 31,225 |
| Bullion produced: | | |
| Gold..... | ounces | 9,299.37 |
| Silver..... | ounces | 5,505.82 |
| Percentage recovery..... | | 94.2 |

The ore milled during the year was distributed as follows:—

| | No. of stopes | Tons produced |
|---------------------------------|---------------|---------------|
| No. 1 shaft development: | | |
| 125-foot level..... | 2 | 3,474 |
| 250-foot level..... | 6 | 12,400 |
| 375-foot level..... | 1 | 436 |
| 485-foot level..... | 1 | 548 |
| No. 2 shaft development: | | |
| 250-foot level..... | ..... | 308 |

The mining is done by shrinkage methods.

On February 1 diamond-drilling operations were started on the Rowe vein, which outcrops near the shore of Rowe lake about 2,400 feet north of the main shaft. Some 19 holes were completed, totalling 6,094 feet, over a length of 1,300 feet, which showed 300 feet of good ore extending at least 350 feet in depth. Sinking was started in June on a 3-compartment, vertical shaft and a headframe and a sinking plant were installed.

By the end of the year the shaft was 382 feet deep, with levels at 125 and 250 feet. A third level is to be established at 375 feet. The development completed was 159 feet of drifting and 82 feet of crosscutting on the 125-foot level, and 418 feet of drifting, 74 feet of crosscutting, and 39 feet of raising on the 250-foot level.

A tramway 2,300 feet long has been built from the main shaft to No. 2 shaft, of which 900 feet is trestle work. A 3½-ton gasoline locomotive will be used to transport ore and supplies between the two shafts.

During 1937 a new office building was erected, and a 45-foot headframe, hoist-house, dry-house, boiler-house, and pump-house were erected at No. 2 shaft.

At No. 2 shaft two 7- by 10-inch, single-drum Mead Morrison hoists and a 40 h.p. Rumley steam boiler were installed.

An average of 99 men was employed, distributed as follows: surface, 40; underground, 51; mill, 8. W. W. Westaway is the manager.

Kenland Gold Mines, Limited

Kenland Gold Mines, Limited, which was incorporated in February, 1929, has an authorized capitalization of 4,000,000 shares of \$1 par value, of which 3,513,765 have been issued. The officers and directors are: Geo. H. Shaver, president; M. Abraham, vice-president; R. Abraham, secretary-treasurer; Leslie G. Sams, director. The head office is at 36 Toronto Street, Toronto, and the mine address is Kenora.

The property consists of 6 claims, totalling 308 acres, and includes the old Regina mine, which was later called the Horseshoe, on Regina bay, Lake of the Woods, district of Kenora. It is 45 miles southwest of Kenora.

The mine was idle from September, 1934, to September, 1935, but operations were resumed on September 10 and continued until December 25. The work done consisted mainly of repairing the mine buildings and the shaft and making a geological survey of part of the property.

Operations were resumed again in July, 1936, and continued until June 1, 1937. A new mining plant was installed, new buildings were erected, the mill was put into operation, and exploration work was done on the 8th, 9th, and 10th levels.

New buildings erected included a shaft-house and headframe, 2 bunk-houses, a cookery, and an office.

The present mining plant consists of a 560-cubic-foot Canadian Ingersoll-Rand compressor, driven by a 125 h.p. Dominion Crossley Diesel engine, a 200-cubic-foot Ingersoll-Rand steam-driven compressor, a 60 h.p. locomotive-type boiler, and an Ingersoll-Rand drill-sharpener.

The shaft, on No. 1 vein, is 547 feet deep, and a winze has been sunk 117 feet from the 527-foot level. The following table shows the amount of drifting on each level:—

| Level | Feet |
|------------|-------|
| 1st..... | 194 |
| 2nd..... | 464 |
| 3rd..... | 425 |
| 4th..... | 675 |
| 5th..... | 242 |
| 6th..... | 765 |
| 7th..... | 218 |
| 8th..... | 726 |
| 9th..... | 618 |
| Total..... | 4,327 |

A small amount of crosscutting has been done on the fourth level.

The average number of men employed daily during the 1937 period of operation was 20, of whom 10 were underground. J. M. Thompson was manager.

Kenricia Gold Mines, Limited

Kenricia Gold Mines, Limited, was incorporated in April, 1936, with an authorized capitalization of 2,000,000 shares of no par value, of which 1,300,000 have been issued. The officers and directors are: Jos. Errington, president; D. M. Hogarth, vice-president; L. A. Macdonald, secretary-treasurer; W. S. Morlock and C. W. Greenland, directors. The head office is at 25 King Street West, Toronto, and the mine address is Kenora.

The property consists of 13 claims, including the old Three Ladies mine operated some 40 years ago, on the south shore of Clearwater bay, Lake of the Woods, district of Kenora. The mine can be reached by road from Kenora.

Operations continued until December 8, 1937, when the plant was shut down temporarily.

When operations were discontinued, the vertical, 3-compartment shaft was 383 feet deep, with levels at 200 and 350 feet. The development completed to date is as follows:—

| Level | Drifts | Crosscuts | Raises |
|---------------|--------|-----------|--------|
| | feet | feet | feet |
| 200-foot..... | 1,746 | 655 | 102 |
| 350-foot..... | 2,812 | 691 | 38 |

| | |
|-------------------|--------|
| DIAMOND-DRILLING: | Feet |
| Surface..... | 5,684 |
| Underground..... | 5,609 |
| Total..... | 11,293 |

An average of 46 men was employed daily. D. A. Duff is the manager.

Kerr-Addison Gold Mines, Limited

Kerr-Addison Gold Mines, Limited, was incorporated in April, 1936, with an authorized capital of 5,000,000 shares of \$1 par value, 4,718,066 of which have been issued. The officers and directors are: Geo. B. Webster, president; G. A. Cavin, secretary-treasurer; A. H. Cockeram, J. H. Colville, F. M. Connell, André Dorfman, H. S. Munroe, and J. H. C. Waite, directors. W. S. Row is manager. The head office is at 38 King Street West, Toronto. The mine address is Larder Lake.

The property consists of 27 claims, 848.16 acres, in McGarry township, Larder Lake area, district of Timiskaming.

The mine was operated throughout 1937. Sinking on the Kerr-Addison, or No. 1, shaft was continued to a depth of 750 feet, and levels were established at 500 and 700 feet. A new vertical shaft, known as No. 3, was sunk to a depth of 773 feet. About 1,727 feet of crosscutting, 3,641 feet of drifting, and 340 feet of raising were done. Surface diamond-drilling amounted to 11,844 feet, and underground diamond-drilling to 27,500 feet. Some 230 feet of surface-trenching was done.

Buildings erected during the year included 2 hoist-rooms, 2 compressor houses, 2 water tanks, 2 headframes, 4 camp buildings, 6 dwellings, 5 mine shops, 6 mine buildings, 5 garages, dry-house, and office. Foundations for a 500-ton mill were poured. Power lines were constructed, and surface lighting installed.

An average of 169 men was employed.

Kerry Gold Mines, Limited

Early in 1937 Ardeen Gold Mines, Limited, went into bankruptcy and later in the year the assets of the company were sold at auction to the Manhattan Investment Corporation of Montreal for approximately \$23,000. On December 20, 1937, Kerry Gold Mines, Limited, was incorporated to operate the property, which is located in Moss township, district of Thunder Bay, about 18½ miles by road from Tip Top spur on the Fort Frances branch of the Canadian National Railways. The authorized capitalization is 3,000,000 shares of \$1 par value, of which 500,000 shares were offered to the shareholders of Ardeen Gold Mines, Limited, at 10 cents a share.

The officers and directors are: T. B. Armstrong, president; W. G. Chipp, secretary-treasurer, and T. M. Mongovan director. The head office is at 36 Toronto Street, Toronto. The mine address is Kashabowie.

It is reported that this company intends to resume operations at the old Ardeen property early in 1938.

Kirana Kirkland Gold Mines, Limited

Kirana Kirkland Gold Mines, Limited, was incorporated in August, 1936, with an authorized capital of 3,000,000 shares of \$1 par value, of which 1,851,000 have been issued. The officers and directors are: R. A. Scott, president; G. S. Haines, vice-president; W. J. Boyd, secretary-treasurer; D. McKenna, H. Coulston, B. Bain, directors. F. W. Trickey is general manager. The mine office address is Box 364, Kirkland Lake. The head office is at 1009 Royal Bank Building, Toronto.

The property consists of 7 claims, 267 acres, in Teck and Lebel townships, Kirkland Lake area, district of Timiskaming.

During 1937 the shaft was reconditioned from surface to the 275-foot level, and 820 feet of crosscutting was done.

An average force of 16 men was employed from January 1 to May 14, under the direction of A. W. Grierson, mine manager.

Kirkland Consolidated Mines, Limited

Kirkland Consolidated Mines, Limited, has an authorized capitalization of 7,000,000 shares of \$1 par value, of which 5,214,409 have been issued. The officers and directors are: Ira Scheifley, president; Ferdinand Frohe, vice-president; C. C. Tyx, secretary-treasurer; Geo. F. Pfeiffer, Kevin Killeen, Richard W. Langford, and Norman R. Davis, directors. The head office is at 702 Excelsior Life Building, Toronto.

The company owns several groups of claims: 9 claims in the Sturgeon River area, district of Thunder Bay, and 14 in Gauthier township and 14 in Grenfell township, Kirkland Lake area, district of Timiskaming.

On the Grenfell township property there is a shaft 265 feet deep, and a considerable amount of lateral work has been done. During 1937 this property was leased to Donald E. Sirola for a period of two years. An open pit, 30 by 7 by 6 feet, was worked from August to December. Some ore was shipped.

Four men were employed during the period of operation. The mine address is care of Donald E. Sirola, Box 271, Kirkland Lake.

Kirkland Gold Rand, Limited

Kirkland Gold Rand, Limited, was incorporated in June, 1931, with an authorized capital of 3,000,000 shares of \$1 par value, of which 2,310,895 have been issued. The officers and directors are: J. T. Tebbutt, president; P. D. Martel, vice-president; E. J. Putnam, secretary-treasurer; R. J. MacDonald, Jas. M. Smibert, C. Price-Green, J. H. Rainville, directors. Chas. Spearman is general manager, and H. S. Gerson is mine manager. The head office and mine office are at Kirkland Lake. The administrative office is at 1812 Royal Bank Building, Montreal, Que.

The property consists of 9 claims, 315 acres, in Teck township, Kirkland Lake area, district of Timiskaming.

During 1937 the No. 1 winze, which is collared on the 800-foot level, was sunk 386 feet below the 1,050-foot level and stations were cut at the 1,175-, 1,300-, and 1,425-foot horizons. Some 11,658 feet of underground diamond-drilling, 845 feet of crosscutting, 943 feet of drifting, and 50 feet of raising were done.

An average force of 33 men was employed until December 18, when operations were temporarily suspended.

Kirkland Lake Gold Mining Company, Limited

Kirkland Lake Gold Mining Company, Limited, was incorporated in November, 1915, with an authorized capital of 5,500,000 shares of \$1 par value, of which 5,326,669 have been issued. The officers and directors are: J. B. Tyrrell, president; R. G. O. Thomson, vice-president; H. F. Cassidy, secretary-treasurer; V. H. Emery, managing director; J. A. Dalton, J. C. Haight, A. C. Matthews, W. S. Walton, and R. V. Le Sueur, directors. The head office and mine office are at Kirkland Lake. The executive office is at 1314 Metropolitan Building, Toronto.

The property consists of 11 claims, 334.5 acres, in Teck township, Kirkland Lake area, district of Timiskaming.

The following is taken from the report of the managing director for the year ending December 31, 1937:—

ANALYSIS OF OPERATING COST

| | Total cost | Cost per ton milled |
|--|--------------|---------------------|
| Development and exploration..... | \$99,231.43 | \$1.17 |
| Stoping..... | 163,040.41 | 1.92 |
| Transporting ore, hoisting, etc..... | 103,442.24 | 1.22 |
| Milling..... | 111,294.07 | 1.31 |
| Marketing bullion..... | 15,632.93 | .18 |
| Taxes..... | 20,822.66 | .24 |
| General and undistributed charges (maintenance mine buildings, administration and management, insurance, workmen's compensation, assaying, and miscellaneous)..... | 93,200.66 | 1.11 |
| Total..... | \$606,664.40 | \$7.15 |

The increase in operating cost over the previous year is largely due to the increase in wages paid to all employees. Some was due to the increase in cost of supplies.

SUMMARY OF WORK DONE IN MINE

| | | |
|-----------------------|---------|--------|
| Ore broken..... | tons | 87,741 |
| Drifting..... | feet | 4,185 |
| Crosscutting..... | feet | 2,211 |
| Raising..... | feet | 46 |
| Slashing..... | cu. ft. | 17,573 |
| Diamond-drilling..... | feet | 8,529 |

The distribution of the work done for the year was as follows:—

| | Ore broken | Development |
|---|------------|-------------|
| | per cent. | per cent. |
| 1st hoisting lift (surface to 2,400-foot level)..... | 40 | 3 |
| 2nd hoisting lift (2,400-foot level to 4,900-foot level)..... | 60 | 97 |

There was added to the broken ore reserves 2,855 tons, bringing the total broken ore in the mine to 43,511 tons.

MILLING STATISTICS

| | |
|----------------------------------|----------------|
| Tons of ore milled..... | 84,886 |
| Average value per ton..... | \$16.24 |
| Gross value..... | \$1,378,608.08 |
| Recovery per ton..... | \$14.72 |
| Loss in tailings..... | \$128,883.44 |
| Net value recovered..... | \$1,249,724.64 |
| Average tons milled per day..... | 232.6 |
| Value in tailings per ton..... | \$1.52 |
| Per cent. extraction..... | 90.65 |

The value per ton in tails is somewhat above the previous year, but the extraction is higher. This is accounted for by the increased value of the mill heads.

As stated last year, if conditions justified the expenditure, there would be an addition made to the agitating capacity of the mill. The excellent developments encountered early in the year proved this to be justified. Experimental work indicated that the saving to be made from the increased extraction would pay for the addition inside of one year. This work was undertaken and completed at a cost of about \$40,000. This addition was in operation for part of the month of November and all of December. The expected improvement from it was fully realized. During the month of December an average of 252 tons per day were milled, giving an extraction of 95.3 per cent.

The following table, giving the production figures for the different quarters, shows the improvement during the year, particularly in the last quarter:—

| | Tons milled | Bullion value | Recovery per ton | Per cent. extraction |
|------------------|-------------|----------------|------------------|----------------------|
| 1st quarter..... | 20,671 | \$276,218.75 | \$13.36 | 89.89 |
| 2nd quarter..... | 20,486 | 306,439.34 | 14.96 | 89.77 |
| 3rd quarter..... | 21,111 | 304,242.15 | 14.41 | 89.4 |
| 4th quarter..... | 22,618 | 362,824.40 | 16.04 | 92.9 |
| Total..... | 84,886 | \$1,249,724.64 | \$14.72 | 90.65 |

During the year considerable development and exploration was done, some new levels were opened up, and others extended. While some excellent ore was found in the vicinity of the main break on these levels, the diamond-drilling campaign from the 3,475-foot level disclosed the existence of a rich subsidiary break to the south. This was dipping appreciably flatter than the main break, and later was found to be the same vein that was cut considerably further to the south and west in the long crosscut driven to the southwest on the 3,600-foot level. This southerly vein during the year was fully developed on the 3,475- and 3,600-foot levels and for 313 feet on the 3,750-foot level. This new vein is 140 feet south of the main break on the 3,600-foot level, and 325 feet south of the main break on the 3,750-foot level. Drifting on this south vein on the 3,750-foot level was started from the winze crosscut and continued westward a distance of 313 feet by the end of the year. There still is 755 feet to be developed to the west boundary. Due to the westerly pitch of this vein the portion still to be developed would correspond to the best

section on the levels above. The section developed on 3,750-foot level shows an average grade of \$21.76 over an average width of 2.5 feet. The finding of high-grade ore so far from the main Kirkland Lake break opens up possibilities over a wider field than was previously appreciated.

The persistency of this new vein, both latterly and vertically, as compared with the ore shoots along or adjacent to the main break, makes possible an estimate of ore reserves in this vein.

Taking the block of ore as opened up in this south vein section at end of the year, after reducing the high values and allowing for dilution, shows 126,516 tons, having a gross value of \$3,147,248, of which about 14,000 tons were taken out during the year from development and stoping.

In driving the crosscut on the 3,750-foot level to intersect this south vein, a second south vein was encountered about 95 feet south of the main break. This was dipping at about the same angle as the main south vein and characteristically high grade. This vein pitched below the level to the west and was drifted on to the diabase dike to the east, disclosing a length of 140 feet with an average width of 4.5 feet and an average grade of \$35.80. A drive through the dike is now being made to explore the ground between the east boundary and the dike.

As mentioned in last year's report, a long crosscut was being driven into the newly acquired Grozell ground to the west on the 3,600-foot level. This was completed and an ore shoot opened up on that level in this area 102 feet long with an average grade of \$22.05 over an average width of 4 feet. Some years ago on the 4,900-foot level a drift, on the main break, was partly driven into this area. This year this drift was completed to the west boundary. This was driven chiefly to determine whether the bottom of the syenite, which was known to be pitching across that area, would reach that level. While the syenite was not found on that level, toward the west end an ore shoot was opened up in the lamprophyre 85 feet long with an average grade of \$14.00 over an average width of 2.7 feet. While this is small, the presence of this ore would indicate the probability that the syenite would be found crossing over not far above this level. A number of dip diamond-drill holes drilled from the 36th level down into this area proved that the condition expected in this area existed. That is the extreme bending and folding of the main break in the presence of syenite and porphyry intrusives. It is this set of conditions in the Kirkland Lake camp that has proved to be the most productive.

It is planned to sink a winze from the 3,600-foot level to be able to open up this area between the 3,600-foot and the 4,900-foot levels. This winze will be approximately 2,000 feet west of the main shaft.

Diamond-drilling on the property of Kirkland Basin Gold Mines, Limited, which comprises most of the north lobe of Kirkland lake and in which your company owns a 61.6 per cent. interest, is still proceeding. The results as yet are inconclusive.

Your mine has concluded the best year in its history. The results obtained in the year's development and exploration have been of an important nature. Besides the value of the new ore already discovered, the nature and extent of its occurrence has very much widened the possible field for profitable exploration, within the central portion of the property. It has also proved that an excellent set of conditions exists in the new western section.

An average of 160 men was employed throughout the year under the direction of P. J. Harris, superintendent.

Kirkroyale Gold Mines, Limited

Kirkroyale Gold Mines, Limited, was incorporated in March, 1937, with an authorized capitalization of 3,500,000 shares of \$1 par value. Of the 2,342,000 shares issued at the end of the year, 1,717,000 were pooled. The company succeeded Conroyal Gold Mines, Limited, and the shares were exchanged on a basis of one new share for three old shares.

The officers and directors are: G. E. Harrison, president; L. E. Schlemm, vice-president; W. B. Marshall, secretary-treasurer; Dr. A. Moir and J. S. Knechtel, directors. The executive office is at 409 Kent Building, Toronto, and the mine office is at King Kirkland.

The property consists of 331 acres in Lebel township, Kirkland Lake area, district of Timiskaming.

The former operators had sunk a shaft to a depth of 550 feet, and a winze from 550 feet to 1,150 feet. Lateral development work to the extent of about 5,000 feet had been done on the various levels. The mine had been idle since 1928. In 1937 the present owners reconditioned the buildings and dewatered the mine. A new electrically driven hoist and compressor plant were installed. A programme of sampling and diamond-drilling was carried on until November, when operations ceased.

An average of 10 men was employed from April to November. S. S. W. Cole, who was manager during the early part of the operation, was succeeded by Arthur Mushlian.

Kir-Vit Mines, Limited

Kir-Vit Mines, Limited, which was incorporated in February, 1937, to succeed Kir-Vit Gold Mines, Limited, has an authorized capitalization of 3,500,000 shares of \$1 par value. The officers and directors are: F. T. Pattison, president; John Dehn, vice-president; C. C. Tyx, secretary-treasurer; Dr. T. Wright, E. C. Green, H. J. Mollenberg, and A. S. Damude, directors. The head office is at 702 Excelsior Life Building, Toronto. The mine address is Larder Lake.

The property consists of 17 claims in McVittie township, Larder Lake area, district of Timiskaming. Four of the claims were acquired from Kirkland Consolidated Mines, Limited, for 750,000 shares and the other 13, known as the Grainger-Yuill group, were bought for \$125,000 cash.

A mining plant consisting of a Canadian Ingersoll-Rand 650-cubic-foot compressor, driven by a 125 h.p. motor, and a Canadian Ingersoll-Rand 75 h.p. double-drum hoist was installed. The necessary buildings were erected.

Following a diamond-drilling campaign the sinking of a 3-compartment shaft to an objective depth of 500 feet was begun. At the end of the year the shaft had reached a depth of 276 feet, and some drifting and crosscutting had been done on the 125- and 250-foot levels.

An average force of 30 men was employed for 10 months under the direction of Ralph Hurd, who was succeeded by J. W. Robertson after the end of the year.

Lake Caswell Mines, Limited

Lake Caswell Mines, Limited, was incorporated in April, 1934, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: T. A. Burke, president; L. J. Layden, vice-president; H. J. Stuart, secretary-treasurer; F. J. Sullivan, general manager; D. McKenna and A. Ritchie, directors. The head office is at 1465 Yonge Street, Toronto.

The property is located in Macmurchy township, West Shiningtree area, district of Sudbury.

Underground work was continued during 1937 until October, when it was suspended for the rest of the year. A total of 460 feet of drifting and 250 feet of crosscutting was accomplished on the 500-foot level, and 1,941 feet of diamond-drilling was done.

An average of 13 men was employed during the year under the direction of C. Van Norman. The mine address is Shiningtree.

Lake Rowan Gold Mines, Limited

Lake Rowan Gold Mines, Limited, was incorporated in September, 1934, with an authorized capitalization of 3,000,000 shares of no par value. The officers and directors are: L. E. Schlemm, president; H. M. Porteous, vice-president; C. G. Macartney, secretary-treasurer; L. G. W. Schlemm, S. W. Fairweather, Mostyn Lewis, Horace G. Young, and H. M. Wallis, directors. The head office is at 1178 Phillips Place, Montreal, Que. The mine address is Golden Arm.

The property consists of 42 claims, totalling 1,800 acres, in Todd township, Pipestone Bay section of the Red Lake area, Patricia portion of Kenora district. The mine is reached from the town of Red Lake by boat or airplane to Golden Arm and thence over a 2-mile tractor road.

Diamond-drilling commenced in November, 1936, and 5 holes totalling 1,320 feet were completed by the end of the year. By August, 1937, some 19 holes had been drilled, totalling 6,770 feet, and a tunnel driven 624 feet into what is known as Discovery hill, 108 feet below the top.

A mining plant and buildings were erected at the top of the hill, and a 3-compartment vertical shaft was raised from the adit level. Following the erection of the headframe, sinking commenced and continued to 433 feet with levels established at 250 and 400 feet. No development was done up to the end of the year.

The plant buildings include a warehouse, power-house, hoist-house, dry-house, powder magazine, and blacksmith shop. The camp buildings include an office and staff residence, bunk-houses and cookery.

The mining equipment consists of one 500-cubic-foot Alley and MacLellan compressor, two 70 h.p. locomotive-type Leonard boilers, one Ingersoll-Rand single-drum hoist, and one Ingersoll-Rand No. 34 steel-sharpener.

During the latter part of the year an average of 42 men was employed daily, of whom 19 were underground. H. Lefebvre was the mine superintendent.

Lake Shore Mines, Limited

Lake Shore Mines, Limited, was incorporated in February, 1914, with an authorized capital of 2,000,000 shares of \$1 par value, all of which have been issued. The officers and directors are: Dr. W. P. St. Charles, president and treasurer; W. H. Wright, vice-president; A. L. Blomfield, managing director; Albert Wende and Ernest Martin, directors. Kirkland Securities, Limited, is secretary. E. W. Todd is mine superintendent. The head office and mine office are at Kirkland Lake.

The property consists of 8 claims and 4 fractions, 287.15 acres, in Teck township, Kirkland Lake area, district of Timiskaming.

During the year 1,175 feet of pilot-raising and 1,502 feet of shaft-raising were done in the construction of No. 5 shaft, which has 5 compartments and is 13 feet 3 inches by 17 feet 7 inches outside the steel. Some 26,885 feet of underground diamond-drilling, 4,328 feet of crosscutting, 20,418 feet of drifting, and 6,552 feet of raising were done during the year. An average of 2,467 tons of ore per day was milled during the year.

The average number of men employed was 1,677.

The following is taken from the report of the superintendent for the fiscal year ending June 30, 1938:—

In the period under review, 928,036 dry tons of ore were milled. The gross value, derived from 427,105 ounces of gold and 107,824 ounces of silver, amounted to \$15,030,273.43.

Development

The total footage of drifting accomplished during the year amounted to 16,748 feet, of which 58 per cent. was in material of ore grade. The length of ore developed, amounting to 9,709 feet, had an average gold content of 0.615 ounces per ton across a width of 53 inches before slashing. In the south or No. 1 vein zone there was exposed, during the period, a total of 3,306 feet of ore having an average grade of 0.693 ounces across an average drifting width of 55 inches. In the No. 2 or north vein zone the length developed amounted to 6,403 feet, showing an average grade of 0.574 ounces per ton across an exposed width of 53 inches. The total extent of drifts driven in the No. 1 and No. 2 vein zones amounted to 6,752 and 9,996 feet, respectively.

During the period 86 per cent. of the exploration for new ore was done between the 3,075- and 4,325-foot levels, inclusive; development of this block of ground will be continued during the next year.

SUMMARY OF TOTAL ORE EXPOSED BETWEEN THE 3,075- AND 4,023-FOOT HORIZONS

| Level | Total drifting | Ore | Per cent. in ore | Width | Grade, ounces per ton |
|-----------------|----------------|-------|------------------|--------|-----------------------|
| | feet | feet | | inches | |
| 3,075-foot..... | 5,969 | 3,396 | 56.9 | 55 | 0.584 |
| 3,200-foot..... | 7,277 | 3,412 | 46.9 | 56 | .688 |
| 3,325-foot..... | 5,304 | 3,005 | 56.6 | 54 | .654 |
| 3,450-foot..... | 4,907 | 3,040 | 61.9 | 53 | .596 |
| 3,575-foot..... | 4,054 | 2,429 | 59.9 | 54 | .541 |
| 3,700-foot..... | 4,568 | 2,908 | 63.7 | 53 | .580 |
| 3,825-foot..... | 3,941 | 2,427 | 61.6 | 53 | .763 |
| 3,950-foot..... | 3,814 | 2,410 | 63.2 | 53 | .561 |
| 4,075-foot..... | 3,174 | 2,095 | 66 | 52 | .492 |
| 4,200-foot..... | 2,560 | 1,872 | 73.1 | 53 | .542 |
| 4,325-foot..... | 2,673 | 2,080 | 77.8 | 54 | .765 |

A comparison of the total development results obtained during the last two fiscal years is shown in the following table:—

| Period | Advance | Ore | Width | Grade | Per cent. in ore |
|--------------------------------|---------|--------|--------|--------|------------------|
| | feet | feet | inches | ounces | |
| Year ending June 30, 1937..... | 18,410 | 10,502 | 53.1 | 0.585 | 57 |
| Year ending June 30, 1938..... | 16,748 | 9,709 | 53 | .616 | 57.9 |

DEVELOPMENT FOOTAGE FOR THE YEAR, 1937-38

| Level | Drift- ing | Cross- cutting | Rais- ing | Box- holing | Sub- drift- ing | Ore and waste passes | Shaft- raising | Shaft- slashing | Total footage | Dia- mond- drilling | Sta- tion cutting |
|-----------------|---------------|-------------------|--------------|----------------|-----------------------|----------------------------|-------------------|--------------------|------------------|---------------------------|-------------------------|
| | feet | feet | feet | feet | feet | feet | feet | feet | feet | feet | cu. ft. |
| 200-foot..... | | 76 | | | | | | | 76 | 387 | |
| 400-foot..... | | | 169 | | 308 | | | | 476 | 811 | |
| 600-foot..... | 59 | | 108 | | 119 | | | | 286 | 1,485 | |
| 800-foot..... | 153 | 58 | | 21 | 19 | | | | 250 | 1,484 | |
| 1,000-foot..... | 397 | 62 | 762 | | 536 | | | | 1,756 | 1,754 | |
| 1,200-foot..... | 438 | 152 | 501 | | 207 | | | | 1,298 | 2,304 | |
| 1,400-foot..... | | | 618 | 28 | 375 | | | | 1,020 | 1,153 | |
| 1,600-foot..... | | | 148 | | 211 | | | | 359 | 725 | |
| 1,800-foot..... | | 310 | 401 | | 235 | | | | 945 | 341 | |
| 2,000-foot..... | | 23 | | | 50 | | | | 73 | | |
| 2,200-foot..... | | | | | 59 | | | | 59 | 281 | |
| 2,325-foot..... | 12 | 25 | | | | | | | 36 | | |
| 2,450-foot..... | | | 178 | | 6 | | | | 183 | 148 | |
| 2,575-foot..... | 604 | 26 | 20 | | | | | | 650 | 356 | |
| 2,700-foot..... | 241 | 27 | 40 | | 37 | | | | 345 | 410 | |
| 2,825-foot..... | | 23 | 375 | | 499 | | | 99 | 998 | 688 | 1,296 |
| 2,950-foot..... | 495 | 76 | 59 | | 5 | | | 94 | 728 | 220 | |
| 3,075-foot..... | 73 | 554 | 222 | | 121 | | | 112 | 1,083 | 225 | |
| 3,200-foot..... | 313 | 163 | 225 | | 146 | | | 112 | 959 | 1,583 | |
| 3,325-foot..... | 683 | 189 | 407 | | 94 | | | 112 | 1,485 | 1,488 | |
| 3,450-foot..... | 968 | 197 | 338 | | 33 | | | 116 | 1,653 | 2,224 | |
| 3,575-foot..... | 1,011 | 422 | 223 | | | | 111 | 117 | 1,884 | 1,478 | 8,472 |
| 3,700-foot..... | 1,312 | 74 | 345 | | | 206 | 205 | 109 | 2,250 | 1,062 | 7,368 |
| 3,825-foot..... | 1,302 | 325 | 415 | | 170 | | 58 | 117 | 2,387 | 1,662 | 36,984 |
| 3,950-foot..... | 1,921 | 771 | 423 | | 171 | 635 | 231 | 57 | 4,210 | 1,109 | 30,564 |
| 4,075-foot..... | 1,754 | 118 | 208 | | | | 261 | | 2,342 | 2,013 | 8,880 |
| 4,200-foot..... | 2,342 | 42 | 180 | | | | 118 | | 2,683 | 917 | 10,596 |
| 4,325-foot..... | 2,673 | 292 | 107 | | | | | | 3,073 | 714 | 4,656 |
| Total.. | 16,751 | 4,005 | 6,472 | 49 | 3,401 | 841 | 984 | 1,045 | 33,547 | 27,022 | 108,816 |

SUMMARY OF DEVELOPMENT WORK PERFORMED SINCE THE BEGINNING OF OPERATIONS

| | Feet |
|----------------------------|--------------------|
| Drifting | 163,494 |
| Crosscutting | 46,438 |
| Raising | 96,126 |
| Subdrifting | 25,515 |
| Ore and waste passes | 12,502 |
| Shaft-sinking | 7,998 |
| Shaft-raising | 5,582 |
| Shaft-slashing | 4,194 |
| Winze-sinking | 1,151 |
| Diamond-drilling | 170,629 |
| Box-holing | cu. ft. 344,637 |
| Station-cutting | 1,059,137 |
| Sumps | 64,748 |

SUMMARY OF ORE TRAMMED FOR THE YEAR 1937-38

| Level | Development | Stoping | Total |
|------------------|-------------|---------|---------|
| | tons | tons | tons |
| 400-foot | 1,001 | 6,701 | 7,702 |
| 600-foot | 534 | 13,982 | 14,516 |
| 800-foot | 531 | 13,754 | 14,285 |
| 1,000-foot | 2,883 | 25,657 | 28,540 |
| 1,200-foot | 2,901 | 18,451 | 21,352 |
| 1,400-foot | 3,046 | 9,513 | 12,559 |
| 1,600-foot | 1,201 | 15,852 | 17,053 |
| 1,800-foot | 1,998 | 12,491 | 14,489 |
| 2,000-foot | 152 | 18,752 | 18,904 |
| 2,200-foot | 214 | 7,725 | 7,939 |
| 2,325-foot | | 5,185 | 5,185 |
| 2,450-foot | 331 | 11,986 | 12,317 |
| 2,575-foot | 1,191 | 7,157 | 8,348 |
| 2,700-foot | 431 | 34,534 | 34,965 |
| 2,825-foot | 2,195 | 80,163 | 82,358 |
| 2,950-foot | 614 | 97,497 | 98,111 |
| 3,075-foot | 1,207 | 62,549 | 63,756 |
| 3,200-foot | 2,135 | 81,243 | 83,378 |
| 3,325-foot | 4,727 | 56,442 | 61,169 |
| 3,450-foot | 5,629 | 69,139 | 74,768 |
| 3,575-foot | 4,456 | 39,264 | 43,720 |
| 3,700-foot | 7,910 | 46,773 | 54,683 |
| 3,825-foot | 7,697 | 55,958 | 63,655 |
| 3,950-foot | 10,202 | 29,665 | 39,867 |
| 4,075-foot | 6,762 | 10,346 | 17,108 |
| 4,200-foot | 7,877 | 5,464 | 13,341 |
| 4,325-foot | 9,548 | 4,375 | 13,923 |
| Total | 87,373 | 840,618 | 927,991 |

Shaft Work

No. 5 shaft was completed during the year, and the major part of the necessary mechanical equipment was installed.

A start was made on No. 6 shaft, which will serve as the downward continuation of No. 5 below the 3,950-foot level. A hoist-room was completed on the 3,825-foot level, and considerable work was accomplished in driving crosscuts to the No. 6 shaft location, station-cutting and pilot-raising on levels down to the 4,325-foot horizon.

Mining

At the end of the period the total length of ore exposed in drifts, on which no stoping had been done, amounted to 17,226 feet having an average grade of 0.60 ounces and an exposed width of 55 inches. Production from the No. 1 or south vein zone amounted to 40.6 per cent. of the total ore sent to the mill. During the year 481,156 tons of backfill, consisting of a mixture of sand and waste rock, were placed in stopes. Sources of material stoped are shown in the summary of ore trammed for the year 1937-38.

Milling

An experimental roasting plant was erected and extensive tests performed on concentrates formed from the cyanide tailing. Favourable results were obtained and a decision made to enlarge the roasting plant, so that concentrates from the whole tonnage passing through the mill may be treated. Work on this project was started near the end of the year.

PRODUCTION RECORD

| Period | Months | Tons milled | Gross value of bullion ¹ | Dividends paid |
|-------------------------------------|--------|-------------|-------------------------------------|----------------|
| Mar. 1, 1918, to Nov. 30, 1918..... | 9 | 14,948 | \$372,352.35 | \$100,000 |
| Dec. 1, 1918, to Nov. 30, 1919..... | 9 | 11,907 | 302,518.17 | 100,000 |
| Dec. 1, 1919, to Nov. 30, 1920..... | 12 | 18,889 | 525,278.38 | 80,000 |
| Dec. 1, 1920, to Nov. 30, 1921..... | 12 | 21,681 | 523,597.39 | 120,000 |
| Dec. 1, 1921, to June 30, 1923..... | 19 | 36,825 | 850,282.92 | 160,000 |
| July 1, 1923, to June 30, 1924..... | 12 | 24,223 | 590,119.98 | 160,000 |
| July 1, 1924, to June 30, 1925..... | 12 | 96,838 | 1,812,008.05 | 600,000 |
| July 1, 1925, to June 30, 1926..... | 12 | 125,676 | 2,233,475.85 | 700,000 |
| July 1, 1926, to June 30, 1927..... | 12 | 214,335 | 3,105,047.85 | 1,200,000 |
| July 1, 1927, to June 30, 1928..... | 12 | 237,962 | 3,629,317.57 | 1,600,000 |
| July 1, 1928, to June 30, 1929..... | 12 | 367,015 | 5,519,138.86 | 2,000,000 |
| July 1, 1929, to June 30, 1930..... | 12 | 467,648 | 6,609,728.42 | 2,600,000 |
| July 1, 1930, to June 30, 1931..... | 12 | 698,624 | 9,153,546.62 | 3,600,000 |
| July 1, 1931, to June 30, 1932..... | 12 | 834,434 | 13,798,128.33 | 6,000,000 |
| July 1, 1932, to June 30, 1933..... | 12 | 797,673 | 13,277,685.72 | 6,000,000 |
| July 1, 1933, to June 30, 1934..... | 12 | 836,991 | 16,382,274.27 | 6,000,000 |
| July 1, 1934, to June 30, 1935..... | 12 | 833,094 | 16,026,108.57 | 8,000,000 |
| July 1, 1935, to June 30, 1936..... | 12 | 873,101 | 16,361,529.69 | 8,000,000 |
| July 1, 1936, to June 30, 1937..... | 12 | 879,559 | 15,692,652.85 | 12,000,000 |
| July 1, 1937, to June 30, 1938..... | 12 | 928,036 | 15,030,273.43 | 10,000,000 |
| Total..... | | 8,319,459 | \$141,795,065.27 | \$69,020,000 |

¹Includes exchange premiums.

Supplies and Equipment Purchased

| | March 1, 1918, to June 30, 1937 | July 1, 1937, to June 30, 1938 | Total to date |
|--|---------------------------------|--------------------------------|---------------|
| Explosives..... | \$1,857,653 | \$151,957 | \$2,009,610 |
| Lumber and timber..... | 2,449,505 | 420,538 | 2,870,043 |
| Rock drills and parts..... | 739,140 | 42,555 | 781,695 |
| Pipe and fittings, plumbing supplies..... | 631,196 | 82,221 | 713,417 |
| Electrical supplies..... | 909,227 | 50,808 | 960,035 |
| Mill supplies..... | 3,087,697 | 297,134 | 3,384,831 |
| Machinery and parts..... | 3,947,705 | 206,323 | 4,154,028 |
| Building material..... | 699,889 | 79,568 | 779,457 |
| Fuel..... | 417,891 | 19,972 | 437,863 |
| Steel products..... | 1,772,987 | 214,536 | 1,987,523 |
| Oil and lubricants..... | 237,314 | 12,447 | 249,761 |
| Groceries..... | 587,879 | 7,948 | 595,827 |
| Trucks and cars..... | 66,040 | 4,092 | 70,132 |
| Miscellaneous..... | 1,566,154 | 211,760 | 1,777,914 |
| Backfill..... | 576,602 | 11,727 | 688,329 |
| Power..... | 3,792,622 | 400,404 | 4,193,026 |
| Total..... | \$23,339,501 | \$2,313,990 | \$25,653,491 |
| Freight and express included in above materials..... | \$1,760,513 | \$197,031 | \$1,957,544 |

STATEMENT OF COSTS FOR THE YEAR

| | Cost per ton |
|---|-----------------|
| Development..... | \$0.887 |
| Mining..... | 3.740 |
| Milling and refining..... | 1.048 |
| Marketing bullion..... | .206 |
| General and administrative expense..... | .111 |
| Operating cost..... | \$5.992 |
| Depreciation..... | .390 |
| | \$6.382 |
| Provision for taxes..... | 1.516 |
| Total cost..... | \$7.898 |

Lakeside-Kirkland Gold Mines, Limited

Lakeside-Kirkland Gold Mines, Limited, was incorporated in April, 1934, with an authorized capital of 3,000,000 shares of \$1 par value, of which 1,990,839 have been issued. The officers and directors are: E. B. Knapp, president and managing director; C. H. Musselman, vice-president; G. E. Eastman, secretary-treasurer; David Gross, A. C. Wintermeyer, W. T. Sass, and Paul Mills, directors. The head office is at 106 Dunker Building, Kitchener. The mine address is Kirkland Lake.

The property consists of 7 claims in Lebel township, Kirkland Lake area, district of Timiskaming.

Operations were carried on from August 6 to December 31, 1937. About 1,000 feet of surface-trenching and 2,220 feet of diamond-drilling from surface were accomplished.

New buildings erected included a blacksmith shop, boiler-room, shaft-house, and manager's residence. A 12,000-gallon water tank was built.

New plant equipment installed included a 50 h.p. firebox-type heating boiler and a 5 h.p. Wesco 25-cycle, 550-volt, 1,500 r.p.m. pump.

An average force of 19 men was employed under the direction of E. B. Knapp.

Lebel Oro Mines, Limited

Lebel Oro Mines, Limited, which was incorporated in April, 1920, has an authorized capitalization of 3,500,000 shares of \$1 par value. The officers and directors are: L. K. Fletcher, president; E. H. Watt, vice-president; A. B. Mortimer, secretary-treasurer; E. J. Dwyer, W. H. Englebright, and T. H. Rea, directors. The head office is at 320 Bay Street, Toronto.

The property includes the Long Lake mine, located in township 69, district of Sudbury.

During 1937 mining work was started in April, when the crushing plant and 75-ton cyanide mill were completed and put in operation. The open pit was then mined, the ore being drawn off on the 2nd level and hoisted in No. 2 shaft. A total of about 28,900 tons of ore was broken in the open pit in 1937, of which 23,758 tons was hoisted. A total of 80 feet of drifting and 176 feet of raising was completed on the 2nd level; 2,256 feet of diamond-drilling was done.

The plant included a 400 h.p. Diesel engine, driving a 325 k.v.a. generator; a 100 h.p. Diesel engine, driving a 90 k.v.a. generator; a 110 h.p. Diesel engine, driving a 537-cubic-foot compressor; and a Stephens-Adamson electric hoist.

The mill treated a total of 23,687 tons during the year. The crushing and milling equipment included a 10- by 20-inch Nordberg double-action jaw crusher,

vibrating screen, a 5- by 7-foot Marcy ball mill, Akins classifier, 4 Dorr agitators, 2 Dorr thickeners, and two American filters.

An average of 60 men was employed. D. W. M. Ross and R. P. Teare were successively in charge of operations. The mine address is Box 156, Sudbury.

Leitch Gold Mines, Limited

Leitch Gold Mines, Limited, was incorporated in July, 1935, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,850,005 had been issued at December 31, 1937. The officers and directors are: K. J. Springer, president; W. E. Segsworth, vice-president; H. J. Mackay, secretary-treasurer; Dr. J. H. C. McClelland and Russell Cryderman, directors. The head office is at 320 Bay Street, Toronto. The mine address is Beardmore.

The property consists of some 400 acres in Eva township, district of Thunder Bay, about 5 miles from Beardmore, on the Longlac-Port Arthur branch of the Canadian National Railways. It is reached from Beardmore by an automobile road completed during the summer of 1937. The claim numbers are H.F. 1, east half of A.L. 416, and west half of H.F. 3.

Underground work was continued throughout 1937. From January 10 to the end of the year, the cyanide-amalgamation mill treated 23,058 tons, with a gross recovery of \$448,128.66. Ore hoisted totalled 25,206 tons, of which 2,839 tons were sorted in the stopes and on the picking belt in the crusher-house. Production was taken from 17 stopes from 3 different veins on all 5 levels. The mining method is resuing cut-and-fill. During the year 12,400 tons of waste rock was used for back-fill.

The following table shows the development accomplished at the end of 1936, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|--------------------------------------|---------------------|-------|-------|
| | feet | feet | feet |
| Shaft (3-compartment vertical) | 547 | ..... | 547 |
| 125-FOOT LEVEL: | | | |
| Drifts | 750 | 131 | 881 |
| Crosscuts | 257 | 398 | 655 |
| Raises ..... | ..... | 200 | 200 |
| 225-FOOT LEVEL: | | | |
| Drifts | 727 | 1,572 | 2,299 |
| Crosscuts | 223 | 499 | 722 |
| Raises | 50 | 177 | 227 |
| 325-FOOT LEVEL: | | | |
| Drifts | 627 | 1,348 | 1,975 |
| Crosscuts | 153 | 267 | 420 |
| Raises | 40 | 222 | 262 |
| 425-FOOT LEVEL: | | | |
| Drifts | 100 | 1,753 | 1,853 |
| Crosscuts | 50 | 58 | 108 |
| Raises ..... | ..... | 292 | 292 |
| 525-FOOT LEVEL: | | | |
| Drifts | 100 | 1,769 | 1,869 |
| Crosscuts | 50 | 232 | 282 |
| Raises ..... | ..... | 291 | 291 |
| Diamond-drilling, underground ..... | ..... | ..... | 5,277 |

Additions to mining-plant equipment included a Canadian Ingersoll-Rand 42- by 30-inch, double-drum hoist driven by a Westinghouse 75 h.p. induction motor.

Buildings constructed during the year included a new boiler-house and bunk-house.

There was an average of 103 men employed, of whom 55 were underground and 8 in the mill. W. S. Hamilton is mine manager.

Little Long Lac Gold Mines, Limited

Little Long Lac Gold Mines, Limited, was incorporated in January, 1933, with an authorized capitalization of 2,000,000 shares of no par value, of which 1,833,000 have been issued. The officers and directors are: Jos. Errington, president; Thayer Lindsley, vice-president; L. A. Macdonald, secretary-treasurer; D. M. Morin, A. B. Gordon, and D. M. Hogarth, directors. The head office is at 25 King Street West, Toronto. The mine address is Little Long Lac.

The property is 2 miles south of Geraldton, on the Longlac-Port Arthur branch of the Canadian National Railways, Ashmore township, Little Long Lac area, district of Thunder Bay. There is an automobile highway from Geraldton to the mine.

Operations were continued throughout 1937. The flotation-amalgamation-cyanide mill treated a total of 98,025 tons of ore, with a gross recovery of 46,577 fine ounces of gold and 3,908 fine ounces of silver. About 67 per cent. of the recovery was by amalgamation and 29 per cent. by cyanidation.

In June, 1937, a 100- by 30-foot addition to the mill was constructed for additional milling equipment, including 6 Denver Sub-A flotation cells and two 20- by 15-foot Dorr agitators. This unit made possible the retreatment of about 6,000 tons of mill tailings produced during 1935.

Plant buildings erected during the year included the previously mentioned 30- by 100-foot addition to the mill building, a 32- by 70-foot warehouse, a 25- by 70-foot blacksmith- and steel-shop, and a 16- by 16-foot oil-storage house.

On the Little Long Lac townsite, the company erected seven modern dwellings to house employees. There were no major additions in mining plant equipment.

Production during 1937 was maintained from 32 overhand back stopes distributed as follows:—

| Level | Number of stopes | | | |
|-----------------|------------------|-------------------------|-------------------|-------------|
| | Shrinkage | Horizontal cut-and-fill | Rill cut-and-fill | Back stopes |
| 204-foot..... | | 2 | | 1 |
| 324-foot..... | | 1 | | |
| 445-foot..... | 1 | 5 | | |
| 570-foot..... | 2 | 2 | | |
| 694-foot..... | | 1 | 3 | |
| 848-foot..... | | 6 | | |
| 998-foot..... | | 2 | | 5 |
| 1,350-foot..... | | | | 1 |
| Total | 3 | 19 | 3 | 7 |

Waste rock from development work and gravel, totalling 39,875 tons for the year, were used as back-fill in the stopes.

The following table shows the development work accomplished at the end of 1936, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|-------------------|---------------------|------|-------|
| | feet | feet | feet |
| 126-FOOT LEVEL: | | | |
| Drifts..... | 112 | | 112 |
| Crosscuts..... | 57 | | 57 |
| Raises..... | 50 | | 50 |
| 204-FOOT LEVEL: | | | |
| Drifts..... | 1,396 | 229 | 1,625 |
| Crosscuts..... | 404 | 526 | 930 |
| Raises..... | 561 | 369 | 930 |
| 324-FOOT LEVEL: | | | |
| Drifts..... | 1,091 | 145 | 1,236 |
| Crosscuts..... | 239 | 12 | 251 |
| Raises..... | 422 | 28 | 450 |
| Ore passes..... | 133 | | 133 |
| 446-FOOT LEVEL: | | | |
| Drifts..... | 2,175 | 163 | 2,338 |
| Crosscuts..... | 1,000 | | 1,000 |
| Raises..... | 522 | 46 | 568 |
| Ore passes..... | 189 | | 189 |
| 570-FOOT LEVEL: | | | |
| Drifts..... | 1,188 | | 1,188 |
| Crosscuts..... | 86 | 16 | 102 |
| Raises..... | 88 | 137 | 225 |
| Ore passes..... | 30 | | 30 |
| 694-FOOT LEVEL: | | | |
| Drifts..... | 1,071 | | 1,071 |
| Crosscuts..... | 277 | 20 | 297 |
| Raises..... | 585 | 39 | 624 |
| Ore passes..... | 155 | | 155 |
| 848-FOOT LEVEL: | | | |
| Drifts..... | 1,040 | 87 | 1,127 |
| Crosscuts..... | | 80 | 80 |
| Raises..... | | 464 | 464 |
| Ore passes..... | 177 | | 177 |
| 998-FOOT LEVEL: | | | |
| Drifts..... | 1,304 | 745 | 2,049 |
| Crosscuts..... | 598 | 930 | 1,528 |
| Raises..... | | 219 | 219 |
| 1,152-FOOT LEVEL: | | | |
| Drifts..... | | 786 | 786 |
| Crosscuts..... | | 23 | 23 |
| 1,300-FOOT LEVEL: | | | |
| Drifts..... | | 673 | 673 |

| | |
|-------------------|-------|
| DIAMOND-DRILLING: | Feet |
| Surface..... | 2,164 |
| Underground..... | 6,284 |
| Total..... | 8,448 |

The following is taken from the mine manager's report for the fiscal year ending December 31, 1937:—

PRODUCTION

| | |
|------------------------------------|-------------------|
| Tons hoisted..... | 122,627 |
| Tons sorted..... | 24,602 |
| Tons milled..... | 98,025 |
| Bullion recovered..... | ounces 46,577.177 |
| Total gold lost in tailings..... | ounces 2,205.563 |
| Calculated mill heads assay..... | ounces 0.4977 |
| Calculated mill residue assay..... | ounces 0.0225 |
| Percentage recovery..... | 95.48 |
| Bullion marketing costs..... | \$20,923.24 |

During 1937 the mill operated 362 days, indicating 99 per cent. running time. Tonnage milled was increased from 250 to 280 tons in June, 1937.

Production since the beginning of mill operations in November, 1934, is:—

| Period | Tons milled | Gross value | Value per ton |
|-------------------------------|----------------|-----------------------|-----------------|
| Nov. 24 to Dec. 31, 1934..... | 4,715 | \$85,480.39 | \$18.129 |
| 1935..... | 62,073 | 1,108,147.61 | 17.852 |
| 1936..... | 83,555 | 1,500,791.86 | 17.961 |
| 1937..... | 98,025 | 1,630,532.49 | 16.633 |
| Total..... | 248,368 | \$4,324,952.35 | \$17.413 |

Development

During the year, two new levels were opened up, the 9th and 10th, at 1,152 feet and 1,300 feet, respectively. On the 9th level, a length of 1,072 feet of continuous ore was developed, giving an average of 0.462 ounces across an average width of 4.05 feet. The 10th level, although not yet fully developed, shows an average grade up to April 26, 1938, of 0.456 ounces across 4.30 feet, for a length of 832 feet.

Development work accomplished for the year was as follows:—

| | | |
|------------------------------------|---------|--------|
| Drifting..... | feet | 2,797 |
| Crosscutting..... | feet | 1,573 |
| Slashing..... | cu. ft. | 10,649 |
| Raising..... | feet | 883 |
| Ore passes..... | feet | 335 |
| Sumps..... | cu. ft. | 4,550 |
| Fill pass (backfill)..... | feet | 105 |
| Station-cutting..... | cu. ft. | 19,524 |
| Shaft-sinking..... | feet | 296 |
| Diamond-drilling, surface..... | feet | 2,163 |
| Diamond-drilling, underground..... | feet | 6,284 |

Ore Reserves, January 1, 1938

| | Tons | Ounces gold per ton |
|----------------------------|----------------|---------------------|
| Proved ore..... | 99,380 | 0.541 |
| Probable ore..... | 197,450 | .549 |
| Possible ore..... | 90,440 | .413 |
| Total reserves..... | 387,270 | 0.515 |

Construction and Equipment Expenditures

| | |
|---|------------|
| Lathe..... | \$1,398.68 |
| Mill addition, crusher-house, and mill equipment..... | 34,562.55 |
| Employees' residences..... | 22,901.29 |
| Blacksmith and steel shops..... | 2,919.85 |
| Warehouse..... | 5,606.44 |
| Outside pipe system..... | 3,450.87 |
| Sprinkler system..... | 3,794.09 |
| Airplane hangar..... | 2,085.68 |
| Oil-house..... | 1,074.14 |
| Testing and research equipment..... | 999.23 |
| Two dump trucks..... | 5,875.00 |
| Truck trailer..... | 707.00 |
| Electric tugger hoist..... | 1,392.75 |
| Mine car loader..... | 2,853.55 |
| Mine drills..... | 2,504.85 |
| Mine cars..... | 3,259.82 |
| Additional expenditures on plant and equipment..... | 6,068.84 |

| | |
|--|---------------------|
| Total..... | \$101,454.63 |
| LESS: Transmission line taken over by Hydro-Electric Power Commission..... | \$127,660.32 |

Operating Costs

| | Total cost | Cost per ton milled |
|---|--------------|---------------------|
| Development and exploration..... | \$118,256.67 | \$1.2064 |
| Mining..... | 328,741.31 | 3.3536 |
| Milling..... | 184,222.87 | 1.8793 |
| Testing and research..... | 1,652.95 | .0169 |
| Mine office and supervision..... | 39,196.68 | .3999 |
| General expense at property..... | 63,066.87 | .6434 |
| Administrative and general expense, Toronto office..... | 32,722.34 | .3338 |
| Total..... | \$767,859.69 | \$7.8333 |

During the year there was an average of 284 men employed, of whom 156 were underground and 21 in the mill. A. A. Barton is mine manager, J. C. Kilpatrick is mine superintendent, and A. Rennick is mill superintendent.

Lucky Kirkland Gold Mines, Limited

Lucky Kirkland Gold Mines, Limited, was incorporated in April, 1934, with an authorized capital of 3,000,000 shares of \$1 par value, of which 1,900,000 have been issued. The officers and directors are: Dr. T. B. Armstrong, president; J. J. Gray, vice-president; S. L. Macdonald, secretary-treasurer. The executive office is at 159 Bay Street, Toronto. The mine office is at Swastika.

The company has 4 claims and an option on another claim in Teck township, and a 99-year lease on the Baldwin Kirkland property in Eby township, Kirkland Lake area, district of Timiskaming.

Operations were carried on from January 31 to December 31, 1937, on the Baldwin Kirkland property. Underground development amounted to 55 feet of crosscutting, 125 feet of drifting, and 2,500 feet of underground diamond-drilling.

An average of 6 men was employed under the supervision of S. L. Macdonald.

Macassa Mines, Limited

Macassa Mines, Limited, was incorporated in April, 1926, with an authorized capital of 3,000,000 shares of \$1 par value, of which 2,678,068 have been issued. The officers and directors are: Robert A. Bryce, president; Thomas Riggs, vice-president; L. Soliague, secretary-treasurer; H. M. Porteous, J. D. Perrin, A. G. Slaght, directors. G. A. Howes is mine manager. The head office is at 85 Richmond Street West, Toronto. The mine address is Kirkland Lake.

The property consists of 10 claims, 374.27 acres, in Teck township, Kirkland Lake area, district of Timiskaming.

New equipment added to the mill during 1937 consisted of a tube mill operated by a 175 h.p. motor, a bowl classifier, and an 1,800-cubic-foot air compressor. New buildings erected included 4 frame residences and extensions to the machine shop and dry-house.

The following is an extract from the president's report for the year ending December 31, 1937:—

During the period under review, the mill treated a total of 90,617 tons from which was recovered bullion having a gross value of \$1,464,560.69, equivalent to \$16.16 per ton of ore milled. After deducting all costs of operation, including exploration and development, a gross operating profit of \$902,845.54 was obtained, which after making provision for taxes, depreciation and preliminary exploration write off, resulted in a net profit of \$608,193.49.

It will be seen from the accompanying balance sheet that the current assets amount to \$886,782.55 and current liabilities to \$143,626.91 resulting in an excess of current assets of \$743,155.64.

The following is taken from the report of the mine manager for the year ending December 31, 1937:—

Production

During the past year 90,617 dry tons of ore were milled, from which bullion to the value of \$1,464,560.69 was recovered, or \$16.16 per ton milled.

Development

The summary of development work and a comparison with the previous three years is as follows:—

| | 1937 | 1936 ¹ | 1935-36 | 1934-35 |
|-----------------------|--------|-------------------|---------|---------|
| | feet | feet | feet | feet |
| Drifting..... | 11,402 | 4,320 | 9,094 | 5,988 |
| Crosscutting..... | 1,812 | 1,215 | 1,697 | 1,033 |
| Raising..... | 944 | 787 | 1,700 | 1,409 |
| Shaft-sinking..... | | | 101 | 481 |
| Winze-sinking..... | | 415 | | |
| Station-cutting..... | | 73 | 43 | 91 |
| Total..... | 14,158 | 6,810 | 12,635 | 9,002 |
| Diamond-drilling..... | 18,600 | 5,403 | 10,109 | 3,489 |

¹Nine months.

The major exploration and development work during the year consisted of opening up the three new levels at 3,100, 3,225, and 3,350 feet along the main break and crosscutting to and drifting on branch veins in the south or hanging wall. As explored to date, these three levels show a combined total length of 3,601 feet of ore, averaging 0.46 ounces over an average width of 6.1 feet. There remains approximately 800 feet on each of these levels along the main break through a favourable geological area yet to be explored east.

The presence of branch veins was first indicated during the latter part of 1936 by diamond-drilling on the 3,000-foot level, and was referred to in the supplemental report dated March 31, 1937. During the year, diamond-drilling on the 2,475-, 2,575-, and 2,675-foot levels indicated branch vein structure at those horizons as well. Two veins were crosscut to and partially developed on the 2,475-foot level, which proved to be of good grade, and a programme of exploring for and developing the same structure both above and below this level will be carried out during 1938.

In addition to continuing the above work and the development on the present lower block of levels, 3,100, 3,225, and 3,350 feet, it was decided in December to resume sinking in the main winze. New levels at depths of 3,475, 3,600, and 3,725 feet will be established. Sinking will be completed and crosscuts extended south to intersect the vein some time in July.

Ore Reserves

The following is an estimate of positive ore only:—

| | Tons | Ounces per ton | Value per ton at \$35 |
|-------------------------------|---------|----------------|-----------------------|
| Unbroken ore..... | 260,300 | 0.45 | \$15.75 |
| Broken ore ¹ | 29,700 | .43 | 15.05 |
| Total..... | 290,000 | 0.45 | \$15.75 |

¹Including surface dump of 2,400 tons.

Milling

In May, a tube mill and bowl classifier was installed, which permitted a boost in tonnage to an average of 275 tons per day. While we have milled up to 300 tons per day, our extraction is better at the 275-ton rate. The average extraction during the year was 94.4 per cent.

Operating Costs

The following are the operating costs per ton milled, including head office administration, but before provision for taxes, depreciation, and preliminary exploration write-off, and a com.

parison with those of 1935 and 1936. The average number of employees per day during the year was 170, and a total of \$309,815.79 was paid in wages. All mining, exploration, and development was charged to operating costs, there being no deferred charges.

OPERATING COSTS PER TON MILLED

| | 1937 | 1936 | 1935 |
|--|--------|--------|--------|
| Development and exploration..... | \$2.40 | \$2.46 | \$2.80 |
| Mining (stoping, tramming, pumping, etc.)..... | 1.82 | 2.32 | 2.48 |
| Milling..... | 1.46 | 1.51 | 1.49 |
| Administration and general charges (including head office, Mint charges, and bullion handling charges) | .94 | .99 | .97 |
| Total..... | \$6.62 | \$7.28 | \$7.74 |

Capital Expenditures

The addition to mine buildings and mill equipment, together with the new compressor and 4 additional residences, comprised the major portion of the capital expenditures during the period. The itemized list is as follows:—

| | |
|-----------------------------------|-------------|
| Compressor and installation..... | \$15,411.27 |
| Additions to mine buildings..... | 3,094.63 |
| Mill equipment additions..... | 26,049.25 |
| Company residences (4)..... | 29,347.64 |
| Heating additions..... | 3,743.77 |
| Machine-shop equipment..... | 2,562.16 |
| East shaft rehabilitation..... | 1,165.38 |
| Surface pipe lines..... | 1,001.23 |
| Electrical equipment..... | 981.61 |
| Fire protection..... | 542.27 |
| General surface improvements..... | 368.60 |
| Assay office..... | 550.75 |
| Mine truck..... | 781.00 |
| Underground equipment..... | 2,294.70 |
| Total..... | \$87,894.26 |

An average force of 170 men was employed throughout the year.

Mace Gold Mines, Limited

Mace Gold Mines, Limited, which was incorporated in March, 1937, has an authorized capitalization of 5,000,000 shares of \$1 par value, of which 2,200,000 have been issued. The officers and directors are: André Dorfman, president; Balmer Neilly, vice-president; E. D. Fox, secretary-treasurer; J. Ingram and G. C. Andrew, directors. The head office is at 15 King Street West, Toronto. The mine office address is Schumacher. W. R. Adams is mine manager.

The property held by the company is in Tisdale township, Porcupine area, district of Cochrane, and consists of the Vipond mine, comprising 11 claims and formerly owned by Anglo-Huronian, Limited, and the former property of Inspiration Gold Mines, Limited, consisting of 3 claims, which was also controlled by Anglo-Huronian, Limited. The latter company received 1,412,500 shares of Mace stock for the Vipond property, and Inspiration Gold Mines, Limited, received 287,500 shares of Mace stock. The remaining 500,000 issued shares were purchased by McIntyre-Porcupine Mines, Limited. This company has options on further large blocks of treasury shares, and is now playing a large part in the technical guidance of mine operations at the property.

The Vipond mine has been producing since 1911. To the end of 1936, 1,597,000 tons had been milled, producing bullion worth \$11,847,952. Production in 1937 amounted to 94,240 tons milled, from which bullion recovery was

11,601.929 ounces of gold and 1,876.87 ounces of silver, having a gross value of \$406,668.

The mine is 1,450 feet in depth, with levels at 100, 200, 300, 400, 500, 600, 733, 866, 1,000, 1,200, and 1,450 feet. Operations in 1937 consisted mainly of mining remnants of ore bodies and small, hitherto neglected ore shoots on the upper levels, and at the same time exploring laterally from the 1,450-foot level toward the unexplored Inspiration claims to the west. About 1,932 feet of cross-cutting was done on this level to get out to this western area, as well as 20,331 cubic feet of slashing to enlarge the 1,450-foot level station and to make the old crosscut on this level meet requirements for electric-motor transportation, which was introduced during the year.

Hoisting from the 1,450-foot level was formerly done in two stages, the first being to the 1,200-foot level. In the spring of 1937 an Ingersoll-Rand, Type PE-1, 72- by 48-inch, double-drum hoist was purchased and replaced the former hoist. The rock pentice at the 1,200-foot level was then taken out, and direct hoisting from the bottom level to surface made possible. A new hoist-room, 34 by 30 feet, was built to house the new hoist. Other additions to plant and equipment included a 12- by 20-foot transformer-switch house and a bank of three 500 k.v.a. Ferranti transformers, which were put into service when a contract with the Hydro-Electric Power Commission was effected.

The average number of men employed was 150, of whom 105 were underground and 18 about the mill.

MacFarlane Long Lac Gold Mines, Limited

MacFarlane Long Lac Gold Mines, Limited, which was incorporated on July 9, 1934, has an authorized capitalization of 4,000,000 shares of \$1 par value, of which 2,999,203 had been issued at December 31, 1937. The officers and directors are: F. J. MacFarlane, president; C. F. Dietz, vice-president; W. G. Chipp, secretary-treasurer; M. L. Petrie and W. J. Melody, directors. The head office is at 710 Excelsior Life Building, Toronto. The mine address is Longlac.

The property consists of 9 claims on the east shore of Long lake, at a point about 12 miles south of Longlac station on the Longlac-Port Arthur branch of the Canadian National Railways, district of Thunder Bay. The claim numbers are T.B. 13,003-13,011.

In June, 1937, the sinking of a 2-compartment, vertical shaft was commenced on claim T.B. 13,005. At the end of the year the shaft, which was sunk by hand steel, had reached a total depth of 145 feet.

The mining plant consists of a 16 h.p. vertical boiler and a Jenckes 6- by 8-inch, single-drum steam hoist.

Surface buildings include power-house and hoist-room, magazine, cap-house, bunk-house, cookery, and office.

At the end of the year, there were 19 men employed, of whom 10 were underground, under the direction of W. MacFarlane.

McIntyre-Porcupine Mines, Limited

McIntyre-Porcupine Mines, Limited, incorporated in March, 1911, has an authorized capital of 800,000 shares of \$5 par value, of which 798,000 have been issued. The officers and directors are: J. P. Bickell, president; Bernard E. Smith, vice-president; E. D. Fox, secretary; Balmer Neilly, treasurer; Strachan Johnston, D. H. McDougall, and R. S. McLaughlin, directors. R. J. Ennis is general

manager. The executive office of the company is at 15 King Street West, Toronto. The head office and mine office are at Schumacher.

The main property of the company consists of 15 claims, 680 acres, in Tisdale township, Porcupine area, district of Cochrane.

During 1937, an average of 1,286 men was employed. Of this number, 952 were employed underground and 77 in the mill.

The following is taken from the general manager's report for the fiscal year ending March 31, 1938:—

Production

| | |
|--|-----------------------|
| Ore treated.....tons | 871,200 |
| Value per ton (0.279 ounces)..... | \$9.75 |
| Gross value..... | \$8,495,286.60 |
| Bullion recovered: | |
| Gold (229,873.359 ounces at \$34.996)..... | \$8,044,569.67 |
| Silver (39,624.28 ounces at \$0.437)..... | 17,336.78 |
| Total value..... | \$8,061,906.45 |
| Recovered per ton (0.264 ounces)..... | \$9.25 |
| Bullion melting, refining, and handling charges..... | 98,020.82 |
| | \$7,963,885.63 |

PRODUCTION SINCE THE BEGINNING OF MILLING OPERATIONS IN 1912

| Period | Months | Tons milled | Value per ton | Gross value | Recovery per ton | Total value | Price received per ounce for gold |
|-----------------------------------|--------|-------------|---------------|------------------|------------------|-----------------|-----------------------------------|
| 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 | 779,090.94 | |
| 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 | \$20.67 |
| 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 | 3,488,883.00 | 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 | |
| Apr. 1, '27, to Mar. 31, '28..... | 12 | 520,460 | 8.09 | 4,207,553.00 | 7.66 | 3,987,634.94 | |
| Apr. 1, '28, to Mar. 31, '29..... | 12 | 538,165 | 8.24 | 4,433,378.00 | 7.83 | 4,212,624.82 | |
| Apr. 1, '29, to Mar. 31, '30..... | 12 | 550,495 | 8.46 | 4,657,188.00 | 8.05 | 4,433,626.45 | |
| Apr. 1, '30, to Mar. 31, '31..... | 12 | 558,115 | 8.84 | 4,934,122.00 | 8.30 | 4,635,140.73 | |
| Apr. 1, '31, to Mar. 31, '32..... | 12 | 655,030 | 8.47 | 5,548,278.10 | 8.10 | 5,305,475.29 | 21.95 |
| Apr. 1, '32, to Mar. 31, '33..... | 12 | 736,300 | 8.45 | 6,224,493.40 | 8.12 | 5,981,714.69 | 22.79 |
| Apr. 1, '33, to Mar. 31, '34..... | 12 | 776,845 | 10.68 | 8,296,704.60 | 10.24 | 7,957,252.54 | 31.50 |
| Apr. 1, '34, to Mar. 31, '35..... | 12 | 862,100 | 10.23 | 8,819,660.27 | 9.78 | 8,430,670.26 | 34.67 |
| Apr. 1, '35, to Mar. 31, '36..... | 12 | 873,000 | 9.88 | 8,621,410.67 | 9.38 | 8,190,639.14 | 35.17 |
| Apr. 1, '36, to Mar. 31, '37..... | 12 | 864,500 | 10.00 | 8,641,205.24 | 9.49 | 8,201,416.94 | 34.99 |
| Apr. 1, '37, to Mar. 31, '38..... | 12 | 871,200 | 9.75 | 8,495,286.60 | 9.25 | 8,061,906.45 | 34.996 |
| Total..... | | 10,999,663 | \$9.40 | \$103,365,057.15 | \$8.93 | \$98,218,164.95 | |

Development

Development work amounted to 28,655 feet. This includes 18,862 feet of drifting, of which 3,880 feet was on line and 14,982 feet in vein material; of this 5,894 feet was in ore averaging 0.325 ounces per ton over drift width.

ORE RESERVES, 1937-38

| | Tons | Fine ounces gold | Value at \$35 |
|--------------------------|-----------|------------------|---------------|
| Estimated, in place..... | 3,608,891 | 1,085,323 | \$37,986,291 |
| Broken ore..... | 174,230 | 51,222 | 1,792,780 |
| Total..... | 3,783,121 | 1,136,545 | \$39,779,071 |
| Average per ton..... | | 0.3005 | \$10.50 |

SUMMARY OF DEVELOPMENT AND EXPLORATION, 1937-38

| Period | Drifts | Cross-cuts | Raises | Winzes | Shafts | Stations | Sumps | Excavations | Total footage | Total Excavation | Diamond-drilling |
|------------------|-----------|------------|----------|--------|----------|-----------|---------|-------------|---------------|------------------|------------------|
| | feet | feet | feet | feet | feet | cu. ft. | cu. ft. | cu. ft. | feet | cu. ft. | feet |
| 1..... | 1,340 | 991 | 15 | | | | | | 2,346 | | 4,492 |
| 2..... | 1,887 | 551 | | | | | | | 2,438 | | 3,880 |
| 3..... | 1,712 | 605 | | | | | | 3,612 | 2,317 | 3,612 | 3,650 |
| 4..... | 1,533 | 992 | | | | | | | 2,525 | | 3,962 |
| 5..... | 1,888 | 381 | | | | | | 1,780 | 2,269 | 1,780 | 4,228 |
| 6..... | 1,875 | 627 | 167 | | | | | 1,444 | 2,669 | 1,444 | 3,409 |
| 7..... | 1,805 | 616 | 465 | | | | | | 2,886 | | 4,596 |
| 8..... | 1,510 | 748 | 581 | | | | | | 2,839 | | 4,622 |
| 9..... | 1,653 | 455 | 209 | | | | | 2,421 | 2,317 | 2,421 | 3,480 |
| 10..... | 1,184 | 658 | | | | | | 2,952 | 1,842 | 2,952 | 5,335 |
| 11..... | 1,330 | 619 | 9 | | | | | 180 | 1,958 | 180 | 4,319 |
| 12..... | 1,145 | 1,062 | 42 | | | | | 2,274 | 2,249 | 2,274 | 4,425 |
| Total | 18,862 | 8,305 | 1,488 | | | | | 14,663 | 28,655 | 14,663 | 50,398 |
| Previous to date | 270,624.8 | 134,529.8 | 25,306.9 | 612.7 | 14,759.4 | 1,013,582 | 55,039 | 145,591 | 445,833.6 | 1,214,212 | 544,036 |
| Total to date | 289,486.8 | 142,834.8 | 26,794.9 | 612.7 | 14,759.4 | 1,013,582 | 55,039 | 160,254 | 474,488.6 | 1,228,875 | 594,434 |

Operating Costs

| | Total cost | Cost per ton ore milled |
|---|----------------|-------------------------|
| MINING: | | |
| Exploration..... | \$100,672.64 | \$0.1155 |
| Development..... | 406,115.48 | .4662 |
| Breaking and stoping..... | 2,949,219.23 | 3.3852 |
| | \$3,456,007.35 | \$3.9669 |
| Milling..... | 665,536.83 | .7639 |
| Administration and general expense..... | 96,993.63 | .1114 |
| Total..... | \$4,218,537.81 | \$4.8422 |

ANALYSIS OF MINING COSTS PER TON MILLED

| | Stoping | Drifting | Cross-cutting | Raising | Total cost | Cost per ton |
|--------------------------------|----------------|--------------|---------------|-------------|----------------|--------------|
| Labour..... | \$1,333,534.53 | \$139,672.60 | \$52,663.37 | \$7,657.74 | \$1,533,528.24 | \$1.7602 |
| Explosives..... | 100,552.60 | 50,660.74 | 21,460.21 | 2,278.29 | 174,951.84 | .2008 |
| Supplies..... | 131,164.99 | 3,359.88 | 1,729.58 | 23.39 | 136,277.84 | .1565 |
| Power..... | 86,909.43 | 14,905.40 | 5,872.22 | 2,934.73 | 110,621.78 | .1271 |
| Timbering..... | 399,180.37 | | | 9.84 | 399,190.21 | .4582 |
| Shaft repairs..... | 11,971.87 | | | | 11,971.87 | .0137 |
| Back-filling..... | 239,316.56 | | | | 239,316.56 | .2747 |
| Retimbering..... | 41,510.22 | | | | 41,510.22 | .0476 |
| Guniting..... | | 1,707.72 | 226.10 | | 1,933.82 | .0022 |
| Steel-sharpening..... | 44,703.55 | 13,803.11 | 5,946.72 | 1,783.10 | 66,236.48 | .0760 |
| Drill repairs..... | 26,567.22 | 4,581.81 | 1,893.22 | 840.02 | 33,882.27 | .0389 |
| Surveying and engineering..... | 41,266.45 | 7,365.95 | 2,913.45 | 1,333.74 | 52,879.59 | .0607 |
| Sampling and assaying..... | 55,138.74 | 3,477.44 | 1,375.20 | 690.66 | 60,682.04 | .0697 |
| Pumping..... | 15,003.53 | 2,452.35 | 989.80 | 425.58 | 18,871.26 | .0217 |
| Ventilating..... | 9,907.71 | 1,604.65 | 702.95 | 268.89 | 12,484.20 | .0143 |
| Fire protection..... | 461.03 | | | | 461.03 | .0005 |
| Underground lighting..... | 22,673.95 | | | | 22,673.95 | .0260 |
| Tramming..... | 126,110.43 | 20,749.40 | 8,275.90 | 3,974.41 | 159,110.14 | .1826 |
| Underground crushing..... | 8,397.81 | 515.82 | | | 8,913.63 | .0102 |
| Hoisting..... | 254,848.24 | 14,989.50 | | | 269,837.74 | .3098 |
| Total..... | \$2,949,219.23 | \$279,846.37 | \$104,048.72 | \$22,220.39 | \$3,355,334.71 | \$3.8514 |
| Exploration..... | | | | | 100,672.64 | .1155 |
| Total..... | | | | | \$3,456,007.35 | \$3.9669 |
| Unit cost per ton..... | \$3.3852 | \$0.3212 | \$0.1195 | \$0.0255 | | |

SUMMARY OF MILLING COSTS

| | Labour | Supplies | Shop repairs and main- tenance | Power | Total cost | Cost per ton |
|----------------------------------|--------------|--------------|--------------------------------------|--------------|---------------|-----------------|
| Crushing and convey- ing..... | \$40,559.15 | \$31,853.02 | \$5,321.28 | \$18,078.98 | \$95,812.43 | \$0.1100 |
| Flotation..... | 53,051.65 | 149,519.08 | 12,650.94 | 63,564.84 | 278,786.51 | .3200 |
| Cyanidation..... | 46,033.80 | 178,679.42 | 7,639.70 | 23,448.40 | 255,801.32 | .2936 |
| Refining..... | 7,478.70 | 8,697.17 | 274.54 | 1,352.89 | 17,803.30 | .0204 |
| Assaying..... | 7,776.06 | 3,169.55 | 991.79 | 2,188.05 | 14,125.45 | .0162 |
| Mill alterations..... | 3,194.70 | 1.38 | 11.74 | ..... | 3,207.82 | .0037 |
| Total..... | \$158,094.06 | \$371,919.62 | \$26,889.99 | \$108,633.16 | \$665,536.83 | \$0.7639 |
| Unit cost per ton..... | \$0.1814 | \$0.4269 | \$0.0309 | \$0.1247 | ..... | ..... |

ADDITIONS TO PLANT BUILDINGS AND EQUIPMENT

| | |
|--------------------------------|--------------|
| Surface..... | \$96,657.50 |
| Underground..... | 7,581.95 |
| Total..... | \$104,239.45 |
| Less buildings demolished..... | 24,384.80 |
| Net additions..... | \$79,854.65 |

General

Operating costs are up 17.4 cents a ton over the previous period. Approximately 75 per cent. of this rise is due to the increased rate of wages, and the balance to higher commodity prices.

Development work on the lower levels through No. 12 internal shaft continues to be satisfactory. Little stoping has been done on these levels, and it will be some time yet before this part of the mine is called upon for any appreciable amount of ore.

Outside Exploration

Belleterre Quebec Mines, Limited.—On this property surface prospecting discovered No. 12 and No. 13 veins, 2,200 feet north of No. 2 shaft. Trenching and 49 diamond-drill holes have explored these veins over a distance of 1,650 feet and have shown an ore continuity of 80 per cent. There is thus indicated 200,000 tons of \$10.00 ore over a width of 5 feet, calculated to a depth of 350 feet.

A three-compartment shaft has been completed to a depth of 550 feet, and crosscuts are now being driven out to the vein on four levels. The No. 2 shaft, at which the milling plant is located, is being connected to No. 3, or the new shaft, by a crosscut on the 500-foot level.

The power available was not sufficient to enable milling and sinking on the new vein to be carried on simultaneously, and as a consequence the mill, after treating 29,828 tons for a gross recovery of \$275,185.00, was temporarily closed down.

The operation of Diesel engines 35 miles from the railway has been costly, and to provide cheaper power for this operation, a 1,500-horsepower hydro-electric plant is being constructed by the company on the Winneway river, 13½ miles distant. This plant will be completed about September 15, when milling operations will be resumed.

Mace Gold Mines, Limited.—Early in 1937, the Vipond and Inspiration properties were merged into Mace Gold Mines, Limited, and this company negotiated an option on half of the authorized capital.

A crosscut was driven on the 1,450-foot level from the Vipond shaft to the Inspiration property, a distance of about 3,000 feet. From the terminus of this crosscut, diamond-drilling is proceeding to explore the ground to a depth of 2,500 feet.

Eighteen other properties were examined during the year and an option acquired on one. This is now being drilled.

McKenzie Red Lake Gold Mines, Limited

McKenzie Red Lake Gold Mines, Limited, was incorporated February 1, 1933, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,900,000 have been issued. The officers and directors are: W. G. Armstrong, president; F. D. Reid, vice-president; H. M. Anderson, secretary-treasurer; M. F. Fairlie, managing director; G. W. Quinn, C. A. Gentles, and A.

H. Seguin, directors. The head office is at 507 National Building, 347 Bay Street, Toronto, and the mine address is McKenzie Island.

The property consists of 11 claims at the north end of Mackenzie island in Red lake, Dome township, Patricia portion of Kenora district. Summer freight transportation is by barge from Hudson, via Lac Seul, and the property can be reached by airplane daily from Hudson, Kenora, or Winnipeg.

During 1937 the 36-degree winze was continued below the 650-foot level, and two new levels were established at 750 and 850 feet. An exploration shaft was sunk to a depth of 79 feet to determine the character of an east-west vein some distance west of the main workings.

The following table shows the development completed to the end of 1936, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|--------------------------------|---------------------|-------|-------|
| | feet | feet | feet |
| Shafts (main) | 461 | | 461 |
| Shafts (exploration) | | 79 | 79 |
| Winzes | 524 | 262 | 786 |
| 150-FOOT LEVEL: | | | |
| Drifts | 1,828 | | 1,828 |
| Crosscuts | 384 | | 384 |
| Raises | 475 | | 475 |
| 250-FOOT LEVEL: | | | |
| Drifts | 2,797 | 529 | 3,326 |
| Crosscuts | 1,119 | 65 | 1,184 |
| Raises | 1,100 | 185 | 1,285 |
| 350-FOOT LEVEL: | | | |
| Drifts | 2,607 | 429 | 3,036 |
| Crosscuts | 498 | 118 | 616 |
| Raises | 1,044 | 426 | 1,470 |
| 450-FOOT LEVEL: | | | |
| Drifts | 3,042 | 198 | 3,240 |
| Crosscuts | 586 | 15 | 601 |
| Raises | 1,063 | 704 | 1,767 |
| 550-FOOT LEVEL: | | | |
| Drifts | 1,198 | 708 | 1,906 |
| Crosscuts | 239 | 170 | 409 |
| Raises | 121 | 461 | 582 |
| 650-FOOT LEVEL: | | | |
| Drifts | 1,011 | 706 | 1,717 |
| Crosscuts | 22 | 90 | 112 |
| Raises | 194 | 601 | 795 |
| 750-FOOT LEVEL: | | | |
| Drifts | | 873 | 873 |
| Crosscuts | | 75 | 75 |
| 850-FOOT LEVEL: | | | |
| Drifts | | 1,030 | 1,030 |
| Crosscuts | | 158 | 158 |

The diamond-drilling accomplished on the property is shown in the following table:—

| | To Dec. 31, 1936 | | 1937 | | Total | |
|-----------------------|------------------|--------|-------|--------|-------|--------|
| | Holes | Feet | Holes | Feet | Holes | Feet |
| Surface | 12 | 1,744 | 18 | 2,866 | 30 | 4,610 |
| Underground | 127 | 15,013 | 216 | 28,089 | 343 | 43,102 |

The mill operated continuously during 1937 and treated 160 tons per day. The production was as follows:—

| | | |
|---------------------------|--------|-----------|
| Waste hoisted | tons | 27,710 |
| Ore hoisted: | | |
| Development | tons | 10,053 |
| Stopes | tons | 59,765 |
| Total | tons | 69,818 |
| Waste sorted | tons | 11,817 |
| Tons milled | tons | 58,001 |
| Bullion produced: | | |
| Gold | ounces | 24,520.73 |
| Silver | ounces | 4,939.03 |
| Percentage recovery | | 99.7 |

Mining is done by open-stope methods and, owing to the flatness of the vein, which dips from 20 to 45 degrees, the ore is, in most cases, removed from the stopes by the use of hoe-type scrapers operated by tugger hoists.

During the year 2 new frame dwellings and an oil-house were built and a second storey was added to the bunk-house. A new double-drum Manitoba Bridge hoist, gear-driven from a 60 h.p. motor, was installed on the 250-foot level, and a type C.L.-S.F. chlorinator, made by the Patterson Engineering Company, was put into service.

The average number of men employed daily during the year was 116, divided as follows: underground, 70; mill, 12; surface, 34. J. L. Ramsell was the manager.

McLaren-Porcupine Gold Mines, Limited

McLaren-Porcupine Gold Mines, Limited, incorporated in August, 1934, has an authorized capitalization of 3,000,000 shares of no par value. Issued shares at the end of 1937 numbered 1,900,000. The officers and directors are: Dr. W. M. McLaren, president; J. M. McLaren, vice-president; J. J. Gallagher, secretary-treasurer; Gerard Ruel, N. W. Kingsland, and R. P. Smith, directors. The head office and mine office are at South Porcupine.

The holdings of the company consist of 8 claims in the middle of Deloro township, Porcupine area, district of Cochrane, about 6 miles from the station of South Porcupine.

Mining operations at this property have been carried on mainly by the glory-hole method. Since commencement of operations, approximately 12,000 tons of material have been hoisted from an open cut, which now has a maximum depth of about 70 feet. Two drifts, one at each end of the pit, having floors a few feet above the bottom of the pit, have been advanced an aggregate distance of 200 feet. During 1937 approximately 1,000 tons were hoisted from the pit. Some 200 tons of material sorted from this tonnage were milled, and bullion having a gross value of \$2,314 was shipped.

During 1937, ten diamond-drill holes, having a total footage of 6,000 feet, were drilled on the property.

A new compressor building was erected to replace the original building destroyed by fire early in the year. The mine was operated for approximately six months and the mill for two months. J. M. McLaren was in charge of operations, employing an average of 7 men.

MacLeod-Cockshutt Gold Mines, Limited

MacLeod-Cockshutt Gold Mines, Limited, which was incorporated in September, 1933, has an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,811,490 had been issued at December 20, 1937. The officers and directors are: F. G. MacLeod, president; Jos. Errington, vice-president;

J. M. Macintosh, secretary-treasurer; Arthur Cockshutt, D. M. Hogarth, W. H. Marsh, and Dr. R. J. Manion, directors. The head office is at 357 Bay Street, Toronto. The mine address is Little Long Lac.

The property consists of 22 claims, totalling 1,709 acres, about 3 miles from Geraldton on the Longlac-Port Arthur branch of the Canadian National Railways, Ashmore township, Little Long Lac area, district of Thunder Bay.

Underground work was continued at this property throughout 1937. The No. 2, or main, 4-compartment, vertical shaft was sunk an additional 298 feet, to a total depth of 830 feet, and additional levels were established at the 650- and 800-foot horizons. The following table shows the development work accomplished at the end of 1936, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|---------------------------|---------------------|-------|-------|
| | feet | feet | feet |
| No. 1 shaft..... | 172 | ..... | 172 |
| No. 2 shaft..... | 532 | 298 | 830 |
| 150-FOOT LEVEL: | | | |
| Drifts and crosscuts..... | 1,782 | 228 | 2,010 |
| 200-FOOT LEVEL: | | | |
| Drifts..... | 961 | 2,420 | 3,381 |
| Crosscuts..... | 123 | 313 | 436 |
| Raises..... | ..... | 788 | 788 |
| 350-FOOT LEVEL: | | | |
| Drifts..... | 143 | 2,828 | 2,971 |
| Crosscuts..... | 179 | 608 | 787 |
| Raises..... | ..... | 929 | 929 |
| 500-FOOT LEVEL: | | | |
| Drifts..... | 107 | 2,968 | 3,075 |
| Crosscuts..... | 228 | 1,576 | 1,804 |
| Raises..... | ..... | 871 | 871 |
| 650-FOOT LEVEL: | | | |
| Crosscuts..... | ..... | 178 | 178 |
| 800-FOOT LEVEL: | | | |
| Crosscuts..... | ..... | 5 | 5 |

The total amount of diamond-drilling from underground accomplished to the end of 1937 was 34,338 feet.

In the early spring of 1937, electric power was brought to the property from the Cameron Falls-Little Long Lac line of the Hydro-Electric Power Commission. An electrical mining plant was installed, including an Ingersoll-Rand XVH, 2,780-cubic-foot compressor, driven by a 500 h.p. synchronous motor, and an Ingersoll-Rand, 72- by 54-inch double-drum hoist, driven by a Westinghouse 250 h.p. induction motor. In the fall of the year, construction was commenced on a 500-ton flotation-cyanide-amalgamation mill. It is expected that the mill will be completed in February, 1938, and operation at the rate of 300 tons per day will be commenced. The process will include crushing and grinding in water, followed by flotation, and cyanidation of flotation concentrates.

In March, 1937, the old bunk-house and cookery were destroyed by fire. New buildings erected during the year included a compressor- and hoist-room; a building housing a machine shop, electric shop, blacksmith and steel shop; tile substation; switch-house, housing 3 Ferranti 750 k.v.a., 2,300-volt, 60-cycle transformers and three 250 k.v.a., 575-volt, 60-cycle transformers; oil-house; garage; 2 bunk-houses; cookery; mill- and crusher-building; a pump-house containing fire-fighting equipment, including a Worthington 6-LG-1 centrifugal fire pump, driven by a Sterling 5¾- by 6¾-inch, 6-cylinder gasoline engine.

There was an average of 212 men employed, of whom 89 were underground. A. A. Barton is mine manager, and J. C. Kilpatrick is mine superintendent.

McMillan Gold Mines, Limited

McMillan Gold Mines, Limited, which was incorporated in December, 1926, has an authorized capitalization of 4,000,000 shares of \$1 par value. The officers and directors for 1937 were: G. A. Foot, president; T. F. Wende, vice-president; F. Lafferty, secretary-treasurer; Dr. F. C. Fraser and Dr. S. S. Polack, directors. The head office is at Sudbury. The property is located in Mongowin township, district of Sudbury.

Work was continued during 1937 until the end of March. During this period stoping was done on the 525-, 750-, and 875-foot levels, and the 125-ton mill treated a total of 7,608 tons of ore. Later in the year the mining plant and mill were sold.

An average of 54 men was employed during the period of operation under the direction of E. Harris.

Madsen Red Lake Gold Mines, Limited

Madsen Red Lake Gold Mines, Limited, which was incorporated in March, 1935, has an authorized capitalization of 5,000,000 shares of \$1 par value, of which 3,362,007 have been issued. The officers and directors are: Jos. McDonough, president; F. R. Marshall, vice-president; W. G. Hughson, secretary-treasurer; C. D. Kaeding, managing director; W. J. Ryan, Marius Madsen, A. J. Doane, and D. M. Hogarth, directors. E. L. Brown is consulting engineer. The head office is at 811 Bank of Hamilton Building, Toronto, and the mine address is Red Lake.

The property consists of a block of 29 claims, totalling 1,553 acres, in Baird and Heyson townships, Red Lake area, Patricia portion of Kenora district. The mine is about 7½ miles southwest of the Howey mine and may be reached by road from Red Lake.

At the end of 1936 the following development work had been completed from the No. 1 shaft:—

| Level | Crosscutting | Drifting |
|---------------|--------------|----------|
| | feet | feet |
| 100-foot..... | 236 | 177 |
| 212-foot..... | 150 | 874 |
| 325-foot..... | 150 | 835 |
| 437-foot..... | 63 | 280 |
| 550-foot..... | 76 | 215 |

Work from this shaft had been suspended in September, 1936, in order that activities might be concentrated on a new discovery known as the No. 2, or Austin, vein about 1,800 feet west of the original workings.

On January 3, 1937, the collaring of the new shaft on No. 2 vein was started by hand, a mining plant was installed, and camp buildings were erected.

The new buildings include an office, hospital, cookery, food warehouse, 3 bunk-houses, mine warehouse, assay office, power-house, boiler-house, blacksmith shop, and powder-magazine. The mining equipment included two 60 h.p. locomotive-type boilers moved from No. 1 shaft, 1,000-cubic-foot Belliss and Morcom compressor, driven from a 12- by 14-inch Ingersoll-Rand steam engine, and the single-drum hoist from the No. 1 shaft operations.

Sinking under steam power commenced April 22, and the shaft was completed to a depth of 535 feet by September 6, with levels at 200, 350, and 500 feet. Development work on this shaft to the end of the year was as follows:—

| Level | Drifts | Crosscuts |
|---------------|--------|-----------|
| | feet | feet |
| 200-foot..... | 1,048 | 116 |
| 350-foot..... | 809 | 176 |
| 500-foot..... | 563 | 226 |

The total diamond-drilling completed on the property was as follows:—

| | No. 1 vein | | No. 2 vein | |
|------------------|------------|-------|------------|--------|
| | Holes | Feet | Holes | Feet |
| Surface..... | 12 | 2,005 | 69 | 17,179 |
| Underground..... | | | 96 | 5,463 |

Hydro power was delivered to the mine in August from the Ear Falls-Howey line, and the equipment was remodelled or changed to operate by electricity. A new 42- by 30-inch, double-drum Ingersoll-Rand hoist, driven by a 100 h.p. Westinghouse induction motor, was put into service. Late in the fall it was announced that equipment for a 300-ton mill would be brought in and preparations made to have it in operation by July, 1938. In the meantime work underground has been discontinued while the mill is being built.

The average number of men employed daily was 95, distributed as follows: surface, 47; construction, 24; underground, 24. E. G. Crayston is superintendent in charge of operations.

Magnet Consolidated Mines (1936), Limited

Magnet Consolidated Mines (1936), Limited, which was incorporated in April, 1936, has an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,165,005 had been issued at December 31, 1937. The officers and directors are: A. W. Burt, president; T. M. Mungovan, vice-president; George Scott, secretary-treasurer; Fred Searls, Jr., and H. E. Dodge, directors. The head office is at 347 Bay Street, Toronto. The mine address is Geraldton.

The company owns 46 claims in Errington township, Little Long Lac area, district of Thunder Bay, adjoining the property of Bankfield Consolidated Mines, Limited, to the south and east, about 2 miles southwest of Bankfield station on the Longlac-Port Arthur branch of the Canadian National Railways. It is reached from Geraldton by a 4-mile automobile road, which was completed in the summer of 1937.

Work was continued during 1937. A 3-compartment, vertical shaft was sunk to a depth of 380 feet, with levels established at 203 and 328 feet. At the end of May, about 65 feet of crosscutting had been done on the second level and 80 feet of crosscutting on the first level.

At the end of May, operations were suspended owing to lack of finances. Toward the fall of the year the Newmont Mining Corporation of New York bought an interest in the company, and operations were resumed in November.

Additions in plant equipment at the end of the year included an Ingersoll-Rand 8- by 6-inch, double-drum, reversible steam hoist.

At the end of the year there were 20 men employed, of whom 10 were underground. Arthur Kendall is mine manager, and J. A. Pike is mine superintendent.

Manitoba and Eastern Mines, Limited

Manitoba and Eastern Mines, Limited, was incorporated in May, 1928, with an authorized capital of 5,000,000 shares of no par value, 4,770,654 of which have been issued. The officers and directors are: W. E. Hurd, president; T. M. Mungovan, secretary; W. G. Chipp, treasurer; A. J. Bolton and R. J. Jowsey, directors. The head office is at 36 Toronto Street, Toronto. The mine address was Timagami.

The property consists of 18 claims, approximately 720 acres, in Strathy township, district of Nipissing.

The mine was operated from January 1 to March 31, 1937, at which time work was suspended and the workings were allowed to flood. The mining plant was sold in November, and in December the property was leased for one year. The lease is renewable, and the company is to receive 10 per cent. of gross recovery from all ores.

The company reports the following work done during the period of operation in 1937: 2,424 feet of diamond-drilling from underground, 57 feet of crosscutting, and 366 feet of drifting.

An average force of 8 men was employed from January 1 to March 31, under the direction of B. M. Arnott, manager.

Manor Gold Mines, Limited

Manor Gold Mines, Limited, was incorporated in 1927, with an authorized capitalization of 5,000,000 shares of \$1 par value. In 1936 the capitalization was reduced to 2,666,831 shares of \$1 par value, the shareholders receiving 1 new share for 10 of the old and the debentures being paid off with stock. At October, 1937, 1,505,712 shares had been issued.

The officers and directors are: Wm. H. Yates, president; J. E. Riffer, vice-president; S. W. Somerville, secretary-treasurer; A. W. Bate, W. H. Brown, A. L. Smith, and F. W. Watson, directors. The head office is at 356 Aberdeen Avenue, Hamilton. The mine office is at Boston Creek.

The property, consisting of 15 claims, approximately 600 acres, in Skead township, Larder Lake area, district of Timiskaming, had been idle for some years prior to 1937. During former operations a 2-compartment shaft had been sunk to a depth of 485 feet, and the following lateral work had been done: 60 feet of drifting and 544 feet of crosscutting on the 200-foot level, 35 feet of crosscutting on the 340-foot level, and 70 feet of drifting and 166 feet of crosscutting on the 460-foot level. Late in 1937 the mine was dewatered and sampled. About 1,000 feet of surface-trenching was done during the year.

New buildings erected during 1937 include an office, bunk-house, boiler-house, hoist-house, stable, warehouse, and residence. A 6- by 8-inch Jenckes hoist and 100 h.p. boiler were installed.

An average force of 9 men was employed from February to December, under the direction of E. S. MacCarthy, manager.

Margaret Red Lake Mines, Limited

Margaret Red Lake Mines, Limited, which was incorporated in July, 1936, to succeed Margaret Mines, Limited, has an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,800,000 have been issued. The officers and

directors are: A. Kelso Roberts, president; W. W. Soden-Irwin, vice-president; G. E. Gare, secretary-treasurer; C. Price-Green and Nixon Berry, directors. C. W. Greenland is consulting engineer. The head office is at 320 Bay Street, Toronto, and the mine address is McKenzie Island.

The property consists of a group of 54 patented claims, totalling 2,000 acres, located 4 miles north of the Howey mine in Dome, Balmer, and McDonough townships, Red Lake area, Patricia portion of the district of Kenora.

Following a campaign of diamond-drilling and surface-trenching, it was decided in July, 1937, to resume underground operations through a new 3-compartment, vertical shaft on claim K.R.L. 1,023. By October, the shaft had been sunk 32 feet by hand, a cement collar installed, and a 55-foot headframe erected. Underground operations were then suspended, and a camp and plant buildings were erected and a new mining plant was installed.

The new camp and plant buildings include an office, power- and hoist-house, blacksmith shop, carpenter shop, and warehouse.

The new mining equipment includes: a 500-cubic-foot Sullivan air compressor, driven by a 125 h.p. Caterpillar Diesel engine; an 8- by 12-inch, double-drum Marsh Twin hoist, manufactured by the Stephens-Adamson Company; a 125 h.p. Leonard locomotive-type boiler; a No. 34 Ingersoll-Rand steel-sharpener; and a 10 h.p. Dominion Crossley Diesel engine, direct-coupled to a 125-volt D.C. generator.

Diamond-drilling completed to the end of the year was given as 77 holes, totalling 19,865 feet, of which 22 holes, totalling 4,940 feet, were drilled during 1936.

An agreement was made with Richmac Gold Mines, Limited, under which the latter company's claims adjoining those of Margaret Red Lake could be developed from the latter's shaft.

The average number of men employed was 20. W. W. Mills was manager.

Martin-Bird Gold Mines, Limited

Martin-Bird Gold Mines, Limited, was incorporated in May, 1936, with an authorized capitalization of 4,000,000 shares of \$1 par value, of which 3,340,000 have been issued. The officers and directors are: S. J. Bird, president; L. O. Lumbers, vice-president; T. W. Jull, B. M. Stephens, and G. D. O'Meara, directors. The head office is at 200 Bay Street, Toronto. The mine office is at Larder Lake.

The property consists of 13 claims, 415 acres, in Hearst township, Larder Lake area, district of Timiskaming.

Underground development during 1937 amounted to 3,379 feet of cross-cutting, 5,265 feet of drifting, 102 feet of shaft-raising, and 220 feet of development-raising. A total of 11,588 feet of diamond-drilling was done from underground and 8,759 feet from surface.

New buildings erected included a bunk-house, boiler-house, hoist-house, and timber headframe.

New plant equipment included a 96 h.p. Diesel engine, a 496-cubic-foot compressor, a 45 h.p. tractor, a 73 h.p. hoist, and a 100 h.p. boiler.

An average force of 88 men was employed during the year under the supervision of D. M. MacPhail, manager.

Matachewan Consolidated Mines, Limited

Matachewan Consolidated Mines, Limited, was incorporated in July, 1933, with an authorized capitalization of 4,000,000 shares of no par value, of which

3,430,000 have been issued. The officers and directors are: Thayer Lindsley, president; H. H. Sutherland, vice-president; H. Whittingham, secretary-treasurer; Jos. Errington and H. S. Munroe, directors. The head office is at 25 King Street West, Toronto. The mine office is at Matachewan.

The property consisting of 21 claims, approximately 860 acres, in Powell and Cairo townships, Matachewan area, district of Timiskaming, was operated throughout 1937.

New plant equipment included an 18- by 30-inch Hadfield jaw crusher, a Mancha Little Trammer locomotive, 6 ore cars, a spare hoisting cage, and an electric shaft cable. Two residences, for the manager and shift boss, were built on the townsite.

An average of 161 men was employed during the year under the supervision of G. W. Mitchell, manager.

The following is taken from the report of the manager for the year ending December 31, 1937:—

Mine Development

Development work performed during the year was as follows:—

| | Feet |
|---------------------|--------------|
| Shaft-sinking | 63 |
| Drifting | 4,687 |
| Crosscutting | 1,278 |
| Raising | 1,470 |
| Box-holes | 828 |
| Total | 8,326 |

No. 3 shaft, our main entry, was extended from 627 feet to 690 feet, and sinking stopped early in the year. The fifth-level station was cut at the 650-foot elevation.

On the first level both east and west six new stopes were opened up. In five of these mining has been completed. Work is now in progress opening up a fair-sized area in the west dike zone.

Work was pushed on the second and third levels during the year. Development work was carried on to open up 14 stopes. Stopping has been completed in 8 of these. In addition to this, development work has been practically completed to open up three additional stopes on each of the above two levels.

Approximately 1,600 feet of drifting and crosscutting has been done on the fourth level. Two small bodies of low-grade ore were intersected in the west heading and one in a crosscut out of the east heading. The best area in the east end of the mine has not yet been reached. Diamond-drilling from the second and third levels indicates a comparatively large body of very good grade just ahead of the crosscut now being driven on the fourth level. This body has already been developed on the third level. Work on the 5th level has just been started.

Diamond-drilling

The total footage drilled during the year is as follows:—

| | Feet |
|--------------------|---------------|
| Underground | 25,949 |
| Surface | 3,954 |
| Total | 29,903 |

Eight surface holes totalling 3,000 feet were put down on the O'Connell group of claims which were under option to us this summer. Results were all negative and the option was dropped. Four surface holes totalling 954 feet were drilled on our own ground on a structure south of the mill on claims Nos. 5,401 and 5,406. Results here were also negative.

Practically all of the holes drilled underground were systematically placed flat and inclined holes on our system of vertical sections, which are roughly at right angles to the main second, third, and fourth level drifts. Some holes were drilled at an angle to these sections when this was found necessary. Three diamond-drills have been in use on the property for the last half of the year drilling approximately 4,000 feet a month.

Ore Reserves

We have been successful in maintaining our ore position because of the aggressive diamond-drilling and development policy outlined above. Because of the irregularity of our ore bodies both horizontally and vertically, it has been deemed advisable to follow the practice of some other mines and dispense with positive ore reserve figures except broken reserves. Figures classed

as probable ore reserves may, however, be compared directly with past figures on positive ore. The figures classed as possible ore are directly comparable to previous figures on probable ore. Our experience in the last year has indicated that it is impossible to arrive at a positive ore reserve figure with a reasonable degree of accuracy.

As at December 31, 1937, probable ore reserves are estimated as follows:—

| | Tons |
|--------------------------------------|---------|
| Ore reserves, December 31, 1936..... | 290,940 |
| Added during 1937..... | 146,398 |
| Total..... | 437,338 |
| Less hoisted during 1937..... | 133,118 |
| Ore reserves, December 31, 1937..... | 304,220 |

The average grade of reserves is estimated at 0.171 ounces.

The grade is estimated from diamond-drill holes and underground openings plus 20 per cent. dilution. An additional quantity of low-grade material indicated above the fifth level by diamond-drilling shows 46,530 tons, at 0.08 ounces, which may show a mill grade when more thoroughly prospected.

Mining

A summary of mining operations for the year is given below:—

| BROKEN ORE | |
|---|---------|
| | Tons |
| Broken during 1937..... | 145,762 |
| Less hoisted from stopes and development during 1937..... | 133,118 |
| Added to broken reserves during 1937..... | 12,644 |
| Carried over from 1936 (adjusted)..... | 28,236 |
| Broken ore reserves, December 31, 1937 (average estimated grade, 0.164 ounces)..... | 40,880 |
| ORE HOISTED | |
| | Tons |
| From stopes..... | 116,606 |
| From development..... | 16,512 |
| Total to mill, 1937..... | 133,118 |

Ore hoisted from the west contact and dike ore zones was 23 per cent. and ore from the central and east zones was 77 per cent. of the total. The proportion coming from each level was: first, 42; second, 48; third, 10 per cent.

Milling

The mill performance for the year was as follows:—

| | |
|--|---------|
| Days operated..... | 365 |
| Tons ore milled..... | 132,764 |
| Average milling rate, per day..... tons | 364 |
| Average value heads, ounces per ton..... | 0.1668 |
| Average value tails, ounces per ton..... | 0.0142 |
| Average recovery, ounces per ton..... | 0.1526 |

Mill tonnage was gradually increased during the year, as the mine was able to produce and as weaknesses in the crushing plant and mill circuit were discovered and remedied, to the present average of approximately 410 tons per 24 hours. The mill has demonstrated its capacity at 432 tons per 24 hours, but to date has been unable to hold to that tonnage as an average without some additional loss in the tails. Effort is being made to overcome this disadvantage by further tuning up our present equipment.

Production

Total metal recovery was as follows: gold, 20,255.282 fine ounces; silver, 4,061.33 fine ounces.

Matona Gold Mines, Limited

Matona Gold Mines, Limited, has an authorized capitalization of \$2,000,000 in shares of \$1 par value. The officers and directors are: A. H. Waite, president; W. B. McPherson, secretary-treasurer; Garnet Chaplin, George Tough, and Hugh

Jardine, directors. The executive office is at 171 Yonge Street, Toronto. The mine office is at Shiningtree.

The property consists of 19 claims, 789 acres, in Tyrrell township, Matachewan area, district of Timiskaming.

During 1937 the 2-compartment shaft was deepened to 215 feet. A second level was established at 215 feet and some drifting was done. A raise was driven from the 125-foot level to surface. Underground work was suspended in October.

An average force of 22 men was employed during the year under the direction of A. H. Smith, manager.

May-Spiers Gold Mines, Limited

May-Spiers Gold Mines, Limited, was incorporated in June, 1934, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,320,442 have been issued. The officers and directors are: H. A. Newman, president; C. E. St. Paul, vice-president; C. B. Ridley, secretary-treasurer; E. N. Spiers and O. May, directors. The head office is at 36 Toronto Street, Toronto. The mine address was Cole.

The property consists of a group of 8 patented claims, totalling 250 acres, in Ball township, at the west end of Red lake, Patricia portion of Kenora district. The mine workings are on an island about 1,000 feet in length; a large part of the holdings are under water. The property can be reached by boat or airplane from Red Lake.

Lateral work was carried on in 1937 until March. Underground diamond-drilling was done until May 1, when it was decided to suspend all operations. The headframe was dismantled and sold, and the plant and buildings were destroyed by a bush fire late in the summer.

The following table shows the total amount of underground development work done on the property:—

| | Feet |
|-------------------|-------|
| Shafts..... | 375 |
| Stations (2)..... | 54 |
| Drifts..... | 931 |
| Crosscuts..... | 1,047 |

Diamond-drilling during 1937 amounted to 2,097 feet from surface and 2,474 feet from underground.

During the three months of operation in 1937 an average of 26 men was employed. E. N. Spiers was in charge.

Melba Gold Mines, Limited

Melba Gold Mines, Limited, was incorporated in July, 1936, with an authorized capital of 3,000,000 shares of \$1 par value, of which 1,600,000 have been issued. The executive office is at 388 St. James Street West, Montreal, Que. The head office and mine office are at Bourkes. The officers and directors are: A. P. Earle, president; C. L. Jerrom, vice-president; G. F. Racine, secretary-treasurer; W. H. Laidley, W. S. Edwards, A. A. Lessard, and T. J. Day, directors.

The property consists of 27 claims, 1,080 acres, in Melba township, in the Bourkes section of the Kirkland Lake area, district of Timiskaming.

During 1937 a mining plant was installed and camp buildings were erected. Surface exploration was carried on throughout the year. A 2-compartment shaft, inclined at 55 degrees, begun on June 9, was sunk to a depth of 246 feet and levels were established at 185 and 225 feet. About 239 feet of crosscutting

and 716 feet of drifting were done. Diamond-drilling amounted to 3,241 feet from surface and 726 feet from underground. Operations were suspended on December 23.

Buildings constructed during the year included an office, headframe, dry-house, 2 bunk-houses, cookery, storehouse and ice-house, power-house, machine shop, machinery storehouse, powder magazine, blacksmith shop, water-tower, pump-house, stable, and root-house.

New plant equipment installed consisted of the following: a single-drum, 8- by 10-inch steam hoist; a locomotive-type, 55 h.p. stationary boiler; an 80 h.p. Chicago Pneumatic Diesel air compressor; a steam dynamo; an Ingersoll-Rand sump pump; a Cameron steam pump; a Worthington steam pump; blacksmith shop equipment, complete with forge and steel-sharpener; 3 Ingersoll-Rand rock drills.

An average of 27 men was employed throughout the year under the direction of H. Brassaw, superintendent.

Mesabi Gold Mines, Limited

Mesabi Gold Mines, Limited, was incorporated in October, 1936, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,088,722 have been issued. The officers and directors are: Henry D. Tudor, president; B. R. Mackenzie, vice-president; D. A. Ampleford, secretary-treasurer; O. L. Knutson and S. A. Caldbick, directors. The head office is at 80 King Street West, Toronto. The mine office is at Bourkes.

The company acquired the property formerly held by Bourkes Syndicate, consisting of 142 acres in Benoit township, Bourkes section of the Kirkland Lake area, district of Timiskaming.

There is a shaft 400 feet deep on the property, with levels at 80, 180, 280, and 380 feet; the former operators had done 181 feet of crosscutting, 1,621 feet of drifting, and 1,506 feet of underground diamond-drilling. The present company carried on operations from October 16 to December 31, 1937. Some 37 feet of drifting and crosscutting was done.

New buildings erected in 1937 included a mine office and warehouse, cookery, bunk-house, blacksmith shop, and powder magazine.

The company purchased a 100-ton mill from McMillan Gold Mines, Limited, and late in the year excavating was commenced for the foundations.

An average force of 27 men was employed under the direction of H. F. Knutson, mine manager.

Miles-Martin Kirkland Mines, Limited

Miles-Martin Kirkland Mines, Limited, was incorporated in March, 1937, with an authorized capital of 3,000,000 shares of \$1 par value, of which 1,175,333 have been issued. The officers and directors are: Murdoch L. Martyn, president; E. M. Cowan, vice-president; Albert O. L. Burnese, secretary-treasurer and manager; E. C. Shapira and J. C. C. Cornell, directors. The head office is at 302 Sterling Tower, Toronto. The mine office was at Kirkland Lake.

The property consists of 16 claims, in Morrisette and Bernhardt townships, Kirkland Lake area, district of Timiskaming, and includes the Goodfish mine.

Operations were carried on at the property from September 28 to December 3, 1937. The Costello shaft was dewatered to a depth of 600 feet, but no development work was done. A considerable amount of repair work was done, and some replacements to machinery and equipment were made.

An average of 11 men was employed under the supervision of W. F. Gowans, superintendent.

Minaura Mines, Limited

Minaura Mines, Limited, was incorporated in November, 1935, with an authorized capitalization of 3,000,000 shares of no par value. The officers and directors are: D. M. Gilpin, Sr., president; H. McBrien, secretary-treasurer; W. H. Wilson and D. M. Gilpin, Jr., directors. The head office is at 72 Queen Street West, Toronto. The mine office is at Englehart.

The property, formerly known as the Telluride, contains about 1,080 acres and is situated in Skead township, Larder Lake area, district of Timiskaming. There are four shafts on the property and a large amount of lateral work has been done.

The mine was operated for several months during 1937, during which time No. 2 shaft was deepened from 60 to 120 feet and about 60 feet of drifting and crosscutting were done on the 100-foot level.

About 25 men were employed under the direction of D. M. Gilpin, Jr.

Minto Gold Mines, Limited

Minto Gold Mines, Limited, was incorporated in July, 1930, with an authorized capitalization of 8,000 shares of no par value. The officers and directors are: John Knox, Jr., president and manager; M. E. Knox, secretary-treasurer; A. Dorfman and J. Ingram, directors. The executive and mine offices are at Wawa.

The property consists of the Minto, Jubilee, and Cooper mines, located in township 29, range 23, Michipicoten area, district of Algoma.

Operations were continued at the Jubilee mine until June, 1937. Open stoping was done on the 4th and 5th levels, and the ore was transported by truck to the 100-ton cyanide mill at the Minto mine, where it was milled.

The mill operated 144 days during 1937 and treated a total of 15,577 tons of ore, of which 3,461 tons was obtained from the fourth level, and 12,116 tons from the fifth level.

The property was then shut down for the balance of the year. An average of 40 men was employed during the period of operation.

Moneta Porcupine Mines, Limited

Moneta Porcupine Mines, Limited, which was incorporated in 1910, has an authorized capitalization of 3,000,000 shares of \$1 par value; of which 2,543,860 have been issued. The officers and directors are: W. E. Segsworth, president; L. L. Steindler, vice-president; W. C. C. McKenzie, secretary-treasurer; R. J. Jowsey, J. D. Conover, and R. S. Robertson, directors. The head office is at 67 Yonge Street, Toronto. The mine office address is Timmins.

The company owns 8 claims, situated west of and adjacent to the Hollinger mine, in the township of Tisdale, Porcupine area, district of Cochrane. The mine workings are on the northeast quarter of the south half of lot 12, concession II.

Development work previous to 1936 consisted of two shallow shafts, the deepest of which was at 125 feet, about 600 feet of lateral work, and some 10,000 feet of diamond-drilling. No important ore was found in this work. In 1936 a diamond-drilling programme carried out during the summer months indicated a sizeable ore body, and the sinking of a 3-compartment shaft was started late in the fall. By the end of the year the shaft had reached a depth of 52 feet, a steel

headframe had been partially erected, and plant installation was in progress. In 1937 the headframe was completed, and 2 Canadian Ingersoll-Rand, model XVHE-2, 815-cubic-foot compressors, with 150 h.p. motors, and a Canadian Ingersoll-Rand double-drum hoist and 75 h.p. motor were installed.

In the spring of 1937 the new shaft was completed to a depth of 540 feet, and four levels were opened at 150, 275, 400, and 525 feet. The drifting, crosscutting, and raising done on these levels during 1937 are shown in the following table:—

| Level | Crosscutting | Drifting | Raising |
|---------------|--------------|----------|---------|
| | feet | feet | feet |
| 150-foot..... | 263 | 458 | 71 |
| 275-foot..... | 282 | 448 | 166 |
| 400-foot..... | 232 | 472 | 133 |
| 525-foot..... | 221 | 456 | 126 |
| Total..... | 998 | 1,834 | 496 |

In the fall a 150- to 200-ton cyanide mill was erected and was being tuned in at the end of the year.

While mill construction was in progress the mine shaft was deepened to 965 feet and 3 new level stations were cut at 650, 775, and 900 feet. Two diamond-drill holes having an aggregate footage of 1,061 feet were drilled from surface during the year, and 36 holes were drilled from underground, in which the footage totalled 2,916 feet. The ore dump on surface was estimated at the end of the year to contain 14,500 tons, grading approximately \$20.00 per ton.

Two residences, a refinery, and a water tank were built.

The average number of men employed during the year was 81, of whom 39 were employed underground and 28 on construction work. J. D. Barrington is manager.

Morris Kirkland Gold Mines, Limited

Morris Kirkland Gold Mines, Limited, which was incorporated in January, 1935, has an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,594,759 have been issued. The officers and directors are: W. B. Robb, president; G. W. Morris and Jas. E. Day, vice-presidents; E. E. Meadows, secretary-treasurer; H. P. Armstrong, L. H. Watts, and Dr. W. H. Bennett, directors. The head office is at 156 Yonge Street, Toronto. The mine office is at King Kirkland.

The property consists of 5 claims, 296 acres, in the township of Lebel, Kirkland Lake area, district of Timiskaming.

The mine and mill operated throughout 1937. Underground development work consisted of 649 feet of crosscutting, 1,954 feet of drifting, and 291 feet of raising. About 5,003 feet of diamond-drilling was done from underground. The average daily tonnage milled throughout the year was 98.5.

During the year a new cap-house was built to replace one destroyed by fire, and 1,000 feet of 4-inch woodstave slime disposal line was constructed. A 250 k.v.a. transformer was added to the electrical equipment.

An average of 80 men was employed. O. R. Wray succeeded T. C. Fawcett as manager.

Murray-Algoma Mining Company, Limited

The Murray-Algoma Mining Company, Limited, was incorporated in January, 1934, with an authorized capitalization of 40,000 shares of no par value.

The officers and directors are: J. V. Trowell, president; E. G. Archer, vice-president; E. L. Lamb, secretary-treasurer; G. J. Lamb, managing director; T. E. Carmichael and T. H. Barnard, directors. The head office is at 18 Lansdowne Avenue, Sault Ste. Marie. The mine address is Hawk Junction.

The property is located in township 28, range 24, Michipicoten area, district of Algoma, about 2 miles west of Hawk Junction.

Work was continued on a small scale until the middle of August, 1937. The property was idle for the rest of the year. About 500 tons of surface ore was mined and tested in the 20-ton amalgamation mill.

An average of 10 men was employed during the period of operation under the direction of G. J. Lamb.

N. A. Timmins Corporation

In June, 1936, the N. A. Timmins Corporation optioned a group of 36 claims held by A. Caouette, near Longlac, district of Thunder Bay. The property is situated on the west side of the Making Ground river, about $7\frac{1}{2}$ miles south and slightly east of Longlac, and is contiguous to the south boundary line of the Martin Falls Indian Reserve. It is accessible by water, via the river, in the summer, and in winter may be reached by road through the Reserve from the siding at mileage 96.7 on the Caramat subdivision of the Canadian National Railways.

Underground exploration commenced in November, 1936, and continued until May 4, 1937. The option was then dropped.

When operations ceased the 2-compartment, inclined shaft had been sunk to a depth of 135 feet and 241 feet of drifting and 97 feet of crosscutting had been done on the 125-foot level.

When the option on the above property was dropped a second option was taken on another group of claims on the east side of the river. A 2-compartment, inclined shaft was sunk on claim T.B. 16,851, and levels were opened up at the 125- and 200-foot horizons. Lateral development was continued to the end of 1937, when the option was dropped and the entire plant moved off the property. At that time the shaft had reached a depth of 217 feet and the following lateral work had been done:

| | Feet |
|-------------------|------|
| 125-FOOT LEVEL: | |
| Drifting..... | 36 |
| Crosscutting..... | 145 |
| 200-FOOT LEVEL: | |
| Drifting..... | 110 |
| Crosscutting..... | 420 |
| Total..... | 711 |

Diamond-drilling from surface amounted to 7,868 feet.

During the year there was an average of 34 men employed, of whom 7 were underground, under the direction of F. C. Tomlinson. The mine address is Longlac.

Naybob Gold Mines, Limited

Naybob Gold Mines, Limited, was incorporated in January, 1934, with an authorized capitalization of 3,500,000 shares of \$1 par value. The number of shares issued at the end of 1937 numbered 2,352,143. The officers and directors are: Robert J. Naylor, president; Richard N. Clarke, vice-president; Jos. Sheedy, secretary; Harvey J. Haddleton, treasurer; Jos. Montgomery, George E. Beggs,

John G. Jones, and Sherman J. Le Pard, directors. The head office is at 711 Federal Building, Toronto. The mine office address is Box 2772, Timmins.

The property, formerly the Hayden mine, is situated $3\frac{1}{2}$ miles due south of Timmins and consists of 16 claims, 606 acres, which lie on both sides of the Deloro-Ogden township line, Porcupine area, district of Cochrane.

The mine has been developed through a 2-compartment shaft, 719 feet in depth. The following table shows the amount of underground development work done at the end of 1936, during 1937, and the total at the end of 1937:—

| Level | To Dec. 31, 1936 | 1937 | Total |
|----------------|---------------------|-------|-------|
| | feet | feet | feet |
| 100-FOOT: | | | |
| Drifts..... | 128 | ..... | 128 |
| Crosscuts..... | 330 | ..... | 330 |
| 200-FOOT: | | | |
| Drifts..... | 85 | ..... | 85 |
| Crosscuts..... | 198 | ..... | 198 |
| 300-FOOT: | | | |
| Drifts..... | 1,971 | 1,138 | 3,109 |
| Crosscuts..... | 1,220 | 294 | 1,514 |
| Raises..... | 42 | 249 | 291 |
| 400-FOOT: | | | |
| Drifts..... | 66 | 803 | 869 |
| Crosscuts..... | 696 | 407 | 1,103 |
| Raises..... | 60 | 242 | 302 |
| 550-FOOT: | | | |
| Crosscuts..... | 35 | ..... | 35 |
| 700-FOOT: | | | |
| Drifts..... | 2,392 | 633 | 3,025 |
| Crosscuts..... | 1,763 | 333 | 2,096 |
| Raises..... | 590 | 227 | 817 |

Seventy-one diamond-drill holes, having a total length of 14,983 feet, have been drilled from underground.

No important changes were made in the mining plant in 1937. Construction was confined to the erection of one building in which diamond-drill core is logged, split, and stored, and an extension to the pipe-shop building, which is used as a draughting office.

The mine operated during the first ten months of the year, and the mill from July 15 to the end of the year. Several alterations and additions were made to the mill. Two Dorr thickeners with 2-inch diaphragm pumps, a Denver mineral jig, and a small Dorr type C rake classifier were installed, and an agitator was converted into a thickener. Milling operations have been stated to be more or less metallurgical experiments, for which most of the ore was taken from the surface dump. The estimated number of tons milled during 1936 was 13,500.

The average number of men employed per month was 56. R. V. Neily was mine manager.

New Golden Rose Mines, Limited

New Golden Rose Mines, Limited, was incorporated in April, 1935, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: J. Bradley Streit, president; W. M. Archibald, vice-president; J. E. Robinson, secretary; Jas. E. Riley, treasurer; J. J. Warren, E. G. Montgomery, and W. B. McHenry, directors. The head office is at 302 Bay Street, Toronto.

The property is located in Afton township, Timagami Provincial Forest, district of Sudbury, and includes the Afton mine. Operations were carried on throughout 1937 under the direction of the Consolidated Mining and Smelting Company of Canada, Limited. An account of the work done on the property appears on page 108 of this report. The mine address is care of the superintendent, W. E. Aitchison, Glen Afton; or care of the manager, D. C. McKechnie, Sudbury.

North Huron Gold Mines, Limited

North Huron Gold Mines, Limited, was incorporated in June, 1936, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: Dr. A. Moir, president; E. W. Savage, vice-president; J. J. Glass, secretary-treasurer; M. U. Knechtel and O. E. Rawson, directors. The head office is at 372 Bay Street, Toronto. The mine address is Havilah.

The property includes the old Havilah or Ophir mine, situated in lot 12, concession III, Galbraith township, district of Algoma. It is about 15 miles north of Bruce station on the Canadian Pacific railway.

Operations were continued during 1937 until September, then suspended for the rest of the year. The work accomplished consisted of stripping, trenching, test-pitting, and 3,500 feet of diamond-drilling.

An average of 10 men was employed during the period of operation. A. D. Harding was in charge.

Northern Empire Mines Company, Limited

The Northern Empire Mines Company, Limited, was incorporated in July, 1932, with an authorized capitalization of 500,000 shares of \$1 par value. The officers and directors are: Fred Searls, Jr., president; H. E. Dodge, secretary-treasurer; Carroll Searls, Geo. B. Agnew, and A. Douglas, directors. The executive office is at 14 Wall Street, New York, N. Y. The mine address is Empire.

The property is located at Empire, on the Longlac-Port Arthur branch of the Canadian National Railways, in Summers township, Beardmore area, district of Thunder Bay.

Work was continued at this property throughout 1937. During the year, the mill treated 65,026 tons of ore. Production was maintained from 4 stopes east of the shaft on the 150-foot level, 7 stopes east and 2 stopes west of the shaft on the 300-foot level, 5 stopes east and 3 stopes west of the shaft on the 450-foot level, and 6 stopes east and 2 stopes west on the 600-foot level. The mining method used is resuing cut-and-fill, and during the year 96,600 tons of waste rock were mined for back-fill. The 2-compartment, vertical shaft, deepening and enlarging of which was commenced in 1936, was completed to a total depth of 1,479 feet, and new levels were established at 750 and 1,400 feet. The shaft broke through the diabase sill at a depth of about 1,350 feet from surface. Lateral developments on the 1,400-foot level disclosed the continuance of the main vein with no displacement or decrease in size. Toward the end of the year plans were under way to sink the shaft in an attempt to locate the second sill found by diamond-drilling on the adjoining property of Spooner Gold Mines, Limited, during the summer of 1937.

The following table shows the development work accomplished at the end of 1936, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|---------------------|---------------------|-------|-------|
| | feet | feet | feet |
| Shaft..... | 796 | 683 | 1,479 |
| 75-FOOT LEVEL: | | | |
| Ore-pass raise..... | 63 | | 63 |
| 150-FOOT LEVEL: | | | |
| Drifts..... | 3,476 | | 3,476 |
| Crosscuts..... | 208 | | 208 |
| Raises..... | 350 | | 350 |
| 300-FOOT LEVEL: | | | |
| Drifts..... | 3,073 | 717 | 3,790 |
| Crosscuts..... | 331 | 15 | 346 |
| Raises..... | 277 | 160 | 437 |
| 450-FOOT LEVEL: | | | |
| Drifts..... | 2,791 | 739 | 3,530 |
| Crosscuts..... | 541 | | 541 |
| Raises..... | 79 | 145 | 224 |
| 600-FOOT LEVEL: | | | |
| Drifts..... | 3,240 | | 3,240 |
| Crosscuts..... | 938 | 136 | 1,074 |
| Raises..... | 309 | 105 | 414 |
| 750-FOOT LEVEL: | | | |
| Crosscuts..... | | 1,000 | 1,000 |
| Raises..... | | 60 | 60 |
| 1,400-FOOT LEVEL: | | | |
| Drifts..... | | 368 | 368 |
| Crosscuts..... | | 213 | 213 |

New buildings erected during 1937 included a cap-house and two residences.

A Denver agitator was added to the mill for the treatment of flotation concentrates from the property of Tombill Gold Mines, Limited, during 1938.

There was an average of 187 men employed, of whom 136 were underground and 12 in the mill. Arthur Kendall is mine manager, George Dunn is mine captain, and W. Hargraft is mill superintendent.

Neil O'Hara and Associates

Neil O'Hara and associates have purchased in part and optioned in part 40 claims formerly known as the Beggs, Ollman, O'Hara, and Edwards properties, situated in the township of Pic, district of Thunder Bay. It is located near Heron Bay station on the main line of the Canadian Pacific Railway.

The property includes the old workings of the Bowhill mine, which operated about 40 years ago.

Toward the end of 1937 work was commenced on the surface outcrops on the Bowhill property, and a road was being built to the claims from Heron Bay. Plant equipment consisted of a portable Diesel compressor.

There were 11 men employed under the direction of Neil O'Hara. The mine address is Heron Bay.

Old Diamond Gold Mines, Limited

Old Diamond Gold Mines, Limited, was incorporated in July, 1936, with a capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: J. E. Ayhart, president and manager; J. M. Haig, vice-president; C. L. Wallbridge, secretary-treasurer. The head office is at 74 King Street East, Toronto. The mine address is Madoc.

During 1937 the mine in Madoc township, Hastings county, was operated from January to May and again from September 1 to October 15. There is an

inclined shaft 100 feet deep on No. 1 vein, with a level at 100 feet and a shallow winze below the level. The 1937 operations consisted of drifting and crosscutting and a small amount of winze-sinking. Some trenching and test-pitting were also done on surface.

An average of 15 men was employed under the direction of T. A. Westbrook, resident manager.

Olive Gold Mines, Limited

Olive Gold Mines, Limited, was incorporated in January, 1935, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: Dr. W. C. Ryckman, president; J. J. Hoefle, vice-president; C. V. Jacobs, secretary-treasurer; E. J. Wolff and H. F. Lichtenstein, directors. The head office is at 372 Bay Street, Toronto. The mine address is Mine Centre.

The property consists of the old Olive mine, located $4\frac{1}{2}$ miles west of Mine Centre, district of Rainy River. The Fort Frances branch of the Canadian National Railways is within a very short distance of the property.

Previous operators sank a 2-compartment, 70-degree shaft to a depth of 251 feet, and established levels at 60, 135, and 245 feet. They did 867 feet of drifting on the 60-foot level, 290 feet on the 135-foot level, and 177 feet of drifting and 65 feet of crosscutting on the 245-foot level. A second shaft was connected with the first level 300 feet east of the first shaft, and there was a third shaft, 50 feet deep, put down 290 feet east of the second shaft. There were three stopes on the first level, two on the second level, and a small backstope on the third level. The ore was milled in a 25-stamp mill.

Work was commenced in May, 1935, and the underground workings were sampled in June and July. In September, the installation of a plant and the construction of buildings were started.

Underground operations were commenced toward the end of 1936 and continued during 1937 until October 31, at which time work was suspended.

During the period of operation in 1937, 100 feet of crosscutting and approximately 1,000 feet of drifting were accomplished on the second level.

On September 1, 1937, a 20-ton Straub amalgam mill was installed, and some ore from the development work was treated, with a gross recovery of 49.557 ounces of fine gold and 7.93 ounces of fine silver.

An average of 16 men was employed, of whom 8 were underground, with 3 in the mill during September and October. F. G. Huycke was in charge of operations.

Omega Gold Mines, Limited

Omega Gold Mines, Limited, was incorporated in May, 1935, with an authorized capitalization of 5,000,000 shares of \$1 par value, all of which have been issued. The officers and directors are: J. P. Bickell, president; E. D. Fox, secretary-treasurer; Balmer Neilly, A. Dorfman, E. M. Thomson, Dr. A. F. Demary, directors. R. J. Ennis is consulting engineer. A. D. Campbell is manager. The executive office is at 15 King Street West, Toronto. The head office and mine office are at Larder Lake.

The property consists of 25 claims, 799.75 acres, in McVittie township, Larder Lake area, district of Timiskaming.

During the calendar year 1937 some 5,784 feet of underground diamond-drilling, 1,072 feet of crosscutting, 2,871 feet of drifting, and 2,158 feet of raising were done. An average of 439 tons of ore per day was milled during the year.

An addition to the hoist-room was built and a new 54- by 84-inch Nordberg hoist was installed.

An average force of 194 men was employed throughout the year.

The following is taken from the report of the general manager for the fiscal year ending March 31, 1938:—

Production

| | | |
|--|------|---------------------|
| Ore treated..... | tons | 167,051 |
| Value per ton (0.1532 ounces) | | \$5.362 |
| Gross value..... | | \$895,732.82 |
| Bullion recovered: | | |
| Gold (22,240.649 ounces at \$35.00) | | \$778,381.34 |
| Silver (3,171.47 ounces at \$0.437) | | 385.31 |
| Total value..... | | \$779,766.65 |
| Recovered per ton (0.1333 ounces) | | \$9.49 |
| Bullion melting, refining, and handling charges..... | | 9,512.61 |
| | | <u>\$770,254.04</u> |

PRODUCTION SINCE THE BEGINNING OF MILLING OPERATIONS IN 1936

| Period | Months | Tons milled | Value per ton | Gross value | Recovery per ton | Total value |
|--------------------------------|--------|-------------|---------------|----------------|------------------|----------------|
| Feb. 1, 1936, to Mar. 31, 1936 | 2 | 17,352 | \$4.286 | \$74,369.00 | \$3.557 | \$61,726.28 |
| Apr. 1, 1936, to Mar. 31, 1937 | 12 | 132,642 | 5.00 | 663,010.70 | 4.324 | 573,504.29 |
| Apr. 1, 1937, to Mar. 31, 1938 | 12 | 167,051 | 5.36 | 895,393.36 | 4.668 | 779,766.65 |
| Total | | 317,045 | \$5.15 | \$1,632,773.06 | \$4.463 | \$1,414,997.22 |

While making the year's production, ore reserves were maintained from new development.

Mining

The ore milled during the year was obtained from the following sources:—

| | |
|--------------------|----------------|
| | Tons |
| Development | 10,605 |
| Stoping | 153,672 |
| Surface dump | 2,774 |
| Total | <u>167,051</u> |

The ore hoisted from the various levels was:—

| Level | Tons | Ounces per ton | Total ounces |
|-----------------|---------|----------------|--------------|
| 170-foot..... | 780 | 0.114 | 89 |
| 300-foot..... | 35,200 | .141 | 4,966 |
| 425-foot..... | 17,712 | .132 | 2,331 |
| 550-foot..... | 44,200 | .152 | 6,715 |
| 675-foot..... | 31,515 | .159 | 5,033 |
| 800-foot..... | 24,440 | .187 | 4,583 |
| 925-foot..... | 2,930 | .167 | 491 |
| 1,050-foot..... | 7,500 | .132 | 991 |
| Total | 164,277 | 0.153 | 25,199 |

Development

Development done during the year was:—

| | |
|--|--------------|
| | Feet |
| Drifting | 3,053 |
| Crosscutting | 436 |
| Raising | <u>1,712</u> |
| | 5,201 |
| Diamond-drilling..... | 8,097 |
| | cu. ft. |
| Stations, including slashing out of station crosscuts..... | 13,068 |

Some further work of enlarging shaft stations and station crosscuts was completed during the year. The ore-pass was driven from the loading-pocket below the 1,050-foot level to the bottom of the ore-pass previously completed to the 800-foot level. Fill raises were completed to all working stopes to the 1,050-foot level. Some 60,395 tons of backfill were placed, of which 26,762 tons were gravel, the balance being development and surface dump rock.

The chief ore developments were:—

No. 1 Vein.—Lateral extensions made on the 675- and 800-foot levels were responsible for the better than average grade of the 24,440 tons of ore hoisted from the 800-foot level. New ore was also found towards the eastern end of the 425-foot level.

No. 2 Vein.—Further ore was developed on No. 2 vein on the 1,050-foot level, and stoping results were favourable on the 800-foot level.

No. 4 Vein.—Lateral extensions in ore were made on the 425-foot level, and ore was also developed on the 550- and 675-foot levels, which were new levels for this vein.

Nos. 6 and 7 Veins.—These veins were cut on the 1,050-foot level by a crosscut driven 1,000 feet to come under ore indicated in diamond-drilling from the 1,000-foot level of No. 2 shaft. The ore developed was of good grade but the rock formations at this level had been subjected to folding, which made individual ore shoots in the veins short. There are possibilities of developing further ore on these veins from the 750- and 500-foot levels above.

Two diamond-drill holes in No. 6 vein below the 1,050-foot level showed considerably better than average grade ore. One hole followed the vein down for 64 feet below the level before entering wall rock. For this depth the average assay of the core was 0.48 ounces (\$16.80) per ton. The appearance of this ore and the sampling results were distinctly encouraging. The 1,175-foot level will be driven 1,000 feet to come under veins Nos. 6 and 7, which we believe will extend at least to this level.

Ore Reserves

The ore reserves are estimated at a little more than those of a year ago, being 515,000 tons, averaging 0.164 ounces (\$5.72) per ton. Further ore remains to be developed.

Operating Costs

Operating costs, which include all general and administration costs exclusive of depreciation, were somewhat higher than for the previous year due to increased costs of supplies and higher wages, but were still low as shown by the following table:—

| | Total cost | Cost per ton milled |
|-------------------------------|--------------|---------------------|
| Development..... | \$78,997.99 | \$0.473 |
| Mining..... | 359,856.42 | 2.154 |
| | \$438,854.41 | \$2.627 |
| Milling..... | 203,315.67 | 1.217 |
| | \$642,170.08 | \$3.844 |
| Administration and taxes..... | 6,225.23 | .037 |
| Total..... | \$648,395.31 | \$3.881 |

Milling Operations

With the increased mine production made possible by the new hoist, mill tonnage was increased in August. The average tonnage for the year was 458 tons per day, with 525 tons per day being currently handled.

MILLING COSTS

| | Total cost | Cost per ton milled |
|----------------------------|--------------|---------------------|
| Crushing..... | \$39,479.97 | \$0.2364 |
| Flotation..... | 75,344.24 | .4510 |
| Cyanidation..... | 72,223.95 | .4324 |
| Refining and assaying..... | 12,368.00 | .0739 |
| Mill alterations..... | 3,899.51 | .0233 |
| Total..... | \$203,315.67 | \$1.2170 |

Additions to Plant, Buildings, and Equipment

| | |
|---|--------------------|
| Additions to office, change-house, and other surface buildings. | \$1,536.55 |
| New hoist and addition to hoist-house | 30,536.70 |
| Underground equipment..... | 5,653.98 |
| Surface equipment..... | 1,964.67 |
| Total..... | \$39,691.90 |

General

The profits derived from the year's operations have taken care of capital expenditures and substantially improved our cash position. The boundaries of the known ore have been extended both laterally and vertically. Knowledge gained from the diamond-drilling and ore developments of the past year now permits of the direction of future development into favourable areas.

The profits for the first month of the present fiscal year have been higher than those of the average month of the past year. Profits for the coming year should be higher than for the year now reviewed.

Oremond Gold Mines, Limited

Oremond Gold Mines, Limited, was incorporated in March, 1936, with an authorized capitalization of 2,500,000 shares, of which 1,525,000 had been issued at December 31, 1937. The officers and directors are: A. E. Dumond, president; T. J. Day, vice-president; George Scott, secretary-treasurer; J. W. Shaw and J. T. Oliver, directors. The head office is at 347 Bay Street, Toronto. The mine address is Jellicoe.

The property consists of 25 claims in one block, about 5 miles northwest of Jellicoe, on the Longlac-Port Arthur branch of the Canadian National Railways, in Leduc township, district of Thunder Bay.

Operations were continued at this property during the first seven months of 1937. On March 5, 1937, underground work was suspended, and diamond-drilling and surface work were carried on until the end of July, at which time all operations were suspended.

The following table shows the development work accomplished at the end of 1936, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|-----------------|---------------------|-------|-------|
| | feet | feet | feet |
| Shaft | 300 | ..... | 300 |
| 150-FOOT LEVEL: | | | |
| Drifts | 489 | 752 | 1,241 |
| Crosscuts | 274 | 314 | 588 |
| 275-FOOT LEVEL: | | | |
| Drifts | 95 | 447 | 542 |
| Crosscuts | 118 | 173 | 291 |

During the first three months of the year there was an average of 26 men employed, of whom 12 were underground, under the direction of D. H. MacKay. Diamond-drilling and surface exploration were in charge of F. L. Casey.

Oriole Mines, Limited

Oriole Mines, Limited, was incorporated in July, 1927, with an authorized capital of 5,000,000 shares of \$1 par value, of which 4,653,958 have been issued. The officers and directors are: W. R. Biton, president; Thos. Swan, secretary-treasurer; Wm. Reid, A. M. Heron, F. Philp, directors. The head office is at 45 Richmond Street West, Toronto. The mine address is Larder Lake.

The property consists of 14 claims, 572.5 acres, in Gauthier township, Kirkland Lake area, district of Timiskaming.

The company reports that 800 feet of surface-trenching and 10,100 feet of diamond-drilling from surface were done during 1937.

Pamour Porcupine Mines, Limited

Pamour Porcupine Mines, Limited, which was incorporated in March, 1934, has an authorized capitalization of 5,000,000 shares of no par value, all of which have been issued. The officers and directors are: James Y. Murdoch, president; G. H. Rainville, vice-president; R. Horsfall, secretary; R. G. Rudolph, treasurer; E. Hibbert, M. Kendall, W. Meen, and Jules R. Timmins, directors. The executive offices of the company are at 804 Royal Bank Building, Toronto. The mine office is at Pamour.

The main property held by the company is located in concessions V and VI of Whitney township, Porcupine area, district of Cochrane, and contains 1,160 acres. Three additional claims located at the south end of Three Nations lake were purchased in 1937.

During 1937 the main shaft was sunk 378 feet to a total depth of 1,091 feet, and a winze was sunk 43 feet from the 600-foot level. There are two other shafts on the property, sunk by former operators to depths of 110 and 220 feet.

The following is taken from the report of the general manager for the year ending December 31, 1937:—

Mine

Sinking of the main shaft has been resumed, and at the end of the year was down to the 1,100-foot level. The 1,000- and 1,100-foot stations are completed, preparatory to continuing sinking, with the sinking hoist located at the 1,000-foot station.

During the year 23,337 lineal feet of development work was done, practically all on the 200-, 400-, and 600-foot levels, including 9,230.6 feet of drifting, 2,171.7 feet of crosscutting, 4,950.9 feet of raising, 1,870.7 feet of box-holing, and 4,691.6 feet of stope development. Following is the development record of the mine:—

| | 1937 | Total to date |
|------------------------|---------------|---------------|
| | feet | feet |
| Shafts..... | 378 | 1,422 |
| Winzes..... | 43 | 99 |
| Drifts..... | 9,230 | 19,470 |
| Crosscuts..... | 2,172 | 7,928 |
| Raises..... | 4,951 | 10,165 |
| Box-hole raises..... | 1,871 | 3,796 |
| Stope development..... | 4,692 | 9,870 |
| Total..... | 23,337 | 52,750 |

Throughout this year, as in 1936, the development objective has been primarily to open up new ore ready for immediate stoping. During the first half of the year the objective was to place such development a safe margin ahead of production requirements, and during the second half to prepare for increased output. One hundred and twenty chutes were completed in shrinkage stopes, and a large tonnage was made ready for production. The working levels were also extended east and west, and lengths are now as follows:—

| Level | Total length | Extension during 1937 |
|-------------------|---------------|-----------------------|
| | feet | feet |
| 200-foot..... | 4,645 | 1,136 |
| 400-foot..... | 4,685 | 3,035 |
| 600-foot..... | 2,595 | 2,007 |
| Total..... | 11,925 | 6,178 |

Early in the year mechanical haulage was installed on the 200- and 400-foot levels, using General Electric 5-ton locomotives with 42 cell M.V.M. Exide batteries; 60-cubic-foot solid cars; and 10½-foot diameter, single car tipples.

Mine production was as follows:—

| | Tons |
|-----------------------------------|----------------|
| 200-foot level..... | 102,382 |
| 400-foot level..... | 153,594 |
| 600-foot level (development)..... | 8,525 |
| Surface stock pile..... | 11,667 |
| Total..... | 276,168 |

In October, underground operations were shut down for two weeks to allow of pulling down the old wooden headframe and connecting up the new steel headframe. During this period 11,667 tons of ore from a surface stock pile was crushed and fed to the mill so that there was no interruption in production.

Diamond-drilling

A programme of surface-drilling was started at the end of last year and continued until November. It consisted of a series of inclined holes, drilled in parallel sections, spaced 200 feet apart and cross-sectioning the bedding of the formation from the old No. 2 shaft west to the west boundary of Pamour property, a distance of one mile. Some ore was encountered in this drilling, but no attempt was made to drill it sufficiently closely to allow of any estimates as to tonnage or grade. This will have to be done from underground, as the areas are reached.

Considerable underground drilling was done, and at the end of the year 4 machines were in operation. The record is as follows:—

| | Surface | Underground | Total |
|----------------------|-----------------|-----------------|------------------|
| | feet | feet | feet |
| Old drilling..... | 6,569.8 | ..... | 6,569.8 |
| 1934 (16 holes)..... | 5,966.5 | ..... | 5,966.5 |
| 1935 (55 holes)..... | 29,105.5 | ..... | 29,105.5 |
| 1936 (59 holes)..... | 676 | 14,799.5 | 15,475.5 |
| 1937 { 34 holes..... | 19,355.5 | ..... | 65,990.9 |
| 238 holes..... | ..... | 46,635.4 | |
| Total..... | 61,673.3 | 61,434.9 | 123,108.2 |

Ore Reserves

From information obtained in diamond-drilling, drifting, crosscutting, raising, and from actual mining within the length of 2,500 feet immediately tributary to the main shaft and above the 600-foot horizon, and including 201,000 tons of broken ore in stopes, ore in sight is estimated at 1,644,000 tons, averaging 0.176 ounces gold per ton.

This is an increase over the previous years' estimates of 623,000 tons, which is made up partly from the ore so far opened up on the 600-foot level but more particularly by including low-grade extensions which are developed for the increase in tonnage. These low-grade extensions have considerably lowered the computed average grade of the ore reserves. As noted in last year's report there are considerable quantities of ore indicated by surface diamond-drilling in the north and south greywacké, agglomerate, and greenstone formations, but so far very little of this has been proved up and included in ore reserves. It is considered probable that future work will prove more of these sections to be mineable, although it may be that they will tend to further lower the average grade of the ore.

Mill

Average tonnage milled for the year was 757 tons per day. Beginning the year at a little over 700 tons per day, the tonnage was gradually increased to 800 tons per day in December. The record of production is as follows:—

| Period | Tonnage milled | Heads assay, ounces per ton | Gold marketed | Recovery, per cent. |
|-------------------|----------------|-----------------------------|-----------------------|---------------------|
| 1st quarter..... | 63,629 | 0.211 | \$421,434.18 | 89.5 |
| 2nd quarter..... | 67,433 | .229 | 490,514.97 | 90.9 |
| 3rd quarter..... | 72,200 | .246 | 574,508.18 | 92.2 |
| 4th quarter..... | 72,906 | .236 | 557,591.57 | 92.5 |
| Total..... | 276,168 | 0.231 | \$2,044,048.90 | 91.4 |

The mill operated 99.43 per cent. of total possible running time. Improvements and adjustments were made to the processes which resulted in increasing the over-all gold recovery from

89.5 per cent. in the first quarter to 92.5 per cent. in the last quarter. Two additional 6-cell flotation units were put into operation in August, one as cleaner cells and the other as scavenger cells, which raised the ratio of concentration with less loss in the tailings.

The mill was designed as a unit, in which only one-half of the grinding and flotation equipment was installed, and in July decision was reached to install the balance of the equipment estimated to bring the capacity up to 1,400 to 1,500 tons per day. At the end of the year all this equipment was in place, excepting the primary 9- by 10-inch ball mill, delivery of which was delayed and only expected to arrive in January.

Construction

During the year the following construction was completed: steel headframe with insulated galvanized iron siding, and housing 850-ton circular steel ore bin, with base 50 by 100 feet and 13 feet 4 inches high to the centre of headsheaves; extension to hoist- and compressor-building increasing the size of the building from 40 by 60 feet to 40 by 140 feet; 5 residences.

In addition to the mill equipment and to various small equipment and standby units throughout the plant, a 96- by 60-inch double-drum cage-hoist was installed.

The installation of equipment to double the capacity of the mill was in progress at the end of the year. The main items installed included a 5- by 14-foot Dominion regrind mill, 24 Denver A flotation cells, two 80-foot Dorr classifiers, a 32-foot steel bowl classifier, an 11-foot steel agitator, and a precipitation tank. At the end of the year the only large piece of machinery remaining to be installed to complete this project was a 9- by 10-foot Dominion ball mill.

The average number of men employed in 1937 was 419, divided as follows: underground, 248; mill, 29; surface, 107; construction, 35. R. M. Macaulay is general manager.

Parkhill Gold Mines (1937), Limited

Parkhill Gold Mines (1937), Limited, was incorporated in January, 1937, with an authorized capitalization of 3,000,000 shares of \$1 par value, to succeed Parkhill Gold Mines, Limited. The stock was exchanged on a basis of two shares of the new for three shares of the old. The officers and directors for 1937 were: A. P. Earle, president; F. C. Dobell, vice-president; G. F. Racine, secretary-treasurer; G. M. McKee and W. A. Pennington, directors. The executive office was at 388 St. James Street West, Montreal, Que. The mine address was Gold Park.

The property is located in township 29, range 23, Michipicoten area, district of Algoma.

Operations were continued throughout 1937, but were suspended on January 5, 1938, when the company was adjudged bankrupt. The 42-degree shaft was sunk an additional 122 feet to a total depth of 1,912 feet on the incline, and a fourteenth level was established at 1,877 feet.

Development footages accomplished on the various levels from January 1, 1937, to January 5, 1938, were as follows:—

| Level | Drifting | Crosscutting | Raising |
|------------|----------|--------------|---------|
| | feet | feet | feet |
| 8th..... | | | 46 |
| 9th..... | 269 | 18 | 97 |
| 10th..... | | | 36 |
| 11th..... | 59 | | 61 |
| 12th..... | 731 | 21 | 161 |
| 13th..... | 881 | 43 | 546 |
| 14th..... | 845 | 232 | 96 |
| Total..... | 2,785 | 314 | 1,043 |

A total of 25,524 tons of ore was obtained from the mine during this period, of which 21,457 tons was from stoping and the balance from development. It

was treated in the 100-ton amalgamation-cyanide mill. Stoping was done by open-stoping methods on the eighth to the fourteenth levels, inclusive, with about half of the total stope production being obtained from the eleventh and twelfth levels. A total of 3,182 feet of diamond-drilling was done from underground.

A 48- by 36-inch Ingersoll-Rand double-drum electric hoist was installed to eliminate 2-stage hoisting in the shaft.

An average of 82 men was employed, of whom 57 were underground. R. D. Caylor was in charge.

Paulore Gold Mines, Limited

Paulore Gold Mines, Limited, was incorporated in July, 1934, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,111,076 had been issued at the end of 1937. The officers and directors are: Charles E. St. Paul, president; J. B. St. Paul, vice-president; E. M. Tice, secretary-treasurer; Colin A. Campbell, Dr. T. A. J. Duff, and L. E. Wood, directors. The head office is at 357 Bay Street, Toronto, and the mine address is Red Lake.

The company holds two groups of claims, known as North Paulore and South Paulore, in the Red Lake area, Patricia portion of Kenora district. The north group comprises 10 claims, totalling 423 acres, and is located in Todd township. The south group comprises 11 claims, totalling 535 acres, and is located in the northeast corner of Baird township. The property is 7 miles southwest of the Howey mine and may be reached by boat or airplane from Red Lake to the company's dock and over a 2-mile tractor road from the lake.

Diamond-drilling was started on both groups of claims in September, 1936, following surface exploration, but the drilling on the north group failed to confirm the results previously obtained and operations were then confined to the south group, where more favourable results were obtained. The diamond-drilling on the north group amounted to 12 holes, totalling 1,998 feet.

During 1937 operations were confined to the south group. After 24 holes, totalling 5,612 feet, had been diamond-drilled and about 650 feet of trenching had been done, it was decided to sink a shaft. Camp and mine buildings were erected, and the installation of a mining plant was begun in May. The buildings erected included a pump-house, daily powder-house, powder magazine, cookery, two bunk-houses, manager's residence, office, assay office, boiler-house, dry-house, blacksmith shop, hoist-house, tractor garage, and a 40-foot headframe.

The mining plant includes a 125 h.p. locomotive-type John Inglis boiler, a 7- by 10-inch single-drum Petrie steam hoist, and a 315-cubic-foot Ingersoll-Rand 67 h.p. Diesel compressor.

The sinking of the vertical, 3-compartment shaft was commenced on June 15. The objective depth of 330 feet was reached in September, and levels were established at 150 and 300 feet. Diamond-drilling and lateral work were proceeded with, and by the end of the year 245 feet of development work on the 150-foot level, 158 feet on the 300-foot level, and 15 diamond-drill holes, totalling 1,720 feet, had been completed.

During the year an average of 38 men was employed daily under the direction of N. R. Morrison, manager.

Paymaster Consolidated Mines, Limited

Paymaster Consolidated Mines, Limited, which was incorporated in February, 1930, has an authorized capitalization of 9,000,000 shares of \$1 par value,

of which 8,629,000 had been issued at December 31, 1937. The officers and directors are: E. H. Walker, president and managing director; A. S. Fuller, vice-president; E. L. O'Reilly, secretary-treasurer; Chas. E. Cook, Jos. Errington, C. J. O'Brien, and D. M. Hogarth, directors. The head office and mine office are at South Porcupine. The executive office is at 204 McKinnon Building, Toronto.

The main property, in Deloro and Tisdale townships, Porcupine area, district of Cochrane, contains approximately 748 acres and consists of the amalgamated holdings of several smaller former operating companies. The company also owns another 160 acres in Tisdale township, 920 acres in Cody township, and 80 acres in Whitney township, all in the district of Cochrane, and holds under lease 500 acres in Leonard and Tyrrell townships, Matachewan area, district of Timiskaming.

The main property operated throughout 1937 with an average force of 352 men, of whom 231 were underground, 33 in the mill, 68 on surface, and 17 on construction work. Chas. E. Cook is manager.

No. 5 shaft was sunk 687 feet, to a total depth of 1,806 feet, in 1937.

The following table shows the amount of underground development work done during 1937:—

| Level | Crosscuts | Drifts | Raises |
|-----------------|-----------|--------|--------|
| | feet | feet | feet |
| 180-foot..... | | 751 | |
| 200-foot..... | | 400 | |
| 300-foot..... | 192 | 1,236 | 157 |
| 400-foot..... | 401 | 1,163 | 293 |
| 525-foot..... | | 372 | |
| 675-foot..... | 91 | 567 | 98 |
| 750-foot..... | | 74 | |
| 800-foot..... | 18 | | |
| 1,050-foot..... | 1,713 | 56 | 64 |
| 1,200-foot..... | 78 | 989 | 31 |
| 1,325-foot..... | 81 | 518 | |
| 1,450-foot..... | 491 | 941 | 18 |
| 1,575-foot..... | 1,268 | 1,783 | |
| Total..... | 4,333 | 8,850 | 661 |

Diamond-drilling in 1937 totalled 55,502 feet from underground and 17,575 feet from surface.

During the year the following additions were made to the mill and mining plant: a 12-inch wood stave pipe line from McDonald lake to the mill was completed; a 10- by 12-inch steam hoist was converted to electric motor drive and was installed at No. 2 shaft; a Fullerton, Hodgart and Barclay electric hoist installation at No. 5 shaft was practically complete at the end of the year; a 9- by 8-inch Ingersoll-Rand Class PSR double-drum air hoist was installed at No. 5-1,050-3 winze; a new cement block assay office was completed and equipped with electric furnaces, suction fan, etc.; the erection of a 90-foot headframe and ore bins at No. 5 shaft was partially completed; 4 additional agitators, 2 Denver Wallace super-agitators, and a 52-inch Merrill-Crowe precipitation press were installed in the mill; a 6- by 5½-foot Wabi ball mill was partially installed in the mill at the end of the year.

The total tonnage milled in 1937 was 170,824 tons, from which gross production amounted to \$1,266,639.74.

The following is taken from the general manager's report for the fiscal year ending June 30, 1938:—

Ore Reserves

Ore reserves, which were increased 37.9 per cent. from 413,533 tons of 0.248 ounces ore as of June 30, 1937, to 569,891 tons of 0.227 ounces ore as of June 30, 1938, are as follows:—

| | Tons | Ounces per ton |
|---|---------|----------------|
| Positive ore (blocked out two or more sides)..... | 324,202 | 0.232 |
| Probable ore..... | 140,028 | .228 |
| Broken ore..... | 105,661 | .214 |
| Total..... | 569,891 | 0.227 |

Milling

During the fiscal year there were milled 180,092 dry tons of ore, having an assay value of 0.232 ounces per ton. The average daily tonnage milled for June, 1937, was 477.6 dry tons, as compared with 551.8 dry tons for June, 1938, an increase of 15.54 per cent.

Costs

The mining costs per ton broken were as follows: Nos. 2 and 3 shafts, \$1.70; Nos. 5 and 6 shafts, \$2.99. Following is an analysis of operating costs:—

| | Total cost | Cost per ton milled |
|---|---------------------------|---------------------|
| EXPLORATION AND DEVELOPMENT: | | |
| Diamond-drilling..... | \$55,217.85 | \$0.31 |
| Surface exploration..... | 227.69 | ..... |
| Development, Nos. 2 and 3 shafts..... | 21,604.57 | .12 |
| Development, Nos. 5 and 6 shafts..... | 128,699.21 | .71 |
| Sinking No. 3 winze, No. 5 shaft..... | 23,723.70 | .13 |
| Station-cutting No. 3 winze, No. 5 shaft..... | 2,894.19 | .02 |
| Total..... | \$232,367.21 | \$1.29 |
| MINING: | | |
| Nos. 2 and 3 shafts..... | \$72,548.63 | \$2.42 |
| Nos. 5 and 6 shafts..... | 413,740.43 | |
| Less mining cost of ore broken in excess of ore milled..... | \$486,289.06 51,096.95 | ..... |
| Total..... | \$435,192.11 | \$2.42 |
| Ore transportation..... | \$22,287.23 | \$0.12 |
| Crushing..... | 25,611.17 | .14 |
| Milling..... | 120,175.09 | .67 |
| General expense..... | 58,121.22 | .32 |
| Total..... | \$226,194.71 | \$1.25 |
| Total operating costs..... | \$893,754.03 | \$4.96 |

General

The total production for the fiscal year was \$1,352,639.54.

Carl F. Peters

The Ashley mine, in Argyle and Bannockburn townships, Matachewan area, district of Timiskaming, was leased to Carl F. Peters, 54 Wellington Street West, Toronto. The mine address is Matachewan.

A 5-ton Gibson mill and a 60-cubic-foot compressor were installed on the property in June, 1937. A small amount of production was obtained from ore taken from an open cut on the Garrie vein.

At the end of the year plans were being made to form the Peters Gold Mining Syndicate, Limited.

Pickle Crow Gold Mines, Limited

Pickle Crow Gold Mines, Limited, was incorporated in January, 1934, with an authorized capitalization of 3,000,000 shares of \$1 par value, all of which have been issued. The officers and directors are: J. E. Hammell, president; A. L. Smith, vice-president; Robert Fennell, secretary-treasurer; John Bland, assistant secretary-treasurer; Mrs. Eola Hammell and B. H. Budgeon, directors. The head office is at 25 King Street West, Toronto, and the mine address is Pickle Crow.

The property consists of 59 claims, totalling 2,537 acres, in the Pickle-Crow area, in the Patricia portion of Kenora district. The property may be reached by airplane from Hudson or Sioux Lookout on the main western line of the Canadian National Railways, to Pickle lake, and from there over a 9-mile gravel road. Supplies are taken in by water from Hudson over Lac Seul, up Root river, across a marine railway to Lake St. Joseph, and thence to Doghole Bay. During 1936 and 1937 a 30-mile truck road was constructed from Doghole Bay to the mine, the expense being shared by Pickle Crow Gold Mines, Limited, Central Patricia Gold Mines, Limited, and the Dominion and Provincial governments.

During 1937 the shaft was enlarged to 4 compartments below the 1,200-foot level, and sinking was resumed. At the end of the year a depth of 1,685 feet had been reached and stations had been cut at 1,350, 1,500, and 1,650 feet. It is proposed to continue the shaft to 2,000 feet, with additional levels at 1,800 and 1,950 feet.

The development completed to the end of 1937 is as follows:—

| Level | Drifts | | Crosscuts | | Raises | |
|-----------------|------------------|-------|------------------|-------|------------------|-------|
| | To Dec. 31, 1936 | 1937 | To Dec. 31, 1936 | 1937 | To Dec. 31, 1936 | 1937 |
| | feet | feet | feet | feet | feet | feet |
| 125-foot..... | 1,427 | ..... | 126 | ..... | 134 | ..... |
| 250-foot..... | 1,135 | ..... | 222 | ..... | 177 | ..... |
| 375-foot..... | 1,529 | ..... | 379 | ..... | 114 | ..... |
| 500-foot..... | 1,329 | 232 | 265 | 26 | 148 | 145 |
| 625-foot..... | 1,114 | 197 | 232 | ..... | 155 | 122 |
| 750-foot..... | 1,501 | 374 | 412 | 49 | 168 | ..... |
| 900-foot..... | ..... | 1,417 | 17 | 200 | ..... | 180 |
| 1,050-foot..... | ..... | 1,415 | 13 | 306 | ..... | 173 |
| 1,200-foot..... | ..... | 1,543 | 70 | 269 | ..... | 183 |
| 1,650-foot..... | ..... | ..... | ..... | 15 | ..... | ..... |
| Total..... | 8,035 | 5,178 | 1,736 | 865 | 896 | 803 |

The following table shows the amount of diamond-drilling completed to the end of 1937:—

| | To Dec. 31, 1936 | | 1937 | |
|------------------|------------------|--------|-------|--------|
| | Holes | Feet | Holes | Feet |
| Surface..... | 60 | 16,322 | 44 | 21,015 |
| Underground..... | 130 | 10,355 | 90 | 8,708 |

Towards the end of 1936 construction was commenced on an addition to the mill, and on April 14, 1937, the enlarged mill went into operation and is now treating 325 tons of ore daily. Additions to the mill equipment during this period include: a 30- by 18-inch Hadfield jaw crusher, driven by a 40 h.p. English Electric motor; a 6- by 5½-foot Marcy ball mill, driven by a 125 h.p. English Electric motor; a 36-inch duplex spiral Akins classifier; two 30- by 12-foot Dorr thickeners; four 17- by 17-foot Dorr agitators; one 10- by 8-foot Feine filter; and one 1,000-ton precipitation unit made by the Merrill-Crowe Company.

The production to the end of 1937 is as follows:—

| | To Dec. 31, 1936 | 1937 |
|---------------------------|---------------------|---------|
| Waste hoisted.....tons | 18,292 | 16,627 |
| Ore hoisted.....tons | 103,707 | 110,899 |
| Ore sorted.....tons | 12,693 | 12,836 |
| Ore ground.....tons | 91,068 | 98,063 |
| Gold recovered.....ounces | 70,900 | 64,790 |
| Recovery.....per cent. | 97 | 98 |

During 1937 the additions to the camp and plant buildings included a 2-storey hospital; 6 residences; staff-house; oil-house; fuse-house; 2 warehouses; root-house; mill addition, 56 by 152 feet; crusher-house addition, 36 by 95 feet; and compressor-house addition, 18 by 33 feet. New mining equipment included a 1,500-cubic-foot Bellis and Morcom compressor, with a 300 h.p. General Electric synchronous motor; a 42- by 30-inch Turner and McLellan single-drum hoist, with a 60 h.p. General Electric motor installed on the 1,200-foot level for sinking; and a Cameron centrifugal pump with a 60 h.p. General Electric motor.

During the year the average number of men employed daily was 221, distributed as follows: surface, 60; construction, 8; underground, 134; mill, 19. A. G. Hattie was manager.

The following is taken from the report of the manager for the 12 months ending December 31, 1937:—

Ore Reserves

Since the change from shrinkage to cut-and-fill stoping, our experience has shown that drift width averages have been very conservative estimates, no allowance having been made for bulges and folds. From the sections of the mine that have been stoped out, our experience discloses that there is sufficient ore above the 1,200-foot level to operate the mill for at least three years at the present rate. The grade of this ore will be as high or slightly higher than the 1937 average grade of ore milled. By the end of 1938 drifting will have been completed on five new levels, at 150-foot intervals below the 1,200-foot level.

Mill

The new mill unit was placed in operation on April 14, 1937, and has been operating continuously since that date.

Costs

DEVELOPMENT

| | Footage | Total cost | Cost per foot |
|--------------------|---------|-------------|---------------|
| | feet | | |
| Drifting..... | 7,180 | \$66,996.58 | \$9.33 |
| Crosscutting..... | 941 | 15,576.44 | 16.55 |
| Raising..... | 938 | 12,703.94 | 13.54 |
| Shaft-sinking..... | 423 | 44,683.83 | 105.64 |
| | cu. ft. | | |
| Stations..... | 17,000 | 7,471.28 | .44 |

The attached statement of costs shows the total costs, as well as the cost per ton and per ounce recovered, for each operation, and is self explanatory.

SUMMARY OF COSTS, 1937

| | Total cost | Cost per ton of ore milled (110,899 tons) | Cost per ounce of gold produced (64,790 ounces) |
|--|--------------|---|---|
| Development (including surface prospecting) .. | \$206,458.29 | \$1.86 | \$3.19 |
| Mining | 334,882.90 | 3.02 | 5.17 |
| Milling | 155,500.57 | 1.40 | 2.40 |
| Camp expenses | 22,338.69 | .20 | .34 |
| Administration expenses | 41,344.54 | .37 | .64 |
| Total cost before depreciation | \$760,524.99 | \$6.85 | \$11.74 |
| Depreciation | 183,626.58 | 1.66 | 2.83 |
| Total cost, including depreciation | \$944,151.57 | \$8.51 | \$14.57 |

Planet Gold Mines, Limited

Planet Gold Mines, Limited, was incorporated in January, 1937, with an authorized capitalization of 2,000,000 shares of \$1 par value, which was increased to 3,000,000 shares in May, 1937. Up to the end of the year no president had been appointed. The other officers and directors are: D. S. Baird, vice-president; M. C. Van Der Voort, secretary; Mark Emery, treasurer; Peter Tagliamonti and Oscar R. Smith, directors. The head office is at 903 Atlas Building, Toronto.

The company's holdings consist of 2 claims, and an option on a third claim, in Boston township, in the Boston Creek section of the Kirkland Lake area, district of Timiskaming, and 6 claims in the Michipicoten area, district of Algoma.

Work was carried on at the Boston Creek property from May 23 to August 20, 1937. Considerable surface exploration and diamond-drilling were done, and a 2-compartment, vertical shaft was sunk 20 feet by hand steel.

An average force of 20 men was employed for four months under the direction of D. S. Baird. The mine address is Boston Creek.

Porcupine Lake Gold Mining Company, Limited

The Porcupine Lake Gold Mining Company, Limited, has a Dominion charter and is capitalized at 3,000,000 shares of no par value. The officers and directors are: C. E. Calvert, president; H. H. Sutherland, vice-president; Geo. McKeown, secretary-treasurer; J. R. L. Starr, Lindsey Hooper, and R. O. Sweezy, directors. The head office is at 112 Yonge Street, Toronto. The mine address is Porcupine.

The property consists of 6 claims in Whitney township, Porcupine area, district of Cochrane. It is situated less than a mile from Porcupine station on the branch line of the Temiskaming and Northern Ontario Railway serving the Porcupine area.

The 3-compartment shaft is on the northeast shore of Porcupine lake, under which it dips at an angle of 56 degrees. During 1937 this shaft was deepened 465 feet, making the present depth 748 feet. Stations were cut at 362, 482, 603, and 723 feet. On the 280-foot level the development work at the end of the year amounted to 632 feet of crosscutting, 1,150 feet of drifting, and 32 feet of raising. The raising, 382 feet of drifting, and 288 feet of crosscutting were done in 1937.

Twenty-six diamond-drill holes, having a total footage of 4,170 feet, were also drilled in 1937, all from underground.

The average number of men employed during the year was 19. J. G. Sipprell is mine manager.

Porcupine Triumph Gold Mines, Limited

Porcupine Triumph Gold Mines, Limited, was incorporated in July, 1936, with an authorized capitalization of 5,000,000 shares of \$1 par value. The company succeeds the Porcupine Triumph Gold Syndicate, and the stock transfer was made on a basis of 300 shares of the new for one unit of the old. The officers and directors are: J. A. Thomas, president and general manager; Thos. Crookston, secretary-treasurer; W. A. Houghton and A. L. Heintzman, directors. Jos. D. Thomas is mine superintendent. The head office is at 811 Kent Building, Toronto. The mine address is Box 510, South Porcupine.

The property held by the company consists of 8 claims, approximately 320 acres, in two groups, in Deloro township, Porcupine area, district of Cochrane. On the smaller group, containing 3 claims, located in the centre of the township and 2 miles south of the Buffalo Ankerite mine, development work was begun in 1936. During 1937 a 2-compartment shaft, inclined at 78 degrees, was completed to a depth of 100 feet on a quartz-tourmaline vein. There is a second shaft on the property, 25 feet deep, which was sunk at an earlier date.

The mine plant now consists mainly of an 80 h.p. locomotive-type boiler, a 2-stage Ingersoll-Rand compressor of 620-cubic-foot capacity, a Jenckes 8- by 10-inch hoist, and a No. 5 Cameron pump. A frame building to house the boiler, compressor, and hoist was erected during 1937.

Work at the property was carried on spasmodically through the year. Shaft-sinking was stopped in May. The average number of men employed was 9.

Preston East Dome Mines, Limited

Preston East Dome Mines, Limited, was incorporated in 1911, with an authorized capitalization of 3,000,000 shares of \$1 par value. The company was reorganized in 1936 after a long period of inactivity. At the end of 1937 the number of shares outstanding was 2,760,000. The officers and directors are: D. M. Robertson, president; W. H. Bouck, vice-president; L. I. Hall, secretary-treasurer; D. G. H. Wright, managing director; H. Preston Coursen, E. W. Wright, and Stuart Playfair, directors. The head office is at 706 Concourse Building, Toronto. The mine address is South Porcupine.

The mine property consists of 5 lots, 200 acres, in concession I, Tisdale township, Porcupine area, district of Cochrane.

Previous to 1936 an inclined shaft had been sunk to a vertical depth of 90 feet, and a small amount of crosscutting had been done at this depth. In 1936 some 443 feet more crosscutting and 787 feet of drifting were done on this level. A new vertical, 5-compartment shaft was sunk 271 feet in 1936 and continued to a depth of 346 feet in 1937. Levels at 200 and 300 feet are now being developed from this shaft. On the former level 1,458 feet of crosscutting, 1,824 feet of drifting, and 157 feet of raising were done in 1937; on the latter level 976 feet of crosscutting, 910 feet of drifting, and 130 feet of raising were done. Diamond-drilling in 1937 totalled 1,134 feet from surface and 8,477 feet from underground.

The mine plant equipment was increased during the year by the addition of a Canadian Ingersoll-Rand double-drum, double-clutch hoist, with 48-inch

diameter by 36-inch face, and a 200 h.p. motor. This had not been put into service at the end of the year. A 30- by 28-foot ore- and waste-bin was also constructed.

The average number of men employed was 44. D. J. Ludgate is mine superintendent.

Raven River Mines, Limited

Raven River Mines, Limited, was incorporated in November, 1934, with an authorized capital of 2,500,000 shares of \$1 par value, of which 1,520,859 have been issued. The officers and directors are: Paul A. Fisher, president; R. W. Farrar, vice-president; C. D. McGregor, secretary-treasurer; Wm. Weller and W. W. Snider, directors. E. M. Thomson is general manager. The head office is at 67 Yonge Street, Toronto. The mine office is at Larder Lake.

The property consists of 11 claims, approximately 440 acres, in Hearst and McVittie townships, Larder Lake area, district of Timiskaming. Seven of these claims comprise the former Harris-Maxwell mine.

The former operators had sunk a 2-compartment shaft to a depth of 438 feet, with level workings at 53, 100, 249, 325, and 420 feet. Considerable lateral work had been done.

During 1937 some 335 feet of crosscutting, 389 feet of drifting, and 319 feet of development raising were accomplished. Another level from No. 1 shaft was established at the 174-foot horizon. Considerable slashing was done in preparation for the sinking of a winze from the 5th level. About 400 feet of surface-trenching was done. Diamond-drilling amounted to 1,407 feet from surface and 1,807 feet from underground.

A complete mining plant, a steam-heating plant, and a 60-ton cyanide mill and crushing plant were installed. A mine office and an assay office were built.

From November 14 to December 1 the mill operated at the rate of 42 tons per day, and from then until the end of the year at the rate of 58 tons per day.

An average force of 38 men was employed under the direction of C. Rutherford, superintendent.

Red Crest Gold Mines, Limited

Red Crest Gold Mines, Limited, was incorporated in May, 1934, with an authorized capitalization of 3,000,000 shares of no par value, of which 2,294,500 have been issued. The officers and directors are: L. E. Schlemm, president; H. M. Porteous, vice-president and managing director; C. G. Macartney, secretary-treasurer; L. G. W. Schlemm, R. H. Webster, Horace G. Young, and A. A. McKelvie, directors. The head office is at 1178 Phillips Place, Montreal, Que. The mine address is Golden Arm.

The property consists of 7 patented claims, totalling 181 acres, in Todd township, Pipestone Bay section of the Red Lake area, in the Patricia portion of Kenora district, and was formerly known as the Rowan Discovery.

In 1935 some ore was mined by open-cut methods and treated in a 10-ton amalgamation mill. The recovery up to the end of April, 1936, was valued at \$13,779.00. At the beginning of May, 1936, a mining plant was installed, and on May 25 the sinking of a 3-compartment, 7- by 15-foot, vertical shaft was commenced. By the end of November, 1936, the shaft was 300 feet deep, with levels established at 150 and 275 feet, and some 505 feet of crosscutting and 825 feet of drifting had been completed. The plant was then closed down and some of the equipment was replaced.

On April 14, 1937, shaft-sinking was resumed, and reached its objective of 600 feet on July 7. New levels were established at 425 and 575 feet, and lateral work proceeded with.

The following table shows the lateral development work done at the end of 1936, during 1937, and the total:—

| Level | To Dec. 31, 1936 | 1937 | Total |
|----------------|---------------------|-------|-------|
| | feet | feet | feet |
| 150-FOOT: | | | |
| Drifts..... | 507 | 152 | 659 |
| Crosscuts..... | 197 | 57 | 254 |
| 275-FOOT: | | | |
| Drifts..... | 414 | 234 | 648 |
| Crosscuts..... | 371 | ..... | 371 |
| 425-FOOT: | | | |
| Drifts..... | ..... | 399 | 399 |
| Crosscuts..... | ..... | 272 | 272 |
| 575-FOOT: | | | |
| Drifts..... | ..... | 209 | 209 |
| Crosscuts..... | ..... | 160 | 160 |

During the year 21 diamond-drill holes, totalling 3,772 feet, were drilled from underground.

Buildings erected on the property during 1937 included an addition to the boiler-house, a core shack, and a cap-house. A 50 h.p. Leonard locomotive-type boiler was added to the mining plant.

There was an average of 36 men employed daily, of whom 14 were underground. T. L. Lynch succeeded S. F. Porteous as superintendent.

Red Lake Gold Shore Mines, Limited

Red Lake Gold Shore Mines, Limited, was incorporated in December, 1927, with an authorized capitalization of 5,000,000 shares of no par value, of which 4,500,000 have been issued. The officers and directors are: Chas. E. St. Paul, president; Henry A. Newman, vice-president; Ira E. Hough, secretary-treasurer; John A. Baker and Harley Percy, directors. The head office is at 350 Bay Street, Toronto, and the mine address is Red Lake.

The property consists of 23 claims about a mile from the town of Red Lake in Heyson and Dome townships, Red Lake area, Patricia portion of Kenora district.

During 1937 diamond-drilling amounted to 12 holes, totalling 1,847 feet, from surface and 25 holes, totalling 3,381 feet, from underground.

The mill operated continuously during 1937 and treated 150 tons per day. The production was given as:—

| | | |
|--------------------|-----------|------------|
| Waste hoisted..... | tons | 7,951 |
| Ore hoisted..... | tons | 66,747 |
| Waste sorted..... | tons | 17,243 |
| Ore milled..... | tons | 47,557 |
| Bullion recovered: | | |
| Gold..... | ounces | 12,873.271 |
| Silver..... | ounces | 2,222.80 |
| Recovery..... | per cent. | 97.8 |

During 1937 a 2-compartment, 6- by 10-foot winze, inclined at 77 degrees, was sunk from the 550-foot level, and levels were established at 700 and 830 feet.

A drift was driven over to the shaft position, and the shaft was raised to connect below the 550-foot level. The winze is being deepened to 1,000 feet.

The following table shows the development work completed at the end of 1936, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|-----------------|---------------------|------|-------|
| | feet | feet | feet |
| Shaft | 564 | 142 | 706 |
| Winze | | 314 | 314 |
| 182-FOOT LEVEL: | | | |
| Drifts | 332 | | 332 |
| Crosscuts | 50 | | 50 |
| Raises | 160 | | 160 |
| 300-FOOT LEVEL: | | | |
| Drifts | 1,040 | 161 | 1,201 |
| Crosscuts | 211 | 125 | 336 |
| Raises | 132 | | 132 |
| 425-FOOT LEVEL: | | | |
| Drifts | 542 | 302 | 844 |
| Crosscuts | 352 | | 352 |
| Raises | 130 | 111 | 241 |
| 500-FOOT LEVEL: | | | |
| Drifts | 511 | | 511 |
| Crosscuts | 472 | | 472 |
| Raises | | 19 | 19 |
| 700-FOOT LEVEL: | | | |
| Drifts | | 564 | 564 |
| Crosscuts | | 194 | 194 |
| Raises | | 176 | 176 |
| 830-FOOT LEVEL: | | | |
| Drifts | | 411 | 411 |
| Raises | | 35 | 35 |

An average force of 94 men was employed daily, distributed as follows: underground, 59; mill, 15; surface, 20. W. P. Mackle was manager.

Walter Regnery

Walter Regnery is the owner of 37 claims in township 28, range 24, Michipicoten area, district of Algoma. It is about 3 miles west of Hawk Junction.

Underground work was started in July, 1937, following an electrical survey and 1,100 feet of diamond-drilling. A 2-compartment, 45-degree shaft was sunk on claim A.C. 3,126 to a depth of 105 feet on the incline, and a level was established at 92 feet. By the end of the year a total of 160 feet of drifting and 105 feet of crosscutting had been accomplished on the 92-foot level. Molybdenum and copper values are reported.

The plant included a 270-cubic-foot Ingersoll-Rand semi-Diesel compressor and an 8- by 10-inch single-drum air hoist. Buildings consisted of an office, bunk-house, cookery, blacksmith shop, and hoist-compressor house.

An average of 13 men was employed throughout the year under the direction of Walter Regnery. The mine address is Hawk Junction.

Ronda Gold Mines, Limited

Ronda Gold Mines, Limited, was incorporated in March, 1936, with an authorized capitalization of 3,500,000 shares of \$1 par value. The officers and directors are: E. H. Dickenson, president; James E. Day, vice-president; T. J. Day, secretary-treasurer; E. C. Wainwright and Garbett C. Edwards, directors.

The head office is at 85 Richmond Street West, Toronto. The mine address is Shiningtree.

The property is located in Churchill and Macmurchy townships, West Shiningtree area, district of Sudbury.

During 1937 underground work was continued until July, then suspended until November, and continued for the balance of the year. A 3-compartment, vertical winze was sunk from the 300-foot level to a depth of 556 feet from surface, and levels were established at 425 and 550 feet. A total of 55 feet of drifting was done on the 200-foot level, 230 feet of drifting and 35 feet of crosscutting on the 300-foot level, 40 feet of crosscutting on the 425-foot level, and 65 feet of crosscutting on the 550-foot level in 1937.

A 500-cubic-foot Ingersoll-Rand compressor, driven by a 150 h.p. Dominion Crossley Diesel engine was installed to replace the boilers and steam-driven compressor formerly used.

A 7- by 12-inch single-drum air hoist was installed on the 300-foot level to service the winze.

An average of 22 men was employed during the year under the direction of J. R. Hughes.

Sachigo River Exploration Company, Limited

The Sachigo River Exploration Company, Limited, was incorporated on March 20, 1936, with an authorized capitalization of 100,000 shares of no par value, of which 90,000 have been issued. The officers and directors are: C. D. Kaeding, president; E. L. Brown, vice-president; Miss E. I. Jenking, secretary; W. S. Morlock, director. The head office is at 25 King Street West, Toronto, and the mine address is Sachigo River, Ont., via Gods Lake, Man.

The main property consists of 59 claims, 2,225 acres, in the Sachigo River area, Patricia portion of Kenora district. It is 350 miles due north of Sioux Lookout, and 110 miles due east of Gods Lake, Man. The company also holds 16 claims at Matthews lake, 16 miles south of the main group, and 39 claims at Kistigan lake, Manitoba.

The mine may be reached by airplane from Red Lake or from Lac Du Bonnet, Man. Supplies and freight are hauled by tractor during the winter months from Ilford on the Hudson Bay railroad, a distance of 250 miles.

The following is taken from the company's first annual report covering the year 1936:—

Property

The property, as originally taken over by the company, consisted of 45 unsurveyed claims located on the north side of Sherman lake, in the Sachigo River area. In the early summer of 1936 a second group of 11 claims was staked to the northwest of the main group. In the fall of 1936, 3 claims were staked in Sherman lake adjoining the main group on the south.

Development

Diamond-drilling on the original discovery, No. 1 vein, was started in March, 1936. The No. 1 vein is a narrow quartz vein in diorite. Owing to the deep muskeg, with which most of the property is covered, it was only possible to expose the outcrop of the vein by a few trenches. In these trenches the vein had an average width of 2.5 feet and an average grade of 0.30 ounces. Fourteen shallow holes were drilled to cut this vein, in a length of 800 feet. The vein was found to be quite persistent, but the drilling failed to find any improvement in width or grade.

In order to keep the company's large block of ground in good standing, 5 diamond-drill holes were put down on outlying claims for assessment work purposes. One of these holes, located over half a mile away from the No. 1 vein, intersected a narrow quartz vein carrying very high gold values. Drilling was continued on the No. 2 vein until August, a total of 26 holes being drilled. A section approximately 450 feet long was found to be ore-bearing. Out of 21 holes drilled in this section, 13 gave ore intersections, an average of 62 per cent. The outcrop of this vein is covered by from 10 to 30 feet of muskeg, making it impossible to expose the outcrop by trenching.

Construction

Camp construction was started in September, 1936. Seventeen tons of supplies and equipment were flown in to the property before freeze-up. A portable saw-mill was set up on the shore of Sherman lake, and over 8,000 logs were cut along the shores of Sherman and Milum lakes and towed in to the mill. Owing to the small size of the trees in this area we could get only 40,000 board feet of lumber out of these logs. However, this amount was sufficient to build a cook-house, bunk-house, and office. Excavation for the foundations of several additional buildings was completed before the end of the year.

General

Slightly over 2,000 cords of wood were cut during the fall. This wood will be hauled into the camp site during the winter months. Owing to the scarcity of wood in the area, it was necessary to go as far as 2 miles from the camp to get wood of any size. A clearing of some 30 acres in extent was made around the camp as a fire break.

During the fall a winter road, 120 miles in length, was cut between Gods Lake, Man., and the property. This road connects with the Ilford-Gods Lake road and so gives us a connection with the Hudson Bay railroad. The total length of the road from Ilford to Sachigo is 250 miles.

A complete mining plant, consisting of a Diesel-driven compressor and a steam-driven hoist, with all the necessary accessories, has been placed on order. This plant, together with supplies for one year's operations will be delivered at Ilford in January and February of 1937. A contract has been let to God's Lake Gold Mines, Limited, to haul this equipment and supplies from Ilford to the property. The total tonnage of freight will amount to about 500 tons and the contract freighting price is \$80.00 per ton.

The underground development programme is to sink the shaft to a depth of about 280 feet, cut two stations at 125-foot intervals, and then crosscut to the vein on both levels. Owing to the vein being located under muskeg, it was necessary to locate the shaft a considerable distance in the footwall. Consequently the crosscuts to the vein will be rather long and we do not anticipate cutting the vein in either crosscut before August 15. The vein will be followed by drifting for the length of the diamond-drilled section. If results on these two levels are satisfactory, the shaft will be deepened during the fall and early winter, and two additional levels opened up. Supplies have been provided to take care of this additional shaft-sinking.

The collaring of a 2-compartment, vertical shaft was commenced February 1, 1937. Shaft-sinking started March 13 and had reached 281 feet by July 10. Levels were established at 125 and 250 feet and lateral work was carried on until the middle of October, when it was decided to resume sinking and establish another level at 375 feet. No development was done on the 375-foot level.

The development completed for the year was as follows:—

| | 125-foot level | 250-foot level | Total |
|----------------|----------------|----------------|-------|
| | feet | feet | feet |
| Shaft..... | ..... | ..... | 405 |
| Crosscuts..... | 120 | 193 | 313 |
| Drifts..... | 292 | 452 | 744 |
| Raises..... | ..... | 155 | 155 |

Diamond-drilling completed to the end of the year amounted to 59 holes, totalling 10,324 feet.

The buildings erected on the property included a hospital, staff-house, 2 bunk-houses, radio shack operated by Canadian Airways, assay office, warehouse, powder magazine, power- and hoist-house, machine shop, blacksmith shop, and dry-house. The headframe is 45 feet high, and all buildings are frame construction with sawdust-filled walls and sheeted outside with corrugated galvanized iron.

The mining equipment includes a 10- by 10-inch Manitoba Bridge double-drum hoist; a 60 h.p., locomotive-type boiler, manufactured by the Vulcan Iron Works; a 600-cubic-foot Broom and Wade compressor, driven from a 150 h.p. Ruston-Hornsby Diesel engine; a Gardner Denver steel-sharpener; and a 110-volt, steam-driven lighting unit.

It has been decided by the management to install a small mill at the property. The average number of men employed daily was 52, distributed as follows:

surface, 26; construction, 11; underground, 15. B. G. Edward was resident superintendent in charge.

St. Anthony Gold Mines, Limited

St. Anthony Gold Mines, Limited, was incorporated in September, 1921, with an authorized capitalization of 3,000,000 shares of \$1 par value. The capital was increased to 3,300,000 shares in 1934, and in April, 1937, was again increased to 5,000,000 shares. The officers and directors are: H. P. Bellingham, president and general-manager; R. F. Taylor, vice-president and consulting engineer; R. F. Cairns, secretary-treasurer; R. Robertson and D. M. Bellingham, directors. The head office is at 159 Bay Street, Toronto. The mine address is Savant Lake.

The mine property in the Sturgeon Lake area, lies 12 miles south of Savant Lake station on the main line of the Canadian National Railways, in Thunder Bay district. The 3½-mile wagon road from Savant Lake station leads to the north end of the North arm of Sturgeon lake. From this point, transportation to the mine is by water. Scows and power boats are used to transport supplies over the water route.

Underground development was continued at this property throughout 1937, and the 125-ton cyanide-amalgamation mill, which was shut down in the fall of 1936, resumed operations in June, 1937. Production was maintained throughout the remainder of 1937.

The following table shows the development work accomplished during 1936 and 1937:—

| | 1936 | 1937 | Total (1936 and 1937) |
|-----------------|------|------|-----------------------|
| | feet | feet | feet |
| Shaft..... | 529 | 277 | 806 |
| 150-FOOT LEVEL: | | | |
| Drifts..... | | 38 | 38 |
| Raises..... | | 50 | 50 |
| 250-FOOT LEVEL: | | | |
| Drifts..... | 88 | | 88 |
| Raises..... | 56 | | 56 |
| 350-FOOT LEVEL: | | | |
| Drifts..... | 125 | 42 | 167 |
| Crosscuts..... | 64 | 155 | 219 |
| Raises..... | | 568 | 568 |
| 500-FOOT LEVEL: | | | |
| Drifts..... | 73 | | 73 |
| Crosscuts..... | 79 | | 79 |
| Raising..... | 193 | 253 | 446 |
| 625-FOOT LEVEL: | | | |
| Drifts..... | | 289 | 289 |
| 750-FOOT LEVEL: | | | |
| Drifts..... | | 79 | 79 |
| Crosscuts..... | | 197 | 197 |
| Raises..... | | 25 | 25 |

During 1937 the mill treated a total of 17,896 tons, with a gross recovery of 4,443 ounces of fine gold and 1,755 ounces of fine silver. Production was taken from one shrinkage stope on each of the 150-, 250-, 350-, 500-, 625-, and 750-foot levels.

During the last six months of the year there was an average of 72 men employed, of whom 37 were underground and 12 in the mill. B. D. Elderkin is mine manager.

Sand River Gold Mining Company, Limited

The Sand River Gold Mining Company, Limited, which was incorporated in February, 1935, has an authorized capitalization of 3,000,000 shares of \$1 par

value, of which 2,392,325 had been issued at December 31, 1937. The officers and directors are: R. J. Jowsey, president; A. V. Trimble, vice-president; A. Jackson, secretary-treasurer; T. A. Cass and C. H. Hitchcock, directors. The head office is at 302 Bay Street, Toronto. The mine address is Beardmore.

The property consists of 22 claims, comprising about 880 acres, adjoining the property of Leitch Gold Mines, Limited, on the west in Eva township, Beardmore area, district of Thunder Bay. It is about 6 miles by an automobile road, which was completed in the summer of 1937, from Beardmore, on the Longlac-Port Arthur branch of the Canadian National Railways. The claim numbers are: T.B. 12,941-12,948, 13,040, 13,041, 13,060, 13,061, 13,757-13,764, 14,416, and 18,545.

Underground work was continued throughout 1937. The 3-compartment, vertical shaft was sunk an additional 265 feet to a total depth of 684 feet, and an additional level was established at the 650-foot horizon.

In August, 1937, construction of a 75-ton cyanide mill was commenced, and production was started in the early part of December, 1937. During this month, the mill treated 2,537 tons of ore, with a gross recovery of approximately 758 ounces of gold.

Mill equipment includes the following: an Allis-Chalmers 15- by 9-inch jaw crusher; a 5- by 9-foot Allis-Chalmers ball mill, in closed circuit, with an 8- by 12-inch, 2-compartment Denver jig and classifier; 2 Dorr agitators; 2 Dorr thickeners; and a 6- by 8-inch scooper-type filter. The hutch product from the jig is reground in a 3- by 3-foot Allis-Chalmers grinding barrel, the pulp from which is returned to the cyanide circuit.

Additions to mining plant equipment included an Ingersoll-Rand 36- by 24-inch double-drum hoist driven by a General Electric 75 h.p. induction motor.

New buildings erected during the year included an addition to the hoist-room to accommodate the new hoist, mill, and crusher building, dry, assay office, refinery, cookery, and two residences. A 100,000-gallon all-steel water-tank was also constructed.

Production during December, 1937, was taken from 15 stopes, including back stopes. The mining method will be resuing cut-and-fill.

The following table shows the development work accomplished at the end of 1936, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|-----------------|---------------------|-------|-------|
| | feet | feet | feet |
| Shaft..... | 419 | 265 | 684 |
| 150-FOOT LEVEL: | | | |
| Drifts..... | | 1,400 | 1,400 |
| Crosscuts..... | 20 | 65 | 85 |
| Raises..... | | 145 | 145 |
| 275-FOOT LEVEL: | | | |
| Drifts..... | 1,100 | 475 | 1,575 |
| Crosscuts..... | 28 | | 28 |
| Raises..... | | 17 | 17 |
| 400-FOOT LEVEL: | | | |
| Drifts..... | 1,100 | 840 | 1,940 |
| Crosscuts..... | 32 | 120 | 152 |
| 525-FOOT LEVEL: | | | |
| Drifts..... | | 360 | 360 |
| Crosscuts..... | | 90 | 90 |
| 650-FOOT LEVEL: | | | |
| Drifts..... | | 150 | 150 |
| Crosscuts..... | | 160 | 160 |
| Raises..... | | 45 | 45 |

Underground diamond-drilling amounted to 2,708 feet.

There was an average of 68 men employed, of whom 26 were underground, with 9 men in the mill during the month of December. G. B. Tribble is mine manager.

Sanshaw Mines, Limited

Sanshaw Mines, Limited, was incorporated in June, 1936, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,839,672 have been issued. The office of president was left vacant by the death of Mr. K. B. Heisey. The other officers and directors are: R. J. Driscoll, vice-president; J. P. Manley, secretary; A. J. Flood, treasurer; J. H. Rattray, director. The head office is at 330 Bay Street, Toronto, and the mine address is Red Lake.

The company holds 26 claims, totalling 1,110 acres, in Dome township and 12 claims, totalling 480 acres, in Fairlie township, in the Red Lake area, Patricia portion of Kenora district. The property may be reached by boat from Red Lake.

Diamond-drilling and surface exploration were carried on during the fall of 1936 and spring of 1937, as well as the construction of camp buildings. A shaft begun on June 15 was 35 feet deep on July 11. Mining operations were then suspended, a mining plant was installed, and a 40-foot headframe was erected.

The buildings on the property include a bunk-house, two-storey office and warehouse, ice-house, cookery, directors' lodge, manager's residence, blacksmith shop, powder magazine, detonator-house and dry-house.

The mining plant includes a 750-cubic-foot Alley-McLellan compressor, driven by a 125 h.p. English Electric motor; a 36- by 24-inch double-drum hoist made by the Manitoba Bridge and Foundry Company and driven by a 60 h.p. English Electric induction motor.

Operations were suspended in September, pending refinancing.

Some 34 men were employed daily, of whom 6 were engaged in shaft-sinking. J. M. Robinson was manager.

Santa Fe Gold Mines, Limited

Santa Fe Gold Mines, Limited, was incorporated in November, 1936, with an authorized capitalization of 4,000,000 shares of \$1 par value. The officers and directors were: S. R. Snook, president; N. M. Davis, vice-president; F. M. Little, secretary-treasurer; George Bagwell and H. R. Mountain, directors. The head office is at 38 King Street West, Toronto. The mine address is Mine Centre.

In November, 1936, the company commenced operations at the old Foley mine, near Mine Centre, district of Rainy River. The south shaft was reopened and the workings dewatered for sampling. In May, 1937, operations were suspended.

During the period of operations, there was an average of 15 men employed, under the direction of George Stagee.

Sarmac Gold Mining Corporation

The Sarmac Gold Mining Corporation was incorporated on October 24, 1936, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: J. E. Savard, president; Charles Fontaine, vice-president; Ayme La Fontaine, secretary-treasurer; R. M. Rainville, A. A. Collet, and J. Bruce McMartin, directors. The head office address is 513 Aldred Building, Montreal, Que. The mine address is Jellicoe. This company was formed to resume operations at the J. Bruce McMartin property, consisting of

297.1 acres, claims T.B. 11,070-11,078, on Atigogama lake in Rickaby township, Sturgeon River area, district of Thunder Bay. The property lies 9 miles, by winter road, north of Kinghorn on the Longlac-Port Arthur branch of the Canadian National Railways.

The company resumed operations on February 10, 1937. The underground workings were pumped out and plans were made for underground development, which was no sooner under way than operations were suspended, about the middle of May.

During the period of operation, there were 17 men employed, of whom 8 were underground, under the direction of W. J. Hacker.

Savant Sturgeon Gold Mines, Limited

Savant Sturgeon Gold Mines, Limited, was incorporated in June, 1936, succeeding the Metropolitan Gold Mines, Limited. The authorized capitalization is 3,000,000 shares, of which 870,504 have been issued and 750,000 pooled. The officers and directors are: H. M. Richardson, president; B. H. Meyers, vice-president; H. J. Beck, secretary-treasurer. The head office is at 314 Metropolitan Building, Toronto. The mine address is Savant Lake.

The property consists of claims T.B. 8,845-8,855, 8,899-8,907, 9,801-9,806, and 11,323-11,326. It is located at the northeast end of Sturgeon lake, district of Thunder Bay, and is reached by water or air from Savant Lake station on the main line of the Canadian National Railways.

Operations were suspended at this property at the end of 1936 and were resumed in June, 1937. A 2-compartment, vertical shaft was sunk to a depth of 175 feet, and 396 feet of drifting and 151 feet of crosscutting were accomplished by the end of October, when operations were again suspended.

During the period of operation there was an average of 21 men employed, of whom 13 were underground, under the direction of W. F. Stewart.

Schreiber Pyramid Gold Mines, Limited

Schreiber Pyramid Gold Mines, Limited, was incorporated in October, 1934, with an authorized capital of 3,000,000 shares of \$1 par value. The officers and directors are: J. L. Kestle, president; M. L. Donevan, secretary-treasurer; F. E. Horne and W. E. Mayor, directors. The head office address is 372 Bay Street, Toronto. The mine address is Schreiber.

The property consists of 21 claims, all in one block, about 4 miles northeast of Schreiber on the main line of the Canadian Pacific Railway, in township 84, district of Thunder Bay, and includes claims T.B. 10,089-10,094 and 10,101.

During 1937 a crosscut adit was driven 125 feet into the side of a hill, and from the end of the adit 124 feet of drifting was done on the vein. The underground work was accomplished in the months of March and April, during which time the test mill operated for the purpose of running bulk samples from an open cut on top of the hill and from the adit. The remainder of the year was spent in surface exploration. Operations were suspended at the end of November.

During the period of operation there was an average of 12 men employed, under the direction of J. G. White.

Selby Lake Mines, Limited

Selby Lake Mines, Limited, was incorporated in October, 1936, with an authorized capitalization of 3,000,000 shares of \$1 par value. The financing so far has been done privately. C. A. Billings is the managing director. The head

office is at 10 Adelaide Street East, Toronto, and the mine address is Goldrock, via Wabigoon.

The property consists of 136 acres, on the north shore of Trafalgar bay, Upper Manitou lake, in Kenora district. It is about a mile from Goldrock and adjoins the Elora and Big Master mines. The mine may be reached by airplane from Dryden, or by boat and motor car, a 30-mile route, from Wabigoon on the main western line of the Canadian Pacific Railway.

Following considerable trenching and diamond-drilling on claims H.P. 405 and S. 25, which started late in 1935 and continued through 1936 and the early part of 1937, a mining plant was installed and the sinking of a 3-compartment, vertical shaft was started in August on claim S. 25. The shaft reached its present objective depth of 275 feet in November, 1937, with levels established at 125 and 250 feet. About 200 feet of drifting was done on the 250-foot level. Underground work was suspended on December 21, and the plant was completely overhauled. Operations were resumed in January, 1938.

Diamond-drilling to the end of 1937 amounted to 24 holes, totalling 2,000 feet, drilled during 1936, and 1 hole 50 feet drilled during 1937, all from surface.

The camp is located at Selby lake, about a mile from the mine, and consists of bunk-house, cookery, office and staff quarters. The mine buildings include a compressor- and boiler-house, hoist-house, blacksmith shop, office and staff-house, warehouse, powder magazine, cap-house, daily powder-house, and daily fuse-house.

The mining plant includes a 100 h.p. Polson Iron Works horizontal return tubular boiler; a 420-cubic-foot Gardner Denver compressor, driven by a Caterpillar Diesel engine; an 8- by 12-inch Stephens-Adamson single-drum, reversible hoist; and a Gardner Denver steel-sharpener.

An average of 44 men was employed daily, of whom 12 were underground

Shenango Gold Mines, Limited

Shenango Gold Mines, Limited, was incorporated in March, 1935, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: Louis Normandin, president; Bruce Cameron, vice-president; James Hutchison, secretary-treasurer; J. A. Owens and William Cromar, directors. The head office is at 67 Yonge Street, Toronto.

The property consists of a group of 9 claims in Hawkins township, and one of 12 claims in Walls township, district of Algoma.

Work was continued throughout 1937 on the Hawkins township claims. In the early part of the year a 90-foot adit was driven from the bottom of the open pit, and 40 feet of crosscutting was done from the adit. Later in the year a 52-foot vertical shaft was sunk in another location. The balance of the work was on surface. A total of 2,500 feet of diamond-drilling was done.

The 50-ton amalgamation mill was operated intermittently during the year, and a total of 828 tons of ore was treated.

An average of 39 men was employed. J. A. Owens and the late T. Trevaile-Williams were successively in charge of operations. The mine address is Oba.

Skookum Gold Mines, Limited

Skookum Gold Mines, Limited, was incorporated in December, 1935, with an authorized capitalization of 4,000,000 shares of \$1 par value. The officers and directors are: G. B. S. Cousens, president; G. S. Johnson, vice-president; E. P. Raymond, secretary-treasurer; W. P. Umphrey and Alfred Perks, directors. The head office is at 244 Bay Street, Toronto, and the mine address is Red Lake.

The company holds 11 claims, totalling about 440 acres, in Dome and Heyson townships, west of and adjoining the Red Lake Gold Shore property, Red Lake area, Patricia portion of Kenora district.

A vertical 3-compartment shaft was collared in January, 1937, a headframe was erected, and a mining plant installed.

Sinking was resumed on May 15 and had reached a depth of 190 feet at the end of June, when operations were suspended owing to lack of funds. The mine remained idle throughout the remainder of the year.

The mining plant includes an Ingersoll-Rand 530-cubic-foot gasoline compressor, an 8- by 6-inch Ingersoll-Rand double-drum, air-driven hoist, a 130 h.p. Crossley Diesel engine, and a 110-volt generator.

The surface plant and buildings include a power- and hoist-house, dry-house, powder magazine, blacksmith shop, assay office, cap-house, warehouse, office, 2 bunk-houses, cookery, and 2 residences.

An average of 33 men was employed during shaft-sinking operations, of whom 18 worked underground. J. D. Turner was the manager.

Sol D'Or Gold Mines, Limited

Sol D'Or Gold Mines, Limited, was incorporated in September, 1934, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: C. M. Edwards, president; E. R. Bremner, vice-president; G. W. Mitchell, secretary-treasurer; F. W. Runge and A. B. Wright, directors. The head office is at 140 Wellington Street, Ottawa, and the mine address is Narrow Lake.

The property consists of 38 claims, comprising 1,520 acres, located in the northeast corner of Honeywell township, the northwest corner of McNaughton township, and in the block immediately north of these two townships. The claims take in part of the west end of Grace or Rainbow lake and are south of Birch lake in the Patricia portion of Kenora district. The mine may be reached by airplane from Hudson or Sioux Lookout, on the main line of the Canadian National Railways.

At the end of 1936 the vertical, 3-compartment shaft had reached a depth of 164 feet, a level had been established at 150 feet, and approximately 1,000 feet of drifting and crosscutting had been done.

Mining continued until May, 1937, when it was decided to suspend operations. The mine was still idle at the end of the year. A watchman is kept at the property.

The buildings on the property include power-house, hoist-room, dry-house, 2 warehouses, blacksmith shop, mill, office, 3 bunk-houses, cookery, staff-house, laundry, and a residence.

The mining equipment includes a 350-cubic-foot Gardner Denver compressor, driven by a 130 h.p. Caterpillar Diesel engine; a 30 h.p. boiler; an 8- by 10-inch Mead-Morrison, single-drum, reversible steam hoist; and a Gardner Denver steel-sharpener.

During the four months of operation an average of 20 men was employed, 7 of whom were underground. The mill did not operate. J. A. Warburton was in charge.

Split Lake Gold Mines, Limited

Split Lake Gold Mines, Limited, was incorporated in November, 1935, to succeed Koch Daneff Gold Mines, Limited, with an authorized capitalization of 4,000,000 shares of no par value, all of which have been issued. The officers and

directors are: Hugh C. McRae, president; Glen A. Rea, secretary-treasurer; W. S. Kickley, F. B. Anderson, and H. L. Donaldson, directors. The head office is at 67 Yonge Street, Toronto, and the mine address is Kenora.

The company did work on two properties in Kenora district during 1937. The property at Split lake, about 14 miles southeast of Sioux Lookout and 6 miles from Alcona station on the Port Arthur-Sioux Lookout branch of the Canadian National Railways, consists of 54 claims, totalling 2,200 acres. The second group, known as the Oliver-Severn claims, in Indian Reserve No. 38b, some 6 miles east of Kenora, contains 240 acres.

Split Lake Claims

During 1936, the company operated the Split Lake claims and, commencing on April 3, a 2-compartment, vertical shaft was sunk to a depth of 360 feet and levels were established at 100, 225, and 350 feet. Lateral work was done on each of the levels, followed by diamond-drilling, until April, 1937, when work was suspended. The development accomplished was as follows:—

| Level | Drifts | Crosscuts |
|---------------|--------|-----------|
| | feet | feet |
| 100-foot..... | 30 | 75 |
| 275-foot..... | 165 | 290 |
| 350-foot..... | 115 | 145 |
| Total..... | 310 | 510 |

The following table shows the diamond-drilling accomplished to the end of 1937:—

| | 1936 | | 1937 | |
|------------------|-------|-------|-------|-------|
| | Holes | Feet | Holes | Feet |
| Surface..... | 20 | 4,260 | 5 | 1,017 |
| Underground..... | 4 | 704 | 6 | 1,674 |

The buildings on the property included power-house, 2 warehouses, blacksmith shop, assay office, 2 bunk-houses, cookery, powder magazine, and cap-house. The mining plant consisted of a 550-cubic-foot Laidlaw-Dunn compressor; an 8- by 10-inch Ingersoll-Rand, single-drum, reversible hoist; and a 100 h.p. locomotive-type steam boiler. The average number of men employed daily was 7.

Oliver-Severn Claims

Following three months of surface exploration, the sinking of a 2-compartment shaft on the vein started in August, 1937, at the Oliver-Severn claims. The shaft was intended to be vertical, but after 20 feet of sinking it was found that the vein dipped to the north and the shaft was changed to 75 degrees. Sinking continued until November 1, when operations were temporarily suspended. At that time the shaft was 100 feet deep and station-cutting had been started at the 100-foot level. The camp buildings included cookery, bunk-houses, office, and manager's quarters. The sinking plant included a 6- by 8-inch Beattie single-drum, reversible hoist; a 12 h.p. vertical boiler; a 320-cubic-foot Sullivan portable gasoline compressor; and a Gardner Denver steel-sharpener.

The average number of men employed daily was 7, of whom 3 were underground. H. L. Donaldson was in charge of both operations.

Spooner Gold Mines, Limited

Spooner Gold Mines, Limited, was incorporated in January, 1935, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,952,103 had been issued at December 31, 1937. The officers and directors are: H. T. Leslie, president; J. H. Colville, vice-president; J. A. Doupe, secretary-treasurer; E. M. Thomson, C. D. McGregor, and Fred Spooner, directors. The head office is at 67 Yonge Street, Toronto. The mine address is Empire.

The property consists of a group of 15 claims, totalling 650 acres, adjoining that of the Northern Empire Mines Company on the east, and includes claims T.B. 4,812-4,817, 5,059-5,061, in Summers township, Beardmore area, Thunder Bay district. On March 23, 1936, a 2-compartment shaft was started on T.B. 4,815, about 400 feet east of the Northern Empire boundary and 200 feet south of the track on the Longlac-Port Arthur branch of the Canadian National Railways.

Underground operations were continued until April 27, 1937, following which diamond-drilling was continued from surface on the Power vein, to the south and east of the workings. It was found on drilling that the diabase sill continuing through the property from the Northern Empire to the west was located only 250 feet from surface and was about 390 feet thick, as compared with a depth of 650 feet from surface and a thickness of about 650 to 700 feet on the Northern Empire property. Deeper drilling below this first sill showed the presence of a second diabase sill only about 450 feet below the upper sill. This second sill was penetrated for 100 feet, but the drill did not go through it, so its thickness is not yet known.

The following table shows the underground development accomplished to the end of 1937:—

| | To Dec. 31, 1936 | 1937 | Total |
|-----------------|---------------------|-------|-------|
| | feet | feet | feet |
| Shaft..... | 303 | ..... | 303 |
| 150-FOOT LEVEL: | | | |
| Drifts..... | 375 | 650 | 1,025 |
| Crosscuts..... | 10 | ..... | 10 |

Diamond-drilling accomplished to the end of 1937 was as follows:—

| | |
|-------------------|-------|
| | Feet |
| Underground..... | 516 |
| From surface..... | 5,477 |
| Total..... | 5,993 |

There were no additions to buildings or plant equipment. During the period of operations there were 10 men employed, under the direction of T. C. Holmes.

Stanley Gold Mines, Limited

The property of Stanley Gold Mines, Limited, is located in township 29, range 23, Michipicoten area, district of Algoma.

During the early part of 1937 the 2-compartment, inclined shaft was sunk an additional 158 feet to a total depth of 550 feet. Underground work was suspended in May. The 50-ton amalgamation mill was operated until March. Surface work was continued until December, when the company was declared

bankrupt. Geo. R. Bacon and Company, 1410 Stanley Building, Montreal, Que., are trustees in bankruptcy.

An average of 34 men was employed during the year. S. L. MacDougall and J. C. Pinch were successively in charge of operations.

Strathy Basin Mines, Limited

Strathy Basin Mines, Limited, was incorporated in August, 1934, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: W. J. Hanley, president; Hugh Creighton, vice-president; E. C. Thompson, secretary; Dr. Herbert Walker, C. E. Struthers, and H. E. Bounsall, directors. The executive office is at 712 Federal Building, Toronto.

The property includes a group of 15 claims in Chester township, Three Duck Lakes area, district of Sudbury, about 20 miles west of Gogama.

Work on these claims was carried on in 1937 until September, and then suspended for the rest of the year. A 2-compartment, 65-degree shaft was started in May on claim S. 21,613 and sunk to a depth of 116 feet on the incline. A level was established at 100 feet, on which 286 feet of drifting was accomplished before work was suspended.

The plant included a 50 h.p. boiler, a steam-driven compressor, and a 6- by 5-inch Ingersoll-Rand single-drum hoist. Buildings erected included a hoist-compressor house, blacksmith shop, and 2 bunk-houses.

An average of 17 men was employed during the period of operation, under the direction of A. E. Taylor. The mine address is Gogama.

Straw Lake Beach Gold Mines, Limited

Straw Lake Beach Gold Mines, Limited, was incorporated in August, 1934, with an authorized capitalization of 3,000,000 shares of no par value, of which 2,279,999 have been issued. The officers and directors are: M. C. Mosher, president; W. M. Sixt, vice-president and managing director; W. R. Salter, secretary-treasurer; W. G. Chipp, assistant secretary-treasurer; W. R. Baker, director. The head office is at 36 Toronto Street, Toronto. The mine address is Emo.

The property consists of a group of 24 claims, totalling 985 acres, at Straw lake in the district of Kenora. Straw lake is about 35 miles north of Fort Frances by air. The mine may be reached over a 70-mile road and water route from Emo, which is 20 miles west of Fort Frances on the Canadian National railway.

Surface work was done at this property until October, 1934, when the sinking of a vertical, 2-compartment shaft was started. By January, 1935, the shaft had reached a depth of 105 feet, a level had been established at 100 feet, and 187 feet of drifting had been done. During 1935 the shaft was deepened to 320 feet and some lateral work was done. Operations ceased the end of October.

Work was resumed in March, 1937, following the construction of new plant and camp buildings and the installation of a new mining plant.

In preparation for underground work the shaft was dewatered to the 100-foot level, a new shaft collar was installed, and the shaft was retimbered to the 100-foot level. A 6- by 8-foot raise was driven to surface, the rest of the shaft was dewatered, and sinking was resumed. The shaft has three compartments below the 300-foot level. Sinking was continued to a depth of 441 feet, and a new level was established at 425 feet.

The following table shows the development work prior to 1937, and during 1937:—

| Level | Crosscuts | | Drifts | | Raises | |
|---------------|---------------------|-------|---------------------|-------|---------------------|-------|
| | to Dec. 31, 1936 | 1937 | to Dec. 31, 1936 | 1937 | to Dec. 31, 1936 | 1937 |
| | feet | feet | feet | feet | feet | feet |
| 100-foot..... | 68 | ..... | 585 | ..... | ..... | 87 |
| 300-foot..... | 142 | ..... | 822 | ..... | ..... | 13 |
| 425-foot..... | ..... | 66 | ..... | 366 | ..... | ..... |

Diamond-drilling prior to 1937 consisted of 6 holes, totalling 1,563 feet, and during 1937 of 5 holes, totalling 2,016 feet, all from surface.

The plant and camp buildings include an office and staff quarters, cookery, ice-house, assay office, power- and hoist-house, blacksmith shop, 2 bunk-houses, dry-house, powder magazine, and cap-house.

The plant equipment includes a 6- by 8-inch, single-drum Ingersoll-Rand air hoist; an 8- by 9-inch, double-drum Ingersoll-Rand air hoist; a 680-cubic-foot Ingersoll-Rand compressor, driven by a 150 h.p. Crossley Diesel engine; a compressor; and an Ingersoll-Rand steel-sharpener.

An average of 12 men was employed daily, of whom 5 were underground. J. D. Tolman was manager.

Sturgeon River Gold Mines, Limited

Sturgeon River Gold Mines, Limited, which was incorporated in August, 1934, has an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,749,758 shares had been issued at December 20, 1937. The officers and directors are: A. L. Bishop, president and managing director; J. M. Wood, vice-president; C. S. Kennedy, secretary-treasurer; Alex. Longwell, W. T. Brown, and Fraser Raney, directors. The head office is at 320 Bay Street, Toronto. The mine address is Nezhah.

The property consists of 7 claims in Irwin township, in the Sturgeon River area, district of Thunder Bay, about 8 miles northwest of Nezhah station on the Longlac-Port Arthur branch of the Canadian National Railways. The claim numbers are T.B. 13,641-13,647.

The 50-ton amalgamation-cyanide mill, which was in the course of construction at the end of 1936, was completed in February, 1937, and commenced operations in March, the first gold brick being poured on April 23. During the year 17,997 tons of ore were treated, with a gross recovery of \$309,624.00.

Milling equipment includes an Allis-Chalmers 5- by 7-foot ball mill, an 18- by 3-foot Dorr classifier, two 10- by 16-foot Dorr tray thickeners, a 14- by 14-foot Dorr agitator, a 6- by 6-foot Eimco filter, and a Merrill-Crowe precipitation unit.

The ore is hand-sorted in the stopes and on a picking belt in the crusher-house, after which it is crushed to $1\frac{1}{4}$ -inch size. Standard cyanide practice follows grinding in the ball mill. A jig takes out concentrates, which are reground in an amalgam barrel.

During the year 24,946 tons of ore were hoisted, of which 6,949 tons of waste was hand-sorted from the picking belt before milling.

Production was maintained from three cut-and-fill stopes and one shrinkage stope. The method of cut-and-fill is by resuing, and during the year 50,000 tons of waste rock was used for fill.

The entire plant was electrified during the early part of the year, and a road was constructed from the property to Nezhah.

The double-drum Ingersoll-Rand steam hoist was converted to electric drive by the installation of a Westinghouse 50 h.p. induction motor. A Babcock-Wilcox and Goldie-McCulloch 850-cubic-foot steam compressor was electrified by the installation of a General Electric 200 h.p. synchronous motor. A Sullivan, single-stage, 350-cubic-foot steam compressor was also installed toward the end of the year.

Buildings erected during 1937 included the mill, refinery, new bunk-house, and electric substation.

The following table shows the development work accomplished at the end of 1936, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|-----------------|---------------------|-------|-------|
| | feet | feet | feet |
| Shaft..... | 774 | ..... | 774 |
| 125-FOOT LEVEL: | | | |
| Drifts..... | 609 | ..... | 609 |
| Crosscuts..... | 96 | ..... | 96 |
| Raises..... | 174 | ..... | 174 |
| 250-FOOT LEVEL: | | | |
| Drifts..... | 1,322 | ..... | 1,322 |
| Crosscuts..... | 145 | ..... | 145 |
| Raises..... | 179 | 143 | 322 |
| 375-FOOT LEVEL: | | | |
| Drifts..... | 1,219 | ..... | 1,219 |
| Crosscuts..... | 173 | ..... | 173 |
| Raises..... | 422 | 108 | 530 |
| 500-FOOT LEVEL: | | | |
| Drifts..... | 754 | 447 | 1,201 |
| Crosscuts..... | 362 | ..... | 362 |
| Raises..... | ..... | 107 | 107 |
| 625-FOOT LEVEL: | | | |
| Drifts..... | 436 | ..... | 436 |
| Crosscuts..... | 69 | ..... | 69 |
| 750-FOOT LEVEL: | | | |
| Drifts..... | 745 | 248 | 993 |
| Crosscuts..... | 118 | ..... | 118 |

Diamond-drilling amounted to 2,938 feet from underground and 752 feet from surface.

There was an average of 77 men employed, of whom 42 were underground and 11 in the mill. T. D Anderson is mine manager.

Supreme Gold Mines, Limited

Supreme Gold Mines, Limited, which was incorporated in February, 1934, has an authorized capitalization of 2,000,000 shares of \$1 par value, of which 775,000 were pooled and 415,000 held in the treasury at December 31, 1937. The officers and directors are: W. F. Stewart, president; H. M. Richardson, vice-president and managing director; Harry J. Beck, secretary-treasurer; J. G. Holt and R. F. Johnson, directors. The head office is at 44 Victoria Street, Toronto. The mine address is Savant Lake.

The company holds 33 claims, east of Couture lake, between the North and Northeast arms of Sturgeon lake, about 5 miles east of Savant Lake station on the main line of the Canadian National Railways, district of Thunder Bay.

Operations were continued at this property during 1937. A 2-compartment, vertical shaft was sunk on claim T.B. 9,850 to a depth of 175 feet. On the 150-foot level, 325 feet of drifting and crosscutting was accomplished.

The mining plant equipment consists of a 35 h.p. boiler; an 8- by 10-inch single-drum, reversible steam hoist; and a 220-cubic-foot Sullivan portable gasoline compressor.

Operations were suspended in October, 1937. During the period of operations there were 42 men employed, of whom 26 were underground. B. S. Thomas was mine manager.

Sylvanite Gold Mines, Limited

Sylvanite Gold Mines, Limited, was incorporated in June, 1913, with an authorized capitalization of 3,300,000 shares of \$1 par value, of which 3,299,500 have been issued. The officers and directors are: Edward L. Koons, president; William L. Marcy, vice-president; Clark L. Ingham, treasurer; William S. Walton, secretary; Welles V. Moot, managing director; Alfred H. Sharpe and Harry Yates, directors. C. E. Rodgers is general manager, and W. S. Maguire is superintendent. The executive office is at 300 Erie County Bank Building, Buffalo, N.Y. The secretary's office is at 603 Royal Bank Building, Toronto. The head office and mine office are at Kirkland Lake.

The property consists of 5 claims and a fraction, approximately 230 acres, in Teck township, Kirkland Lake area, district of Timiskaming. An average of 311 men was employed throughout 1937.

The following is taken from the general manager's report for the fiscal year ending March 31, 1938:—

Production

Milling rate was again increased to about the same extent as during 1937, namely another 1,000 tons per month. Extraction was maintained at the same level as for the previous year, or an average of 95.67 per cent.

| Fiscal year ending March 31 | Tons milled | Fine ounces gold produced | Average price per ounce | Production total | Average recovery, troy ounces per ton |
|-----------------------------|-------------|---------------------------|-------------------------|---------------------------|---------------------------------------|
| 1933..... | 96,140 | ..... | ..... | ¹ \$912,377.15 | 0.40 |
| 1934..... | 98,311 | ..... | ..... | ¹ 1,558,912.87 | .52 |
| 1935..... | 124,956 | 51,445.27 | \$30.81 | ¹ 1,584,817.39 | .41 |
| 1936..... | 153,942 | 55,798.66 | 34.62 | ¹ 1,931,891.87 | .36 |
| 1937..... | 166,131 | 61,208.92 | 35.08 | ² 2,147,237.26 | .37 |
| 1938..... | 178,462 | 64,299.41 | 35.08 | ² 2,255,381.11 | .36 |

¹Including exchange on bullion.

²Including exchange on bullion, after bullion tax is deducted.

³Including exchange on bullion, after deducting bullion tax effective for period April 1, 1935, to May 31, 1935, but before deducting Mint handling charge of 35 cents per fine ounce gold, effective for period June 1, 1935, to March 31, 1936.

Mining

| Year | Ore broken | | | Waste | | | Total ore and waste broken |
|-----------|------------|------------------|---------|--------------------|-------------------|--------|----------------------------|
| | In stopes | From development | Total | Hoisted to surface | Used for backfill | Total | |
| | tons | tons | tons | tons | tons | tons | tons |
| 1935..... | 93,883 | 37,161 | 131,044 | 11,812 | 10,623 | 22,435 | 153,479 |
| 1936..... | 111,091 | 42,183 | 153,274 | 12,576 | 7,607 | 20,183 | 173,457 |
| 1937..... | 121,778 | 47,017 | 168,795 | 19,499 | 15,247 | 34,746 | 203,541 |
| 1938..... | 120,433 | 55,703 | 176,136 | 20,873 | 24,526 | 45,399 | 221,535 |

During last year drifting and subdrifting through ore amounted to 6,387 feet.

Ore Reserves

At the year end broken reserves were estimated at 82,292 tons, being slightly less than last year, notwithstanding the increase milled.

Operating Costs

| | Total cost | Cost per ton ore milled | Cost per fine ounce gold produced |
|--|-----------------------|-------------------------|-----------------------------------|
| 1936: | | | |
| Development and exploration..... | \$211,169.44 | \$1.372 | \$3.784 |
| Mining..... | 348,251.50 | 2.262 | 6.241 |
| Milling..... | 167,324.47 | 1.087 | 2.999 |
| General charges..... | 47,641.25 | .310 | .854 |
| Administrative charges (partly mine).... | 59,116.83 | .384 | 1.060 |
| Township drainage tunnel expense..... | 5,914.12 | .038 | .106 |
| Kirkland District Hospital expense..... | 3,868.15 | .025 | .069 |
| Bullion selling expense: | | | |
| Insurance, shipping, and Mint refining charges..... | 5,834.38 | .038 | .105 |
| Mint handling charge..... | 16,750.88 | .109 | .300 |
| Total..... | \$865,871.02 | \$5.625 | \$15.518 |
| 1937: | | | |
| Development and exploration..... | \$300,751.11 | \$1.810 | \$4.914 |
| Mining..... | 338,917.71 | 2.040 | 5.537 |
| Milling..... | 169,774.56 | 1.022 | 2.774 |
| General charges..... | 54,812.88 | .330 | .896 |
| Administrative charges..... | 60,112.18 | .361 | .982 |
| Tailings disposal expense (new dam).... | 3,640.69 | .022 | .059 |
| Bullion selling expense: | | | |
| Insurance, shipping, and Mint refining charges..... | 5,782.15 | .035 | .094 |
| Mint handling charge..... | 21,349.53 | .129 | .349 |
| Total..... | \$955,140.81 | \$5.749 | \$15.605 |
| 1938: | | | |
| Development and exploration..... | \$335,110.43 | \$1.878 | \$5.212 |
| Mining..... | 384,749.70 | 2.156 | 5.984 |
| Milling..... | 191,501.05 | 1.073 | 2.978 |
| General charges, including employees' group life, accident, and sickness insurance and pension plan expense... | 69,514.59 | .389 | 1.081 |
| Administrative charges..... | 60,722.25 | .340 | .944 |
| Tailings disposal expense (extension of area, etc.)..... | 10,920.34 | .061 | .170 |
| Bullion selling expense: | | | |
| Insurance, shipping, and Mint refining charges..... | 5,861.59 | .033 | .091 |
| Mint handling charges..... | 22,703.56 | .127 | .353 |
| Total..... | \$1,081,083.51 | \$6.057 | \$16.813 |

No. 2 Shaft.—A high rate of exploration and development was carried on throughout the period, total volume being about 5 per cent. above 1937. Drifting was higher than for the previous year, crosscutting was lower, and raising footage was substantially increased.

Encouraging results, on a subsidiary vein north of the north vein system, were secured from continued development of the area east and west of the Sylvanite fault, on the 700-, 800-, and 1,000-foot levels. Additional ore was developed on the north vein system east of the major fault within the section 400 to 1,250 feet and on levels 2,000, 2,200, 2,500, 2,875, and 3,000 feet.

Substantial quantities of ore were also found west of this fault on the south vein, in the horizon from the 1,625- to the 2,250-foot levels, inclusive, on the inclined vein on the 1,350-foot level near where this fracture joins the north vein and on the 2,000-foot level, where it lies close to the north branch of the south vein.

No. 4 Shaft.—Exploration and development was carried on to a moderate extent throughout the year. The work resulted in 18,853 tons being milled from this source.

Additional Buildings and Equipment.—This included the construction of a new powder magazine, also some additional storage space at the plant. Compressor capacity was increased by one unit of 1,500 cubic feet. Transformer and switching equipment was increased.

In the mill, one new 5- by 16-foot, low discharge tube mill was added and a 3-foot extension was also made to No. 1 secondary mill, converting it to an open-end type, 5 by 16 feet in size. A tray was added to a 36-foot thickener; one filter, 11 feet 6 inches by 12 feet, was installed, and a tailing pump of greater capacity was purchased and put in operation.

Underground, a loading pocket serving the lower working levels was completed at 3,000 feet. In addition, extensions were made to the upper ore-pass system.

Development and Exploration

| Class of work | Year ending March 31, 1936 | Year ending March 31, 1937 | Year ending March 31, 1938 | Total from beginning of operations to March 31, 1938 |
|---|----------------------------------|----------------------------------|----------------------------------|---|
| Drifting..... | feet 8,837 | feet 14,855 | feet 15,950.5 | feet 88,033 |
| Crosscutting..... | 2,875.5 | 7,221 | 5,255 | 40,177 |
| Raising..... | 1,392.5 | 1,531.5 | 2,802 | 19,464.5 |
| Sublevel drifting..... | 349.5 | 392.5 | 821 | 10,853.5 |
| Box-hole raising..... | 301 | 57 | 357 | 7,359.5 |
| Winzing..... | | | | 97.5 |
| Shaft-sinking..... | | | | 5,654 |
| Total..... | 13,755.5 | 24,057 | 25,185.5 | 171,639 |
| Per cent. of crosscutting to total of crosscutting and drifting..... | 24.6 | 32.7 | 24.8 | 31.3 |
| Shaft stations and sump excavations..... | cu. ft. 1,420 | cu. ft. 3,438 | cu. ft. 912 | cu. ft. 211,628 |
| Diamond-drilling..... | feet 19,359 | feet 14,285 | feet 14,787 | feet 125,457 |

Summary

Having in mind the increased milling demands, general underground conditions were satisfactory. Promising ore possibilities remain over extensive areas, and sections prospected during the year responded reasonably well on development.

Drifting and subdrifting through ore amounted to 38.1 per cent. of the total footage of this work completed. On a basis of tons milled, the per cent. of sedimentary ore treated during the period was 31.08. An increasing amount of ore, in proportion to the total milled, has been coming from this source, the figure last year being 25.7 per cent.

Total production increased substantially, while recovery per ton was maintained at the 1936 level and was but 0.01 troy ounces per ton below 1937. Operating costs for the year ending March 31, 1938, were about 30 cents per ton higher than last year. This was largely caused by a general increase in wages, added expense toward future tailing disposal requirements and an increase in the cost of stoping, the latter being due to the more extensive use of a modified method and contract system.

Tashota Goldfields, Limited

Tashota Goldfields, Limited, was incorporated in November, 1932, with an authorized capitalization of 3,000,000 shares of \$1 par value. In December, 1936, the company was reorganized and the authorized capital increased to 5,000,000 shares of \$1 par value, of which 4,294,148 were outstanding at December 31, 1937. The officers and directors are: H. H. Vaughan, president; G. L. Maxwell, vice-president; P. W. Ogden, secretary-treasurer; Raymond Caron, Thomas Arnold, and E. Moseley, directors. The office of the president is at 1111 Beaver Hall Hill, Montreal. The head and mine offices are at Tashota.

The property consists of 10 patented claims and 7 unpatented claims, comprising about 642 acres, lying about 15 miles south of Tashota station on the main line of the Canadian National Railways, district of Thunder Bay. Access to the property is by airplane from Tashota or Jellicoe to Onaman lake, about 3 miles from the property; in winter by a 17-mile road from Tashota; and in summer by an 18-mile canoe route, starting from Paska Siding, and a 6-mile wagon road. The

claim numbers are K.K. 522-526, 536, 537, 562, 563, 565, 2,167-2,170, and 2,608-2,610.

Operations were continued at this property during 1937. The 3-compartment shaft, inclined at 70 degrees, was put down from surface to the west of the workings, which are located on claims K.K. 523 and 524. The shaft was connected with them only at the 90-foot level. The 2-compartment winze, inclined at 70 degrees, which was commenced from the 325-foot level toward the latter part of 1936, was completed to a total depth of 1,300 feet, and new levels were established at the 475-foot and 625-foot levels. Shrinkage stopes were opened up on the 625- and 475-foot levels, but the ore bodies were found to be small.

Development work on the two bottom levels failed to disclose any further ore and operations were suspended during the first week of October, 1937.

The following table shows the development work accomplished at the end of 1936, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|-----------------------|---------------------|-------|--------|
| | feet | feet | feet |
| Shaft No. 2..... | | 87 | 87 |
| Shaft No. 1..... | 367 | | 367 |
| Diamond-drilling..... | 16,719 | 2,254 | 18,973 |
| 100-FOOT LEVEL: | | | |
| Drifts..... | 426 | | 426 |
| Crosscuts..... | 55 | | 55 |
| Raises..... | 9 | | 9 |
| 200-FOOT LEVEL: | | | |
| Drifts..... | 2,079 | 47 | 2,126 |
| Crosscuts..... | 893 | | 893 |
| Raises..... | 302 | | 302 |
| 325-FOOT LEVEL: | | | |
| Drifts..... | 274 | | 274 |
| Crosscuts..... | 248 | | 248 |
| Raises..... | 112 | | 112 |
| 475-FOOT LEVEL: | | | |
| Drifts..... | 124 | 15 | 139 |
| Crosscuts..... | 5 | 94 | 99 |
| Raises..... | 131 | | 131 |
| 625-FOOT LEVEL: | | | |
| Drifts..... | | 1,047 | 1,047 |
| Crosscuts..... | | 193 | 193 |
| Raises..... | | 126 | 126 |

A new 42- by 30-inch Canadian Ingersoll-Rand double-drum hoist driven by a 60 h.p. General Electric induction motor was purchased in February, 1937, for the new inclined shaft, but was never installed as the shaft was not used. A No. 14½ Kennedy gyratory crusher was also purchased for the mill, but was not installed for use.

During 1937 the 75-ton flotation-amalgamation mill treated a total of about 15,730 tons of ore. This was taken from three shrinkage stopes on the three bottom levels of the mine.

During the period of operations in 1937 there was an average of 70 men employed, of whom 34 were underground and 8 in the mill. Andrew Robertson was mine manager, and Frank Allen was mine superintendent.

Teck-Hughes Gold Mines, Limited

Teck-Hughes Gold Mines, Limited, was incorporated in March, 1923, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 4,807,144

have been issued. The officers and directors are: Albert W. Johnston, chairman of the board; D. L. H. Forbes, president and general manager; George C. Miller, vice-president; H. C. McCloskey, secretary; K. P. Emmons, treasurer; John F. Lash and John F. Thompson, directors. The executive office is at 25 King Street West, Toronto. The mine office and head office are at Kirkland Lake.

The property in Teck township, Kirkland Lake area, district of Timiskaming, operated throughout 1937 with an average force of 557 men. J. G. McMillan is general superintendent; G. Gill, mine superintendent; and E. H. Whitman, mill superintendent.

During the calendar year 1937 the following development work was done: 1,281 feet of crosscutting, 3,153 feet of drifting, and 5,622 feet of raising. Exploration work totalled 337 feet of surface-trenching and 520 feet of surface diamond-drilling. An average of 1,127 tons of ore per day was hoisted.

The following is taken from the report of the general superintendent for the fiscal year ending August 31, 1937:—

During this period 369,652 tons of ore from the mine and 37,780 tons of old tailings were milled. The total recovery of bullion and precipitate was the equivalent of 130,885.00 troy ounces of fine gold, of which 3,747.55 troy ounces was recovered from the retreatment of old tailings. The realized value of bullion production was \$4,570,855.41; and after addition of \$104,876.88, being the interest earned on investments, the gross revenue was \$4,675,732.29, or \$11.48 per ton. The total operating cost amounted to \$2,085,083.91, or \$5.12 per ton milled. After provision of \$387,257.73 for taxes, net surplus for the fiscal year was \$2,203,390.65. An analysis of operating costs follows:—

| | Total cost | Cost per ton of ore treated | Cost per ounce of gold produced |
|---|----------------|--------------------------------|------------------------------------|
| Development and exploration..... | \$105,098.19 | \$0.26 | \$0.80 |
| Mining..... | 1,227,379.56 | 3.01 | 9.38 |
| Milling..... | 422,642.08 | 1.04 | 3.23 |
| General expense..... | 294,752.05 | .72 | 2.25 |
| Examination and exploration of new properties..... | 35,212.03 | .09 | .27 |
| Total..... | \$2,085,083.91 | \$5.12 | \$15.93 |

The technical estimate of "positive ore" reserve at September 1 is as follows:—

| | Tons | Gold content in troy ounces | Average grade in pennyweights per ton |
|------------------|---------|-----------------------------------|---|
| Broken ore..... | 216,365 | 64,129.2 | 5.93 |
| Blocked ore..... | 424,078 | 192,836.7 | 9.09 |
| Total..... | 640,443 | 256,965.9 | 8.02 |

Development footage for the fiscal year was as follows:—

| | Feet |
|---------------------------------|--------|
| Drifting..... | 2,190 |
| Crosscutting..... | 887 |
| Subdrifts and subcrosscuts..... | 6,913 |
| Raising..... | 5,161 |
| Total development..... | 15,151 |

Diamond-drill exploration amounted to 13,234 feet. Ore produced from drifting and cross-cutting totalled 2,922 tons.

New ore was found in some of the older as well as in newer parts of the mine. Sublevel exploration and development between the 43rd and 46th level horizons resulted in the finding of numerous, small, irregular ore bodies, which in aggregate amounted to a substantial tonnage of medium-grade ore.

Temiskaming Mining Company, Limited

The Temiskaming Mining Company, Limited, was incorporated in November, 1906, with an authorized capitalization of 2,500,000 shares of \$1 par value, all of which have been issued. The officers and directors are: J. P. Bickell, president; Balmer Neilly, secretary-treasurer; Strachan Johnston, W. Linton, and D. H. McDougall, directors. The head office is at 15 King Street West, Toronto.

The company owns, among other holdings, a property consisting of 3 claims, 120 acres, in Tisdale township, Porcupine area, district of Cochrane, adjoining the Schumacher section of the Dome mine on the east.

Prior to 1913 two shafts were sunk on the property to depths of 50 and 260 feet, and levels were established at 50 and 250 feet. Work on the 50-foot level consisted of 800 feet of drifting and crosscutting and 25 feet of raising. On the 250-foot level 1,100 feet of drifting and crosscutting and 50 feet of raising were done.

Operations were suspended, and the mine remained idle until May, 1937. At that time, under the technical supervision of McIntyre-Porcupine Mines, Limited, a small electrical plant was installed on surface and the workings were dewatered. Both shafts were recollared and repaired, and the workings were put into condition for operating. Some sampling and diamond-drilling were done. Two holes, having a total depth of 2,500 feet, were drilled from surface, and 6 holes, totalling 1,015 feet, were drilled from underground. Operations were suspended on January 15, 1938.

During the period of operation about 10 men were employed. The work was in charge of N. D. Adams, of the McIntyre-Porcupine mine staff.

Thesaurus Gold Mines, Limited

Thesaurus Gold Mines, Limited, has an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,332,741 have been issued. The officers and directors are: W. L. Forrest, president; G. W. Adams, secretary-treasurer; M. J. Conkey, Alexander Gillies, and P. A. Barry, directors. The head office is at 1302 Canada Permanent Building, Toronto. The mine address is Matachewan.

The property consists of 16 claims, 598.33 acres, in the township of Baden, Matachewan area, district of Timiskaming.

There is a 300-foot shaft on the property, and about 300 feet of lateral work had been done on the 100- and 300-foot levels prior to the end of 1924. In July, 1935, the mine was pumped out, and a small amount of lateral work was done on the 300-foot level. Operations ceased in September.

In January, 1937, operations were resumed, and 202 feet of diamond-drilling was done from the 300-foot level. Work was suspended in February. J. A. Little was in charge of operations.

Toburn Gold Mines, Limited

Toburn Gold Mines, Limited, was incorporated in January, 1931, with an authorized capitalization of 2,000,000 shares of no par value, of which 1,850,000 have been issued. The officers and directors are: H. A. Guess, president; R. F. Goodwin, vice-president; G. A. Brockington, secretary; C. Earl, assistant secretary; J. C. Emison, treasurer; E. C. Corson, assistant treasurer; A. W. Holmsted and S. C. Guess, directors. The head office is at 1809 Royal Bank Building, Toronto. The mine office is at Kirkland Lake.

The property consists of 10 claims, 343 acres, in Teck and Lebel townships, Kirkland Lake area, district of Timiskaming.

During 1937 an addition to the mill was built, and the necessary equipment was installed for raising the operating capacity from 100 to 150 tons per day. The new equipment included a 150-ton steel ore bin, 2 Dorr tray thickeners, an Oliver filter, five 4-inch Dorr Duplex suction pumps, one 4-inch Dorr Duplex pressure pump, one 36-inch Akins classifier, one 14-inch Akins classifier, and one agitator. Four 16- by 12-foot agitators were enlarged to 16 by 20 feet.

An average force of 192 men was employed during the year under the management of M. W. Hotchkin.

The following is taken from the annual report of the president for the year ending December 31, 1937:—

Earnings for the year 1937, after deducting administration and taxes, but before deduction of \$65,393.84 depreciation and depletion, were \$363,686.95.

INCOME STATEMENT

| | |
|---|--------------|
| Value of ore produced, less marketing expenses..... | \$908,890.70 |
| Operating expenses | 481,513.08 |
| Earnings from mine operations..... | \$427,377.62 |
| Miscellaneous loss, net..... | 4,563.37 |
| Total earnings..... | \$422,814.25 |
| DEDUCT: | |
| Administrative and legal expenses | \$7,022.72 |
| Corporate taxes (including income taxes estimated)..... | 52,104.58 |
| Depreciation and depletion..... | 65,393.84 |
| | 124,521.14 |
| Net income..... | \$298,293.11 |

SURPLUS STATEMENT

| | |
|-----------------------------------|--------------|
| Balance at beginning of year..... | \$236,758.04 |
| Net income for year..... | 298,293.11 |
| | \$535,051.15 |
| Dividends..... | 166,500.00 |
| Balance at end of year..... | \$368,551.15 |

Total development work performed at Toburn during the year 1937 amounted to 10,043 feet, which is 1,664 feet more than the development footage completed in 1936. All of this was done above the 1,018-foot level and consisted of 7,883 feet of drifting, 412 feet sublevel drifting, 703 feet of raising, 771 feet of crosscutting, and 274 feet of slashing.

Of this total, 2,511 feet of development was on ore, breaking 7,961 tons of ore, averaging 0.46 ounces gold. The previous year's comparison is 3,043 feet on ore, breaking 9,510 tons.

Approximately 83 per cent. of the above development was confined to the A-400-, 542-, 667-, and 893-foot levels. Long exploratory drifts were put out to the east on the A-400- and 893-foot levels in order to cross-section the rock formation for veins by diamond-drilling in north and south directions.

During the year diamond-drilling totalled 7,857.5 feet, consisting chiefly of horizontal holes underground put out from main eastward-pointing development drifts to locate possible parallel veins to the north and south of these headings. Outstanding development results for 1937 were:

1. Development of the high-grade ore shoot known as the No. 425-drift vein found on the A-400-foot level by diamond-drilling northward from No. 419 drift and developed for a length of 390 feet. Its vertical extension has been proved by No. 561 raise from the 542-foot level to the A-400-foot and the No. 425 raise from the A-400-foot level to the A-200-foot level. Total inclined stoping height is 437 feet.

2. The location of the Nos. 696- and 697-drift veins found on the south side of the north porphyry dike and developed for a length of 241 feet. It seems probable that this ore shoot is the downward projection of the No. 549 drift vein on the level above.

During 1937 the No. 419 drift was continued eastward for 1,865 feet, and the ground passed through was cross-sectioned by flat diamond-drill holes both north and south, but the only ore discovered was a shoot 85 feet long, averaging 0.35 ounces gold across 5 feet, located east of a major fault, and it probably is the eastward continuation of the No. 425-drift vein.

However, some further diamond-drilling is justified to completely disprove ore possibilities in the vicinity of the high-grade surface showings, which occurred in a much disturbed and faulted area farther to the east.

Production figures for 1937 compared with those of the year 1936 are:—

| Year | Tons milled | Average ounces gold per ton | Ounces fine gold produced | Percentage mill recovery |
|-----------|-------------|-----------------------------|---------------------------|--------------------------|
| 1936..... | 34,400 | 0.619 | 20,577 | 96.5 |
| 1937..... | 37,465 | .729 | 26,243 | 96.1 |

At the close of the year the mill was handling approximately 150 tons daily, the mill tonnage for December being 4,390 tons.

The estimated ore reserves broken and unbroken at December 31, 1936, were 113,800 tons, averaging 0.67 ounces gold per ton, and at December 31, 1937, were 151,850 tons, averaging 0.57 ounces gold per ton. In actual mining due to some dilution this tonnage may be somewhat increased, with corresponding decrease in grade.

This increase in the ore reserves after milling 37,465 tons, means that under the continued skilled direction of your manager, Mr. M. W. Hotchkin, 75,515 tons of new ore, averaging approximately 0.48 ounces gold per ton were found and opened up by the exploration and development of 1937.

Continental Kirkland Mines, Limited

In the annual report for 1936 details were set forth of the purchase in December, 1936, at 20 cents per share by a group made up of your company, American Smelting and Refining Company, and Premier Gold Mining Company, Limited, of 500,000 shares of the above company from the then president and various directors and 125,000 treasury shares, and of the two years' option upon all the remaining 2,009,844 shares at 20 cents per share. In this transaction your company had a one-third interest.

Beginning in March, 1937, rehabilitation was started upon the few existing buildings at No. 1 shaft of the Continental Kirkland, some new buildings, essential to proceeding with unwatering and development, were erected and the essential machinery and equipment were installed. Toward the end of May, unwatering down to the bottom or 800-foot level was started. At the end of August, this was completed and the walls of the underground workings were washed clean with high-pressure water for close geological and other inspection.

A detailed survey and mapping of the underground workings was made and the geology plotted thereon. Several flat diamond-drill holes were put out from the western part of the 800-foot level workings. One of these holes at the western end of the workings put out north-westerly cut a 5-foot width, averaging 0.26 ounces gold per ton and some lesser values, so a crosscut was driven along this hole to explore the possibilities of a commercial ore body there. During the balance of 1937 a total of 375 feet of crosscutting, 238 feet of drifting, and 25 feet of slashing was done in this area, which disclosed several quartz veins varying in width from a few inches to over 6 feet, but the only continuity of values was for a short length of 20 feet in one drift, averaging 0.42 ounces gold over a width of 4.7 feet. All other values were very low except in a few spots here and there. But the zone is well mineralized and has a sufficiently favourable appearance to justify further exploration. Therefore toward the end of December, 1937, an additional 100,000 shares of the optioned treasury shares were purchased with which to carry on, and your company's proportion of that purchase was one-third, or 33,333 shares at 20 cents per share.

A further report on Continental Kirkland Mines, Limited, appears on page 108 of this volume.

Tombill Gold Mines, Limited

Tombill Gold Mines, Limited, was incorporated in October, 1935, with an authorized capitalization of 1,000,000 shares of \$1 par value. The officers and directors are: Percy E. Hopkins, president; Fred Searls, Jr., first vice-president; Carroll Searls, second vice-president; A. W. Burt, secretary; Henry E. Dodge, treasurer; Gus Mrkvicka, assistant secretary and assistant treasurer; T. A. Johnson, W. R. G. Johnson, C. H. Ellis, and D. E. Thomas, directors. The head office and mine office are at Empire. The Toronto office is at 908 Royal Bank Building.

Work was continued throughout 1937 on the property of 6 claims, located immediately west of the property of Bankfield Gold Mines, Limited, in Lindsley township, Little Long Lac area, district of Thunder Bay.

Early in the year, electric power was brought to the property and a new mining plant was installed, including an Ingersoll-Rand double-drum electric hoist, and a 1,000-cubic-foot Ingersoll-Rand XVH compressor driven by a 200 h.p. Westinghouse synchronous motor.

Underground development was suspended for a few months in the summer during the installation of the new plant, and a considerable amount of diamond-drilling from surface was done in the interval. On August 10 the sinking of the 3-compartment, vertical shaft was resumed from the 400-foot level, and during the last three months of the year development work was carried on in preparation for production.

A 100-ton concentrating mill was erected, the equipment including a 9- by 21-inch Telsmith jaw crusher, a 3-foot Symons cone crusher, a 7- by 4-foot Hardinge ball mill, a Dorr rake classifier, 8 Denver flotation cells, and an Oliver filter. It is planned to commence milling early in 1938 and to ship the flotation concentrates to the mill of the Northern Empire Mines Company, Limited, at Empire.

The following table shows the development work accomplished at the end of 1936, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|---------------------------|---------------------|-------|-------|
| | feet | feet | feet |
| Shaft..... | 417 | 194 | 611 |
| 220-FOOT LEVEL: | | | |
| Drifts and crosscuts..... | 1,423 | ..... | 1,423 |
| Raises..... | ..... | 40 | 40 |
| 400-FOOT LEVEL: | | | |
| Drifts and crosscuts..... | 602 | 1,245 | 1,847 |
| 600-FOOT LEVEL: | | | |
| Drifts..... | ..... | 286 | 286 |
| Crosscuts..... | ..... | 226 | 226 |

Some 6,147 feet of diamond-drilling has been done from surface.

New buildings erected during the year included a bunk-house, office, warehouse, crusher-house, concentrating plant, assay office, and cap-house.

During the year there was an average of 29 men employed, of whom 10 were underground. Arthur Kendall is mine manager, and J. A. Pike is mine superintendent.

Tyranite Mines, Limited

Tyranite Mines, Limited, was incorporated in April, 1935, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,199,993 have been issued. The officers and directors are: E. L. Koons, president; W. S. Walton, secretary; C. L. Ingham, treasurer; Harry Yates and A. H. Sharpe, directors; Welles V. Moot, managing director. The head office and mine office are at Gowganda. The executive office is at 319 Erie County Bank Building, Buffalo, N.Y., and the secretary's office is at 603 Royal Bank Building, Toronto.

The property consists of 9 claims, 356 acres, in Knight and Tyrrell townships, Matachewan area, district of Timiskaming.

The mine operated throughout 1937, and the following work was accomplished: 200 feet of surface-trenching, 1,497 feet of surface diamond-drilling, 8,182 feet of underground diamond-drilling, 1,655 feet of crosscutting, and 2,115 feet of drifting. An assay laboratory, 16 by 32 feet, and an assayer's residence were built.

An average of 34 men was employed during the year under the supervision of W. J. Trestrail, superintendent.

Uchi Gold Mines, Limited

Uchi Gold Mines, Limited, was incorporated in January, 1937, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,550,006 have been issued. The officers and directors are: J. E. Hammell, president; A. L. Smith, vice-president; Robt. Fennell, secretary-treasurer; Mrs. Eola Hammell and B. H. Budgeon, directors. The head office is at 25 King Street West, Toronto. The mine address is Uchi Lake, via Hudson.

The property, which consists of 11 patented and 18 unpatented claims, totalling 1,200 acres, is located half way between Lost bay of Confederation lake and Uchi lake in Earngey township, Patricia portion of the district of Kenora. It may be reached by airplane from Sioux Lookout or Hudson on the main western line of the Canadian National Railways.

These claims were originally known as the MacAulay group. An option was given in 1927 to the Consolidated Mining and Smelting Company, who, during 1928, drilled 6 diamond-drill holes from surface, totalling 2,987 feet, and did 110 feet of crosscutting and 400 feet of drifting from a 2-compartment, vertical shaft 110 feet deep, which had been sunk by the former operators. The option was dropped and the operation closed down in February, 1929.

During the fall of 1936, J. E. Hammell, together with Val D'Or Mineral Holdings, Limited, and the Harker Gold Mines, Limited, completed 17 diamond-drill holes from surface, drilled over a length of 1,300 feet and averaging 600 feet deep. All these holes, with the exception of two, were reported to have cut commercial-grade ore.

Early in 1937 camps and plant buildings were erected and a mining plant was installed. The buildings erected included a power-house, steel shop, daily powder-house, ice-house, 2 bunk-houses, office and warehouse, 4 dwellings, 4 log cabins, 2 staff tents, stable, core-shack, cookery, cap-house, dry-house, assay office, and a main powder magazine near Uchi lake.

The plant equipment includes the following: an enclosed wooden head-frame, 40 feet high; two Leonard locomotive-type steam-boilers, totalling 130 h.p.; an Ingersoll-Rand 8- by 6-inch, double-drum steam hoist; a 110 h.p. Deutz Diesel engine; a Gardner Denver D.S.2 steel-sharpener; a 550-cubic-foot Ingersoll-Rand compressor; a 400-cubic-foot Alley and MacLellan compressor; and a 7- by 10-inch, single-drum Mead Morrison hoist (not in use).

Further sinking of the old shaft was commenced early in March, and a depth of 623 feet had been reached at the beginning of September when sinking was discontinued. New levels were established at 300, 450, and 600 feet. The development completed to the end of 1937 was as follows:—

| Level | Drifts | Crosscuts |
|---------------|------------------|------------------|
| | feet | feet |
| 100-foot..... | ¹ 993 | ² 169 |
| 310-foot..... | 864 | 94 |
| 450-foot..... | 237 | 90 |
| 600-foot..... | 743 | 107 |
| Total..... | 2,837 | 460 |

¹Includes 394 feet done prior to 1937.

²Done prior to 1937.

The following table shows the amount of diamond-drilling done on the property:—

| | Before 1937 | | 1937 | |
|-------------------|-------------|-------|-------|-------|
| | Holes | Feet | Holes | Feet |
| From surface..... | 21 | 6,864 | 18 | 6,093 |
| Underground..... | | | 122 | 6,552 |

An average of 41 men was employed daily, of whom 17 were underground. In August H. Hermance was succeeded as manager by R. H. Sturgess.

Upper Canada Mines, Limited

Upper Canada Mines, Limited, was incorporated in 1936 with an authorized capitalization of 2,500,000 shares of \$1 par value, of which 2,478,337 had been issued at December 31, 1937. The officers and directors are: R. R. Brown, president; T. J. Day, vice-president; Wm. Magladery, secretary-treasurer; Grover Murdoch and G. Goodelle, directors. The head office is at 80 Richmond Street West, Toronto. The mine office is at Kirkland Lake.

The property consists of 19 claims, 800 acres, in Gauthier township, Kirkland Lake area, district of Timiskaming.

The mine operated throughout 1937. No. 1 shaft was sunk a further 250 feet, to a total depth of 526 feet, and new levels were established at 375 and 500 feet. Lateral development amounted to 2,240 feet of drifting and 1,193 feet of crosscutting. Some 5,134 feet of diamond-drilling was done from surface and 2,807 feet from underground.

New buildings erected during the year included an office, assay office, and compressor building.

An average of 34 men was employed throughout the year under the supervision of C. W. Tully, mine superintendent.

Upper Seine Gold Mines, Limited

Upper Seine Gold Mines, Limited, was incorporated in April, 1937, to succeed the Upper Seine Gold Syndicate. The authorized capitalization is 3,000,000 shares of \$1 par value, of which 1,115,950 had been issued at December 31, 1937. The officers and directors are: Wm. L. Doyle, president; W. L. Anderson, vice-president; C. A. Mills, secretary-treasurer; Dr. E. A. Dolson, director. The head office is at 156 Yonge Street, Toronto. The mine address is Atikokan.

The property consists of 560 acres, located on Sawbill lake in the Upper Seine area, district of Rainy River. It may be reached by water in the summer, and in the winter by a 27-mile road north of Atikokan on the Port Arthur-Fort Frances branch of the Canadian National Railways. The claim numbers are F.F. 2,659-2,665, 2,730, X313, 314, and 323. The last three mining locations include the old Sawbill mine, which previously produced gold in the nineties. The underground work accomplished by the operators at that time includes a vertical shaft to a depth of 240 feet, with a total of 935 feet of lateral work. About 200 feet south of No. 1 shaft is a second vertical shaft, which is connected to the lateral workings from No. 1 shaft on the 50-foot level. On the 240-foot level, north of No. 1 shaft, a winze was sunk to a further depth of 50 feet. Stopping was carried on north and south of No. 1 shaft on the 50- and 100-foot levels.

The present operators engaged in surface exploration during 1936 and continued this throughout 1937; they also did 575 feet of diamond-drilling from surface.

In September, 1937, dewatering of the old workings was begun. At the end of the year it was reported that practically all the workings were pumped out and that sampling was in progress.

Plant equipment includes a Chicago-Pneumatic, oil-driven compressor. Buildings erected in 1937 included a machine-shop and barn.

At the end of the year there were 19 men employed, under the direction of W. N. McClintock.

Val D'Or Mineral Holdings, Limited

The Val D'Or Mineral Holdings, Limited, was incorporated September 15, 1935, with an authorized capitalization of 750,000 shares of \$1 par value, of which 511,236 have been issued. The officers and directors are: J. E. Hammell, president; A. L. Smith, vice-president; R. Fennell, secretary-treasurer; Mrs. Eola Hammell and B. H. Budgeon, directors. The head office is at 25 King Street West, Toronto, and the mine address is Box 320, Red Lake.

The company holds under option a group of 19 claims, 1,130 acres, known as the Starratt-Olsen group, about 7 miles southwest of the town of Red Lake, in Baird township, Red Lake area, Patricia portion of the district of Kenora.

Exploration work on the property consists of 9,758 feet of diamond-drilling done during 1936 and 903 feet done during 1937, and 760 feet of surface-trenching, averaging 3 feet in depth. A 2-compartment, vertical shaft was sunk to a depth of 45 feet, and 17 feet of crosscutting was done at the 32-foot horizon.

The buildings erected on the property include a blacksmith shop near the shaft, and 2 bunk-houses and a cookery at Flat lake, about a mile and a half from the shaft.

An average of 2 men was employed daily, except during the sinking period when the force was increased to 10. H. L. Edwards was the contractor for the shaft-sinking. A. G. Hattie, of the Pickle Crow Gold Mines, Limited, directed the operations.

Wascanna Mines, Limited

Wascanna Mines, Limited, which was incorporated in March, 1936, has an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,851,155 had been issued at December 20, 1937. The officers and directors are: J. H. Colville, president; E. M. Thomson, vice-president; J. A. Doupe, secretary-treasurer; H. T. Leslie, C. D. McGregor, and L. W. Nachman, directors. The head office is at 67 Yonge Street, Toronto. The mine address is Tashota.

The property consists of 13 claims, totalling about 600 acres, in the Kowkash area, district of Thunder Bay, immediately east of Tashota station on the main line of the Canadian National Railways. The claim numbers are K.K. 2,638, 2,639, 2,667-2,672, 2,694-2,696, K. 385, and T.B. 2,892. The last claim is the location of the old Tash-Orn mine, which was originally operated in 1916, following the discovery of a vein on surface about 5 feet in width containing considerable native gold.

During the early operations, a 2-compartment, vertical shaft was sunk to a depth of 152 feet and about 400 feet of lateral work was completed on the 100-foot level. During the sinking of the shaft, a test shipment was made of 1,000 pounds of ore reported to have yielded about 1.12 ounces per ton in gold.

After expenditures of about \$140,000 by the former operators, funds ran out, and the mine was closed down and remained idle until the Fort Rouille Mining

Corporation, Limited, secured the property early in 1936 and incorporated the present company.

In June, 1936, the work of pumping out the shaft was commenced, and at the beginning of October construction was begun, together with the installation of a mining plant. A spur line was also constructed to the railroad.

Underground development was continued during 1937. A mining plant was installed, including a 750-cubic-foot Bellis and Morcome compressor, driven by a 170 h.p. Ruston-Hornsby Diesel engine; a 7- by 10-inch, single-drum air hoist; and a 16 h.p. vertical boiler for heating purposes.

Buildings constructed included a shaft-house, power-house, dry-house, bunk-house, cookery, office, and one residence.

The 2-compartment, vertical shaft was sunk an additional 170 feet to a total depth of 322 feet, levels were established at 200 and 300 feet, and a total of 1,421 feet of drifting and crosscutting was accomplished.

In addition to the underground development, a total of 2,019 feet of diamond-drilling was done from surface, and 1,618 feet from the underground workings.

Operations were suspended in October, 1937. During the period of operation there were 25 men employed, of whom 15 were underground. P. W. Meahan was mine manager.

Wendigo Gold Mines, Limited

Wendigo Gold Mines, Limited, was incorporated in October, 1933, with an authorized capitalization of 2,000,000 shares of \$1 par value. The capitalization was increased to 3,000,000 shares in July, 1935, and was again increased in June, 1936, to 4,000,000 shares. The number of shares issued at December 31, 1937, was 3,472,190.

The officers and directors are: H. D. Tudor, president; H. G. Young, vice-president; H. R. Tudhope, secretary-treasurer; W. G. Cameron and J. B. Taylor, directors. The head office is at 80 King Street West, Toronto, and the mine address is Box 990, Kenora.

The property consists of 29 claims, 1,165 acres, at Witch bay, on the Lake of the Woods, district of Kenora, and includes the old Wendigo mine. The mine is about 22 miles southeast of Kenora and may be reached by boat in summer and by road in winter.

The mine and mill operated continuously during 1937. A flotation unit was added to the mill during December. The following table shows the underground development previous to 1937, during 1937, and the total:—

| | To Dec. 31, 1936 | 1937 | Total |
|-----------------|---------------------|-------|-------|
| | feet | feet | feet |
| 50-FOOT LEVEL: | | | |
| Drifts..... | 183 | ..... | 183 |
| 100-FOOT LEVEL: | | | |
| Drifts..... | 306 | ..... | 306 |
| Crosscuts..... | 56 | ..... | 56 |
| 200-FOOT LEVEL: | | | |
| Drifts..... | 863 | ..... | 863 |
| Crosscuts..... | 155 | 33 | 188 |
| Raises..... | ..... | 14 | 14 |
| 350-FOOT LEVEL: | | | |
| Drifts..... | 213 | 384 | 597 |
| Crosscuts..... | 43 | 8 | 51 |
| Raises..... | ..... | 136 | 136 |
| 500-FOOT LEVEL: | | | |
| Drifts..... | 868 | 44 | 912 |
| Crosscuts..... | 87 | 95 | 182 |
| Raises..... | ..... | 211 | 211 |

The diamond-drilling accomplished during 1936 and 1937 is shown in the following table:—

| | 1936 | 1937 | Total |
|------------------|-------|-------|-------|
| | feet | feet | feet |
| Surface..... | 1,666 | 2,406 | 4,072 |
| Underground..... | 688 | ..... | 688 |

The following table shows the production during 1937:—

| | | |
|--------------------|--------|--------------|
| Waste hoisted..... | tons | 1,904 |
| Ore hoisted..... | tons | 25,464 |
| Waste sorted..... | tons | 4,289 |
| Ore milled..... | tons | 21,175 |
| Bullion recovered: | | |
| Gold..... | ounces | 7,224.72 |
| Silver..... | ounces | 1,342.10 |
| Value..... | | \$253,316.86 |

The ore was obtained from development work and two stopes on the 350-foot and two on the 500-foot level. The mill treated an average of 65 tons of ore per day.

During 1937 the following additions were made to the mining plant: a new 8- by 11-inch Ingersoll-Rand double-drum steam hoist to operate two 2-ton skips in balance; a 575-volt, A.C. General Electric generator, driven by a Ruston-Hornsby Diesel engine; a 100 h.p. horizontal tubular boiler. New mill equipment includes the following: a 150-ton flotation unit consisting of 6 roughers and 2 cleaners, 18-cell Denver Fahrenwald No. 8 flotation units; a 48- by 18-inch Denver rotary vacuum filter; an 8- by 8-foot Denver low-head conditioner; an 11- by 8-foot Denver low-head spiral thickener; a 12- by 8-inch Denver mineral jig.

Buildings erected included a bunk-house, assay office, refinery, and addition to the power-house.

Preparations were made to deepen the shaft a further 600 feet early in 1938 and to open up new levels at 650, 800, 950, and 1,100 feet.

An average of 76 men was employed daily, of whom 35 were underground and 13 in the mill. G. G. Campbell succeeded A. M. Potter as manager in March.

W. H. Wright Property

W. H. Wright, of Barrie, owns three claims adjoining the northern boundary of the Buffalo Ankerite mine, in the township of Deloro, Porcupine area, district of Cochrane. These claims were diamond-drilled during the latter part of 1936 and in 1937. During 1937 considerable exploratory underground work was done on them from the workings of the Buffalo Ankerite mine. The following table is a summary of the work accomplished:—

| Level | Drifts | Crosscuts | Slashing |
|-----------------|--------|-----------|----------|
| | feet | feet | tons |
| 675-foot..... | 386 | 253 | 401 |
| 875-foot..... | 573 | ..... | 292 |
| 1,050-foot..... | 608 | 182 | 456 |
| Total..... | 1,567 | 435 | 1,149 |

The diamond-drilling consisted of 13 holes, totalling 13,080 feet, drilled from surface, and 16 holes, totalling 4,089 feet, drilled from underground.

A combination office and dwelling and a diamond-drill core-house were the only buildings erected on the property.

All work was suspended in September, 1937. The work was done entirely as an individual enterprise by W. H. Wright.

Wright-Hargreaves Mines, Limited

Wright-Hargreaves Mines, Limited, was incorporated in June, 1916, with an authorized capitalization of 5,500,000 shares of no par value, all of which have been issued. The officers and directors are: E. L. Miller, president; W. H. Wright, vice-president; P. H. Gerhard, secretary; Gerard F. Miller, treasurer; M. W. Summerhayes, managing director and general manager; Oliver G. Donaldson and J. Y. Murdoch, directors. R. L. Healy is assistant to the general manager. The head office is at Fort Erie North. The executive office is at the Liberty Bank Building, Buffalo, N.Y. The mine address is Kirkland Lake.

The main property consists of 4 claims, 155 acres, in Teck township, Kirkland Lake area, district of Timiskaming.

Four claims, totalling 203 acres, were staked in Morrisette township, district of Timiskaming, for use as sand pits. During the year 20,000 tons of sand were taken from the pit.

Surface rights were acquired on two fractions in Teck township, for slimes disposal. The company now owns two claims in Teck township and 8 claims in Lebel township, which are being used for slimes disposal.

The company took an option on a group of 16 claims in Hearst township, Larder Lake area, district of Timiskaming. A crew of 7 men was employed for approximately 4 months. Roads were built, 1,397 feet of trenching was done, and the property was surveyed. A contract for 2,519 feet of diamond-drilling was completed.

The Wright-Hargreaves mine and mill operated throughout 1937, the mill running at an average rate of 1,200 tons per day. An average of 852 men was employed.

Diamond-drilling on the property amounted to 26,774 feet from underground and 464 feet from surface. Lateral work underground consisted of 4,986 feet of crosscutting and 22,720 feet of drifting. Some 584 feet of raising, 6 by 8 feet, and 1,975 feet, 4 by 17 feet, were done. No. 5 winze, which is vertical and has 4 compartments, was sunk 220 feet and stations were cut at the 5,400- and 5,550-foot levels.

The following is taken from the report of the general manager for the fiscal year ending August 31, 1937:—

During the period 429,120 tons of dry ore were treated in the mill, from which we recovered 220,100 ounces fine gold and 34,653 ounces fine silver. There was realized from marketing this bullion, \$7,714,485.82.

The average grade of the ore going to the mill, at \$35.00 per ounce, was 0.534 ounce, or \$18.695 per ton, with a recovery of 0.514 ounce or \$17.977 per ton, an extraction of 96.16 per cent.

SUMMARY OF DEVELOPMENT AND EXPLORATION August 31, 1937

| | Drifting | Shaft-sinking | Cross-cutting | Raising | Total footage | Diamond-drilling | Excavation |
|-------------------|----------|---------------|---------------|---------|---------------|------------------|------------|
| | feet | feet | feet | feet | | feet | cu. ft. |
| Aug. 31, 1936.... | 179,975 | 12,471 | 57,383 | 14,043 | 263,872 | 138,714 | 630,846 |
| Fiscal year..... | 25,101 | ..... | 4,499 | 1,012 | 30,612 | 22,656 | 23,292 |
| Aug. 31, 1937.... | 205,076 | 12,471 | 61,882 | 15,055 | 294,484 | 161,370 | 654,138 |

PRODUCTION RECORD, 1921-1937

| Year | Tons milled | Value per ton | Gross value | Recovery per ton | Bullion produced | Dividends |
|----------------------------|-------------|---------------|--------------|------------------|------------------|--------------|
| 1921 (8 mos.) | 36,081 | \$13.96 | \$503,302 | \$13.00 | \$468,665 | ..... |
| 1922 ¹ | 66,181 | 12.49 | 827,447 | 11.52 | 762,752 | \$412,500 |
| 1923 | 79,242 | 10.48 | 830,992 | 9.52 | 754,978 | 206,250 |
| 1924 | 84,487 | 14.16 | 1,194,217 | 12.89 | 1,088,725 | 206,250 |
| 1925 | 147,939 | 14.49 | 2,148,554 | 12.93 | 1,913,401 | 550,000 |
| 1926 | 153,392 | 15.66 | 2,400,795 | 14.02 | 2,150,844 | 893,750 |
| 1927 | 209,164 | 11.77 | 2,455,460 | 10.51 | 2,151,916 | 1,237,500 |
| 1928 | 256,331 | 8.36 | 2,144,002 | 7.20 | 1,845,923 | 825,000 |
| 1929 | 188,238 | 10.29 | 1,938,552 | 9.25 | 1,741,872 | ..... |
| 1930 | 220,430 | 12.20 | 2,687,828 | 11.03 | 2,431,896 | 275,000 |
| 1931 | 266,352 | 12.20 | 3,248,496 | 11.37 | 3,027,848 | *825,000 |
| 1932 | 295,525 | 14.52 | 4,292,194 | 13.57 | 4,011,554 | 1,100,000 |
| 1933 (8 mos.) ³ | 193,441 | 17.85 | 3,452,207 | 16.62 | 3,215,730 | *550,000 |
| 1934 ⁵ | 330,741 | 22.44 | 7,423,229 | 21.44 | 7,089,884 | 2,750,000 |
| 1935 | 350,196 | 21.76 | 7,619,834 | 21.06 | 7,374,158 | 3,300,000 |
| 1936 | 387,464 | 20.30 | 7,866,397 | 19.60 | 7,595,231 | 3,300,000 |
| 1937 | 429,120 | 18.70 | 8,022,580 | 17.98 | 7,714,486 | 3,850,000 |
| Total | 3,694,324 | \$15.99 | \$59,056,086 | \$14.98 | \$55,339,863 | \$20,281,250 |

¹Period 1922 to 1932, inclusive, calendar years.²Years 1931 to 1937 reflect increase in value of gold.³In 1933, fiscal year closing changed to August 31.⁴April and July dividends only. ⁵12 months ending August 31.

ORE RESERVES ESTIMATE

| | Tons | Ounces | Grade | Value at \$35 per ounce |
|-------------------------------|-----------|--------|---------|-------------------------|
| On hand August 31, 1936 | 1,352,779 | 0.56 | \$19.70 | \$26,656,381 |
| Developed in fiscal year | 531,950 | .46 | 16.10 | 8,563,474 |
| | 1,884,729 | 0.53 | \$18.69 | \$35,219,855 |
| Milled in fiscal year | 429,120 | .53 | 18.70 | 8,022,580 |
| Ore reserves, August 31, 1937 | 1,455,609 | 0.53 | \$18.68 | \$27,197,275 |

ANALYSIS OF OPERATING COSTS

| | Total cost | Cost per ton milled |
|--|----------------|---------------------|
| Development, exploration, and pumping | \$509,653.24 | \$1.188 |
| Stoping | 1,098,751.36 | 2.560 |
| | \$1,608,404.60 | \$3.748 |
| Less backfilling, undistributed portion | 56,000.00 | .130 |
| | \$1,552,404.60 | \$3.618 |
| Transporting ore (hoisting, etc.) | 348,858.18 | .813 |
| Milling charges | 509,618.08 | 1.187 |
| General surface and miscellaneous mine buildings charges | 108,437.67 | .253 |
| Stock transfer, dividend and annual report expense | 24,793.74 | .058 |
| Employees' group insurance, silicosis, workmen's compensation, property taxes, and insurance | 90,113.93 | .210 |
| General and miscellaneous undistributed charges | 133,505.39 | .311 |
| Marketing bullion | 18,395.05 | .043 |
| | \$2,786,126.64 | \$6.493 |
| Provision for taxes | 665,000.00 | } 2.385 |
| Royal mint special bullion handling tax | 76,946.26 | |
| Depreciation buildings and equipment | 281,656.71 | |
| Total | \$3,809,729.61 | \$8.878 |

MILLING STATISTICS
September 1, 1936, to August 31, 1937

| | | |
|---|--------|----------------|
| Ore milled..... | tons | 429,120 |
| Average value per ton..... | | \$18.695 |
| Gross value..... | | \$8,022,580.18 |
| Loss in tailings..... | | 308,094.36 |
| Net value recovered..... | | \$7,714,485.82 |
| Average tons milled per day..... | | 1,175.67 |
| Per cent. of possible running time..... | | 97.97 |
| Tons 100 per cent. running time..... | | 1,200 |
| Solution precipitated..... | tons | 1,484,230 |
| Solution precipitated per ton of ore..... | tons | 3.46 |
| Value per ton in tailings..... | | \$0.718 |
| Yield per ton of ore..... | | \$17.986 |
| Per cent. extraction..... | | 96.16 |
| Cyanide consumed per ton of ore (K.C.N.)..... | lbs. | 0.518 |
| Zinc consumed per ton of ore..... | ounces | 1.600 |
| Zinc consumed per ton of solution..... | ounces | 0.462 |
| Lime consumed per ton of ore..... | lbs. | 3.730 |
| Steel consumed per ton of ore, ball mills..... | lbs. | 2.592 |
| Steel consumed per ton of ore, tube mills..... | lbs. | 2.615 |
| Grinding, average per cent., -325 mesh..... | | 82.8 |
| Cost of flotation reagents consumed per ton of ore..... | | \$0.045 |
| Average value of pregnant solution per ton..... | | \$5.200 |
| Average h.p. consumed per day..... | | 2,690 |
| Average h.p. consumed per ton milled..... | | 2.29 |
| Power cost per h.p. consumed..... | | \$51.70 |

Development

During the period just closed, the major portion of our development work has been centred on the levels above the 3,900-foot horizon; however, quite a little work has been done below this horizon, which has resulted in opening up considerable ore of very good grade.

Milling

Due to the greater daily tonnage being milled, the extraction was fractionally lower than the previous year, or 96.16 per cent., as against 96.55 per cent. for 1936. This greater tonnage was made possible by the addition of one tube mill and one bowl classifier, allowing an increase for the year of 117 tons daily.

General

Considerable work was done in the mine to facilitate the passing of waste and gravel to the stoping areas, greatly assisting in the safe working of the ore bodies. There was also much attention given to, and work accomplished, with regard to improving our ventilation, not only to the lower workings but to the older areas as well.

A new recreation hall was built for the use of the Wright-Hargreaves Athletic Association. This building is suitable for wrestling and boxing, basket ball, social functions, and as a gymnasium.

ADDITIONS TO PLANT, BUILDINGS, AND EQUIPMENT
September 1, 1936, to August 31, 1937

| | |
|------------------------------------|--------------|
| Mill..... | \$48,728.40 |
| Coarse crusher house..... | 10,500.51 |
| Shops..... | 2,855.04 |
| Power-house..... | 1,239.27 |
| Substation..... | 8,020.96 |
| Assay office..... | 563.97 |
| General surface and buildings..... | 12,173.13 |
| Underground equipment..... | 10,570.50 |
| Timber-treating plant..... | 3,163.98 |
| New buildings and additions..... | 34,855.01 |
| Sprinkler system..... | 2,297.41 |
| Miners' electric cap lamps..... | 9,247.48 |
| Offices..... | 1,014.71 |
| Total..... | \$145,230.37 |

Young-Davidson Mines, Limited

Young-Davidson Mines, Limited, was incorporated in April, 1926, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,584,108

had been issued by October, 1937. The officers and directors are: Gideon Grant, president; C. G. Knott, vice-president; Frank M. McKay, secretary-treasurer; W. C. Young, managing director; A. C. Ross, Jacob A. Davidson, and R. J. Driscoll, directors. The mine office and head office are at Matachewan.

The property consists of 5 claims, 161.9 acres, in Powell township, Matachewan area, district of Timiskaming, which is being operated under agreement by Hollinger Consolidated Gold Mines, Limited. A reference to the property appears on page 135 of this report.

During 1937 No. 2 shaft was raised 101 feet and 279 feet of development raise was driven. Some 405 feet of crosscutting and 1,914 feet of drifting were done. Diamond-drilling from underground totalled 1,523 feet. An average of 930 tons per day was milled during the year.

An average force of 206 men was employed under the direction of H. North, mine manager.

Young-Shannon Gold Mines, Limited

Young-Shannon Gold Mines, Limited, was incorporated in January, 1932, with an authorized capitalization of 3,000,000 shares of no par value. The officers and directors are: C. T. Young, president; A. J. Bolton, vice-president; W. C. Huff, secretary-treasurer; Gerard Ruel, Duncan McLaren, and Oscar R. Smith, directors. The head office is at 1 Toronto Street, Toronto.

Work was continued in 1937 on the property of the Martin Syndicate in Chester township, Three Duck Lakes area, district of Sudbury, until the end of March, and was then suspended for the rest of the year. A total of 160 feet of drifting was done on the 200-foot level. About 500 feet of diamond-drilling was also done.

An average of 26 men was employed during the period of operation. A. E. Taylor was in charge. The mine address is Gogama.

GRAPHITE

Black Donald Graphite Company, Limited

Black Donald Graphite Company, Limited, was incorporated in 1906, with an authorized capital of 3,000 shares of \$100 par value, all of which are issued. The officers are: R. F. Bunting, president; W. B. Bunting, vice-president; R. A. Telfer, secretary-treasurer. The head office and mine office are at Calabogie.

The property consists of 300 acres in Brougham township, Renfrew county. The mine and mill operated throughout 1938, producing an average of 25 tons of graphite per day.

Development work consisted of 22 feet of crosscutting and 400 feet of drifting. A new ball mill was installed during the year.

An average of 34 men was employed under the direction of W. B. Bunting.

GYPSUM

Canadian Gypsum Company, Limited

The Canadian Gypsum Company, Limited, as a capitalization of 3,000 shares of \$100 par value. The officers and directors of the company are: O. M. Knode, president; W. L. Keady, vice-president; C. H. Shaver, secretary-treasurer, F. B. Gibbs, director of sales; S. L. Avery, J. E. MacLeish, and Otis Wack, directors. W. F. Anderson is production manager and B. S. Barns, agent and

comptroller. The head office is at Windsor, N.S., and the business office is at 1221 Bay Street, Toronto. Otis Wack, Windsor, N.S., is director of operations.

The company operates a gypsum mine and plant near Hagersville, in Oneida township, Haldimand county. All commercial gypsum products are produced at the plant, which includes a mill, wall board, and block manufacturing buildings. During 1936 some 32,499 tons of gypsum were mined. An average of 35 men was employed. W. E. Allen, Hagersville, is superintendent.

The company also operates a quarry and lime plant at Guelph; a large gypsum quarry at Windsor, N.S.; a gypsum mill at Hillsborough, N.B.; a gypsum calcining mill at Iona, Cape Breton; and a winter gypsum storage depot at Deep Brook, N.S.

Through a wholly owned subsidiary, Toronto Asphalt Roofing Manufacturing Company, Limited, the company owns and operates an asphalt roofing plant at Mount Dennis, Ont.

Associated with the company is the Gypsum Packet Company, Limited, operating four 7,000-ton freight and passenger steamers between Nova Scotia and United States ports.

Gypsum, Lime and Alabastine, Canada, Limited

Gypsum, Lime and Alabastine, Canada, Limited, has a capitalization of 2,000,000 shares of no par value. The officers are R. E. Haire, president and manager; S. H. J. Reid, secretary-treasurer; W. E. Armstrong, Henry Cockshutt, H. J. Haire, Jas. R. Inksater, G. H. Kranenberg, J. E. McConnell, R. S. McCurdy, N. L. Nathanson, W. C. Pitfield, and John F. Cameron, directors. The head office is at Paris, Ont.

The mine and mill at Caledonia, Seneca township, Haldimand county, was operated throughout the year. L. V. Robinson was superintendent, employing an average of 64 men.

There were hoisted 36,170 tons of rock. Of this, some 3,310 tons were milled and sold, and the rest was manufactured into land-plaster, stucco, Paristone, Gyproc, dry Insulux, Gyproc wool, gypsum lath, and other building products.

In addition to the Caledonia mine, the company operates gypsum plants at Montreal, Winnipeg, Vancouver, and Calgary. Lime plants are situated at Beachville, Elora, Hespeler, Milton, Limehouse, and Puslinch, Ont., and at St. Mark and Joliette, Que. Quarries are operated at Mabou, N.S.; Gypsumville, Man.; and Salmon River, B.C. The alabastine plant is at Paris, Ont.

IRON

Algoma Ore Properties, Limited

Algoma Ore Properties, Limited, was incorporated in February, 1936, with an authorized capitalization of 50,000 shares of no par value. The officers and directors are: Sir James Dunn, president; T. F. Rahilly and Ward Wright, vice-presidents; William Jeffrey, secretary; E. W. Shell, treasurer; Edmund Carey, comptroller; W. C. Franz, J. A. McPhail, E. G. McMillan, and H. E. Langford, directors. The executive office is at Sault Ste. Marie.

This company is a wholly owned subsidiary of the Algoma Steel Corporation, Limited, from which various iron properties in Algoma district were acquired, including the Helen mine in township 29, range 24.

Construction work was started at the Helen mine in August, and by the end of 1937 an office, warehouse, blacksmith shop, compressor-house, temporary

substation, pump-house, inclined tramway and hoist-house, steam-heating plant, cookery, and 2 bunk-houses, were erected. A transmission line was completed to obtain electrical power from the Great Lakes Power Company's plant at High Falls.

Two 350-cubic-foot electric compressors were installed, and underground work was started on December 15. By the end of the year 36 feet of adit had been driven.

An average of 42 men was employed during the working period, under the direction of A. A. Richardson. The mine address is Helen Mine.

M. A. Hanna Company

The M. A. Hanna Company, of Iron River, Michigan, sampled the Moose Mountain iron mine in Hutton township, district of Sudbury, during the late summer of 1937. A 60-ton sample was obtained for experimental testing in the United States.

An average of 6 men was employed for three months under the direction of G. B. Hunner.

Minaki Mining and Development Company, Limited

The Minaki Mining and Development Company, Limited, was incorporated on May 31, 1937, with an authorized capitalization of 300,000 shares of no par value, of which 100,000 shares have been issued privately. The officers and directors are: R. Morison, president; C. F. Gray, vice-president and consulting engineer; B. C. Parker, secretary-treasurer; C. F. Stokvis, A. Stokkink, J. G. Wiebenga, F. McCallum, J. R. Brodie, and W. J. Dickson, directors. The head office address is c/o Popham and Benedickson, Kenora. The address of C. F. Gray, the consulting engineer, is 204 Birks Building, Winnipeg, Man. The mine address is Minaki.

The property consists of 10 claims, 8 of which were acquired during 1937, about 6 miles northeast of Minaki on the Canadian National railway, in Kenora district. The property is best reached from Ena on the Canadian National railway, via Ena lake, over a short portage, and into Outlet bay of Vermilion lake.

Work was carried on during 1937 from June 1 to August 15, and from November 1 to December 20, and consisted of 100 feet of trenching, 4 to 5 feet deep; 14 diamond-drill holes, totalling 2,018 feet; a 5- by 6-foot timbered tunnel, 90 feet long; and an open pit, 58 by 25 feet and from 5 to 8 feet deep. Solid sulphides were exposed over the whole area of the open pit. There are test pits, 22 to 25 feet deep, sunk by previous operators.

Buildings erected on the property include a bunk-house, cookery, office, and blacksmith shop. There is no mining equipment on the property yet.

This company is interested in a deposit of iron pyrites reported to contain 46 per cent. native sulphur. A large tonnage has been indicated.

The average number of men employed daily was 4. C. F. Gray was in charge of operations.

LEAD AND ZINC

Consolidated Lead Mines, Limited

Consolidated Lead Mines, Limited, was incorporated on March 21, 1936, with an authorized capitalization of 3,000,000 shares of \$1 par value. The

officers and directors are: Alexander Watson, president; V. I. Tiffin, secretary-treasurer; M. H. Robertson, J. A. McLean, and J. E. McPhail, directors. The head office is at 21 King Street West, Toronto.

The property, consisting of 100 acres, on lot 2, concession V, Somerville township, Victoria county, was formerly known as the Victoria mine, and was operated by Summerville Lead Mines, Limited.

The previous operators erected camp and plant buildings and sank a 2-compartment shaft, with levels at 50 and 100 feet.

Operations were carried on during July and August, 1937. A small steam hoist and compressor plant were installed, and the shaft was dewatered and reconditioned. Some drifting was done on the 100-foot level. A concentrator with a capacity of 50 tons per day was installed.

About 16 men were employed under the management of John Price. The mine address was Burnt River.

Katherine Lead Mines, Limited

Katherine Lead Mines, Limited, was incorporated on February 5, 1937, with an authorized capitalization of 1,500,000 shares of \$1 par value. The officers and directors are: Jas. McCluskey, president; M. O. Inglis, secretary-treasurer; Auguste Lemieux, Duncan McLaren, and Christopher Lewis, directors. The head office is at 80 King Street West, Toronto.

The property is located in Lake township, Hastings county, about 3 miles northwest of Millbridge.

Operations in 1937 commenced in April and ceased on December 31. During this time new camp and plant buildings and the framework of a small concentrator were erected. A 7- by 10-inch air hoist and a Diesel-driven air compressor were installed. The shaft was reconditioned, and some underground work was done.

C. W. Thompson was manager until September and was succeeded by Ralph Adair, who was in charge until the cessation of operations. An average of 22 men was employed. The mine office was at Millbridge.

Lake Geneva Mining Company, Limited

Lake Geneva Mining Company, Limited, was incorporated in April, 1928. The authorized capitalization was increased from 1,000,000 to 1,500,000 shares of \$1 par value during 1937.

The officers and directors are: C. D. H. MacAlpine, president; A. A. MacKay, vice-president; P. C. Finlay, secretary-treasurer; Leo. H. Timmins and Leo. George, directors. The head office is at 941 Dominion Square Building, Montreal.

The property is located in Hess township, district of Sudbury, and contains a lead-zinc deposit.

Work was resumed in March, 1937, after being suspended since April, 1930. In the previous operation a vertical 2-compartment shaft was sunk to a depth of 250 feet, and a level established at 235 feet, on which 714 feet of drifting, 68 feet of crosscutting, 328 feet of raising, and 47 feet of sublevel drifting were accomplished. During 1937 the shaft was deepened to 400 feet, and a station cut at 375 feet. The backs were slashed on the 235-foot level in preparation for stoping.

Underground work was suspended on August 27, when the power plant was destroyed by fire. The plant was rehabilitated, following which the property was closed down at the end of November to await an improvement in lead-zinc prices.

The plant included a 240 h.p. Fairbanks-Morse Diesel engine, driving a 200 k.v.a. generator; a Canadian Ingersoll-Rand 140 h.p. SKF Diesel engine, driving a 125 k.v.a. generator; a 600-cubic-foot oil engine; and an Ingersoll-Rand double-drum electric hoist.

A 100-ton concentrator was constructed during 1937 and put into operation on July 27. A total of 1,287 tons of ore was concentrated before the power plant was destroyed. The equipment included a 12- by 20-inch jaw crusher, 2-foot Symons crusher, Niagara screen, 6- by 4-foot ball mill, drag classifier, two 6-cel and one 2-cell General Engineering Company flotation units.

An average of 37 men was employed during the period of operation under the direction of W. E. Bawden. The mine address is Benny.

MOLYBDENITE

Phoenix Molybdenite Corporation, Limited

Phoenix Molybdenite Corporation, Limited, was incorporated in October 1923, with a capitalization of \$1,000,000. In 1937 the capitalization was increased to 2,000,000 shares of \$1 par value. The officers and directors are: Dr. J. S. Boyd, president; W. H. Hamblin, vice-president and managing director; E. E. Trent, secretary-treasurer; T. W. Best and F. L. Stinson, directors. The head office is at Room 620, Federal Building, Toronto.

The property is on the west half of lots 27 and 28, concession IV, Bagot township, Renfrew county, and contains 200 acres.

The shaft is 200 feet deep, with levels at 95 and 175 feet, and a considerable amount of lateral development work has been done. Stopping was begun on the 95-foot level in 1936.

In 1937 the mine and mill operated from early in August to November 30, when work was temporarily suspended. During this period a small amount of lateral work was done, and 5,287 tons of ore were mined and milled.

An average of 24 men was employed for four months, under the direction of Wm. Haybaker, foreman. The mine address is Ashdad.

NICKEL AND COPPER

Denison Nickel Mines, Limited

Denison Nickel Mines, Limited, was incorporated in November, 1936, with an authorized capitalization of 3,500,000 shares of \$1 par value. The officers and directors are: J. R. Rea, president; J. H. Greenberg, vice-president; M. Campbell, secretary-treasurer; H. L. Sheppard and L. B. Sheppard, directors. The head office is at 217 Bay Street, Toronto. The mine address is Worthington. The property is located in Denison township, district of Sudbury.

Operations were started in January, 1937. A vertical, 3-compartment shaft was sunk to a depth of 522 feet, and levels were established at 200, 350, and 500 feet. The development work accomplished on these levels during 1937 was as follows:—

| Level | Drifting | Crosscutting |
|---------------|----------|--------------|
| | feet | feet |
| 200-foot..... | 468 | 637 |
| 350-foot..... | 30 | 105 |
| 500-foot..... | 348 | 397 |
| Total..... | 846 | 1,139 |

A total of 288 feet of diamond-drilling was done during the year.

The plant included a 437-cubic-foot Gardner-Denver compressor driven by a 128 h.p. Caterpillar Diesel engine, a 7- by 10-inch single-drum steam hoist, a 24 h.p. boiler, and a 27 h.p. boiler. Buildings erected included an office, hoist-compressor building, change-house, and blacksmith shop.

An average of 28 men was employed. W. Harmon and Carl R. Boehm were successively in charge of operations.

Falconbridge Nickel Mines, Limited

Falconbridge Nickel Mines, Limited, was incorporated in August, 1928, with an authorized capitalization of 5,000,000 shares of no par value. The officers and directors are: J. Gordon Hardy, president; Thayer Lindsley and Halstead Lindsley, vice-presidents; N. F. Parkinson, secretary-treasurer; W. S. Morlock, H. S. Munroe, and H. Whittingham, directors. The head office is at 25 King Street West, Toronto.

The company operates a nickel-copper mine, concentrator, and smelter in Sudbury district, and a refinery at Kristiansand, Norway. Ernest Craig is manager of the Sudbury district operations; J. R. Gill, assistant manager; E. J. Martin, mine superintendent; R. C. Mott, concentrator superintendent; and M. J. Tamplin, smelter superintendent. During 1937 an average of 700 men was employed, of whom 253 were underground. The mine address is Falconbridge.

The following is an extract from the annual report of the company for the year ending December 31, 1937:—

All units of the plant, as completed in the expansion programme of 1936, were in continuous operation throughout the year, with the expected increase in production being fully realized.

Mine Development

Combined development footages completed on all levels during the year were as follows:—

| | Feet |
|---|---------|
| Drifting and crosscutting (including slashing)..... | 5,141 |
| Raising (including slashing)..... | 1,666 |
| Fill passes (including slashing)..... | 602 |
| Diamond-drilling..... | 4,054 |
| Shaft-sinking (including 30 feet of winzes)..... | 945 |
| | cu. ft. |
| Station-cutting..... | 47,365 |

Of the total of 5,141 feet of drifting and crosscutting, 3,518 feet were along the ore zone on different levels, the greater part of this footage being accounted for on the 1,200- and 1,750-foot levels at No. 5 shaft. On the latter level, where a start has been made to explore this deeper horizon, ore was exposed throughout the 1,340 feet driven, showing an average width of about 11 feet and with grade somewhat above mine average.

On the 1,200-foot level, a further advance of 495 feet, to a point 1,952 feet east of No. 5 shaft, terminated in ore, but of somewhat lower than average grade for this level. This, in addition to a westerly advance of 518 feet beyond No. 1 shaft in a high-grade but narrow ore zone, served to open up a total length of 4,900 feet of practically continuous ore on this level. The remaining footage was driven in preparation for stoping in already recorded blocks.

No. 1 shaft was deepened 915 feet from the sump below the 1,200 level to a total depth of 2,126 feet. Stations were cut commencing at 1,400 feet, and thereafter at 175-foot intervals to 2,100 feet. While the ore body was crosscut only at 1,750 feet, showing there 10 feet of better than average grade ore, diamond-drilling from the 2,100-foot level revealed a continuation of the ore zone to at least 2,275 feet. At the end of the year, preparation was under way to resume sinking of No. 5 shaft early in 1938. The fill-pass system at No. 1 shaft was extended to the 1,000-foot level, and a start made on a system to serve the No. 5 shaft area.

Ore Reserves

The satisfactory development reported last year on the then bottom level at 1,200 feet was at least equalled, if not bettered, by our experience on the present bottom level at 1,750 feet. It is noteworthy that, in addition to the new areas in the Falconbridge mine itself, we are now able to

bring into the ore reserves, for the first time, tonnages from our holdings in other sections of the Sudbury district. Hence, the figures we would present are the following:—

| | Tons |
|---|------------------|
| Ore reserves as of December 31, 1936..... | 5,331,076 |
| New ore added in 1937 in Falconbridge mine..... | 1,217,978 |
| New ore added from outside holdings..... | 249,000 |
| Total..... | 6,798,054 |
| Less ore drawn during 1937..... | 465,453 |
| Total ore reserves (averaging 1.82 per cent. nickel and 0.89 per cent. copper), December 31, 1937..... | 6,332,601 |

Ore Production

Mining activities for ore production summarize as follows:—

| | Tons |
|---|----------------|
| Broken ore reserves, December 31, 1936..... | 336,185 |
| Ore broken in stopes during 1937..... | 343,499 |
| Total..... | 679,684 |
| Less: trammed from stopes, 1937..... | 427,105 |
| Broken ore balance, December 31, 1937..... | 252,579 |

Since a portion of the ore production came from development, tonnage of ore hoisted tabulates as below:—

| | Tons |
|---------------------------------------|----------------|
| Ore trammed from stopes, 1937..... | 427,105 |
| Ore from development, 1937..... | 38,348 |
| Total..... | 465,453 |
| Less: waste rejected underground..... | 14,911 |
| Total ore hoisted..... | 450,542 |

Several shrinkage stopes above the 500-foot level were completely drawn during the year, and these openings are being backfilled as rapidly as possible.

Ore Treatment

The ore-dressing plant, operated on a 6-day-week basis, records 309 operating days, while the reduction plants lost only 3 per cent. of full operating time, accounted for by periodic repair campaigns.

From the total ore hoisted, some 12,243 tons of waste were picked and discarded. This, together with a slight reduction for difference in above-ground storage inventory, develops the reduction plant performance as follows:—

| | Short tons |
|---|---------------|
| Total ore treated (made up of 195,658 tons of milling ore and 242,971 tons of smelter ore)..... | 438,629 |
| Matte produced..... | 13,384.2 |
| Nickel in matte produced..... | 7,384.4 |
| Copper in matte produced..... | 3,522.8 |
| NICKEL: | Pounds |
| Recovered per ton treated..... | 33.67 |
| Metallurgical losses per ton treated..... | 3.69 |
| Indicated grade of ore treated (1.87 per cent.)..... | 37.36 |
| COPPER: | |
| Recovered per ton treated..... | 16.06 |
| Metallurgical losses per ton treated..... | 2.43 |
| Indicated grade of ore treated (0.925 per cent.)..... | 18.49 |

The trend towards the elimination of waste rock by concentration is still further emphasized this year by the reduction in tonnage of waste picked and the larger proportion of ore being milled.

Construction

Though the main units added in 1936 were in operation, considerable expenditure was necessary to round out that extensive programme. It was found necessary to rearrange and extend the

grinding facilities and add further flotation, thickening, and filtering equipment, involving also an addition to the building. To improve conditions in the sintering plant, a third machine was installed, with such changes and additions as were necessary to the building and accessory equipment. Housing facilities in the townsite were further increased by the construction of ten dwellings. Accommodation for the medical office, first-aid hospital, and doctor's residence was provided in a new building erected in a central location.

Refinery

The refinery, which is located in Norway, operated steadily and normally throughout the year with the exception of a 5-weeks' close-down due to a strike and the disorganization due to same. The excess of matte, which during this period was accumulated beyond what was needed to restore the depleted matte stocks at the refinery, will completely have been worked off during the next few months. Certain remaining parts of the 1936 extension programme were finished during the year. A new laboratory was built, the boiler-house extended, and a new boiler installed. Building of a plant for recovery of SO_2 from the roaster gases was started and should be finished in the early summer. Custom nickel matte containing 895.76 metric tons of nickel was received. This was somewhat less than the normal amount.

For the year 1937, the amount of metals in matte received from the smelter, the refinery production, the metals in process and metals in matte on hand at the end of the year is set out in the following table:—

| | Nickel | Copper |
|---|------------|-----------|
| | lbs. | lbs. |
| Total of custom and Falconbridge refined metals produced..... | 14,858,490 | 7,619,279 |
| Metals in Falconbridge matte received, less refining losses..... | 14,208,045 | 6,707,881 |
| Produced in marketable form during year—for Falconbridge..... | 12,869,776 | 6,210,593 |
| Metals in process of refining at end of year—for Falconbridge.... | 2,209,804 | 468,970 |
| Metals in matte on hand at end of year—for Falconbridge..... | 1,685,530 | 751,194 |

International Nickel Company of Canada, Limited

The authorized capital of the International Nickel Company of Canada, Limited, consists of \$27,679,900 of preferred shares of \$100 and \$5 par value, and 15,000,000 shares of common stock of no par value.

The officers are: Robert C. Stanley, chairman of the board and president; John F. Thompson, executive vice-president; Paul D. Merica, Donald MacAskill, and D. Owen Evans, vice-presidents; John C. Nicholls, assistant to the president; James L. Ashley, secretary-treasurer.

The directors whose term expires in 1938 are: J. P. Bickell, Hon. H. Cockshutt, Wm. N. Cromwell, D. Owen Evans, Sir Harry McGowan, R. H. McMaster, Wm. W. Mein, Rt. Hon. Lord Melchett, Paul D. Merica, Sir Robert Mond, Thomas Morrison, Seward Prosser, and Grant B. Shipley.

The directors whose term expires in 1939 are: James L. Ashley, John F. Dulles, Reg. Halladay, Donald MacAskill, J. W. McConnell, R. S. McLaughlin, Britton Osler, J. A. Richardson, Robt. C. Stanley, Andrew V. Stout, John F. Thompson, and Rt. Hon. Lord Weir of Eastwood.

The executive office is at 67 Wall Street, New York, N.Y., and the general offices are at Copper Cliff, Ont.

This company and subsidiary companies operate hydro-electric plants at High Falls, Big Eddy, Wabageshik, and Nairn Falls, Ont.; nickel-copper mines in the Sudbury district, Ont.; smelters at Copper Cliff and Coniston, Ont.; refineries at Copper Cliff and Port Colborne, Ont., Acton, England, and Clydach, Wales; rolling mills at Birmingham, England, Huntington, W. Va., and Glasgow, Scotland; a colliery at Pontardawe, Wales; and a foundry at Bayonne, N.J.

The following information is extracted from the annual report of the company covering the year ending December 31, 1937:—

General

This report for the year 1937 shows an increase in net profit of 36 per cent. over that of 1936, the previous record year.

Sales of nickel exceeded those of 1936 by 23 per cent., notwithstanding a marked decrease in consumption in the United States during the last quarter. There was an increase in sales of copper over prior years, while sales of the platinum metals, although approaching record volume during the first nine months, decreased sharply in the final months.

The price of nickel remained unchanged except for a downward adjustment in the sterling price at the beginning of the year. The prices realized for copper and platinum declined during the last four months.

Expenditures for additions and betterments throughout all of the company's plants amounted to \$7,924,204.19.

Capital expenditures of about \$14,000,000 are contemplated for 1938. The improvements planned are not, with the exception of the development in Finland, directed primarily towards increased production but are designed to effect economies throughout all your company's plants in an endeavour to offset higher wages, shortened working hours, and also taxes and other charges which are beyond the control of your management.

Adequate plant research laboratories staffed by competent investigators are essential in conducting economically the complex metallurgical processes used in the separation and refining of nickel and copper. During the past year the technical departments of all the company's larger works have been augmented both with respect to laboratory facilities and personnel.

A net profit of \$50,299,623.81 was realized after all charges, including provision for taxes, depreciation, ore depletion, and other purposes. After payment of preferred dividends of \$1,933,898.75, there remained \$48,365,725.06, equivalent to \$3.31 per share of common stock.

Sales

| | 1937 | 1936 |
|---|-------------|-------------|
| | pounds | pounds |
| Nickel in refinery and smelter products (Copper Cliff, Port Colborne, Clydach)..... | 173,386,406 | 133,141,180 |
| Nickel in rolling mill and foundry products (Birmingham, Glasgow, Huntingdon, Bayonne)..... | 29,881,744 | 31,921,050 |
| Nickel in salts and chemicals..... | 4,432,793 | 3,865,750 |
| Totals sales of nickel in all forms..... | 207,700,943 | 168,927,980 |
| Monel metal..... | 19,494,912 | 16,730,789 |
| Rolled nickel..... | 12,066,459 | 15,856,614 |
| Inconel..... | 1,115,367 | 731,952 |
| Copper..... | 291,880,403 | 265,954,589 |
| Selenium..... | 81,334 | 107,791 |
| Tellurium..... | 4,423 | 2,567 |
| | ounces | ounces |
| Gold..... | 75,840 | 73,142 |
| Silver..... | 2,356,170 | 2,425,332 |
| Platinum metals..... | 188,756 | 220,980 |

Mines

Ore requirements were extracted from four mines as follows:—

| | |
|-----------------|------------|
| | Short tons |
| Frood..... | 3,804,409 |
| Cresighton..... | 1,283,046 |
| Levack..... | 399,076 |
| Garson..... | 393,747 |
| Total..... | 5,880,278 |

The Levack mine was reopened in March. A new shaft, 16 by 28 feet in cross-section is being sunk to a depth of 2,000 feet. This shaft, together with a new surface plant and mine equipment, will be ready for operation in 1939 for an output up to 4,000 tons per day.

As a result of a comprehensive survey it has been decided to adopt open-pit mining for the upper portion of the Frood ore body. Equipment for this purpose will be installed promptly and it is expected that 4,000 tons of ore per day will be available from this operation during the early months of 1939. While the grade of ore is somewhat lower than that now being mined, great economies in mining costs will be effected. Moreover, and of greater importance, the combination of surface mining and mining at depth will assure an average grade of ore over the future life of this mine.

In all the mines ordinary development was continued at a rate conforming with production requirements. The total footage advance was 60,639 feet, thus bringing the total underground workings in the four operating mines to 673,120 feet, or approximately 127 miles. Every effort has been made to improve working conditions and minimize the risk of injuries underground. It is gratifying to report that, through continued co-operation between employees and the safety department, time loss due to accidents was reduced to 5.25 working shifts per thousand shifts of eight hours each, comparable with 6.05 per thousand reported for 1936.

Smelters

The concentrator operated at capacity and treated 4,583,100 tons of ore at a rate slightly in excess of 12,500 tons per day. A new tailings disposal scheme was started in 1937, the old disposal area having been filled. The new basin is $3\frac{1}{2}$ miles from the mill, and it is estimated that at the present rate of operation it will provide a tailings disposal area for more than 25 years. The necessary funds have been appropriated to enlarge the concentrator to treat the ore from the open-pit mining operation of the Frood mine. As the result of technical study and experimentation, improvements in process and equipment were attained.

The Copper Cliff smelter produced 188,169 tons of bessemer matte and 158,100 tons of converter copper. An intensive campaign was conducted by the research laboratory staff to improve the recovery of metals. The progress made has been very gratifying and indicates clearly the valuable assistance this new research laboratory can contribute to process operations.

The Coniston smelter was operated at full capacity. Ore to the amount of 891,956 tons was treated, and 54,329 tons of bessemer matte produced.

Refineries

Port Colborne Nickel Refinery.—Capacity having been increased, this refinery produced 147,264,099 pounds of refined nickel. The plant research staff was augmented and more adequate laboratory facilities installed. As the result of the activities of this department many improvements in process and plant have already been attained or are indicated. Over recent years the advance in metallurgy has lowered operating costs and thereby offset to a considerable extent higher wages, shortened hours, and other increasing charges against plant operations.

Ontario Refining Company, Limited.—This refinery processed 159,286 tons of converter copper produced by the Copper Cliff smelter and produced 145,600 tons of refined copper. The converter copper received during the year was largely in the form of metal, which was transported in molten form from the Copper Cliff smelter and charged directly to the anode furnaces, thus effecting a substantial reduction in operating expenses. Additional transfer cars have been purchased, and henceforth all converter copper will be transferred to the refinery as molten metal. Operating costs increased somewhat, due to an advance in wages and to the higher cost of supplies. However, operating results were satisfactory and a high standard of quality was maintained. The research department was engaged actively in development work and in studies of processes. The results of its work in co-operation with the operating staff were reflected in increased efficiencies, particularly in important advances in electric-furnace refining. The established high quality of "ORC" brand of refined copper was maintained and is favourably known to European consumers.

Ore Reserves

Proven ore reserves at December 31, 1937, were 206,397,000 short tons. While the total ore reserves show an increase of 3,777,000 tons over the figures first reported in 1930 the net result is that, due to the inclusion of lower grade ores, the total ore reserves now contain 6,739,000 tons of copper-nickel, comparable with 6,927,000 tons of copper-nickel in the reserves as at December 31, 1929.

A campaign of exploratory diamond-drilling was conducted by the geological department. This drilling was done to obtain a more intimate knowledge of known ore occurrences on your company's properties in order to determine economic areas for future mining operations.

Outlook

This is the fifth successive report dealing with a period of trade expansion and increasing profits. During these more prosperous years every phase of your company's mine-to-market programme has been critically studied with the object of producing metals of superior quality and providing the highest standard of service to the consumers. Not only have plants been modernized and further enlarged to meet the demands of a growing industry, but the mines have been so developed that ample ore of uniform grade may be available as required. Research and market development activities have been vigorously pursued with the result that new outlets for nickel are being discovered and consumption for known uses substantially increased. Moreover, all of the company's funded obligations have been retired and more adequate cash reserves have been established.

The sharp trade recession which developed in the United States during the closing months of the year, and to a lesser extent in other countries, caused a considerable decrease in the demand for nickel and the company's other metals. While the immediate outlook is uncertain, there are indications of improvement. Your company is in an advantageous position due to its ore reserves, water powers, modernized plants, experienced personnel, and financial strength. Thus, if world business improves, and no further international trade restrictions are imposed, your company should enjoy continuing prosperity.

Employees

The total number of employees at the year-end was 17,434, distributed as follows: Canada, 11,486; Great Britain, 3,421; United States, 2,472; other countries, 55. Employees on December 31, 1936, numbered 15,433. The increase, amounting to 13 per cent., was due to the larger scale of operations.

During 1937 an average of 2,759 men was employed at Copper Cliff, 504 at Coniston, 2,745 at Frood, 1,077 at Creighton, 401 at Levack, and 243 at Garson. Of these, an average of 2,276 was employed underground at Frood, 766 at Creighton, 102 at Levack, and 168 at Garson.

Donald MacAskill is general manager; R. D. Parker, general superintendent; H. J. Mutz, superintendent of mines; P. F. MacDonald, superintendent of smelters; D. Finlayson, assistant superintendent of smelters; F. J. Eager, superintendent of the Frood mine; B. F. Crandall, superintendent of the Creighton mine; C. H. Stewart, superintendent of the Levack mine; J. B. Fyfe, superintendent of the Garson mine; R. M. Coleman, superintendent of the Copper Cliff smelter; E. Herbert Rose, superintendent of the Copper Cliff concentrator; E. T. Austin, superintendent of the Coniston smelter.

Ontario Nickel Corporation, Limited

Ontario Nickel Corporation, Limited, was incorporated in December, 1936, with an authorized capitalization of 6,000,000 shares of \$1 par value. The officers and directors are: Paul M. Macklin, chairman; A. L. Herbert, vice-president; Gordon McLaughlin, secretary-treasurer; B. W. Watkins, managing director; Hon. James Lyons and W. G. Watkins, directors. Geo. M. Lee is manager. The head office is at 38 King Street West, Toronto.

During 1937 the company carried on work on several properties. Some surface operation and construction work were done at the Alexo property in Dundonald and Clergue townships, district of Cochrane, between January 25 and March 31, following which the option was dropped. At the Mount Nickel property, in Blezard township, district of Sudbury, some 3,547 feet of surface diamond-drilling was done between June 1 and August 31. The option was dropped in September. Prospecting, stripping, and trenching were done on the Norman township claims, district of Sudbury.

The Cuniptau mine, consisting of 63 claims, 2,500 acres, in Strathy township, district of Nipissing, was acquired from Cuniptau Mines, Limited, for \$15,000 cash and 1,200,000 shares of Ontario Nickel. From January 1 to July 15, some 957 feet of surface diamond-drilling and 2,628 feet of underground diamond-drilling were done. The mine address is Goward.

PEAT

H. L. Hodgkins and Son

At a peat operation near the Forks Road, 5 miles from the village of Wainfleet, Wainfleet township, Welland county, 15 tons of peat was produced. The operators are H. L. Hodgkins and Son, R.R. 2, St. Ann's. Three men were employed intermittently during the summer.

Industrial Compounds, Limited

Industrial Compounds, Limited, was incorporated on August 6, 1936, with an authorized capitalization of 10,000 shares of \$10 each and 100,000 common shares of no par value. The officers are: Jas. A. Brand, president; W. W. Taylor,

vice-president; Donald Linden, secretary-treasurer. The head office is at 215 Crown Life Building, Toronto, and the property address is Grand Valley.

The property is on lots 19, 20, and 21, concession IV, East Luther township, Dufferin county, about $4\frac{1}{2}$ miles northwest of Grand Valley.

During 1937 some 300 tons of peat was produced. P. F. Stibbard was manager, employing an average of 8 men.

Wm. Leasa

The largest peat operation in the province for the past year is located in lot 11, concession X, Ellice township, county of Perth, some 7 miles north of Stratford. The operator is Wm. Leasa, Milverton.

During the summer of 1937 some 400 tons of peat fuel was produced. About 10 men were employed.

Northern Peat Company

The Northern Peat Company, incorporated in March, 1936, has a capitalization of 40,000 shares of \$1 par value each. The officers and directors are: W. B. Brewer, president; E. L. Giblin, secretary-treasurer; B. M. Brewer and U. S. Annett, directors. The head office of the company is at Timmins.

The mining of peat from a bog $5\frac{1}{2}$ miles west of Timmins, in lot 8, concession III, Mountjoy township, district of Cochrane, formed a part of the company's activities during 1937. During the months of June, July, and August an average of 4 men worked in the bog and produced approximately 150 tons of dried peat. Only about 60 tons of this had been sold at the end of the year.

W. B. Brewer is the company manager.

Geo. Runke and Sons

Geo. Runke and Sons, 115 Cameron Street North, Kitchener, produced and sold about 10 tons of peat fuel from a small bog, 20 acres in extent, situated in the upper part of the German tract, lot 55, Waterloo township, Waterloo county.

Three men were employed intermittently during the summer.

SILVER AND COBALT

Agnico Mines Syndicate

The Agnico Mines Syndicate owns and operates the old Wettlaufer mine, consisting of one claim, 20 acres, in South Lorrain township, district of Timiskaming. Joseph Huard, Haileybury, is secretary and managing director of the syndicate. The mine office is at 37 Lang Street, Cobalt.

During 1937 operations were confined to dewatering the workings, picking ore from broken rock and mining exposed veins. About 70 tons of mill rock were hoisted and sent to the O'Brien mill for test purposes.

An average force of 6 men was employed from March 22 to December 31, under the direction of Herman Laitenen, superintendent.

Cane Silver Mines, Limited

Cane Silver Mines, Limited, was incorporated in 1917, with an authorized capitalization of 2,500,000 shares of \$1 par value. The officers are: John Lumsden, president; W. A. Taylor, vice-president; F. L. Hutchinson, secretary-treasurer. The secretary's address is Box 700, New Liskeard.

The company owns a property consisting of 280 acres in Cane township Gowganda area, district of Timiskaming.

There are two shallow shafts on the property, which has been idle for some years. In 1937 a small amount of silver ore was shipped to Deloro for treatment.

Cobalt Properties, Limited

Cobalt Properties, Limited, was incorporated in August, 1931, with an authorized capitalization of 25,000 shares of \$1 par value, all of which have been issued. The officers and directors are: W. Mavor, president; E. L. Tomney, secretary-treasurer; J. D. Henry, E. A. McDonald, and S. S. W. Cole, directors. The head office and mine office are at Cobalt.

The company owns and operates several properties in Bucke and Coleman townships, Cobalt area, district of Timiskaming.

Mining operations were carried on from May 15 to December 31, 1937. Development work consisted of 35 feet of crosscutting, 350 feet of drifting, and 45 feet of raising. From October 1 to December 31 an average of two tons of mill rock per day was handled.

An average of 22 men was employed under the supervision of Arthur Brocklebank, manager.

Cobalt Silver Syndicate

Cobalt Silver Syndicate is composed of Roy Thompson and Ambrose Murphy, trustees, and Fred Sullivan, secretary-treasurer. The head office and mine office are at Cobalt.

The syndicate operated the old Red Jacket mine on claims A2 and A4, in the Gillies limit, Cobalt area, district of Timiskaming, from September 1 to November 30, 1937.

An 8- by 10-foot shaft-house and a 12- by 16-foot hoist-house, both of frame construction, were built.

Mine operations consisted of 170 feet of crosscutting and 170 feet of drifting.

An average force of 4 men was employed during the period of operation under the direction of Ambrose Murphy.

Comet Leasing Company

The Comet Leasing Company is composed of James H. Price, Cobalt; Bruce Williams, Kirkland Lake; and J. A. Price, Cobalt. The company has a lease on the Kerr Lake mine, in the township of Coleman, Cobalt area, district of Timiskaming. The head office is at 1 Government Road East, Kirkland Lake, and the mine address is Cobalt.

Operations were carried on throughout 1937. Some 40 feet of surface-trenching and 80 feet of shaft-raising were done.

Shipments totalling 220 tons of low-grade and 24 tons of high-grade silver-cobalt ore were made.

An average of 10 men was employed under the supervision of James H. Price, manager.

J. C. Dean

The Silver Bar mine, owned by J. C. Dean, consists of 25 acres in Coleman township, Cobalt area, district of Timiskaming. The mine address is Cobalt. Two men were employed on surface from June to November, 1937.

Five tons of cobalt-nickel concentrates were shipped. A frame hoist-house was constructed during the year. J. C. Dean was in charge of the work.

S. P. Dillabough

S. P. Dillabough leased the Badger mine in Coleman township, Cobalt area, district of Timiskaming, during 1937 from the owner, Thomas Mullholland.

No underground work was done, but two men were employed for about a month sorting over surface dumps. Small shipments of silver and cobalt ore were made.

Fauteaux and Dworski

The Silver Cliff mine in Coleman township, Cobalt area, district of Timiskaming, was operated under lease by R. Fauteaux and A. Dworski, from August 23 to December 11, 1937.

A total of 215 tons of ore was shipped, having a content of 4,489 ounces of silver.

An average force of 4 men was employed during the period of operation, under the supervision of R. Fauteaux.

Harrison-Hibbert Mines, Limited

Harrison-Hibbert Mines, Limited, has an authorized capitalization of 1,000,000 shares of \$1 par value, of which 612,000 shares have been issued. The officers and directors are: Robert C. Harrison, president and manager; John B. Sandy, vice-president; Garrett F. Frankland, secretary-treasurer; Charles E. Love, Alexander MacKenzie, and Cecil W. Tom, directors. The head office is at 35 Gough Avenue, Toronto. The mine address is P. O. Box 409, Cobalt.

The property consists of one claim, 33 acres, on lot 13, concession I, Bucke township, Cobalt area, district of Timiskaming.

Operations were carried on from January 1 to July 17, 1937. A blacksmith shop and a transformer-house were erected. Two 100 k.v.a. transformers and 1,500 feet of 11,000-volt electric line were installed. A 2-compartment shaft, 7 by 11 feet, was sunk a distance of 40 feet.

Four men were employed for four months.

La Rose-Rouyn Mines, Limited

La Rose-Rouyn Mines, Limited, was incorporated in October, 1926, with a capitalization of 3,000,000 shares of no par value. The officers and directors are: J. E. Jamieson, president; H. H. Sutherland, vice-president; George McKeown, secretary-treasurer; J. A. C. Cameron and Jos. Pritchard, directors. The head office is at 112 Yonge Street, Toronto. The mine address is Cobalt.

A small amount of work was done by lessees on the Lawson and University properties in Coleman township, Cobalt area, district of Timiskaming, during 1937, and shipments of cobalt and silver ore were made.

W. E. McCready

The Columbus mine, in Coleman township, Cobalt area, district of Timiskaming, was operated under lease from September 13 to October 29, 1937, by W. E. McCready, of Cobalt.

During the period of operation a frame hoist-house was built. Shipments of ore from the dump and an open cut totalled 1,607 pounds, and yielded 52.5 ounces of silver and 147 pounds of cobalt.

McGarry, Craig, and McGarry

J. McGarry, G. W. Craig, and A. McGarry operated their claim, No. 1,205, in the Gillies limit, Cobalt area, district of Timiskaming, from April 15 to July 10, 1937.

The 2-compartment, vertical shaft was deepened from 114 to 117 feet, and 150 feet of diamond-drilling was done from underground.

An average of 4 men was employed under the supervision of J. McGarry, manager. The mine address is Cobalt.

F. M. Mackay

F. M. Mackay operated the Waldman and Wyandoah properties in Gillies limit, Cobalt area, district of Timiskaming, under lease throughout 1937. The mine address is Cobalt.

No underground work was done, but two men were employed in picking over the rock dumps on both properties. Shipments of silver and cobalt ore were made.

George Martin

Crown Reserve Mine

George Martin, of Cobalt, leased the Crown Reserve mine in the township of Coleman, Cobalt area, district of Timiskaming, in 1937.

An average of 6 men was employed from May 1 to November 24, sorting surface dumps.

Provincial Mine

George Martin leased the Provincial mine, in the Gillies limit, Cobalt area, district of Timiskaming, in 1937.

A shaft-house, hoist-room, and blacksmith shop were erected. The workings were dewatered, and the 65-foot level was examined.

Two men were employed from January 1 to April 17 and from December 1 to December 31, under the supervision of Mr. Martin. The post office address is Box 659, Cobalt.

H. G. Miller and Associates

H. G. Miller and associates acquired the Canadian Lorrain property in South Lorrain township, district of Timiskaming, and shipped silver ore to the O'Brien mill for treatment.

The mine address is Silver Centre.

M. J. O'Brien, Limited

O'Brien Mine

The O'Brien (Cross Lake) mine in the township of Coleman, Cobalt area, district of Timiskaming, is owned and operated by M. J. O'Brien, Limited. The officers of the company are: M. J. O'Brien, president; J. A. O'Brien, vice-president; J. N. Rougvie, secretary-treasurer; J. G. Dickenson, general manager.

A new Canadian Ingersoll-Rand air hoist was installed in 1937. During the year the No. 2 winze, vertical, 7 by 16 feet, was raised 36 feet and sunk 95 feet. A new level was opened at a depth of 700 feet. Some 604 feet of crosscutting, 3,410 feet of drifting, and 203 feet of raising were done. Exploration work consisted of 3,786 feet of underground diamond-drilling. The mill treated an average of 97.5 tons daily.

A force of 109 men was employed. H. G. Kennedy is manager. The mine address is Cobalt.

Miller Lake O'Brien Mine

The Miller Lake O'Brien mine, in the townships of Nicol and Haultain, Gowganda area, district of Timiskaming, is owned and operated by M. J. O'Brien, Limited. H. G. Kennedy is manager, and H. D. Palser is assistant manager. The mine address is O'Brien.

During 1937 the No. 9 winze, vertical, 6 by 16 feet, was collared at the 730-foot level and sunk a distance of 103 feet. Lateral development work consisted of 1,060 feet of drifting and 1,173 feet of crosscutting. Some 5,858 feet of diamond-drilling was done from surface.

The mill treated an average of 59 tons per day during the year. An average of 96 men was employed.

A. G. Morgenthaler

Adanac Mine

The Adanac mine, in the township of Coleman, Cobalt area, district of Timiskaming, was leased to A. G. Morgenthaler, Philadelphia, Pa., in 1937. Rory Stewart is foreman in charge of operations. The mine address is Cobalt.

During the year a new headframe, hoist-room, and blacksmith shop were built, and a new hoist was installed.

Some 130 feet of drifting was done. About 91 tons of mill rock were hoisted. An average of 4 men was employed from May 1 to December 31.

Beaver Mine

A. G. Morgenthaler leased the Beaver mine, in Coleman township, Cobalt area, district of Timiskaming, in 1937.

Underground development work consisted of 27 feet of crosscutting and 124 feet of drifting. About 21 tons of mill rock were hoisted. Rory Stewart, Cobalt, was foreman, employing an average of 5 men.

Murphy and Landry

Ambrose Murphy and C. A. Landry, of Cobalt, operated the Coniagas and Trethewey mines, in the township of Coleman, Cobalt area, district of Timiskaming, from June 1 to December 31, 1937.

Mining consisted of underhand stoping of level pillars and the driving of 18 feet of raise. Some 2,539 tons of mill ore were shipped.

The work was done under the management of Ambrose Murphy.

Nerlip Mines, Limited

Nerlip Mines, Limited, was incorporated in February, 1932, with an authorized capitalization of 500,000 shares of no par value. In 1937, the capitalization was increased by the creation of an additional 1,000,000 shares of common stock of no par value and 100,000 shares of preferred stock of no par value. The officers and directors are: C. H. Mathews, president; A. B. Pilliner, vice-president; M. A. Gough, secretary-treasurer; L. B. Cuddy and Wm. Ambler, directors. The head office is at 46 Wolverton Avenue, Toronto. The mine address is Cobalt.

The company owns a property consisting of 40 acres in Coleman township, Cobalt area, district of Timiskaming.

During 1937 the 2-compartment, vertical shaft was sunk from 277 feet to 620 feet, and a small amount of drifting and crosscutting was done.

An average of 11 men was employed throughout the year under the management of A. B. Pilliner.

Nipissing Mining Company, Limited

Nipissing Mines Company, Limited, which was incorporated in September, 1917, has a capital of 1,200,000 shares of \$5 par value. The officers and directors of the company are: E. P. Earle, president and treasurer; Alexander Fasken, vice-president and secretary; Richard T. Greene, C. W. Nichols, Dr. F. R. Bennetto, Halstead Lindsley, and Hugh Park, directors. The head office is at the Excelsior Life Building, Toronto. The New York office is at 165 Broadway.

The operating company is the Nipissing Mining Company, Limited, which was incorporated in 1904, with a capital of 2,500 shares of \$100 par value. The officers and directors of the company are: Alexander Fasken, president and secretary; E. P. Earle, vice-president and treasurer; Hugh Park, general manager; Richard T. Greene, C. W. Nichols, Dr. F. R. Bennetto, Halstead Lindsley, directors. The executive offices are the same as those of the parent company.

No underground mining operations were carried on at the property in Coleman township, Cobalt area, district of Timiskaming, during 1937, but a small mill was operated from June 10 to October 30, concentrating low-grade material from the dumps. Some 3,712 tons were treated.

The following is taken from the report of the general manager for the year ended December 31, 1937:—

Operations at Cobalt, which were carried on only during the summer months, consisted of milling low-grade cobalt ore and from which there were shipped during the year 257 tons of concentrate and crude ore. There was also some production of silver from leasing operations. The gross value of all shipments for the year amounted to \$42,000. These small operations gave some employment and the profit was approximately sufficient to cover expenses at Cobalt.

On claim No. 105, in the Gillies limit, district of Timiskaming, a small force of men was employed during January and February, mining a pocket of cobalt ore. The operation then shut down.

J. H. Plouffe

J. H. Plouffe, of Cobalt, leased the Watts mine in Coleman township, Cobalt area, district of Timiskaming, in 1937.

No underground work was done. Silver ore obtained from the dumps was shipped to Deloro for treatment. The mine address is Cobalt.

C. W. Price

The Foster mine in Coleman township, Cobalt area, district of Timiskaming, was operated under lease throughout 1937 by C. W. Price, of Cobalt, who employed two men.

Shipments of ore totalled 7 tons, which yielded 1,100 pounds of cobalt and 1,000 ounces of silver.

Rowe and Stuckey

Alfred Rowe and Charles Stuckey, Box 79, Cobalt, leased the surface and dumps of the Frontier mine, in South Lorrain township, district of Timiskaming, during 1937. Work was confined to picking rock from the dumps. Shipments of silver and cobalt ore were made.

Russell, Presse, and McCready Syndicate

The Russell, Presse, and McCready Syndicate was formed in 1936 with 15 units of \$5,000 each, all of which are issued.

The officers are: Albert Presse, manager, and W. E. McCready, secretary-treasurer. The other member of the syndicate is D. J. Russell. The mine office is at the Moore-Gibson Building, Cobalt.

The syndicate held a lease on the Reuthel mine, in Bucke township, Cobalt area, district of Timiskaming, during 1937, and made some shipments of silver-cobalt ore.

Sandoe and Moyle

Richard Sandoe and H. Moyle, both of Cobalt, leased the Temiskaming mine, in Coleman township, Cobalt area, district of Timiskaming, from the Temiskaming Mining Company, Limited, during 1937. The property consists of two claims, 40 acres.

The work was done by subleasing and consisted of going over the broken ore left in stopes and taking out any patches, such as remnants of pillars, floors, etc.

The Temiskaming Mining Company, Limited, reports that 19,788 tons of ore, containing 89,011.60 ounces of silver, 1,532 pounds of cobalt, and 588 pounds of nickel, with a gross value of \$40,059.86, were shipped during 1937.

An average of 4 men was employed during the year under the direction of Richard Sandoe. The mine address is Cobalt.

Silver Valley Mines, Limited

Silver Valley Mines, Limited, was incorporated in June, 1933, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: E. N. Tabah, president and manager; Douglas Banks, secretary-treasurer; Chas. A. Zenkert, Arthur I. Land, and Paul Gagnon, directors. The head office is at 66 King Street West, Toronto.

The property consists of 16 claims in Leith and Charters townships, Gowganda area, district of Timiskaming. Five of these claims are owned by the company, three claims are operated on a royalty basis, and eight claims on a profit-sharing basis.

There are four shafts on the claims, and a considerable amount of lateral work has been done. In 1937 the No. 2 shaft was dewatered. This is a vertical, 2-compartment shaft, 100 feet deep, with levels at 50 and 85 feet. Some drifting was done on the 85-foot level, and test shipments of ore were made.

About 20 men were employed during the period of operation, under the supervision of O. L. Dixon, resident engineer. The mine address is Elk Lake.

Donald E. Sirola

Donald E. Sirola leased and operated the Colonial mine, a property of 40 acres in Coleman township, Cobalt area, district of Timiskaming.

Four men were employed from January to June 30. During this period 38 tons of ore and mill rock were hoisted. Shipments of ore were made to Deloro and to the O'Brien mill. The mine address is Cobalt.

Smith, MacPherson, and Giffin

J. A. Smith, G. A. MacPherson, and L. G. Giffin leased the Pittsburgh-Lorrain, or Curry, mine on lot 12, concession I, South Lorrain township, district of

Timiskaming, in 1937. The leasers have an office at 244 Bay Street, Toronto. The mine address is Cobalt.

Operations were carried on from September 20 to December 31 under the direction of L. G. Giffin. The mine was dewatered and examined, and some stoping was done. Four tons of ore were shipped.

W. D. Taylor

The Rochester mine, in Coleman township, Cobalt area, district of Timiskaming, is privately owned by W. D. Taylor. It consists of one claim, 40 acres. The address is Cobalt.

Operations were carried on from January 1 to July 31, 1937. During this period 50 feet of surface-trenching was done and a change-house was built. Underground work consisted of 20 feet of crosscutting, 20 feet of drifting, and 60 feet of raising.

Shipments of ore, totalling 12.35 tons, yielded 1,192 fine ounces of silver and 2,156 pounds of cobalt.

An average of 5 men was employed.

J. T. Thornham

J. T. Thornham, Box 385, Cobalt, leased the Nipissing Lorrain mine, in South Lorrain township, district of Timiskaming, in 1937.

No underground work was done. Eight men were employed from May 28 to October 4 sorting rock from the dumps. The silver ore obtained was shipped to the O'Brien mine for treatment.

Windsor-Cobalt Silvers, Limited

Windsor-Cobalt Silvers, Limited, was incorporated in September, 1927, with a capitalization of 2,000,000 shares of \$1 par value, of which 1,441,179 have been issued.

The officers and directors are: A. D. McArthur, president and general manager; J. A. McArthur, vice-president; D. C. Walmsley, secretary-treasurer and engineer. F. Harrington and B. L. Wrench, directors. The executive office is at 1 Toronto Street, Toronto. The mine address is Cobalt.

The property consists of one claim, 40 acres, in Coleman township, Cobalt area, district of Timiskaming, leased from the T. and N. O. Railway.

During 1937 an average of 5 men was employed from November 28 to December 31. Underground work consisted of some 60 feet of crosscutting.

York Bousquet Gold Mines, Limited

York Bousquet Gold Mines, Limited, was incorporated in December, 1936, under a Quebec charter, with an authorized capitalization of 3,000,000 shares of \$1 par value. The officers and directors are: L. D. McKelvey, president; N. D. Johnston, vice-president; J. A. Booth, secretary-treasurer; Dr. R. Townsend, J. Perry, and B. Martyn, directors. The head office is at 276 St. James Street West, Montreal, Que.

In 1937 the company purchased the Cobnor silver mine, in the township of Bucke, Cobalt area, district of Timiskaming, for 75,000 shares of stock.

Operations were carried on from August 26 to November 15. A small addition to the mill was built to accommodate a slime table, and a 7- by 10-inch Jenckes hoist was installed.

Underground operations consisted of 120 feet of drifting and a small amount of stoping. About 1,000 tons of ore were hoisted.

The mill operated from September 15 to November 15, and treated 750 tons of ore, from which some 24 tons of concentrates were shipped.

S. S. W. Cole was manager, employing an average of 8 men. The mine address is North Cobalt.

TALC

Canada Talc, Limited

The Connolly mine and the mill of Canada Talc, Limited, at Madoc, Huntingdon township, Hastings county, were operated throughout the year, with an average force of 17 men. The officers and directors of the company are: E. S. James, president; Roy Taylor, vice-president, secretary-treasurer, and general manager; C. A. Cameron, director. The capitalization is \$250,000. The mine address is Madoc.

During the year a new shaft, No. 3, was sunk to a depth of 280 feet, and a connection was made to the other workings at the 270-foot level. The average daily production for the year was 20 tons.

On November 1, 1937, Canada Talc, Limited, bought the property and assets of Henderson Mines, Limited, and the Geo. H. Gillespie Company, Limited.

Geo. H. Gillespie Company, Limited

The Geo. H. Gillespie Company, Limited, operated the Henderson mine, in Huntingdon township, Hastings county, from January 1 to October 31, 1937.

During this period the shaft was deepened to 443 feet, and 82 feet of raising was done. The mill treated a total of 6,451 tons. An average of 19 men was employed under the management of W. A. Roberts.

On November 1 the Henderson mine and the mill were sold to Canada Talc, Limited, and the Geo. H. Gillespie Company, Limited, ceased carrying on business.

METALLURGICAL WORKS

Algoma Steel Corporation, Limited

During 1937 only one blast furnace was operated by the Algoma Steel Corporation, Limited, located at Sault Ste. Marie. No. 4 furnace was in blast throughout the year, and produced a total of 156,258 tons of iron.

Jas. H. Bell was blast furnace superintendent.

Canadian Furnace, Limited

The directors of Canadian Furnace, Limited, are as follows: Richard C. Yates, managing director; H. L. Caulkins, P. G. Harrison, and W. S. Ober, directors. The address is Port Colborne.

The following table shows the number of days the furnace operated and the tonnage of iron produced during 1937:—

| Grade | Tons | No. of days operated |
|-------------------|--------|----------------------|
| Pig iron..... | 81,860 | 299 |
| Spiegeleisen..... | 3,837 | 15 |
| Total..... | 85,697 | 314 |

An average of 130 men was employed during the periods of operation. D. J. Higgon is superintendent.

Canadian Industries, Limited

During 1937 the plant of Canadian Industries, Limited, located at Copper Cliff, was in continuous operation.

The three 50-ton-per-day sulphuric acid units were operated to capacity. These units manufacture the acid from converter gases produced at the smelter of the International Nickel Company. The oleum unit was also operated at full capacity. The nitre-cake unit, in which sodium sulphate is treated with sulphuric acid to produce nitre cake, was operated at about 30 per cent. of capacity.

An average of 39 men was employed. E. H. Jordan was works manager.

Deloro Smelting and Refining Company, Limited

The blast furnace at the plant of the Deloro Smelting and Refining Company, Limited, operated throughout 1936. Silver production amounted to 1,527,149 ounces. Arsenic and cobalt products, including stellite, were also produced. An average of 190 men was employed.

The officers of the company are: J. A. O'Brien, president and chairman; S. F. Kirkpatrick, vice-president and managing director; S. B. Wright, general manager; F. A. Bapty, secretary-treasurer; R. A. Elliott, works superintendent. The address of the company is Deloro.

International Nickel Company of Canada, Limited

The refinery of the International Nickel Company of Canada, Limited, at Port Colborne was operated continuously throughout the year. An account of the operations appears on page 238 of this report.

Ontario Refining Company, Limited

The copper refinery of the Ontario Refining Company, Limited, situated at Copper Cliff, was operated at capacity throughout 1937.

The 30-ton arc-type electric melting furnace, which was installed in 1936, was in commercial operation throughout 1937. A pointing machine was installed and put in operation for double-pointing vertical-cake wire bars. This is a new product in the copper industry, and it was well received by the trade. Three additional movable holding furnaces were put into service in 1937 transporting molten blister copper from the International Nickel smelter to the anode furnaces at the refinery, and practically all of the blister copper from this source during the latter half of the year was handled in this manner.

The precious metals and by-products departments operated continuously during the year.

An average of 783 men was employed. F. Benard was plant manager.

Steel Company of Canada, Limited

The Steel Company of Canada, Limited, operated both "A" and "B" furnaces throughout the year. The average number of men employed was 168. H. S. Hilton is works manager, J. T. Slee is blast furnace superintendent, and N. B. Clark is assistant blast furnace superintendent.

The officers of the company are: Charles S. Wilcox, chairman of the board; R. H. McMaster, president; H. M. Jaquays and H. T. Diplock, vice-presidents; H. H. Champ, vice-president and treasurer; H. S. Alexander, secretary; S. E. Le Brocq, comptroller. The address is Hamilton.

MINING ACCIDENTS IN 1937

Chief Inspector of Mines, D. G. Sinclair, Toronto; Inspectors, W. O. Tower, J. B. Taylor,
D. P. Douglass, Kirkland Lake; A. S. Bayne, Port Arthur; A. E. Cave, Kenora;
D. F. Cooper, Sudbury; E. B. Weir, Timmins; A. R. Webster, Toronto.

Accidents during 1937

During the year 1937 at the mines, metallurgical works, quarries, and clay, sand, and gravel pits regulated by *The Mining Act*, there were 2,770 accidents to employees reported to the Department of Mines up to January 15, 1938. Fifty-two fatalities, arising out of 49 separate accidents, were reported.

These returns represent an increase of 457 in the total number of accidents reported and a decrease of 13 in the number of fatalities recorded over the preceding year. The report shows a fatality rate of 1.62 men killed per thousand men employed, which is a decrease of 0.68 per thousand from the preceding year and is 0.87 per thousand lower than the average for the past twenty-five years.

There were 85 non-fatal accidents per thousand men employed, which is an increase of 2 per thousand from the rate for 1936. The percentage of non-fatal accidents followed by infection remained fairly constant, decreasing from 8.9 per cent. in 1936 to 8.7 per cent. in 1937.

Employment in the industry again increased greatly during the year. Returns in this respect show an approximate increase of 14 per cent. over 1936.

Fatal Accidents

A comparison of fatal accidents for the past five years is given below:—

| Distribution | 1933 | 1934 | 1935 | 1936 | 1937 |
|----------------------------------|------|------|------|------|------|
| Mines, underground..... | 20 | 23 | 26 | 45 | 36 |
| Mines, surface..... | 1 | 2 | 2 | 5 | 5 |
| Metallurgical works..... | 1 | 5 | 3 | 4 | 5 |
| Quarries..... | 0 | 1 | 0 | 2 | 1 |
| Clay, sand, and gravel pits..... | 2 | 2 | 1 | 0 | 2 |
| Total..... | 24 | 33 | 32 | 56 | 49 |

By months the fatal accidents occurred as follows:—

| Month | No. accidents | No. men killed |
|----------------|---------------|----------------|
| January..... | 2 | 3 |
| February..... | 2 | 2 |
| March..... | 9 | 9 |
| April..... | 2 | 2 |
| May..... | 3 | 3 |
| June..... | 4 | 5 |
| July..... | 8 | 8 |
| August..... | 2 | 2 |
| September..... | 10 | 10 |
| October..... | 1 | 1 |
| November..... | 1 | 1 |
| December..... | 5 | 6 |
| Total..... | 49 | 52 |

Classifying the fatalities according to industries gives the following:—

| | |
|----------------------------------|----|
| Gold mines | 33 |
| Gypsum mines..... | 1 |
| Nickel mines..... | 6 |
| Silver mines..... | 0 |
| Talc mines..... | 1 |
| Metallurgical works..... | 8 |
| Quarries..... | 1 |
| Sand, clay, and gravel pits..... | 2 |
| Total..... | 52 |

ANALYSIS OF FATALITIES AT MINES, 1933-1937

| Cause | 1933 | 1934 | 1935 | 1936 | 1937 |
|---------------------------------|-----------|-----------|-----------|-----------|-----------|
| | per cent. | per cent. | per cent. | per cent. | per cent. |
| Fall of ground..... | 23 | 31 | 47 | 20 | 20 |
| Run of ore or rock..... | 9 | 8 | 6 | 8 | 0 |
| Shaft accidents..... | 9 | 8 | 9 | 28 | 44 |
| Explosives..... | 9 | 18 | 16 | 16 | 17 |
| Miscellaneous, underground..... | 45 | 27 | 16 | 18 | 12 |
| Surface..... | 5 | 8 | 6 | 10 | 7 |

TABLE OF FATAL ACCIDENTS IN MINES, METALLURGICAL WORKS, QUARRIES AND GRAVEL, SAND, AND CLAY PITS, 1913-1937

| 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 |
|-------------------------|---|---|---|------------------------|------------------------------------|
| 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 |
| 1927..... | 33 | 13,311 | 2,000 | 15,311 | 2.1 |
| 1928..... | 85 | 15,787 | 2,000 | 17,787 | 4.76 |
| 1929..... | 55 | 17,145 | 1,849 | 18,994 | 2.89 |
| 1930..... | 56 | 18,217 | 317 | 18,534 | 3.02 |
| 1931..... | 37 | 17,820 | 447 | 18,267 | 2.03 |
| 1932..... | 25 | 14,378 | 431 | 14,809 | 1.69 |
| 1933..... | 25 | 15,080 | 804 | 15,884 | 1.57 |
| 1934..... | 34 | 19,302 | 1,254 | 20,556 | 1.65 |
| 1935..... | 36 | 21,444 | 1,528 | 22,972 | 1.57 |
| 1936 ¹ | 65 | 25,725 | 2,547 | 28,272 | 2.30 |
| 1937..... | 52 | 28,938 | 3,220 | 32,158 | 1.62 |

¹1936 data corrected to include deaths in 1937 resulting from accidents in 1936.

The comparative fatality rate per thousand men employed at mines, metallurgical works, quarries, and clay, sand, and gravel pits is as follows:—

| | Men employed | No. killed | Rate per thousand |
|----------------------------------|--------------|------------|-------------------|
| Mines..... | 23,787 | 41 | 1.72 |
| Metallurgical works..... | 6,471 | 8 | 1.24 |
| Quarries..... | 1,050 | 1 | .95 |
| Clay, sand, and gravel pits..... | 850 | 2 | 2.35 |
| Total..... | 32,158 | 52 | 1.62 |

The occupation and nationality of the men killed at mines, metallurgical works, and clay, sand, and gravel pits are set out in the following table:—

| Occupation | Austrian | British | Czecho-Slovakian | Finn | German | Italian | Jugo-Slav | Pole | Swede | Total |
|-------------------------------|----------|---------|------------------|------|--------|---------|-----------|------|-------|-------|
| Assistant superintendent..... | | 1 | | | | | | | | 1 |
| Blacksmith helper..... | | | | | | 1 | | | | 1 |
| Blockholer..... | | | | | | | | 1 | | 1 |
| Chute blaster..... | | 2 | | | | | | | | 2 |
| Craneman..... | | 1 | | | | | | | | 1 |
| Deckman..... | | 1 | | | | | | | | 1 |
| Driller..... | | 5 | | 3 | | | 1 | | 1 | 10 |
| Drill helper..... | | 2 | | | | | | 1 | | 3 |
| Electrician..... | | 1 | | | | | | | | 1 |
| Electrician's helper..... | | 1 | | | | | | | | 1 |
| Fitter..... | | 1 | | | | | | | | 1 |
| Fitter's helper..... | | 1 | | | | | | | | 1 |
| Labourer..... | | 3 | | | | | | | | 3 |
| Level boss..... | | 1 | | | | | | | | 1 |
| Mechanic..... | | 3 | | | | | | | | 3 |
| Motorman..... | | 1 | | | | | | | | 1 |
| Salvageman..... | | | 1 | | | | | | | 1 |
| Scaler..... | 1 | | | | | | | | | 1 |
| Shaftman..... | 1 | 3 | | 4 | | | | | | 8 |
| Skip tender..... | | 2 | | | | | | | | 2 |
| Timber passer..... | | 1 | | | | | | | | 1 |
| Timberman..... | | | | 1 | | | | | | 1 |
| Trammer..... | 1 | 2 | | 1 | 1 | | | | | 5 |
| Truckman's helper..... | | | | | | | | 1 | | 1 |
| Total..... | 3 | 32 | 1 | 9 | 1 | 1 | 1 | 3 | 1 | 52 |

The ages of the men killed are as follows:—

| 17-20 | 21-25 | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 | Over 50 | Total |
|-------|-------|-------|-------|-------|-------|-------|---------|-------|
| 1 | 10 | 12 | 11 | 11 | 4 | 3 | 0 | 52 |

Non-fatal Accidents

The causes of non-fatal accidents at mines are shown in the following table:—

| Cause | Surface | Under-ground | Total |
|---|---------|--------------|-------|
| Fall of persons..... | 164 | 164 | 328 |
| Falling objects..... | 87 | 178 | 265 |
| Tramming..... | 10 | 202 | 212 |
| Hand tools..... | 106 | 87 | 193 |
| Flying objects, sledging, etc..... | 36 | 116 | 152 |
| Falling rock or ore, drilling, etc..... | | 140 | 140 |
| Fall of rock or ore at face..... | | 118 | 118 |
| Crushed between two objects..... | 30 | 85 | 115 |
| Handling rock or ore..... | 4 | 109 | 113 |
| Nails or splinters..... | 38 | 73 | 111 |
| Strain while lifting..... | 43 | 67 | 110 |
| Rock or ore at chute..... | | 102 | 102 |
| Drilling machines..... | | 96 | 96 |
| Running into or striking objects..... | 15 | 60 | 75 |
| Machinery..... | 56 | 12 | 68 |
| Cage, skip, or bucket..... | 2 | 38 | 40 |
| Fall down shaft, winze, or stope..... | | 40 | 40 |
| Explosives..... | | 38 | 38 |
| Burns..... | 28 | 1 | 29 |
| Gas..... | 14 | | 14 |
| Transportation..... | 13 | | 13 |
| Rock or air blast..... | | 9 | 9 |
| Explosions from carbide..... | 6 | | 6 |
| Poisoning from cyanide..... | 4 | | 4 |
| Electricity..... | 2 | | 2 |
| Unclassified..... | 6 | | 6 |
| Total..... | 664 | 1,735 | 2,399 |

The causes of non-fatal accidents at metallurgical works were:—

| | | | |
|--------------------------------------|----|---------------------------------------|-----|
| Falling objects..... | 33 | Cranes, ladles, or hooks..... | 7 |
| Fall of persons..... | 23 | Gas..... | 6 |
| Machinery..... | 13 | Handling material..... | 5 |
| Burned by slag, matte, or scrap..... | 12 | Running into or striking objects..... | 4 |
| Flying objects, sledging, etc..... | 11 | Nails or splinters..... | 4 |
| Hand tools..... | 10 | Burns by acid..... | 2 |
| Strain while lifting..... | 8 | Unclassified..... | 2 |
| Burns..... | 8 | | |
| Transportation..... | 8 | | |
| Crushed between two objects..... | 7 | Total..... | 163 |

The causes of non-fatal accidents at quarries were:—

| | | | |
|------------------------------------|----|---------------------------------------|-----|
| Handling material..... | 30 | Hand tools..... | 5 |
| Fall of persons..... | 15 | Crushed between two objects..... | 4 |
| Falling objects..... | 15 | Running into or striking objects..... | 4 |
| Transportation..... | 14 | Explosives..... | 2 |
| Fall of rock..... | 11 | Nails or splinters..... | 1 |
| Strain while lifting..... | 11 | Unclassified..... | 2 |
| Machinery..... | 9 | | |
| Flying objects, sledging, etc..... | 8 | Total..... | 131 |

The causes of non-fatal accidents at sand, gravel, and clay pits were:—

| | | | |
|------------------------------------|---|---------------------------------------|----|
| Fall of material..... | 8 | Hand tools..... | 1 |
| Fall of persons..... | 6 | Running into or striking objects..... | 1 |
| Machinery..... | 4 | Nails or splinters..... | 1 |
| Falling objects..... | 2 | Unclassified..... | 1 |
| Strain while lifting..... | 2 | | |
| Flying objects, sledging, etc..... | 2 | Total..... | 28 |

Infection

Records show that infection followed in 238 cases out of a total of 2,721 accidents.

| Location | No. of accidents | Accidents followed by infection | Per cent. infection |
|----------------------------------|------------------|---------------------------------|---------------------|
| Mines, underground..... | 1,735 | 163 | 9.3 |
| Mines, surface..... | 664 | 62 | 9.3 |
| Metallurgical works..... | 163 | 8 | 4.3 |
| Quarries..... | 131 | 4 | 3 |
| Clay, sand, and gravel pits..... | 28 | 1 | 3.5 |
| Total..... | 2,721 | 238 | 8.7 |

Non-fatal Accident Frequency

The following table gives the non-fatal accident frequency at mines, metallurgical works, quarries, and clay, sand, and gravel pits, based on the number of accidents per thousand men employed, for the years 1927-1937, inclusive.

| 1927 | 1928 | 1929 | 1930 | 1931 | 1932 | 1933 | 1934 | 1935 | 1936 | 1937 |
|------|------|------|------|------|------|------|------|------|------|------|
| 160 | 141 | 126 | 117 | 100 | 98 | 95 | 93 | 90 | 83 | 85 |

Accidents from Explosives

| Cause | Non-fatal | | Fatal | | Total | |
|---|------------------|-------------|------------------|------------|------------------|-----------------------|
| | No. of accidents | Men injured | No. of accidents | Men killed | No. of accidents | Men killed or injured |
| Blasted wrong charge..... | 1 | 1 | ..... | ..... | 1 | 1 |
| Blast came through diamond-drill hole.. | 2 | 2 | ..... | ..... | 2 | 2 |
| Delayed explosion..... | 5 | 6 | ..... | ..... | 5 | 6 |
| Delayed too long at blast..... | 3 | 3 | ..... | ..... | 3 | 3 |
| Drilled into explosive..... | 12 | 16 | 2 | 2 | 14 | 18 |
| Explosive in muck..... | 1 | 1 | ..... | ..... | 1 | 1 |
| Fumes from blasting..... | 3 | 3 | ..... | ..... | 3 | 3 |
| Insufficient cover from blast..... | 1 | 1 | ..... | ..... | 1 | 1 |
| Premature blast..... | ..... | ..... | 1 | 1 | 1 | 1 |
| Returned too soon to blast..... | 5 | 5 | 1 | 1 | 6 | 6 |
| Struck by flying fragments..... | 1 | 1 | ..... | ..... | 1 | 1 |
| Struck explosive..... | 1 | 1 | ..... | ..... | 1 | 1 |
| Unexplained..... | ..... | ..... | 2 | 2 | 2 | 2 |
| Walked into blast..... | ..... | ..... | 1 | 1 | 1 | 1 |
| Total..... | 35 | 40 | 7 | 7 | 42 | 47 |

Electric Accidents

The following table shows the fatal accidents due to the use of electricity at mines, metallurgical works, and quarries during the last ten years:—

| 1928 | 1929 | 1930 | 1931 | 1932 | 1933 | 1934 | 1935 | 1936 | 1937 | Total |
|------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | | 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7 |

The following table shows the total number of non-fatal electric accidents during the last ten years:—

| 1928 | 1929 | 1930 | 1931 | 1932 | 1933 | 1934 | 1935 | 1936 | 1937 | Total |
|------|------|------|------|------|------|------|------|------|------|-------|
| 4 | 14 | 10 | 7 | 3 | 4 | 4 | 6 | 4 | 2 | 58 |

Classification of Non-fatal Accident Rates at Producing Mines

In the following table the producing mines are arranged in order, according to their rate of non-fatal accidents in 1937 per thousand men employed:—

| | |
|---------|---|
| 0—50 | <ul style="list-style-type: none"> Garson (International Nickel) Hollinger mine Creighton (International Nickel) McIntyre-Porcupine Levack (International Nickel) Frood (International Nickel) Young-Davidson (Hollinger) Falconbridge (mine only) |
| 51—100 | <ul style="list-style-type: none"> Lake Geneva Stanley Miller Lake O'Brien Howey J-M Consolidated O'Brien (Cross Lake) mine New Golden Rose Canadian Gypsum Paymaster Consolidated Ross (Hollinger) <p>Average for producing mines—88 per M</p> <ul style="list-style-type: none"> Lake Shore Toburn Parkhill |
| 101—150 | <ul style="list-style-type: none"> McKenzie Red Lake Dome Tashota Darwin Shenango Wright-Hargreaves Coniaurum Red Lake Gold Shore Algold Sylvanite Argosy Macassa Omega Teck-Hughes Algoma Summit Gillies Lake-Porcupine Vipond (Mace) |
| 151—200 | <ul style="list-style-type: none"> Kirkland Lake Gold Little Long Lac Matachewan Consolidated Sturgeon River Sand River Black Donald Graphite Central Patricia Delnite St. Anthony Raven River Buffalo Ankerite Bankfield Pamour Northern Empire Pickle Crow Elora Jubilee (Minto) |

| | | |
|----------|---|------------------------------------|
| 201—250 | { | Bidgood |
| | | Obonga Lake mine (Chromium Mining) |
| | | Gold Eagle |
| | | Canada Talc (including Henderson) |
| | | Cobalt Properties |
| 251—300 | { | Naybob |
| | | Edwards |
| | | Gypsum, Lime and Alabastine (mine) |
| | | Long Lake (Lebel Oro) |
| | | Bousquet |
| Over 300 | { | Wendigo |
| | | Darkwater |
| | | Morris Kirkland |
| | { | Leitch |
| | | McMillan |

Mine Fires

Argosy Gold Mines, Limited

A contract diamond-drill operator was slightly burned about the face and hands at the Argosy mine, when inflammable gas¹ encountered in drilling below the 600-foot level was ignited by his open light as it issued from the hole.

Several other minor occurrences of gas had been previously noted in other diamond-drill holes from the same approximate location in the mine.

Similar experiences have been met in other mines in the province, particularly in the Sudbury and Timmins areas, and while the occurrences are comparatively rare they indicate a potential hazard in operations of this nature which should be kept in mind and against which protective measures to minimize the possible dangers should be taken.

International Nickel Company of Canada, Limited

Creighton Mine.—At 3.10 A.M., April 14, a minor fire occurred in the 20th level crusher station at the Creighton mine.

The shift electrician had finished greasing the two motors in this location at 2.40 A.M., and everything was in good order when he left the station.

At 3.10 A.M. the crusherman, J. Lodsins, who was up on the level at the time, smelled smoke and, on investigating, found that the windings of one motor were burning. He pulled the switch and put out the fire with a pyrene extinguisher.

A short circuit in the windings was the apparent cause of the fire.

Garson Mine.—About 7.00 P.M. on September 20, a minor fire occurred at the pump station on the 14th level at the Garson mine.

Previous to the fire the pump motor had been submerged, and an attempt to dry out the motor at the time was the cause of the fire. The motor had been covered with a tarpaulin while electric heaters installed under this covering were being used to dry it out. The tarpaulin was ignited in this way and created a dense smoke, which spread through the mine workings.

A general alarm was sounded, stench gas was introduced into the mine, and a call was put through to the Mine Rescue Station at Sudbury.

On the arrival of the rescue truck men in breathing apparatus inspected the scene and found the fire completely burned out, as the tarpaulin was entirely consumed by this time. No indication of oxygen deficiency or poisonous gas was found, as the normal ventilation circuits of the mine had rapidly removed the products of combustion.

¹Analysis of the gas gave the following composition: carbon dioxide (CO₂), 0.5 per cent.; methane (CH₄), 82.7 per cent.; nitrogen (N₂), 16.8 per cent.

All the men working in the mine climbed to surface through the escapement shaft (ventilation raise route), the last men reaching surface approximately an hour after the introduction of the stench.

In approximately two and a half hours from the giving of the alarm the mine was entirely clear of smoke and the shift returned to work.

Hollinger Consolidated Gold Mines, Limited

About 5.45 P.M., on January 19, Shift Boss J. McPhail in the course of his rounds encountered smoke in No. 8.1 crosscut on the 675-foot level of the Hollinger mine. Investigation by McPhail disclosed the source of the trouble in a chute which a crew of timbermen and burnermen had been dismantling on the day shift.

After sending warning to some of his men working in an area in which he believed they might be affected by smoke from the fire, McPhail proceeded to the main shaft and closed the fire-doors there, then reported the fire to surface.

About the same time Shift Boss F. McLean, on the 550-foot level, met smoke on his beat and also came to surface to report the occurrence. Equipping themselves with gas masks and accompanied by Geo. Jones of the safety department, the two shift bosses returned underground and, with the assistance of men gathered at the shaft-station on the 675-foot level, proceeded to lay a line of hose from the closest connection available. Before completing this work they were joined by Geo. Gedge, head of the safety organization of the mine, who arrived on the scene with chemical fire extinguishers. The fire was speedily put out, and by 6.45 P.M. all traces of active fire or smouldering embers were quenched. As a further precaution the entire chute was torn out and the whole area thoroughly wet down and men left to guard the locality throughout the night.

On receipt of the first alarm at surface a call was put through to the district Mine Rescue Station and equipment was at the shafthead within eight minutes of receipt of the message. It was not found necessary, however, to call the equipment into service in dealing with the situation.

As the location and extent of the fire were definitely known it was not considered necessary to introduce the warning stench into the mine to bring out the working shift. Later, however, after the recovery crew had returned to the mine and the men were out of communication with surface, exaggerated rumours spread as to the nature and extent of the fire and, as an added precaution, the stench was turned into the mine at 6.45 P.M.

This fire was caused by the negligence of the crew engaged on the dismantling job in their non-observance of mine rules regarding the use of acetylene torches underground. Instructions issued by the management to all men doing this class of work require the laying of water-hose to the scene of operation and a thorough wetting-down of all inflammable material situated where it might come in contact with the burner flame or splashes of hot metal from the operation. In this case the crew did not install a water-hose or take any precautions as to wetting down the area, and there is no doubt that the fire originated through their negligence in this regard.

M. J. O'Brien, Limited

When the shift went to work at 7 A.M. on July 27 at the Miller Lake O'Brien mine a small fire was discovered in the wooden foundation of the hoist at No. 7 winze on the 730-foot level.

This hoist is located approximately 75 feet east of No. 6 winze in an old empty stope. In installing the hoist in this location, stulls and lagging were placed in the stope approximately 10 feet above the drift floor, and about 3 feet above the lagging three horizontal stulls, 8 feet in length, were placed across the stope as bearers for the hoist foundation. For the protection of the hoist and operator two series of stulls and lagging had been installed above the hoist at distances of 12 and 16 feet above the foundation.

Only one shift is worked underground in this mine, from 7 A.M. to 4 P.M., with one hour off at noon for lunch. On the day previous to the fire the men left work at the usual time, and there was no indication of fire about the hoist at the end of the shift.

When the shift came on at 7 A.M. on July 27 fire was discovered in the base of the hoist and the men were able to quench it quickly with water. The extent of the blaze had not been great; two of the bearing timbers were badly burned and one set of lagging over the drift was slightly charred. The hoist itself was not damaged, but the hoisting rope was replaced as a precautionary measure before operations were continued.

When the fire was discovered all the men except those retained to do repair work were removed from the mine and compressed air was blown into all the workings for twenty-four hours to free the mine of any traces of smoke and gas.

The cause of the fire is unknown, but it is presumed to have resulted from a smouldering cigarette butt, possibly dropped by the hoistman before he left work on July 26.

Fire Caused by Gasoline Compressor

McLaren-Porcupine Gold Mines, Limited

A fire causing the complete tie-up of all mining operations at the McLaren-Porcupine mine took place about 8 A.M., on January 10, when the combined compressor-house and blacksmith shop was burned to the ground. In the building there were a 310-cubic-foot Ingersoll-Rand gasoline compressor, a Climax drill-sharpener, two Climax drills, blacksmith's forge, miscellaneous tools, and a heating stove.

The fire broke out while a workman was attempting to start the compressor for the day and is believed to have been caused by the flooding of the carburettor and the ignition of the gasoline fumes by the fire burning in the stove.

Prosecutions

Rex vs. Charles E. Cook

A charge was laid against Charles E. Cook, manager of Paymaster Consolidated Mines, Limited, as follows:—

That Charles E. Cook did on the 20th of March, 1937, at the township of Tisdale in the district of Cochrane, being the manager of the Paymaster Consolidated Mines, Limited, fail to adequately protect workmen in stope No. 501 of the said Paymaster Consolidated Mines, Limited, by suitable signs and barricades, and in which muck was hung up, and by failing to adequately notify the said workmen of the danger of working in the said stope, contrary to the Mining Act, Section 163, subsection 80.

A plea of "guilty" was made and a fine of \$100 and costs levied by the magistrate in settlement of the case without hearing.

Rex vs. R. H. Miner

A charge was laid against R. H. Miner, president and managing director of Clark Gold Mines, Limited, in the Police Court at Kenora on June 18. Judgment

was reserved at the time and the decision was given on August 9, a conviction being returned and a fine of \$100 and costs, with the alternative of three months' imprisonment, imposed.

The charge was as follows:—

That on or about the 20th day of May, 1937, R. H. Miner, being president and managing director and agent of Clark Gold Mines, Limited, the owner of certain mining claims near Dymont, in the district of Kenora, did not in his direction or management of the said Clark Gold Mines, Limited, comply with certain written orders of A. S. Bayne, an inspector under the Mining Act of Ontario, being R.S.O. Chapter 45 and the regulations made thereunder, which said orders were issued under the authority of Section 172, subsection 1 (a), which said orders were given in writing by the said inspector under date of the 5th of March, 1937, which said orders not so complied with are as follows:—

That all boilers must be inspected by a certified inspector before being put into operation (Sec. 163, subsection 157(b)).

That the 5- by 10-inch hoist was not to be used, it not being suitable for mine operation (Sec. 163, subsections 116, 117, 118).

That suitable fire-fighting equipment must be installed around the surface plant.

That no machinery must be installed any closer to the hoist than the nearest compressor behind the hoist. Machine-shop equipment must not be installed in the power-house but must be in a separate building.

The partition between the manway and the adjacent hoisting compartment in the shaft must be closely boarded (Sec. 163, subsection 90).

That a suitable detonator storage is to be built (Sec. 163, subsection 33).

That a mine stretcher is to be purchased and kept in a conspicuous and convenient place (Sec. 163, subsection 18).

Contrary to Section 174 of the Mining Act of Ontario.

The prosecution against the president and managing director as agent was the first of its kind in Ontario and was based on the definition of "agent" contained in the Act, as follows: "Agent, where it occurs in Parts VIII and IX, shall mean any person having, on behalf of the owner, the care or direction of a mine or any part thereof."

It was contended by the defence at the hearing that Miner, in his capacity as president and managing director of the company, residing in Montreal, only acted in an executive manner on behalf of the owner.

It was shown in evidence that Miner was thoroughly conversant with every detail connected with the operations of the property and rendered the final decisions on all matters pertaining to the operations. The prosecution called attention to the systematically detailed correspondence between Miner and the mine manager and submitted letters to the court concerning the items contained in the inspector's instructions. Further illustrating the minute detail of matters dealt with by Miner, a letter was presented which specified the exact kind of paint which should be used in decorating the cookery.

The magistrate found that the accused, R. H. Miner, was an agent within the meaning of the Act and then heard evidence from Miner as to the reasons for "non-compliance" with the inspector's orders. He did not feel that the explanations given were sufficient, and the conviction was filed.

Arseniuretted Hydrogen Poisoning

Serious consequences of an unusual type of arsenic poisoning were narrowly averted in the mill of the Lebel Oro Mines, Limited, through the prompt diagnosis of the trouble and the speedy application of proper treatment to the affected men by the company's contract physician, Dr. S. S. Polack, of Sudbury.

Subsequent investigation by the Industrial Hygiene Division of the Provincial Department of Health showed the condition to be due to the liberation of arseniuretted hydrogen (AsH_3), an extremely poisonous gas, in parts of the milling circuit and refining process used at the property.

This dangerous compound is likely to be formed wherever hydrogen may be liberated in the presence of solutions containing even minute quantities of arsenic compounds—such as in the acid bath usual in the treatment of filter leaves where the reaction between the metal frames of the filters and the acid bath will liberate hydrogen, or in the acid treatment of gold precipitates where residual zinc is rapidly attacked by the acid used, evolving hydrogen, which in turn reacts with arsenic compounds present, forming arseniuretted hydrogen.

In the case of the Lebel Oro mill, every man working in the mill was more or less affected and several of them to an alarming degree. All, however, responded satisfactorily to treatment, and fatalities, which at first seemed possible, were averted.

As arsenic is a quite common constituent of many of the ores in Ontario, millmen throughout the province should be on guard to prevent a similar occurrence elsewhere and provide adequate ventilation in all processes where there is a possibility of the liberation of hydrogen in the presence of arsenic-bearing solutions.

Summary of Rope Tests

The following is a summary of the tests made in the Wire Rope Testing Laboratories of the Department of Mines during 1937:—

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|--|-----|
| Tests for Ontario mines under Act..... | 538 |
| Special informative tests..... | 5 |
| Tests for wire-rope manufacturers..... | 20 |
| Tests for mines outside Ontario..... | 16 |
| Other tests..... | 1 |
| Total..... | 580 |

Classes for Prospectors, 1937-38

By W. D. Harding

Introduction

During the season 1937-38 prospectors' classes were conducted at 18 different towns and cities scattered throughout Ontario. The instructors were W. D. Harding and H. C. Horwood.

In recent years the normal duration of a course at each town has been 8 days. During the past season, however, the course has been shortened to 6 days, or one work week. Under this new arrangement the course consisted of six day classes, at which instruction was devoted largely to the study of minerals and rocks, and five evening lectures on subjects related to geology and mining. The table of instruction was revised and somewhat shortened to conform to the shorter period. The revisions consisted largely of the elimination of matter pertaining to theory and the introduction of more practical instruction. In general, it was found that none of the essential instruction had to be curtailed. The new shortened course emphasizes the importance of mineral identification. It also includes instruction in practical prospecting, claim-staking, and Ontario mining laws. Demonstrations of gold-panning were given at each course.

Analysis of Class Attendance

The following table gives a summary of the attendance for each town at which a class was held during the season of 1937-38:—

TABLE OF ATTENDANCE, 1936-37

| Instructor and place | Period of course | Total registration at mineralogy classes | Average daily attendance at mineralogy classes | Average attendance at evening lectures | Total student hours, afternoons and evenings | Practical experience in prospecting or mining | Repeat course |
|----------------------------|------------------|--|--|--|--|---|---------------|
| W. D. HARDING: 1937 | | | | | | | |
| Marmora..... | Oct. 18-26..... | 26 | 9 | 19.5 | 260 | 9 | 18 |
| Ottawa..... | Oct. 28-Nov. 5. | 39 | 30 | 32.6 | 651 | 5 | 9 |
| Hamilton..... | Nov. 8-16..... | 24 | 18.9 | 26.4 | 434 | 5 | 4 |
| Niagara Falls.. | Nov. 17-25..... | 37 | 22 | 27.8 | 501 | 5 | 7 |
| H. C. HORWOOD: | | | | | | | |
| Peterborough.. | Nov. 22-27..... | 52 | 34 | 54 | 678 | 6 | 1 |
| W. D. HARDING: 1938 | | | | | | | |
| Port Arthur... | Jan. 10-15..... | 29 | 24 | 32 | 449 | 16 | 9 |
| Fort William.. | Jan. 17-22..... | 51 | 34.9 | 39.2 | 615 | 17 | 24 |
| Fort Frances... | Jan. 25-31..... | 26 | 22.1 | 16 | 330 | 14 | 9 |
| Kenora..... | Feb. 2-9..... | 58 | 34.9 | 35 | 688 | 28 | 26 |
| Sioux Lookout. | Feb. 11-17..... | 27 | 17.1 | 20 | 307 | 16 | 15 |
| Geraldton..... | Feb. 21-26..... | 82 | 58.9 | 83 | 1,121 | 53 | 13 |
| New Liskeard.. | Feb. 28-Mar. 5. | 30 | 26.4 | 25.6 | 444 | 22 | 14 |
| H. C. HORWOOD: | | | | | | | |
| Toronto..... | Jan. 3-8..... | 263 | 275 | 283 | 4,715 | 95 | 38 |
| North Bay..... | Jan. 10-15..... | 41 | 30 | 45 | 585 | 11 | 3 |
| Sturgeon Falls. | Jan. 17-22..... | 75 | 55 | 154 | 1,430 | 10 | 2 |
| Blind River.... | Jan. 24-29..... | 17 | 16 | 20 | 260 | 4 | 2 |
| Sault Ste. Marie | Jan. 31-Feb. 5.. | 51 | 42 | 26 | 550 | 12 | 12 |
| Timmins..... | Feb. 7-12..... | 87 | 60 | 146 | 1,450 | 54 | 11 |
| Total..... | | 1,015 | | | 15,468 | | |

¹Registrations incomplete.

The above table shows that interest in prospectors' classes throughout the province appears to have been well sustained during the past season. Altogether 1,015 persons attended the 18 classes. This represents a total of 15,468 student hours of instruction. During the previous year 1,185 persons at 21 towns accounted for 17,305 student hours of instruction.

As in previous years, the attendance was generally high in towns situated adjacent to active prospecting or mining fields, in towns where classes had not been held previously, and in those where classes were held after a long interval. For this reason there was a good response at Peterborough and Geraldton, where classes were held for the first time. The attendance at Sturgeon Falls and at Timmins was also high. The registrations at the Toronto class were slightly lower than in the previous year.

The following table summarizes the number of prospectors' classes held and the total registrations during the past 10 years:—

| Year | No. of classes held | Total registrations |
|--------------|------------------------|------------------------|
| 1928-29..... | 14 | 353 |
| 1929-30..... | 15 | 281 |
| 1930-31..... | 15 | 345 |
| 1931-32..... | 13 | 614 |
| 1932-33..... | 13 | 1,667 |
| 1933-34..... | 15 | 1,257 |
| 1934-35..... | 10 | 1,084 |
| 1935-36..... | 10 | 604 |
| 1936-37..... | 21 | 1,185 |
| 1937-38..... | 18 | 1,015 |

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PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. PAUL LEDUC, *Minister of Mines*

H. C. RICKABY, *Deputy Minister*

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OF THE
ONTARIO DEPARTMENT OF MINES
BEING
VOL. XLVII, PART III, 1938

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COLOURED GEOLOGICAL MAPS

(In pocket at back of report)

- Map No. 47b—Crow River Area, District of Kenora (Patricia Portion), Ontario. Scale, 1,000 feet to the inch.
- Map No. 47c—Uchi Lake Area, District of Kenora (Patricia Portion), Ontario. Scale, 800 feet to the inch.

THE CROW RIVER AREA

By Jas. E. Thomson

INTRODUCTION

The Crow River area comprises a group of mining properties located in the vicinity of the Crow (Kawinogans) river in Patricia portion of the district of Kenora. Pickle lake lies at the west end of the area and is the local air base. This mining camp is situated about 125 miles northeast of the town of Sioux Lookout on the Canadian National railway, or roughly 85 miles due north of Allanwater station on the same line.

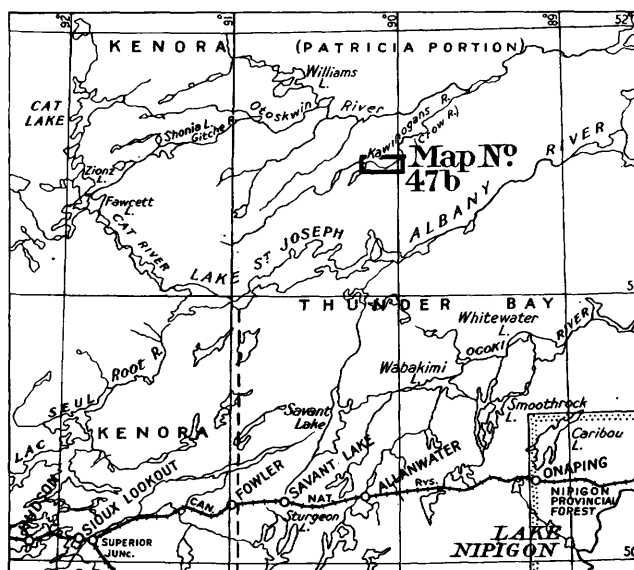


Fig. 1—Key map showing the location of the Crow River area, Patricia portion of Kenora district. Scale, 50 miles to the inch.

During the summers of 1936 and 1937 a detailed geological map was made of the properties that were being actively developed in the Crow River area. This sheet (map No. 47b) covers approximately 30 square miles and extends about $9\frac{1}{2}$ miles in an east-west direction along the main belt. Within the map boundaries two companies are producing gold and other properties are in various stages of development. The importance of the Crow River area as a gold-producing camp may be judged from the 1937 output, which amounted to about \$3,643,000. The production from the camp will be increased considerably in 1938.

A community of several hundred people has grown up in the area, chiefly centred about the two producing mines, which are about $4\frac{1}{2}$ miles apart. It is served with a good highway, local stores, banking facilities, hotels, hospitals, post-offices with daily mail delivery, and a radio-telephone service maintained by the Ontario Forestry Branch.

Scope of Report

The object of the investigation was to map the geology in as great detail as possible in the hope that it would provide useful information about the nature of the ore deposits and their relation to geological features. Plane-table surveys on the scale of 100 feet to the inch were made in the vicinity of the main showings. A geological map of the entire area was prepared on the scale of 400 feet to the inch and later reduced to the scale of 1,000 feet to the inch for publication. Plane-table surveys were carried out in the vicinity of roads, power lines, and some surveyed claim lines. Geophysical surveys were being made at several properties and parallel picket lines had been cut 300 to 500 feet apart. The picket lines were tied to surveyed claim lines and stations were established every 50 or 100 feet. Traverses were made along these lines and the outcrops on and between them were accurately located. In the few places where picket lines were not cut, pace-and-compass traverses were made around and across surveyed claims at distances not more than 400 feet apart.

The Crow river country presents two outstanding obstacles to any detailed study of the geology. Firstly, the greater part of the area is covered by overburden, and secondly, the rocks that are exposed do not present much variety in type, so that it is difficult to trace geological horizons. In some sections, however, bands of iron formation are intercalated with lava flows and some horizons may be traced for considerable distances. The tracing of these bands has proved to be of great assistance in showing the deformation of the region. This work is of paramount importance in prospecting the region, because the known gold deposits are pretty well localized in the vicinity of the iron formation. Dip-needle and magnetometer surveys have been made by company geologists and very kindly placed at the writer's disposal. In the summer of 1937, Dr. A. A. Brant, geophysicist at the University of Toronto, was attached to the writer's party and made additional magnetometer surveys of certain sections of the area. At some properties where very little rock is exposed, systematic diamond-drilling programmes were carried out to explore the drift-covered portions. In several instances the geological information thus obtained has been placed at the writer's disposal and indicated on the map.

The accompanying coloured geological map (No. 47b) is somewhat modified from the original field-sheets. This is due to the increase in scale of the published maps and the necessity of plotting outcrops in sufficient size to take colours in the lithographic process. In many places several small outcrops had to be grouped as one rock exposure. For the same reason the size of dikes and bands of iron formation has been exaggerated in some cases.

Acknowledgments

From the above statement it may be inferred that the writer is greatly indebted to the management of the various mining companies in the area for their co-operation during the course of the field work. Every possible assistance was rendered at all the properties visited. Much of the information in this report has been obtained from a study of mine maps and records placed at the writer's disposal.

In order that the reader may know the exact source of information the following acknowledgements are made:—

The management of Central Patricia Gold Mines, Limited, supplied a geological surface map of their property prepared by W. F. James, B. S. W. Buffam, and R. Byers, consulting geologists. Geophysical surveys of iron forma-

tion lying north and west of the Central Patricia mine were made by R. Byers and are included on the accompanying geological map. Mine plans and sections dealing with underground exploration of the property were cordially furnished by company officials and are reproduced here with their permission.

The management of Pickle Crow Gold Mines, Limited, kindly provided mine plans and geological maps showing the results of underground development. These were prepared by the Engineering Department. In 1936, E. F. Creelman, consulting geologist, made a detailed dip-needle survey of the Pickle Crow claims and traced out bands of iron formation. The company and Mr. Creelman gave the writer the results of this survey. On the geological map the iron formation indicated on drift-covered parts of the Pickle Crow claims is taken from Mr. Creelman's map plus some later drilling information.

J. W. Morrison, president, and G. S. Gilbert, manager, of Albany River Mines, Limited, furnished drilling information and underground plans of the mine.

At Winoga Patricia, Kaw-Crow Patricia, Gateway Patricia, and Pickwick mines, all of which were operated under one management, much information was provided through the courtesy of R. E. Hore, managing director, and H. F. Taylor, manager. Detailed geological maps of Winoga Patricia and Kaw-Crow Patricia claims, prepared by Robert Thomson, geologist, and P. Hamilton, engineer, were placed at the writer's disposal, and information from these has been freely used on the accompanying map. Results of dip-needle surveys and drilling at the Pickwick mine were supplied by the management. At the Gateway Patricia, surface geological maps and diamond-drilling plans were made by P. Hamilton. These were supplied also, and the information incorporated in the published map.

Roeanor Gold Mines, through J. D. Johannesen, manager, provided a geological map and magnetometer surveys of the company's west group of claims prepared by Hans Lundberg, Limited.

A dip-needle survey of the group of claims owned by Coniagas Mines was made by M. F. Tesky, geologist, in 1936 and supplied by J. F. Sutherland, manager. In 1937 Mr. Sutherland also provided a dip-needle survey of the Crowshore property that had been made by B. L. Smith, geologist. L. D. Dougan, mining engineer, supplied information on drilling operations at the Canadian Patricia, and A. J. Anderson, consulting engineer of the Crow River Development Company, gave the writer data on dip-needle surveys and drilling on the property. Information on the Nytor Patricia property was supplied by J. B. Mawdsley, consulting geologist. J. A. MacArthur provided a plan of a dip-needle survey on the Cohen-MacArthur claims.

The writer was ably assisted in the field by P. A. Chubb in 1936 and by A. A. Brant, T. F. Slater, and G. R. Smith in 1937. Mr. Chubb did a considerable part of the geological mapping. Dr. Brant carried out detailed surveys with an Askania magnetometer at a number of localities.

Previous Geological Work

A reconnaissance survey was made along the Crow river between 1903 and 1905 by Wm. McInnes¹ of the Geological Survey of Canada. Following the gold rush of 1928, M. E. Hurst² made a preliminary geological examination of the Pickle Lake-Crow River area. Articles on the Central Patricia mine have been

¹Ont. Bur. Mines, Vol. XXI, 1912, pt. 2, pp. 112, 126.

²M. E. Hurst, "Pickle Lake-Crow River Area," Ont. Dept. Mines, Vol. XXXIX, 1930, pt. 2, pp. 1-35.

written by J. M. Cormie¹ and J. A. Reid,² and the Pickle Crow mine has been described in an article by the mine staff.³

History and Development

The Crow River area attracted little attention until the summer of 1928, when promising gold discoveries were announced and a gold rush ensued. The original discovery was at the present claims of the Albany River Mines. During the following winter months the country for about 12 miles east of Pickle lake was largely staked. This ground was prospected in the summer of 1929. Up to that time the most promising discoveries were at the Central Patricia mine, the showings of Northern Aerial Minerals Exploration (later the Pickle Crow mine), and a vein on the Springer claims, which were under option to F. M. Connell and associates. Development on other groups of claims did not provide much encouragement, although on many claims very little rock was exposed and no real exploration could be done.

The original discoveries on Central Patricia and N.A.M.E. ground were drilled in 1929. In the spring of 1930 a mining plant was assembled at the Central Patricia and underground work was done during that summer. An ore body was outlined and a 50-ton mill recommended, but, because of financial conditions, the mill was ordered only in 1933 and was completely installed by May, 1934. In the same year Pickle Crow Gold Mines, Limited, was organized and took over the property of Northern Aerial Canada Golds, Limited, successors to N.A.M.E. Underground work had commenced at the original discovery (Howell vein) in the fall of 1933 and soon indicated an ore body. A 125-ton mill was ordered and commenced operations in April, 1935.

The immediate success attained at both properties led to a resumption of activity in the area. In the summer of 1936, 14 companies were at work. Owing to the large areas of overburden, detailed examination of the country was carried on by means of geological mapping, geophysical surveys, surface trenching, and diamond-drilling.

Transportation

Passenger traffic into the area is almost entirely by airplane from Sioux Lookout or Hudson on the Canadian National railway. In the early days of the camp, transportation was by canoe and airplane. Heavy freight was taken in over a winter road by tractor-drawn sleds from a point near Savant Lake station. Canoe trips into the region were begun from either Savant Lake or Hudson; the routes have been described by Hurst.⁴

In 1934, when it became necessary to take in heavy mining equipment, Pickle Crow Gold Mines joined with Central Patricia Gold Mines and the Department of Northern Development of the Province of Ontario to provide a summer transportation route from Hudson to the east end of Lake St. Joseph. Freight is now taken on scows and boats up Lac Seul to the Root river, portaged over a section of the river by a marine railway, and then transported by water to Doghole bay on Lake St. Joseph.

In 1936, Central Patricia and Pickle Crow incorporated the Lake St. Joseph Transportation Company, Limited, to operate the Root River portages, the

¹Econ. Geol., Vol. XXXI, pp. 93-103.

²Ibid, pp. 527-530.

³Bull. Can. Inst. Min. and Met., April, 1938, pp. 125-158.

⁴M. E. Hurst, op. cit., p. 2.

Root River railway, and a new truck road from Doghole bay on Lake St. Joseph to the Central Patricia and Pickle Crow mines. The entire capital stock of this company is held equally between the two mining companies. The Lake St. Joseph Transportation Company gave a contract for the construction of this road and was granted financial assistance for the project by the Dominion and Provincial governments. The road was completed in 1937 and resulted in a material reduction in freight rates to the mines. The freighting costs from the railway to the mines in 1937 ranged between \$30 and \$35 per ton.

Power

Electric power for the area comes from a generating station at Rat Rapids on the Albany river at the outlet of Lake St. Joseph. The plant was placed in service in March, 1935, by the Hydro-Electric Power Commission of Ontario. Power is supplied by a 22,000-volt transmission line for a distance of 27 miles and goes entirely to the mines of the Crow River area. The maximum normal plant capacity in 1935 was 1,000 horse-power with a peak load of 1,314 horse-power.¹ Rapid expansion of mining, however, led to a power shortage, and a new unit was added to the station at Rat Rapids, stepping up the plant capacity to 3,000 horse-power. This installation was completed in October, 1936. At this time a new contract became effective whereby the Central Patricia and Pickle Crow mines agreed to purchase 800 horse-power at \$65 per horse-power for a period of 7 years. For amounts in excess of 800 horse-power the mines will pay \$35 per horse-power. A new contract will be negotiated at the end of the 7-year period. Albany River Mines also obtains power from this plant.

GENERAL GEOLOGY

The general geology of the area may be briefly summarized as follows: The consolidated rocks are pre-Cambrian in age and, with the exception of a few diabase and lamprophyre dikes, belong to the earlier pre-Cambrian or Archean era. Basic lava flows of Keewatin age, commonly called "greenstones," make up the predominant rock formation. Interbanded with the lavas are narrow bands of iron formation, other fine-grained sediments, and fragmental rocks such as agglomerate, volcanic breccia, and tuffs. Diorites are also associated with the lavas. Granite, porphyries, and associated acid rocks intrude the older Keewatin complex. The gold deposits are located entirely within Keewatin rocks and are generally associated with iron formation, but were probably introduced during the closing stages in the period of granitic intrusion. Lamprophyre and diabase dikes intersect the granite. The diabase is similar to that found so commonly in the Lake Superior region and assigned to the Keweenawan period. The mantle of clay, sand, and gravel that covers such a large part of the country was laid down during the continental glaciation of Pleistocene time.

The various rock formations may be conveniently classified as follows, the oldest rocks being placed at the bottom:—

QUATERNARY

PLEISTOCENE: Boulder clay, sand, gravel.

Great unconformity

PRE-CAMBRIAN

KEWEENAWAN: Diabase, lamprophyre.

¹Annual Report of Hydro-Electric Power Commission for Ontario, 1935, p. 8.

Intrusive contact

| | |
|-------------|--|
| ALGOMAN(?): | { Granite and gneiss. Massive (later?) quartz-feldspar porphyry, syenite porphyry, and quartz porphyry. Aplite, rhyolite, and felsite. Schistose (older?) quartz porphyry and quartz-sericite schist. |
|-------------|--|

Intrusive contact

| | |
|-----------|---|
| KEEWATIN: | { Gabbro and diorite. ¹ Sediments interbanded with lava flows: Iron formation, quartzite, greywacké, graphitic schist. Volcanic fragmentals: Agglomerate, tuff, volcanic breccia. Basic lavas (greenstones): Andesite, basalt, and pillow lava; chlorite and hornblende schist; carbonated basic lavas and schists. |
|-----------|---|

Keewatin Series

The Keewatin series is made up of four or probably five rock groups that may be recognized in the field. These groups are differentiated on the accompanying geological map and are as follows: (1) basic lavas and their metamorphosed equivalents (greenstones); (2) fragmental rocks, consisting of pyroclastics and volcanic breccias; (3) fine-grained sediments; (4) iron formation; and (5) probably gabbro and diorite. The last group may be partly post-Keewatin. These groups are interbanded in various combinations, and the different formations may recur at a number of different horizons in the stratigraphic sequence. They appear to be conformable with one another but tend to lens out along the strike. The iron formation is the best horizon marker in the Keewatin complex, and the study of its distribution has proved to be of great assistance in showing the geological structure of the area. Structural information indicates that the iron formation occurs at many different horizons in the volcanics. In the eastern part of the area, however, the bands seem to be concentrated in the upper part of the Keewatin series near the synclinal axis. Sediments other than iron formation are very sparsely distributed, and the bands are always narrow.

Basic Lavas

Basic lavas, commonly called "greenstones" in the field, make up by far the greater part of the Keewatin series. They generally range from andesite to basalt in composition. The lavas are fine- to medium-grained, dark-green rocks but show some variation dependent upon the degree and type of alteration that they have undergone. Often these greenstones are fairly massive and show such primary structures as pillows and vesicles. The alteration, however, is sufficiently developed that it is generally impossible to recognize individual flows or flow contacts. In a very few places a flow may be bounded by a narrow band of chert or iron formation and the boundaries thus recognized. The pillow structures are so distorted that only at two places in the whole area was the writer able to determine the attitude of the flows by the shape and distribution of the pillows. Amygdaloidal lavas are rarely found, but a few fine exposures occur on claims Pa. 2,118 and 2,119 of the Kaw-Crow Patricia group. The bubble holes (vesicles) formed by contained gases in the original flows have been filled with silica to form the amygdules. These are of all sizes up to one-half inch in diameter and are more or less spherical in outline.

Dacite is exposed at a few points south of the Central Patricia mine and east along the power line. The rock is fine-grained, weathers light-grey in colour, and

¹Part of this group may be post-Keewatin.

sometimes contains pillow structures. The extreme scarcity of outcrops of the rock renders it quite unimportant as a horizon marker in the greenstone complex.

Fragmental Rocks

The group of fragmental rocks consists of volcanic (or flow) breccia, agglomerate, and volcanic tuffs; in places the tuff is well bedded. By definition, volcanic breccia is a rock formed by the shattering of part of a flow and cementation of the fragments by the consolidation of still molten lava; ordinarily the fragments are of one rock type. Agglomerate and tuff, on the other hand, are formed by fragments that are hurled from some source of volcanism and mixed with the molten lava and ash; the fragments may be of varied rock types. The fine-grained, ashy portion when consolidated into a rock is called volcanic tuff. If any such



Drag-folded agglomerate, Dona Patricia claims.

material should be sorted into strata by erosional agencies before consolidation, it is then a bedded tuff. The bedded tuffs are thus sedimentary rocks almost identical with ordinary greywacké.

All these fragmental rocks occur within the map area, but it is not always possible to distinguish between the volcanic breccia and agglomerate on account of rock alteration. Typical agglomerate consists of fragments of dark- and light-coloured rock material in a tuffaceous matrix. On claims Pa. 85 and 88 of the Central Patricia, elongated fragments of basalt, rhyolite, and chert occur in the agglomerate. On Dona Patricia ground the rock sometimes contains large fragments of rhyolitic material that are very much contorted (see photograph above). At other places the fragments are porous and resemble bombs. Near the east boundary of the Pickle Crow property (claims Pa. 646, 644, and 727) the fragments in the agglomerate are very much rounded and the rock might be called volcanic conglomerate. The coarser pyroclastics on the Dona Patricia claims are intermingled with rhyolitic tuff, bedded tuff, and lean iron formation. The rhyolitic tuff is light-grey or pink in colour and grades into a rudely stratified, thin-bedded variety. Microscopic examination of a specimen of the latter rock from a point near the creek just south of the Dona Patricia camp showed that it consists of alternate bands of chlorite, which contain scattered grains of mag-

netite and quartz-siderite-magnetite *laminae* (see photomicrograph below). It is thus a ferruginous greywacké or lean iron formation and a sort of transitional variety between the pyroclastics and the typical banded iron formation of the country.

The occurrence of different horizons of pyroclastics in the Keewatin series indicates that at certain periods during Keewatin time, rock fragments and ash were ejected from the subterranean sources that produced the flows and caused



Photomicrograph of ferruginous greywacké, Dona Patricia claims, showing chlorite bands (dark) with scattered grains of magnetite (black), interbanded with beds of quartz and siderite (grey). The chloritic *laminae* show tiny drag folds. (Single nicol, $\times 11$.)

the intermingling of these types. At a few places the ash and other fine debris were sorted into beds forming the bedded tuffs. Even the fragments of the agglomerate are sometimes rounded as if they had undergone some erosion.

Altered Lavas and Fragmental Rocks

The greater part of the lavas have undergone some alteration. Stresses produced during the folding of the rocks in the region have locally changed the basic lavas to chlorite and hornblende schists. In some places throughout the area narrow bands of fissile chlorite schists are developed between areas of massive greenstone. Such a zone of chlorite schist, much drag-folded, occurs a short distance south of the Central Patricia mine on claims Pa. 621 and 678. A similar zone is located just north of the mine near the dam on the Crow river. Other localized zones of strong shearing in the lavas are reported from Nytor Patricia, Winoga Patricia, and other properties. Pronounced shearing of the lavas often occurs at the contact with harder competent rocks, such as iron formation. This

may be seen underground at the Central Patricia and Albany River mines. The sheared zones are the probable locus of faulting movements that relieved pressures produced during the general folding of the region.

Another type of metamorphism of the lavas near granitic intrusives has produced a mixture of hornblende and chlorite schist, amphibolite, and gneiss. This rock group is found near granite contacts on claims of the Kaw-Crow Patricia, Roeanor, Nytor Patricia, and Dona Patricia.

At a few places in the area the basic lavas and schists have been heavily carbonated. The carbonated zones are characterized by outcrops with a reddish-brown surface gossan due to the weathering of iron-bearing minerals. Probably the largest area of carbonated rock occurs on claims Pa. 774 and 777 of the Cohen-MacArthur group north of the Pickle Crow mine. Fresh rock from drill-cores is greyish-white in colour and consists of intermixed quartz and carbonate. The rock was probably formed by hot solutions, rich in silica and carbonate material, which circulated through the greenstones and replaced certain areas. The result is that the carbonated zones are quite irregular in outline.

The fragmental rocks have been altered in a similar way to the lavas.

Sediments

Besides the previously mentioned tuffaceous sediments and the iron formation, discussed below, there are small bands of fine-grained sediments interbedded with lava flows at a few places in the area. A narrow band of bedded greywacké outcrops at the old Pickle Crow camp (near the southwest corner of claim Pa. 729). Rock of similar appearance has been intersected in drilling northwest of the Pickle Crow mine and is possibly the extension of the same band.

A poorly defined zone of sediments, interfingering with greenstones, occurs at the extreme southeastern corner of the Kaw-Crow Patricia claims. Both sediments and lavas are greatly altered, owing to the proximity of granitic intrusives. The belt strikes in a northeasterly direction and, therefore, runs parallel with the general structure of the region. Hurst¹ described the sediments on claim Pa. 3,281 (formerly one of the Maloney claims) as gneissic quartzite. Drill-holes put down across the zone in 1937 revealed several bands of sediments intercalated with hornblende schist. The maximum width of sedimentary material in the cores was around 100 feet. The sediments were logged by Robert Thomson, geologist, as "garnetiferous arkoses and quartzites," and showed bedding *laminae* in places. The probable southwest continuation of this zone of schists and sediments was cut in drill-holes on the northwest side of claim Pa. 2,442.

Sediments were intersected in drill-holes on claims of Gateway Patricia Gold Mines lying immediately northeast of the Crow river (Pa. 2,188 and 2,191). The rocks have the composition of greywacké, quartzite, and graphitic schist. The relationship of the sediments to the adjoining rocks is shown in Fig. 2 (prepared by P. Hamilton, mining engineer, Gateway Patricia Gold Mines). Drilling has revealed bands of white siliceous sediments up to 70 feet in thickness. Core samples of the rock appear rather similar to sugary vein quartz. Microscopic examination of a sample of the rock from hole No. G. 21 indicated that it was a bedded siliceous greywacké containing quartz, orthoclase, and chlorite. A section of similar rock from hole No. G. 17 consisted almost entirely of well-sorted clastic quartz grains and was thus a quartzite. The graphitic schist occurs in bodies that attain a thickness as great as 30 feet. It is rather closely associated with the greywacké and quartzite and is very probably of sedimentary origin. The

¹M. E. Hurst, *op. cit.*, p. 11.

graphite occurs in a black slaty rock along with balls and grains of pyrite. Graphite and pyrite make up a considerable proportion of the rock. Analysis of a representative sample of the graphitic rock from hole No. G. 19 showed 10.67 per cent. carbon and 23.68 per cent. pyrite. Under the microscope this rock shows graphite fragments and pyritic masses cemented together by quartz. The quartz has been recrystallized, and the crystals are oriented parallel to the schistosity along with wisps of chlorite and sericite.

Iron Formation

The iron formation is a sedimentary rock occurring in narrow bands, which lie between the lava flows. These bodies range in width from a few inches to 250 feet. Some of the prominent bands have been traced more or less continuously for miles along the strike; others are quite lenticular and may extend only



Exposure of drag-folded iron formation, Winoga Patricia claims.

a few feet. The more persistent horizons may pinch and swell, or even die out, at various places along the strike but are sufficiently continuous to provide horizon markers in the greenstone complex over considerable areas. The iron formation is a harder, more competent rock than the greenstone surrounding it. In the general deformation of the country the greenstone has flowed under pressure and become schistose, whereas the brittle iron formation yielded by fracturing or folding. Thus in some exposures the beds of iron formation are extremely contorted and drag-folded (see photograph above); even the whole band may be intricately folded.

A horizon of iron formation may consist of a distinct band of appreciable width or it may consist of several small parallel bands intercalated between thin lava flows. For example, near the bunk-house at the Albany River mine one small outcrop shows seven parallel bands of iron formation alternating with thin lava flows over a width of 50 feet. Similarly in the underground workings at the mine a large number of different bands have been found. The same horizon, however, at the Pickle Crow mine consists of one band over 200 feet in width on the surface, although underground it comprises two or three separate bands.

Hurst¹ has described the rock as follows:—

The iron formation consists of bands, ranging from a fraction of an inch to 2 inches in thickness, in which iron carbonate, silica, and magnetite are present in varied proportions. The oxidation of the iron carbonate to limonite imparts a rusty appearance to the outcrops and frequently accentuates the banded structure. The silica occurs as a chalcedonic or flinty variety and never as jasper.

On an unweathered surface the iron formation may be light-grey, buff, greenish-brown, or black in colour. Usually it is made up of alternating light and dark grey layers. The light-coloured bands consist of finely laminated silica with only minor amounts of iron carbonate. The grey



Iron formation on the 375-foot level, Central Patricia mine, showing cross-fractures, some of which contain vein quartz.

or brown layers contain much iron carbonate, some silica, and a little magnetite. In the dark-grey or black bands magnetite is abundant and usually predominates over the other constituents. In places, streaks and fragments of chloritic material from the greenstone walls are included in the iron formation near its margins.

Thin sections of the iron formation from different parts of the area always show bands of finely granular quartz grains alternating with bands of siderite, magnetite, or both minerals. Quartz grains are intimately mixed with the iron-bearing minerals. The deposition of silica seems to have been a continuous process, whereas the magnetite and siderite were laid down periodically. Tiny wisps of chlorite sometimes occur in the layers of iron and silica. Pyrite, pyrrhotite, and other sulphides in the rock have been introduced after its consolidation. The introduction of these minerals is discussed elsewhere in this report.²

¹M. E. Hurst, *op. cit.*, p. 8.

²See pages 28 and 29.

The magnetite content of the iron formation varies considerably throughout the area. A thin section of iron formation from the Albany River mine showed some thick bands of almost pure magnetite. The rock had undergone some deformation, and tiny fractures containing chlorite cut across the beds (see photomicrograph on page 14). A thin section of iron formation from the Pickle Crow claims happened to show a low magnetite and relatively low siderite content. This is a lean or cherty iron formation. Sometimes the iron content becomes negligible, and the rock is almost entirely composed of silica; it then has the composition of a chert.



Photomicrograph of iron formation, Pickle Crow mine. Bands of quartz (larger grey and white grains) are interbedded with siderite (small dark-coloured grains). (Crossed nicols, $\times 38$.)

The variation in magnetite content has caused certain difficulties in tracing iron formation under drift-covered areas by means of dip-needle surveys. The magnetic attraction of the rock varies with the magnetite content. Where this mineral is sparingly present, the difference in magnetic attraction between iron formation and some other rock formations in the area becomes quite small and cannot be detected by the use of an ordinary dip needle. In some cases, neighbouring rocks may produce greater magnetic anomalies than the iron formation. This was found to be the case near the Pickle Crow mine where certain dioritic bands produce greater magnetic effects than some parts of the iron formation. Another example is furnished by the large diabase dike that crosses the western part of the area and produces magnetic anomalies equal to or greater than the neighbouring iron formation. It is useless to attempt a dip-needle survey of the iron formation in this vicinity owing to the limited sensitivity of the instrument. The iron formation adjacent to the diabase east of the Central Patricia mine (claims Pa. 85 and 88), however, was traced out by A. A. Brant, a member of the writer's party in 1937. This was done by a careful survey with an Askania magnetometer, an instrument of very great sensitivity compared with a dip

needle. When the readings were closely spaced, and the necessary corrections applied, it was possible to distinguish narrow bands of iron formation, despite the great magnetic influence of the neighbouring diabase.

The iron formation is a sediment deposited during brief quiescent periods in Keewatin volcanism. Silica and iron, the latter probably in the form of soluble ferrous carbonate, could have been transported in solution and precipitated under reducing conditions in bodies of water occupying shallow depressions on the lava surfaces. Owing to the absence of any associated detrital sediments



Photomicrograph of iron formation, Albany River mine. Bands of magnetite (black) and siderite are interbedded with quartz (grey). Tiny faults that offset the beds contain wisps of chlorite. (Single nicol, $\times 11$.)

which would indicate prolonged weathering of the region, Hurst¹ believes that the silica and iron solutions were largely given off by the lavas during or shortly after their eruption and only to a small extent were derived from the weathering of these rocks. The horizons of iron formation in the eastern part of the area occur near a synclinal axis in the upper part of the Keewatin series. The iron formation north and south of the Central Patricia mine is probably well up stratigraphically in the volcanic complex. Apparently the intervals of quiescence with resultant sedimentation began during the latter part of the Keewatin period but occurred quite frequently once the lull in volcanic activity had commenced.

Distribution of Iron Formation

All the bands of iron formation in the area and its immediate vicinity known to the writer are shown diagrammatically on Fig. 3. Those within the map sheet

¹M. E. Hurst, op. cit., p. 11.

are indicated in greater detail on the coloured geological map (No. 47b), and here the surface outcrops have been differentiated from the drift-covered rock. A relatively small proportion of the iron formation indicated on Fig. 3, actually outcrops; most of it has been traced out by dip-needle and magnetometer surveys. Owing to the frequent association of gold deposits with the iron formation a great deal of drilling has been done on the bands indicated by geophysical surveys. This has provided a fine check on the magnetic indications, the accuracy of which was found to be in proportion to the care exercised in the original surveys. In rare instances exploratory drilling has picked up bands of appreciable size that were not indicated by dip-needle surveys. These evidently have a low magnetite content. In other cases distinct magnetic anomalies were indicated over considerable widths by dip-needle surveys. Drilling of these zones proved the existence of several closely spaced bands of iron formation with intervening lava flows rather than one wide band as might have been interpreted by the survey.

Gabbro and Diorite

A few bands of dark-green to greenish-grey basic rocks of medium- to coarse-grained texture are associated with the Keewatin lavas. They are generally massive but may be locally schisted, especially near the borders of the bands, and the mineral constituents are always considerably altered. In the field they may be classified as diorite or gabbro. As it is not possible to distinguish between diorite and gabbro on account of the alteration the minerals have undergone, they are grouped together on the accompanying map.

In some places the coarse-textured rock grades laterally into fine-grained lava, in which case it is interpreted as being the central part of a flow that cooled more slowly than the margin, resulting in the coarser crystallization of the mineral constituents. In a few places, narrow dikes of dioritic rock cut across agglomerate, or exhibit a well-defined intrusive contact with the lavas and contain inclusions of the intruded rock. It is often difficult to distinguish between intrusive diorite and coarse-grained phases of lava flows, and impossible in the case of isolated outcrops where no relationships with adjoining rocks may be seen.

About half a mile northwest of the Pickle Crow mine a body of diorite follows around the nose of a pitching synclinal fold. It conforms with the structure of the adjoining greenstones and iron formation and shows no evidence of cutting these rocks. In the northwest quadrant of claim Pa. 750, the diorite is coarse-grained but near the border of the band it becomes finer-grained, is sheared, and resembles the adjoining greenstone in appearance. For this reason the boundary between the diorite and lava is difficult to delineate. It is probable that the diorite body is a sill that was injected between the flows and derived from the same magmatic source as the lavas. During the later deformation of the region this sill was folded with the adjacent formations. If this interpretation is correct, the diorite would be Keewatin in age. However, some of the well-defined dioritic dikes that truncate lavas and agglomerate could be post-Keewatin.

Algoman(?)

Granite and Gneiss

Granitic bodies flank the greenstone belt in the Crow River country (see Fig. 3), but only a few exposures of the rock occur within the map area proper. The age of the granite cannot be accurately determined, but it is definitely later than the volcanic complex and older than the diabase. As pointed out by Hurst,¹

¹Op. cit., p. 11.

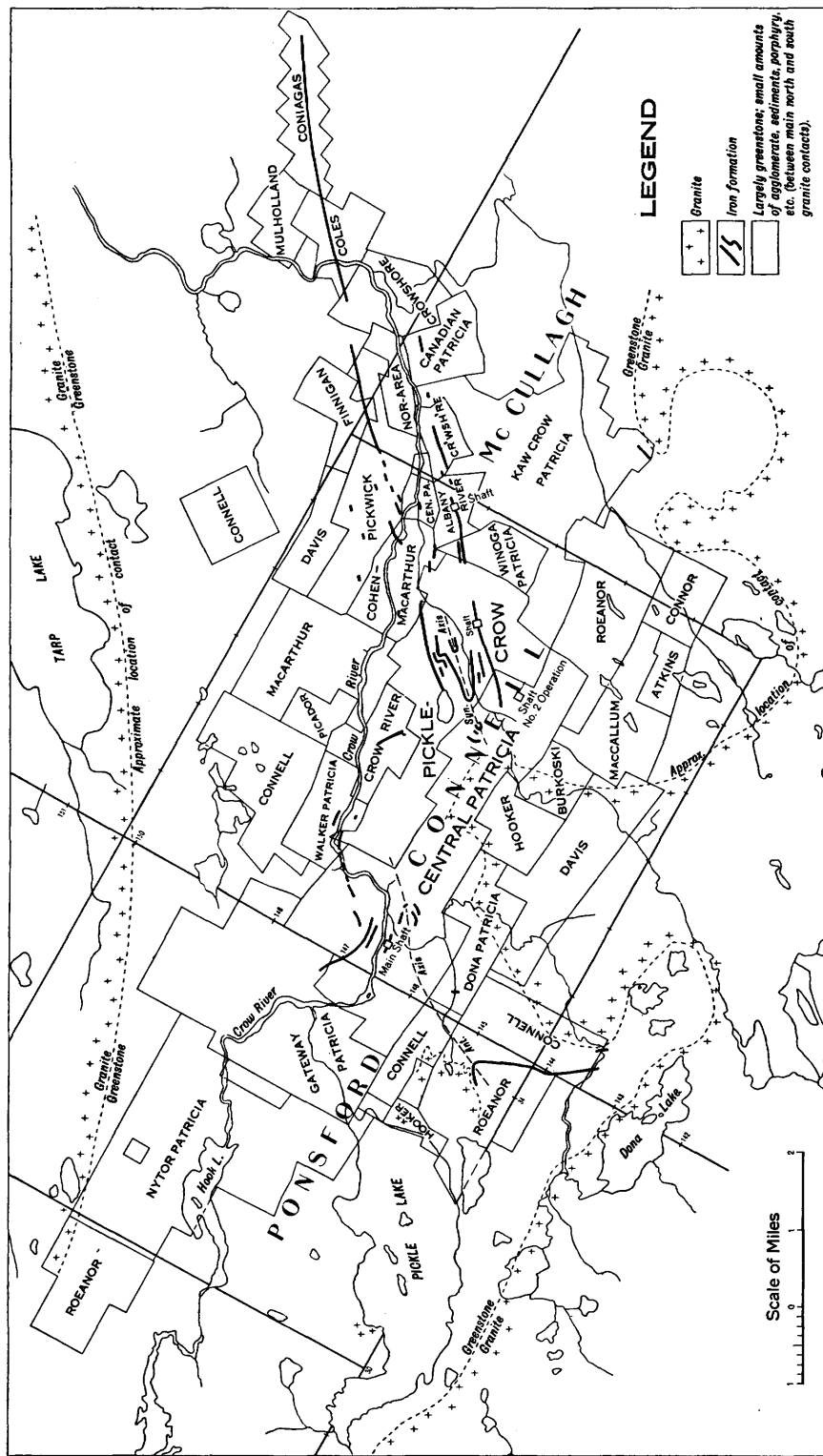


Fig. 3—Generalized geological sketch map showing mining properties and major structural features of the Crow River area.

it might be tentatively correlated with the granite and porphyry of the Algomian period of batholithic invasion.

Massive grey granite outcrops on the southwestern claims of the Hooker group (Pa. 2,678, etc.) and on the eastern claims of the Dona Patricia group. Farther north near the highway on claim Pa. 2,246 there are exposures of granite and quartz-feldspar porphyry. There appears to be a gradation from normal granite to porphyritic phases in this vicinity. On claims Pa. 655 and 636 of the Central Patricia, bodies of sheared quartz porphyry occur near the greenstone contact and may be a marginal phase of the granite exposed to the south and southwest. More detailed information is lacking due to the scarcity of rock outcrops. Massive granite occurs at the greenstone contact on claim Pa. 2,014.

Porphyries and Other Acid Intrusives

As previously mentioned, the granite seems to grade into porphyritic phases at a few points, and it is thus probable that the porphyries and other acid intrusives are of the same general age as the granite, and were derived from the same parent magma. The rocks of this group consist of three distinct types that may be recognized in the field. These are: (1) sheared quartz porphyry and quartz-sericite schist, (2) massive porphyries, and (3) fine-grained acid dikes named aplite, rhyolite, or felsite.

The sheared quartz porphyry is largely confined to the country around the Central Patricia mine. It generally contains distinct eyes of quartz and is occasionally massive, but in most exposures has been considerably altered and is a quartz-sericite schist. It occurs as irregularly shaped bodies, small dikes, and larger sill-like masses, which strike about parallel to the adjacent formations. In the early days of the Crow River mining camp some doubt was expressed as to whether this rock was an intrusive or an acid extrusive interbanded with the basic flows. However, detailed mapping of surface exposures and information obtained by drilling and underground exploration indicate that this sheared porphyry is intrusive. On the north side of the Crow river at the Central Patricia mine, small dikes of the porphyry intersect pillow lavas and contain inclusions of the greenstone. According to Dr. J. B. Mawdsley, consulting geologist, this porphyry cuts a band of iron formation in the Central Patricia shaft at the station of the 1,450-foot level.¹ As the schistosity of these porphyry bodies has the same strike and dip as the adjoining lavas, it is evident that both formations were deformed simultaneously. Northeast of the Central Patricia mine it was noted that some of the porphyry dikes had yielded to the deforming stresses to a greater degree than the greenstones and are highly sheared, whereas the enclosing lavas are fairly massive.

Massive porphyries occur at the Central Patricia No. 2 operation and on the Pickle Crow, Albany River, Winoga Patricia, Kaw-Crow Patricia, and Gateway Patricia claims. A stock of massive quartz-feldspar porphyry occurs near the Albany River mine, and dikes are found on neighbouring properties. Small dikes of syenite porphyry occur in the general vicinity of the Pickle Crow mine and the Central Patricia No. 2 operation, and on the Kaw-Crow Patricia claims. An elongated body of massive quartz porphyry strikes across the northern corner of the Winoga Patricia and Albany River claims. It has been traced southwest on Pickle Crow ground by diamond-drilling. This porphyry is light-grey in colour and contains quartz phenocrysts up to a third of an inch in diameter embedded in a medium-grained matrix of feldspar, chlorite, and sericite.

¹Personal communication.

Rhyolite dikes outcrop on the Kaw-Crow Patricia claims and have been cut by drilling on Winoga Patricia ground. Some of these are very persistent and have been traced for a considerable distance along the strike.

It is almost impossible to work out the age sequence of the various types of acid intrusives as they have not been found in contact with one another. The sheared quartz porphyry and quartz-sericite schist near the Central Patricia mine have a certain resemblance to some contact phases of the granite. It is possible that these schistose intrusives are an earlier phase of the granitic invasion and



Photomicrograph of syenite porphyry near the Pickle Crow mine. Crystals of feldspar are embedded in a groundmass of quartz, feldspar, and chlorite. (Crossed nicols, $\times 11$.)

that the massive porphyries in the eastern part of the area constitute a later phase. If this assumption is true, it would mean that the rocks of the area underwent a considerable amount of deformation, including shearing and faulting, between the intrusion of earlier and later porphyries. The fact that certain border phases of the granite batholith have been sheared with the greenstones would indicate that some folding took place after the intrusion of a portion of the granite body. This could easily happen if the time of batholithic invasion was contemporaneous with the period of folding of the greenstones.

Keweenawan

A diabase dike, ranging from 200 to 270 feet in width, strikes in a general northwest-southeast direction across the Central Patricia and Dona Patricia claims. The dike dips 75° to 80° S.W. The rock is massive, weathers dark-brown, and intrudes the greenstone and granite. It closely resembles the Keweenawan diabase found in other parts of northwestern Ontario.

Lamprophyre dikes are found at the Pickle Crow mine, on claims of the Cohen-MacArthur group, Pickwick Gold Mines, Nytor Patricia Mines, and west of the Central Patricia No. 2 operation. A lamprophyre dike 5 to 10 feet in width cuts across the vein at the Pickle Crow mine. It strikes about N. 60° W. and dips 85° S.W. A possible continuation of this dike outcrops 2,000 feet along the strike to the northwest. These dikes are dark-grey or black in colour, are massive, and have a porphyritic texture produced by biotite flakes. The rock generally has the composition of a variety of lamprophyre known as minette. On the south side of claim Pa. 655 of the Central Patricia, a lamprophyre dike, 20 feet wide, intrudes schisted quartz porphyry, which is regarded as a contact phase of the granite body that lies to the southwest. The lamprophyre is thus post-granite and later than the quartz veins of the region. It may be of the same general age as the diabase.

Pleistocene

The glacial deposits of the Pleistocene period have greatly modified the topography of the country and covered the greater part of the bed rock. Glacial striae and grooves in the pre-Cambrian rocks indicate that the ice-sheet moved southwestward. The glacial deposits consist of boulder clay, gravel, sand, and silt. Drumlin-like hills run in a general northeast-southwest direction through the country. Extensive areas of sand plain occur near the Central Patricia mine and small rounded kettle lakes are dotted here and there in the sand-plain country. The depth of overburden, as indicated by extensive drilling operations, varies from a few feet on the higher ground to 100 feet or even more in the depressions.

The retreat of the ice left a comparatively flat-lying terrain with small areas of bed rock protruding above the level of the glacial deposits. The lowlands are covered by spruce muskeg and areas of open tamarac swamp.

STRUCTURAL GEOLOGY

The interpretation of the geological structure in the Crow River area is impeded by lack of rock exposures and by the uniformity of rock types over most of the country. As already stated, the lavas are so uniform in appearance and so deformed that individual flows can scarcely ever be recognized; only in rare cases can the attitude of the flows be determined by the shape or arrangement of the pillow structures. Fortunately, however, bands of iron formation occur at various stratigraphic horizons in the lavas and some of these may be traced for considerable distances, thus serving as key horizons in the complex. Fig. 3 shows all the known bands of iron formation in the Crow river country that are of sufficient size to serve as horizon-markers. This map also indicates the major structural features of the region.

The large drift-covered area in the central part of the map-sheet separates the area into two natural divisions and makes a correlation of regional structure between the eastern and western parts of the area somewhat difficult. For this reason the structural features of the eastern and western units will be discussed separately.

Eastern Belt

The eastern belt includes the No. 2 operation of Central Patricia Gold Mines and all other properties lying to the north and east.

Folding

The major structural feature of the eastern belt is a closely folded syncline, the axis of which strikes in a northeasterly direction across the country (see

Fig. 3). This structure has been followed for over nine miles along the strike by tracing out bands of iron formation. At the southwest end it noses out near granitic intrusives. Throughout the country around the Pickle Crow mine and north of the Central Patricia No. 2 operation the beds on both limbs of the syncline generally dip to the northwest at 75 to 80 degrees, indicating that the axial plane is overturned at about this angle. At the Albany River mine the structure flattens slightly and dips 65 to 70 degrees northwest.

West of Pickle Crow mine three horizons of iron formation have been traced around the trough of the fold and along either limb. A series of dip measurements taken on the nose of the folds on claims Pa. 706 and 750 indicate that the trough of the syncline pitches to the northeast at an angle somewhere between 45 and 70 degrees. Dip measurements on a large subsidiary drag fold in the iron formation near the southeast corner of claim Pa. 738 showed the pitch to be somewhere between 52° and 75° N.E.

The upper horizon of iron formation is located along the northern boundary of claim Pa. 750 and consists of at least three narrow bands separated by thin lava flows. It is possible to follow surface exposures of the iron formation around the nose and along either limb of the fold. A sill-like mass of diorite lies stratigraphically below this iron formation and fits symmetrically about the synclinal axis. The second prominent horizon of iron formation, which noses out on claim Pa. 706, consists of from one to three bands at different places along the strike. Near the southwest corner of claim Pa. 738 the rock is much contorted and the detailed structure is not exactly known, but at least one large drag fold may be traced out by following surface outcrops. A third horizon of iron formation occurs in the northeast quadrant of claim Pa. 627 (Central Patricia). Surface outcrops of the band are scarce, but a detailed magnetometer survey by A. A. Brant has indicated its distribution. The iron formation is closely folded about the steeply pitching synclinal axis to such an extent that there is only a gap of 80 feet between the two ends of the bands. As no outcrops occur near the nose of the fold, the pitch cannot be accurately estimated but it is probably very steep. If the dip were gentle the magnetometer survey would have indicated such a structure by the position of contour lines of equal magnetic intensity on the geophysical map.

The lowest horizon of iron formation is the most prominent and has had the greatest economic significance to date. It cannot be followed continuously around the nose of the fold or along either limb of the syncline. It is a common characteristic of iron formation, however, to pinch out along the strike and then reappear. The writer believes that sufficient number of bands have been traced out to establish this as a fairly definite stratigraphic horizon in the Keewatin complex.

The northern bands of iron formation at this horizon do not outcrop anywhere. The rock has been traced across the Coniagas and Coles groups of claims by a dip-needle survey, and its presence checked by drilling on Coniagas ground. According to H. Taylor, manager of Pickwick Gold Mines, strong magnetic attraction is shown in dip-needle surveys on the northeast claims of this group, and the iron formation has been found by drilling elsewhere on the property. A drill-hole put down on the Finnigan claims (see Fig. 3) in 1938 is reported to have intersected this horizon of iron formation. A dip-needle survey of the Cohen-MacArthur claims, made by J. A. MacArthur in the spring of 1938, indicated the probable occurrence of a number of bands of iron formation under drift-covered areas, but the main horizon seems to pinch out in the central claims (Pa. 2,078, 2,074, and 774) of the group. The horizon was traced through Pickle Crow ground as far as the small lake on claims Pa. 707 and 705 by E. F. Creelman,

consulting geologist. In 1937 the writer's party spent some time in trying to follow this horizon around the nose of the fold to the exposures of iron formation north of the Central Patricia No. 2 operation. A magnetometer survey revealed two bands near the centre of claim Pa. 627 on what is thought to be the same horizon.¹ They show that the structure bends around here and conforms with that of the upper horizons of iron formation. The southwest band of iron formation on claim Pa. 627 continues southward beyond the point indicated on the map, but there was not sufficient time to trace it farther. Iron formation is next found on claim Pa. 625 and has been traced continuously to the Pickle Crow mine by surface outcrops, diamond-drilling, and geophysical surveys. It pinches out northeast of the mine but comes in again and has been traced across Winoga Patricia and Albany River ground. Bands at about the same horizon occur farther along the strike on Crowshore, Kaw-Crow Patricia, and Canadian Patricia claims.

Structural information obtained at two points along the southern horizon of iron formation strengthens the evidence that this band lies on the south limb of a syncline. Near the northeast corner of claim Pa. 648 (Central Patricia), drag folds in the iron formation indicate that the top of the band faces north. On the east side of claim Pa. 729 (Pickle Crow) there are well-exposed pillow structures in the lavas about 600 feet south of the iron formation. The shape and distribution of the pillows between two successive flow contacts indicate that the top of the structure faces north. This attitude of the flows was checked at two other points northeastward along the well-exposed rock ridge.

Little is known about the folding of the Keewatin rocks lying northwest and southeast of this syncline along the Crow river. Bands of iron formation and sediments occur near the granite contact at the eastern extremity of the Kaw-Crow Patricia claims and trend about parallel to the Crow River syncline, but their relationship to it is not known.

Shearing

Shearing movements have been largely confined to the lavas and pyroclastics; the porphyries and the marginal phase of the granite have been sheared locally. The regional schistosity in the lavas strikes about parallel to the various rock formations; the complementary shearing direction angles across the formation and is discussed below. Near granitic intrusions the schistosity tends to run parallel with the contacts of these bodies. The general strike of the schistosity near the Pickle Crow mine is N. 45° E., and the dip is steeply to the northwest. West of the Central Patricia No. 2 operation, however, the strike of the schistosity swings to the northwest in harmony with the change in strike of the iron formation. This abrupt change of strike is probably due to the cross-folding of the formations along the granitic tongue that projects northward into the greenstones in this vicinity. Local sheared zones occur in the lavas on Winoga Patricia and Albany River ground. These are roughly parallel to the iron formation and are concentrated in its general vicinity.

Vein Shearing and Fracturing

The quartz veins on the Pickle Crow claims and at the Central Patricia No. 2 operation are all in the general zone of structural influence about the nose of a steeply pitching syncline. All veins in this vicinity occupy a vein fissure or

¹Somewhere near this part of the area the anticlinal structure that probably exists to the north on claims of the Crow River Development Company (see Fig. 3) would swing south to the trough of the syncline. It is within the realm of possibility that this iron formation on claim Pa. 627 lies stratigraphically along a horizon that comes in from the northern anticline.

fracture that is characteristically contorted and drag-folded. There is often a moderate amount of shearing along the various vein flexures in the greenstone. The entire absence of brecciation in the quartz around the ends of drag folds indicates that it occupies a structure that was deformed before the vein material was introduced. Accordingly, the configuration of a quartz vein reveals the deformation of a pre-existing line of weakness.

It is thought that compressional stresses during the regional folding were relieved by shearing parallel to the iron formation and flow contacts and to a

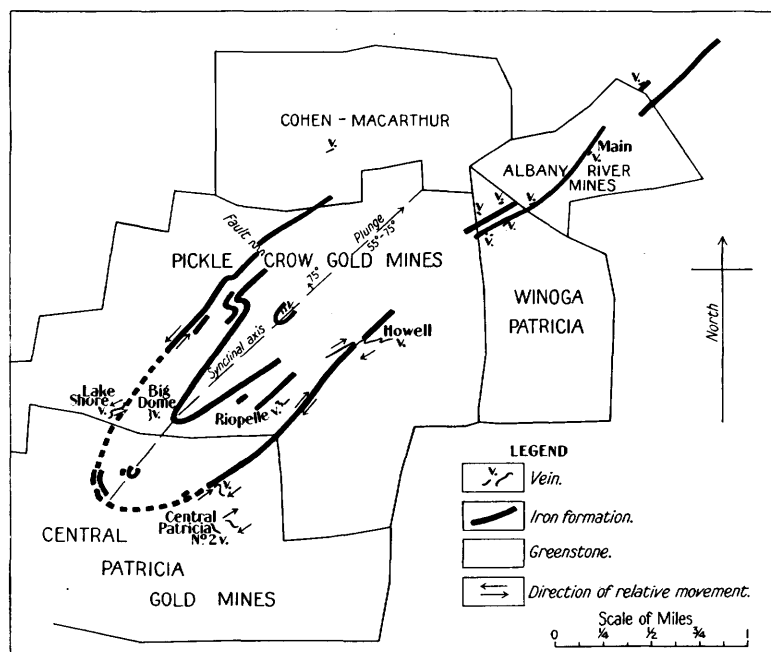


Fig. 4—Sketch map showing the relation of veins to structural features near the Pickle Crow mine.

lesser extent by complementary shears that angled across the formations. These complementary shears were drag-folded by the differential movement between beds and flows. Later, when the folding was completed compressional stresses were relieved and tension became operative owing to regional readjustments. This produced fractures along these previously established drag-folded sheared zones and provided channels for the vein solutions.

In support of the above hypothesis it may be noted that the veins on the south side of the syncline follow a drag-folded structure in such a way that the northwest side always moved northeast, whereas the veins on the north side show just the opposite direction of movement (see Fig. 4). The shape of the drag folds coincides with the direction of movement that must take place during the folding on either limb of a syncline. This strongly suggests that the structures controlling the veins were formed during the period of regional folding and that the fracture pattern in this part of the country is primarily dependent on the major structural features. Underground development at the Central Patricia No. 2 operation and at the Pickle Crow and Albany River mines shows that the

drag folds on the veins pitch northeast with the general structure of the region, and the Pickle Crow and Albany River ore bodies show a tendency to plunge in this direction.

The iron formation fractures more readily than the lavas, and for this reason wider ore sections are sometimes obtained at the Pickle Crow and Albany River mines in the iron formation than in the greenstone.

Western Belt

Folding

The main structural feature in the country between the southwestern claims of Roeanor Gold Mines and the Central Patricia mine is an anticlinal fold that strikes northeastward and pitches in that direction at an angle somewhere between 40 and 70 degrees (see Fig. 2). On Roeanor ground a band of iron formation was traced around the anticlinal fold by a magnetometer survey under the direction of Hans Lundberg, Limited. This work was checked by a considerable amount of diamond-drilling. It indicated that the pitch of the anticline at the crest of the fold is probably not greater than 40 degrees. The country north from this point is largely covered by sand plain and provides little information. However, drag folds in the iron formation exposed near the camp of the Dona Patricia Gold Mines show that it lies on the southeast limb of an anticline that pitches northeastward.

East of the Central Patricia mine the bands of iron formation converge, and it is believed that they lie on either side of the anticlinal axis. Outcrops of iron formation are scarce, but the bands were traced out by a magnetometer survey conducted by A. A. Brant. The only information concerning the pitch of the folds in this vicinity came from a study of the drag folds in the lavas and, to a lesser extent, in the iron formation. Theoretically, the pitch of the drag folds should parallel the pitch of the major structure. Eleven determinations were made at various points on claims Pa. 621 and 678 and at the Central Patricia mine and these indicated that the structure pitches to the northeast at angles ranging between 50 and 80 degrees with an average of 60 to 65 degrees. The drag folds also show that the anticlinal axis passes northeast across the east boundary of claim Pa. 621. On this claim they indicate at five different points that the top of the formation faces northwest, whereas on the adjoining claim, Pa. 678, one determination showed the top facing southeast. At the Central Patricia mine drag folds in the iron formation, observed at 13 points underground, indicated that it is on the north limb of a northeastward-pitching anticline, although some of the drag folds contradicted this interpretation.

North of the Crow river on Central Patricia claims there are different horizons of iron formation that bend around and run northeast to the Walker-Patricia claims, where the strike swings to the east. These have been very largely traced out by geophysical surveys. Exploration on the Crow River Development Company's claims indicates that the iron formation there strikes south of east. The trend of these bands suggests that they may be following around an anticlinal fold more or less in harmony with the structure of the iron formation at lower horizons in the volcanics.

Faulting

There is evidence of faulting through the porphyry body along the bed of the Crow river immediately north of the Central Patricia mine. In the early days of the camp it was thought that this faulting along the river was the cause of the offset of the diabase dike to the east on claims Pa. 76 and 81.¹ Drilling has

¹J. A. Reid, *Economic Geology*, Vol. 39, 1936, p. 527.

indicated, however, that the porphyry has moved laterally in an opposite direction to the dike. In addition, the schistosity of the intensely sheared porphyry and greenstone near the dam on the river strikes about parallel to the regional schistosity and suggests that any faulting here is of the shear type coincident with the general deformation of the country. A gold-bearing vein has also been found by drilling near the fault and may have some relation to it. If this faulting offset the diabase, it would mean that the regional folding and possibly the mineralization was post-diabase or post-Keweenaw in age. This seems highly improbable and suggests that the Crow river fault is pre-diabase.

It seems to the writer more probable that the diabase was offset by movements along Fault creek, although proof of this is lacking. Southeast of the creek the iron formation may be offset about 400 feet southwest while the diabase has been moved the same distance northeast. Since the diabase dips to the southwest at about the same angle as the dip of the iron formation to the north, the structure could be explained by normal faulting with the southeastern block moving downward. The writer's field party made a detailed magnetometer survey around Fault creek in an endeavour to trace the iron formation up to the supposed fault on either side. It was found that the bands end as shown on the geological map. This distribution of the iron formation has also been partially checked by drilling. There is thus a possibility that the iron formation east of Fault creek is a different horizon to that near the mine; in which case the apparent offset is not necessarily due to faulting.

Fracturing and Shearing

The fracturing is largely confined to the hard, brittle iron formation and the shearing to the softer greenstones. A detailed discussion of the fracturing is given in the description of the Central Patricia mine. Just as in the eastern part of the area, the shearing is roughly parallel to the trend of the formations; this trend is best indicated by the outline of the bands of iron formation. A complementary shearing direction, more weakly developed, angles across the formations. In the course of the folding the contacts between the iron formation and the lavas appear to have been zones of weakness, and strong shearing has sometimes taken place.

Summary of Structural Geology

The Keewatin rocks of the Crow River country have been closely folded into anticlines and synclines, which strike northeastward about parallel to the greenstone belt and pitch rather steeply to the northeast. This structure has been further complicated by drag-folding, cross-folding, overturning, and faulting. The rocks have yielded to the deformation in two distinct ways, dependent upon their internal characteristics. The harder iron formation and the massive greenstones have fractured and folded, whereas the softer lavas have yielded by shearing movements. The fracturing and shearing provided lines of weakness and openings for the introduction of vein materials. For this reason the ore deposits of the country have a certain relationship to the regional structure. This subject is discussed in greater detail below.

ECONOMIC GEOLOGY

Gold is the only metal that occurs in deposits of economic importance throughout the Crow River area. The iron content in the iron formation is so

low that the rock is valueless as an iron ore. The gold occurrences have been developed by surface-trenching, diamond-drilling, or underground exploration, the amount of work done being dependent on the importance of the deposit. Sufficient work has been done to yield a considerable amount of information as to the general character of these deposits, their structural features, and some of their relationships to the regional geology.

Types of Gold Deposits

For purposes of description, the gold deposits may be classified under four general types, defined below, but more than one type may be represented at a mine. The classification is based primarily on the physical features of a deposit, such as structure, shape, size, or continuity, and to a lesser extent on mineralization.

1. Fissure or Composite Quartz Veins

The first type is the fissure or composite quartz vein, which occupies fractures and may follow a single fissure with well-defined walls, or may consist of parallel veins, irregularly connected, with country rock intervening in places. Veins of this character are generally contorted and drag-folded. They contain tourmaline, chlorite, sericite, and native gold, but sulphide mineralization is rather sparse. This group is represented by most of the veins on the Pickle Crow claims, including the main (Howell) vein, the quartz veins at the Central Patricia No. 2 operation, and those at the Albany River mine. The ore bodies tend to be relatively long and narrow.

2. Stockworks in Iron Formation

The second type is the stockwork in iron formation. The iron formation contains a network of fractures filled with quartz and sulphides; the adjoining rock is generally replaced by sulphides. These ore bodies tend to be wide but discontinuous along the strike. The ore bodies at the Central Patricia, and part of those at the Albany River and Pickle Crow mines belong to this group.

3. Silicified Sheared Zones

The third classification is silicified sheared zones. These occur in the greenstone or at the contact of greenstone and iron formation. The sheared zone may be silicified and mineralized with sulphides and contain quartz lenses or stringers. These occur on the Albany River, Cohen-MacArthur, Winoga Patricia, and other groups of claims.

4. Replacement Bodies

The fourth classification is replacement bodies. In this type, sulphide replacement accompanying fracturing and shearing in groups Nos. 2 and 3 has produced some ore. Siliceous carbonate replacement bodies in greenstone occur on the Cohen-MacArthur claims. Replacement bodies without attendant fracturing usually carry only low gold values.

Structural Features of the Gold Deposits

An outstanding characteristic of the gold occurrences is the way in which they are associated with bands of iron formation. At the three most important mines the ore bodies are either wholly or partly enclosed by iron formation, whereas at other known gold occurrences this rock occurs in the general vicinity.

To date no gold discovery of any importance has been made at a distance greater than a quarter of a mile from some prominent band of iron formation. Although the deposits may be contained within the iron formation, the ore bodies were formed long after its consolidation. Unless gold-bearing solutions have circulated through the iron formation it is devoid of values. The mineralizing solutions, however, only reached those sections of the rock where channels and openings were previously provided. Such openings were formed both in the iron formation and in the lavas either during or closely following the period of



Part of the Riopelle vein, Pickle Crow Gold Mines, showing the drag-folded nature of the vein.

regional folding. Thus, the localization, continuity, pitch, and dimensions of the ore bodies were controlled by the inherent nature of the rocks and the regional geological structure.

The localization of the gold deposits depends primarily upon the way rocks of different competency react to the deforming stresses. The hard, competent rocks yielded mainly to the tensional forces that produced fractures. The incompetent rocks flowed under compressive forces and sheared zones were formed. The greenstones have failed under both tensional and compressional stresses. The fracturing of these rocks has been largely concentrated within the sphere of structural influence about the nose of a syncline near the Pickle Crow mine and the Central Patricia No. 2 operation. Shearing has also been a factor, but the

important point is that the gold-bearing quartz veins preferred fissures or fractures to sheared zones. The fractures were probably formed by the opening of older sheared zones that had been formed during regional folding.

The iron formation is a hard, brittle rock, and has yielded almost entirely by fracturing, thus forming open cracks and fissures. Shearing in the iron formation has been confined to movements on narrow layers of chloritic material in the rock. The way in which the iron formation was fractured has an important bearing on the shape of the ore bodies. At the Central Patricia mine a fracture system has been produced by the shattering of the iron formation along certain zones in the band. As a result the ore shoots are relatively short and discontinuous along the strike but attain considerable width. At the Pickle Crow mine the iron formation yielded along one strong "break," which extended into the greenstone on either side, so that the ore body is continuous but relatively



Part of the Springer vein, Central Patricia Gold Mines, showing characteristic drag-folding.

narrow except where there are subsidiary fractures in the iron formation parallel to the main vein. Conditions making for wide ore bodies are also indicated in the iron formation at the Albany River mine.

In the discussion of structural features in the area, reference has already been made to the drag folds that are common to all veins located within the zone of structural influence near the end of a pitching synclinal fold east of the Pickle Crow mine (see Fig. 4). It has been noted that the movement indicated by the drag folds on the veins coincides with that normally produced on the limbs of a syncline, and shows that their configuration was controlled by the broader regional structure. Farther northeast along the syncline shearing movements predominated in relieving the stresses during the folding of the formations. The gold occurrences on Winoga Patricia, Albany River, and Cohen-MacArthur ground show a closer relationship to shearing movements in the greenstone than those in other parts of the area. The sheared zones have been impregnated with gold-bearing quartz and sulphides, which are largely replacement bodies, although quartz veins also occur. Developments to date at the Albany River

mine would indicate that fracturing in the iron formation is probably equal in importance to shearing in the greenstone as a structural control in ore deposition.

At the Central Patricia, Pickle Crow, and Albany River mines sufficient depth has been attained in exploration work to give some idea of the rake of the ore bodies. The various ore shoots at the Central Patricia mine rake to the east about parallel with the pitch of the regional structure. The length of the Pickle Crow vein makes an accurate calculation of the rake rather difficult, but the ore body appears to plunge to the northeast in harmony with the pitch of the adjoining syncline. The ore body at the Albany River mine is also believed to have a northeasterly rake.

Mineralization of the Gold Deposits

Quartz is the predominant non-metallic gangue mineral in the ore bodies. The veins on the Pickle Crow claims and at the Central Patricia No. 2 operation consist almost entirely of quartz, which is generally banded with tiny streaks of tourmaline, chlorite, or sericite. Fracturing in the quartz is distinctly noticeable and is concentrated along the mica and tourmaline seams. At the Central Patricia mine, quartz makes up a relatively small proportion of the ore bodies. Vein quartz contains a fair percentage of the gold at the Albany River, but the ore bodies are by no means confined to its boundaries. Two generations of quartz occur at the Central Patricia and Pickle Crow mines. The later variety is white, unfractured, and largely devoid of gold values; at the Pickle Crow mine it distinctly traverses the earlier generation, but at the Central Patricia this feature is not so apparent. The secondary quartz is scantily distributed at the Pickle Crow mine but is often found along the boundaries of the iron formation at the Central Patricia. Albite occurs in the vein quartz at the Cohen-MacArthur showing. Chlorite is found in all the ore bodies and is especially noticeable at the Central Patricia mine; seams of sericite are common in the quartz at the Pickle Crow mine. A secondary carbonate, probably ankerite in composition, occurs in small amounts in the ore bodies at all the properties. Thin sections of the ore from the Pickle Crow, Albany River, and Central Patricia No. 2 operation show that the grains of native gold are often associated with this carbonate along fractures in the quartz (see Fig. 10 on page 48 and photomicrograph on page 59).

Sulphides are present in all the gold deposits, but the proportion of sulphides to non-metallic gangue varies greatly. They occur in vein quartz or as replacements in a favourable host rock, generally near vein quartz. Pyrrhotite, pyrite, and arsenopyrite are the chief sulphides; traces of chalcopyrite often occur with the pyrrhotite. Central Patricia ore has a high content of pyrrhotite and arsenopyrite; pyrite is a common sulphide at the Albany River mine, and pyrrhotite, chalcopyrite, arsenopyrite, galena, and sphalerite are also found. The veins at the Pickle Crow mine and the Central Patricia No. 2 operation contain a relatively small amount of sulphides, including pyrite, pyrrhotite, and arsenopyrite. A microscopic study of the ore from most of the above-mentioned occurrences shows that the arsenopyrite and pyrite have been fractured and replaced by pyrrhotite and gold.

All the mines contain native gold, but it occurs in different degrees of fineness and the distribution is not so uniform in some ore bodies as in others. At the Central Patricia mine visible gold is rarely found in hand samples, but a microscopic examination of the ore shows small grains and stringers of the metal. Rich samples of native gold are obtained at the Pickle Crow mine, but, on the whole, it is finely divided and is not very abundant in the underground workings.

The gold is uniformly distributed throughout the vein quartz. The Central Patricia No. 2 operation shows spectacularly rich samples of coarse gold, but its distribution in the vein is spotty. Visible gold is found at the Albany River mine. In all the ores, gold occurs mainly along fractures in quartz and sulphides. It was largely deposited later than all associated minerals with the possible exception of carbonate material. In general, visible gold is commonly found in the ore bodies that are bounded by greenstone but is rarely seen in the iron formation ore. This feature is particularly noticeable at the Pickle Crow and Albany River mines, where both types of ore occur.

A feature of the mineralization in the area is the association of gold with different minerals at the various mines. The best values are obtained at the Central Patricia in heavy pyrrhotite-arsenopyrite ore, and the unmineralized quartz bodies are almost barren. At the Pickle Crow mine vein quartz with a low sulphide content contains the gold, while the heavily mineralized iron formation that adjoins the vein quartz in certain parts of the mine carries only low values. Pyrrhotite has replaced these areas in the iron formation, but there has been little fracturing and quartz-filling. Where the latter conditions exist in the iron formation parallel to the main vein, gold values are obtained. At the Central Patricia No. 2 operation the metal is found in quartz that contains only a small amount of sulphides. At the Albany River mine the best gold values occur with pyrite; pyrrhotite is a less favourable host mineral.

The mineralization of vein quartz bounded by iron formation is somewhat different from that of vein quartz lying in greenstone. The latter type of quartz contains tourmaline, chlorite, and sericite along fracture planes but has only small quantities of sulphides. Visible gold is common in this quartz and is sometimes quite coarse. In contrast, the vein quartz in iron formation shows heavy sulphide mineralization. Tourmaline and sericite are practically absent, and the chlorite content varies considerably; visible gold is extremely scarce.

Replacement has played a minor rôle compared with fracture-filling in the mineralization of the ore bodies. While it is true that replacement sulphides occur in some of the iron formation ore bodies, the grade of the ore is generally more dependent on the number of quartz-filled fractures than on the extent of the sulphide replacement in the neighbouring rock. Replacement bodies of pyrite and pyrrhotite adjoin fractured zones in the iron formation at the Central Patricia, Pickle Crow, and Albany River mines. At the Central Patricia and Pickle Crow these purely replacement bodies are known to carry only low values. Replacement sulphide bodies in iron formation without associated fracturing have been intersected in drilling operations at many places throughout the area but, to date, have only yielded non-commercial gold values. They generally consist of massive or disseminated pyrite and pyrrhotite. Massive sulphide replacement bodies in greenstone and sediments other than iron formation have also been explored.

Wall Rock Alteration

When the ore bodies lie in iron formation it is difficult to define exactly what constitutes the wall rock. If the wall rock at the Central Patricia mine is regarded as the rock adjoining the mineralized fractured zones and the network of quartz veins, then it makes up a considerable proportion of the rock broken in the stopes, although it is not believed to carry very high gold values. Actually, the margins of the ore bodies are delimited by assay boundaries rather than by well-marked changes in geological conditions. Wall rock may be mineralogically similar to ore but have a gold content that is not of commercial grade. The

Central Patricia ore bodies consist essentially of high-grade material in and adjoining the fractured parts of the iron formation that carry sulphide mineralization; the neighbouring rock is replaced by pyrrhotite along the iron-rich layers of the iron formation. Mine officials state that the replacement sulphides do not contain much gold except near the fractured areas. The pyrrhotite may have been formed by the action of introduced hydrogen sulphide on the ferrous carbonate (siderite) of the iron formation.

At the Albany River mine sulphides and silica replace the lava in the vein zone. Some of the replacement material in silicified sheared zones is of commercial grade, but the boundaries between ore and wall rock are determined by sampling. The iron formation has been replaced by sulphides in a similar way to that at the Central Patricia mine.

The quartz veins passing through greenstone at the Pickle Crow mine and the Central Patricia No. 2 operation are bounded by well-defined walls, which are not greatly altered. Gold values are confined almost entirely to the vein quartz at both mines. At the Pickle Crow a grey chloritic schist has been formed by the shearing of the greenstone along the vein walls; it grades outward into massive greenstone. The wall rock along the part of the vein lying in greenstone shows little sign of silicification or carbonatization and is practically devoid of sulphides. Heavy pyrrhotite mineralization sometimes occurs in the iron formation adjoining the vein quartz, but this is reported to carry only low gold values.

It has already been pointed out in the discussion on mineralization that the mineral content of the vein quartz is different when the vein lies in greenstone from what it is when it passes through iron formation.

Age and Origin of the Gold Deposits

Only a limited amount of information has been obtained on the age and origin of the gold deposits. They were probably all formed during one general period of mineralization, but proof of this is lacking. The process of mineralization no doubt extended over a considerable length of time but was continuous. Although the gold is associated with different minerals at the various mines, there is roughly the same order of mineral deposition in all deposits, and this might suggest their origin from a common magma. The veins are clearly younger than the Keewatin rocks. North of the Crow river at the Central Patricia mine, quartz veins cut through the sheared quartz porphyry. Drilling at the Albany River mine also shows that the quartz veins and gold-bearing sulphides are later than the porphyry. The main vein at the Central Patricia No. 2 operation cuts through the porphyry. A small gold-bearing vein near the granite contact on the Dona Patricia claims cuts through a syenite porphyry dike but is intersected by aplite dikes. As the aplite is a late differentiate of the granitic magma, this would allocate the vein formation to a late stage in the granitic invasion between the formation of the porphyry and the aplite. The Pickle Crow vein is cut by lamprophyre dikes, which also intrude the contact phases of the granite.

If one period of gold deposition is assumed, the observations recorded above would suggest that the gold deposits were formed during the closing stages of the granitic invasion. It is probable that the ore-bearing solutions originated from a late differentiate of the magma that produced the granite and porphyry of the area. The occurrence of porphyry intrusives in the vicinity of the known ore bodies would support this hypothesis.

Temperature Classification of the Gold Deposits

The minerals in the vein material in the Crow River area suggest that the ores were formed under high temperature conditions. The presence of tourmaline, feldspar, arsenopyrite, and pyrrhotite in the veins is diagnostic of such temperatures. Arsenopyrite is a prominent mineral at the Central Patricia mine; it occurs in very small amounts in the veins at the Pickle Crow, Albany River, Central Patricia No. 2 operation, Cohen-MacArthur, Roanor, and other properties. Pyrrhotite is a common mineral in the ores; albite occurs in the vein quartz on the Cohen-MacArthur claims. Many of the quartz veins in the camp contain tourmaline.

The pressures that existed during vein formation are more problematical. Vugs lined with large crystals of pyrite occur along fissures in the iron formation at the Central Patricia mine. They indicate the presence of open fractures and show that pressures were not so very great. In the case of well-defined veins, such as those at the Pickle Crow mine and the Central Patricia No. 2 operation, it seems probable that the vein materials were injected along previously established fractures, but whether these were open or closed spaces is a matter of speculation.

The gold deposits of the area would be classified with the hypothermal, or high temperature division outlined by Lindgren.¹ Other gold camps in Northern Ontario with the same high temperature type of ore include Porcupine, Lake of the Woods, and Michipicoten. The ores are considered to have been formed at some distance below the surface and exposed by the erosion of a considerable thickness of overlying rock.

DESCRIPTION OF PROPERTIES²

Albany River Mines, Limited

History and Development

The property of Albany River Mines, Limited, consists of 8 mining claims, which lie northeast of the Pickle Crow and Winoga Patricia mines. It was staked in 1928 and was the first group of claims to be recorded in the Crow River area. The ground was optioned by F. M. Connell and associates in 1929, and some surface trenching was done. Between 1933 and 1935 a diamond-drilling programme was carried out, and 42 holes with an aggregate footage of 6,616 feet were put down along the main vein zone. This indicated gold values in a number of places, but the intersections were difficult to correlate from drilling data. In February, 1936, underground work was decided upon, and a shaft was sunk 400 feet. Levels were opened at 125, 250, and 375 feet, but most of the drifting was done on the lowest level. In the fall of 1937 it was decided to deepen the shaft to 700 feet and establish levels at 500 and 625 feet.

In the summer of 1938 Albany River Mines made an agreement with Pickle Crow Gold Mines, Limited, whereby the future operations of the property would be financed and carried forward to production under the control and technical direction of Pickle Crow Gold Mines. A new company, called Albany River Gold Mines, Limited, was organized to take over the property of Albany River Mines and the nine claims of Winoga Patricia Gold Mines, Limited. Pickle Crow Gold

¹W. Lindgren, *Mineral Deposits*, McGraw-Hill Book Co., p. 718.

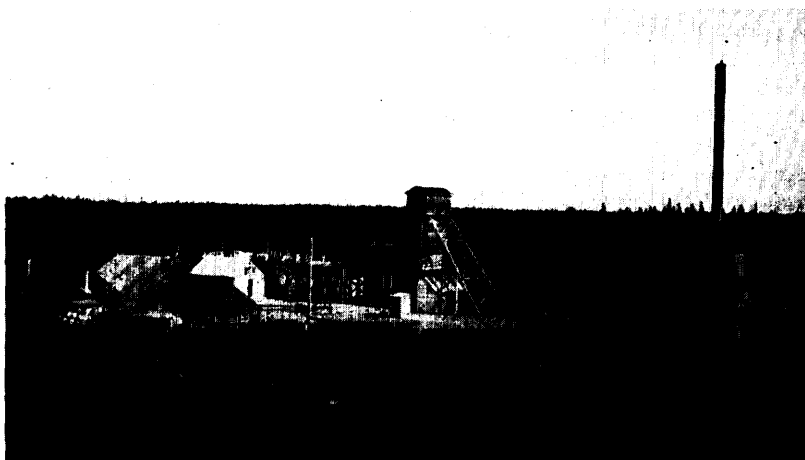
²In the following descriptions, all values stated are based on gold at \$35.00 per ounce.

Mines took over complete management of the Albany River properties and agreed to increase its mill capacity from time to time to take care of additional ore from Albany River properties.

General Geology

The rocks on the property consist of basic lavas with interbanded iron formation, agglomerate, and tuff, and also intrusive porphyries. The lavas are mostly massive andesite and may occasionally have a dioritic texture. In the vein zone they are sometimes sheared over considerable widths. South of the creek on claims Pa. 67 and 65 a ridge of coarse-grained porphyritic lava occurs. Agglomerate and tuff are largely confined to the southern part of claim Pa. 66.

The bands of iron formation range from a few inches to 60 feet in width; they may pinch down and widen out considerably within short distances either along the strike or in a vertical plane. Most of the rock belongs to the horizon



View of the Albany River mine.

of iron formation that extends in a northeasterly direction from the eastern boundary of the Pickle Crow claims across Winoga Patricia ground to the property. On the Albany River claims this horizon is broken up into a number of narrow, discontinuous bands with lava flows intervening. This iron formation is believed to be at about the same stratigraphic horizon in the volcanics as the iron formation at the Pickle Crow mine. It is located on the southeast limb of the syncline that passes in a northeasterly direction across the Pickle Crow and other properties (see Fig. 3). The iron formation near the northeast boundary of the property on claim Pa. 63 lines up with a band on the adjoining Crowshore ground and is probably a different horizon from that at the Albany River shaft.

The lavas and iron formation near the mine are intruded by an irregularly shaped stock of massive grey quartz-feldspar porphyry. The shaft zone lies near the nose of the porphyry body where it breaks up into many small dikes. The dikes have a porphyritic texture, but in the main body of the stock the rock is more granitic in appearance. The band of acid intrusive that extends across the northern part of claims Pa. 68 and 70 is a light-grey quartz porphyry with large quartz eyes in a fine-grained groundmass. It is sometimes sheared but in other places is quite massive.

Veins and Ore Bodies

Gold values are found (1) along silicified and mineralized sheared zones in the lavas, or at the contact of lavas and bands of iron formation, (2) in sulphide replacement zones and quartz stringers in iron formation, and (3) in quartz veins. Some drill intersections have also indicated low values in porphyry. Two parallel veins (Nos. 1 and 2 on Fig. 4) occur near the shaft. About 1,750 feet southwest of the shaft, ore intersections are reported from two drill-holes (Nos.



Quartz vein on the back of the 375-foot level, Albany River mine, showing type of fracturing.

52 and 55). About 200 feet south of these drill-holes on the boundary between claims Pa. 69 and 70 surface-trenching and drilling revealed gold values.

No. 1 vein is exposed in a test pit located 150 feet northeast of the shaft. It strikes about N. 28° E., and dips 67° N.W. The vein lies along a sheared and silicified zone in the greenstone. The shearing is about 6 feet wide and contains irregularly shaped areas of sulphides, including pyrite, pyrrhotite, and traces of chalcopyrite. The intensity of the shearing is indicated by a 3- to 6-inch width of graphitic gouge along the central part of the pit. Surface sampling in the pit and drilling to a depth of 136 feet are reported to have indicated a section of ore averaging \$23.64 per ton across 5.4 feet over a length of 20 feet. The vein does not outcrop in either direction along the strike. It was picked up on the 125-foot level below the pit and contained gold, but the ore shoot was small.

No. 2 vein was described in a report on the property by John A. Reid, consulting engineer, dated January, 1936, as follows:—

No. 2 showing is 70 feet north of No. 1 and was only found by drilling. This is of similar character and occurrence to No. 1, but is more narrow and longer. Five holes (Nos. 17–21) show a length of 54 feet, a proved depth of 60 feet, a (true) width of 2 feet, and a value of \$21.89 per ton. By taking in drill-hole No. 5, the length is extended to 125 feet and the value reduced to \$20.05, the width and depth remaining the same.

No. 2 vein strikes about N. 35° E., and the dip is about 68° N.W. Some gold values of ore grade were obtained in the vein on the 125-foot level, but only a small amount of drifting has been done here to date. Underground exploration on the vein has been largely confined to the 375-foot level. Here it has been traced by drifting and drilling for a length of about 1,000 feet (see Fig. 6). Gold values along the ore zone at this depth are contained within three kinds of rock. These include vein quartz, silicified and mineralized sheared zones in lava, and fractured and mineralized zones in iron formation. The main quartz vein is localized at or near the contact between iron formation and lava, but over certain distances may be entirely confined within one of these formations. To the northeast the vein breaks away from the contact and enters a wide shearing in the lavas. Here the quartz is contorted and drag-folded; the structure weakens so that eventually the vein breaks up into small lenses and stringers of quartz. The vein quartz is milky white in appearance but is well fractured and carries sulphides and native gold. Values in the iron formation come from quartz stringers in fractured zones and from areas of sulphides adjacent to the fractures.

There is a possibility that another ore zone may occur southeast of the main drive on the 375-foot level. Diamond-drilling and crosscutting indicate that this parallels the main ore body for some distance but tends to converge with it to the southwest. Quartz stringers and sulphides have been intersected in crosscuts southeast of the main drift. This gold-bearing zone lies within iron formation. A probable northeastern extension of No. 2 vein is indicated by drilling west of the shaft on the 375-foot level. Here gold-bearing quartz and sulphides in iron formation have been cut in drill-holes over a length of 450 feet.

In the annual report of the company, dated September 30, 1937, it was stated that an ore length of 340 feet had been proved on the 375-foot level. This averages \$16.50 per ton across an average width of 40 inches. This ore length is an aggregate of 4 separate ore shoots, which lie between short non-commercial sections. According to the same report diamond-drilling below the level proved the persistence of the vein and favourable conditions to a depth of 525 feet. The best ore widths seem to be indicated in the iron formation, but this is sometimes balanced by abundant visible gold in the part of the vein that lies in the greenstone. One point at the southwest end of the drift shows a fine grade of ore in the iron formation over a width of 19.1 feet.

The showing on the northwest boundary of claim Pa. 69 occurs in a silicified sheared zone in greenstone near a 2-foot band of iron formation. The sheared zone strikes N. 70° E. and dips about 60° N.W. On the surface, values are reported at the places where there is heavy sulphide mineralization. The report of John A. Reid, referred to above, states that drilling at this location showed gold values "averaging \$9.19 over an assumed true width of 3.4 feet, a length of 80 feet, and at depths varying from 10 to 102 feet."

Mineralization and Ore Relationships

The mineralization varies somewhat in the different types of ore. The vein quartz contains a moderate amount of pyrite, pyrrhotite, and chalcopyrite with

lesser quantities of arsenopyrite, zinc blende, galena, and native gold. The sulphides and gold are concentrated along fractured zones in the quartz (see photomicrograph below). Replacement ore in the iron formation and sheared greenstone contains a large amount of pyrite and pyrrhotite. Thin sections and polished sections of high-grade ore show that pyrrhotite is lodged along fracture planes in the pyrite. Gold is later than pyrite, pyrrhotite, and quartz. It occurs along fracture planes within pyrite, around the edge of pyrite crystals, and along tiny fractures in the quartz. A secondary carbonate is often associated with the native gold along the fractures.



Photomicrograph of rich ore from the Albany River mine, showing gold (G) within and adjoining pyrite (light-grey). The dark-coloured material is gangue. ($\times 125$.)

Canadian Patricia Gold Mines, Limited

The property of Canadian Patricia Gold Mines, Limited, consists of 14 claims located in the northwestern part of the Crow River area. The ground is largely covered by overburden, and only three or four small outcrops of greenstone have been found. In 1937, a dip-needle survey on the southern claims of the group indicated the presence of iron formation near the south side of claim Pa. 2,640. Five drill-holes with an aggregate footage of 1,575 feet were put down within a length of 900 feet along this zone.

All the drill-holes cut greenstone and iron formation. The horizon of iron formation is made up of from two to four separate bands sandwiched between narrow strips of greenstone. The aggregate widths of iron formation in the different holes varied between 25 and 64 feet. The bands strike in a northeasterly direction and dip to the northwest at a fairly steep angle. This horizon

of iron formation lines up fairly well with other bands located along the prominent horizon on the southeast limb of the syncline that strikes northeast across the Pickle Crow and other properties (see Fig. 3).

Drilling showed that parts of the iron formation were mineralized with pyrite and pyrrhotite, which carried low gold values in places. A 5-foot and 3-foot width of mineralized quartz was cut in hole No. 5. The quartz veins lie in the greenstone close to iron formation.

Central Patricia Gold Mines, Limited

History and Development

Central Patricia Mines, Limited, was organized in February, 1929, and at that time owned a group of 18 claims, which surrounded the original gold discovery near the Crow river. Later the company acquired additional ground



View of the Central Patricia mine.

including the so-called Springer group of 25 claims, which adjoined the N.A.M.E. (now Pickle Crow) claims on the west. In February, 1938, the company held 145 claims, of which 94 were patented.

In 1929 the main ore zone was developed by surface-trenching and diamond-drilling. A shaft was sunk to a depth of 527 feet in 1930, and lateral work was done on four levels established at 125-foot intervals. This development outlined an ore body, and a 50-ton mill was recommended. To carry out this enlarged programme a new company was incorporated in 1931 under the name of Central Patricia Gold Mines, Limited. Because of financial conditions the mill was not designed until February, 1933, and, owing to transportation difficulties, it was May, 1934, before the mill was finally installed and commenced operations. The milling rate was gradually increased, until in the fall of 1938 the mill was treating around 315 tons daily. At this time eleven levels had been opened, the deepest being at 1,450 feet, and the shaft was being deepened another 600 feet.

A gold discovery was made on the Springer claims in 1929. Underground exploration of this vein commenced in 1935, when one level was opened at a depth of 150 feet. The plant at this location is called the Central Patricia No. 2 operation, although it is sometimes referred to as the Springer mine. Owing to

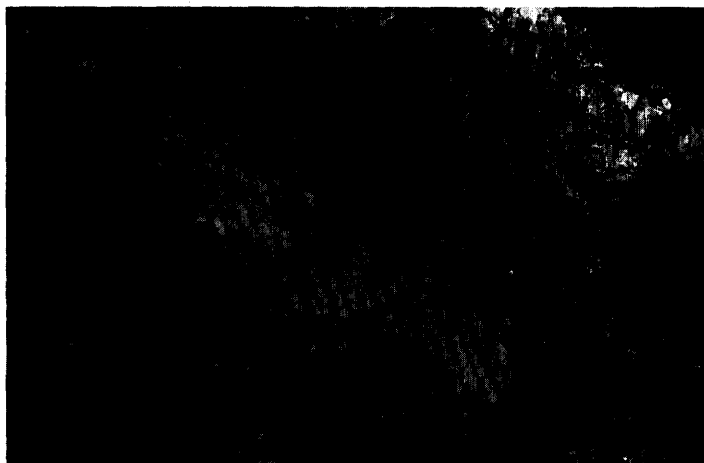
power shortage further development was delayed until the winter of 1936-37, when the shaft was deepened to 420 feet and levels were opened at 275 and 400 feet. As the tonnage of ore developed by this work was not large, it was decided to install a picking plant at the mine and truck the ore to the mill at the main operation at the rate of about 30 tons daily. In the autumn of 1938 the company decided to deepen the shaft to 1,000 feet.

In the following discussion the Central Patricia mine and the Central Patricia No. 2 operation will be described separately.

CENTRAL PATRICIA MINE

General Geology

On the western group of claims the outcrops are largely andesitic lavas of Keewatin age. Generally they are fairly massive but may be locally sheared to



High-grade gold ore on the back of B-5 stope, Central Patricia mine. Quartz and associated heavy sulphide mineralization cut across fractured zones in the iron formation. The drill-holes are 2 inches in diameter.

chlorite schist. At a few places south and southeast of the mine there are light-coloured lavas of dacitic composition, but the scarcity of outcrops of this rock makes it almost useless as a horizon marker. In rare instances the contacts between individual flows may be distinguished. The lavas contain pillow structures, but these are not sufficiently preserved to indicate the attitude of the flows. Bands of iron formation are interbedded with the greenstones. They are not uniform in width or continuity but show a tendency to pinch and swell along the strike.

The iron formation and greenstone are intruded by dikes and irregularly shaped bodies of sheared quartz porphyry and sericite schist. Some sill-like bodies of porphyry are roughly conformable in strike and dip with the adjacent flows. The porphyry has been sheared with the lavas. About half a mile east of the mine a diabase dike runs in a northwest-southeast direction across the property.

It has already been stated that the iron formation containing the Central Patricia ore bodies lies on the north limb of an anticline, the axis of which strikes

in a general northeasterly direction (see Fig. 3). Southeast of the mine the axis of the fold swings to an east-northeast direction. It is believed that the anticline plunges to the northeast at an angle of about 60 to 65 degrees. The bands of iron formation all dip to the north at a steep angle. The strike and dip of the main direction of schistosity in the greenstone and porphyry conforms with that of the iron formation. Another direction of shearing near the mine strikes northwestward and dips to the northeast at about 60 degrees.

Ore Bodies

The ore bodies lie entirely within iron formation. The main horizon at the mine consists of lenticular bodies, which do not lie exactly along the same line of strike. Four bands outcrop in the general vicinity of the mine and have an aggregate length of about 1,700 feet. The band on which the main workings are located is about 600 feet in length on the surface and in the upper levels, but below a depth of 500 feet it begins to lengthen towards the west¹ (see Fig. 7). The band attains a width of over 50 feet in places but narrows down to less than 5 feet. It strikes in an east-west direction and dips to the north at about 75 degrees. Its lateral boundaries are fairly well defined in the drifts to a depth of 500 feet, and through this vertical distance it plunges to the east at an angle of 55 to 65 degrees. Other parallel bands of iron formation lie in the greenstone a short distance south of the main band. These do not outcrop but have been discovered in underground workings and by drilling.

At its eastern extremity the ore-bearing band of iron formation ends against a 30- to 40-foot section of greenstone that separates it from a shorter band of iron formation. On the 125-foot level the contact with the greenstone cuts across the strike of the main band of iron formation at a steep angle and, in the early period of mine development, was believed to indicate a fault. However, further drifting and drilling here and on the 250- and 375-foot levels indicate that the two bands of iron formation simply lens out in this vicinity. The mine plans of this section on the 250-foot level show very definitely that the iron formation pinches out in the greenstone. On the 375-foot level the two bands may possibly join. The drift swings to the north off the strike of the band in this section, and there is no lateral drilling to give definite information.

The mine is made up of a number of different ore shoots in the iron formation. To date 8 on 9 ore bodies have been mined, but sometimes an ore body found on one level will merge with another or split up at greater depth and the differentiation of ore shoots becomes difficult until traced through between levels. The different ore bodies rake downward to the east at an angle that averages about 55 degrees. The most productive bodies have been the "B" and "C" ore shoots. The "B" shoot is well defined from the surface to a depth of 1,000 feet, which was the depth of mine development at the time of writing, in 1937. Above

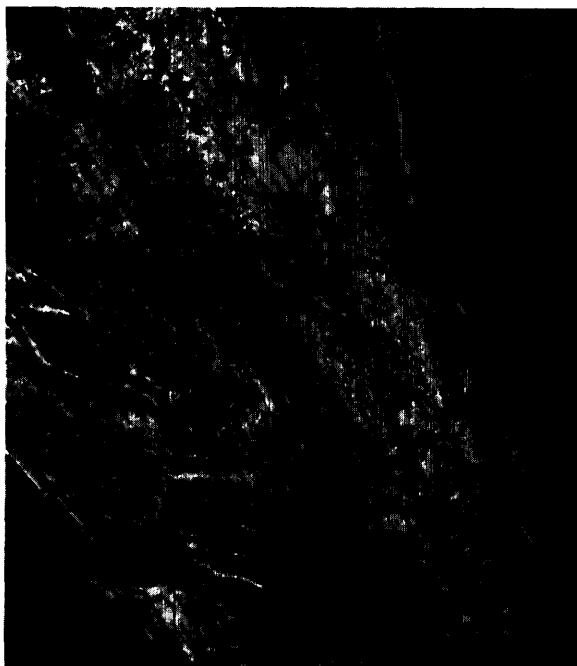
¹Further underground exploration has indicated that this statement should be modified. The following is quoted from a communication from R. E. Barrett, mine manager, dated March 5, 1938:—

"The first four levels indicated that the iron formation pinched out at points corresponding in plunge to the rake of the ore shoots. Below the 500-foot level it extended much further west. . . . However, we now have found that on the 375-foot level the main iron band does not terminate where originally indicated, but after a short 'break' continues westward for a distance of at least 500 feet. This has been proved by drill-holes and crosscuts. Indications are that on other upper levels the same condition may exist.

"I now consider that this 'break' is caused by lateral movement along a fault or slip that cuts the iron formation at a very small angle, so that where it is narrow, the two halves are drawn or sliced apart. Where the iron is sufficiently wide, the two halves are drawn apart, but not a sufficient distance to produce a gap. Hence, for example, on the 625-foot level we find continuous iron formation extending much farther west than found on the levels above."

the 500-foot level it has been stoped over a maximum length of about 125 feet. In B-5 stope the maximum width of ore mined has been between 35 and 40 feet. The "B" ore body is reported to contain the best grade of ore in the mine. The "C" ore shoot attains a greater length than the "B" body and in places it merges with the "K" ore shoot, which comes in below the 500-foot level. The "F" and "H" ore shoots on the 375-foot level lie in iron formation, which runs more or less parallel to the main band but is slightly offset to the south.

Most of the ore bodies, including the "B" and "C" shoots, are confined to the hanging-wall side of the iron formation, especially on the lower levels. For this reason development drifts are run along the north side of the iron formation.



High-grade ore on the breast of B-5 stope, Central Patricia mine. A quartz-sulphide vein, 2 feet wide, cuts across the iron formation.

Exceptions to the rule are furnished by the "K" and "D" ore shoots. The "K" body angles across the iron formation from the hanging wall on the 625-foot level to the footwall on the 875-foot level. The "D" body behaves similarly and ends against the footwall below the 125-foot level. The small No. 1910 shoot followed the footwall from the first to the second level.

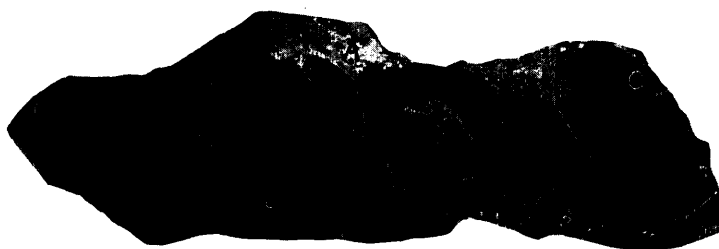
The outline of the different ore shoots is quite irregular, and their boundaries are determined by assay values rather than by any well-defined change in geological conditions. The ore shoots are confined to those sections of the iron formation that have been well fractured (see Fig. 8). The openings in the rock have been subsequently filled with vein quartz and heavy sulphide mineralization. The iron formation adjacent to the fractures has been partially replaced by sulphides and carries low gold values. The heavy sulphide material in the fractured zones makes high-grade ore, and this compensates for the low values in

the replaced iron formation. Accordingly, the main ore bodies consist of groups of mineralized fractures, which are close enough together to bring the grade of the



Polished specimen (one-half natural size) of typical gold ore, Central Patricia mine. The upper right part consists of banded iron formation replaced by pyrrhotite (P) along certain parts of the bed. The lower left part is dark-coloured vein quartz (Q) containing arsenopyrite (A) crystals. The arsenopyrite is generally fractured and replaced by pyrrhotite along the fractures. Gold (G) occurs at a number of places in the specimen in quartz and arsenopyrite.

whole mass up to ore standards. The iron formation lying between the ore bodies is not entirely barren and may contain a few mineralized fractures with



Polished specimen (about one-quarter natural size) of ore in iron formation from B-5 stope, Central Patricia mine. Pyrrhotite (P) has selectively replaced the part of the beds rich in magnetite instead of the chert (C). Arsenopyrite (A) replaces iron formation but is fractured and replaced by pyrrhotite.

gold values, but these are so disseminated that a mineable section would not be of commercial grade.

Pyrrhotite and arsenopyrite are the sulphides with which most of the gold is associated; pyrite and chalcopyrite also occur in small amounts and carry gold. Mine officials believe that the quartz veins without sulphides are practically barren. A very considerable percentage of the gold is associated with irregularly shaped bodies of pyrrhotite bunched with chlorite along and near fractured zones that are devoid of quartz. The proportion of the different sulphides in the ore is about the same throughout all the ore shoots.

Structural Control of Ore Bodies

The controlling factor in the localization of the ore shoots has been the amount of fracturing in the iron formation. Although there is no regular fracture pattern, yet a sort of rough uniformity is found in the strike and dip of the stronger fractures. Most of these strike at nearly right angles to the bedding or in a general north-south direction. The mine plans show that the mineralized fractures dip at all angles between 25 degrees to the east and vertical. Out of 57 major fractures indicated on the plans above the 1,000-foot level, 41, or 72 per cent., dip between 50 and 70 degrees to the east, and the average is 60 degrees. This coincides fairly well with the rake of the ore shoots, which is considered to be about 55 degrees to the east. Mine officials believe that some of the stronger mineralized fractures can be traced through from one level to another in the stopes. A complementary set of joints and barren fractures dips to the west at angles of 40 to 70 degrees, with an average of about 55 degrees.

Below the 500-foot level there is a tendency for the fracture groups to occur near points of curvature along the hanging-wall (north) contact of the iron formation. At a few places the fractures form a sort of radial pattern about these flexures in the contact. The drifts on the levels between depths of 500 and 1,000 feet intersected 13 different ore sections, and of these 8 are adjacent to points of curvature in the hanging-wall contact, 2 are located along straight line contacts, and in 3 cases the development work had not closely defined the contact. Thus 80 per cent. of the ore-shoot intersections on which information is available show a rough relationship between their location and the curvature of the hanging-wall contact of the iron formation.

On all levels there is evidence of strong shearing in the greenstone at the hanging-wall contact with the iron formation. At several places on the hanging-wall side of the iron formation the beds strike towards this sheared zone and are truncated by it at a considerable angle. When miners are drifting along this side of the band and following the strike of the beds, they will sometimes run directly into the hanging wall. In every case the iron formation has been dragged to the west and cut off at the contact. It is thus evident that there have been faulting movements along this zone. Barren masses of white quartz occur in the greenstone along the hanging-wall contact throughout the entire mine. This is thought to be a later generation of quartz than that in the iron formation. It is possible that the ore-bearing solutions arose near this contact and that the barren quartz is an end phase of this mineralization and "healed" the faulted contact. The footwall contact between greenstone and iron formation is "tight" and shows little evidence of shearing. The writer knows of only one place (C-6 stope) where white quartz occurs in the greenstone on the footwall contact.

Mineralogy and Ore Relationships

The metallic minerals associated with the ore, in probable order of their abundance throughout the mine, are pyrrhotite, arsenopyrite, magnetite and

ilmenite, pyrite and chalcopyrite, and native gold. Pyrite and chalcopyrite are always negligible in quantity compared with pyrrhotite and arsenopyrite. The non-metallic gangue is vein quartz, chlorite, siderite, chert, and secondary carbonate.

Arsenopyrite occurs as distinct crystals, largely in vein quartz and to a lesser extent in iron formation. The crystals are generally well fractured and often replaced in part by other minerals. Pyrrhotite is always in irregular-shaped patches, small grains, or stringers. It occurs in rows of tiny grains parallel to the banding of the iron formation, along fractured zones in arsenopyrite crystals, and as veinlets in quartz; it also replaces pyrite. Chalcopyrite is



Photomicrograph of ore from the Central Patricia mine, showing pyrrhotite (P) and quartz (black) replacing arsenopyrite (white) along a fracture. ($\times 130$.)

intimately associated with pyrrhotite. Pyrite seems to be best developed in fractures, vugs, and open fissures in the iron formation. In such places large crystals have grown outward from the fissure wall. Sometimes chain-like masses of joined pyrite crystals run in irregular patterns over the surface of a vug. This vuggy pyritic material carries high gold values; picked samples have assayed up to 15 ounces of gold per ton.

Vein quartz fills many of the fractures in the iron formation. It is generally dark-coloured and well mineralized with sulphides. It stands out in distinct contrast to the milky-white barren quartz that is found in some parts of the mine, especially along the hanging wall of the iron formation. Chlorite occurs in bunches with pyrrhotite and secondary quartz. Narrow chloritic bands occur throughout the iron formation in the Crow River area and may be the metamorphosed equivalents of slate or greywacké beds, or else narrow inclusions of

the nearby lavas. The chlorite is replaced by sulphides and is clearly pre-ore. Two kinds of carbonate occur in the ore; iron carbonate (siderite) is found as tiny grains in the primary *laminae* of the iron formation and is interbanded with chert. Large crystals of a mixed carbonate (either dolomite or ankerite) replace the siderite.

Visible gold is found only in rare instances in hand samples of the ore. Microscopic study of polished sections, however, shows a considerable amount of finely divided gold. A detailed examination of the ore has been made by M. H. Haycock, of the Ore Dressing and Metallurgical Laboratories, Ottawa.¹ A study of five samples (30 polished sections) of different grade ore showed that



Photomicrograph of ore from the Central Patricia mine, showing gold (G) in gangue (dark-grey and black) and replacing arsenopyrite (white) along fractures. Pyrrhotite (P) occurs in the arsenopyrite. ($\times 130$.)

about 84 per cent. of the gold grains were between 150- and 1,600-mesh in size, and 11 per cent. was finer than 1,600-mesh. A grain analysis of the gold showed that 38 per cent. was free in the quartz-chlorite gangue, 18.9 per cent. was associated with arsenopyrite (in the fractured and unfractured mineral, and against grains), 28.3 per cent. was associated with pyrrhotite, 11.6 per cent. with pyrite, and 3.2 per cent. with chalcopyrite. This confirms the general experience at the mine that high-grade ore is found where heavy arsenopyrite-pyrrhotite mineralization is associated with vein quartz.

Polished sections of ore show gold along fractures in arsenopyrite, but the relation of the precious metal to pyrrhotite was not ascertained. Nevertheless,

¹Report No. M. 395, Sept., 1936.

the fact that those parts of the iron formation replaced by pyrrhotite alone carry only low gold values indicates that most of the gold was introduced after the formation of this mineral and confined to the quartz and sulphides in the main fractures.

Paragenesis

The first stage in the mineralization of the ore deposit was the introduction of vein quartz along open fissures in the iron formation. Pyrite and arsenopyrite may have been introduced at this time or at a slightly later stage after weak fracturing in the quartz. A small amount of arsenopyrite replaced the iron formation, but most of it was confined to the quartz. The quartz, arsenopyrite,



Photomicrograph of a thin section of ore from the Central Patricia mine, showing pyrrhotite (black) replacing siderite bands (grey) in iron formation. The white material is quartz. ($\times 12$.)

and pyrite were then fractured. In the second stage of mineralization, pyrrhotite and a small amount of chalcopyrite were introduced. Pyrrhotite occupied fractures in vein quartz and arsenopyrite crystals and replaced the iron-rich minerals of the iron formation adjacent to the fractured zones. The introduction of gold apparently commenced during this stage, but most of it was brought in at a slightly later period.

Origin of the Deposit

The general character of the ore-forming solutions may be inferred from the mineral constituents of the ore bodies, but only the vaguest conjecture is possible as to the source of these emanations. The intrusive porphyries near the mine could be genetically related to the same magmatic body as the ore, but there is no visible relationship between the porphyry and the ore within the present mine workings. The origin of the fracture system within the iron formation, however,

is of more immediate interest in mine development, because the ore bodies are located only where the mineralized fractures are grouped closely enough to enable the whole mass to be profitably extracted.

In the writer's opinion any theory that would satisfactorily account for the localization of the ore bodies must take into consideration the following facts:—

1. The ores are entirely related to tensional fractures in the hard brittle iron formation. These openings do not extend into the softer greenstones, which yielded to the deforming stresses by shearing. If the ore solutions had found easier access in sheared conditions, the ore bodies would lie in the lavas near the hanging wall of the iron formation or along the bed of the Crow river. The ore bodies contain vugs that are lined with rich, gold-bearing sulphides; these indicate that the fractures were open at the time of mineralization.

2. The eastward rake of the ore shoots is controlled by the dip of the mineralized fractures.



Specimen (four-fifths natural size) of high-grade gold ore from B-2 stope, Central Patricia mine. Pyrite crystals have grown along the wall of an open fissure or vug. The crystals are sometimes arranged in rows, which run in various directions. Samples of this type of ore have assayed as high as 15 ounces of gold per ton.

3. The main ore shoots are confined to the hanging-wall side of the iron formation, indicating that the fracturing must have been localized on one side of the band.

In the early period of the mine's development it was thought that the location and rake of the ore shoots was determined by the intersection of north-westward-striking planes of shearing with shearing along the bands of iron formation.¹ Assuming a dip of 60° N.W. and a strike of N. 45° W. for the schistosity, its intersection with the iron formation, which dips 75° N., would almost coincide with the rake of the ore bodies. About 500 feet southeast of the shaft there are some cross-shears in the greenstone that, if projected, would intersect the main band of iron formation near its eastern end. The main objection to this conception is that it explains the fractures as planes of shearing. A more applicable modification of this idea is that the fractures have been produced by tensional forces in the iron formation resulting from the two directions of shearing in the greenstone mentioned above. In the crosscuts on some levels some sheared zones in the greenstone strike northwestward and have a northeasterly dip. The projection of some of these diagonal shears would intersect ore shoots, but others would not.

¹J. A. Reid, Private Rept., Sept., 1930; Econ. Geol., Vol. 31, 1936, p. 528.

The writer would draw attention to another possible explanation for the localization of the ore shoots that depends simply on tensional forces acting within the iron formation and is independent of cross-shearing. It has already been pointed out that the mine is located on the north limb of an anticlinal fold, which pitches to the northeast at an angle that would average between 60 and 65 degrees. The ore shoots rake to the east at an average angle of 55 degrees, or in other words they plunge about parallel to the major structure. The lateral boundaries of the main lens of iron formation, and subordinate structure such as local bulges, undulations, or minor folds within the band, all pitch with the major structure. The intense shearing and faulting along the hanging-wall contact of the iron formation in contrast to the "tight" footwall contact indicates the concentration of rock movements on one side of the main band. The differential movements between iron formation and greenstone along the hanging-wall contact would set up tensional stresses in the brittle iron formation that could produce the fractures. These openings would naturally be concentrated on the hanging-wall side of the band, especially around zones of curvature or undulation along the contact where the differential movement would have a maximum shattering effect on the adjacent iron formation. This could account for the grouping of the fractures that control the localization of the different ore shoots. The fractures would tend to strike at high angles to the hanging-wall contact and dip approximately parallel to the trend of the undulations on it, thus controlling the rake of the ore shoots.

Production, Ore Reserves, Etc.

The information in the following table has been taken from the annual reports of the company for the years mentioned:—

| | Dec. 31, 1934 ¹ | Dec. 31, 1935 | Dec. 31, 1936 | Dec. 31, 1937 |
|--|-------------------------------|------------------|---------------------|---------------------|
| Tons milled..... | 11,536 | 35,192 | 58,466 | 77,119 |
| Tons milled daily..... | 54 | 97 | 164 | 211 |
| Recovery per ton..... | \$19.03 | \$22.09 | \$19.57 | \$18.06 |
| Value of bullion recovered..... | \$219,562 | \$777,570 | \$1,144,154 | \$1,392,840 |
| Operating costs per ton milled (not including taxes, depreciation and deferred development)..... | | \$9.15 | \$8.95 ² | \$7.71 ³ |
| Estimated ore reserves..... tons | 77,670 | 95,413 | 112,198 | 204,543 |
| Estimated average grade of ore reserves..... ounces per ton | 0.66 | 0.64 | 0.50 | 0.53 |
| Gold extraction in mill..... per cent. | 97 | 97.36 | ..... | 97-98 |
| Net yearly profit..... | \$42,127 | \$256,581 | \$417,017 | \$534,809 |
| Dividends paid..... | ..... | ..... | \$200,000 | \$400,000 |

¹Seven months mill operation.

²Operating costs, including taxes, depreciation, and deferred development, were \$12.26 per ton milled.

³Operating costs, including taxes, depreciation, and deferred development, were \$10.97 per ton milled.

For the eight months' period up to August 31, 1938, 66,128 tons were milled and the value of bullion recovered was \$1,037,319.

CENTRAL PATRICIA NO. 2 OPERATION

General Geology

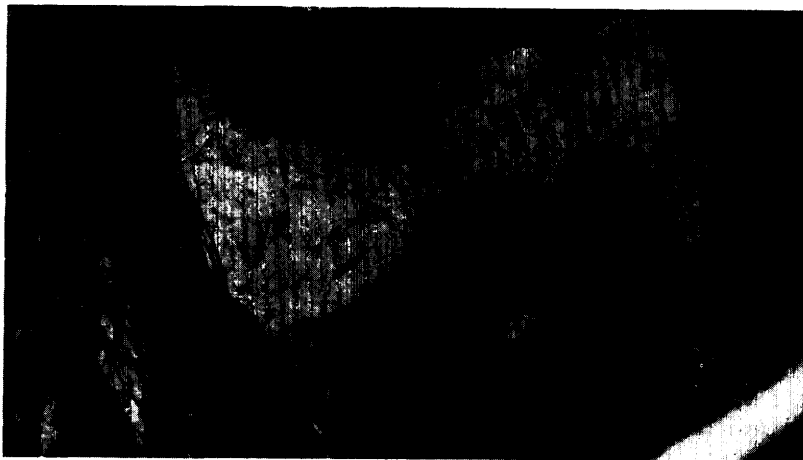
The country rock in the general vicinity of the Central Patricia No. 2 operation is largely basic lava. At one point it may be massive and show pillow structures and within a short distance may be highly sheared to chlorite schist.

Occasionally the flows have a dioritic texture. Some zones of porphyritic lava occur with the more massive variety on the ridge south of the shaft. Narrow, discontinuous bands of chert and iron formation are interbanded with the flows. One strong horizon of iron formation has been traced southwest from the Pickle



View of mining plant, No. 2 operation, Central Patricia Gold Mines.

Crow mine to a point about a third of a mile north of the Central Patricia No. 2 shaft. Southwest of this point it occurs only in small lenses, sometimes less than a foot in width. Small dikes and irregularly shaped masses of syenite porphyry intrude the lavas.



Drag-folded quartz vein on the back of the 275-foot level, No. 2 operation, Central Patricia Gold Mines.

North of the shaft the flows and iron formation strike northeast and dip steeply to the northwest. In this vicinity the rocks are located on the southeast limb of the syncline that lies to the north. On the ridge south of the shaft the flows strike N. 20° E., and the pillows indicate that the tops face southeast.

This is contradicted by the drag folds in a small band of iron formation near the northwest corner of claim Pa. 2,005, which indicate that the tops face northwest. The latter determination may not be very reliable.

Veins and Ore Bodies

A number of quartz veins occur on the surface in the general vicinity of the mine, but only two are of any appreciable size (Fig. 10). A large drag-folded quartz vein is located near the branch road to the mine on the northern half of

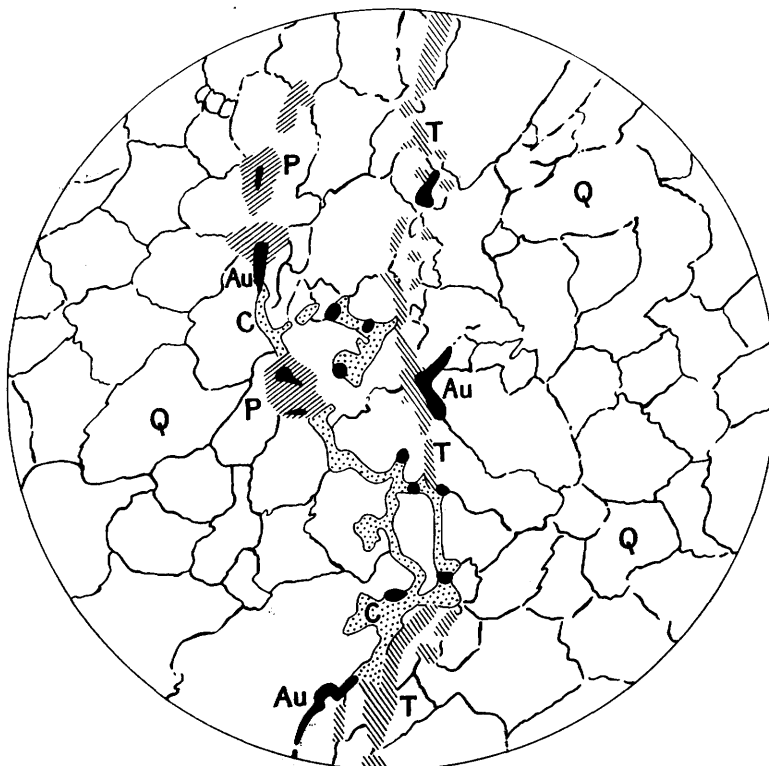


Fig. 10—Drawing from a thin section of gold ore, No. 2 operation, Central Patricia Gold Mines. Gold (Au) is associated largely with carbonate (C) veinlets in the vicinity of a narrow band of tourmaline (T) in the vein quartz (Q). Gold also replaces arsenopyrite (P).

claim Pa. 625. The vein has been traced 470 feet, and in places the quartz attains a width of 6 feet. The country rock is massive greenstone and is carbonated near the vein. The vein filling consists of white quartz, streaks of black tourmaline, and crystalline calcite and ankerite. It is almost devoid of sulphides. Surface sampling has shown the presence of gold at a few points, but elsewhere the vein is reported to be barren.

The main gold-bearing vein occupies a fracture in fairly massive greenstone. It has been traced about 350 feet on the surface and disappears under low ground to the east. The vein is considerably drag-folded and contorted; it is generally narrow, although local bulges show fair widths. The general strike swings about considerably; the dip varies somewhat, but along the main part of the vein it is

about 65° N. Towards the west end the vein swings around to the northwest and dips more steeply to the northeast. Underground at the east end of the workings, the vein weakens and pinches out within and near the intrusive porphyry.

Vein material consists of white quartz, tourmaline, chlorite, carbonate, and small amounts of sulphides, including pyrite, pyrrhotite, and arsenopyrite. The wall rock is sheared near the vein but is otherwise unaltered; gold values are confined to the quartz. Native gold occurs in spectacular amounts along certain parts of the vein, but its distribution is erratic. Ore sections occur along the drag folds in the quartz at some places. The gold is largely confined to fractures in the quartz, which follow seams of chlorite and tourmaline. Thin sections of the vein material also show gold along fractures in pyrite and arsenopyrite. It is quite evident that the precious metal was introduced later than the quartz and sulphides. Carbonate material is frequently associated with native gold along fractures in the quartz, and must have been introduced at about the same time as the gold (see Fig. 11).

In 1935 developments on the 150-foot level indicated 4 ore shoots, ranging in length from 25 to 90 feet, with an aggregate length of 198 feet. These averaged 2.35 ounces of gold per ton over a width of 14 inches. According to the annual report of the company for 1937, 8,326 tons of ore had been developed to a depth of 400 feet. This averages 0.97 ounces of gold per ton, calculated on a 36-inch mining width. The vein contains two ore shoots with a combined average length per level of 131 feet.

Cohen-MacArthur Claims

The Cohen-MacArthur group comprises 17 surveyed and 5 unsurveyed claims, which lie on either side of the Crow river immediately north of the eastern claims of Pickle Crow Gold Mines. Rock outcrops are largely confined to five claims south of Kishkap falls and consist of massive andesitic greenstone, which is locally sheared to chlorite schist. Two very small exposures of contorted iron formation are interbedded with the greenstones. Narrow lamprophyre dikes cut the lavas at a few places. A siliceous carbonate body with a rusty-weathering surface extends in an east-west direction along a ridge on claims Pa. 777 and 774.

A gold discovery was made on the east boundary of claim Pa. 773 by J. A. MacArthur in March, 1933. This was developed by surface-trenching and test-pitting in the summer of 1934. Fourteen drill-holes were put down along the vein zones in 1936.

The original discovery on the east boundary of claim Pa. 773 consists of discontinuous sheared zones, which contain silicified schist with quartz stringers in places. These are mineralized with traces of arsenopyrite, and visible gold has been found. A section across 85 inches in a trench on the claim line is reported to assay \$9.00 per ton in gold.

Near the northwest corner of claim Pa. 774 on the north side of the carbonated greenstone ridge a number of sheared zones contain irregular quartz veins and stringers. The vein quartz contains carbonate, albite, and seams of chlorite and tourmaline. It is mineralized with arsenopyrite and contains some visible gold. Values have been obtained in the surface trenches over a length of 150 feet, and are confined to the vein quartz with included schist and to areas of arsenopyrite mineralization. The arsenopyrite is largely massive and unfractured. Small quartz veins occur in the siliceous carbonate body and sometimes contain disseminated sulphides.

A dip-needle survey of the claims was made by J. A. MacArthur in the early months of 1938. This work indicated the probable occurrence of a number of bands of iron formation under drift-covered areas. The approximate location of these supposed bands of iron formation is shown on the accompanying geological map (No. 47b), but they had not been drilled at the time the map was prepared.

Coniagas Mines, Limited

During the summer of 1936, J. F. Sutherland staked and explored a group of 18 claims for Coniagas Mines, Limited, in the northwestern part of the Crow River area (see Fig. 3). A dip-needle survey traced out a band of iron formation over a length of about 4 miles across this group and adjoining claims staked by B. Coles. A series of exploratory diamond-drill holes were put down along the iron formation on the Coniagas group.

The rocks exposed on the claims consist of massive basic lavas, which sometimes show pillow structures and also have dioritic phases. Drilling showed that the band of iron formation was narrower than indicated by the dip-needle survey. Dioritic lava adjacent to the iron formation was the cause of the wider magnetic indications.

Small amounts of sulphides and quartz carbonate stringers were intersected in the iron formation, but no encouraging gold values were obtained.

Crow River Development Company, Limited

The Crow River Development Company, Limited, acquired the assets of Crow River Mines, Limited (now Bristol Mines, Limited) in June, 1936. The company owns a group of 17 claims adjoining the Crow river and tying on to the Pickle Crow claims on the south and eastern boundaries. The claims are almost entirely covered by muskeg. Four outcrops of greenstone were mapped on the property. A small quartz carbonate vein occurs near the southeast corner of claim Pa. 2,081.

In the winter of 1937-38, a dip-needle survey was made of the property. This indicated a band of iron formation on claims Pa. 2,085 and 2,086, and another on claim Pa. 2,082. These bands are approximately located on the accompanying geological map (No. 47b) from information supplied by A. J. Anderson, consulting engineer for the company. At the time this map was prepared, 3 drill-holes had intersected the northern band of iron formation. According to Mr. Anderson hole No. 3 cut a 15-foot section in the fractured iron formation, which assayed \$5.60 per ton in gold. Drilling operations were being continued.

Crowshore Gold Mines, Limited

Crowshore Gold Mines, Limited, owns two groups of claims in the north-eastern part of the Crow River area. One group of 7 claims adjoins those of Albany River Mines on the northeast. A second group of 19 claims lies a mile to the northeast and adjoins the Canadian Patricia holdings on the north. Development work has been concentrated on the former group. In 1937 a dip-needle survey was made and traced out some bands of iron formation. A series of drill-holes was put down to intersect this formation.

A few outcrops of greenstone and small exposures of iron formation are found on the southwestern group of claims. The iron formation strikes north-eastward and dips about 75° N.W. A band (zone "B") was traced by drilling

more or less continuously for about 2,800 feet from the boundary of the Albany River claims across the southern part of claims Pa. 2,161, 2,162, and 2,163. Some holes were also put down on another horizon (zone "A") lying about 600 feet to the north on claim Pa. 2,161 and traced it for about 300 feet. Four different bands of iron formation were cut here. In places shearing was found in the greenstone adjoining the iron formation. Quartz and sulphides were intersected in and near the iron formation in a number of holes. This material is reported to contain gold values, some of which were moderately encouraging. Drilling was continued in 1938.

Dona Patricia Gold Mines, Limited

Dona Patricia Gold Mines, Limited, was incorporated in 1936 and owns a group of 18 claims adjoining the Central Patricia claims on the south. In 1936 the property was developed by surface-trenching and a limited amount of diamond-drilling.

The Keewatin rocks outcropping on the western claims belong to two geological groups. Massive greenstone occurs to the west, while to the east and south light-coloured fragmental rocks are found. These include agglomerate, massive rhyolitic tuff, and bedded tuff. At the creek just south of the camp there are exposures of iron formation adjoining bedded tuffs and greywacké. The band of iron formation strikes about N. 15° W. and dips 80° N.E., although at the creek it is considerably contorted and drag-folded. It has been traced 170 feet from the creek and then disappears under heavy overburden in both directions along the strike.

Some small quartz porphyry dikes intrude the greenstone on the property. The extreme eastern claims are largely drift covered but are probably underlain by granite because this rock outcrops on claims Pa. 2,491 and 2,493. Diabase is found at a few places and intersects all other rocks.

A few quartz veins have been uncovered; two zones of rusty schist outcrop near the granite contact on claim Pa. 2,491. A gold-bearing vein was found near the southwest corner of claim Pa. 2,493. It lies in highly sheared greenstone and in small syenite porphyry dikes. As aplite dikes cut across the vein quartz, it probably lies not far from the granite contact. The vein is one foot or less in width and has been traced about 100 feet but is irregular in outline and broken into different parts. The vein-filling is white and pinkish quartz with traces of sulphides. In the fall of 1936 the company reported that chip and grab samples of the quartz carried gold values. Some short drill-holes were put down to intersect this vein.

Gateway Patricia Gold Mines, Limited

Gateway Patricia Gold Mines, Limited, owns a group of 38 claims adjoining the Central Patricia claims on the west. It was organized in March, 1936, and commenced development work immediately. As a large part of the property is covered by a heavy mantle of overburden, a geophysical survey was made under the direction of Hans Lundberg, Limited. This survey indicated 5 zones of major electrical conductivity. A large amount of drilling has been done to test out the favourable zones shown by the electrical surveys, and to make a north-south section across the east side of the property.

Rock outcrops consist of fairly massive greenstone cut by small porphyry and aplite dikes. Sericite schist was intersected in drilling on the east boundary and may be highly altered porphyry. More massive dikes of distinct porphyritic

texture were also intersected. North of the Crow river, drilling revealed bands of fine-grained sediments interbanded with the flows. The sediments consist of quartzite, greywacké, and graphitic schist. The various formations along the east boundary dip to the north at angles of 45 to 60 degrees.

Some sulphides are associated with the siliceous sediments; these are reported to carry erratic gold values of a non-commercial grade. Surface-trenching on the property revealed a few small quartz veins.

Kaw-Crow Patricia Gold Mines, Limited

Kaw-Crow Patricia Gold Mines, Limited, was incorporated in January, 1936, to explore a large group of claims lying east of the Winoga Patricia claims. Part of these holdings had been previously owned by Kawinogans Gold, Limited, and prospected on the surface and by diamond-drilling. In 1937 the Kaw-Crow Patricia group comprised 67 surveyed and 9 unsurveyed claims. As these are largely covered by muskeg, swamp, and other heavy overburden, prospecting is difficult. A geophysical survey was made of the western section of the property in 1936 by Hans Lundberg, Limited. Favourable indications of this survey were drilled without reward. Further exploration consisted of surface-trenching and drilling across the structure in order to have a continuous section from outcrop to outcrop. A total of 47 holes, comprising 21,635 feet, were drilled, but no encouraging results were obtained.

Rock outcrops are mostly basic lavas with minor amounts of agglomerate and tuff. Diorite occurs at a few places. Outcrops of iron formation and altered gneissic sediments occur on the eastern and southeastern claims. Iron formation was cut in drilling on the claims south of the Crow river between the Crowshore and Canadian Patricia claims. Dikes of massive porphyry and rhyolite cut the older rocks at a number of places on the property.

A number of small quartz veins and mineralized sections were uncovered by surface work and cut in drilling operations but were not of commercial importance. The iron formation on claim Pa. 2,444 contains sulphides and low gold values in places. A drill-hole 100 feet east of the Winoga Patricia boundary on claim Pa. 2,122 cut a vein, 4 feet wide, which assayed \$8.40 per ton in gold.

Nytor Patricia Mines, Limited

Nytor Patricia Mines, Limited, was incorporated in June, 1937, and owns a group of 84 claims in the northwestern section of the Crow River area. These are largely covered by overburden. In the summer of 1937 the property was explored by surface work, a dip-needle survey, and diamond-drilling. No iron formation was found; the rocks consist mostly of schisted and dioritic greenstone cut by acid dikes. Some gold values of non-commercial grade were reported from drill operations.

Pickle Crow Gold Mines, Limited

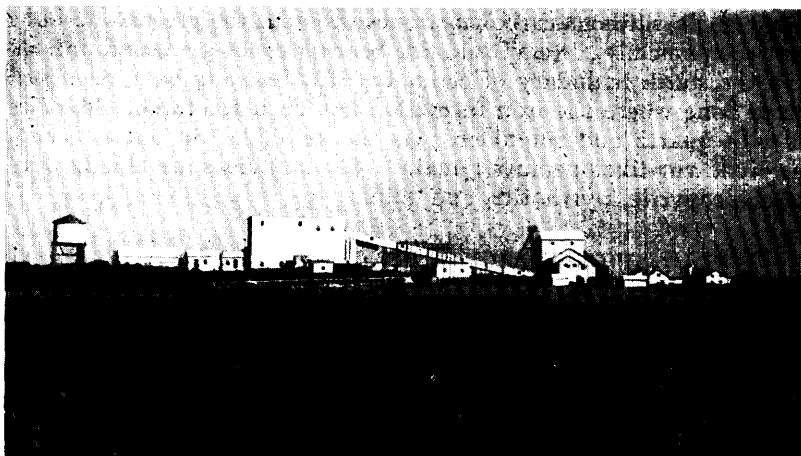
History and Development

Pickle Crow Gold Mines, Limited, owns a group of 57 claims comprising 2,536 acres. The original claims were staked by H. H. Howell and J. McFarlane of Northern Aerial Minerals Exploration, Limited (N.A.M.E.) in 1928, and consisted of an eastern and western group. Later the intervening claims were acquired. A number of gold discoveries were made on the eastern group, the most promising being the Howell vein, on which the Pickle Crow ore body was later

developed. In 1929, this vein was opened up by surface-trenching, and in the fall of that year 10 diamond-drill holes were put down along it.

The property then remained dormant until September, 1933, when a steam plant was installed and shaft-sinking commenced. Early in 1934, Pickle Crow Gold Mines was organized and purchased the property from Northern Aerial Canada Golds, Limited, successor to N.A.M.E. In the summer of 1934 plans were made for the construction of a 125-ton mill, but transportation difficulties prevented its completion until April, 1935. By the end of that year the mill capacity was stepped up to 150 tons. Later it was raised to 200 tons, and in 1937 again enlarged to 400 tons daily capacity.

Up to May, 1938, the shaft had been sunk to a depth of 2,000 feet and 9 levels had been explored to a depth of 1,200 feet.



View of the Pickle Crow mine.

General Geology of the Property

The rock outcrops are largely lava of andesitic composition. They are generally massive and sometimes show pillow structures but are sufficiently deformed that the attitude of the flows can scarcely ever be determined by the shape and arrangement of the pillows. These greenstones are sheared locally to chlorite schist. Small amounts of fragmental rocks including volcanic breccia, agglomerate, and tuff are intimately associated with the lavas on some of the eastern claims of the group, especially Pa. 644, 727, and 646.

Several bands of iron formation are interbedded with the lavas. They range in width from a few inches to over 200 feet; some horizons may be traced for considerable distances, while others are lenticular and discontinuous. In some bands the iron-bearing mineral is largely siderite with only traces of magnetite. These have little magnetic attraction and are hard to trace out by geophysical methods. In fact, neighbouring bands of diorite sometimes have a greater magnetic influence than the iron formation. A sill-like body of diorite, schistose near its margin, occurs northeast of the mine.

Small dikes of syenite porphyry and quartz-feldspar porphyry cut the greenstones lying west and south of the mine. A band of sheared porphyry, 80 feet wide, was cut in drilling northeast of the mine on claim Pa. 725. Narrower intersections of the same rock were cut about 800 feet north of the shaft. Quartz

and feldspar phenocrysts may be seen in core samples of this porphyry, but microscopic examination shows that the rock is pretty well altered to sericite schist. This may be the southwestern extension of the porphyry body that outcrops on the northern corner of the Winoga Patricia and Albany River claims. A lamprophyre dike cuts across the main vein at the mine and similar dikes occur on claim Pa. 737.

Veins and Mineralization

Mineralized quartz veins have been found at a number of places on the property. The principal veins are known as the Howell, Lake Shore, Riopelle, and Big Dome. Gold values have been obtained by drilling in the iron formation southwest of the shaft towards the Central Patricia boundary. Underground work has been confined entirely to the Howell vein, but most of the other veins have been drilled.

A few, small, siliceous carbonate zones occur in the greenstone but are unimportant economically. Small sulphide-bearing zones are found in iron formation. On the south boundary of claim Pa. 751, test-pits have been sunk on a mineralized zone where the iron formation has been fractured, chloritized, and injected with quartz and sulphides. As the sulphides do not entirely fill the fractures, little vug-like openings remain. The sulphides are chiefly pyrite with traces of chalcopyrite, pyrrhotite, and gold.

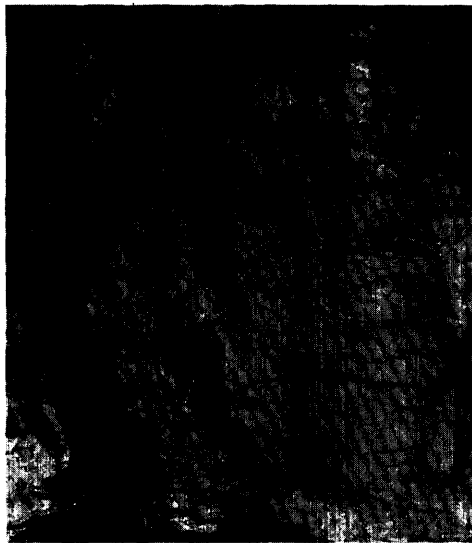
PICKLE CROW MINE (HOWELL VEIN)

Vein and Ore Body

The Pickle Crow ore body is confined to the Howell vein, which lies along the northwest side of a ridge on claims Pa. 746 and 747 (Fig. 13). To date it has been explored underground over a maximum length of 1,600 feet in a straight line (see Fig. 14). On the 750-foot level, which has been used as an exploratory horizon, a total length of 1,838 feet of quartz has been opened up by following around the folds and twists along the vein. On the surface the main section of the vein extends an over-all distance of about 750 feet southwest from the shaft; 200 feet farther southwest along the strike a 50-foot length of contorted quartz vein outcrops and carries visible gold; 250 feet beyond this vein, drill-hole No. 60 intersected some quartz. Drilling east of the creek near the southeastern corner of claim Pa. 750 cut gold-bearing quartz, although this is northwest of the projected strike of the main Howell vein. East of the shaft the surface continuation of the vein is largely covered by muskeg, but it has been traced underground for a distance of about 950 feet in a straight line from the shaft. On the surface a 70-foot length of vein extends across an outcrop east of the raise from the 125-foot level. Gold-bearing quartz was cut in drill-hole No. 748-2 on the west side of claim Pa. 748. This lies more or less along the projected strike of the Howell vein about 600 feet east of the limit of the underground workings.

The whole vein is twisted and contorted by drag folds so that the strike swings around considerably. The eastern section strikes about N. 82° E., the western part N. 50°-60° E., and the general over-all strike would be roughly N. 65°-75° E. The dip is about 75° N.W., but between certain levels is almost vertical (see Fig. 15). The vein angles across the enclosing rock formations, which have a general northeast-southwest strike in its vicinity. The eastern and western parts lie in greenstone and the central section is either along the contact of greenstone and iron formation or entirely within the latter rock. Mine officials state that 80 to 85 per cent. of the ore section lies in greenstone.

The Howell vein occupies a strong fracture, which cuts across greenstone and iron formation indiscriminately both in vertical and in horizontal section. In the greenstone the vein generally occupies a single fissure and has a well-defined wall, but in places it branches out into a lode with braided structure and intervening bodies of schist. The vein may pinch down to a few inches of quartz, which cannot be mined profitably, and also swell out to widths as great as 15 feet. The average width is about 3 feet. Wide ore bodies are generally stoped in the drag-folded sections of the vein. For example, in stope No. 260, above the 250-foot level, stoping widths of vein material have varied from 26 inches to 20.5 feet, the greater width being in the vicinity of drag folds. The drag-folded



Gold-quartz vein showing banded structure exposed in the breast of a stope, Pickle Crow mine. A width of 6 feet is shown in the photograph.

sections of the vein generally contain high-grade ore and produce some of the best specimens of visible gold. The average stoping width throughout the mine is estimated by mine officials to be about 4 feet.

The greenstone is sheared to chlorite schist near either wall of the vein, but shows no evidence of silicification or carbonatization and contains practically no mineralization. On the levels between 750 and 1,200 feet the hanging wall of the vein is often bordered by a band of black, massive, fine-grained rock. It is never more than a few feet wide and has a sharp contact with the chlorite schist on one side and the quartz on the other. The rock is so similar in appearance to the adjacent schist that it can only be distinguished on clean surfaces. It could be either a tiny basic dike or ordinary greenstone that has escaped intense shearing. The fact that it follows the vein in places through iron formation rather strongly suggests that it is a dike. Under the microscope the rock was found to be very greatly altered and shows only a matte of chlorite, sericite, magnetite, and a little secondary quartz.

The main vein fracture in the iron formation is generally well defined, but, in limited sections, parallel fractures filled with quartz veins and stringers occur

over good widths. For instance, in a stope on the 125-foot level a fractured zone filled with quartz stringers in the iron formation made ore over an average width of 20 feet throughout a 90-foot length.¹ On the 900- and 1,050-foot levels, also, the ore widens appreciably over a length of about 200 feet in a similar structure in the iron formation. Mineable widths of 8 to 15 feet are sometimes produced by the quartz-filled fractures and attendant sulphide mineralization. Throughout the mine in general the part of the ore zone in iron formation is wider and lower in grade than the sections in greenstone. Bodies of massive sulphides, chiefly pyrite and pyrrhotite, replace the iron formation in certain parts of the mine. The replacement is well shown in the vicinity of the large drag folds on the vein east of the shaft on the 125- and 250-foot levels. In some cases the massive sulphides entirely obscure the original rock. Mine officials report that these sulphides carry low values in gold. In many places the iron formation adjoining the vein is unaltered to any extent.



Quartz vein on the breast of No. 360 stope, Pickle Crow mine. The vein contains inclusions of the wall rock (black). The photograph shows a 10-foot width of vein.

Tiny cross-faults have offset the quartz vein a few inches to a foot or so at a number of places. These strike northwest, and the east side has generally moved south. The fault-planes are often filled with calcite and marcasite, and sometimes contain small unfilled vugs.

Mineralization

Typical vein filling consists of white quartz with chlorite, sericite, tourmaline, and a carbonate, probably ankerite in composition. Tourmaline, chlorite, and sericite occur as narrow seams running parallel to the vein walls, and they give the quartz a banded appearance. The vein quartz is very well fractured, and the cracks are confined largely along the zones of dark-coloured minerals. The narrow seams of chlorite and sericite are slickensided as the result of shearing movements within the vein. Sulphides are comparatively rare in the vein quartz, but pyrite, pyrrhotite, chalcopyrite, arsenopyrite, galena, and sphalerite have been found; pyrite and pyrrhotite are the commonest sulphides in the ore. The vein quartz in iron formation contains a much larger sulphide content and a smaller amount of chlorite and tourmaline than the vein quartz in greenstone.

¹Annual report, Pickle Crow Gold Mines, December 31, 1935.

Two generations of quartz are present in the veins. A later white quartz occurs as veinlets, which cut across the earlier quartz-tourmaline-chlorite type. Both generations of quartz are similar in appearance and can only be distinguished where the latter variety cuts through the seams of chlorite and tourmaline of the earlier quartz. Only small amounts of the later quartz can be identified, and the gold values appear to be in the earlier generation.

Gold occurs very largely along the fracture planes in the quartz and is thus closely associated with sericite, chlorite, tourmaline, and carbonate. Spectacular samples of visible gold are found in different parts of the mine, but, considering the high grade of the ore and the mine as a whole, visible gold is not very abundant. The company reports that about 40 per cent. of the mill recovery is by



Polished specimen (one-half natural size) of high-grade gold ore from the Pickle Crow mine. It consists of quartz with narrow seams of tourmaline (black) and sericite (grey) and pyrite (P) mineralization. Fractures along the tourmaline and sericite zones contain native gold (G).

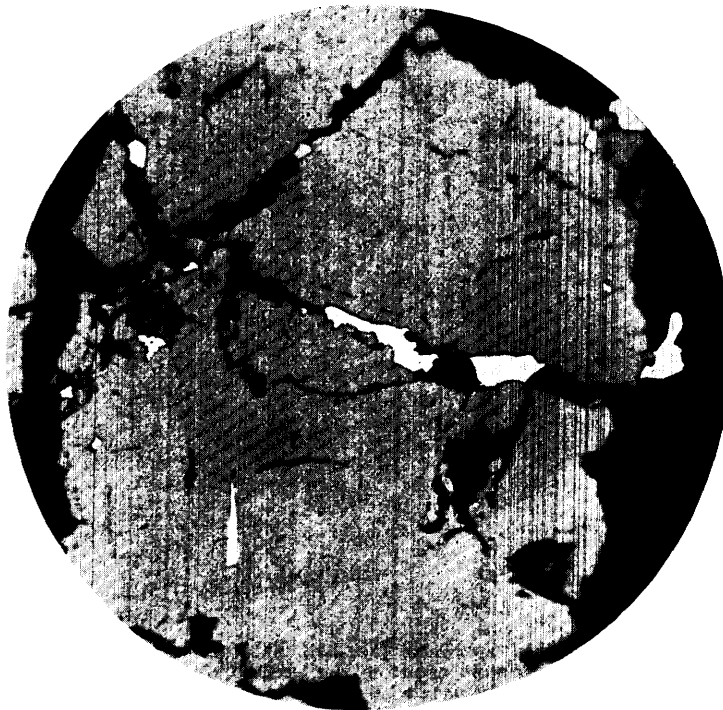
amalgamation of the coarser gold.¹ Systematic mine sampling, however, shows that gold values are consistent along the drifts and in stopes. Values are confined almost entirely to the vein quartz, the wall rock carrying only traces of gold. Exceptions to this rule occur when quartz stringers run through the schist adjacent to the vein and carry gold.

Sequence of Mineralization

The vein structure shows that the quartz was injected into a well-defined fracture that had been drag-folded before the introduction of the vein material. The cause of the banding of the dark-coloured minerals with quartz is not definitely known. A possible explanation is that narrow parallel seams of chlorite in the quartz may be wall rock that was worked into the interior of the vein by

¹Bull. Can. Inst. Min. and Met., April, 1938, p. 136.

successive injections of quartz along the contact zone between already consolidated quartz and the greenstone. When the break occurred a narrow sheet of country rock, cemented to the vein quartz, might split from the wall and fresh vein material occupy the fracture. Repetition of this process could produce the banded alternation of quartz and chlorite. This is the explanation suggested by Hurst¹ to account for the banded nature of the quartz veins at Porcupine. Isolated crystals of tourmaline occur here and there through the white quartz and along well-defined narrow bands. The intercrystallization of the two minerals proves that they were formed simultaneously.



Photomicrograph of gold ore from the Pickle Crow mine, showing gold (white) and pyrrhotite (dark-grey) replacing arsenopyrite (light-grey). The black is gangue. ($\times 125$.)

After consolidation the vein quartz was fractured by structural readjustments, probably tensional in origin. Sulphides, such as pyrite and pyrrhotite, were introduced in limited amounts along these fractured zones in the quartz. On the stopes above the 250-foot level open fractures in the quartz have been partially filled with pyrite and pyrrhotite, leaving empty spaces between the sulphide crystals. Polished samples of ore show that pyrite and pyrrhotite cut across tourmaline as well as quartz. Arsenopyrite is found in the quartz in rare instances and has a distinct crystal form. A polished section of ore containing arsenopyrite showed that the mineral was very much fractured and replaced by gold and pyrrhotite along the fractured zones. In some instances gold and pyrrhotite occupy the same fracture in alternating masses (see photomicrograph above). Pyrrhotite is slightly later than pyrite.

¹M. E. Hurst, *Econ. Geol.*, Vol. 30, 1935, pp. 103-127.

Gold is later than all minerals with which it has been found in contact, with the possible exception of carbonate. Thin sections of vein quartz show the gold distributed along fractures in the quartz and closely associated with carbonate, which is also later than the vein quartz (see photomicrograph below).

Structural Control of the Vein and Ore Body

Two outstanding structural features of the deposit are: (1) the numerous drag folds along the vein, and (2) the fact that the ore body appears to be controlled within certain limits by the iron formation, even though the vein passes through iron formation and greenstone with equal ease.



Photomicrograph of a thin section of rich gold ore, Pickle Crow mine. Gold (black) is associated with carbonate (C) and occurs along fractures in quartz (light-grey). (Single nicol, $\times 13$.)

The drag folds on the vein always show the same direction of relative movement, i.e. the north side has moved east with respect to the south side. Three of the more pronounced drag folds occurring at intervals along the vein have been followed downward for a considerable distance. One of these lies about 100 feet west of the shaft crosscut on the 125-foot level. The drag fold carries the vein out of the greenstone to and along the contact with iron formation on this level, but with greater depth the fold moves progressively away from the iron formation. Between the 125- and 1,200-foot levels this drag fold pitches downward at an angle of 70 degrees in a direction of N. 21° E. One hundred feet east of the shaft crosscut on the 125-foot level another important drag fold carries the vein out of the iron formation and along the contact with the greenstone body. This structure persists to a depth of 900 feet and then dies out. It pitches at an angle

of 70 degrees in a direction N. 23° E. The third large drag fold on the vein is about 600 feet northeast of the shaft and lies entirely within the greenstone. Between the 125- and 750-foot levels it pitches at 69 degrees in a direction N. 4° E. From the 750-foot level to a depth of 1,200 feet the pitch is 74 degrees in a direction N. 27° E.

The vein quartz near the nose of the drag folds shows no evidence of faulting or brecciation. The banded structure bends around the various flexures in the vein without any particular disturbance (see photograph below). This would indicate that the vein had been injected into a pre-existing drag-folded fracture. If the vein had been folded after it was solidified, a hard brittle substance such as quartz could not be deformed without considerable fracturing and brecciation around the nose of the folds.



Nose of a large drag fold on the Pickle Crow vein as exposed on the back of the 250-foot level east. The vein is about 20 inches wide. The photograph shows the banded nature of the quartz.

The average dip of the Howell vein to a depth of 1,200 feet is about 75° N. This is slightly flatter than the dip of the iron formation, which averages about 82° N.W. to the same depth. The iron formation strikes about N. 45° E., while the over-all strike of the vein, especially the part in the iron formation, is around N. 70° E. Using these figures it may be calculated that the line of intersection of the vein with the iron formation would pitch at about 70 degrees in a direction N. 22° E. However, owing to local irregularities in the strike and dip of both the iron formation and the vein, the actual rake of this intersection varies considerably in different parts of the mine and on either side of the iron formation, but the over-all average is somewhere near 69 degrees in a direction about N. 32° E. to a depth of 1,200 feet. Mine developments to this depth are beginning to show that the entire ore body plunges steeply to the northeast, but the exact angle could not be accurately calculated at the time this report was written.

The above statements indicate a close relationship between the pitch of the intersection of the vein with iron formation, the pitch of drag folds, and the plunge of the ore body. The iron formation undoubtedly exerted a strong controlling influence over the localization of the vein and ore body. The main

fracture probably originated in and along the contact of the iron formation and extended laterally into the greenstone. It followed a sheared zone in the greenstone that was formed under compression during regional folding. Drag folds along the sheared zone were probably the result of differential movements produced at the time within the sphere of structural influence near the nose of a syncline (see Fig. 4). After the folding, tensional readjustments produced the fracture along this original line of weakness. As the axis of the syncline lies only 1,800 feet northwest of the mine, the vein is located on the south limb of a major fold which pitches northeast. During the regional folding the northwest side of the sheared zone would be dragged northeast. This movement corresponds with conditions actually found along the vein. It has been pointed out earlier in this report that other quartz veins in this general vicinity have been injected into a drag-folded structure in the same way.

Ore Developments

The company does not publish an estimate of ore reserves. At the annual meeting of the company in May, 1937, shareholders were told that over-all results to that date showed that about 50,000 to 60,000 tons of ore were made per level. The average stoping width is estimated at about 4 feet, after allowing for a certain amount of unavoidable dilution. In the annual report of the company for 1937, Alex. G. Hattie, manager, made the following statement on ore reserves:—

Since the change from shrinkage to cut-and-fill stoping, our experience has shown that drift-width averages have been very conservative estimates, no allowance having been made for bulges and folds. From the sections of the mine that have been stoped out, our experience discloses that there is sufficient ore above the 1,200-foot level to operate the mill for at least three years at the present rate.

The grade of this ore will be as high or slightly higher than the 1937 average grade of ore milled.

By the end of 1938 drifting will have been completed on five new levels at 150-foot intervals below the 1,200-foot level.

The following table of ore developments on the various levels is taken from annual reports of the company, and is revised to December 31, 1937:—

| Level | Ore length | Ore width | Grade | Ore supplied from stopes and development to Dec. 31, 1937 |
|-------------------------------|--------------------|-----------|---------|---|
| | feet | inches | | tons |
| 125-foot..... | 1,092 | 32 | \$23.80 | 20,523 |
| 250-foot..... | 1,120 | 25 | 39.20 | 44,470 |
| 375-foot..... | 1,192 | 27 | 37.45 | 40,178 |
| 500-foot ¹ | 1,093 | 29 | 22.05 | 26,489 |
| 625-foot ² | 1,114 | 34 | 24.15 | 23,213 |
| 750-foot..... | 1,388 ³ | 32 | 22.05 | 23,813 |
| 900-foot ⁴ | 1,120 | 31 | 22.40 | 8,670 |
| 1,050-foot ⁵ | 1,166 | 35 | 23.10 | 8,503 |
| 1,200-foot..... | 1,235 | 29 | 18.20 | 9,349 |

¹In addition, there is an 84-foot length averaging 9 inches in width and \$29.05 in grade, and another 31-foot section, 8 inches wide, averaging \$11.55.

²In addition there is a section 193 feet long, 14 inches wide, averaging \$8.40 per ton.

³Probably over 95 per cent. of above length is ore. In addition there is a length of 149 feet, averaging 20 inches in width and assaying \$10.85 per ton.

⁴The total vein length is 1,417 feet, averaging 27 inches in width and assaying \$22.05.

⁵The total drifting is 1,415 feet, averaging 31 inches in width and assaying \$22.40 per ton.

Production, Costs, Profits, Etc.

The following table shows the production, operating costs, and profits of the mine from the commencement of mill operations in May, 1935, to June 30, 1938. The information has been taken from the annual reports of the company, except that for the first six months of 1938, which was taken from Bulletin 119 of the Ontario Department of Mines.

| | 1935 | 1936 | 1937 | June 30, 1938 |
|---|---------------------|-------------|---------------------|------------------|
| Ore hoisted..... tons | 40,119 | 63,758 | 110,899 | 66,144 |
| Ore picked..... tons | 2,628 | 9,967 | 12,846 | 10,215 |
| Ore ground..... tons | 37,277 | 53,791 | 98,063 | 55,929 |
| Tons milled daily..... | 144 | 147 | 269 | |
| Recovery per ton ground..... | \$23.45 | \$29.98 | \$23.15 | |
| Value of bullion recovered..... | \$874,089 | \$1,612,451 | \$2,270,113 | \$1,368,979 |
| Operating costs per ton hoisted (excluding depreciation)..... | \$8.07 ¹ | \$8.30 | \$6.85 ² | |
| Gold extraction in mill..... per cent. | 94.3 | 98.2 | | |
| Net yearly profit..... | \$415,963 | \$791,844 | \$1,093,196 | |
| Dividends paid..... | | \$600,000 | \$1,050,000 | |

¹Based on tons milled after sorting and includes all development work.

²Operating costs including depreciation were \$8.51 per ton.

Mining and Milling

A detailed description of mining and milling methods has been published by the mine staff.¹ Shrinkage stoping was carried out to a depth of 375 feet, and then a resuing cut-and-fill method was adopted and found very satisfactory. The ore is comparatively free-milling, and grinding to 80 per cent. minus 200 mesh is sufficient for a good extraction. Gold is extracted by amalgamation and cyanidation, although the amalgamation is a secondary process and the mill might best be described as a conventional cyanidation plant. Milling costs of ore ground and sorted are reported as \$1.24 per ton.

RIOPELLE VEIN

The Riopelle vein is on claim Pa. 730 and lies about half a mile southwest of the mine shaft. On the surface it consists of two separate parts with different strike. One part of the vein strikes northeast and dips 75° N.W. This is roughly parallel to the Howell vein but offset about 400 feet south of its projected strike. The quartz has a maximum width of about one foot. The other section follows a fracture through massive greenstone in a northwesterly direction and is much twisted and drag-folded (see photograph on page 26). The vein quartz is white and banded with chlorite and tourmaline. It ranges from a mere stringer to a vein more than 3 feet wide. To the northwest the vein disappears under swamp. A few particles of visible gold have been observed on the surface of the vein.

Drill-holes were put down on the extension of the Riopelle vein in 1937 and cut gold-bearing vein material. According to a report covering mine operations during the early part of 1937, four of the holes showed values as high as \$15.00 over 24 inches. One intersection assayed \$12.25 over 30 inches; others gave \$4.90 over 36 inches, \$9.80 over 30 inches, \$22.05 over 6 inches, and \$14.70 over 6 inches.

¹Bull. Can. Inst. Min. and Met., April, 1938, pp. 140-158.

LAKE SHORE VEIN

The Lake Shore vein lies on claim Pa. 705 and is just south of a small lake. It has been traced for about 300 feet on the surface and is twisted and drag-folded in a similar way to other veins. The vein occupies a fracture in massive lava; the quartz ranges from a few inches to 3 feet in width. Tourmaline, chlorite, and carbonate occur with the quartz, but sulphides are very scarce. It is reported that visible gold occurs in the vein. Diamond-drilling along it indicated low gold values.

BIG DOME VEIN

The Big Dome vein consists of a 200-foot length of quartz uncovered near the west boundary of claim Pa. 706. It occupies a fracture in massive greenstone and is drag-folded. The vein material is mostly white quartz, but traces of sulphides occur in the wall rock.

VEIN ON CLAIM Pa. 737

A gold discovery was made in 1936 about 2,000 feet northwest of the mine shaft, near the south boundary of claim Pa. 737. Two small parallel veins about 10 feet apart occur in greenstone and iron formation. The larger vein follows along the contact between iron formation and greenstone. Both veins have been drag-folded. The total length of the quartz veins on the surface is less than 50 feet, and the width ranges from 4 to 20 inches. The filling is quartz and carbonate with a little visible gold. The vein was drilled in 1936. Mine officials reported that the two veins carried values over an aggregate length of 70 feet.

OTHER VEINS AND MINERALIZED ZONES

Two gold-bearing zones near the mine were found by drilling in 1937 and are described in the annual report of the company for that year as follows:—

Two interesting areas with ore-making possibilities were outlined. The first lies west and south of the shaft about 2,000 feet, and consists of quartz lenses in mineralized iron formation. Gold occurs in the quartz and in the iron formation adjacent to the quartz. Assays were erratic. It is possible that the quartz does not occur as veins but in lenses, which are difficult to correlate from one hole to the next. . . .

The second area lies 1,600 feet N. 30° E. of the shaft. The gold occurs in well-mineralized quartz veins, which appear to be continuous from hole to hole for a distance of 800 feet. Assays and widths are not large, but the area has possibilities, and further drilling will be carried on in this section to try to establish a definite ore body.

Pickwick Gold Mines, Limited

Pickwick Gold Mines, Limited, was organized late in 1936, to explore a group of 10 claims located north of the Crow river below Kukuku rapids. About 7,000 feet of diamond-drilling was done on these claims. Adjacent ground, including the Benner claims, was subsequently acquired, and in 1937 the company controlled 30 claims. In 1937 some drilling was done on the Benner group.

The drilling was chiefly along bands of iron formation that were revealed by previous dip-needle surveys. There are no outcrops of iron formation, and only 4 or 5 outcrops of greenstone on the whole property. The rocks cut in drilling were mostly greenstone with narrow bands of iron formation and some lamprophyre dikes. No commercial gold values were reported.

Roeanor Gold Mines, Limited

Roeanor Gold Mines, Limited, was organized in the summer of 1936 and took over the Jeffries-Swartman group of 26 claims, which adjoin Central Patricia ground on their west boundary and Kaw-Crow Patricia on the north. Later the

company staked a group of 24 claims east of Pickle lake. A third group was acquired west of the Nytor Patricia claims in 1937, but little work was done on them.

EAST GROUP

The east group of claims is reached by a trail from the camp of the Central Patricia No. 2 operation. The rock exposures consist largely of schisted agglomerate and tuff with lesser amounts of greenstone. On the southern and eastern claims these rocks are considerably schisted on account of the proximity of granitic intrusives. A few quartz veins and mineralized zones were found on the property and some gold values were obtained, although nothing of commercial importance was indicated.

A siliceous sheared zone in greenstone near the northwest corner of claim Pa. 2,372 was opened up. It strikes about N. 25° E., and dips 80° N.W. The zone of shearing is 12 to 15 feet wide in places and contains disseminated pyrite. Trenching on claim Pa. 2,379 disclosed a quartz vein showing visible gold. A number of short drill-holes were put down in this vicinity.

Quartz stringers and sulphide mineralization were found by trenching along a zone 375 feet in length near the northeast corner of claim Pa. 2,652. Native gold occurs in one test pit, and sampling indicated non-commercial gold values in a number of the trenches. The zone lies along a shearing in biotite schist and gneiss, which is probably highly altered greenstone. The mineralization consists of pyrite, pyrrhotite, chalcopyrite, and a considerable amount of arsenopyrite. The vein was drilled in 1937, but the results were not encouraging.

WEST GROUP

The west group of claims was explored by surface-trenching and diamond-drilling in 1936 and 1937. A geophysical survey was made of the eastern part of the holdings by Hans Lundberg, Limited. Seventeen drill-holes, aggregating about 6,300 feet of core, were put down along the more favourable zones.

The Keewatin rocks consist of iron formation and different varieties of greenstone. Granitic intrusives come in on claims Pa. 3,403 and 3,406. The greenstone is predominantly andesitic lava, but near contacts with iron formation it is altered to chlorite-carbonate schists. On the southern claims the lavas are massive and show flow structure. Near the granites the greenstone grades into amphibolite containing crystals of hornblende up to a quarter of an inch in length.

A wide band of iron formation outcrops on the central part of the property. Diamond-drilling in this vicinity gave a complete section across the different bands. They attain a maximum width of about 250 feet. The iron formation bends around the crest of an anticlinal fold that plunges to the north (see Fig. 3). On the east flank it dips steeply to the east, but near the crest of the fold the dip decreases to around 40 degrees. On the west limb the dip is approximately 60 degrees to the west. In the course of the folding the contacts between the iron formation and the greenstones were zones of weakness, and here the rocks were sheared to chlorite schists. On the southeastern part of the property the shearing in the greenstone is usually parallel to the strike of the iron formation, but near the granite it strikes about parallel to the line of contact.

The drilling revealed disseminated pyrite and pyrrhotite in parts of the iron formation. One hole (No. 3) on the crest of the anticlinal fold showed 37 feet of heavily mineralized iron formation, but it contained only traces of gold.

No encouraging gold values were obtained during development operations, and work on the property was discontinued in the summer of 1937.

Walker Patricia Gold Mines, Limited

Walker Patricia Gold Mines, Limited, was organized in February, 1937, and owns a group of 14 unpatented mining claims. These are bounded on the south by Central Patricia and Pickle Crow ground and on the east by claims of the Crow River Development Company. Following a dip-needle survey of the property one diamond-drill hole was put down during the summer of 1938 under the direction of A. J. Anderson, consulting engineer.

The claims are largely covered by muskeg and sand ridges. Rock exposures consist largely of Keewatin greenstone and occasional bands of iron formation. The geophysical survey indicated the probable occurrence of bands of iron formation on claims Pa. 2,623, 2,612, and 2,614.

In July, 1938, Mr. Anderson reported that diamond-drill hole No. 1, located on the eastern part of claim Pa. 2,612, had cut 115 feet of iron formation, the last 20 feet of which assayed \$5.40 per ton in gold.

Winoga Patricia Gold Mines, Limited

Winoga Patricia Gold Mines, Limited, was organized in January, 1936, to develop a group of 9 claims adjoining the Pickle Crow claims on the east. These were explored by surface-trenching and diamond-drilling. Owing to the fact that most of the ground is covered by overburden, a geophysical survey of the whole property was made during the summer of 1936 by Hans Lundberg, Limited. A total of 73 diamond-drill holes, comprising 33,129 feet, were put down.

The outcrops of Keewatin rocks are largely basic lavas with minor amounts of volcanic fragmentals. Drilling has indicated that large areas of volcanic breccia, agglomerate, and tuff underlie the overburden on the central and south-western claims. These rocks are interbanded with the lavas. Small bodies of basic intrusives, classified as diorite and gabbro, were also cut in drilling operations. Bands of iron formation run north of east across claim Pa. 2,062. These lie at about the same stratigraphic horizon as the iron formation at the Pickle Crow and Albany River mines. North of the iron formation an elongated mass of quartz porphyry intrudes the lavas. A number of long, narrow porphyry and rhyolite dikes were traced out by drilling. The various interbanded formations strike about N. 50°-60° E. and dip steeply to the northwest. Four pronounced sheared zones striking more or less parallel to the iron formation were followed by drilling on claim Pa. 2,062.

Drilling revealed a number of gold-bearing veins and stringers, but no continuous section of ore was indicated. Most of the values occur in sheared zones in the greenstone in the general vicinity of the iron formation on claim Pa. 2,062. According to the annual report of the company, dated July 7, 1937, six rather widely separated holes gave intersections of \$8.00 or more across widths ranging from 1 to 2.5 feet. Probably the most interesting values were obtained in hole No. W. 34, located just south of the old road to the Albany River mine and 100 feet east of the Pickle Crow boundary. Visible gold was intersected here, and a neighbouring hole cut 2.3 feet that assayed \$57.05. A deep test pit was put down to investigate these intersections, but the showing was found to be very small.

In the summer of 1938 the property was sold to Albany River Gold Mines, Limited.

THE UCHI LAKE AREA

By Jas. E. Thomson

INTRODUCTION

The Uchi Lake gold camp lies within an area, approximately 4 by 2½ miles in extent, between Uchi lake and Lost bay of Confederation lake. The area is situated in the township of Earngey in the Patricia portion of the district of Kenora. Uchi lake lies about 75 miles northwest of the town of Sioux Lookout on the Canadian National railway.

The Uchi Lake country was prospected during the gold rush into the nearby Woman Lake area from 1926 to 1928. A number of gold discoveries were made in that period, and a limited amount of underground work was done at two locations within the map area. No important ore bodies were found, however, and interest

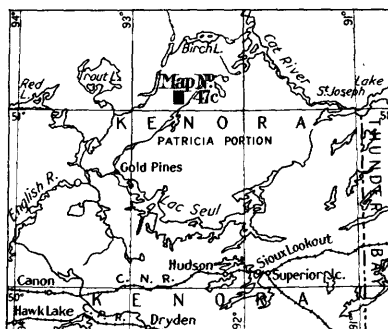


Fig. 1—Key map showing the location of the Uchi Lake area. Scale, 75 miles to the inch.

in the area lapsed for a number of years. Late in 1936, John E. Hammell took over one of the properties near Uchi lake, which had been previously developed by a little underground work. This was organized into Uchi Gold Mines, Limited. During the summer of 1937 activity in the area was confined chiefly to underground work at the property of Uchi Gold Mines and surface exploration and drilling on the neighbouring properties of Woco Gold Developments and Raingold Mines.

Scope of Report

The geological survey was carried out during July and August, 1937. A plane table survey on the scale of 100 feet to the inch was made in the clearing around the Uchi mine. The remainder of the area was mapped on the scale of 400 feet to the inch, using surveyed claim and picket lines as a base for pace-and-compass traverses, which were spaced about 400 feet apart. Drilling information and base maps were supplied by Uchi Gold Mines and Woco Gold Developments.

Acknowledgments

The writer is indebted to the management of Uchi Gold Mines and Woco Gold Developments for much assistance and information. Able assistance was

rendered in the field by A. A. Brant, T. F. Slater, and G. R. Smith. Dr. Brant acted as senior assistant and did part of the geological mapping.

Transportation and Power

In 1937 passenger traffic and the movement of light freight into Uchi lake were handled almost entirely by aerial transportation from Sioux Lookout and Hudson on the railway or from the village of Goldpines at the outlet of Lac Seul. The heavier freight is taken in to Goldpines by boat and from there to Uchi lake by 'plane in summer and over a tractor road in winter. Canoe routes into the area from Goldpines by way of the Woman or Wenasaga rivers have been described by Greig¹ and Bruce.² During the summer of 1938 a motor road from Goldpines to the Uchi mine was under construction.

In 1938 the Ontario Hydro-Electric Power Commission contracted with Uchi Gold Mines to supply power for the mine from the Ear Falls plant on the English river.

Previous Geological Work

In 1926, J. W. Greig³ made a geological reconnaissance through the Woman and Narrow Lakes area and mapped the rock formations around Uchi lake. The gold deposits of Woman, Narrow, and Confederation lakes were studied by E. L. Bruce⁴ in 1927, and the discoveries in the vicinity of Uchi lake were described.

Topography

The area presents the usual topographic features of the pre-Cambrian shield and has not a great amount of relief. Most of the country within the map boundaries is covered by rock outcrops. The greater part is overgrown by green forest, and here the rock ridges are generally buried by 2 to 6 inches of moss. The northern part, however, has been extensively burnt over, and there are excellent rock exposures.

GENERAL GEOLOGY

The geological features of the Uchi Lake area may be summarized as follows: The consolidated rocks are largely Keewatin acid and basic lavas with some inter-banded tuffaceous sediments. Associated with these are bodies of intrusive and extrusive diorite. A band of fine-grained sediments occurs around part of Uchi lake. Post-Keewatin intrusives are sparsely distributed and consist of dikes and small bodies of granite, aplite, syenite, and lamprophyre. Glacial deposits cover the bed rock in some localities.

The various formations may be classified as follows, the oldest being placed at the bottom:—

QUATERNARY

PLEISTOCENE and RECENT: Gravel, sand, clay.

Great unconformity

PRE-CAMBRIAN

ALGOMAN(?):

{ Granite.
{ Syenite porphyry, aplite, lamprophyre, carbonate dikes.

¹J. W. Greig, "Woman and Narrow Lakes Area," Ont. Dept. Mines, Vol. XXXVI, 1927, pt. 3, pp. 88, 89.

²E. L. Bruce, "Gold Deposits of Woman, Narrow and Confederation Lakes," Ont. Dept. Mines, Vol. XXXVII, 1928, pt. 4, p. 2.

³Op. cit., pp. 83-110.

⁴Op. cit., pp. 1-51.

Intrusive contact

KEEWATIN:

| | |
|---|--|
| { | Diorite. ¹ |
| { | Iron formation. |
| { | Greywacké, quartzite, slate, tuff. |
| { | Rhyolite and bedded cherty tuff. |
| { | Basic lavas (greenstone): andesite, basalt, fragmental and pillow lavas, chlorite schist. |

Keewatin Series

The Keewatin series contains five rock groups or formations that may be differentiated in the field. These groups are indicated in the above table of formations. Throughout part of the area there is an alternating succession across the strike of long, narrow bands of these formations. Some of these bands, such as the rhyolite and associated cherty tuff, are remarkably persistent along the strike and have been traced across the entire map area. These serve as marker horizons in the Keewatin complex.

Study of the regional structure indicates that the different members make up a continuous and conformable sequence from older formations at the east side of the area to younger rocks at the western border. The acid volcanics are thus more widely distributed in the upper or later part of the Keewatin series. This evidence corroborates the hypothesis of Bruce² that in this region the acid volcanics generally lie stratigraphically above the basic flows.

The writer wishes to stress the fact that at many places it is extremely difficult to determine accurately the boundaries of certain rock groups. The lavas show all gradations from basic to acid types. Coarse-grained diorites often grade laterally into fine-grained lava. In all such cases the extreme rock types are easily recognized, but the intermediate types are difficult to classify. In places, the dividing line must be arbitrarily drawn. These gradational contacts could easily be located in a slightly different position by different observers.

Basic Lavas

The rocks assigned to the basic lava group, commonly called "greenstones," vary in composition from light-coloured acid andesite to dark-green basalt. These greenstones are generally massive but may be sheared locally to chlorite schist. Vesicular and amygdaloidal structures are commonly observed in the lavas, but good exposures of pillow structures are not often seen. Fragmental tops of basic flows that adjoin narrow bands of rhyolite or cherty tuff are sometimes found. In some cases this brecciated zone is exposed over a width of 10 to 12 feet. Excellent exposures of these structures may be seen along the northern part of the Hill-Sloan-Tivy vein in the burnt-over country.

The writer believes that a considerable part of the rock classified as diorite on the accompanying map is really the coarse-grained central part of lava flows. The diorite generally occurs in long narrow bands bounded by rhyolite, cherty tuff, or greenstone. Fine exposures of these interbedded formations may be seen on the burnt-over ridges in the northern part of the area. The diorite, however, was never found to cut across the adjoining rhyolite or greenstone bands. At a few places a coarsely dioritic band, flanked by rhyolite on either side, was observed to grade into vesicular lava near either boundary. This feature is well displayed west of the Uchi mine near the northwest corner of claim No. 5,038. It is generally very difficult to delineate the contact between diorite and green-

¹Part of this formation is intrusive and may be post-Keewatin in age.

²Op. cit., pp. 12, 13.

stone. The dioritic texture often grades laterally into a fine-grained marginal phase similar to greenstone in appearance.

Rhyolite and Bedded Cherty Tuff

Rhyolite and bedded cherty tuff are always so closely associated and so similar in appearance that they must be mapped as a unit. Generally, it is only possible to differentiate the cherty tuff when bedding *laminae* are found. Both rhyolite and tuff are creamy-white or grey in colour, are very dense and flinty, and break with a conchoidal fracture. They generally exhibit a sharply defined contact with the greenstone and diorite, and are easily distinguished from them. Sometimes the margin of the rhyolite bands is considerably brecciated. The bedding *laminae* in the tuffs are generally less than an inch in thickness and would average around a quarter of an inch.



Bedded iron formation, claim No. 14,845,
Kenelda Gold Mines.

These bands of acid volcanics and pyroclastics range in width from a few inches to a quarter of a mile. Some of the more prominent bands have been traced across the map area and serve as horizon markers.

Microscopic study of a number of rock specimens belonging to this group shows that the tuff is a very fine grained acid sediment, sometimes with delicate bedding *laminae*, sometimes massive. The rhyolite, on the other hand, generally shows small but distinct phenocrysts of quartz and feldspar and has a felsitic texture. In some cases it is quite difficult to distinguish between the two rocks, even by microscopic examination.

Sediments

A rather poorly defined band of sediments occurs around the northern part of Uchi lake. This sedimentary belt was mapped by Greig.¹ Only the southern extremity of the band is shown on the accompanying map, although its extension along the northeastern arm of the lake was also studied. The sediments are all fine-grained clastics with the composition of greywacké, quartzite, slate, chert, and tuff. The beds sometimes attain a thickness of 4 to 6 inches, but frequently

¹Op. cit., map No. 36e.

the bedding is indistinct. Sometimes the rock resembles the cherty tuff described in the previous section.

Insufficient work was done to accurately outline the extent of this band of sediments or to obtain its relationship to the adjoining rock formations. In the central part of the lake, east of the landing of Uchi Mines, the belt attains a possible width of almost half a mile. A low reef of bedded greywacké in the lake about 400 feet from the western contact with the greenstone indicates by gradation in grain size that the top of the beds faces west. Farther south on claim No.



Bedded greywacké exposed on a small reef in Uchi lake.

14,862 the beds near the eastern contact also face west. This would suggest that the sedimentary band is only a horizon in the Keewatin series and conformable with the other rock formations that also face west.

Iron formation

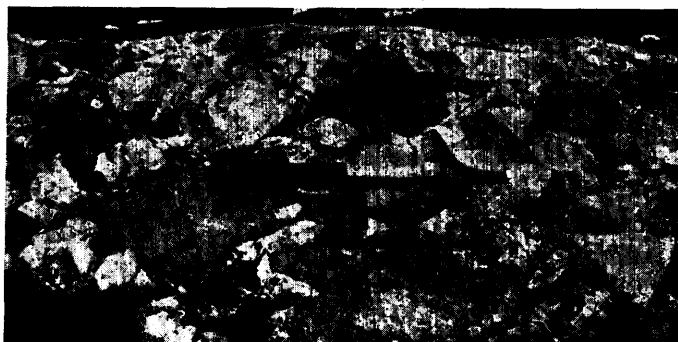
Three small bands of iron formation are known to occur within the map area. They attain a maximum width of about 50 feet. The largest band lies about three-quarters of a mile east of Lost bay. It contains some quartz veins and is exposed in a number of test pits. At the eastern extremity of the map area on claim No. 14,845 two small contorted bands of iron formation outcrop. The rock is thin-bedded, and narrow bands of greenstone alternate with the iron formation.

Diorite

The diorite is a medium- to coarse-grained rock. It generally occurs in bands that trend about parallel with the adjacent formations. The rock is usually massive and often has a fresh appearance, but microscopic examination shows that the original mineral constituents have been greatly altered and cannot be ac-

curately identified. It has been stated in a previous section that much of this rock is believed to be the coarse-grained part of lava flows. There are, however, irregularly shaped areas and dike-like masses of very coarse grained basic diorite or amphibolite that may be intrusives. In Uchi lake some of the coarse diorite contains considerable primary quartz and is thus a quartz diorite. It is possible that the intrusive diorite may be sill-like bodies and derived from the same parent magma as the basic lava flows.

The diorite is scarcely ever found in sharp contact with the other rock formations. Instead it generally grades laterally into fine-grained phases resembling ordinary greenstone. For this reason it is often very difficult to accurately locate the boundaries of the diorite bodies, and impossible to do so when shearing has obliterated the original rock texture.



Intrusive breccia at the granite contact on claim No. 14,832, Kenelda Gold Mines.

Algoman(?)

Only a few small bodies of acid intrusives occur in the map area. A small stock of granite is exposed near the northwest corner of Uchi lake. Some marginal phases of the body have the composition of granodiorite. Interesting exposures of intrusive breccia are found near the boundaries of the granite mass (see photograph above). A few small dikes of syenite, syenite porphyry, and aplite cut the Keewatin rocks in the area.

No information was obtained on the age of the granitic intrusives. It is probable, however, that they are of the same general age as the granite in neighbouring areas. Greig,¹ Bruce,² and Harding³ classify the granite of the region as Algoman in age.

Post-Vein Intrusives

No information was obtained about the age relationship of the quartz veins in the area to the granite and porphyry intrusives. There are some narrow acid and basic dikes that cut the quartz veins. At the Uchi mine narrow, fine-grained acid dikes intersect the veins on surface and underground. These dikes were roughly classified as aplite in the field. Microscopic examination of a sample of a typical dike on the 100-foot level showed that the rock was composed almost

¹Op. cit., map No. 36e.

²Op. cit., pp. 16, 17.

³W. D. Harding, "Geology of the Birch-Springpole Lakes Area," Ont. Dept. Mines, Vol. XLV, 1936, pt. 4, p. 13.

entirely of quartz, carbonate, and some chlorite. The dikes cut sharply across the veins without any effect on the gold values in the adjoining sections of the quartz. Narrow dikes of similar appearance cut the Hill-Sloan-Tivy vein, and microscopic examination shows that they have the same composition as those at the Uchi mine.

Narrow dikes of lamprophyre and other basic intrusives intersect the Hill-Sloan-Tivy vein and the No. 7 vein zone at the Kenelda mine.

STRUCTURAL GEOLOGY

Regional Folding

The various rock formations in the area strike N. 0°-30° E. and dip almost vertically. At a number of localities, indicated on the accompanying map, the fragmental tops show that the flows face west. This attitude was checked at several points by gradation in grain size and cleavage and bedding relationships in the sediments that are intercalated between the flows. The fact that the tops of the beds and flows all face west indicates that the alternating succession of rock types makes up a continuous sequence of strata and is not repeated by close folding. The entire map area is located on the east limb of a syncline, the axis of which lies somewhere west of the area examined.

Shearing and Fracturing

The various Keewatin formations are generally massive, although local sheared zones occur in all rock types that make up the series. The greenstones are the softest rocks; accordingly most of the sheared zones are localized within their boundaries. The diorite is a massive, competent rock and has resisted the shearing movements to a considerable extent. In general the bands of hard diorite have acted as buttresses between the softer greenstones, which were sheared and fractured during and following the regional folding. When sheared, the diorite is altered to chlorite and hornblende schists; these cannot be distinguished from the metamorphosed equivalents of the basic lavas except by general field relationships. The diorite in the vicinity of vein zone No. 7 on claim No. 5,020, Kenelda Gold Mines, is considerably sheared in places.

Rhyolite and cherty tuff have failed by both fracturing and shearing. Owing to the hard, brittle nature of these rocks they have often fractured, and the resulting openings have been filled with quartz stringers, which run in many directions through the rock. In a few instances rhyolite has been sheared to sericite schist. This deformation occurs near some mineralized zones and quartz veins.

Vein Structures

As the rocks within the area are fairly massive they have yielded largely to adjustments that followed the regional folding by fracturing along natural lines of weakness, such as the contact zones between the various formations. For this reason the veins and mineralized zones are largely concentrated along or near these contacts. Two distinct types of fracture pattern are to be seen. In some instances a single fracture follows along or near a contact for a considerable distance. For example, the Hill-Sloan-Tivy quartz vein fills a well-defined fracture and has been traced at intervals for almost two miles. It lies at or near the contact between rhyolite and greenstone throughout the entire distance.

A second type of fracturing is more irregular and has produced a wide shattered zone with quartz stringers filling the openings and running in various

directions. The main ore zone at the Uchi mine is of this type and is localized in greenstone adjacent to the contact with a band of diorite. This zone has been traced by drilling for a distance of $1\frac{1}{2}$ miles south from the Uchi shaft and across claims of Woco Gold Developments. About 3,500 feet north of the Uchi shaft along the same contact similar types of gold-bearing fractured zones have been explored. These have been traced out at intervals across claims of Kenelda Gold Mines and Conwo Gold Mines and lie in greenstone or diorite at a short distance from the contact.

ECONOMIC GEOLOGY

Gold is the only metal that occurs throughout the area in deposits of economic importance. It is found in quartz veins and mineralized zones, which lie in greenstone, rhyolite, diorite, and schistose phases of these rocks. The age of the veins, the period of gold deposition, and the source of the gold-bearing solutions cannot be definitely stated. No bodies of acid intrusives outcrop near the various gold showings. Tiny aplite and syenite dikes, however, indicate that unexposed bodies of these rocks occur at no very great distance.

Favourable structural conditions have been the most important factor in the localization of the gold deposits. In the previous section it has been pointed out that the veins are largely confined to the contact zones between the different rock formations. From this fact it might be inferred that the most interesting ground for prospecting lies in those sections of the area where there is a considerable diversity of rock types, thus providing for greater possibilities of fractured conditions along the contacts. This line of reasoning has been more or less verified by prospecting experience to date.

Types of Gold Deposits

Gold is found under somewhat varying conditions at the different showings. For purposes of description, the gold deposits may be classified under four general types. This classification is based primarily on physical and structural features. It may be summarized as follows:—

1. The first type consists of quartz veins and stringers making up an irregular pattern in a fractured zone. Sometimes there is a main quartz leader with many offshoots on either side, making a sort of herring-bone structure. Along the strike this may change into a network of quartz veinlets running more or less transverse to the long axis of the ore zone. The quartz may contain native gold, and the intervening rock masses may be mineralized with sulphides and carbonate and carry gold values. This type of deposit tends to produce good widths of gold-bearing material. It is represented by the main showings on the Uchi and Kenelda properties.
2. The second type is represented by regular fissure veins filled with quartz, tourmaline, and some carbonate. These are characteristically long and relatively narrow veins with sharply defined walls. The quartz occasionally shows native gold and carries all the values that tend to be erratically distributed. The Hill-Sloan-Tivy vein, sometimes referred to as the "Tapeworm" vein, furnishes the best example of this type of deposit.
3. The third type consists of quartz veins and sulphides occupying sheared zones in either greenstone or rhyolite. Part of the main showing at the Raingold mine comes under this classification.
4. The fourth type is represented by mineralized zones and quartz stringers in iron formation.

DESCRIPTION OF PROPERTIES¹

Uchi Gold Mines, Limited

History and Development

Uchi Gold Mines, Limited, holds a group of 29 claims in the vicinity of Uchi lake. The main showing is located on claim No. 5,038 near the north boundary of the property. This was originally the MacAulay property and was staked during the Woman Lake gold rush. It was optioned by the Huronian Belt Company in 1927. In 1928 it was again optioned by the Consolidated Mining and Smelting Company and shaft-sinking, which had been begun by former operators, was completed to a depth of 110 feet. About 300 feet of drifting was done on the 100-foot level before the property was abandoned. It remained idle until the



View of the Uchi mine.

fall of 1936 and was then taken over by J. E. Hammell in association with Val d'Or Mineral Holdings and Harker Gold Mines. A programme of surface sampling and diamond-drilling indicated ore possibilities and Uchi Gold Mines was organized early in 1937 to carry on further development. The No. 1 shaft was deepened and new levels established at 300, 450, and 600 feet. Ore developments on the four levels were sufficiently important to justify the erection of a 500-ton mill, which was ordered in the summer of 1938.

A new 4-compartment shaft, No. 2, located about 800 feet to the south and west of the No. 1 shaft, was sunk, and crosscuts were driven to it on each level.

The following description of the mine is based on the field examination of the surface showing and part of the development on the 100-foot level. Information on deeper developments has been obtained from official statements by the company.

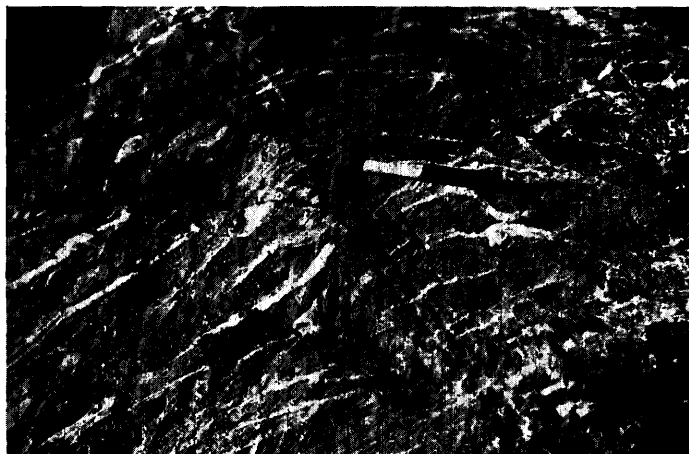
General Geology

In the vicinity of the mine there is an alternating series of interbanded rock formations across the strike. These consist of basic lava flows (greenstones), diorite, and rhyolite; cherty tuff is associated with the rhyolite at some points.

¹In the following descriptions all values stated are based on gold at \$35.00 per ounce.

These bands strike in a north-south direction and dip almost vertically. At some places the diorite is coarse-grained and rather basic. This phase approaches amphibolite in composition. Near the borders of the diorite bands the rock becomes fine grained and is very difficult to distinguish from the greenstone. For this reason it is hard to delineate the contact between these formations on outcrops and in drill cores. Different observers might draw an arbitrary contact at slightly different locations. For reasons previously stated the writer believes that a considerable part of the dioritic rock is merely a coarse-grained phase of lava flows.

Near the mine most of the light-coloured bands of rock could be classified as rhyolite, but at a few places it is finely bedded and has the composition of a cherty tuff. Typical bedded tuff may be seen near the northwest corner of claim



Section of the main ore zone near the shaft, Uchi mine, showing quartz stringers and mineralized rock.

No. 5,038. The greenstone is fairly massive, although it may be locally sheared. Fragmental flow tops are exposed about 900 feet north of the shaft. About 300 feet northeast of the shaft there is a horizon of lava containing vesicles or gas cavities.

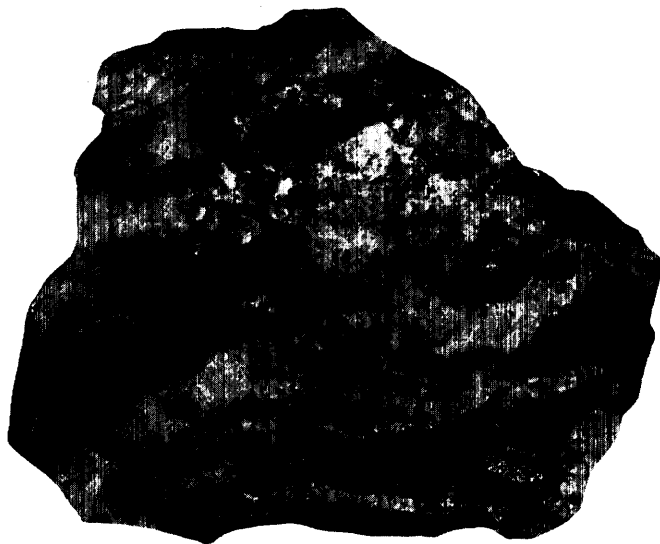
A few acid narrow dikes of aplitic appearance cut across all other rocks and are also later than the vein material along the ore zone.

Veins and Ore Bodies

No. 1 (Main) Zone.—The Uchi ore bodies are composed of a great number of quartz veins and stringers, which run in several directions throughout the enclosing rocks. The main ore zone lies adjacent to the contact between a band of diorite and greenstone. The ore bodies lie mainly in greenstone and to a much lesser extent in rhyolite; they generally pinch out near the diorite contact. The quartz veins have sharply defined walls and occupy a fractured zone or "break," which has been followed for a considerable distance. Drilling operations are reported to have traced this structure and indicated some gold values along it for a distance of 1,800 feet. South of this a similar structure is reported from drilling operations along the same greenstone-diorite contact on Woco claims.

In some parts of the workings there is a main quartz vein, which runs parallel

to the diorite contact for a short distance. Quartz offshoots branch out from the main vein, and the whole body forms a rough herring-bone pattern. The main quartz leader may pinch out and the zone change to a mass of quartz veinlets, which run in all directions but largely transverse to the long axis of the ore shoot. At some places there are two intersecting sets of quartz stringers. Where these are fairly close together they form a sort of vein breccia with angular or diamond-shaped blocks of pyritized wall rock as inclusions in the quartz mass. On the surface and at the 100-foot level one set of quartz-filled fractures strikes in a northeasterly direction and dips steeply northwest. Another set strikes about east-west, or at about right angles to the strike of the main vein leaders. As far as could be determined, all these sets of fractures were filled with quartz at the same time.



Polished specimen (one-half natural size) of ore from the Uchi mine, showing vein breccia with quartz and fragments of wall rock.

The quartz is white and vitreous in appearance. It contains a fair percentage of carbonate but only a small amount of sulphides. The quartz is fractured and contains visible gold in places. The rock between and adjoining the quartz stringers is impregnated with rather fine grained pyrite and is somewhat carbonated and silicified. A thin seam of carbonate is often found along the surface of fragments of country rock in the vein breccia. The pyritized rock is reported to carry gold values.

These structural conditions have favoured wide ore-making possibilities at different places along or near the main workings. As the quartz stringers angle into the walls of the drifts, short crosscuts and detailed lateral drilling from all the levels have been used to explore the different ore zones. Raises have also been driven through between levels to establish continuity of ore. This work has indicated a number of separate ore shoots, the boundaries of which are irregular and will be determined by what is considered as commercial-grade material. These ore shoots, or possible ore shoots, vary from very high to medium and low grade ore over widths that will make mineable bodies of large tonnage.

No. 2 Zone.—This lies about 700 feet northwest of No. 2 shaft. In 1938 it was cut in three shallow drill-holes, and showed some gold values.

No. 3 Zone.—This zone was explored in 1938. It is located about 1,100 feet west of No. 2 shaft on claims Nos. 5,039 and 5,040. It strikes in a north-south direction and has been traced a considerable distance by surface work and shallow drill-holes.

Ore Developments

The following statement of ore developments is taken from a joint report on the property by B. H. Budgeon and A. G. Hattie, dated August 11, 1938:—

Mr. R. H. Sturgess, manager at the property, forwarded a report on July 1, describing the ore bodies and giving his summary of estimated tonnage in sight and also values, which was 500,000 tons of \$10.00 ore or 650,000 tons of \$8.00 to \$9.00 grade. We have gone over this report and the work done by Mr. Sturgess and have thoroughly examined the surface and underground workings and see no reason why his estimates cannot be fulfilled. It is true that a lot of this ore can only be called "in sight" due to the extensive size of the various ore bodies and the limited means at our disposal of fully slashing them off, but from the slashing done and raises completed, we feel that those delineated by diamond-drilling will stand up to expectations.

To confirm our opinion, four large bulk samples for testing purposes were taken at different times. These samples were from 600 pounds to approximately a ton and a half. We have seen the places where the samples were peeled off the walls and backs at fairly regular intervals and taken in proportion as to what we expect the individual ore shoots to give in tonnage and we feel that they are fair, conservative samples. It is quite remarkable that three of these samples, one sent to Ottawa, one to Pickle Crow, and one to Salt Lake City, all ran approximately one-half ounce, while the one sent to Canadian Industries ran \$27.65.

The tests done on these ores, aside from showing that they were amenable to cyanide treatment, also showed there was considerable free gold present. This was unexpected, as in the work done to date, only in one place was free gold found in any quantity.

The structure is exceptionally strong, the ore bodies tending to lie alongside a diorite dike or flow which is practically vertical and extends across the country for several miles. Aside from this, there are five other veins running parallel to this present main show, one of which is definitely over 3,000 feet long, and although it has not been surface channeled, a large bulk sample taken over 600 feet of its length, ran \$27.00. These veins, of course, are not taken into consideration with regard to ore developed, on which we are recommending the building of a 500-ton milling unit.

It seems evident from work done to date, that there is a distinct rake to the south. This would explain why the 450- and 600-foot levels to date do not show as much ore as the 100- and 300-foot levels. We feel confident that further drifting to the south will reveal similar conditions to those now present on the 100- and 300-foot levels. Shallow surface drilling also indicated a similar condition. Diamond-drilling below the 600-foot, to approximately 75-foot depth, has shown good ore in three holes, and recently three diamond-drill holes were sunk to approximately the 950-foot horizon. The most southerly one cut the ore body showing 31 feet of mineralized core, with visible gold present. The first and second holes, drilled north of No. 3, were only of a prospecting nature, but No. 2 hole showed visible gold. This would confirm our contention of a rake to the south. . . .

We have estimated the operating costs to be \$4.00 per ton based on 500 tons per day. These costs include an adequate amount for current development.

Woco Gold Developments, Limited

Woco Gold Developments, Limited, was organized in February, 1937, and during the year developed a large group of claims, which adjoin those of Uchi Gold Mines on the north and south. Later, two subsidiary companies, known as Conwo Gold Mines and Kenelda Gold Mines were formed to further develop certain of these gold discoveries. In March, 1938, Woco Gold Developments owned 133 claims apart from its interest in the subsidiary companies. These holdings are in two groups, the largest of which lies south and west of the claims of Uchi Gold Mines (see Fig. 2). The geology of the northern part of the southern group is indicated on the accompanying map.

The interbedded greenstones, rhyolites, and diorites, which strike in a north-south direction across the Uchi claims, have been traced southward across the northern claims of the southern group of Woco Gold Developments. During 1937, a vein zone was traced by drilling south from the Uchi boundary across

claims Nos. 15,136 and 15,137. It was intersected in 9 holes over a length of about 2,800 feet and consisted of quartz stringers and disseminated sulphides containing a little gold. In some places a broad zone of shearing and mineralization was cut. This zone is considered to be the southern extension of the main "break" of Uchi Gold Mines.

Some rusty sheared zones with quartz occur along the shore of the southern expanse of Uchi lake. Most of these lie in rhyolite. Some assessment work was done on these zones in 1937.



Hill-Sloan-Tivy vein, Conwo Gold Mines.

Conwo Gold Mines, Limited

History and Development

Conwo Gold Mines, Limited, was organized in November, 1937, and is a subsidiary of Woco Gold Developments. The company owns a group of 22 claims lying north of the Kenelda property and adjoining Lost bay of Confederation lake. Some work was done on these claims by Noah Timmins, Incorporated, in 1927, and afterwards by the Consolidated Mining and Smelting Company. The main discovery at that time was a long narrow vein, the Hill-Sloan-Tivy. A considerable section of this vein lies on Conwo claims. Some development work was done on this group in 1937 by Woco Gold Developments, and new gold discoveries were made.

General Geology

The rocks on the Conwo claims are the northern extension of the same inter-banded diorites, rhyolites, and greenstones that occur on Kenelda, Uchi, and Woco ground to the south. The Conwo claims were burnt over a number of years

ago, and bare rock is now exposed on much of the ground. Most of the light-coloured rocks on these claims are well-bedded cherty tuffs. The greenstones are fairly massive. Along the Hill-Sloan-Tivy vein, fragmental flow tops and pillow structures may be seen. The vein is cut by a few narrow lamprophyre dikes.

Veins

Hill-Sloan-Tivy.—The Hill-Sloan-Tivy vein is remarkably continuous and has been examined at intervals across the entire width of the property. It lies at or near the contact of a narrow band of rhyolite and greenstone. On Conwo ground the vein dips at about 70° to 75° W. It has sharply defined walls and generally occupies a single fissure. The quartz is somewhat banded and in places has a sort of crumpled structure (see photograph on page 78). The width of the quartz is quite uniform along the outcrop and varies from around 20 inches to 3 feet. The vein-filling is white quartz with a little tourmaline and carbonate; sulphides are very scarce. The vein contains visible gold at some points.

Surface sampling and drilling have indicated that gold values are somewhat spotty and are distributed on certain sections along the vein. The following statement of values is taken from the records of Woco Gold Developments and based on sampling by the Consolidated Mining and Smelting Company. The sections are contiguous and extend southward from the northern boundary line of the property.

| Length of section | Width | Grade |
|-------------------|----------|-------------|
| feet | feet | |
| 120.... | 2.3..... | \$17.20 |
| 400.... | | low |
| 47.... | 1.8..... | 19.25 |
| 100.... | | low |
| 140.... | 1.9..... | 8.90 |
| 136.... | 2.6..... | 12.75 |
| 250.... | | low |
| 20.... | 1.6..... | 19.00 |
| 40.... | | low |
| 50.... | 1.7..... | 18.00 |
| 800.... | | low |
| 670.... | | not sampled |
| 60.... | 2.5..... | 14.85 |
| 80.... | | not sampled |

Zone No. 14.—Vein zone No. 14 lies in greenstone on claim No. 12,486 near the south boundary of the property. It was discovered in 1937 by Woco Gold Developments after the writer's visit to the property. Shallow drilling is reported by company officials to have indicated a length of 320 feet on this vein, averaging \$9.30 over 4.3 feet.

Claim No. 12,487.—A series of discontinuous lenticular quartz veins with a sort of *en échelon* arrangement runs at about N. 15° W. for 1,100 feet across claim No. 12,487. They vary from a few inches to about 5 feet in width. Most of the veins dip to the west at an angle of about 45 degrees. Quartz stringers sometimes angle off the main part of the vein into the rock on the footwall. The vein quartz is white but is banded with tourmaline in places. Sulphides are very scarce in the quartz. The veins lie almost entirely in massive greenstone. Some gold values are reported from the northern part of this vein.

In 1938 some coarse gold was obtained from a small quartz stringer (zone No. 16) on this claim.

Kenelda Gold Mines, Limited

Kenelda Gold Mines, Limited, was organized early in 1938 as a subsidiary of Woco Gold Developments. It owns 20 claims, which are arranged in two groups. The larger group lies north of the claims of Uchi Gold Mines (see Fig. 2). These claims were developed in 1937 by Woco Gold Developments. Surface work and drilling was done around the main showings.

The rocks on the eastern group consist of interbedded greenstone, diorite, and rhyolite. These bands trend in a north-south direction. A few small dikes of syenite and basic intrusives, possibly lamprophyre in composition, have been uncovered.

Veins and Mineralization

Several veins and mineralized zones have been located on the group. The most important developments to date are on claims Nos. 5,020 and 4,567. Here, a number of different zones have been investigated.

Zone No. 7.—Zone No. 7 consists of quartz stringers and sulphide mineralization in schisted diorite. The zone lies near the contact with a band of greenstone and is about 3,500 feet north of the Uchi vein along the same greenstone-diorite contact. Owing to the schisted nature of the diorite it is difficult to delineate the greenstone-diorite contact in this vicinity.

The mineralized zone has been explored by surface trenching, closely spaced, shallow, X-ray drill-holes, and deeper holes at 50-foot intervals. This work indicated gold values over a length of about 420 feet and widths of 1 to 8 feet. The vein splits in the middle zone, and the branched portion, which is 1 to 6 feet wide, showed values over a length of 85 feet. The gold-bearing material consists of altered diorite, slightly silicified and carbonated, with disseminated pyrite and irregular quartz stringers.

In March, 1938, the company reported that the shallow drilling at this location indicated a section 240 feet in length, which averaged \$11.26 over a width of 5 feet. A second section along the strike showed a length of 150 feet, which averaged \$11.70 over 3 feet. Deeper drilling under these showings did not find results comparable to those of the shallower operations.

Zones Nos. 12 and 15.—About 1,600 feet north of No. 7 zone and near the same diorite-greenstone contact, another vein zone (No. 12) with quartz stringers was traced 360 feet and showed some gold in two drill-holes. One hundred and fifty feet north of this a series of quartz stringers (zone No. 15) carries coarse visible gold.

Vein No. 9.—Vein No. 9 lies near the northwest corner of claim No. 4,567. A well-defined quartz vein lies along a single fracture in diorite and rhyolite. The vein dips to the west at about 70 degrees. This vein had been trenched and examined by previous operators. To the north the vein ends near a small body of syenite. About 30 feet north of this a small quartz vein, 6 to 7 inches wide, contains visible gold.

Vein on Claims Nos. 5,018 and 5,021.—The vein lying at or near the contact of rhyolite and greenstone on claims Nos. 5,018 and 5,021 is very probably a southern continuation of the Hill-Sloan-Tivy vein. Just west of the vein there is a brecciated zone with rhyolite fragments in a greenstone matrix. The vein material is similar to that in the section that lies on Conwo ground. The quartz is from 20 inches to 5 feet in width. The vein was examined by Noah Timmins, Incorporated, in 1927.

Raingold Mines, Limited

Raingold Mines, Limited, was organized in 1937 to develop a group of 6 claims, which adjoin the property of Uchi Gold Mines on the west. Jos. McDonough and the Jomac Gold Syndicate have a substantial interest in the company. A gold-bearing zone had been opened up by surface work during the earlier period of mining activity in the area. Some surface trenching and drilling was done in 1937.

The claims are underlain by interbanded rhyolite, greenstone, and a small amount of diorite. These formations run in a north-south direction.

The main showing trends about north-south across parts of claims Nos. 10,883 and 10,884. Vein material occurs in a number of test pits over a distance of about 1,100 feet. At the north end it dips under swamp, but quartz outcrops again about 400 feet north along or near the projected strike of the vein. It lies in greenstone near the contact with a band of rhyolite. Quartz stringers and sulphides occur in a wide sheared zone at some places. At the north end the sheared zone is 5 to 9 feet wide and dips about 85° E. Some parts of the schist are heavily mineralized with pyrite and silicified to some extent. Quartz stringers run parallel to and across the shearing. The quartz is white and contains tourmaline and carbonate.

In November, 1937, the company reported that surface sampling indicated a 400-foot section near the north end of the vein that averaged \$9.05 across 7 feet. Gold values were obtained over a length of 900 feet, which was reported to average around \$6.50 across between 7 and 8 feet.

Berrigan Claims

In 1937, S. Berrigan held a group of 8 claims located south of Lost bay of Confederation lake. The probable continuation of the Hill-Sloan-Tivy vein runs across claims Nos. 12,047 and 12,048. This vein was examined on the surface in 1935 by McIntyre-Porcupine Mines. The geology of part of the three eastern claims in the group is shown on the accompanying map.

In the vicinity of the main showing the rocks consist of interbanded rhyolite and greenstone. The vein lies in both of these formations. It follows a well-defined fracture, which runs about N. 63° E. The dip ranges from 45° to 70° N.W. The width of vein quartz varies from 6 inches to about 8 feet. The vein filling consists of white quartz, banded in places with tourmaline. The quartz contains some carbonate and traces of pyrite, chalcopyrite, and galena; visible gold also occurs at a few places. A fine-grained, narrow acid dike cuts across the quartz vein.

Surface sampling of the part of the vein near the lake shore by McIntyre-Porcupine Mines showed the presence of small amounts of gold over a length of 180 feet. A few of the samples indicated moderate values across a width of 3 to 5 feet.

Grasett Claims

J. E. Grasett and associates own a group of three claims, Nos. 4,505, 4,506, and 4,568, located near the northern extremity of the map-sheet. The interbanded rhyolite, greenstone, and diorite extends northward from the property of Conwo Gold Mines into these claims.

The Hill-Sloan-Tivy vein is exposed on claim No. 4,505. A number of years ago the Consolidated Mining and Smelting Company did some underground exploration on this vein. A shaft was sunk, and a limited amount of drifting was done on the 250-foot level.

Tremblay Claims

J. A. Tremblay and associates own a group of 5 claims, Nos. 5,032 to 5,036, 4 of which are located immediately north of the property of Uchi Gold Mines. These were formerly held by Earngey Gold Mines, Limited, but this company surrendered its charter in January, 1938. The claims were optioned by Newmont Mining Corporation in 1937, and a number of drill-holes were put down along the projected strike of the Uchi vein zone. The option was later dropped.

Interbanded greenstones, diorites, and rhyolites run in a north-south direction across the claims.

Milberry Claims

A group of 6 claims lying immediately south of Raingold mines are held by B. Milberry (see Fig. 2). During the summer of 1937 these were optioned by Woco Gold Developments and developed by surface trenching and diamond-drilling.

The rocks on the property consist of interbanded rhyolite, greenstone, and diorite. A few narrow acid dikes cut the older rocks. A vein was traced by drilling for a distance of 750 feet across part of claim No. 12,095. Gold-bearing vein material was intersected in four shallow drill-holes. Core sections in the different holes are reported to contain values of \$1.05 over 2 feet, \$8.40 over 2 feet, \$4.90 over one foot, and \$7.10 over 3 feet.

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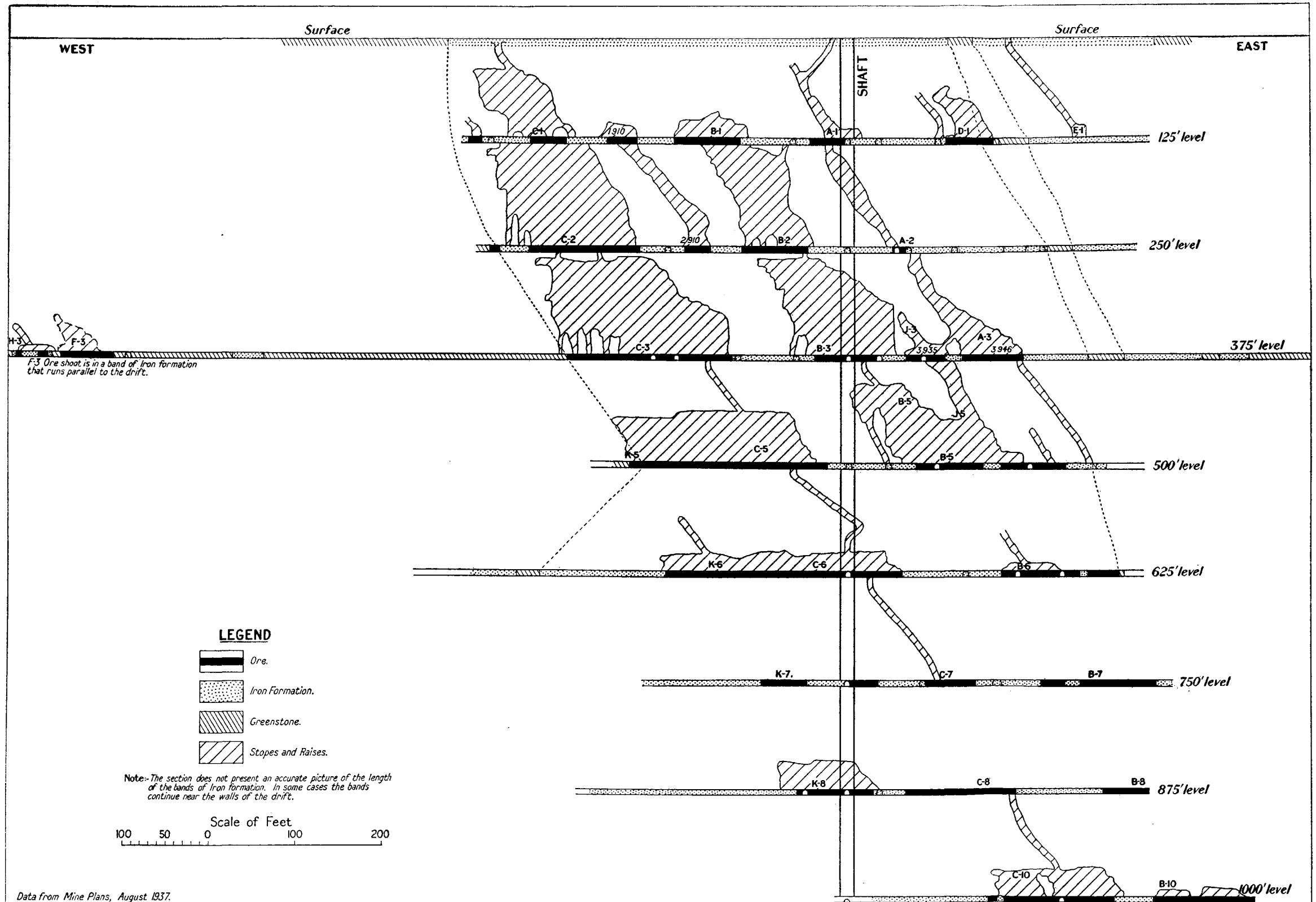


FIG. 7—LONGITUDINAL SECTION THROUGH THE ORE BODIES, PROJECTED ON A VERTICAL PLANE, CENTRAL PATRICIA MINE.

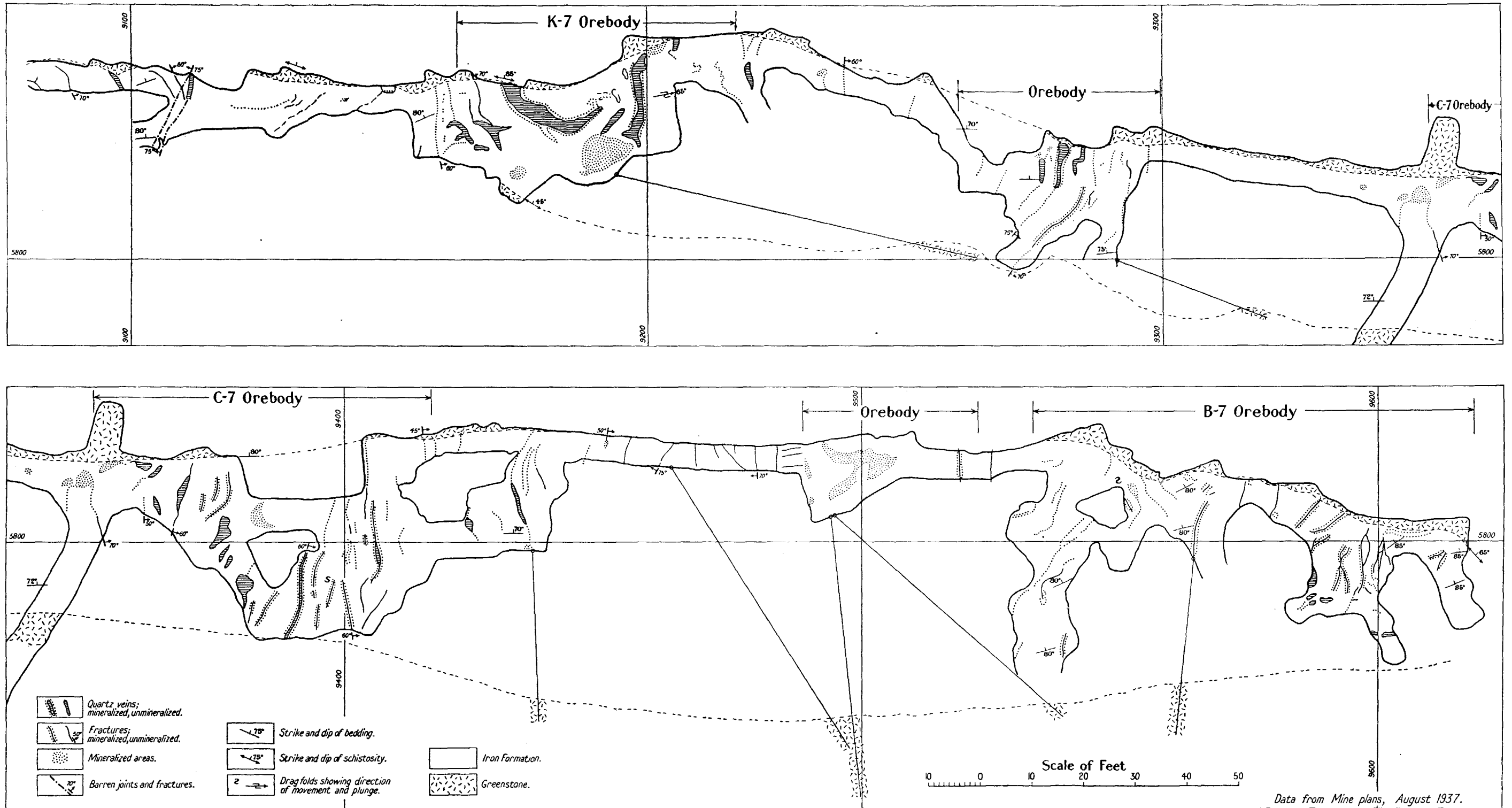


FIG. 8—GEOLOGICAL PLAN OF THE 750-FOOT LEVEL, CENTRAL PATRICIA MINE.

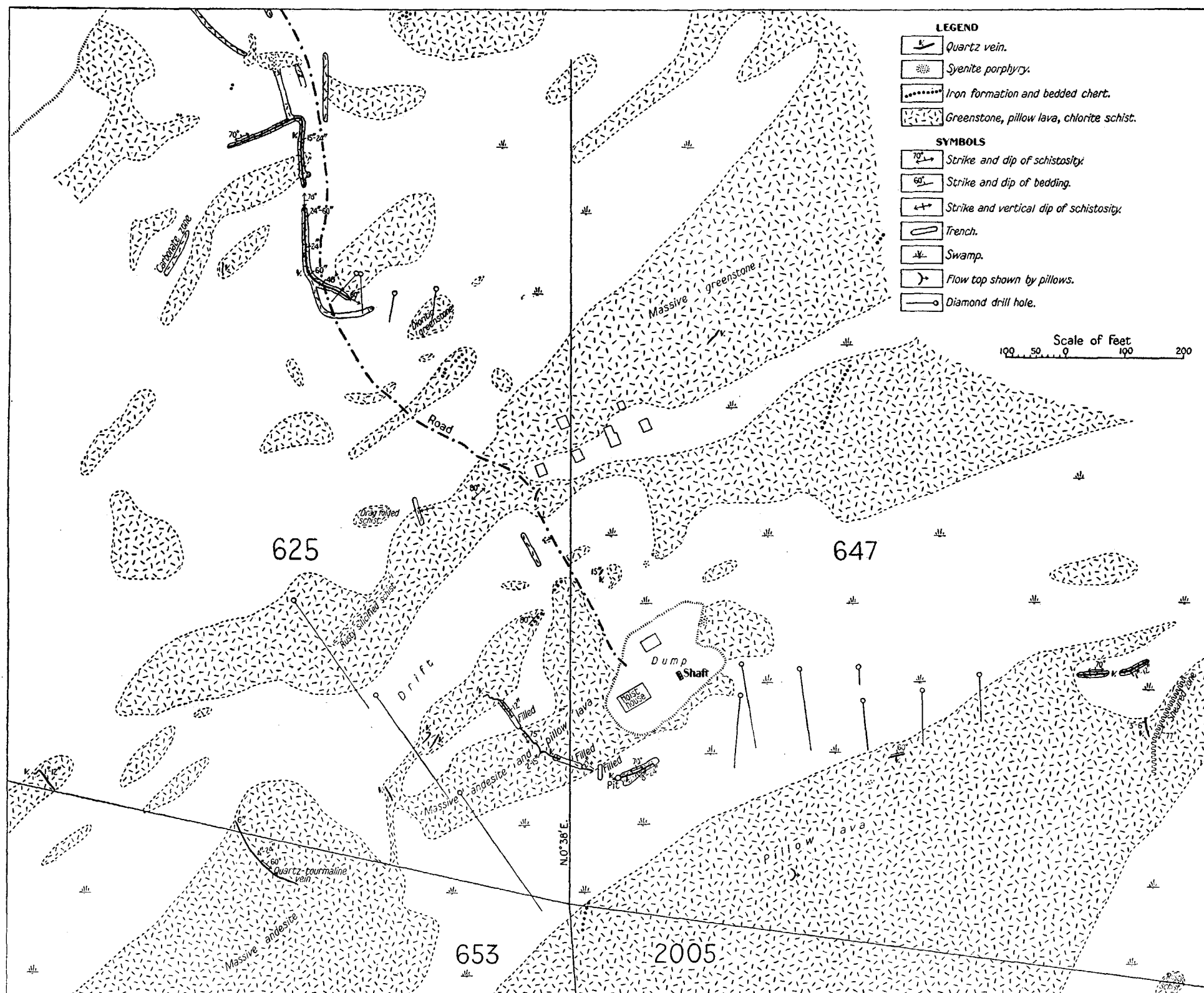


FIG. 9—GEOLOGICAL SKETCH MAP OF THE MAIN SHOWING AT THE NO. 2 OPERATION OF CENTRAL PATRICIA GOLD MINES.

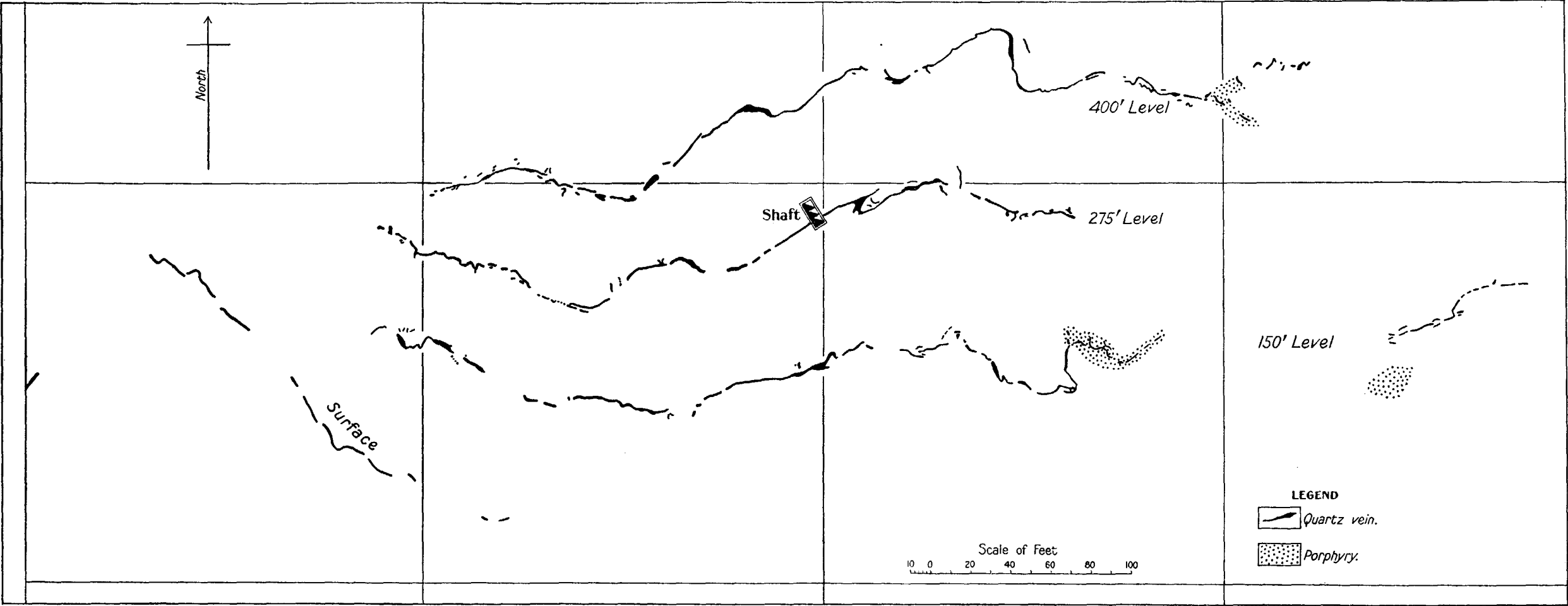


FIG. 11—COMPOSITE PLAN OF VEIN, NO. 2 OPERATION, CENTRAL PATRICIA GOLD MINES.
(Information from mine plans, September, 1937.)

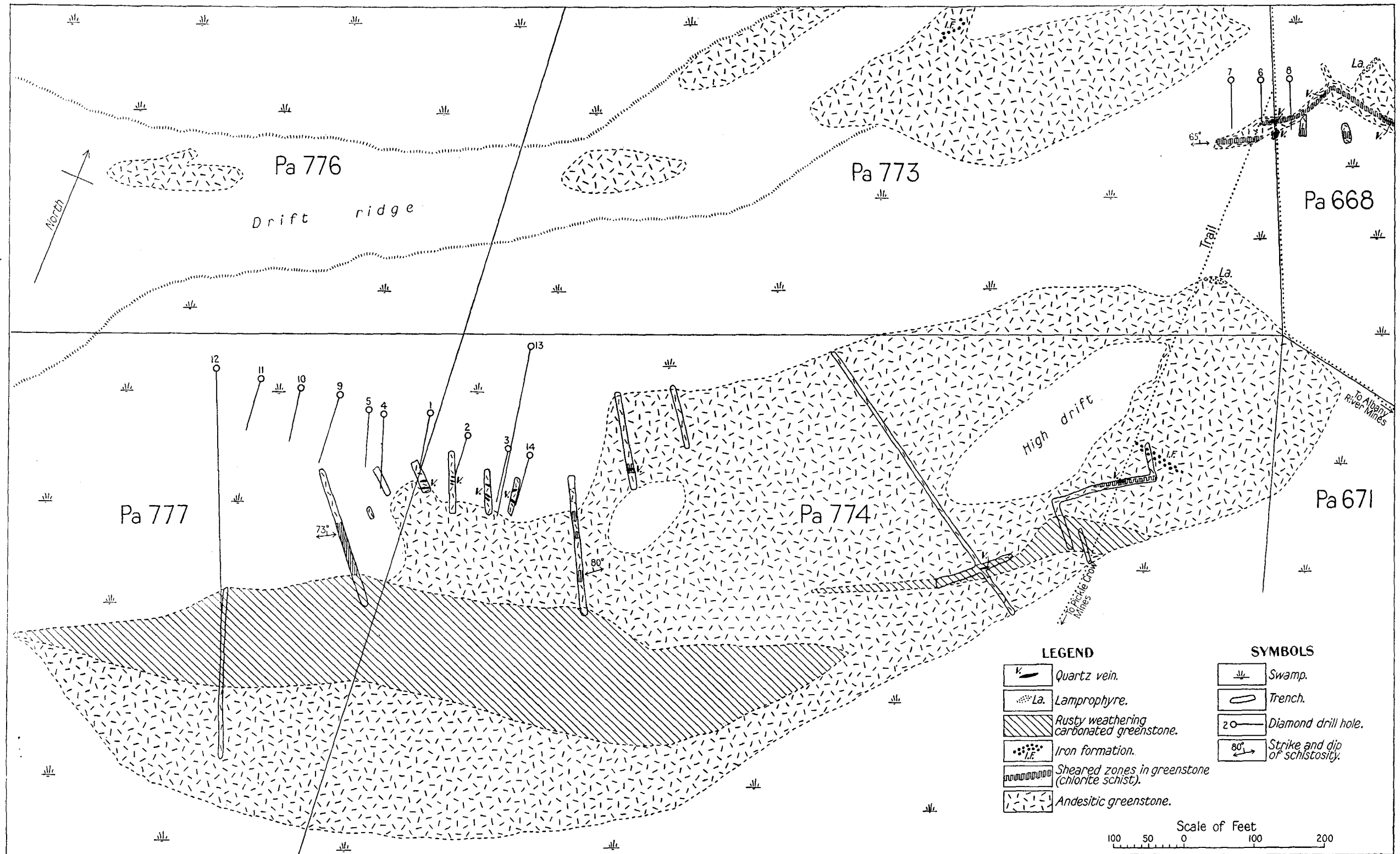


FIG. 12—GEOLOGICAL SKETCH MAP OF THE SHOWING ON THE COHEN-MACARTHUR CLAIMS.

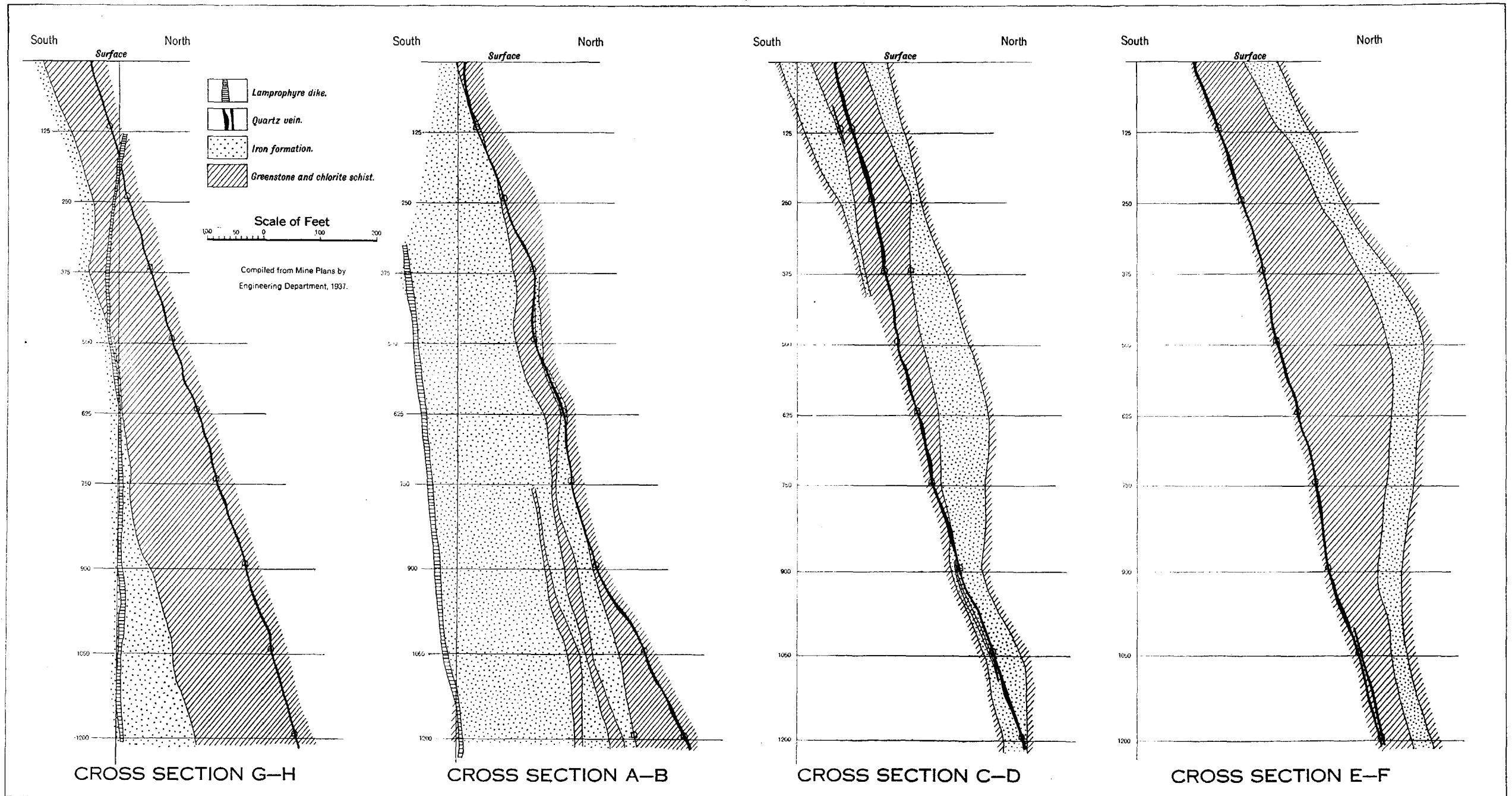


FIG. 15—CROSS-SECTIONS THROUGH THE VEIN, PICKLE CROW MINE.
Locations of cross-section lines are shown on Fig. 14.

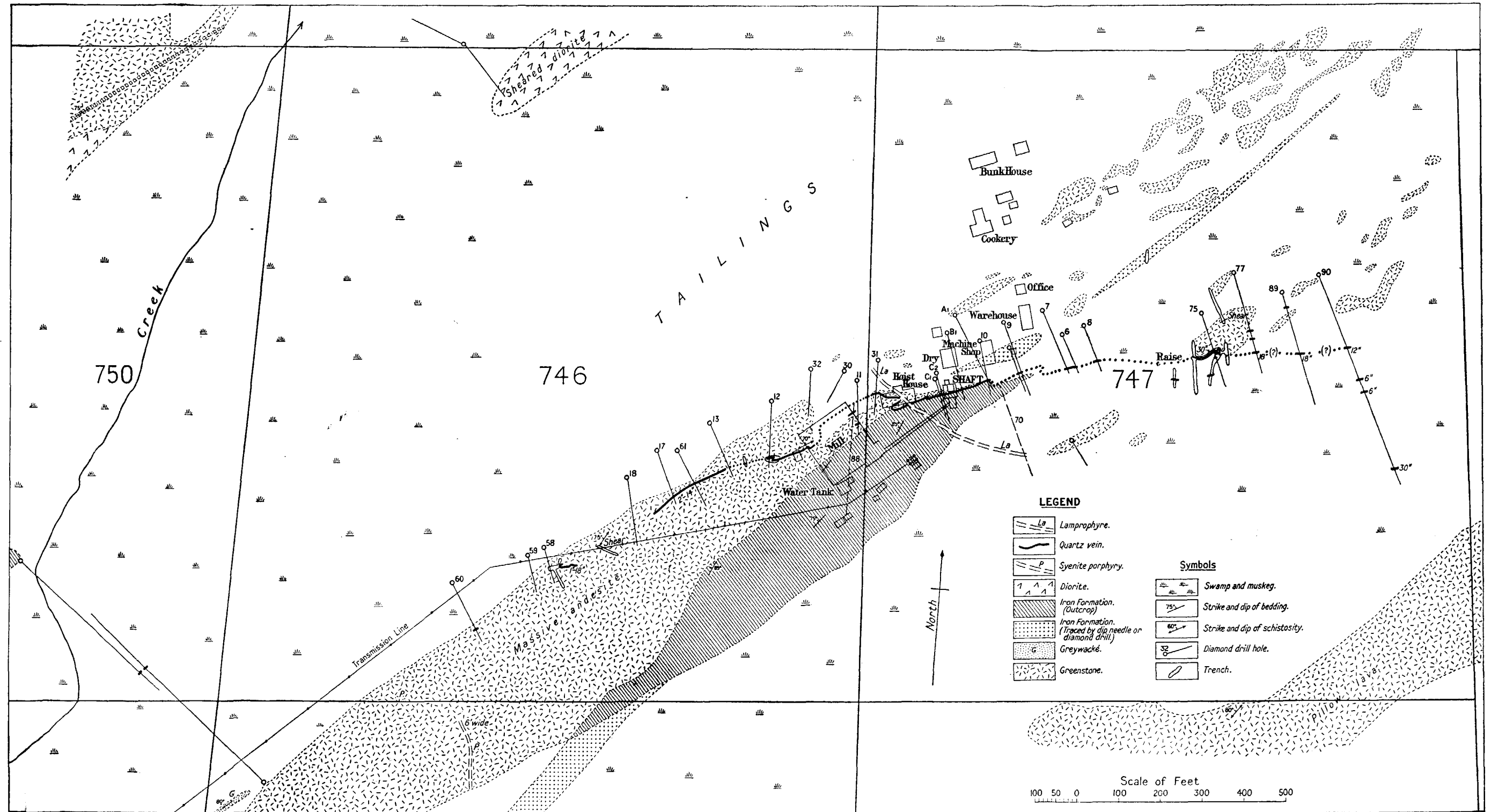


FIG. 13—GEOLOGICAL SKETCH MAP OF THE MAIN SHOWING AT THE PICKLE CROW MINE.

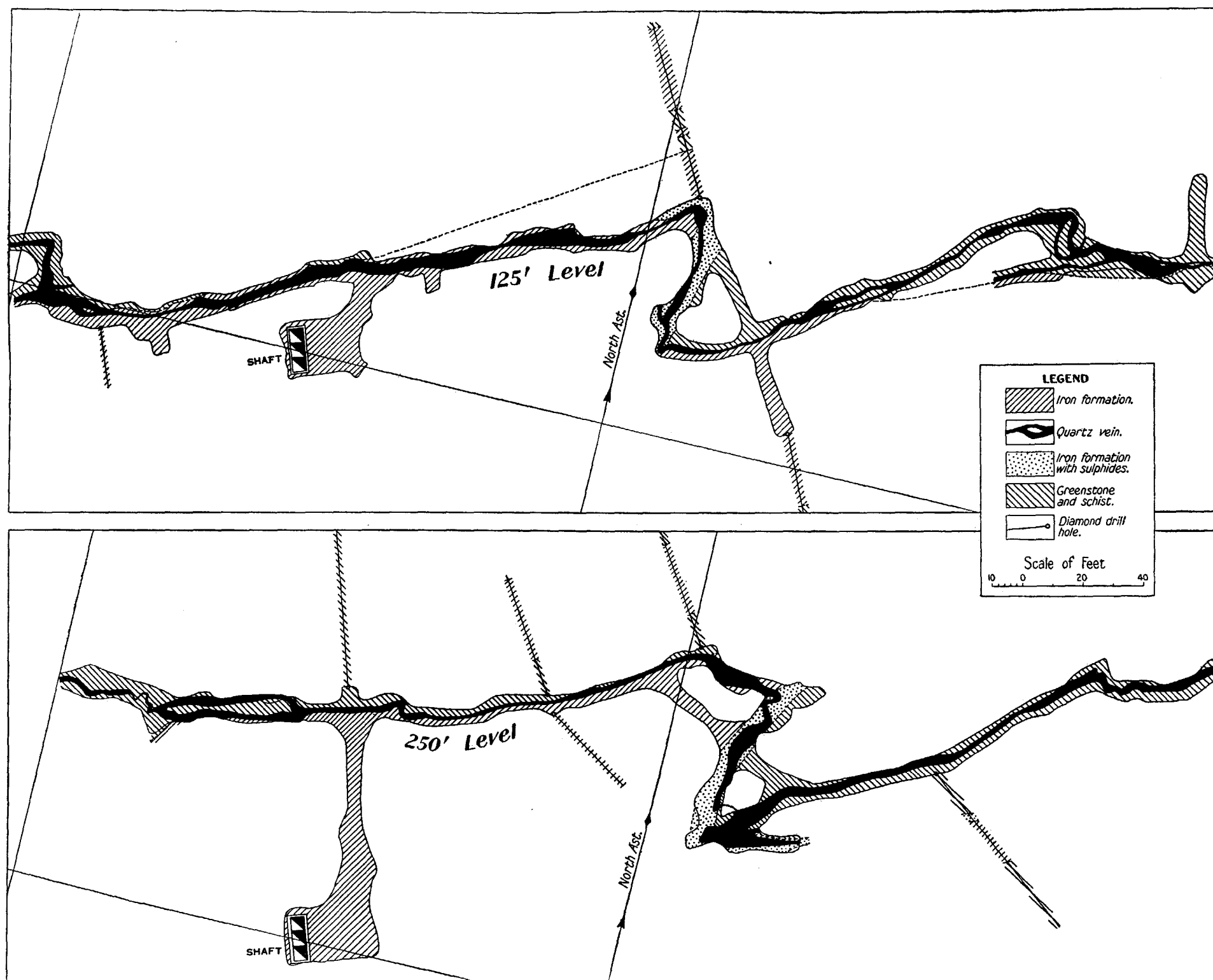


FIG. 16—GEOLOGICAL PLANS OF THE 125-FOOT AND 250-FOOT LEVELS, EAST SIDE, PICKLE CROW MINE.
(After mine plans.)

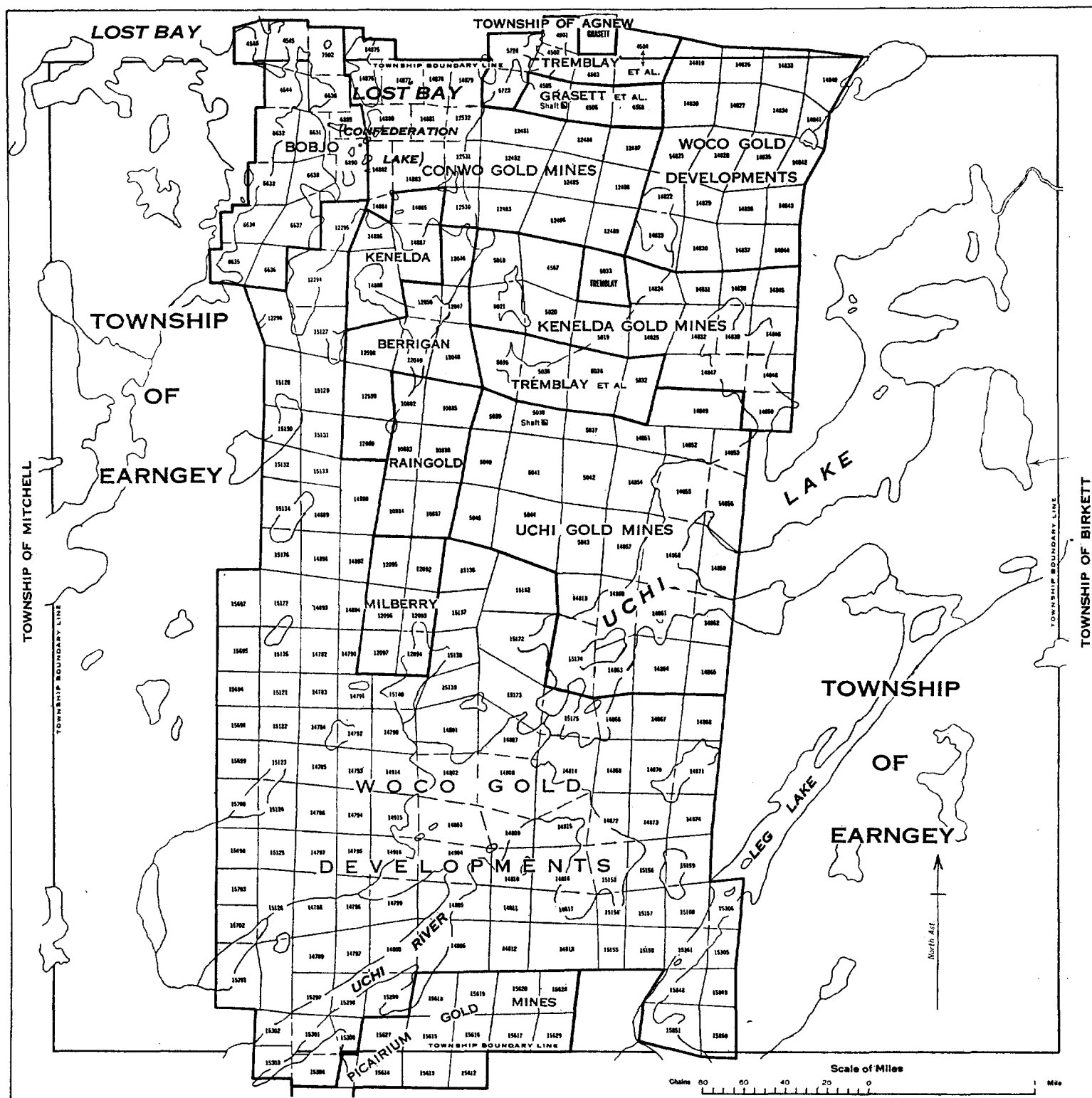


FIG. 2—SKETCH MAP SHOWING OUTLINES OF PROPERTIES, UCHI LAKE AREA, MARCH, 1938.
(Information largely from plan furnished by Woco Gold Developments.)

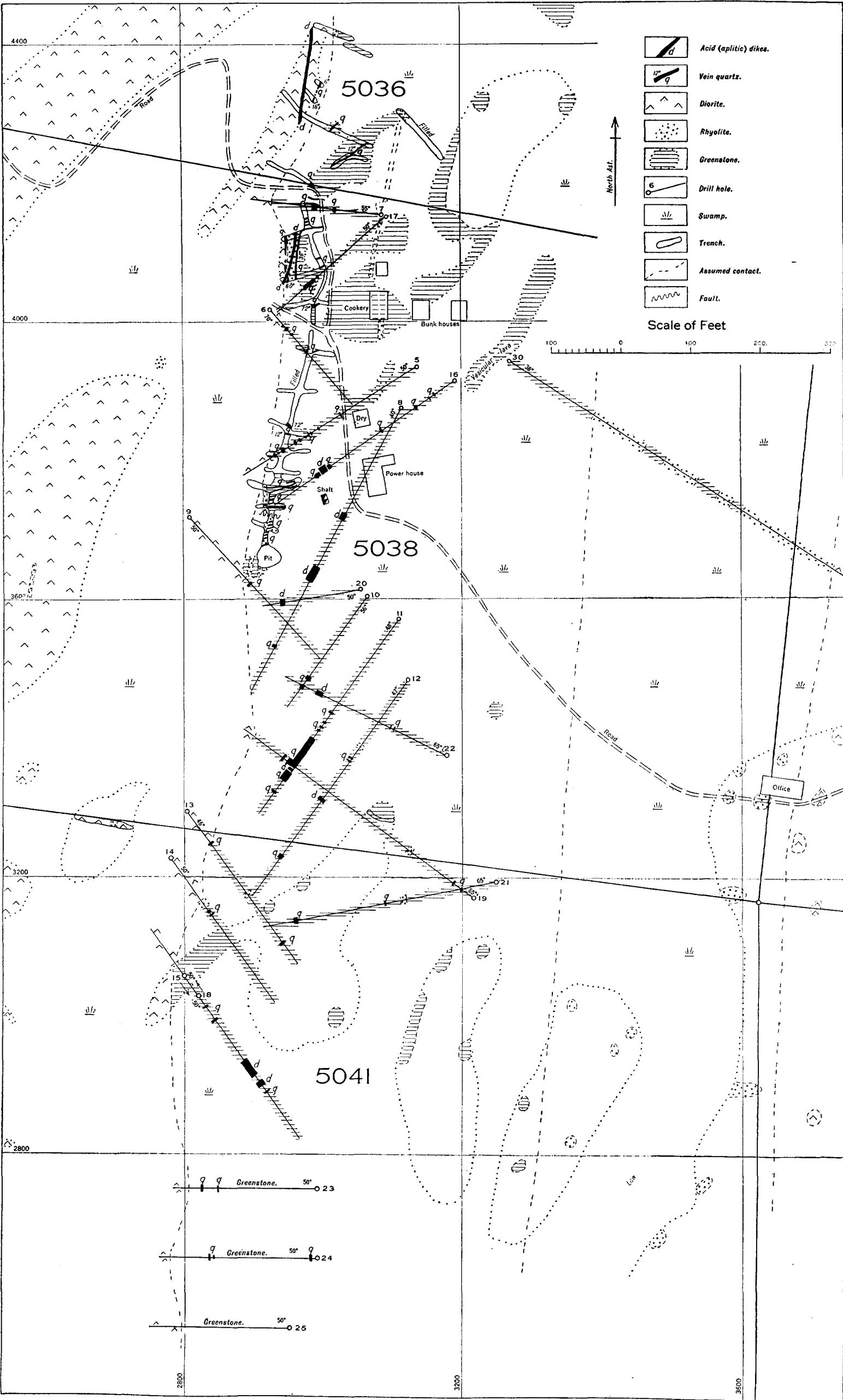


FIG. 3—GEOLOGICAL SKETCH MAP OF THE MAIN SHOWING, UCHI GOLD MINES, LIMITED.

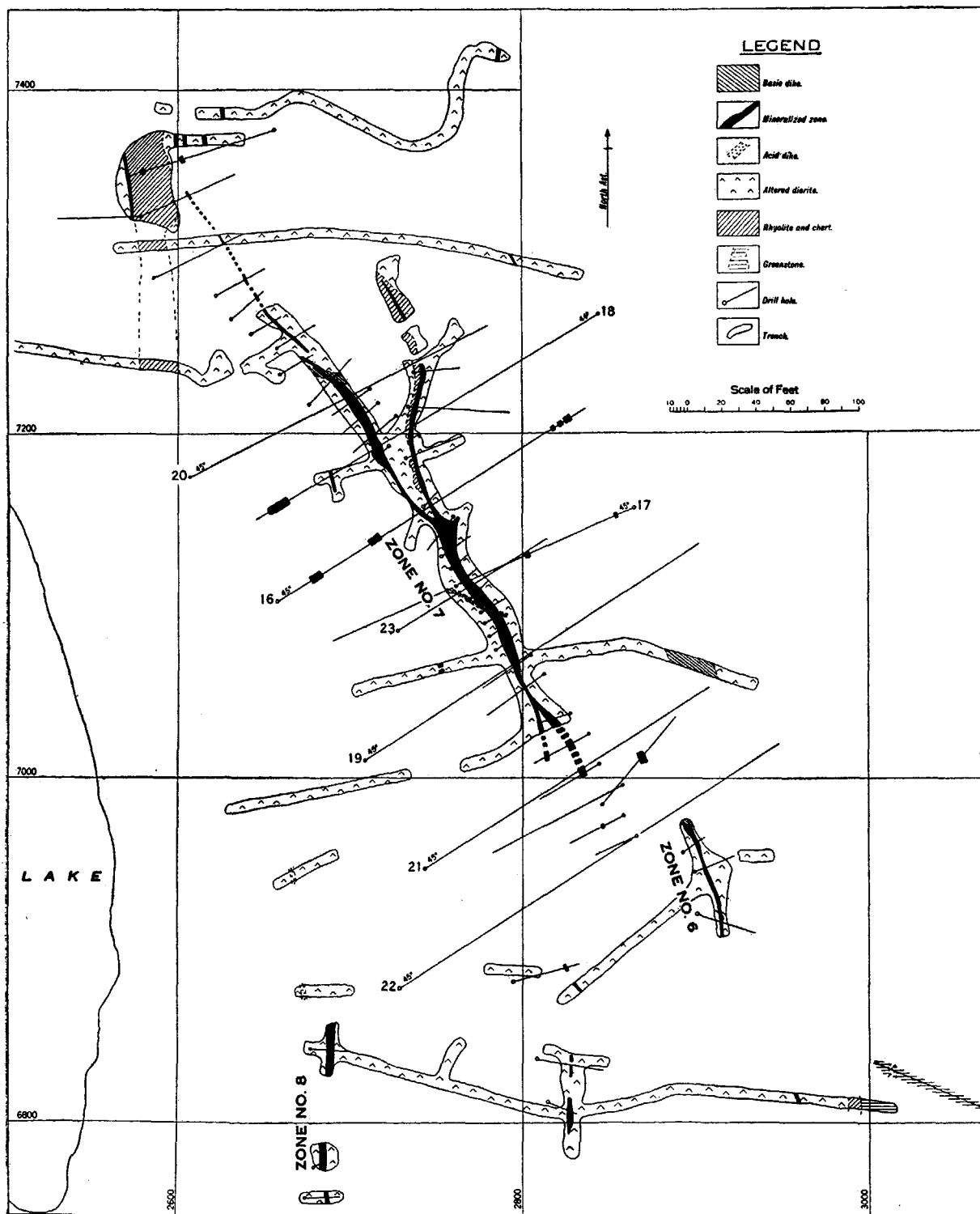
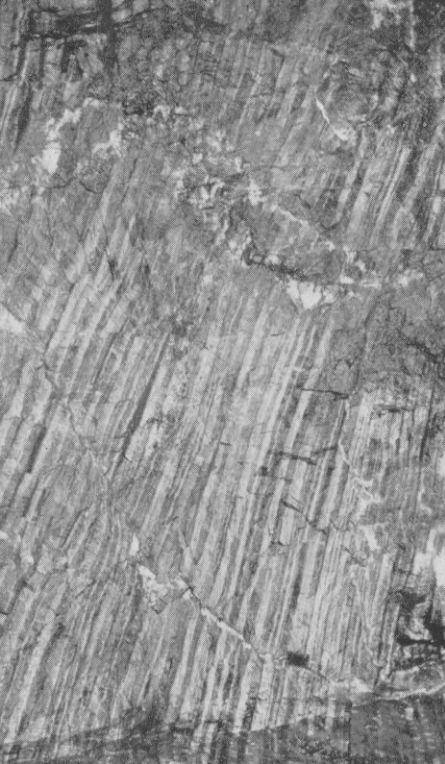
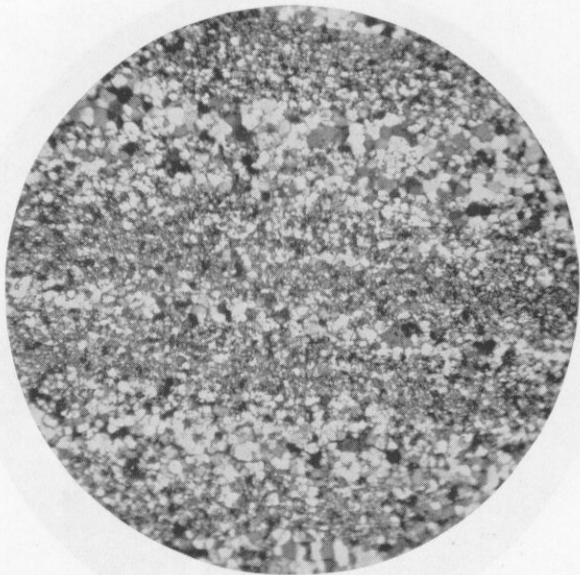
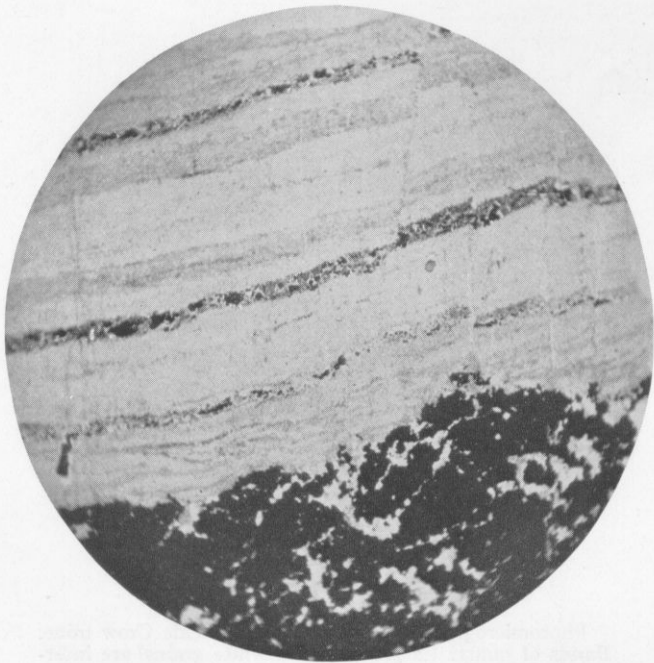


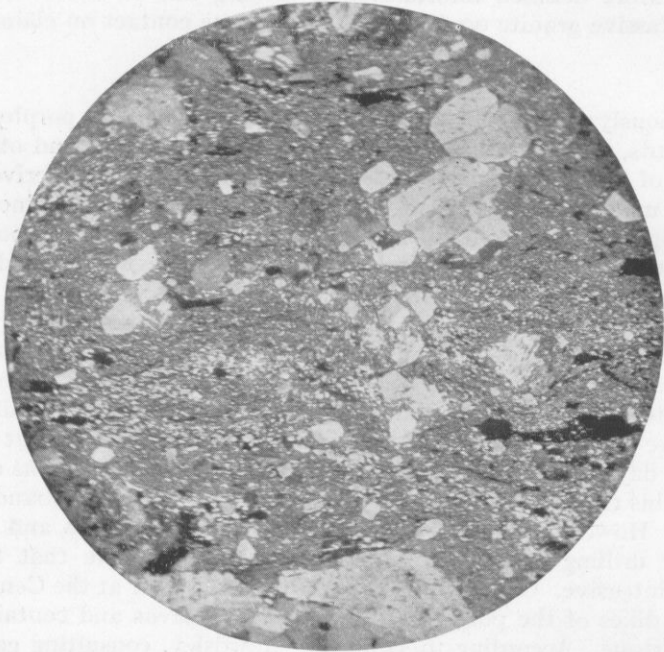
FIG. 4—GEOLOGICAL SKETCH MAP OF NO. 7 ZONE, KENELDA GOLD MINES.
(After G. W. Moore, September, 1937.)











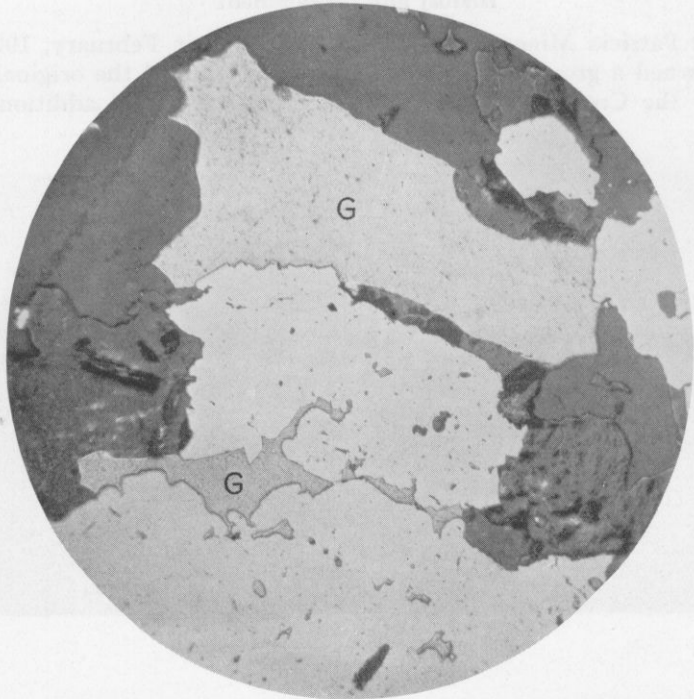




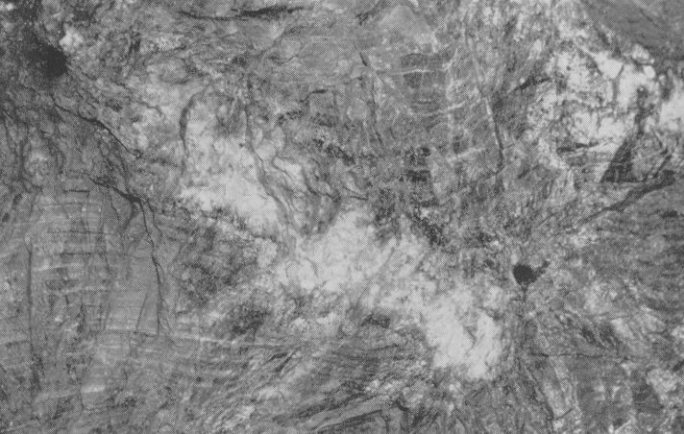




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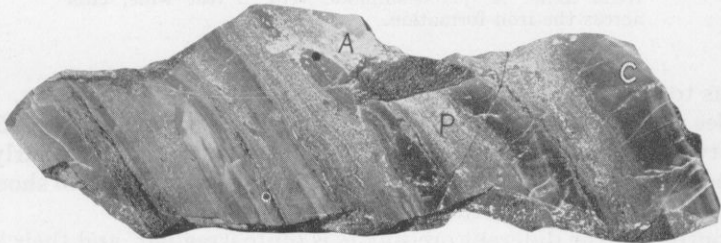


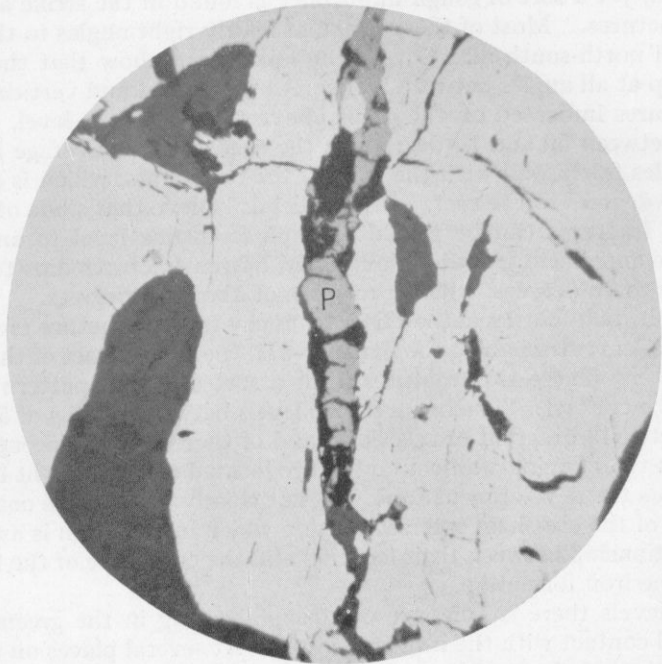


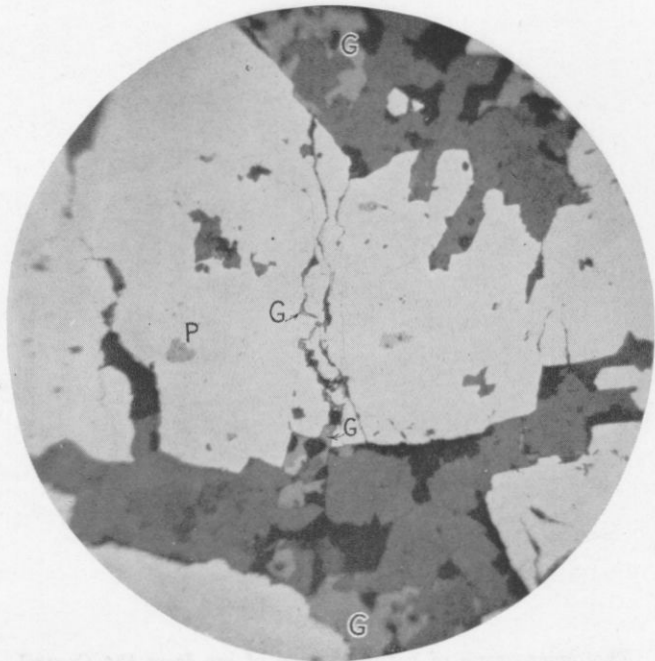
















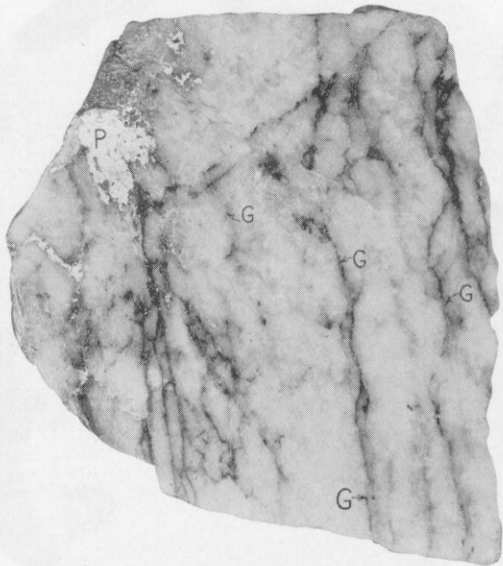


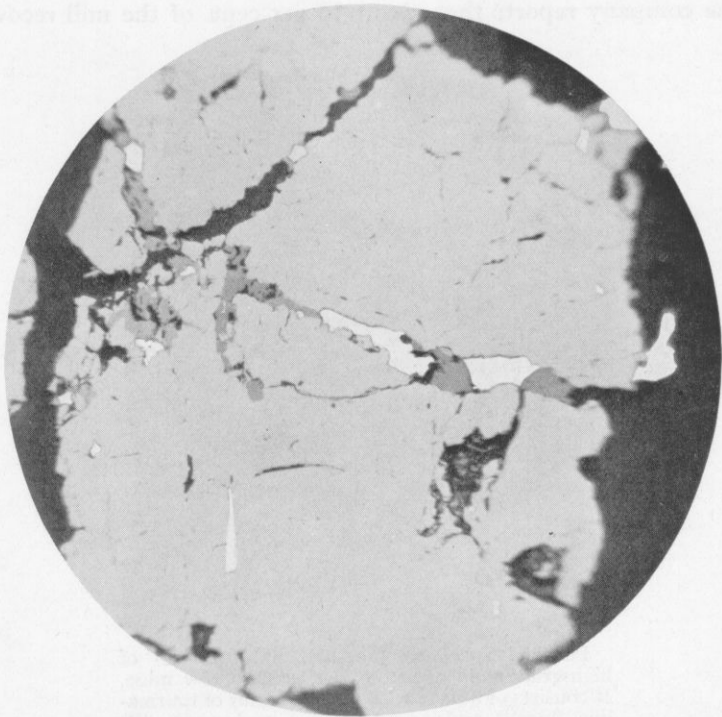


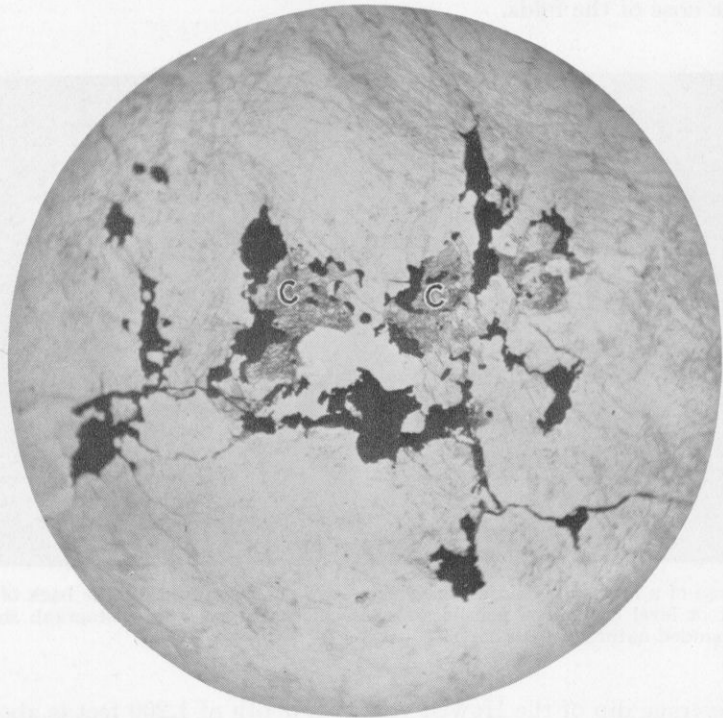














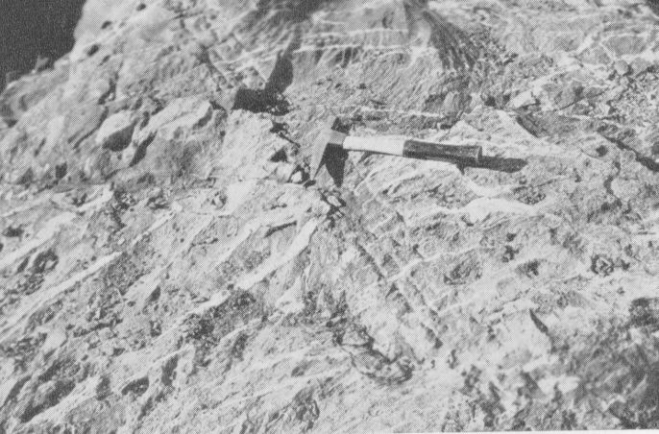


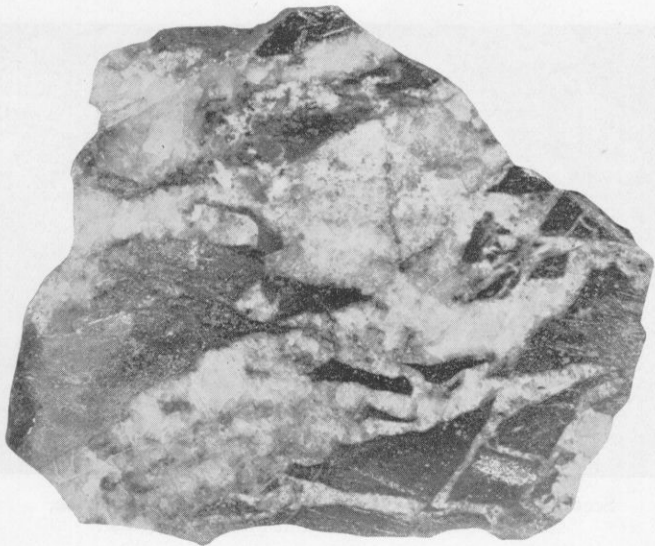




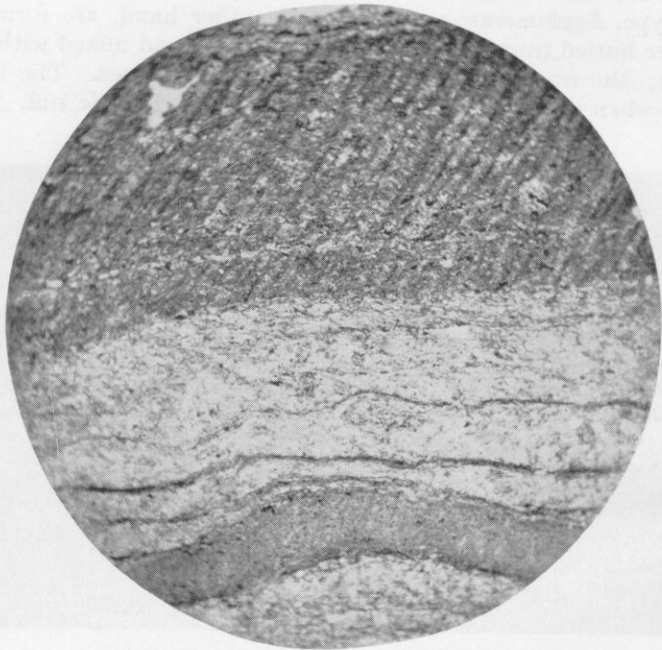














PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. PAUL LEDUC, *Minister of Mines*

H. C. RICKABY, *Deputy Minister*

FORTY-SEVENTH ANNUAL REPORT
OF THE
ONTARIO DEPARTMENT OF MINES
BEING

VOL. XLVII, PART IV, 1938

Geology of the Keefer-Eldorado Area

By

W. D. HARDING and L. G. BERRY

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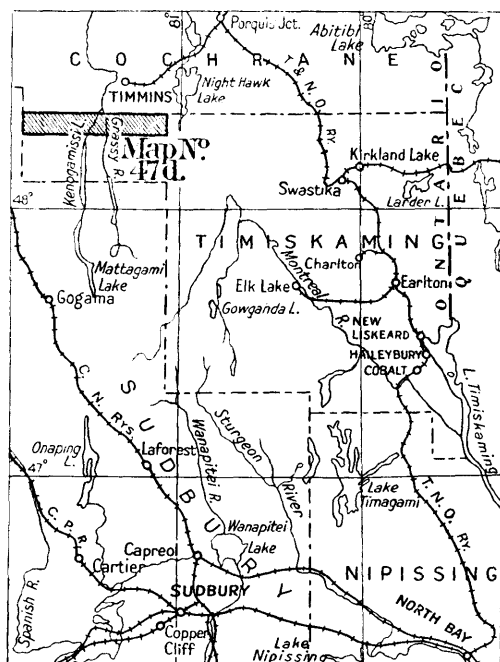
Map No. 47d—Keefee-Eldorado Area, District of Timiskaming, Ontario. Scale, 1 mile to the inch.

Geology of the Keefer-Eldorado Area

By W. D. Harding and L. G. Berry

INTRODUCTION

In 1936, W. Jewitt, assisted by L. G. Berry, began a geological survey of Keefer and Denton townships, district of Timiskaming. This work was completed in the following year by L. G. Berry. During the summer of 1937, W. D. Harding made a geological examination of the townships of Thorneloe, Price, Adams, and Eldorado, which lie to the east of Keefer and Denton townships. The results of all the above-mentioned work are embodied in this report and the accompanying geological map.



Key map showing the location of the Keefer-Eldorado area. Scale, 50 miles to the inch.

Acknowledgments

In addition to the numerous favours received from the prospectors in Keefer and Denton townships during the summer of 1936, Mr. Jewitt's party was accorded the privilege of occupying cabins belonging to Jowsey Denton Gold Mines, Limited, and the Porcupine Quartet Gold Syndicate.

In 1937, W. D. Harding was assisted by L. G. Berry, E. Owen, and D. P. Robertson, all of whom rendered excellent service. Mr. Berry capably performed the duties of senior assistant and was responsible for part of the geological mapping of Thorneloe, Price, Adams, and Eldorado townships.

It is a pleasure to acknowledge the numerous courtesies received from the officials of the Northern Canada Power Company, Limited, and particularly

those received from Mr. Scott Elliot, superintendent for that company at Wawaitin Falls in Thorneloe township. Valuable information and assistance were received from Chief Ranger Tom McCoshen, of the Ontario Forestry Branch, Timmins; Fred Croteau, prospector, of South Porcupine; and other sources too numerous to mention.

Access

All the townships covered by this report, except Keefer, are accessible by wagon road from Timmins or South Porcupine, and all contain waterways navigable by canoe.

Keefer and Denton Townships

Prospectors wishing to travel to Keefer or Denton townships by canoe should go by boat from Timmins to Wawaitin Falls. From Kenogamissi lake, situated south of Wawaitin Falls, a 90-chain portage leads west to the Tatachikapika



Rapids at Wawaitin falls on the Mattagami river north of the dam, Thorneloe township.

(Redsucker) river. Most of the larger lakes in Keefer and Denton townships are accessible by means of Cripple creek, a tributary of the Tatachikapika. Both the Tatachikapika river and Cripple creek contain numerous shallows and are difficult to navigate in low water.

A good wagon road from Timmins, a branch of the Whitesides road (which runs from Timmins through Mountjoy, Ogden, Bristol, and Carscallen townships to Whitesides township), follows the Tatachikapika river in Denton township. Godon lake in Denton township may be reached by trail from this road.

Many of the numerous lakes in Keefer and Denton townships may be reached by airplane.

Thorneloe Township

The best water route to Thorneloe township is via the Mattagami river from Timmins. In summer a daily boat service operates between Timmins and Wawaitin Falls, a distance by river of about 18 miles. A wagon road, which follows the power transmission line of the Northern Canada Power Company, Limited, through Ogden township, also connects Timmins with Wawaitin Falls.

The western part of Thorneloe is accessible by wagon from Timmins by means of the branch of the Whitesides road. In Thorneloe township it follows the west shore of the Tatachikapika river. The Tatachikapika may also be conveniently reached by canoe from Wawaitin Falls by means of Kenogamissi lake and the 90-chain portage from its west shore. The river in this vicinity is navigable by canoe.

Price Township

Canoe navigation on the section of the Grassy river that extends southward from the Mattagami river in Ogden township to the middle of Price township is very difficult owing to shallows and rapids, and during the early summer of



High falls, Grassy river, Price township.

1937 it was obstructed by log-driving operations. The section of the Grassy river that extends from the middle of Price township to High falls on the south boundary may be easily navigated by canoe.

The western part of Price township is also accessible by a wagon road from Wawaitin Falls. This road goes south along the west shore of the Grassy river, which it crosses at a bridge about $3\frac{1}{2}$ miles from the north boundary of the township. It then continues southward along the east shore to the southern part of Price township and beyond. During the past few years the bridge has been considered unsafe. Teams, therefore, have not recently travelled the section of the road that lies east of the Grassy river, and some sections have become overgrown. The western part of Price township is also accessible from Timmins by the road joining Timmins with Wawaitin Falls.

The northeastern part of Price township is accessible by the Mountjoy (east branch) river and by wagon road from Timmins. Split Rock creek (west branch of the Mountjoy river), which flows through the eastern part of Price township, is not navigable by canoe.

Adams Township

The western part of Adams township may be reached by a wagon road running south from Timmins along the boundary between Ogden and Deloro townships. It crosses the Mountjoy river in Price township at a bridge situated a short distance from the west boundary of Adams. About half a mile south of the bridge it crosses into Adams township, and a little farther on it divides into two roads. One follows a southeastward direction to the north end of Papakomeka lake; the other goes southward along the west boundary of Adams and provides access to McArthur township and the area to the south. Both of these roads were in fair condition for wagon travel during 1937.

The Mountjoy river is a navigable stream in high water and may be travelled by canoe from the Mattagami river to Papakomeka lake. There are several portages en route. In low water this stream is not navigable by canoe.

The eastern part of Adams township is accessible by wagon road from South Porcupine.

Eldorado Township

Eldorado township may be reached by wagon road from South Porcupine, which for some distance roughly follows the west boundaries of Whitney and Shaw townships. South of Shaw creek it swings to the west and then to the southeast, cutting across the northeastern part of Adams township into Eldorado township. South of Kennedy creek it again swings to the west and follows southward along the west boundary of Eldorado into McArthur township. At a point on this road about one-eighth of a mile north of where it crosses Kennedy creek, a branch road leads off in a southeasterly direction for about three-quarters of a mile to Kennedy's logging camp, which is situated on the west side of the Redstone river, about 2 miles from the south boundary of Eldorado. The road from South Porcupine to Kennedy's camp was in poor condition in 1937, but it was traversed by teams during that summer. The main road south of the branch leading to Kennedy's camp was in even poorer condition and was not travelled during the summer of 1937. The Miracle road, which was built at great expense during the early days of the Porcupine camp for the purpose of providing access to the Miracle mine in Langmuir township, branches eastward from the main road at a point about half a mile north of Kennedy creek. This road is impassable from disuse and at a few places is so overgrown that it cannot be recognized.

Another route to Eldorado township is via a motor road from South Porcupine to the Redstone river, thence up the river by canoe. This road crosses the Redstone by a bridge situated about 7 miles from South Porcupine near the middle of Shaw township. In order to facilitate logging operations, log jams that formerly obstructed river navigation were, in the summer of 1937, removed from the river south of the bridge. Except in very low water it is now possible to navigate canoes on the section of the Redstone river that extends from the road southward to Kennedy's camp. There are, however, several rapids on this section. Portages were cut at these rapids during 1937.

Topography and Drainage

Topographically the area constitutes part of a gently rolling glaciated peneplain, which lacks prominent features. More than 90 per cent. of the area is

obscured by overburden. The surface consists very largely of sand plains and swamps separated by low rock exposures and mounds of glacial debris. The altitudes of most of the lakes and streams range between 1,000 feet and 1,100 feet above sea-level. Two hills near Godon lake in Denton township, which rise to a height of over 200 feet above the lake level, are among the highest features of the area. In Price township the most important topographic forms consist of rocky hills, which are situated in the southern part, and sand hills of glacial outwash in the middle eastern section. The most prominent features of Eldorado township consist of a few scattered hills of greenstone, granite, and diabase.

The area slopes gently to the north and is drained principally by the Mattagami river and its tributaries. The streams of Eldorado township, however, flow into Night Hawk lake. Most of the higher ground in Denton, Thorneloe, Price, and Adams townships consists of sand and gravel of glacial origin. The



Joe Moore, resident of the Wawaitin Falls vicinity for over fifty years.

Tatachikapika, Mattagami, Grassy, and Mountjoy rivers have, in places, cut deep channels in this debris. The Redstone river in Eldorado township has low shores and flows largely through clay.

During 1911 and 1920 large sections of the area were devastated by forest fires. The best remaining forested sections occur chiefly in Eldorado township.

History of Development

Prior to the discoveries of gold at Porcupine in 1909 the area, which was then unsurveyed, was practically unknown to prospectors. Up to that time the only part familiar to explorers was the Mattagami river section. In the early days the Mattagami river was an important canoe route between the Lake Superior region and Hudson bay. The section of the area adjacent to this river is now part of Thorneloe township.

The first geological work was done by E. M. Burwash, who, as geologist, in 1896 accompanied O. L. S. Niven during the survey of the Nipissing-Algoma boundary. This line now forms the boundary between the districts of Nipissing and Sudbury. It also forms the east boundary of Eldorado township. In 1910, the townships of Keefer, Denton, Thorneloe, Price, Adams, and Eldorado, which form the subject of this report, were surveyed. About that time staking

activities, which previously had been confined largely to the sections nearer to Porcupine, increased in the area. During the field season of 1910, A. G. Burrows, who was making a geological examination of the Porcupine area,¹ mapped the rocks along the north boundaries of Thorneloe, Price, Adams, and Eldorado townships and examined sections of Denton township. Further geological work was done in Thorneloe, Price, Adams, and Eldorado townships by Burrows in 1911.² In the same year W. R. Rogers and E. L. Bruce³ mapped parts of Keefer and Denton townships. In 1922, E. W. Todd⁴ delimited the greenstone belt in Keefer and Denton townships. In 1925, J. E. Hawley,⁵ who was engaged chiefly in mapping the townships of Ogden, Bristol, and Carscallen, examined some claims in Denton township.

Since 1909, prospecting activities in the area have at various periods increased and diminished. Owing to the abandonment of claims, some sections of the area have been restaked several times. During the early part of 1937 many claims were located at scattered places. In general the periods of activity in the area may be regarded as reflections of periods of activity in the life of the Porcupine camp.

No spectacular mineral discoveries have yet been made, although visible gold has been found in Thorneloe township, and low gold values have been obtained from mineralized rocks in most of the other townships.

GENERAL GEOLOGY

The following outline indicates the various rock types found in the area, as well as their positions in the geological time table.

QUATERNARY

| | | |
|--------------|---|---------------------------------|
| RECENT: | } | Unconsolidated sand and gravel. |
| PLEISTOCENE: | | |

PRE-CAMBRIAN

KEWEENAWAN: Olivine diabase dikes.

MATACHEWAN: Quartz diabase dikes.

| | | |
|----------|---|-------------------------------------|
| ALGOMAN: | { | Quartz veins. |
| | | Quartz-feldspar porphyry dikes. |
| | | Pegmatite, granite, granite gneiss. |

HAILEYBURIAN(?): Basic intrusives altered to serpentine.

| | | |
|-----------------|---|---------------------------------|
| TIMISKAMING(?): | { | Conglomerate, greywacké, slate. |
| | | Iron formation. |

KEEWATIN: Volcanics consisting of basic and acid lavas, tuffs, and agglomerates, interbedded with both fine- and coarse-textured sediments, including iron formation.

The consolidated rocks of the area are all pre-Cambrian in age. The oldest rocks consist of Keewatin volcanics and sediments, which include iron formation. Both coarse- and fine-textured sediments, which appear to be of Timiskaming age, are enfolded with the Keewatin rocks. The next rocks in sequence are Haileyburian intrusives, which have been altered to serpentine. From an areal

¹A. G. Burrows, "The Porcupine Gold Area," Ont. Bur. Mines, Vol. XX, 1911, pt. 2.

²A. G. Burrows, "The Porcupine Gold Area (Second Report)," Ont. Bur. Mines, Vol. XXI, 1912, pt. 1, pp. 205-249.

³W. R. Rogers and E. L. Bruce, "Cripple Creek Gold Area," Ont. Bur. Mines, Vol. XXI, 1912, pt. 1, pp. 266-270.

⁴E. W. Todd, "Kenogamisse Lake Area, including Townships of Denton and Keefer," Ont. Dept. Mines, Vol. XXXII, 1923, pt. 3, pp. 23-35.

⁵J. E. Hawley, "Ogden, Bristol, and Carscallen Townships, Cochrane District," Ont. Dept. Mines, Vol. XXXV, 1926, pt. 6, pp. 1-36.

standpoint these rocks are of minor importance. Considerably later than and intruding both the Keewatin and Timiskaming-type rocks are granites and other igneous rocks related to granite. All the above-mentioned rocks are intruded by quartz diabase dikes, which are thought to be of Matachewan age. The youngest consolidated rocks are dikes of olivine diabase, which belong to the Keweenawan period.

Keewatin

The Keewatin rocks consist principally of volcanics and intercalated sediments. They are well exposed in Keefer, Denton, Price, and Eldorado townships and at a few scattered places in Thorneloe and Adams townships.



Greenstone and granite in *lit par lit* relationship on the Tatachikapika river, Denton township.

Volcanics

The Keewatin volcanics consist chiefly of basic lavas, with acid lavas, basic intrusives, tuffs, and agglomerates.

The basic lavas are represented largely by andesites and basalts, which have been metamorphosed to chlorite schists, carbonate schists, and serpentine. In general, the lavas in all the townships are dark-coloured, massive, and of fine texture. Rocks of this description are well exposed near Godon lake in Denton township. Pillow lavas and amygdaloidal lavas were identified in the southeastern part of Keefer township, in Denton township in the vicinity of Cripple creek, and in the northern parts of Thorneloe, Price, and Adams townships. In Eldorado township, pillow lavas, which are exposed near the Redstone river between the 32-chain portage and Kennedy's camp, have been altered to serpentine. Massive lavas altered to dark, fine-textured serpentine outcrop in Adams township near the east boundary and at scattered locations in Eldorado township. In the southeastern part of Denton township at a place on the Tatachikapika

river about a mile above Cripple creek, basic lavas exhibit a *lit par lit* relationship with intrusive granite. Dark-coloured lavas of basic composition, which now consist largely of talc and chlorite schist and which contain flow breccia, occur near Timiskaming sediments on the north side of Cripple creek in Denton township.

Acid lavas are rare in the area. One good outcrop occurs in the vicinity of claim T.R.P. 1,566 in the southeastern part of Eldorado township. At this location a rather light green, dense rhyolite, which is exposed on a bare rocky hill, is intruded by granite and diabase. Fine-grained, banded tuffs of medium to basic composition occur at scattered locations with the basic lavas. Banded volcanic rocks are particularly abundant in the Keewatin sections in Eldorado township and in the southern part of Price township. In both townships, however, there are horizons of iron formation and other banded sediments associated with the volcanics. At places, therefore, it is difficult to distinguish



Sheared conglomerate near the Mattagami river, Thorneloe township.

true sediments from tuffs. Some of the dark, fine-grained, banded rocks associated with the basic lavas along the Redstone river are probably of volcanic origin. In Denton township about half a mile northeast of Godon lake, both light- and dark-coloured, fine-grained tuffs lie adjacent to a mass of granite. The tuffs are well banded. They dip steeply to the northeast and strike north-westward parallel to the granitic contact. Near the granite the tuffs have been altered to biotite schist. Farther north, where the beds have been rather badly contorted, considerable sericite has been developed. Acid tuffs were identified in the southwestern part of Keefer township. In this section the tuffs are associated with greenstones. They are exposed at a point about a mile east of Opishig lake and a quarter of a mile north of the south boundary of Keefer.

Sediments

Keewatin sediments were identified in all the townships covered by this report. They consist mainly of horizons of conglomerate, greywacké, slate, and iron formation, which occur as beds and lenses between the Keewatin volcanics. Beds of impure quartzite are less abundant. Sediments of this type are not well exposed in Keefer, Thorneloe, and Adams townships. In Denton township,

they are represented mainly by iron formation and other fine-grained sediments. They were identified with the volcanics situated east and south of Carlton lake. In Price and Eldorado townships the Keewatin sediments are more abundant. Those in Price are confined largely to the southern part of the township east of the Grassy river. Keewatin lava flows also occur in this section. The sediments strike approximately south and dip steeply to the east. There are granitic intrusions in the vicinity, and locally the rocks are so highly metamorphosed that it is difficult to distinguish volcanics from sediments. Conglomerate, greywacké, and iron formation were identified at several places in this section. In Eldorado township fine-grained Keewatin sediments associated with lavas are exposed near the Redstone river between the 32-chain portage and Kennedy's camp. They consist largely of highly metamorphosed greywacké, quartzite, and iron formation. Greywacké, impure quartzite, slate, and iron formation are exposed on both sides of the Miracle road between the Redstone river and the east boundary of the township. Pyrite and pyrrhotite are associated with the sediments at several scattered places in this part of Eldorado.

Timiskaming(?)

Sedimentary rocks of Timiskaming type consist of conglomerate, greywacké, slate, and iron formation and are exposed at several places in Denton, Thorneloe, and Price townships. There are large sections of overburden between some of the outcrops, but a belt of Timiskaming sediments evidently extends across the northern parts of Denton, Thorneloe, and Price townships for a total distance of about 8 miles. The situation of some of the exposures on the north boundary of Thorneloe indicates that this belt is a southwestward continuation of the Timiskaming sediments in Bristol township previously mapped by Hawley.¹

The Timiskaming-type sediments are probably best exposed along the Mattagami river north of the dam at Wawaitin Falls in Thorneloe township. In this vicinity they consist of well-bedded horizons of metamorphosed conglomerate, greywacké, and slate, which strike almost east-west and dip steeply to the north. The beds outcrop intermittently across the strike for nearly a mile.

The conglomerate, which is well exposed immediately north of the Wawaitin dam, has been sheared and altered. It contains elongated pebbles and boulders, among which the following types were recognized: basic lava, acid lava, dark-coloured greenstone, granite, vein quartz, and some pebbles of altered banded rock that may be iron formation. On account of alteration, much of the conglomerate now consists of carbonate, chlorite, and sericite. Similar conglomerates are exposed in the vicinity of Cripple creek in Denton township and just east of the Tatachikapika river on the trail from Wawaitin dam.

Greywacké and impure quartzites with excellent bedding are exposed near the island in the Mattagami river about three-quarters of a mile north of the Wawaitin dam. In this vicinity there are also beds of grey altered arkose and impure altered sandstone, which exhibit a rather consistent gradation in the size of the grains. The beds strike almost east-west and dip steeply to the north. The gradation in the size of the grains suggests that the tops of the beds may be facing south and that the beds may, therefore, be overturned. Greywackés associated with impure arkoses and quartzites are also exposed near Cripple creek, in Denton township, and on the Tatachikapika river in the northern part of Thorneloe township. In this last-mentioned vicinity the arkose might be mistaken for quartz-feldspar porphyry.

¹J. E. Hawley, *op. cit.*

Slate occurs in the form of beds and lenses among the other Timiskaming rocks. They are well exposed on the Thibeault claims west of Wawaitin Falls, in Thorneloe township, and on Sam Reid's claims, north of Cripple creek, in Denton township. In both localities they vary in colour from grey to black. They are locally contorted by folding.

Iron formation composed of thin beds of impure magnetite, which alternate with thin beds of impure silica and greywacké, occur in Timiskaming greywackés west of the Grassy river in Price township.

Haileyburian(?)

The Haileyburian rocks are confined to pre-Algoman igneous types which intrude the Timiskaming. On account of the absence of Timiskaming rocks throughout most of the area examined, Haileyburian intrusives are difficult to identify. Massive serpentine, however, which is probably of Haileyburian age, is exposed at the south end of Katoshashepek lake in Price township. It is a rather whitish weathering, fine-textured rock, which is of black colour on a fresh fracture. It appears to be similar to the Haileyburian serpentine described by Burrows¹ in his report on the Porcupine gold area. Similar serpentine is exposed west of the Grassy river in the northern part of Price township. The outcrops are surrounded by overburden, and although Timiskaming-type sediments occur in the vicinity, evidence showing the relationships between the two rocks could not be obtained.

Algoman

Acid igneous rocks of Algoman age consisting of granite and rocks related to granite occupy large sections of the area. These rocks consist mainly of pink granite and pink granite gneiss, but they also include pegmatite, quartz-feldspar porphyry, and vein quartz. Most of the granite rocks are light in colour, but there are darker varieties, which may be granodiorites. There are also dark-coloured rocks high in hornblende, which occur along the margins of the greenstone masses. These are probably hybrid types formed by the assimilation of basic material.

At several places in the area, as for instance on the west boundary of Keefer township near the 2-mile post, pink massive granite intrudes granite gneiss. Near the mouth of Lost Dog creek in Denton township, a fine-textured pink granite intrudes a coarse porphyritic granite. These relationships suggest the presence of two granites belonging to the Algoman period. No attempt, however, was made to separate the various granites on the map accompanying this report.

One of the most striking Algoman rocks is a coarse-textured, porphyritic granite of pinkish colour, which in some places contains crystals of orthoclase more than an inch long. This type occupies sections in the southeastern part of Denton township and in the southwestern part of Thorneloe township. It was also identified in Price, Adams, and Eldorado townships.

Massive, coarse-textured granite, containing considerable biotite and small amounts of sulphide, occurs in the eastern part of Eldorado township. The massive granite found near Carlton lake in Denton township contains orthoclase, microcline, yellow altered plagioclase, biotite, and hornblende. Granite gneisses are well exposed near the Grassy river in the southern part of Price township and in Thorneloe township near the southwest corner.

¹A. G. Burrows, Ont. Dept. Mines, Vol. XXXIII 1924, pt. 2, p. 30

Small dikes of pegmatite and aplite cut the earlier Algonian rocks in many localities. Near the north boundary of Denton township a lamprophyre dike cuts the granite along a shear zone. This was one of the few lamprophyre dikes identified in the area.

Quartz porphyry and feldspar porphyry dikes are not abundant. Several dikes of this type, however, intrude the grey biotite granite which is exposed on the north boundary of Denton township west of Mahoney lake. A feldspar porphyry dike containing crystals of pink orthoclase and small amounts of sulphides is exposed on the trail about a quarter of a mile north of Fred Croteau's cabin in Eldorado township.

Matachewan

Dark-coloured vertical dikes of rather fine-textured quartz diabase are scattered throughout the area. They were identified in all the townships covered by this report and were found intruding the Keewatin, Timiskaming, and Algonian rocks. They range in width from a few feet up to 100 feet. The weathered surface is usually brown. On account of the absence of the Cobalt series in the area the precise age of these dikes cannot be determined. Geologists who have worked in other areas in Northern Ontario where the Cobalt series is present have referred similar dikes to the Matachewan period.

Keweenawan

Olivine diabase dikes were found in Keefer, Denton, Adams, and Eldorado townships. These dikes are generally lighter in colour and coarser in texture than the quartz diabase dikes. One large olivine diabase dike strikes north-eastward from the southern part of Adams township into Eldorado township. Its maximum width is over 300 feet, and it is exposed intermittently along the strike for more than 6 miles.

ECONOMIC GEOLOGY

Gold, the only mineral of importance in the area, is found under the following conditions: (1) in shear zones and fracture zones in Algonian granitic rocks and their associated porphyries; (2) along contact zones between Algonian and Keewatin rocks; (3) in shear zones in Keewatin lavas and volcanic fragmentals; (4) in quartz veins in Timiskaming sediments; (5) in veins in Keewatin iron formation; (6) in quartz and carbonate veins in drag folds of the Keewatin rocks; (7) as irregular-shaped bodies of sulphide which represent replacements in Keewatin greenstones and sediments.

The mineralized zones in the altered lavas are associated with carbonate, chlorite, and sericite schists. Talc schists and a little serpentine are also found. In the shear zones of both Keewatin and Algonian rocks the gold is associated with sulphides. In many cases no continuous vein of quartz and carbonate can be distinguished, but the shear zone is a network of stringers. Pyrite and chalcopyrite are the most abundant sulphides. Arsenopyrite, alena, and magnetite have been identified. In many of the veins, particularly in the granitic rocks, tourmaline occurs. Visible gold occurs in narrow stringers in the quartz porphyry just north of the Denton-Carscallen township line, and in quartz veins in Timiskaming sediments in Thorneloe township. Wire gold occurs in quartz-carbonate veins cutting iron formation in Carscallen township.

Description of Properties

KEEFER TOWNSHIP

Moore

The Moore group consists of 22 unsurveyed claims in the southwestern corner of Keefe township. The rocks consist of Keewatin greenstones and acid tuffs, which have been intruded by granite, aplite, quartz-feldspar porphyry, and diabase. The strike of the greenstones varies from N. 45° E. to east. They dip almost vertically. Stripping and trenching has disclosed a vein zone 2 to 5 feet in width in greenstone. It has been followed along the strike for over 150 feet. The zone contains two folded quartz veins, which range in width from 6 inches to 18 inches and conform to a northeastward-pitching drag fold in the greenstone. The veins carry a little pyrite, chalcopyrite, and galena. Gold values are reported to have been obtained. Diamond-drilling done in 1933 failed to locate an important ore body.

Sam Reid

The Sam Reid group of 10 claims is situated in the southern part of Keefe township just west of Boom (Raft) lake. The rocks consist of drag-folded greenstones and banded tuffs, which, in the southern part of the group, have been intruded by granite. Stripping and trenching have uncovered a few small quartz veins, which conform to drag folds in the greenstone. The veins are sparsely mineralized with sulphides. Pyrrhotite mineralization has been disclosed in the greenstones at a place situated about 2 chains north of the granite contact.

Simpson-Marcot

The Simpson-Marcot holdings consist of 13 unsurveyed claims in the southeastern part of Keefe township 1½ miles east of Warren lake. The rocks consist chiefly of massive green lavas, which locally contain pillow structures. Trenching and stripping in 1935 and 1936 uncovered a small quartz vein in a shear zone, which strikes N. 75° W. and dips northeastward. Pyrite, magnetite, and chalcopyrite are visible in the shear zone. Low gold values have been reported.

DENTON TOWNSHIP

Sam Reid

The Sam Reid group consists of approximately 19 claims situated in the central part of Denton township one to two miles northwest of the mouth of Cripple creek. Slates, greywackés, and conglomerate are exposed in the middle of this group. These sediments strike about N. 70° E. and dip steeply to the southeast. North of the sediments there are lavas containing flow breccias. South of the sediments there are white banded tuffs and massive pillow lavas. The sediments have been severely schisted. One band of greywacké, which has been carbonatized and impregnated with pyrite, carries low gold values. About 3,000 feet of diamond-drilling was done in the spring of 1936, but no important ore bodies were indicated. A short distance east of this group, heavily carbonatized greywackés and slates are exposed. A small irregular quartz vein carrying pyrite cuts pyritized greywacké. A grab sample of the best-looking material yielded a trace of gold.

Thomas Dodds

Thomas Dodds, of Timmins, holds a group of 8 claims, which include two surveyed claims, P. 17,791 and 17,792. This group is situated at the south

end of Godon lake. Part of the ground was staked and surveyed in 1910 and at that time was known as the Godon group.¹ Part of the Godon group has since been restaked by Thomas Dodds. The rocks consist of massive greenstones intruded by granite and several diabase dikes. The greenstones strike N. 30° E. and dip steeply to the northwest. Stripping and trenching has uncovered several small quartz veins, which carry carbonates and coarse pyrite. The veins occur in strong but narrow shear zones in the greenstones, which strike approximately northeast.

Phillip Sheehan

The Phillip Sheehan holdings consist of 9 unsurveyed claims situated at the north end of Godon lake. The rocks consist of strongly schisted greenstones and tuffs intruded in the northwestern and southeastern sections by granite. These rocks are cut by diabase dikes. A shear zone 12 feet wide and 75 feet long occurs in the granite lying east of Godon lake. This zone strikes N. 35° W. and dips vertically. It contains an irregular quartz vein, which carries pyrite and purple carbonate. The vein is said to yield traces of gold. In 1937 the group was optioned to the Verity Porcupine Gold Mines, Limited.

Scott

The Scott group consists of 5 surveyed claims, P. 10,767-10,771. The rocks consist of highly schisted and contorted lavas and tuffs, which have been intruded by granite and diabase dikes. The general strike is east and west, but minor folds are so numerous that there is considerable variation from that direction. Numerous drag folds pitching east indicate a syncline to the north. Near the granite the strike follows that of the contact. Surface workings have exposed a number of small quartz veins in rusty-weathering carbonated lavas.

McCoshen

The McCoshen group consists of several unsurveyed claims situated in the central part of the township. The rocks consist of highly schisted and drag-folded greenstones and tuffs. Stripping and trenching on the western part of the group has uncovered small irregular quartz veins in the drag-folded schist. Both the veins and the schist carry pyrite. The claims were optioned in 1937 to Goldale Mines, Limited. Samples taken by the company are said to have yielded erratic gold values.

Jowsey Denton Gold Mines, Limited

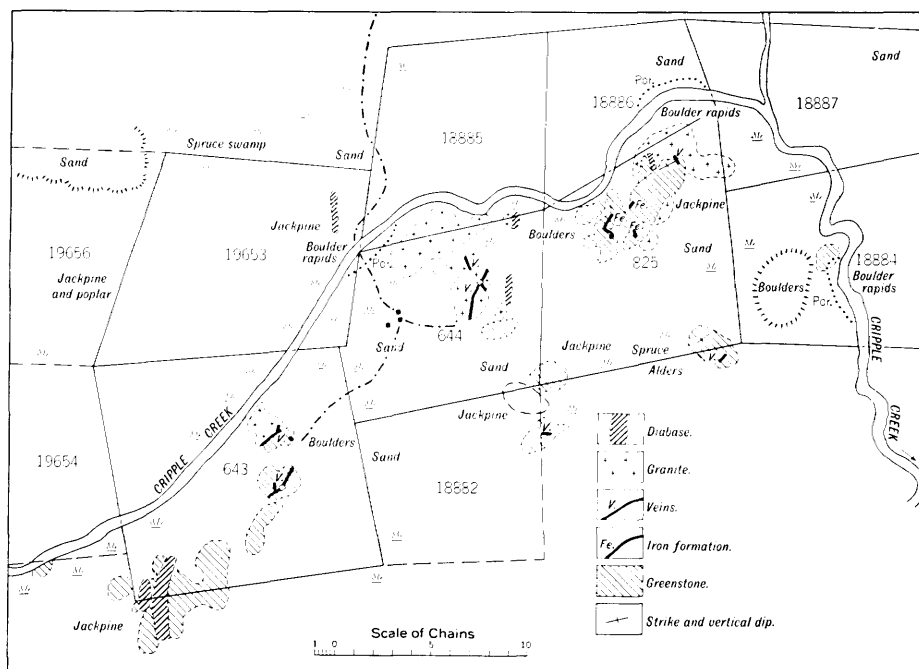
Jowsey Denton Gold Mines, Limited, holds 14 claims in Denton township. The group is situated on Cripple creek south of Carlton lake and includes the following 7 surveyed claims: P. 643, 644, 825, 18,885-18,887, 19,653. Gold was discovered in this section by Terry Carlton, who staked the claims in 1910. The rocks consist chiefly of massive greenstones intruded by granite and diabase dikes. A narrow band of iron formation and some volcanic fragmentals are also exposed.

On claim P. 643 a shear zone about 8 feet wide and 100 feet long strikes approximately N. 30° E. in massive greenstone. The zone is heavily mineralized with pyrite, and gold has been panned from crushed and roasted vein material. In the early days a small shaft was sunk on the zone by Terry Carlton. Diamond-

¹A. G. Burrows, Ont. Bur. Mines, Vol. XX, 1911, pt. 2, p. 19 (map).

drilling was done on the zone in 1935. Erratic gold values are said to have been obtained.

On claim P. 644 a shear zone in the granite strikes approximately N. 25° E. Terry Carlton also sank a small shaft on this showing. The sheared rock is mineralized with pyrite and a little chalcopryite. Seven holes drilled into the zone intersected mineralized material. Erratic gold values are said to have been obtained.



Geological sketch map of part of the property of Jowsey Denton Gold Mines, Limited, Denton township.

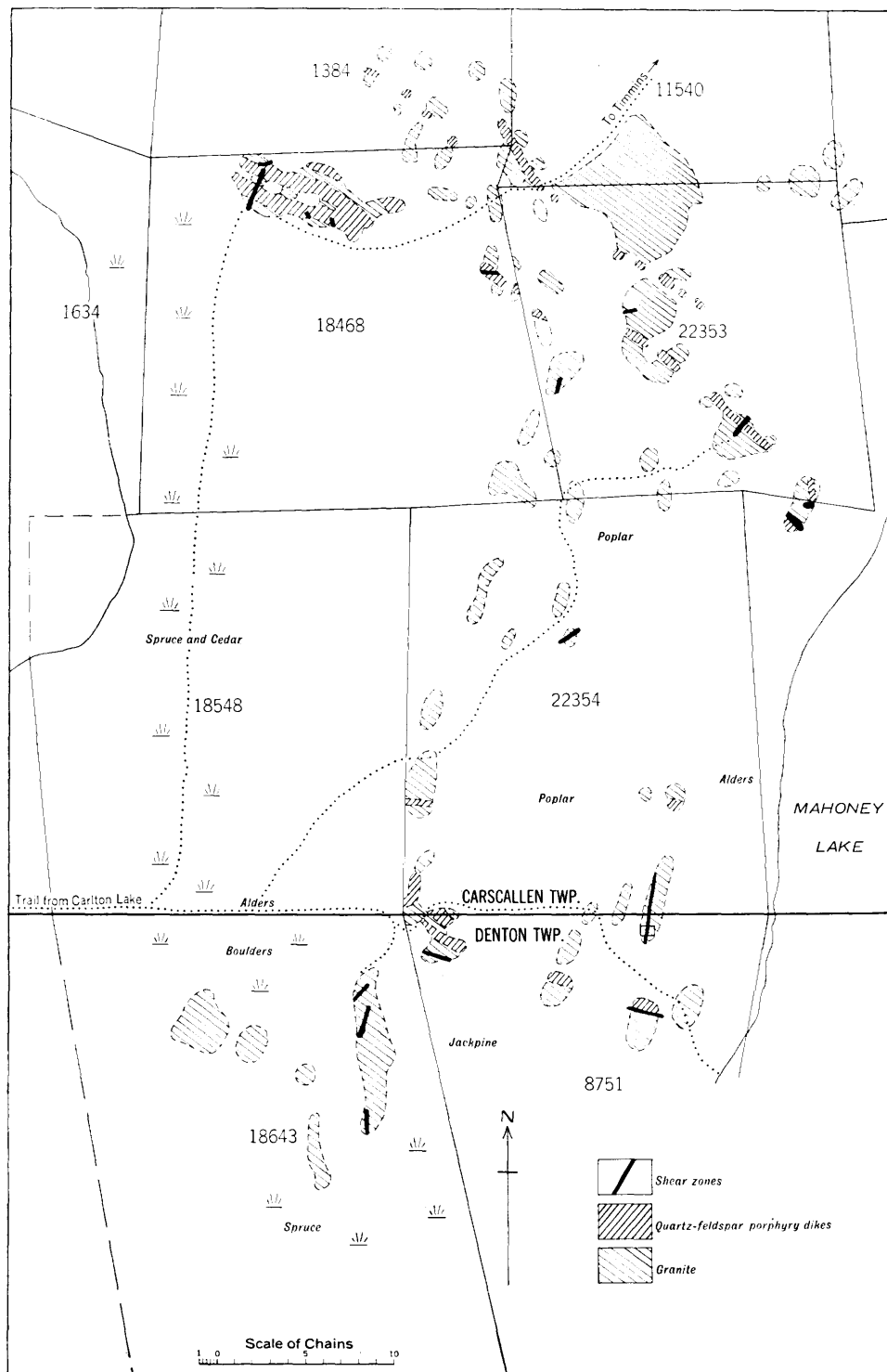
Porcupine Quartet Gold Syndicate

The Porcupine Quartet Gold Syndicate holds a group of 13 unsurveyed claims. Eleven of these are situated in the northern part of Denton township on the east shore of Carlton lake. The remaining two claims of the group lie in the southern part of Carscallen township. Most of the claims were staked by Alex. Stuart. The rocks consist of granite and northwestward-striking porphyry dikes. The dikes have a maximum width of 80 feet and in a few places contain visible quartz phenocrysts. In thin section, they show phenocrysts of altered orthoclase and acid plagioclase, chlorite, and calcite.

On the most northern claim of the group, in Carscallen township, a strong shear zone, striking about N. 20° E., cuts across a porphyry dike into the surrounding granite, but the shearing is less pronounced in the granite wall rock. The zone is well mineralized with pyrite. A picked sample obtained by the writer yielded a high gold value. It is reported that extensive bulk and channel sampling done in 1936 indicated that the gold values are generally low.

Six chains south of the township line in Denton a shear zone 10 feet wide and 100 feet long strikes N. 20° E. in the granite. It was described by Hawley¹ as

¹J. E. Hawley, op. cit., p. 33.



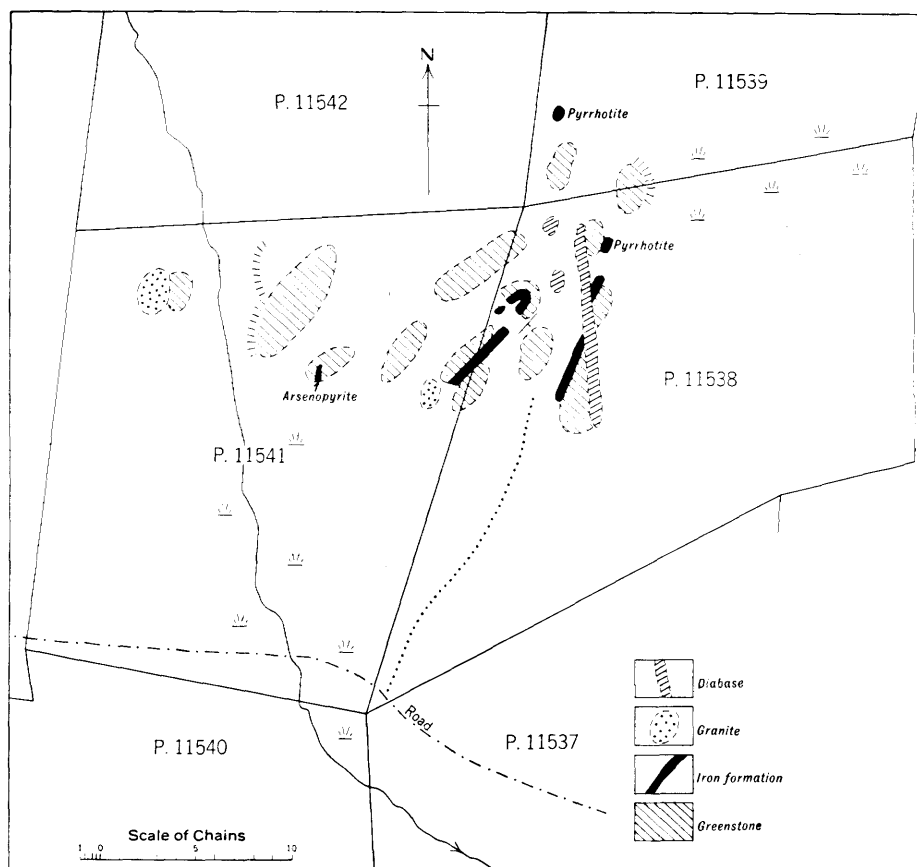
Geological sketch map showing claims P. 22,353 and 22,354 of the Richard Halpenny group and adjoining claims, Carscallen township.

showing "a complete gradation from altered massive biotite granite to sericite schist with eyes of blue quartz." The zone is well mineralized with pyrite and is intruded by a lamprophyre dike one foot in width. Low gold values were reported from extensive channel and bulk sampling done in 1936.

CARSCALLEN TOWNSHIP

Richard Halpenny

In 1936, Richard Halpenny staked two surveyed claims, P. 22,353 and P. 22,354, in the southern part of Carscallen township. In the same year the



Geological sketch map of claims P. 11,542, 11,541, 11,539, and 11,538, Jowsey Denton Gold Mines, Limited, Carscallen township.

claims were optioned to the Porcupine Quartet Gold Syndicate, which holds the adjoining claims. Bulk and channel sampling was done on a strong mineralized shear zone, which cuts across a porphyry dike 25 feet in width. Low gold values are said to have been obtained from the small sheared section of the dike.

Jowsey Denton Gold Mines, Limited

Jowsey Denton Gold Mines, Limited, holds 20 claims in Carscallen township, including the following 15 surveyed claims: P. 1,010, 1,382, 1,384, 1,385, 1,387-1,389, 1,634, 1,635, 11,537-11,542. The local geology has been described

briefly by Hawley.¹ Gold was first discovered on the western section of the group in shear zones in the granite. In 1926, Sydney Beanland and Frank Hurst discovered wire gold on the eastern section of the group. Since then the iron formation that carried the gold-bearing veins has been diamond-drilled. Apparently no records were kept of this work, and as core has been discarded no information was available to the writer. The claims were subsequently restaked by Dave MacKenzie, who reported the presence of visible gold in the old pit on the iron formation. In 1936, the group was acquired by Jowsey Denton Gold Mines, Limited. The company has since done considerable work, and some additional mineralized showings have been exposed.

Mineral Estates, Limited

Mineral Estates, Limited, own a group of 36 claims near the southeast corner of Carscallen township. Very few outcrops occur on the property, but an extensive and systematic programme of trenching was undertaken during the summer of 1936. The camp is now closed down.



Joseph Thibeault, veteran prospector of Thorneloe township.

The rocks exposed consist of a series of Keewatin lavas, ranging in composition from basalt to rhyolite. Trachytic flows are exposed in the northern part of the claims. Sericite schists have been developed in many parts of the flows. Talc schist and minor amounts of serpentine are found near the southeast corner of the claims. An olivine diabase dike with a north-south strike is exposed near the south boundary.

The general strike of the schistosity is N. 50° E., and the dip is either vertical or steeply inclined to the north.

The mineralization occurs either in flat-dipping quartz veins in the trachytic flows or in the shear zones of the altered andesites and basalts. In the more heavily mineralized sections pyrite, chalcopyrite, and sphalerite are present. The gold values are reported to be low.

THORNELOE TOWNSHIP

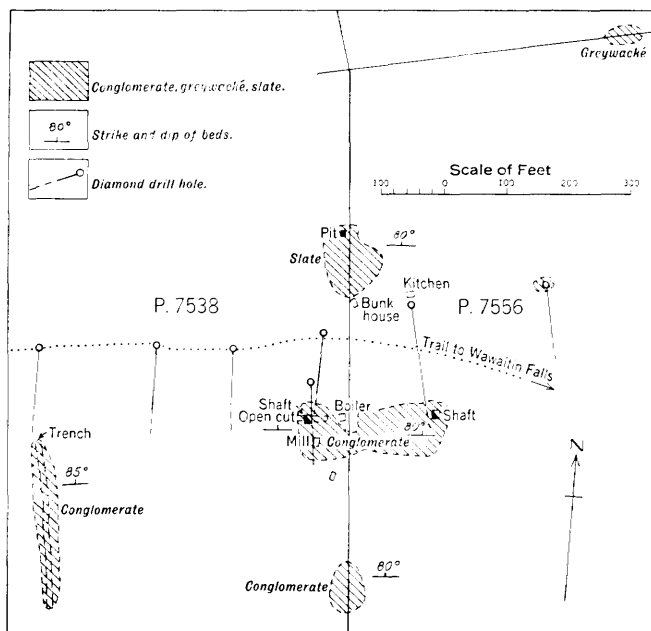
Joseph Thibeault

Joseph Thibeault holds two groups of claims in Thorneloe township. One group of 10 claims lies between the Wawaitin dam and the Tatachikapika river.

¹J. E. Hawley, op. cit., p. 34.

Another group of 12 claims lies between the flooded ground immediately south of the Wawaitin dam and the east boundary of Thorneloe. Most work has been done on the first-mentioned group. In that section claims were staked as early as 1909. Thibeault's first staking was done in 1916. Since then other claims have been acquired, and in 1937 the group consisted of 10 claims, including the four patented claims P. 7,556, 7,538, 7,557, and 8,218.

The rocks in the vicinity consist of beds of Timiskaming conglomerate, slate, and greywacké, which strike east-west and dip steeply to the north. The sediments have been sheared and partly carbonated. The schistosity lies prac-



Geological sketch map of parts of claims P. 7,538 and 7,556, Joseph Thibeault group, Thorneloe township.

tically parallel to the bedding. These rocks are cut by numerous veins and lenses of quartz, the strike and dip of which conform to that of the beds and the schistosity. Some of the veins are well mineralized with sulphides, the most abundant of which is pyrite.

Work on this group has been confined largely to gold-bearing quartz veins in schisted conglomerate near the boundary between claims P. 7,538 and 7,556. In 1917, a small boiler was installed and a shaft was sunk to a depth of 28 feet in quartz and schist on claim P. 7,556. In the same year another shaft was commenced on a gold-bearing quartz vein a little farther west on claim P. 7,538. In the summer of 1937, this shaft, which was said to be 40 feet deep, was filled with water, but gold was visible in the vein a few feet west of the shaft.

The vein minerals consist mostly of quartz with small amounts of calcite, ankerite, pyrite, galena, and some gold. In 1933 the group was optioned by Hollinger Consolidated Gold Mines, Limited, and 14 holes were drilled to intersect the shear zone in the conglomerate which contains the gold-bearing quartz veins. Altogether about 3,000 feet of diamond-drilling was completed. The

results did not justify further work, and the option was not exercised. In 1934, a 5-ton mill was installed, and a small amount of gold has since been recovered.

The rocks in the other Thibeault group are covered with overburden and apart from the assessment requirements no work has been undertaken.

A. Vizina

A. Vizina holds 9 claims in one group situated on the west bank of the Mattagami river at Wawaitin falls. Five claims of this group, H.S. 969-971, 973, and 974, have been surveyed. The rocks consist of conglomerates, greywackés, and slates, which are cut by quartz veins. Most of the exposed rock



The Joseph Thibeault property, showing the boiler-house and small outside mill, near Wawaitin Falls, Thorneloe township.

lies along the shore of the river. The work done consists of pits and trenches. Low gold values have been reported from pyrite-bearing quartz veins.

G. Darby

The G. Darby group consists of two claims, situated north of the J. Thibeault group west of Wawaitin falls. The rocks consist of east-west-striking slates and greywackés, which dip almost vertically. Sheared slates containing mineralized quartz veins are exposed near the south boundary of the group. Surface work done at several places along this zone has exposed pyrite mineralization in quartz.

A. Swanson

The A. Swanson group consists of four surveyed claims, T.R.P. 24,248, P. 22,795, P. 22,794, and W.D. 732, situated on the east shore of the Mattagami river at Wawaitin dam. The rocks consist largely of Timiskaming conglomerate with some slate and greywacké.

The best rock exposures are on claims P. 22,795 and W.D. 732. Quartz veins and schist containing abundant pyrite have been exposed in pits north of the fire tower on claim W.D. 732. No information is available regarding the gold values.

E. Schnubb

E. Schnubb holds a group of three claims, H.S. 983, H.S. 984, and H.S. 987, situated on the east shore of the Mattagami river north of the Wawaitin dam. Mineralized quartz veins and stringers have been exposed in pits on the shore.

A. E. Phillips

The A. E. Phillips group of 9 unsurveyed claims lies between the J. Thi-beault group and the Tatachikapika river. There are few rock outcrops. Sheared mineralized conglomerate containing quartz stringers is exposed along the trail leading to Wawaitin Falls. The outcrops are near the river. The beds in this section strike N. 70° W. and dip almost vertically. A pit at this location has disclosed pyrite mineralization in the highly altered sediments.

Barry O'Neill

Barry O'Neill, of Ottawa, holds about 60 claims in the northern part of Thorneloe township. These claims are situated both east and west of the Tatachikapika river and are part of a large group that extends north into Bristol township. All the claims in this group were staked in 1937. Rock outcrops are rare, but lavas, sediments, and diabase dikes are exposed. Operations during the early part of the summer of 1937 were confined largely to claim P. 23,886, where exposures of Timiskaming sediments occur along the Tatachikapika river. Work had been done in this vicinity in former years by previous stakers, and during 1937 some of the old showings were re-examined. The mineralization, which occurs in quartz veins and in the altered sediments, consists mostly of pyrite. Later in 1937 trenching was done in the northern section of Thorneloe township west of the Tatachikapika river.

PRICE TOWNSHIP**Verity Porcupine Gold Mines, Limited**

Verity Porcupine Gold Mines, Limited, holds a group of 46 claims located chiefly in the northwestern part of Price township. The group includes 6 claims in Thorneloe township on which there is no exposed rock. In Price township outcrops are confined largely to claims P. 22,982, 22,985, 22,987, 22,988, 23,042, and 23,043. The remaining claims of the group are largely covered with sand. The exposed rocks include greenstone, serpentine, diabase, greywacké, iron formation, and other sediments. During 1937 a considerable amount of surface work was done on the few sections where rock is exposed, and pyrite mineralization in quartz and schist was uncovered.

Mineralized showings also occur in another group of 3 claims, which lies west of the Grassy river about the middle of Price township. The company also holds claims in Denton township.

Orpit Mines, Limited

Orpit Mines, Limited, holds 29 claims in the northern part of Price township. The claims, which are largely covered with sand and swamp, are part of a group that extends into Ogden township, where most of the work has been done.

Alfred and Hector Marinacci

The Marinacci group consists of 18 claims situated between the Grassy river and Split Rock creek in the northern part of Price township. Keewatin lavas, which strike northeast and dip steeply to the southeast, are exposed on a large hill situated in the eastern part of the group. There is little other rock

exposed. The lavas include pillow and amygdaloidal types and are intruded by granite, quartz veins, and diabase. Some pyrite mineralization has been disclosed.

Mullen-Turmel-Bernier

In June, 1937, L. Mullen, A. Turmel, and J. E. Bernier, staked a group of 9 claims west of the Grassy river. The group is situated between 2 and 3 miles from the south boundary of the township. The rocks consist of well-banded Timiskaming greywacké and slate, which contains horizons of iron formation. Assessment work done in 1937 has disclosed mineralized quartz veins and zones in the sediments. Low gold values are reported to have been obtained.

A. Stirling

The A. Stirling group of 10 claims is situated in the northeast corner of Price township. No exposed rock was found in this group.

ADAMS TOWNSHIP

A. E. Phillips

The A. E. Phillips group of 9 claims adjoins the north boundary of Adams between the 2- and 3-mile posts. Greenstones, consisting partly of pillow lavas, which strike approximately east-west, are exposed on the eastern part of the group. Locally these rocks have been highly schisted and carbonated. Some small quartz veins have been exposed.

J. McDonough

J. McDonough, of Toronto, holds a group of several claims situated east of the A. E. Phillips claims in the northern part of Adams township. Part of the group consists of surveyed claims. The surface in this section is mostly swamp. There are, however, a few exposures of Keewatin rocks including pillow lavas. Assessment work was carried on in the summer of 1937. No mineralization of importance was uncovered.

ELDORADO TOWNSHIP

Claims T.R.P. 3,969-3,975

Claims T.R.P. 3,969-3,975 adjoin the north boundary of Eldorado township in the vicinity of the 1-mile post. Keewatin rocks of volcanic character are exposed on the northeastern part of this group, mainly on claim T.R.P. 3,975. Old trenches on this claim mark locations at which work was done in former years.

L. Shortt

The L. Shortt group comprises 11 claims situated in the central part of Eldorado township east of the Redstone river. The road to the Miracle mine passes through the southern claims of the group. The rocks consist of Keewatin lavas and sediments, including iron formation, which are intruded by diabase. Work done during 1937 consisted of stripping and trenching in the lavas and sediments. Some pyrite mineralization has been exposed.

Fred Croteau

Fred Croteau of South Porcupine holds claim T.R.P. 6,050, situated on the Miracle road in the southeastern part of Eldorado township. On this claim Keewatin lavas and sediments are intruded by granite, porphyry, and quartz veins of Algonian age, and by later diabase dikes. The Keewatin rocks strike

approximately east-west and dip almost vertically. In the vicinity of the granite and porphyry intrusions they have been hydrothermally altered and impregnated with pyrite and pyrrhotite. At places over 90 per cent. of the rock has been replaced by sulphides. The mineralized zone is exposed along the strike for about 300 feet, but owing to overburden in the vicinity its actual length could not be determined. The width of the zone appears to be about 250 feet. The amount of rock in this zone that has been replaced by sulphides varies considerably from place to place. Assays of massive sulphides, consisting mostly of pyrrhotite and pyrite obtained from a pit situated north of the Miracle road near the east boundary of the claim, yielded low values in gold and nickel.

James Kennedy

Claim T.R.P. 1,566 was staked by James Kennedy in November, 1910. It is situated on the Miracle road directly east of claim T.R.P. 6,050. Basic and acid Keewatin lavas are cut by granite and diabase. Work done some years ago consisted of stripping, trenching, and the sinking of pits. Gold values are reported to have been obtained. No work has been done in recent years.

Charles Williamson

The Charles Williamson group includes about 30 claims situated in the south-eastern part of Eldorado township. Rock exposures are not abundant in this section. Scattered outcrops indicate that the rock types are largely similar to those exposed on the Fred Croteau claim and on the James Kennedy claim, both of which have already been described. Heavy pyrite mineralization occurs in Keewatin rocks a short distance south of the Miracle road in the eastern section. Pyrrhotite mineralization has also been found on this group.

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PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. PAUL LEDUC, *Minister of Mines*

H. C. RICKABY, *Deputy Minister*

FORTY-SEVENTH ANNUAL REPORT
OF THE
ONTARIO DEPARTMENT OF MINES
BEING
VOL. XLVII, PART V, 1938

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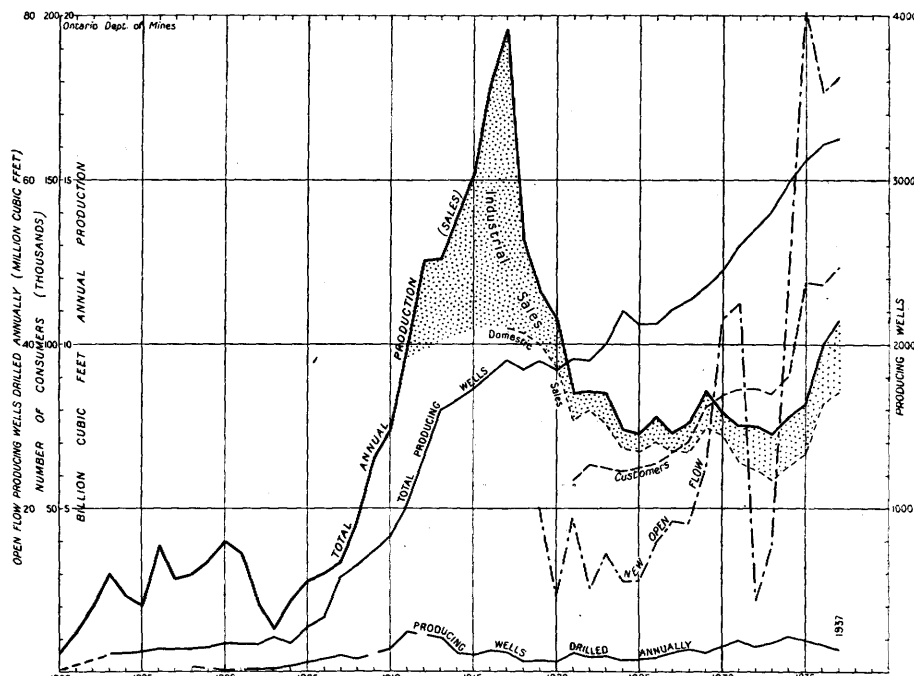
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NATURAL GAS IN 1937

By R. B. Harkness

General

For four consecutive years the production of natural gas in Ontario has shown an increase. It has now reached a "seventeen-year high," totalling 10,746,334 thousand cubic feet, and a value of \$6,588,798. The increased production is from the new fields, Declute, Dawn, and Brownsville, which are still in the development stage. The number of consumers shows an increase as does the quantity used per consumer. This may be the result of improved business



Graph of the natural gas industry in Ontario for the past forty-seven years.

conditions, but it is certain, from incomplete records of sales of appliances, that natural gas is being used for more purposes than ever before.

The capital invested in the industry shows a large increase, and the number of men employed and wages paid shows an "all-time high." These items appear also to follow the trend of business. Economies appear to be practiced in times of business depression and expansions are made in good times.

The search for new supplies goes on with renewed vigour. The Brownsville field has had the major share of development. Forty-five wells were drilled in this field in 1937, 39 of which were producers and account for 60 per cent. of the new open flow of the year. The Declute development accounts for nearly 34 per cent. of the new open flow. In the Haldimand field, the 44 new wells account for only 1 per cent. of the new open flow. It appears that the development of this old field is nearly complete. The number of dry holes in Haldimand county is 34 per cent. of the total, whereas ten years ago it was 23 per cent.

Gas service has been extended to several small villages along the pipe line from the Dawn gas field to London. A second pipe line was laid into the Brownsville field. This one was from the town of Aylmer. A purification plant was built in the village of Springfield; it is similar to the Brownsville plant described in last year's report. The line and purification plant is owned by the Central Pipe Line Company, Limited.

TABLE I—NATURAL GAS PRODUCTION BY FIELDS, 1937

| County | Field | Quantity |
|-----------------------------|--------------------------------|----------------------|
| | | M cu. ft. |
| Essex..... | Kingsville..... | 3,245,333 |
| | Tilbury..... | |
| Kent..... | Declute..... | 1,512,300 |
| | Dover..... | 636,552 |
| Lambton..... | Dawn..... | 1,890,874 |
| | Oil Springs..... | |
| Oxford..... | Brownsville ¹ | 486,931 |
| Elgin..... | Bayham..... | 260,974 |
| Elgin..... | Norfolk..... | 441,375 |
| Norfolk..... | Lincoln..... | 1,784,257 |
| Lincoln..... | Haldimand..... | |
| Haldimand..... | Wentworth..... | 298,493 |
| Wentworth..... | Welland..... | |
| Welland..... | Onondaga..... | 112,482 |
| Brant..... | Amabel..... | 2,763 |
| Bruce..... | Harwich and Howard tps..... | 14,000 |
| Wells in surface drift..... | | 60,000 |
| Private wells..... | | |
| Total produced..... | | 10,746,334 |
| Value..... | | \$6,588,798 |
| Imported mixed gas..... | | M cu. ft. 113,495 |
| Total distributed..... | | 10,859,829 |

¹Dereham township, 455,611 M cu. ft.; Bayham township, 31,320 M cu. ft.

TABLE II—DOMESTIC CONSUMPTION OF NATURAL GAS, CAPITAL INVESTED, AND WAGES PAID, 1921-1937

| Year | Retail rate, cents per M cu. ft. | No. of pay consumers | Total quantity used | Quantity used per consumer | Capital invested in all natural gas operations | No. of men employed | Wages paid |
|-----------|----------------------------------|----------------------|---------------------|----------------------------|--|---------------------|------------|
| | | | M cu. ft. | M cu. ft. | | | |
| 1921..... | 47 | 58,609 | 5,937,316 | 101.3 | \$17,328,757 | 632 | \$592,606 |
| 1922..... | 47 | 63,229 | 6,028,947 | 95.3 | 17,769,664 | 692 | 539,072 |
| 1923..... | 50 | 62,352 | 6,210,459 | 99.6 | 25,570,972 | 603 | 633,365 |
| 1924..... | 55 | 61,100 | 5,933,595 | 97.1 | 24,781,723 | 727 | 639,167 |
| 1925..... | 56 | 62,338 | 5,300,424 | 85.6 | 26,111,387 | 692 | 625,826 |
| 1926..... | 57 | 63,695 | 5,595,521 | 87.8 | 30,500,874 | 860 | 842,305 |
| 1927..... | 60 | 66,818 | 5,210,315 | 78 | 31,987,879 | 1,123 | 1,148,339 |
| 1928..... | 60 | 70,259 | 5,699,553 | 71.2 | 36,601,828 | 1,209 | 1,497,999 |
| 1929..... | 58 | 80,991 | 6,336,873 | 78.2 | 35,162,736 | 1,323 | 1,529,367 |
| 1930..... | 64 | 84,135 | 6,332,519 | 75.2 | 36,162,268 | 1,328 | 1,545,648 |
| 1931..... | 62 | 86,050 | 5,607,744 | 65.1 | 42,921,142 | 1,241 | 1,383,286 |
| 1932..... | 63 | 86,631 | 5,409,154 | 62.2 | 45,982,719 | 893 | 1,059,643 |
| 1933..... | 63 | 84,933 | 5,102,340 | 60 | 51,766,592 | 958 | 958,336 |
| 1934..... | 62 | 89,990 | 5,262,631 | 58.5 | 41,934,395 | 931 | 1,010,979 |
| 1935..... | 60 | 118,719 | 5,553,902 | 46.8-52 | 42,975,846 | 1,273 | 1,219,520 |
| 1936..... | 60 | 118,117 | 6,956,453 | 59.3 | 45,197,240 | 1,336 | 1,354,611 |
| 1937..... | 60 | 123,527 | 7,767,359 | 62.8 | 49,059,740 | 1,501 | 1,668,188 |

Analysis of Gas Consumption

The increase in the consumption of natural gas noted previously is due to a number of causes; certainly the increased use of natural gas for house-heating is one of the principal reasons, but automatic hot-water heaters and individual room heaters are becoming very popular and are an important factor in the increase. The manufacturers of these appliances have increased their efficiency and have made the designs and colour schemes very attractive.

The rate structure that was fixed for conditions in 1921 has undergone a complete change in sixteen years. In 1921 the principle was laid down that rates should increase directly with the consumption; at present it is the reverse—the rates decrease as the consumption increases. The effect has been to encourage a greater use of gas in homes.

It will be noted that the consumption of gas in industries has had a decided increase. This parallels the general revival of industry in 1936 and 1937. Again, American industry having vast supplies of cheap natural gas available have designed modern equipment for this fuel, and Canadian manufacturers find this opposition difficult to meet without falling in line with it. The pressure on the Department to grant new permits and increase allotments has been very great; consequently, where present equipment is in use more hours in the day, increases have been allowed. Permits to certain new industries have been granted where indispensable, where it tended to create new employment, and on sanitary and other grounds.

NATURAL GAS RATES, 1937

| Classification letter | Season, company, or locality | Classification according to amounts of gas used | Net rate and seasonal discount |
|-----------------------|---|---|--|
| A | | Up to 10 M cu. ft..... Over 10 M cu. ft..... | 85c. per M cu. ft. 60c. per M cu. ft. |
| B | October to April..... May to September..... | Up to 10 M cu. ft..... From 10 M to 20 M cu. ft..... Over 20 M cu. ft..... | 55c. M per cu. ft. 60c. per M cu. ft. 70c. per M cu. ft. 80c. per M cu. ft. |
| C | October to April..... May to September..... | Up to 10 M cu. ft..... From 10 M to 20 M cu. ft..... Over 20 M cu. ft..... | 50c. per M cu. ft. 55c. per M cu. ft. 65c. per M cu. ft. 75c. per M cu. ft. |
| D | October to April..... May to September..... | Up to 10 M cu. ft..... From 10 M to 20 M cu. ft..... Over 20 M cu. ft..... | 40c. per M cu. ft. 45c. per M cu. ft. 55c. per M cu. ft. 70c. per M cu. ft. |
| E | October to April..... May to September..... | Up to 10 M cu. ft..... From 10 M to 20 M cu. ft..... Over 20 M cu. ft..... | 60c. per M cu. ft. 65c. per M cu. ft. 75c. per M cu. ft. 85c. per M cu. ft. |
| F | Where imported mixed gas is used..... City of Niagara Falls..... | Less than 1 M cu. ft..... From 1 M to 10 M cu. ft..... Over 10 M cu. ft..... Over 10 M cu. ft..... | \$1.50 \$1.00 per M cu. ft. \$1.30 per M cu. ft. Additional charge for duty \$1.00 per M cu. ft. |
| G | | Minimum bill..... Up to 10 M cu. ft..... From 10 M to 25 M cu. ft..... Over 25 M cu. ft..... | 80c. 80c. per M cu. ft. 65c. per M cu. ft. 55c. per M cu. ft. |

NATURAL GAS RATES, 1937—Continued

| Classification letter | Season, company, or locality | Classification according to amounts of gas used | Net rate and seasonal discount |
|-----------------------|--|--|--|
| H | | Up to 5 M cu. ft..... From 5 M to 10 M cu. ft..... Over 10 M cu. ft..... | \$1.00 per M cu. ft. 90c. per M cu. ft. 60c. per M cu. ft. |
| I | | Up to 5 M cu. ft..... From 5 M to 10 M cu. ft..... From 10 M to 15 M cu. ft..... From 15 M to 25 M cu. ft..... Over 25 M cu. ft..... | \$1.00 per M cu. ft. 90c. per M cu. ft. 80c. per M cu. ft. 70c. per M cu. ft. 60c. per M cu. ft. |
| J | October to April, discount. May to September, discount | Up to 200 cu. ft..... From 200 cu. ft. to 5 M cu. ft.. From 5 M cu. ft. to 10 M cu. ft.. Over 10 M cu. ft..... On bills under \$5.00..... On bills between \$5.00 and \$10.00 On bills under \$5.00..... | 40c. per hundred cu. ft. 70c. per M cu. ft. 60c. per M cu. ft. 45c. per M cu. ft. 15 per cent. 10 per cent. 10 per cent. |
| K | October to April, discount. May to September, discount | Up to 200 cu. ft..... From 200 cu. ft. to 5 M cu. ft.. From 5 M cu. ft. to 10 M cu. ft.. Over 10 M cu. ft..... On bills under \$5.00..... On bills between \$5.00 and \$10.00 On bills under \$5.00..... | 40c. per hundred cu. ft. 75c. per M cu. ft. 65c. per M cu. ft. 50c. per M cu. ft. 15 per cent. 10 per cent. 10 per cent. |
| L | Fonthill-Ridgeville Gas Co. Dominion Natural Gas Co. | First 400 cu. ft., minimum charge Over 400 cu. ft..... | 85c. 75c. per M cu. ft. 75c. per M cu. ft. |
| M | | Up to 15 M cu. ft..... Over 15 M cu. ft..... | 75c. per M cu. ft. 55c. per M cu. ft. |
| N | | Up to 1 M cu. ft..... From 1 M to 10 M cu. ft..... From 10 M to 25 M cu. ft..... Over 25 M cu. ft..... | \$1.00 per M cu. ft. 80c. per M cu. ft. 65c. per M cu. ft. 55c. per M cu. ft. |
| O | Port Colborne..... Summer residents..... | Up to 5 M cu. ft..... From 5 M cu. ft. to 10 M cu. ft.. Over 10 M cu. ft..... | 80c. per M cu. ft. 70c. per M cu. ft. 55c. per M cu. ft. \$2.00 per M cu. ft. |
| P | | 200 cu. ft. or less..... Over 200 cu. ft..... | \$1.00 60c. per M cu. ft. |
| R | November to April..... May to October..... | Up to 10 M cu. ft..... Over 10 M cu. ft..... Up to 10 M cu. ft..... Over 10 M cu. ft..... | 65c. per M cu. ft. 55c. per M cu. ft. 70c. per M cu. ft. 55c. per M cu. ft. |
| S | | Up to 5 M cu. ft..... From 5 M cu. ft. to 10 M cu. ft.. Over 10 M cu. ft..... | \$1.00 per M cu. ft. 90c. per M cu. ft. 60c. per M cu. ft. |
| T | October to April..... May to September..... | Up to 5 M cu. ft..... Over 5 M cu. ft..... | 70c. per M cu. ft. 50c. per M cu. ft. 70c. per M cu. ft. |
| U | | 1 M cu. ft. or less..... From 1 M cu. ft. to 10 M cu. ft.. From 10 M cu. ft. to 15 M cu. ft.. Over 15 M cu. ft..... | 95c. per M cu. ft. 60c. per M cu. ft. 55c. per M cu. ft. 50c. per M cu. ft. |

Tables III and IV give in detail the quantity of gas used by pay, free, and industrial consumers in Ontario, and the rates paid in each municipality. Similar tables have been published since the year 1921 and reflect the changes that have taken place in each municipality during those years.

TABLE III—GAS CONSUMPTION IN TOWNS AND CITIES, 1937

| Town or city | Population | No. of consumers | | Quantity consumed | | | Distance from gas field | Net rate per M cu. ft. |
|---------------------------------|------------|------------------|------|-------------------|-----------|------------|-------------------------|------------------------|
| | | Pay | Free | Pay | Free | Industrial | | |
| | | | | M cu. ft. | M cu. ft. | M cu. ft. | miles | |
| Alvinston..... | 650 | 220 | 2 | 11,821 | 58 | | 20 | K |
| Ancaster..... | | 106 | | 12,366 | | | 170 | 70c. |
| Appin..... | | 38 | | 2,118 | | | 32 | K |
| Attercliffe..... | | 30 | | 1,200 | | | 3 | 60c. |
| Aylmer..... | 1,990 | 781 | | 49,374 | | 203 | 16 | T |
| Bartonville..... | 602 | 160 | | 5,571 | | | 19 | 60c. |
| Belle River..... | 810 | 146 | 1 | 12,143 | 82 | 493 | 29 | B |
| Belmont..... | 317 | 115 | | 3,454 | | | 92 | \$1.00 |
| Binbrook..... | 100 | 14 | 1 | 384 | 250 | | 1 | 60c. |
| Blenheim..... | 1,702 | 623 | 2 | 56,463 | 341 | 3,560 | 20 | C |
| Bothwell..... | 685 | 167 | 1 | 11,175 | 17 | 226 | 14 | J |
| Brantford..... | 31,282 | 5,317 | 5 | 269,451 | 1,343 | 22,049 | 140 | G |
| Brigden..... | 433 | 158 | | 9,298 | | 416 | 30 | B |
| Burlington..... | 3,680 | 447 | | 31,217 | | | 48 | H (M.B. 50c.) |
| Byron..... | 350 | 80 | 1 | 8,663 | 18 | | 51 | K |
| Cainsville..... | 325 | 98 | | 5,049 | | | 4 | G |
| Caledonia..... | 1,410 | 533 | 2 | 33,706 | 171 | 23,464 | 7 | 60c. |
| Canfield..... | 165 | 60 | | 3,935 | | | 1 | 60c. |
| Cayuga..... | 664 | 227 | 1 | 16,970 | 30 | 369 | 6 | 60c. |
| Chatham..... | 16,153 | 4,351 | 3 | 431,252 | 4,436 | 14,488 | 22 | J |
| Coatsworth..... | 321 | 27 | 1 | 1,724 | 61 | 482 | 4 | D |
| Comber..... | 505 | 153 | | 17,115 | | 3,570 | 19 | C |
| Cottam..... | 425 | 86 | 4 | 5,206 | 500 | | 35 | 60c. |
| Courtland..... | 350 | 57 | | 3,030 | | 89 | 3 | 60c. (M.B. 50c.) |
| Courtright..... | 334 | 152 | 1 | 6,354 | 97 | | 53 | B |
| Crystal Beach..... | 510 | 138 | | 7,590 | | | 1 | F |
| Delhi..... | 1,675 | 481 | | 35,455 | | 454 | 4 | 60c. (M.B. 60c.) |
| Dorchester..... | 403 | 123 | | 6,458 | | | 95 | E (M.B. 50c.) |
| Dresden and Tupperville..... | 1,700 | 543 | 2 | 43,375 | 156 | 517 | 38 | C |
| Dundas..... | 4,955 | 1,090 | 1 | 52,577 | 22 | 6,417 | 172 | 70c. (M.B. \$1.00) |
| Dunnville..... | 4,005 | 1,067 | 3 | 95,786 | 323 | 10,940 | 7 | 60c. |
| Dutton..... | 810 | 247 | 1 | 19,338 | 29 | 719 | 52 | B (M.B. 50c.) |
| Echo Place..... | 735 | 78 | | 3,978 | | | 5 | G |
| Eden..... | 150 | 32 | | 1,854 | | | 11 | 60c. (M.B. 50c.) |
| Essex..... | 1,785 | 493 | 1 | 42,315 | 5 | 3,972 | 33 | B |
| Fairground..... | 75 | 18 | | 680 | | | 1 | 60c. (M.B. 50c.) |
| Fenwick..... | 330 | 117 | | 5,632 | | | 18 | 75c. |
| Fingal..... | 170 | 35 | | 2,123 | | | 71 | B (M.B. 50c.) |
| Fisherville..... | 160 | 46 | | 3,246 | | | 2 | 50c. |
| Florence..... | 185 | 64 | | 4,585 | | 315 | 5 | J |
| Fonthill..... | 870 | 266 | | 6,755 | | | 25 | L |
| Fort Erie..... | 5,755 | 1,417 | 2 | 53,262 | 1,614 | | 8 | F |
| Galt..... | 14,410 | 2,557 | 1 | 115,566 | 22 | 19,901 | 147 | G |
| Grimsby..... | | 360 | 1 | 9,395 | 75 | 990 | 10 | 85c. |
| Grimsby Beach..... | 1,980 | 76 | | 3,365 | | | 11 | 85c. |
| Hagersville..... | 1,307 | 430 | | 30,647 | | | 14 | 60c. (M.B. 35c.) |
| Hamilton..... | 154,020 | 12,173 | 3 | 392,648 | 1,007 | 796,834 | 47 | M |
| Hepworth..... | 380 | 45 | 2 | 2,463 | 300 | | 1 | 75c. |
| Hespeler..... | 2,800 | 497 | | 25,256 | | 18,153 | 155 | N (M.B. \$1.00) |
| Highgate..... | 345 | 114 | 2 | 9,419 | 373 | | 32 | B (M.B. 50c.) |
| Ingersoll..... | 5,175 | 1,141 | 2 | 56,308 | 273 | 10,338 | 100 | G |

¹M.B.—Minimum monthly bill.

TABLE III—GAS CONSUMPTION IN TOWNS AND CITIES, 1937—*Continued*

| Town or city | Popu- lation | No. of consumers | | Quantity consumed | | | Distance from gas field | Net rate per M cu. ft. |
|--|-----------------|---------------------|-------|-------------------|-----------|-----------------|----------------------------------|---------------------------|
| | | Pay | Free | Pay | Free | Indus- trial | | |
| | | | | M cu. ft. | M cu. ft. | M cu. ft. | miles | |
| Inwood | 250 | 87 | ..... | 4,249 | ..... | ..... | 14 | A |
| Jarvis | 505 | 201 | ..... | 14,737 | ..... | ..... | 9 | 60c. |
| Kingsville | 2,365 | 684 | 1 | 62,221 | 218 | 243 | 30 | U |
| Lake Shore ..... | ..... | 110 | ..... | 6,036 | ..... | ..... | 16 | F |
| Lambeth | 475 | 147 | 1 | 13,286 | 228 | 108 | 85 | K |
| Leamington | 5,445 | 1,429 | ..... | 159,580 | ..... | 6,210 | 20 | 55c. |
| London | 73,880 | 15,404 | ..... | 1,585,542 | ..... | 81,072 | 55 | K |
| Lynedoch | 175 | 42 | ..... | 3,285 | ..... | ..... | 2 | 60c. |
| Merlin | 400 | 154 | 2 | 14,453 | 1,892 | 2,157 | 2 | D |
| Merritton | 2,644 | 503 | ..... | 17,219 | ..... | 13,938 | 35 | 70c. |
| Mount Brydges | 525 | 109 | 1 | 8,324 | 64 | 553 | 43 | K |
| Nelles Corners | 86 | 7 | ..... | 850 | ..... | ..... | 1 | 60c. |
| Niagara Falls | 18,747 | 3,633 | ..... | 103,377 | ..... | 23,571 | 11 | F |
| Oil Springs | 470 | 126 | ..... | 8,226 | ..... | 441 | 2 | R |
| Paris | 4,325 | 954 | 2 | 44,869 | 261 | 17,896 | 129 | G |
| Petrolia | 2,710 | 798 | 2 | 69,502 | 449 | 1,192 | 60 | B |
| Port Burwell | 450 | 244 | 1 | 10,487 | 2 | 102 | 3 | 60c. |
| Port Colborne and Humberstone | 8,975 | 2,049 | 4 | 95,921 | 326 | 1,643 | 5 | O (M.B. \$1.00) |
| Port Dover | 1,640 | 575 | ..... | 45,122 | ..... | 402 | 1 | 60c. |
| Port Rowan | 690 | 231 | ..... | 12,046 | ..... | ..... | 1 | 60c. (M.B. 60c.) |
| Preston | 6,415 | 984 | 1 | 58,018 | 56 | 5,371 | 151 | G |
| Ridgetown | 1,955 | 658 | 6 | 57,277 | 2,427 | 1,549 | 28 | C |
| Ridgeway | 1,100 | 201 | ..... | 11,055 | ..... | ..... | 1 | F |
| Rodney | 722 | 240 | 1 | 16,010 | 72 | 337 | 40 | B (M.B. 50c.) |
| St. Anns | 120 | 24 | ..... | 660 | ..... | ..... | 7 | 85c. |
| St. Catharines | 26,834 | 5,856 | 1 | 240,717 | 505 | 59,879 | 35 | 70c. |
| St. George | 510 | 129 | ..... | 4,456 | ..... | ..... | 148 | 80c. |
| St. Thomas | 16,210 | 2,857 | 2 | 79,998 | 550 | ..... | 75 | K |
| St. Williams | 410 | 112 | ..... | 5,138 | ..... | 679 | 1 | 60c. (M.B. 50c.) |
| Sarnia | 18,955 | 5,369 | 3 | 309,896 | 1,615 | 40,233 | 55 | B |
| Selkirk | 200 | 134 | 1 | 9,005 | 111 | ..... | 1 | 60c. |
| Shedden | 235 | 100 | ..... | 6,076 | ..... | 458 | 63 | B (M.B. 50c.) |
| Simcoe | 5,826 | 1,965 | 3 | 179,813 | 873 | 13,010 | 20 | 60c. |
| Smithville | 570 | 181 | ..... | 6,834 | ..... | ..... | 6 | 75c. |
| Sombra and Port Lambton | 420 | 162 | ..... | 11,558 | ..... | 84 | 45 | B |
| Springfield | 420 | 95 | ..... | 5,019 | ..... | 445 | 5 | T |
| Stevensville | 420 | 30 | ..... | 1,650 | ..... | ..... | 1 | F |
| Stratfordville | 255 | 97 | ..... | 6,891 | ..... | 30 | 6 | 60c. (M.B. 50c.) |
| Thamesville | 814 | 264 | 2 | 23,309 | 102 | 2,777 | 13 | J |
| Thorold | 4,905 | 1,097 | ..... | 38,234 | ..... | 1,389 | 35 | 70c. |
| Tilbury | 1,900 | 594 | 2 | 51,804 | 750 | 860 | 14 | C |
| Tillsonburg | 3,830 | 1,185 | 1 | 90,237 | 477 | 130,910 | 16 | 63c. |
| Vienna | 225 | 88 | 1 | 5,669 | 109 | 128 | 1 | 60c. (M.B. 50c.) |
| Vittoria | 205 | 138 | ..... | 4,731 | ..... | ..... | 3 | 60c. |
| Wallaceburg | 4,535 | 1,294 | 3 | 107,038 | 342 | 402,733 | 19 | C |
| Wallacetown | 175 | 53 | 1 | 3,342 | 6 | 828 | 60 | B |
| Waterdown | 900 | 39 | ..... | 1,159 | ..... | ..... | 45 | I |
| Waterford | 1,250 | 230 | ..... | 13,273 | ..... | 242 | 30 | P (M.B. \$1.00) |
| Welland | 10,925 | 3,159 | 7 | 83,707 | 920 | 4,594 | 3 | F |
| West Lorne | 745 | 177 | 1 | 10,919 | 238 | 448 | 49 | B (M.B. 50c.) |
| Wheatley | 745 | 224 | 1 | 17,541 | 50 | 421 | 12 | 60c. (M.B. 60c.) |
| Windsor (Border Cities) | 114,390 | 19,457 | 1 | 1,326,289 | 898 | 318,024 | 45 | K |
| Woodstock | 11,380 | 2,429 | 3 | 114,279 | 267 | 6,042 | 110 | G |
| Wyoming | 528 | 165 | ..... | 9,382 | ..... | 457 | 65 | A |
| Total ..... | ..... | 115,068 | 101 | 7,229,431 | 25,411 | 2,080,415 | ..... | ..... |

TABLE IV—GAS CONSUMPTION IN TOWNSHIPS, 1937

| County and township | Popu- lation | No. of consumers | | Quantity consumed | | | Net rate per M cu. ft. |
|-----------------------|-----------------|---------------------|-------|-------------------|-------------------|------------------------------|---------------------------|
| | | Pay | Free | Pay M cu. ft. | Free M cu. ft. | Indus- trial M cu. ft. | |
| ESSEX: | | | | | | | |
| Gosfield North..... | 2,164 | 110 | ..... | 7,335 | ..... | ..... | 60c. |
| Gosfield South..... | 2,311 | 591 | 1 | 32,908 | 367 | 45,150 | 60c. |
| Maidstone..... | 2,976 | 71 | 7 | 5,396 | 1,147 | 672 | B |
| Mersea..... | 4,929 | 345 | 2 | 31,740 | 400 | 11,061 | 60c. |
| Rochester..... | 2,260 | 195 | 7 | 14,820 | 748 | 2,480 | B |
| Sandwich East..... | 5,376 | 12 | ..... | 912 | ..... | ..... | B |
| Sandwich South..... | 2,066 | 110 | ..... | 8,366 | ..... | 811 | B |
| Tilbury North..... | 1,920 | 44 | 1 | 1,622 | 168 | 5,529 | C |
| Tilbury West..... | 1,554 | 27 | 1 | 2,074 | 124 | ..... | C |
| LAMBTON: | | | | | | | |
| Brooke..... | 2,217 | 24 | ..... | 479 | ..... | ..... | A |
| Dawn..... | 2,160 | 99 | 4 | 6,238 | 743 | 1,651 | D |
| Enniskillen..... | 2,725 | 133 | ..... | 5,955 | ..... | 402 | B |
| Euphemia..... | 2,692 | 6 | ..... | 302 | ..... | ..... | J |
| Moore..... | 2,873 | 358 | 1 | 19,059 | 390 | 2,939 | B |
| Plympton..... | 2,681 | 6 | ..... | 482 | ..... | ..... | A |
| Sarnia..... | 3,156 | ..... | 6 | ..... | 1,000 | ..... | B |
| Sombra..... | 2,746 | 69 | ..... | 3,539 | ..... | 947 | B |
| KENT: | | | | | | | |
| Camden..... | 2,152 | 18 | ..... | 864 | ..... | ..... | C |
| Chatham..... | 5,832 | 83 | ..... | 4,711 | ..... | 327 | C |
| Dover..... | 3,906 | 426 | 1 | 36,696 | 137 | 12,658 | D |
| Harwich..... | 5,010 | 470 | 9 | 33,861 | 3,401 | 483 | C |
| Howard..... | 2,813 | 168 | 2 | 12,383 | 227 | ..... | C |
| Orford..... | 1,718 | 24 | 2 | 2,851 | 268 | ..... | C |
| Raleigh..... | 4,230 | 640 | 23 | 54,108 | 7,163 | 1,234 | D |
| Romney..... | 1,456 | 84 | 42 | 5,599 | 13,162 | 518 | D |
| Tilbury East..... | 3,406 | 251 | 67 | 19,779 | 22,595 | 2,688 | D |
| Zone..... | 859 | 26 | ..... | 1,057 | ..... | ..... | A |
| ELGIN: | | | | | | | |
| Aldborough..... | 2,708 | 18 | 1 | 751 | 387 | ..... | B |
| Bayham..... | 3,265 | 82 | 16 | 3,597 | 2,561 | 708 | 60c. |
| Dunwich..... | 2,357 | 52 | 2 | 3,223 | 172 | ..... | B |
| Malahide..... | 2,714 | 49 | ..... | 2,008 | ..... | 258 | 70c. |
| Southwold..... | 2,397 | 115 | 2 | 7,623 | 70 | 209 | B |
| Yarmouth..... | 5,030 | 59 | ..... | 3,022 | ..... | ..... | A (M.B. 185c.) |
| MIDDLESEX: | | | | | | | |
| Caradoc..... | 3,026 | 9 | ..... | 521 | ..... | ..... | K |
| Delaware..... | 1,180 | 4 | ..... | 180 | ..... | ..... | K |
| Ekfrid..... | 1,971 | 10 | ..... | 491 | ..... | ..... | K |
| North Dorchester..... | 2,932 | 21 | ..... | 950 | ..... | ..... | E |
| Westminster..... | 6,730 | 65 | ..... | 7,215 | ..... | ..... | K |
| NORFOLK: | | | | | | | |
| Charlotteville..... | 2,978 | 11 | 5 | 976 | 897 | ..... | 60c. |
| Middleton..... | 2,493 | 63 | 5 | 4,505 | 636 | 1,054 | 60c. |
| North Walsingham..... | 2,118 | 8 | 1 | 760 | 198 | ..... | 60c. |
| South Walsingham..... | 1,711 | 20 | 4 | 1,760 | 580 | ..... | 60c. |
| Townsend..... | 2,968 | 31 | ..... | 2,883 | ..... | ..... | 60c. |
| Windham..... | 3,618 | 2 | 3 | 204 | 533 | ..... | 60c. |
| Woodhouse..... | 2,308 | 175 | 10 | 14,504 | 1,437 | ..... | 60c. |
| BRANT: | | | | | | | |
| Brantford..... | 7,336 | 47 | ..... | 2,467 | ..... | ..... | G |
| Burford..... | 3,697 | 6 | ..... | 93 | ..... | ..... | G |
| Onondaga..... | 964 | 32 | 9 | 1,967 | 1,148 | ..... | 70c. |
| South Dumfries..... | 2,523 | 2 | ..... | 104 | ..... | ..... | 80c. (M.B. 50c.) |
| Tuscarora..... | 2,654 | 13 | ..... | 566 | ..... | ..... | 25c. |

¹M.B.—Minimum monthly bill.

TABLE IV—GAS CONSUMPTION IN TOWNSHIPS, 1937—Continued

| County and township | Popu- lation | No. of consumers | | Quantity consumed | | | Net rate per M cu. ft. |
|-----------------------|-----------------|---------------------|------------|-------------------|----------------|-----------------|---------------------------|
| | | Pay | Free | Pay | Free | Indus- trial | |
| | | | | M cu. ft. | M cu. ft. | M cu. ft. | |
| OXFORD: | | | | | | | |
| East Oxford..... | 1,957 | 14 | ..... | 607 | ..... | ..... | 80c. (M.B. 50c.) |
| West Oxford..... | 1,796 | 53 | ..... | 2,144 | ..... | ..... | G |
| HALDYMAND: | | | | | | | |
| Canborough..... | 840 | 83 | 38 | 4,390 | 6,733 | 347 | 60c. |
| Dunn..... | 805 | 132 | 6 | 6,348 | 713 | ..... | 60c. |
| Moulton..... | 1,590 | 138 | 11 | 5,994 | 1,817 | ..... | 60c. |
| North Cayuga..... | 1,282 | 60 | 16 | 2,900 | 3,134 | ..... | 60c. |
| Oneida..... | 1,301 | 90 | 14 | 4,405 | 2,699 | ..... | 60c. |
| Rainham..... | 1,608 | 182 | 24 | 9,532 | 4,506 | 762 | 60c. |
| Seneca..... | 1,590 | 138 | 33 | 7,917 | 5,424 | ..... | 60c. |
| Sherbrooke..... | 350 | 26 | 3 | 1,909 | 646 | ..... | 60c. |
| South Cayuga..... | 580 | 54 | 14 | 1,933 | 2,546 | ..... | 60c. |
| Walpole..... | 3,145 | 342 | 54 | 17,634 | 8,416 | 183 | 60c. |
| LINCOLN: | | | | | | | |
| Caistor..... | 1,260 | 84 | 25 | 3,358 | 3,472 | 286 | 60c. |
| Gainsborough..... | 2,090 | 22 | 2 | 477 | 200 | ..... | 60c. |
| Grantham..... | 5,010 | 15 | ..... | 825 | ..... | ..... | 75c. |
| Louth..... | 2,905 | 13 | ..... | 715 | ..... | ..... | 75c. |
| WELLAND: | | | | | | | |
| Bertie..... | 4,175 | 152 | 61 | 8,207 | 9,330 | ..... | F |
| Crowland..... | 5,082 | 49 | 16 | 2,181 | 1,850 | ..... | F |
| Humberstone..... | 2,370 | 231 | 30 | 11,126 | 4,273 | ..... | F |
| Pelham..... | 2,690 | 78 | 2 | 4,278 | 267 | ..... | L |
| Stamford..... | 8,020 | 76 | 4 | 4,139 | 564 | ..... | F |
| Wainfleet..... | 2,720 | 171 | 18 | 4,233 | 2,986 | ..... | 60c. |
| Willoughby..... | 905 | 24 | 26 | 1,311 | 3,845 | ..... | F |
| WENTWORTH: | | | | | | | |
| Ancaster..... | 3,603 | 80 | ..... | 5,907 | ..... | ..... | 70c. (M.B. \$1.00) |
| Barton..... | 1,840 | 110 | ..... | 8,564 | ..... | ..... | 60c. |
| Binbrook..... | 1,080 | 95 | 22 | 6,462 | 3,438 | 396 | 60c. |
| East Flamborough..... | 3,705 | 53 | ..... | 3,445 | ..... | ..... | S |
| Glanford..... | 1,265 | 141 | 3 | 10,166 | 842 | 354 | 60c. |
| Saltfleet..... | 4,837 | 399 | ..... | 20,654 | ..... | ..... | M (M.B. 75c.) |
| WATERLOO: | | | | | | | |
| North Dumfries..... | 2,361 | 65 | ..... | 2,345 | ..... | ..... | 80c. (M.B. 50c.) |
| Waterloo..... | 7,591 | 5 | ..... | 316 | ..... | ..... | G |
| Total..... | | 8,459 | 656 | 537,928 | 128,360 | 94,107 | |

SUMMARY

| | M cu. ft. |
|---|-------------------|
| Total distribution to customers..... | 10,095,652 |
| Used by companies for all purposes..... | 43,230 |
| Used by private well-owners..... | 74,000 |
| Leakage in transmission lines..... | 198,369 |
| Leakage in distribution plants..... | 260,756 |
| Leakage in rural lines..... | 15,389 |
| Field operations: leakage in gathering and transmission lines to measuring stations (estimated)..... | 172,433 |
| Total amount of gas distributed..... | 10,859,829 |

Gas Wells and Their Production

Table V gives in tabular form the main items in connection with wells in the gas fields of Ontario. Similar tables have been published since 1921. These give a survey of the gas fields of Ontario and the progress of their development.

In 1937, the greatest activity was in the Brownsville field, where an intense drilling programme was carried out. Wells average nearly three million cubic feet open flow each. The field extends into the northwest part of Bayham township, Elgin county, making the third distinct gas field in this township, the other two being Vienna and Eden. The Vienna field is 27 years old and now nearly exhausted.

The Declute field is fairly well outlined on the east and west. It may yet extend to the north, although dry holes and small wells would indicate its present limit in that direction. To the south it undoubtedly extends under the waters of Lake Erie. This field has proved to be a major gas field, and though small in area, the wells are very large in open flow. The Brownsville discovery has encouraged drilling over a wide area.

The Haldimand field for the first time shows a decrease in the number of producing wells, as well as in the number of wells drilled in the year. The percentage of dry holes would indicate that the field has been almost completely drilled.

The Welland field is being given some attention after a period of many years when no wells were drilled.

Exploratory drilling is, as noted above, on the increase and great tracts of land have been leased in new territories. Much of this is not reported and not included in Table V.

The exploratory work being carried out in Chatham township is showing considerable success after the drilling of a number of dry holes. The success in the Brownsville field has encouraged exploratory drilling in East Nissouri, North Dorchester, Bayham, and Malahide townships, where new fields are being sought in the Guelph formation. Two wells in North Easthope township proved non-productive. Drilling north of the old Mersea oil and gas field in Tilbury North and West has been disappointing, as has been an attempt to enlarge the Dawn field. Drilling continues in two wells which have been drilled into the pre-Cambrian, one in Beverly township and one in Nassagaweya township. Some success has attended drilling in Prince Edward county in the town of Picton. These wells are very small in open flow and low in rock pressure.

Drilling rigs used solely in the search for natural gas in Ontario in 1937 number 65. Sixty-seven dry holes were drilled, with a total footage of 84,806 feet. One hundred and forty-four producing wells had a total footage of 141,859 feet; in all, 226,665 feet, as compared with 269,916 in 1936. Drilling contractors, who do all the drilling in Ontario, had an investment of \$352,145, employed 180 men, and paid \$133,519 in wages. These statistics are included with those in Table II.

| | | | | | | | | |
|----------------------------------|-------|-----|----|-----|-----------|------------|---------|-----------|
| Haldimand..... | 183 | 11 | 1 | 5 | 100 | 92 | 314,116 | 111,329 |
| Canborough..... | 51 | 14 | 2 | 2 | 37 | 185 | | |
| Dunn..... | 122 | 11 | 6 | 8 | 363 | 126 | | |
| Moulton..... | 206 | 3 | 1 | 3 | 260 | 193 | | |
| North Cayuga..... | 75 | 7 | 1 | 10 | 597 | 145 | | |
| Oneida..... | 297 | 3 | 1 | 1 | 37 | 224 | | |
| Rainham..... | 178 | 1 | 1 | 1 | 650 | 88 | | |
| Seneca..... | 16 | 2 | 12 | 15 | 1,784,257 | 129 | | |
| Sherbrooke..... | 58 | 7 | | | | 134 | | |
| South Cayuga..... | 428 | | | | | 246 | | |
| Walpole..... | | | | | | | | |
| Wentworth..... | 1 | | | | | 40 | | |
| Ancaster..... | 52 | | | | | 68 | | |
| Binbrook..... | 12 | | | | | 56 | | |
| Glanford..... | | | | | | | | |
| Lincoln..... | 62 | 3 | | 1 | 35 | 82 | | |
| Caistor..... | 13 | | | | | 125 | | |
| Gainsborough..... | | | | | | | | |
| Welland..... | 102 | 5 | 3 | 6 | 85 | 101 | | |
| Bertie..... | 26 | 3 | | 2 | 29 | 135 | | |
| Crowland..... | 56 | 1 | | | | 62 | | |
| Humberstone..... | 31 | | | 4 | 102 | 54 | | |
| Wainfleet..... | 42 | 1 | | | | 189 | | |
| Willoughby..... | | | | | | | | |
| Brant..... | 44 | 5 | | 4 | 86 | 70 | 47,030 | 4,245 |
| Onondaga..... | 78 | 8 | | 2 | 69 | 91 | | |
| Tuscarora..... | | | | | | | | |
| Bruce..... | 7 | | | | | 150 | 17,750 | 238 |
| Amabel..... | | | | | | 150 | | |
| Keppel..... | 1 | | | | | | | |
| Grey..... | | | | | | | | |
| Peel..... | | 5 | | | | | | |
| Caledon..... | | | | | | | | |
| Prince Edward..... | 1 | | | 1 | 19 | 73 | | |
| South Marysburgh..... | 4 | | | 4 | 147 | | | |
| Hallowell..... | | | | | | | | |
| Hastings..... | | | 2 | | | | | |
| Thurlow..... | | | | | | | | |
| Harwich..... | 69 | | | | | | | |
| Howard..... | | | | | | | | |
| Surface wells..... | | | | | | | | |
| Private wells ³ | 300 | | | | | | | |
| Total..... | 3,252 | 105 | 66 | 135 | 181,364 | 10,746,334 | 536,757 | \$310,289 |

¹The part of Bayham that with Dereham township forms the Brownsville field.

²Principally in Haldimand, Norfolk, and Welland counties.

³Estimated.

⁴This gas is not metered, and therefore must be estimated.

Leakage

The year 1937 shows one of the best records in the industry for a reduction of leakage in gas distribution plants, transmission lines, and rural lines. The decrease is over 50 per cent. It has been noted under this heading in 1935 and 1936 that increases and decreases in leakage follow in inverse ratio the number of employees and the wages paid. The record for the year 1937 emphasizes these remarks, with the exception that the decrease in leakage is much greater than the increase in wages paid.

The method of discovering leaks has undergone a considerable change in ten years. Leaks were reported in the past by citizens or by the company's workmen, who noted a smell of gas at a certain point or that the grass was dead or the



Connecting the master gate valve on a large gas well in the Brownsville field. One man is "riding" while two men screw the valve to the well head.

soil blackened. A consumer would report the presence of gas in his basement or the sound of gas leaking from a pipe. At the present time, most gas companies employ an engineer and a crew of men who spend their full time in tracing leaks and making leakage surveys. Instruments have been devised to assist the engineer. In operation a perforated pipe is driven into the ground and the leak detector is attached to the open end. The presence of gas is indicated by the movement of a needle over a dial. As a result of such surveys and the replacement of corroded and leaky pipes by new and larger pipes, the reduction in leakage has been effected.

It will be noted that a number of municipalities that were included in this table in 1936 have been left off the list in Table VII. These are Belle River, Brantford, Chatham, Comber, Essex, Hagersville, Ingersoll, and St. George. In these places instead of selling less gas than was measured into the plant, more gas was sold, indicating a gain instead of a loss. In spite of repeated search and study, no definite explanation can be offered for this result.

TABLE VI—LEAKAGE ON RURAL LINES, 1937

| 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 |
| Chatham..... | 4,656 | M cu. ft. 2,249 | M cu. ft. 2,104 | M cu. ft. 145 | M cu. ft. 176 | 40 | cu. ft. 3,625 | ozs. 5 | lbs. 3 |
| Dawn..... | 13,581 | 2,676 | 2,025 | 651 | 514 | 17 | 38,294 | 12 | 8 |
| Dover..... | 85,708 | 29,827 | 26,786 | 2,741 | 3,246 | 293 | 9,355 | 5 | 8 |
| Enniskillen..... | 10,173 | 2,472 | 2,151 | 321 | 386 | 39 | 8,231 | 6 | 5 |
| Harwich..... | 102,851 | 32,074 | 28,237 | 3,837 | 3,896 | 438 | 8,760 | 5 | 5 |
| Howard..... | 18,905 | 4,835 | 4,798 | 37 | 716 | 63 | 587 | 5 | 5 |
| Moore..... | 11,214 | 2,509 | 2,439 | 70 | 425 | 56 | 1,250 | 5 | 7 |
| Raleigh..... | 143,811 | 36,565 | 34,045 | 2,520 | 5,447 | 346 | 7,283 | 5 | 5 |
| Raleigh (Blake system)..... | 32,314 | 6,322 | 3,823 | 2,699 | 1,224 | 78 | 35,884 | 4 | ..... |
| Rochester..... | 34,983 | 15,457 | 14,659 | 798 | 1,325 | 146 | 5,465 | 5 | 18 |
| Sandwich East..... | 2,386 | 333 | 315 | 18 | 91 | 6 | 3,000 | ..... | 5 |
| Sandwich South..... | 21,779 | 2,614 | 2,323 | 291 | 825 | 26 | 11,192 | ..... | 6 |
| Sombr..... | 2,052 | 628 | 623 | 5 | 78 | 12 | 4,166 | 5 | ..... |
| Tilbury East..... | 53,558 | 28,329 | 27,073 | 1,256 | 2,029 | 181 | 6,939 | 5 | 8 |
| Total..... | 537,971 | 166,790 | 151,401 | 15,389 | 20,378 | 1,741 | ..... | ..... | ..... |

TABLE VII—LEAKAGE IN DISTRIBUTION PLANTS, 1937

| Cities and towns | Company | Equivalent miles of 3-inch pipe in distribu- tion plants | Volume received M cu. ft. | Volume delivered M cu. ft. | Leakage for year | | Average No. of consumers | Leakage per consumer cu. ft. | Pressure distribution plants, per ounces per sq. in. |
|-------------------------|------------------------------|--|-------------------------------------|--------------------------------------|------------------|-----------|--------------------------------|---|---|
| | | | | | Actual | Allowable | | | |
| Alvinston..... | Union Gas Co..... | 6.06 | 12,190 | 11,870 | 320 | 1,212 | 222 | 1,441 | 5 |
| Appin..... | Union Gas Co..... | .9 | 2,121 | 2,118 | 3 | 180 | 38 | 79 | 5 |
| Belmont..... | Ontario Salt Co..... | 6 | 4,797 | 3,454 | 1,343 | 1,200 | 115 | 11,681 | 5 |
| Blenheim..... | Union Gas Co..... | 13.02 | 62,819 | 60,364 | 2,455 | 2,604 | 625 | 3,928 | 5 |
| Bothwell..... | Union Gas Co..... | 5.46 | 11,511 | 11,417 | 94 | 1,092 | 170 | 553 | 5 |
| Brigden..... | Union Gas Co..... | 3.9 | 10,805 | 10,494 | 311 | 780 | 158 | 1,968 | 5 |
| Cainsville..... | Dominion Natural Gas Co..... | 5.57 | 10,990 | 9,028 | 1,962 | 1,114 | 176 | 11,147 | 4 |
| Corunna..... | Union Gas Co..... | 5.34 | 10,075 | 9,472 | 603 | 1,068 | 254 | 2,374 | 4 |
| Courtright..... | Union Gas Co..... | 4.26 | 7,103 | 6,433 | 670 | 852 | 153 | 4,379 | 6 |
| Dorchester..... | Southern Ontario Gas Co..... | 2.86 | 8,163 | 7,408 | 755 | 572 | 123 | 6,138 | 5 |
| Dresden..... | Union Gas Co..... | 12.36 | 45,787 | 44,048 | 1,739 | 2,472 | 545 | 3,191 | 4 |
| Dundas..... | Dominion Natural Gas Co..... | 12.68 | 65,265 | 59,016 | 6,249 | 2,536 | 1,091 | 5,727 | 4 |
| Dunnville..... | Dominion Natural Gas Co..... | 13.87 | 98,397 | 96,970 | 1,427 | 2,774 | 1,057 | 1,350 | 4 |
| Fenwick..... | Dominion Natural Gas Co..... | 1.51 | 6,275 | 5,610 | 665 | 302 | 117 | 5,683 | 4 |
| Fonthill..... | Fonthill Gas Co..... | 5.33 | 8,550 | 6,755 | 1,795 | 1,066 | 266 | 6,748 | 5 |
| Galt, Preston, Hespeler | Dominion Natural Gas Co..... | 76.24 | 255,094 | 244,157 | 10,937 | 15,248 | 4,053 | 2,699 | 4 |
| Hamilton..... | United Gas Co..... | 127 | 122,136 | 108,497 | 13,639 | 25,400 | 3,098 | 4,403 | 4 |
| Inwood..... | Union Gas Co..... | 2.1 | 4,291 | 4,249 | 42 | 420 | 87 | 483 | 5 |
| Kingsville..... | Southern Ontario Gas Co..... | 13.49 | 69,445 | 65,621 | 3,824 | 2,698 | 673 | 5,682 | 4 |
| Leamington..... | Leamington Corporation..... | 25.47 | 186,900 | 165,790 | 21,110 | 5,094 | 1,429 | 14,772 | 8 |
| London..... | City Gas Co..... | 257.49 | 1,713,133 | 1,641,733 | 71,400 | 51,498 | 15,220 | 4,691 | 6 |
| Merlin..... | Union Gas Co..... | 2.64 | 18,745 | 18,507 | 238 | 528 | 156 | 1,526 | 4 |
| Mount Hamilton..... | Dominion Natural Gas Co..... | 22.91 | 57,173 | 51,384 | 5,789 | 4,582 | 1,293 | 4,477 | 4 |
| Paris..... | Dominion Natural Gas Co..... | 14.92 | 48,577 | 47,759 | 818 | 2,984 | 966 | 846 | 4 |
| Petrolia..... | Union Gas Co..... | 16.2 | 78,801 | 71,141 | 7,660 | 3,240 | 800 | 9,575 | 6 |
| Port Burwell..... | Dominion Natural Gas Co..... | 3.84 | 7,542 | 6,060 | 1,482 | 768 | 137 | 10,818 | 4 |
| Port Lambton..... | Union Gas Co..... | 2.04 | 4,746 | 4,425 | 321 | 408 | 76 | 4,223 | 5 |
| Ridgetown..... | Union Gas Co..... | 17.82 | 63,229 | 61,096 | 2,133 | 3,564 | 664 | 3,212 | 5 |
| St. Catharines..... | Dominion Natural Gas Co..... | 68.8 | 386,056 | 377,879 | 8,177 | 13,760 | 6,360 | 1,286 | 4 |
| Sarnia..... | Union Gas Co..... | 77.04 | 351,582 | 334,140 | 17,442 | 15,408 | 5,372 | 3,247 | 5 |
| Shedden-Pingal..... | Southern Ontario Gas Co..... | 6.11 | 11,157 | 8,657 | 2,500 | 1,222 | 135 | 18,518 | 4 |
| Simcoe..... | Dominion Natural Gas Co..... | 29.69 | 199,285 | 196,573 | 2,712 | 5,938 | 1,968 | 1,378 | 4 |
| Sombra..... | Union Gas Co..... | 2.64 | 7,869 | 7,217 | 652 | 528 | 86 | 7,581 | 5 |
| South London..... | Southern Ontario Gas Co..... | 8.87 | 34,242 | 32,283 | 1,959 | 1,774 | 234 | 8,371 | 4 |

| | | | | | | | | |
|------------------------------|----------|-----------|-----------|---------|---------|--------|-------|-------|
| Stratfordville..... | 1.39 | 7,803 | 7,061 | 742 | 278 | 99 | 7,494 | 4 |
| Thorold..... | 13.19 | 44,815 | 42,485 | 2,330 | 2,638 | 1,100 | 2,118 | 4 |
| Tilbury..... | 9.24 | 54,058 | 53,413 | 645 | 1,848 | 596 | 1,082 | 5 |
| Tilsonburg..... | 23.49 | 93,612 | 92,826 | 786 | 4,698 | 1,193 | 659 | 4 |
| Vienna..... | 1.04 | 1,898 | 1,250 | 648 | 208 | 73 | 8,876 | 4 |
| Wallaceburg..... | 23.64 | 118,080 | 117,310 | 770 | 4,728 | 1,296 | 594 | 5 |
| West Hamilton..... | 3.81 | 9,974 | 8,900 | 1,074 | 762 | 275 | 3,905 | 4 |
| Wheatley..... | 3.46 | 19,664 | 18,012 | 1,652 | 692 | 225 | 7,342 | 4 |
| Windsor (Border Cities)..... | 483.78 | 1,737,280 | 1,689,503 | 47,777 | 96,756 | 19,548 | 2,444 | 4 |
| Woodstock..... | 48.45 | 131,481 | 120,883 | 10,798 | 9,690 | 2,432 | 4,440 | 4 |
| Wyoming..... | 5.1 | 10,147 | 9,839 | 308 | 1,020 | 165 | 1,867 | 5 |
| Total..... | 1,491.02 | 6,213,663 | 5,952,907 | 260,756 | 298,204 | 74,919 | ..... | ..... |

TABLE VIII—LEAKAGE IN TRANSMISSION LINES, 1937

| Transmission lines | Size of pipe line | Equivalent miles of 3-in. pipe | Volume received | Volume delivered | Actual leakage | Average pressure on pipe lines |
|---------------------------------------|----------------------|--------------------------------|------------------------|------------------------|---------------------|--------------------------------|
| Gas field to Sarnia and Petrolia..... | 6-, 8-, 10-, 12-inch | 383.52 | M cu. ft. 1,988,980 | M cu. ft. 1,651,597 | M cu. ft. 37,383 | lbs. per sq. in. 40-80 |
| Leamington to Hamilton..... | 8-, 10-, 12-inch | 710.05 | 2,079,437 | 1,993,091 | 86,346 | 75 |
| Gas field to Ridgetown..... | 6-, 8-inch | 81.60 | 234,451 | 201,646 | 32,805 | 25-80 |
| Gas field to Bothwell..... | 4-, 6-inch | 32.04 | 47,699 | 43,508 | 4,191 | 30-50 |
| Gas field to Hamilton..... | 8-inch | 58.32 | 155,301 | 142,420 | 12,881 | 30-50 |
| Dunnville to St. Catharines..... | 8-inch | 57.01 | 439,169 | 414,406 | 24,763 | 50 |
| Total ¹..... | ..... | 1,322.54 | 4,645,037 | 4,446,668 | 198,369 | ..... |

¹In addition to the above the Dominion Natural Gas Company estimate the leakage in their field operations (gathering lines and transmission lines from their wells to the measuring stations) to be 172,433 M cubic feet.

Licenses Issued in 1937

The Natural Gas Conservation Act, R.S.O., 1937, The Well Drillers' Act, R.S.O., 1937, and the Regulations made under these Acts require that the several operations carried out shall be done under license. Tables IX to XIII show a list of those to whom licenses were issued during 1937. The licenses required under the above Acts and the cost of each are as follows:—

| | |
|--|--------|
| To Lease and Prospect for Natural Gas..... | \$5.00 |
| To Drill or Bore for Natural Gas or Oil..... | 5.00 |
| To Produce Natural Gas..... | 10.00 |
| To Distribute Natural Gas..... | 10.00 |
| To Operate Natural Gas Pipe-Lines..... | 10.00 |

TABLE IX—OPERATORS LICENSED TO LEASE AND PROSPECT FOR NATURAL GAS, 1937

| License No. | Name | Address |
|-------------|--------------------------------------|--------------------|
| 941 | Adams, L. W..... | London, Ont. |
| 923 | Ajax Oil and Gas Co., Ltd..... | Toronto, Ont. |
| 972 | Albert, Maurice..... | Detroit, Mich. |
| 987 | Ament, W. G..... | Brussels, Ont. |
| 992 | Barber, Clare..... | Montrose, Mich. |
| 933 | Beattie, James A..... | Glencoe, Ont. |
| 928 | Begin, K..... | Chatham, Ont. |
| 932 | Bornman, B. D..... | Flint, Mich. |
| 981 | Buffalo Drilling Co., Ltd..... | Buffalo, N. Y. |
| 982 | Burchell, F. W..... | Brussels, Ont. |
| 985 | Coates, Wm. A..... | Springfield, Ont. |
| 950 | Connor, D. H..... | Aylmer, Ont. |
| 976 | Coronation Gas Syndicate..... | Stevensville, Ont. |
| 913 | Coste, L. A..... | Chatham, Ont. |
| 1008 | Craig, Donaldson..... | Detroit, Mich. |
| 954 | Culver, Gordon..... | Tillsonburg, Ont. |
| 935 | Daly, G. A..... | Tupperville, Ont. |
| 967 | Darroch, James A..... | Cainsville, Ont. |
| 989 | Dereham Gas and Oil Co., Ltd..... | Toronto, Ont. |
| 1049 | Domestic Natural Gas Co., Ltd..... | Toronto, Ont. |
| 959 | Doran, Benjamin..... | Meaford, Ont. |
| 971 | Early, John J..... | Chatham, Ont. |
| 998 | Eby and Fretz..... | Stevensville, Ont. |
| 921 | Fitzpatrick and Groschner..... | Detroit, Mich. |
| 978 | Fitzpatrick, Patrick H..... | Detroit, Mich. |
| 997 | Foley, E., and Associates..... | Detroit, Mich. |
| 968 | Freeman, George..... | Toronto, Ont. |
| 969 | Gidley, Wm. G..... | Leamington, Ont. |
| 931 | Gillis, Arthur..... | Selkirk, Ont. |
| 930 | Gray, Ira..... | Merlin, Ont. |
| 948 | Haldimand Natural Gas Syndicate..... | Stevensville, Ont. |
| 918 | Hambly, Frank R..... | Strathroy, Ont. |
| 991 | Hanley and Bird..... | Bradford, Pa. |
| 958 | Hoover, A. E..... | Selkirk, Ont. |
| 990 | House, Charles C..... | Stevensville, Ont. |
| 929 | Howard, W. C..... | Leamington, Ont. |
| 980 | Jackson, E. E..... | Vienna, Ont. |
| 922 | Jaspersen, Bon..... | Kingsville, Ont. |
| 983 | Jenkins, Stanley S..... | Buffalo, N. Y. |
| 951 | Kiff, William R..... | Leamington, Ont. |
| 1004 | Kingway Oil, Ltd..... | Chatham, Ont. |
| 924 | Leask, David C..... | Toronto, Ont. |
| 945 | Lincoln Gas Co., Ltd..... | Toronto, Ont. |
| 944 | Lymburner Bros. and Webber..... | Dunnville, Ont. |
| 927 | McConnell, Henry..... | Picton, Ont. |
| 953 | McGill, J..... | Bothwell, Ont. |
| 921 | McGuigan, Virgil G..... | Stoney Creek, Ont. |
| 934 | McKillop, Wm..... | Hepworth, Ont. |
| 952 | McNinch, S. E..... | Canborough, Ont. |

TABLE IX—OPERATORS LICENSED TO LEASE AND PROSPECT FOR
NATURAL GAS, 1937—Continued

| License No. | Name | Address |
|-------------|-----------------------------------|--------------------|
| 966 | MacIntosh, F. R..... | Petrolia, Ont. |
| 962 | Medina Natural Gas Co., Ltd..... | Chatham, Ont. |
| 994 | Midfield Gas Corp., Ltd..... | Toronto, Ont. |
| 936 | Morris, George..... | Merlin, Ont. |
| 916 | Neath, Charles..... | Chatham, Ont. |
| 946 | Nelson, A. R..... | Detroit, Mich. |
| 976 | Newcombe, J. W..... | Detroit, Mich. |
| 961 | Nottawa Oil and Gas Co., Ltd..... | Toronto, Ont. |
| 919 | Osborne, E..... | Toronto, Ont. |
| 1003 | Pure Gas and Oil Co., Ltd..... | Chatham, Ont. |
| 979 | Rawlings, Frank..... | Chatham, Ont. |
| 955 | Rawlings, George H..... | Chatham, Ont. |
| 957 | Reicheld, F. W..... | Jarvis, Ont. |
| 943 | Reicheld, O. E..... | Fisherville, Ont. |
| 1001 | Roberts, J. R..... | Windsor, Ont. |
| 940 | Rockton Oil and Gas Co., Ltd..... | Dundas, Ont. |
| 964 | Rodgers, A. L..... | Tillsonburg, Ont. |
| 1006 | Roth, Elmer A..... | Dearborn, Mich. |
| 915 | Sadlier, L. A..... | Chatham, Ont. |
| 914 | Scullard, Fred B..... | Chatham, Ont. |
| 960 | Siegner, F. W..... | Tavistock, Ont. |
| 1000 | Simpson, C. A..... | Simcoe, Ont. |
| 975 | Smiley, Thos..... | Blackheath, Ont. |
| 995 | Smith, Harry B..... | Windsor, Ont. |
| 937 | Smith, Luke..... | Chatham, Ont. |
| 977 | Sovereign, Herb..... | Toronto, Ont. |
| 970 | Sprague, Louis E..... | London, Ont. |
| 947 | Stewart, Elgin..... | Jarvis, Ont. |
| 1002 | Topp, Nathan E..... | Cayuga, Ont. |
| 938 | Treleaven, A..... | London, Ont. |
| 984 | Turnbull, Gordon..... | Corinth, Ont. |
| 988 | Urquhart, D. A..... | Chatham, Ont. |
| 999 | Van Antwerp, William L..... | Port Huron, Mich. |
| 974 | Von Berg, John..... | Detroit, Mich. |
| 1007 | Waymire, Art..... | Detroit, Mich. |
| 949 | Welland County Gas Syndicate..... | Stevensville, Ont. |
| 917 | Willits, D. E..... | Chatham, Ont. |
| 1005 | Willits, G. E..... | Bothwell, Ont. |
| 956 | Wilson, Bert..... | Sarnia, Ont. |
| 920 | Wilson, E..... | Toronto, Ont. |
| 973 | Wood, D. H..... | Port Huron, Mich. |
| 965 | Wood, D. Ray..... | Detroit, Mich. |
| 925 | Woodhouse, Henry..... | Toronto, Ont. |

TABLE X—OPERATORS LICENSED TO DRILL OR BORE FOR
NATURAL GAS, 1937

| License No. | Name | Address |
|-------------|-------------------------------------|-------------------|
| 830 | Ajax Oil and Gas Co., Ltd..... | Toronto, Ont. |
| 784 | Allen, A. J..... | Dunnville, Ont. |
| 800 | Belleville Aqua Vitae Co., Ltd..... | Belleville, Ont. |
| 776 | Culver, W. H., Jr..... | Dunnville, Ont. |
| 777 | Culver, W. H., Jr..... | Dunnville, Ont. |
| 778 | Culver, W. H., Jr..... | Dunnville, Ont. |
| 842 | Evans, Harry L..... | Brownsville, Ont. |
| 843 | Evans, Harry L..... | Brownsville, Ont. |
| 828 | Glenney, Daniel..... | Dunnville, Ont. |
| 832 | Goit, Lorne R..... | Dunnville, Ont. |
| 806 | Graves, Isaac S..... | Minesing, Ont. |
| 822 | Gregory, Geo. F., and Son..... | Petrolia, Ont. |

TABLE X—OPERATORS LICENSED TO DRILL OR BORE FOR
NATURAL GAS, 1937—*Continued*

| License No. | Name | Address |
|-------------|---------------------------------------|--------------------|
| 823 | Gregory, Geo. F., and Son..... | Petrolia, Ont. |
| 779 | Heal, A. A..... | Corunna, Ont. |
| 820 | High Grade Natural Gas Co., Ltd..... | Chatham, Ont. |
| 821 | High Grade Natural Gas Co., Ltd..... | Chatham, Ont. |
| 814 | Hoover, A. E..... | Selkirk, Ont. |
| 815 | Hoover, A. E..... | Selkirk, Ont. |
| 833 | House, Charles C..... | Stevensville, Ont. |
| 781 | Hussey, W. J..... | Petrolia, Ont. |
| 841 | Hussey, W. J..... | Petrolia, Ont. |
| 791 | Jackson, Percy L..... | Dunnville, Ont. |
| 792 | Jackson, Percy L..... | Dunnville, Ont. |
| 793 | Jackson, Percy L..... | Dunnville, Ont. |
| 794 | Jackson, Percy L..... | Dunnville, Ont. |
| 795 | Jackson, Percy L..... | Dunnville, Ont. |
| 796 | Jackson, Percy L..... | Dunnville, Ont. |
| 780 | Jaspersen, Bon..... | Kingsville, Ont. |
| 804 | Kells, E. E..... | Petrolia, Ont. |
| 835 | Kidd, L. W..... | Toronto, Ont. |
| 787 | Kiser Bros..... | Chatham, Ont. |
| 788 | Kiser Bros..... | Chatham, Ont. |
| 789 | Kiser Bros..... | Chatham, Ont. |
| 790 | Kiser Bros..... | Chatham, Ont. |
| 809 | Lauer, D. G..... | Tillsonburg, Ont. |
| 810 | Lauer, D. G..... | Tillsonburg, Ont. |
| 803 | Lincoln Gas Co., Ltd..... | Toronto, Ont. |
| 802 | Lymburner Bros. and Webber..... | Dunnville, Ont. |
| 819 | McCutcheon, Thos. J..... | Dunnville, Ont. |
| 837 | McCutcheon, Thos. J..... | Dunnville, Ont. |
| 769 | McKechnie, S..... | Dunnville, Ont. |
| 770 | McKechnie, S..... | Dunnville, Ont. |
| 771 | McKechnie, S..... | Dunnville, Ont. |
| 772 | McKechnie, S..... | Dunnville, Ont. |
| 773 | McKechnie, S..... | Dunnville, Ont. |
| 774 | McKechnie, S..... | Dunnville, Ont. |
| 775 | McKechnie, S..... | Dunnville, Ont. |
| 786 | McKillop, Wm..... | Hepworth, Ont. |
| 816 | McNamara Construction Co., Ltd..... | Toronto, Ont. |
| 799 | McNinch, S. E..... | Canborough, Ont. |
| 805 | Nelson, A. R..... | Detroit, Mich. |
| 817 | Nicholls, Jack..... | Pelee Island, Ont. |
| 834 | Ogletree, F. A..... | Sarnia, Ont. |
| 829 | Pelee Island Petroleum Synd. Inc..... | Detroit, Mich. |
| 826 | Perkins, J. E..... | Dunnville, Ont. |
| 836 | Prairie Gas and Oil Co., Ltd..... | Toronto, Ont. |
| 785 | Ricker, Arthur..... | Canborough, Ont. |
| 801 | Rockton Oil and Gas Co., Ltd..... | Dundas, Ont. |
| 831 | Roth Bros..... | Fisherville, Ont. |
| 827 | Rowe, E. P..... | Toronto, Ont. |
| 782 | Smith and Ehde..... | Lowbanks, Ont. |
| 783 | Smith and Ehde..... | Lowbanks, Ont. |
| 808 | Sparling, Harold..... | Port Franks, Ont. |
| 807 | Stewart, Elgin..... | Jarvis, Ont. |
| 811 | Stover and Rawlings..... | Chatham, Ont. |
| 812 | Stover and Rawlings..... | Chatham, Ont. |
| 813 | Stover and Rawlings..... | Chatham, Ont. |
| 768 | Stubble, H. H..... | Chatham, Ont. |
| 767 | Union Gas Company of Canada, Ltd..... | Chatham, Ont. |
| 797 | Walter Gas Syndicate, Ltd..... | Buffalo, N.Y. |
| 838 | Willits, G. E..... | Bothwell, Ont. |
| 839 | Willits, G. E..... | Bothwell, Ont. |
| 840 | Willits, G. E..... | Bothwell, Ont. |
| 818 | Wilson, Bert..... | Sarnia, Ont. |
| 798 | Windover, Wm..... | Sarnia, Ont. |
| 825 | Wood, D. H..... | Port Huron, Mich. |

TABLE XI—OPERATORS LICENSED TO PRODUCE NATURAL GAS, 1937

| License No. | Name | Address |
|-------------|--|----------------------|
| 948 | Acme Gas and Oil Co., Ltd. | Toronto, Ont. |
| 946 | Ajax Oil and Gas Co., Ltd. | Toronto, Ont. |
| 1007 | Barnhart, Mrs. E. L. | Stevensville, Ont. |
| 994 | Broadway Gas Syndicate | Jarvis, Ont. |
| 968 | Buck, C. S. | Port Rowan, Ont. |
| 1013 | Buffalo Drilling Co., Ltd. | Buffalo, N.Y. |
| 1053 | Burchell Natural Gas and Oil Syndicate | Toronto, Ont. |
| 969 | Canadian Natural Gas Syndicate | Simcoe, Ont. |
| 996 | Canfield Gas Syndicate | Detroit, Mich. |
| 1010 | Canfield Natural Gas Co., Ltd. | Canfield, Ont. |
| 1098 | Cartwright, Sydney E. | Toronto, Ont. |
| 1000 | Central Pipe Line Co., Ltd. | Chatham, Ont. |
| 1002 | Central Seneca Gas Syndicate | Cayuga, Ont. |
| 1014 | Colonial Natural Gas and Oil Co., Ltd. | Stoney Creek, Ont. |
| 975 | Columbia Natural Gas and Oil Co., Ltd. | Hamilton, Ont. |
| 938 | Comins, Harry M. | Flint, Mich. |
| 1119 | Continental Gas Corp., Ltd. | Goderich, Ont. |
| 944 | Culver, W. H., Jr. | Dunnville, Ont. |
| 1003 | Delhi Gas Syndicate | Cayuga, Ont. |
| 1076 | Domestic Natural Gas Co., Ltd. | Toronto, Ont. |
| 955 | Dominion Natural Gas Co., Ltd. | Buffalo, N.Y. |
| 997 | Dunnville-Detroit Gas Syndicate | Detroit, Mich. |
| 1081 | Economy Natural Gas Syndicate | Stratford, Ont. |
| 1069 | Emerald Gas Syndicate | Toronto, Ont. |
| 1020 | Emerson, Harry L. | Dunnville, Ont. |
| 1122 | Empire Natural Gas Ltd. | Toronto, Ont. |
| 959 | Erie Gas Ltd. | Toronto, Ont. |
| 1114 | Esmond Avery and Associates Syndicate | Detroit, Mich. |
| 1009 | Fisherville Gas Co. | Fisherville, Ont. |
| 995 | Gas Producers Syndicate | Detroit, Mich. |
| 942 | Gazzo Natural Gas Ltd. | Toronto, Ont. |
| 1103 | Gifford, Arthur W. | Cayuga, Ont. |
| 1107 | Glenney, Daniel | Dunnville, Ont. |
| 1011 | Grand River Gas and Oil Syndicate | Canfield, Ont. |
| 989 | Grimsby Natural Gas Co., Ltd. | Grimsby, Ont. |
| 1004 | Haldimand Gas Syndicate | Cayuga, Ont. |
| 978 | Haldimand Natural Gas Syndicate | Stevensville, Ont. |
| 1116 | Hartzell, Stone, Thurber, Hartzell and Avery, Minnicog Gas Co. | Detroit, Mich. |
| 1124 | Hiawatha Gas and Oil Co. | Hagersville, Ont. |
| 1001 | Highbank Oil, Ltd. | Chatham, Ont. |
| 981 | Hope Gas Syndicate | St. Catharines, Ont. |
| 980 | House, Charles C. | Stevensville, Ont. |
| 993 | Ideal Gas Syndicate | Fisherville, Ont. |
| 962 | Jackson, Percy L. | Dunnville, Ont. |
| 945 | Jasperson, Bon. | Kingsville, Ont. |
| 1015 | Jenkins, Stanley S. | Buffalo, N.Y. |
| 977 | Kelly Gas and Oil Syndicate | Toronto, Ont. |
| 990 | Ladd-Knight | Detroit, Mich. |
| 513 | Lincoln Gas Co., Ltd. | Toronto, Ont. |
| 987 | Lindsay, Wm. Bethune, Estate | Edmonton, Alta. |
| 974 | Lymburner Bros. and Webber | Dunnville, Ont. |
| 1074 | Lynn Valley Gas and Oil, Ltd. | Waterloo, Ont. |
| 1088 | McKechnie and Hussey | Dunnville, Ont. |
| 1096 | Melrose Gas and Oil Syndicate | Toronto, Ont. |
| 960 | Middleton-Norfolk Gas Co., Ltd. | Stratford, Ont. |
| 1016 | Midfield Gas Corp., Ltd. | Toronto, Ont. |
| 950 | Midwal Oil and Gas Co., Ltd. | Toronto, Ont. |
| 963 | Mohawk Gas and Oil Syndicate | Hamilton, Ont. |
| 986 | Monarch Gas and Oil Syndicate | Fisherville, Ont. |
| 998 | National Gas Syndicate | Dunnville, Ont. |
| 1017 | New Tillsonburg Oil and Gas Co., Ltd. | Toronto, Ont. |
| 1079 | Niagara Natural Gas Co., Ltd. | Buffalo, N.Y. |
| 964 | Niece, Elmond | Lowbanks, Ont. |
| 982 | Norhal Gas and Oil, Ltd. | Hamilton, Ont. |

TABLE XI—OPERATORS LICENSED TO PRODUCE NATURAL GAS, 1937—*Continued*

| License No. | Name | Address |
|-------------|---|-----------------------|
| 940 | North Cayuga Gas Syndicate..... | Cayuga, Ont. |
| 943 | North Shore Gas Co..... | Selkirk, Ont. |
| 999 | Nottawa Oil and Gas Co., Ltd..... | Toronto, Ont. |
| 952 | Petrol Oil and Gas Co., Ltd..... | Toronto, Ont. |
| 949 | Provincial Gas Co., Ltd..... | Fort Erie North, Ont. |
| 1005 | Rainham Gas Syndicate..... | Cayuga, Ont. |
| 991 | Reicheld, F. W..... | Jarvis, Ont. |
| 953 | Ricker, Arthur..... | Canborough, Ont. |
| 972 | Riley, J. V..... | Simcoe, Ont. |
| 1012 | Roth Bros..... | Fisherville, Ont. |
| 961 | Salina Gas Co., Ltd..... | Chatham, Ont. |
| 985 | Sandusk Gas Syndicate..... | Fisherville, Ont. |
| 1092 | Sarnia Oil and Gas Co., Ltd..... | Toronto, Ont. |
| 951 | Smith and Ehde..... | Lowbanks, Ont. |
| 954 | Southern Ontario Gas Co., Ltd..... | Buffalo, N.Y. |
| 970 | Springvale Gas and Oil Co., Ltd..... | Hagersville, Ont. |
| 983 | Standard Gas and Oil Syndicate..... | Fisherville, Ont. |
| 973 | Sterling Gas Co., Ltd..... | Guelph, Ont. |
| 956 | Stevensville Natural Gas and Fuel Co..... | Stevensville, Ont. |
| 976 | Stewart, Elgin..... | Jarvis, Ont. |
| 992 | Superior Gas Syndicate..... | Fisherville, Ont. |
| 984 | Sweets Corners Gas Syndicate..... | Fisherville, Ont. |
| 967 | Tanner, F. O..... | Detroit, Mich. |
| 957 | Turkey Point Co., Ltd..... | Simcoe, Ont. |
| 941 | Union Gas Company of Canada, Ltd..... | Chatham, Ont. |
| 958 | Victoria Gas Co..... | Dunnville, Ont. |
| 1006 | Walpole Gas Syndicate..... | Cayuga, Ont. |
| 966 | Walter Gas Syndicate..... | Buffalo, N. Y. |
| 979 | Welland County Gas Syndicate..... | Stevensville, Ont. |
| 1077 | Western Ontario Natural Gas Co., Ltd..... | Dunnville, Ont. |
| 970 | W. C. Patterson Gas Co., Ltd..... | Jamestown, N.Y. |

TABLE XII—OPERATORS LICENSED TO DISTRIBUTE NATURAL GAS, 1937

| License No. | Name | Address |
|-------------|---|-----------------------|
| 520 | Canfield Natural Gas Co., Ltd..... | Canfield, Ont. |
| 518 | Central Pipe Line Co., Ltd..... | Chatham, Ont. |
| 505 | City Gas Co. of London..... | London, Ont. |
| 510 | Dominion Natural Gas Co., Ltd..... | Buffalo, N.Y. |
| 519 | Fisherville Gas Co..... | Fisherville, Ont. |
| 516 | Grimsby Natural Gas Co., Ltd..... | Grimsby, Ont. |
| 535 | Jasperson, Bon..... | Kingsville, Ont. |
| 539 | Leamington, Town of..... | Leamington, Ont. |
| 509 | Manufacturers Natural Gas Co., Ltd..... | Buffalo, N.Y. |
| 521 | Midfield Gas Corp., Ltd..... | Toronto, Ont. |
| 517 | Nottawa Pipe Line Co., Ltd..... | Toronto, Ont. |
| 511 | Oil Springs Oil and Gas Co., Ltd..... | Oil Springs, Ont. |
| 541 | Ontario Salt Co..... | Windsor, Ont. |
| 507 | Provincial Gas Co., Ltd..... | Fort Erie North, Ont. |
| 508 | Southern Ontario Gas Co., Ltd..... | Buffalo, N.Y. |
| 512 | Springvale Gas and Oil Co., Ltd..... | Hagersville, Ont. |
| 502 | Union Gas Co. of Canada, Ltd..... | Chatham, Ont. |
| 506 | United Gas and Fuel Co. of Hamilton, Ltd..... | Hamilton, Ont. |
| 537 | Western Ontario Natural Gas Co., Ltd..... | Dunnville, Ont. |
| 504 | Windsor Gas Co., Ltd..... | Windsor, Ont. |

TABLE XIII—OPERATORS LICENSED TO OPERATE PIPE LINES, 1937

| License No. | Name | Address |
|-------------|------------------------------------|---------------|
| 102 | Central Pipe Line Co., Ltd..... | Chatham, Ont. |
| 101 | Dominion Natural Gas Co., Ltd..... | Buffalo, N.Y. |
| 100 | Southern Ontario Gas Co., Ltd..... | Buffalo, N.Y. |
| 107 | Union Gas Co. of Canada, Ltd..... | Chatham, Ont. |

Logs of Wells

The logs of gas and oil wells drilled in 1937, as given by the drillers, will be found on the pages following. All information regarding water horizons and gas and oil horizons is given. At the request of companies doing exploratory drilling the open flow of gas wells is not given. Samples of drill cuttings from representative wells throughout the province are available to the public.

ABBREVIATIONS

| | |
|-------------|---------------------------|
| Con..... | Concession. |
| E. ½..... | East half. |
| E.B.R..... | East of Baldoon Road. |
| E.F.C..... | East of Fairchild creek. |
| F.C..... | Front concession. |
| N..... | North. |
| N. ½..... | North half. |
| N.E..... | Northeast. |
| N.E. ¼..... | Northeast quarter. |
| N.M.R..... | North of the Middle Road. |
| N.T.R..... | North of Talbot Road. |
| N.W. ¼..... | Northwest quarter. |
| Pt..... | Part. |
| R.R..... | River Range. |
| S. ½..... | South half. |
| S. ¼..... | South quarter. |
| S.E. ¼..... | Southeast quarter. |
| S.T.R..... | South of Talbot Road. |
| S.W. ½..... | Southwest half. |
| T.R..... | Talbot Road survey. |
| Tp..... | Township. |
| W. ½..... | West half. |
| W. ¼..... | West quarter. |
| W.F.C..... | West of Fairchild creek. |
| W.L.P..... | West of Long Point. |

Brant County

BUFFALO DRILLING CO., LTD.

E. Hartley No. 3, lot 17, con. III, Onondaga tp.
Completed June 17, 1937.
Producing gas and oil well.
Rock pressure: 132 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 110 |
| Salina..... | 18 |
| Niagara..... | 283 |
| Rochester..... | 46 |
| Clinton..... | 22 |
| Red Medina..... | 21 |
| Blue shale..... | 45 |
| Manitoulin..... | 21 |
| White Medina..... | 8 |
| Red shale..... | 5 |

Total depth..... 579

Gas at 459 feet.
Oil at 571 and 575 feet.
Show of oil at 566 feet.
Fresh water at 110 feet; sulphur water at 160 and 350 feet.

BUFFALO DRILLING CO., LTD.

E. Hartley No. 4, lot 17, con. III, Onondaga tp.
Completed September 1, 1937.
Producing gas and oil well.
Rock pressure: 128 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 106 |
| Salina..... | 18 |
| Niagara lime..... | 281 |
| Rochester shale..... | 50 |
| Clinton..... | 22 |
| Red Medina..... | 29 |
| Blue shale..... | 34 |
| Manitoulin..... | 24 |
| White Medina..... | 9 |
| Big red shale..... | 55 |

Total depth..... 628

Gas at 456 feet.
Oil at 571 and 573 feet.
Show of oil at 568 feet.
Fresh water at 110 feet; sulphur water at 160 and 350 feet.

BUFFALO DRILLING CO., LTD.

E. Hartley No. 5, lot 17, con. III, Onondaga tp.

Completed December 6, 1937.

Producing gas and oil well.

Rock pressure: 128 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 111 |
| Salina..... | 18 |
| Niagara..... | 286 |
| Rochester..... | 45 |
| Clinton..... | 22 |
| Red Medina..... | 28 |
| Blue shale..... | 55 |
| White Medina..... | 9 |
| Red shale..... | 18 |

Total depth..... 583

Gas at 450 feet.

Gas and oil at 560 feet.

Fresh water at 110 feet; black water at 280 feet.

NOTTAWA OIL AND GAS CO., LTD.

T. Hamilton No. 2, lot 18, con. III, W.F.C.,

Onondaga tp.

Completed December 14, 1937.

Producing gas well.

Rock pressure: 130 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 100 |
| Shale..... | 16 |
| Niagara..... | 282 |
| Shale..... | 48 |
| Clinton..... | 22 |
| Red Medina..... | 35 |
| Shale..... | 40 |
| White Medina..... | 11 |
| Red shale..... | 25 |

Total depth..... 579

Gas at 450 and 553 feet.

Fresh water at 102 and 430 feet.

AJAX OIL AND GAS CO., LTD.

J. Green No. 1, lot 13, R.R., Tuscarora tp.

Completed June 2, 1937.

Producing gas well.

Rock pressure: 177 lbs.

| Formation | Thickness, ft. |
|-------------------------|-------------------|
| Surface..... | 36 |
| Quicksand..... | 4 |
| Salina..... | 59 |
| Guelph and Niagara..... | 261 |
| Rochester..... | 50 |
| Clinton..... | 26 |
| Red Medina..... | 25 |
| Cabot Head..... | 57 |
| White Medina..... | 13 |
| Red shale..... | 50 |

Total depth..... 581

Gas at 414, 519, 527, and 530 feet.

Sulphur water at 58 feet.

PETROL OIL AND GAS CO., LTD.

A. Thomas No. 1, lot 1, con. VI, Tuscarora tp.

Completed June 11, 1937.

Producing gas well.

Rock pressure: 215 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 13 |
| Salina..... | 157 |
| Niagara..... | 241 |
| Rochester..... | 50 |
| Clinton..... | 35 |
| Red Medina..... | 15 |
| Cabot Head..... | 55 |
| White Medina..... | 15 |
| Queenston..... | 50 |

Total depth..... 631

Gas at 463 and 566 feet.

Fresh water at 70 feet.

Elgin County

FERGUSON AND BIRD

D. Ferguson No. 1, lot 6, con. II, Aldborough tp.

Completed June 5, 1937.

Dry hole.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Gravel..... | 20 |
| Sand..... | 5 |
| Clay..... | 60 |
| Gravel..... | 207 |
| Top rock..... | 12 |
| Streaky soap..... | 38 |
| Lower lime..... | 71 |

Total depth..... 413

Show of oil and gas at 347 feet.

Fresh water at 20 feet; salt water at 365 feet.

BROWNSVILLE-NELSON GAS SYNDICATE

G. Nelson No. 1, lot 6, N. $\frac{1}{2}$ con. X, Bayham tp.

Completed February 21, 1937.

Producing gas well.

Rock pressure: 475 lbs.

| Formation | Thickness, ft. |
|---------------------------|-------------------|
| Surface..... | 210 |
| Grey lime..... | 5 |
| Lime..... | 35 |
| Brown lime..... | 127 |
| Brown lime and flint..... | 65 |
| Flint and lime..... | 67 |
| Grey lime and flint..... | 8 |
| Brown lime..... | 43 |
| Lime and chert..... | 15 |
| Brown lime..... | 37 |
| Shale..... | 50 |
| Brown lime..... | 88 |
| Grey lime..... | 175 |
| Brown lime..... | 15 |
| Grey lime..... | 27 |

Total depth..... 967

Gas at 949 to 965 feet.

Fresh water at 55, 149, 164, and 188 feet; sulphur water at 430, 509, and 550 feet.

BROWNSVILLE-NELSON GAS SYNDICATE

G. Nelson No. 2, lot 7, con. X, Bayham tp.

Completed April 22, 1937.

Dry hole.

| Formation | Thickness, ft. |
|-----------------------|-------------------|
| Surface..... | 195 |
| Brown lime..... | 20 |
| Grey lime..... | 40 |
| Brown lime..... | 70 |
| Grey lime..... | 45 |
| Brown lime..... | 25 |
| Sharp sand..... | 105 |
| Brown lime..... | 30 |
| Grey lime..... | 60 |
| Shale and gypsum..... | 72 |
| Grey lime..... | 15 |
| Brown lime..... | 82 |
| Grey lime..... | 208 |
| Water sand..... | 2 |

Total depth..... 969

Gas at 934 and 960 feet; blew down rapidly.

Fresh water at 60 and 150 to 195 feet; sulphur water at 210 and 394 to 500 feet; salt water at 967 to 969 feet.

CANADIAN NATURAL GAS SYNDICATE

C.E. Wilson No. 3, lot 23, S. ¼, con. VIII, Bayham tp.
Completed July 3, 1937.
Dry hole.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 257 |
| Lime and shale..... | 173 |
| Lime and chert..... | 270 |
| Lime and shale..... | 270 |
| Niagara lime..... | 280 |
| Rochester shale..... | 50 |
| Clinton sand..... | 23 |
| Red shale..... | 32 |

Total depth..... 1,355

Gas at 1,315 feet.

Fresh water at 255 feet; sulphur water at 280 and 970 feet.

CONNOR AND McKECHNIE

N. Gray No. 2, lot 24, con. VIII, Bayham tp.

Completed January 27, 1937.

Producing gas well.

Rock pressure: 460 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 244 |
| Lime..... | 191 |
| Lime and flint..... | 135 |
| Lime and shale..... | 420 |
| Niagara..... | 250 |
| Shale..... | 52 |
| Clinton..... | 28 |
| Shale..... | 50 |

Total depth..... 1,370

Gas at 1,315 to 1,318 feet.

Black water at 245 feet.

CONNOR AND McKECHNIE

N. Gray No. 3, lot 23, con. VIII, Bayham tp.

Completed March 16, 1937.

Producing gas well.

Rock pressure: 460 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 248 |
| Lime..... | 182 |
| Lime and flint..... | 135 |
| Lime and shale..... | 420 |
| Niagara..... | 260 |
| Rochester shale..... | 45 |
| Clinton..... | 28 |
| Red Medina..... | 35 |
| Blue shale..... | 54 |
| White Medina..... | 8 |
| Red shale..... | 5 |

Total depth..... 1,420

Black water at 235 feet.

HOLMES AND ROGERS

M. Marenychuk No. 1, lot 10, con. X, Bayham tp.

Completed September 2, 1937.

Producing gas well.

Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Surface..... | 180 |
| Brown and grey lime..... | 220 |
| Flint and lime..... | 100 |
| Gypsum lime..... | 100 |
| Grey and brown lime..... | 130 |
| Shale..... | 110 |
| Lime..... | 89 |
| Niagara..... | 15 |

Total depth..... 944

Gas at 932 and 935 feet.

Fresh water at 80 feet; sulphur water at 184, 250, and 510 feet.

NEW EDEN NATURAL GAS Co., LTD.

J. and E. Capling No. 2, lot 24, N.W. ¼,
con. VIII, Bayham tp.

Completed January 20, 1937.

Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 242 |
| Brown lime..... | 188 |
| Flint..... | 125 |
| Lime and shale..... | 425 |
| Niagara..... | 252 |
| Rochester..... | 53 |
| Clinton..... | 24 |
| Red shale..... | 3 |

Total depth..... 1,312

Black water at 235 and 355 feet.

NEW EDEN NATURAL GAS Co., LTD.

J. and E. Capling No. 3, lot 24, N.W. ¼,
con. VIII, Bayham tp.

Completed May 15, 1937.

Producing gas well.

Rock pressure: 300 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 244 |
| Brown lime..... | 186 |
| Flint..... | 135 |
| Lime and shale..... | 350 |
| Niagara..... | 323 |
| Rochester..... | 51 |
| Clinton..... | 23 |
| Queenston..... | 35 |

Total depth..... 1,352

Gas at 1,312 and 1,316 feet.

Fresh water at 230 feet; sulphur water at 340 feet.

NEW EDEN NATURAL GAS Co., LTD.

W. H. Roloson No. 1, lot 25, con. VIII, Bayham tp.

Completed December 30, 1937.

Dry hole.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 237 |
| Lime and shale..... | 183 |
| Flint..... | 140 |
| Lime and shale..... | 375 |
| Niagara lime..... | 287 |
| Rochester shale..... | 57 |
| Clinton sand..... | 24 |
| Red Medina..... | 15 |

Total depth..... 1,318

Fresh water at 235 feet; sulphur water at 935 feet.

W. C. PATTERSON GAS Co., LTD.

L. Hagel No. 1, lot 4, con. X, Bayham tp.

Completed January 18, 1937.

Producing gas well.

Rock pressure: 470 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 201 |
| Sharp sand..... | 60 |
| Brown lime..... | 140 |
| Flint..... | 95 |
| Lime and shale..... | 405 |
| Guelph lime..... | 65 |

Total depth..... 966

Gas at 933, 945, and 964 feet.

W. C. PATTERSON GAS CO., LTD.

L. Hagel No. 2, lot 4, con. X, Bayham tp.
Completed March 13, 1937.
Producing gas well.
Rock pressure: 470 lbs.

| Formation | Thickness, ft. |
|--------------------------------|-------------------|
| Surface..... | 209 |
| Sharp sand and brown lime..... | 40 |
| Shale..... | 35 |
| Brown lime..... | 148 |
| Flint..... | 105 |
| Grey sand..... | 13 |
| Brown and grey lime..... | 30 |
| Shale..... | 94 |
| Brown lime..... | 50 |
| Shale and lime..... | 20 |
| Brown lime..... | 14 |
| Shale..... | 50 |
| Brown lime and shale..... | 82 |
| Grey lime..... | 63 |

Total depth..... 953

Gas at 949 and 952 feet.

Fresh water at 210 feet; sulphur water at 470 feet.

W. C. PATTERSON GAS CO., LTD.

G. Lindsay No. 1, lot 9, con. X, Bayham tp.
Completed November 24, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 188 |
| Brown lime..... | 197 |
| Flint..... | 120 |
| Lime and shale..... | 409 |
| Guelph..... | 36 |
| Grey lime..... | 28 |

Total depth..... 978

Fresh water at 190 feet; black water at 978 feet.

W. C. PATTERSON GAS CO., LTD.

H. Robinson No. 1, lot 5, con. X, Bayham tp.
Completed April 17, 1937.
Producing gas well.
Rock pressure: 465 lbs.

| Formation | Thickness, ft. |
|---------------------------|-------------------|
| Surface..... | 207 |
| Brown lime..... | 40 |
| Shale and grey lime..... | 63 |
| Brown lime..... | 44 |
| Grey lime..... | 46 |
| Flint..... | 106 |
| Brown and grey lime..... | 20 |
| Brown lime..... | 25 |
| Lime and shale..... | 116 |
| Brown lime..... | 90 |
| Shale..... | 72 |
| Brown lime and shale..... | 110 |
| Grey and brown lime..... | 24 |

Total depth..... 963

Gas at 939, 943, and 952 feet.

W. C. PATTERSON GAS CO., LTD.

C. Turnbull No. 1, lot 5, S. ½, con. X, Bayham tp.
Completed July 8, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------------|-------------------|
| Surface..... | 223 |
| Brown lime..... | 70 |
| Shale..... | 20 |
| Brown lime..... | 40 |
| Grey lime..... | 60 |
| Flint..... | 113 |
| Brown and grey lime..... | 40 |
| Brown lime and shale..... | 105 |
| Brown lime..... | 94 |
| Shale..... | 105 |
| Brown lime and shale..... | 90 |
| Brown and grey lime..... | 20 |
| White sand..... | 62 |

Total depth..... 1,042

E. P. ROWE

C. Ball No. 1, lot 27, S. ½, con. VIII, Bayham tp.
Completed January 29, 1937.
Producing gas well.
Rock pressure: 485 lbs.

| Formation | Thickness, ft. |
|----------------------------|-------------------|
| Surface..... | 200 |
| Grey lime..... | 15 |
| Brown and grey lime..... | 167 |
| Sharp sand..... | 121 |
| Dark-grey shelly lime..... | 117 |
| Lime and gypsum..... | 40 |
| Grey lime..... | 60 |
| Brown and grey lime..... | 194 |
| Niagara lime..... | 292 |
| Shale..... | 51 |
| Clinton..... | 30 |
| Red shale..... | 51 |

Total depth..... 1,338

Gas at 1,279 to 1,283 feet.

Sulphur water at 200 feet.

E. P. ROWE

N. Gray No. 1, lot 27, con. VIII, Bayham tp.
Completed March 13, 1937.
Producing gas well.
Rock pressure: 425 lbs.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Surface..... | 195 |
| Brown and grey lime..... | 170 |
| Sharp sand..... | 110 |
| Grey lime..... | 40 |
| Brown lime..... | 23 |
| Lime and gypsum..... | 112 |
| Brown lime..... | 249 |
| Niagara lime..... | 297 |
| Shale..... | 55 |
| Clinton..... | 29 |
| Red shale..... | 47 |

Total depth..... 1,327

Gas at 1,268 to 1,371 feet; show of gas at 198 feet.

Show of oil at 300 feet.

Water at 198 feet.

ARMOND SMITH

C. Downing No. 2, lot 5, con. X, Bayham tp.
Completed January 29, 1937.
Producing gas well.
Rock pressure: 470 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 211 |
| Lime..... | 188 |
| Flint..... | 125 |
| Lime and shale..... | 428 |
| Guelph..... | 25 |

Total depth..... 977

Gas at 960 to 975 feet.

Sulphur water at 223 and 535 feet.

ARMOND SMITH

C. Downing No. 3, lot 5, con. X, Bayham tp.
Completed April 9, 1937.
Producing gas well.
Rock pressure: 470 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 209 |
| Lime..... | 194 |
| Flint..... | 114 |
| Lime and shale..... | 430 |
| Guelph lime..... | 24 |

Total depth..... 971

Gas at 952, 957, and 965 feet.

Sulphur water at 220 and 529 feet.

WALTER GAS SYNDICATE, LTD.

F. Chandler No. 1, lot 20, con. VIII, Bayham tp.
Completed January 20, 1937.
Dry hole.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Surface | 236 |
| Lime and shale | 208 |
| Flint and lime | 208 |
| Lime and shale | 348 |
| Niagara lime | 245 |
| Rochester shale | 40 |
| Clinton | 24 |
| Red shale | 6 |
| Total depth | 1,321 |

Sulphur water at 237 feet.

C. SCHOLLENBERGER

E. Bakus No. 1, lot 8, con. IX, Dunwich tp.
Completed June 15, 1937.
Dry hole.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Clay | 163 |
| Gravel | 10 |
| Clay and gravel | 57 |
| Clay and hardpan | 40 |
| Black lime | 15 |
| Soap | 57 |
| Lower lime | 169 |
| Total depth | 511 |

Black water at 511 feet.

E. WAYNE SPAULDING

Johnston No. 1, lot 4, S. ½, con. VIII, Malahide tp.
Completed June 25, 1937.
Dry hole.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Surface | 280 |
| Lime | 35 |
| Grey lime | 35 |
| Sharp sand | 20 |
| Grey lime | 165 |
| Sharp sand | 120 |
| Brown lime | 15 |
| Grey lime | 10 |
| Brown lime | 42 |
| Shale and gypsum | 110 |
| Brown lime | 12 |
| Shale | 6 |
| Brown lime | 90 |
| Grey lime | 85 |
| Brown lime | 18 |
| Grey lime | 322 |
| Shale | 15 |
| Grey lime | 40 |
| Blue shale | 28 |
| Grey lime | 12 |
| Red shale | 4 |
| Blue shale | 25 |
| White Medina | 33 |
| Red shale | 95 |
| Total depth | 1,617 |

Fresh water at 125, 165, and 260 feet; sulphur water at 285 feet.

Essex County

BON JASPERSON

G. P. Fox No. 1, lot 21, con. I, Gosfield South tp.
Completed September 11, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------------|-------------------|
| Surface | 62 |
| Brown lime | 258 |
| Sharp brown lime | 40 |
| Brown lime | 125 |
| Grey lime | 115 |
| Brown and grey lime | 390 |
| Brown lime | 30 |
| Grey lime | 22 |
| Total depth | 1,042 |

Fresh water at 25 and 65 feet; salt water at 1,035 feet.

BON JASPERSON

W. J. Gunning No. 1, lot 10, con. I, Gosfield South tp.
Completed May 8, 1937.
Producing gas well.
Rock pressure: 325 lbs.

| Formation | Thickness, ft. |
|----------------------------|-------------------|
| Surface | 120 |
| Brown lime | 275 |
| Sharp sand | 30 |
| Brown lime | 55 |
| Grey lime and gypsum | 12 |
| Brown lime | 98 |
| Grey lime | 80 |
| Brown lime | 140 |
| Grey lime | 50 |
| Brown lime | 175 |
| Grey lime | 25 |
| Total depth | 1,060 |

Gas at 941 to 949 feet.

Fresh water at 120 feet; mineral water at 175 and 530 feet.

POVEC GAS AND OIL SYNDICATE

W. Reid No. 1, lot 10, W. ½, con. VIII, Mersea tp.
Completed November 25, 1937.
Producing gas well.
Rock pressure: 315 lbs.

| Formation | Thickness, ft. |
|--------------------------------|-------------------|
| Surface | 100 |
| Brown lime | 260 |
| Sharp grey lime | 40 |
| Sharp grey lime and sand | 41 |
| Brown and grey lime | 19 |
| Soft sand streak | 10 |
| Brown and grey lime | 70 |
| Brown lime | 20 |
| Brown lime and gypsum | 10 |
| Brown lime | 10 |
| Brown lime and gypsum | 10 |
| Brown and grey lime | 110 |
| Grey lime | 50 |
| Brown lime | 80 |
| Grey lime | 60 |
| Brown and grey lime | 150 |
| Brown lime | 17 |
| Guelph grey lime | 13 |
| Grey lime (water sand) | 5 |
| Total depth | 1,075 |

Gas at 94, 350, and 1,040 to 1,057 feet.
Water at 98 and 471 feet.

VOLCANIC GAS AND OIL CO., LTD.

J. Reaume No. 1, lot 6, con. III, Tilbury North tp.
Completed November 13, 1937.
Dry hole.

| Formation | Thickness, ft. |
|--|-------------------|
| Surface | 122 |
| Lime | 133 |
| Buff sand | 30 |
| Grey, buff, and brown lime | 565 |
| Grey shale, argillaceous lime, and some gypsum | 390 |
| Grey, compact to granular lime and some gypsum | 110 |
| Crystalline lime | 100 |
| Total depth | 1,450 |

Fresh water at 124 feet; salt water at 1,380 feet.

VOLCANIC GAS AND OIL CO., LTD.

E. Hiser No. 1, lot 5, con. VIII, Tilbury West tp.
Completed August 31, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---|-------------------|
| Surface..... | 114 |
| Lime..... | 101 |
| Sand..... | 10 |
| Grey, buff, and brown lime..... | 530 |
| Grey shale, a little argillaceous lime, and some gypsum..... | 365 |
| Grey, brown, and white lime and some gypsum..... | 576 |
| Grey shale..... | 4 |
| Total depth..... | 1,700 |

Sulphur water at 275 feet; salt water at 1,230 feet.

Haldimand County

H. L. EMERSON

H. L. Emerson No. 11, lot 6, con. II, Canborough tp.
Completed March 14, 1937.
Producing gas well.
Rock pressure: 140 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 80 |
| Shale..... | 60 |
| Niagara..... | 220 |
| Shale..... | 54 |
| Clinton..... | 35 |
| Red Medina..... | 37 |
| Shale..... | 60 |
| White Medina..... | 10 |
| Shale..... | 50 |
| Total depth..... | 606 |

Fresh water at 75 feet.

DANIEL GLENNY

D. Glenny No. 5, lot 5, con. III, Canborough tp.
Completed February 26, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 58 |
| Lime and shale..... | 167 |
| Niagara..... | 240 |
| Shale..... | 56 |
| Clinton..... | 33 |
| Red Medina..... | 40 |
| Shale..... | 64 |
| White Medina..... | 13 |
| Shale..... | 4 |
| Total depth..... | 675 |

Gas at 573 feet.
Sulphur water at 61 feet.

S. McKECHNIE

M. Sundry No. 4, lot 1, con. III, Canborough tp.
Completed October 12, 1937.
Producing gas well.
Rock pressure: 200 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 85 |
| Shale..... | 225 |
| Niagara..... | 221 |
| Shale..... | 40 |
| Clinton..... | 30 |
| Red Medina..... | 40 |
| Grey shale..... | 60 |
| White Medina..... | 10 |
| Red shale..... | 5 |
| Total depth..... | 716 |

Sulphur water at 86 feet.

POVEC GAS AND OIL SYNDICATE

C. Lymburner No. 1, lot 8, N.E. pt., Dochstader tract,
Canborough tp.

Completed June 4, 1937.
Producing gas well.
Rock pressure: 205 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 66 |
| Lime and shale..... | 214 |
| Niagara..... | 227 |
| Shale..... | 50 |
| Clinton..... | 30 |
| Red Medina..... | 46 |
| Shale..... | 60 |
| White Medina..... | 10 |
| Red shale..... | 4 |

Total depth..... 707

Gas at 577 and 700 feet.
Sulphur water at 70 feet.

POVEC GAS AND OIL SYNDICATE

S. Weaver No. 2, lot 8, S.W. $\frac{1}{4}$, Dochstader tract,
Canborough tp.

Completed July 8, 1937.
Producing gas well.
Rock pressure: 250 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 80 |
| Lime and shale..... | 199 |
| Niagara..... | 236 |
| Shale..... | 51 |
| Clinton..... | 32 |
| Red Medina..... | 44 |
| Shale..... | 60 |
| White Medina..... | 10 |
| Red shale..... | 48 |

Total depth..... 760

Gas at 607 and 701 feet.
Sulphur water at 83 feet.

POVEC GAS AND OIL SYNDICATE

S. Weaver No. 3, lot 8, Dochstader tract,
Canborough tp.

Completed August 11, 1937.
Producing gas well.
Rock pressure: 300 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 112 |
| Lime and shale..... | 169 |
| Niagara..... | 228 |
| Shale..... | 48 |
| Clinton..... | 30 |
| Red Medina..... | 41 |
| Shale..... | 60 |
| White Medina..... | 10 |
| Red shale..... | 2 |

Total depth..... 700

Gas at 599 and 607 feet.
Sulphur water at 110 feet.

H. L. EMERSON

H. L. Emerson No. 12, lot 19, con. IC., Moulton tp.
Completed April 13, 1937.
Producing gas well.
Rock pressure: 135 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 90 |
| Shale..... | 50 |
| Niagara..... | 236 |
| Shale..... | 55 |
| Clinton..... | 37 |
| Red Medina..... | 40 |
| Shale..... | 65 |
| White Medina..... | 15 |

Total depth..... 588

Sulphur water at 95 feet.

HALDIMAND COUNTY HOME

County Home No. 1, Town of Dunnville, con. I,
E.F.C., Moulton tp.

Completed December 18, 1937.

Producing gas well.

Rock pressure: 200 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 72 |
| Shale and lime..... | 239 |
| Niagara..... | 230 |
| Shale..... | 50 |
| Clinton..... | 30 |
| Red Medina..... | 40 |
| Grey shale..... | 53 |
| White Medina..... | 10 |
| Red shale..... | 50 |
| Total depth..... | 774 |

Fresh water at 90 feet.

SMITH AND EHDE

E. Cook No. 1, lot 2, con. II, Moulton tp.

Completed September 24, 1937.

Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 148 |
| Lime and shale..... | 202 |
| Niagara..... | 220 |
| Shale..... | 54 |
| Clinton..... | 33 |
| Red Medina..... | 52 |
| Shale..... | 45 |
| White Medina..... | 12 |
| Red shale..... | 30 |
| Total depth..... | 796 |

Fresh water at 142 feet; black water at 370 feet.

SMITH AND EHDE

E. Cook No. 2, lot 2, con. II, Moulton tp.

Completed October 20, 1937.

Producing gas well.

Rock pressure: 195 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 115 |
| Lime and shale..... | 225 |
| Niagara..... | 223 |
| Shale..... | 62 |
| Clinton..... | 29 |
| Red Medina..... | 54 |
| Shale..... | 46 |
| White Medina..... | 12 |
| Red shale..... | 45 |
| Total depth..... | 811 |

Gas at 679 feet.

Fresh water at 112 feet; black water at 360 feet.

SMITH AND EHDE

E. Cook No. 3, lot 2, con. II, Moulton tp.

Completed December 22, 1937.

Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 159 |
| Lime and shale..... | 183 |
| Niagara..... | 220 |
| Shale..... | 62 |
| Clinton..... | 33 |
| Red Medina..... | 52 |
| Shale..... | 45 |
| White Medina..... | 12 |
| Red shale..... | 30 |
| Total depth..... | 796 |

Fresh water at 150 feet; black water at 390 feet.

A.P.K. GROUP

J. Craven No. 4, lot 36, con. I, N.T.R.,
North Cayuga tp.

Completed March 10, 1937.

Producing gas well.

Rock pressure: 300 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 40 |
| Broken lime..... | 80 |
| Lime and shale..... | 200 |
| Niagara..... | 262 |
| Shale..... | 36 |
| Clinton..... | 26 |
| Red Medina..... | 43 |
| Grey shale..... | 50 |
| White Medina..... | 11 |
| Red shale..... | 4 |
| Total depth..... | 752 |

Gas at 658 and 662 feet.

Black water at 120 feet.

F. H. ARMITAGE

J. Craven No. 5, lot 36, con. I, N.T.R.,
North Cayuga tp.

Completed April 6, 1937.

Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 82 |
| Lime and shale..... | 282 |
| Niagara..... | 230 |
| Blue shale..... | 55 |
| Clinton..... | 24 |
| Red Medina..... | 45 |
| Grey shale..... | 45 |
| White Medina..... | 6 |
| Red shale..... | 6 |
| Total depth..... | 775 |

Fresh water at 65 feet; black water at 165 feet.

F. H. ARMITAGE

J. Craven No. 6, lot 36, con. I, N.T.R.,
North Cayuga tp.

Completed June 26, 1937.

Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 34 |
| Lime and shale..... | 311 |
| Niagara..... | 210 |
| Shale..... | 48 |
| Clinton..... | 22 |
| Red Medina..... | 46 |
| Grey shale..... | 54 |
| White Medina..... | 8 |
| Red shale..... | 9 |
| Total depth..... | 742 |

Fresh water at 80 feet.

Sulphur water at 160 feet.

KOHLEK GAS CO., LTD.

R. Kline No. 1, lot 38, S.E. ¼, con. II, S.T.R.,
North Cayuga tp.

Completed March 16, 1937.

Producing gas well.

Rock pressure: 300 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 30 |
| Flint..... | 9 |
| Lime and shale..... | 378 |
| Niagara..... | 223 |
| Rochester shale..... | 62 |
| Clinton..... | 26 |
| Red Medina..... | 23 |
| Red shale..... | 18 |
| Grey shale..... | 60 |
| White Medina..... | 11 |
| Red shale..... | 5 |
| Total depth..... | 845 |

Gas at 722 and 744 feet.

Fresh water at 69 feet.

ANDREW MEHLENBACHER

A. Mehlenbacher No. 1, lot 37, S. ½, con. II, S.T.R.,
North Cayuga tp.

Completed February 3, 1937.

Producing gas well.

Rock pressure: 300 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 14 |
| Flint..... | 10 |
| Lime and shale..... | 378 |
| Niagara..... | 224 |
| Rochester shale..... | 59 |
| Clinton..... | 30 |
| Red Medina..... | 24 |
| Red shale..... | 15 |
| Grey shale..... | 60 |
| White Medina..... | 11 |
| Red shale..... | 2 |

Total depth..... 827

Gas at 709 feet.

Fresh water at 58 feet.

MIDFIELD GAS CORPORATION, LTD.

J. Clark No. 3, lot 52, N. ½, con. I, N.T.R.,
North Cayuga tp.

Completed September 14, 1937.

Producing gas well.

Rock pressure: 330 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Flint..... | 7 |
| Sand..... | 33 |
| Lime and shale..... | 370 |
| Niagara..... | 211 |
| Guelph..... | 27 |
| Rochester shale..... | 58 |
| Clinton..... | 24 |
| Red shale..... | 40 |
| Grey shale..... | 64 |
| White Medina..... | 8 |
| Red shale..... | 14 |

Total depth..... 856

Gas at 718 feet.

Fresh water at 35 feet.

MIDFIELD GAS CORPORATION, LTD.

J. Clark No. 4, lot 52, N. ½, con. I, N.T.R.,
North Cayuga tp.

Completed October 5, 1937.

Dry hole.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 7 |
| Flint..... | 30 |
| Lime and shale..... | 373 |
| Niagara..... | 240 |
| Rochester shale..... | 58 |
| Red Medina..... | 6 |
| Red shale..... | 36 |
| Grey shale..... | 47 |
| White Medina..... | 14 |
| Red shale..... | 7 |

Total depth..... 835

Fresh water at 40 feet.

NORTH CAYUGA GAS SYNDICATE

J. Glenn No. 8, lot 1, Huff tract, North Cayuga tp.
Completed September 4, 1937.

Producing gas well.

Rock pressure: 200 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 48 |
| Lime and shale..... | 252 |
| Niagara..... | 230 |
| Shale..... | 55 |
| Clinton..... | 25 |
| Red Medina..... | 45 |
| Grey shale..... | 52 |
| White Medina..... | 15 |
| Red shale..... | 20 |

Total depth..... 742

Gas at 627 feet.

Fresh water at 50 feet; salt water at 425 feet.

NORTH CAYUGA GAS SYNDICATE

J. Glenn No. 9, lot 1, Huff tract, North Cayuga tp.

Completed September 23, 1937.

Producing gas well.

Rock pressure: 235 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 54 |
| Lime and shale..... | 251 |
| Niagara..... | 230 |
| Shale..... | 55 |
| Clinton..... | 25 |
| Red Medina..... | 43 |
| Grey shale..... | 52 |
| White Medina..... | 15 |
| Red shale..... | 25 |

Total depth..... 750

Gas at 593 and 620 feet.

Fresh water at 77 feet; salt water at 425 feet.

W. C. PATTERSON GAS CO., LTD.

W. Hyland No. 3, lot 36, con. I, S.T.R.,
North Cayuga tp.

Completed March 25, 1937.

Producing gas well.

Rock pressure: 335 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 10 |
| Shale and lime..... | 332 |
| Niagara..... | 263 |
| Shale..... | 50 |
| Clinton..... | 27 |
| Red Medina..... | 40 |
| Shale..... | 50 |
| White Medina..... | 15 |
| Red shale..... | 2 |

Total depth..... 789

Gas at 672 feet.

Fresh water at 70 feet; sulphur water at 130 and 349 feet.

W. C. PATTERSON GAS CO., LTD.

R. Kline No. 1, lot 38, con. III, North Cayuga tp.
Completed October 2, 1937.

Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 50 |
| Shale and lime..... | 342 |
| Niagara..... | 272 |
| Shale..... | 55 |
| Clinton..... | 24 |
| Red Medina..... | 40 |
| Grey shale..... | 54 |
| White Medina..... | 17 |
| Red shale..... | 1 |

Total depth..... 855

Fresh water at 35 and 55 feet; sulphur water at 100 and 389 feet.

W. C. PATTERSON GAS CO., LTD.

N. Kohler No. 3, lot 23, Jones tract, North Cayuga tp.
Completed July 6, 1937.

Producing gas well.

Rock pressure: 345 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 24 |
| Flint..... | 30 |
| Shale and lime..... | 331 |
| Niagara..... | 270 |
| Shale..... | 52 |
| Clinton..... | 24 |
| Red Medina..... | 44 |
| Shale..... | 54 |
| White Medina..... | 17 |
| Red shale..... | 2 |

Total depth..... 848

Fresh water at 70 feet; sulphur water at 385 feet.

W. C. PATTERSON GAS CO., LTD.

N. Kohler No. 4, lot 23, Jones tract, North Cayuga tp.
Completed August 25, 1937.
Producing gas well.
Rock pressure: 345 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 20 |
| Flint..... | 31 |
| Shale and lime..... | 343 |
| Niagara..... | 271 |
| Shale..... | 55 |
| Clinton..... | 26 |
| Red Medina..... | 40 |
| Grey shale..... | 54 |
| White Medina..... | 18 |
| Red shale..... | 2 |

Total depth..... 860

Gas at 744 and 750 feet.

Fresh water at 35 feet; sulphur water at 100 and 390 feet.

W. C. PATTERSON GAS CO., LTD.

N. Kohler No. 5, lot 24, S. $\frac{1}{4}$, Jones tract,
North Cayuga tp.

Completed November 13, 1937.
Producing gas well.
Rock pressure: 350 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 20 |
| Flint..... | 32 |
| Shale and lime..... | 345 |
| Niagara..... | 272 |
| Shale..... | 53 |
| Clinton..... | 30 |
| Red Medina..... | 39 |
| Grey shale..... | 52 |
| White Medina..... | 17 |
| Red shale..... | 2 |

Total depth..... 862

Fresh water at 34 feet; sulphur water at 95 and 390 feet.

W. C. PATTERSON GAS CO., LTD.

F. Leavey No. 1, lot 36, S. $\frac{1}{4}$, con. I, S.T.R.,
North Cayuga tp.

Completed February 12, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 11 |
| Shale and lime..... | 341 |
| Niagara..... | 264 |
| Shale..... | 51 |
| Clinton..... | 27 |
| Red Medina..... | 40 |
| Shale..... | 51 |
| White Medina..... | 15 |
| Red shale..... | 1 |

Total depth..... 801

Fresh water at 60 feet; sulphur water at 127 and 359 feet.

PETROL OIL AND GAS CO., LTD.

N. Crawford No. 1, lot 1, con. VI, Oneida tp.

Completed June 30, 1937.
Producing gas well.
Rock pressure: 250 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 18 |
| Salina..... | 142 |
| Niagara..... | 237 |
| Rochester..... | 43 |
| Clinton..... | 35 |
| Red Medina..... | 15 |
| Cabot Head..... | 58 |
| White Medina..... | 13 |
| Queenston..... | 51 |

Total depth..... 612

Gas at 400 and 550 feet.

Fresh water at 30 feet.

PETROL OIL AND GAS CO., LTD.

F. Fishcarrier No. 1, lot 1, con. V, Oneida tp.
Completed July 15, 1937.
Producing gas well.
Rock pressure: 235 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 32 |
| Salina..... | 128 |
| Niagara..... | 245 |
| Rochester..... | 50 |
| Clinton..... | 30 |
| Red Medina..... | 10 |
| Cabot Head..... | 63 |
| White Medina..... | 18 |
| Queenston..... | 2 |

Total depth..... 578

Gas at 460 feet.

Fresh water at 50 feet.

F. O. TANNER

I. Ferguson No. 2, lot 77, R.R., Oneida tp.

Completed May 14, 1937.
Producing gas well.
Rock pressure: 240 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 44 |
| Lime and shale..... | 250 |
| Niagara lime..... | 240 |
| Shale..... | 27 |
| Clinton..... | 25 |
| Red Medina..... | 40 |
| Shale..... | 60 |
| White Medina..... | 14 |
| Red shale..... | 11 |

Total depth..... 711

Gas at 576 and 586 feet.

Fresh water at 50 feet; sulphur water at 90 feet; black water at 230 feet.

C. RAYS

C. Rays No. 2, lot 31, S. $\frac{1}{4}$, Town of Cayuga,
North Cayuga tp.

Completed January 1, 1937.
Producing gas well.
Rock pressure: 350 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 38 |
| Lime and shale..... | 255 |
| Niagara..... | 221 |
| Shale..... | 41 |
| Clinton..... | 28 |
| Red Medina..... | 42 |
| Blue shale..... | 58 |
| White Medina..... | 10 |
| Red shale..... | 32 |

Total depth..... 725

Gas at 556, 583, and 689 feet.

Fresh water at 47 feet; sulphur water at 293 feet.

F. O. TANNER

A. Riley No. 2, lot 36, con. I, N.T.R.,
North Cayuga tp.

Completed February 12, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 39 |
| Lime and shale..... | 271 |
| Niagara..... | 221 |
| Shale..... | 43 |
| Clinton..... | 23 |
| Red Medina..... | 47 |
| Blue shale..... | 60 |
| White Medina..... | 10 |
| Red shale..... | 2 |

Total depth..... 716

Sulphur water at 81 feet.

HALDIMAND GAS SYNDICATE

W. Dashner No. 4, lot 6, N.E. $\frac{1}{4}$, con. IV, Rainham tp.
Completed January 6, 1937.
Producing gas well.
Rock pressure: 265 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 26 |
| Flint..... | 87 |
| Lime and shale..... | 361 |
| Niagara..... | 224 |
| Rochester shale..... | 66 |
| Clinton..... | 28 |
| Red Medina..... | 23 |
| Red shale..... | 22 |
| Grey shale..... | 59 |
| White Medina..... | 11 |
| Red shale..... | 60 |

Total depth..... 967
Gas at 782 and 907 feet.
Fresh water at 30 feet.

KELLY GAS AND OIL SYNDICATE

N. Bacher No. 1, lot 11, E. $\frac{1}{2}$, con. IV, Rainham tp.
Completed June 8, 1937.
Producing gas well.
Rock pressure: 330 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 16 |
| Lime and flint..... | 84 |
| Lime and shale..... | 359 |
| Niagara..... | 239 |
| Rochester shale..... | 51 |
| Clinton..... | 31 |
| Red Medina..... | 30 |
| Red shale..... | 15 |
| Grey shale..... | 56 |
| White Medina..... | 12 |
| Red shale..... | 3 |

Total depth..... 896
Gas at 776 and 796 feet.
Fresh water at 45 feet.

KELLY GAS AND OIL SYNDICATE

N. Bacher No. 2, lot 11, E. $\frac{1}{2}$, con. IV, Rainham tp.
Completed July 27, 1937.
Producing gas well.
Rock pressure: 330 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 11 |
| Lime and flint..... | 87 |
| Lime and shale..... | 362 |
| Niagara..... | 242 |
| Rochester shale..... | 56 |
| Clinton..... | 29 |
| Red Medina..... | 24 |
| Red shale..... | 19 |
| Grey shale..... | 59 |
| White Medina..... | 12 |
| Red shale..... | 2 |

Total depth..... 903
Gas at 780 and 808 feet.
Fresh water at 61 feet.

KELLY GAS AND OIL SYNDICATE

P. Schurr No. 1, lot 10, N. $\frac{1}{2}$, con. III, Rainham tp.
Completed September 22, 1937.
Producing gas well.
Rock pressure: 340 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 26 |
| Lime and flint..... | 78 |
| Lime and shale..... | 349 |
| Niagara..... | 238 |
| Rochester shale..... | 63 |
| Clinton..... | 27 |
| Red Medina..... | 26 |
| Red shale..... | 15 |
| Grey shale..... | 58 |
| White Medina..... | 17 |
| Red shale..... | 35 |

Total depth..... 932
Gas at 758, 803, and 888 feet.
Fresh water at 39 feet.

KELLY GAS AND OIL SYNDICATE

W. Sherk No. 1, lot 11, N. $\frac{1}{2}$, con. III, Rainham tp.
Completed June 30, 1937.
Producing gas well.
Rock pressure: 330 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 25 |
| Flint..... | 78 |
| Lime and shale..... | 358 |
| Niagara..... | 226 |
| Rochester shale..... | 54 |
| Clinton..... | 26 |
| Red Medina..... | 36 |
| Red shale..... | 10 |
| Grey shale..... | 59 |
| White Medina..... | 12 |
| Red shale..... | 3 |

Total depth..... 887
Gas at 748 and 790 feet.
Fresh water at 65 feet.

KELLY GAS AND OIL SYNDICATE

W. Sherk No. 2, lot 11, N. $\frac{1}{2}$, con. III, Rainham tp.
Completed August 20, 1937.
Producing gas well.
Rock pressure: 330 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 23 |
| Flint..... | 77 |
| Lime and shale..... | 369 |
| Niagara..... | 225 |
| Rochester shale..... | 57 |
| Clinton..... | 28 |
| Red Medina..... | 29 |
| Red shale..... | 13 |
| Grey shale..... | 59 |
| White Medina..... | 11 |
| Red shale..... | 2 |

Total depth..... 893
Gas at 753, 759, and 768 feet.
Fresh water at 36 feet.

KELLY GAS AND OIL SYNDICATE

W. Sherk No. 3, lot 11, N. $\frac{1}{2}$, con. III, Rainham tp.
Completed November 4, 1937.
Dry hole.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 26 |
| Flint..... | 75 |
| Lime and shale..... | 362 |
| Niagara..... | 227 |
| Rochester shale..... | 59 |
| Clinton..... | 27 |
| Red Medina..... | 31 |
| Red shale..... | 10 |
| Grey shale..... | 61 |
| White Medina..... | 9 |
| Red shale..... | 3 |

Total depth..... 890
Fresh water at 65 feet.

LYMBURNER BROS. AND WEBBER

W. L. Schweyer No. 2, lot 1, con. III, Rainham tp.
Completed January 6, 1937.
Producing gas well.
Rock pressure: 410 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 11 |
| Lime and flint..... | 124 |
| Lime and shale..... | 359 |
| Niagara..... | 242 |
| Shale..... | 70 |
| Clinton..... | 32 |
| Red Medina..... | 45 |
| Shale..... | 60 |
| White Medina..... | 10 |
| Red shale..... | 1 |

Total depth..... 954
Gas at 827 and 864 feet.
Fresh water at 40 and 104 feet.

LYMBURNER BROS. AND WEBBER

W. L. Schwyer No. 3, lot 1, con. III, Rainham tp.
Completed September 19, 1937.
Producing gas well.
Rock pressure: 440 lbs.

| Formation | Thickness, ft. |
|----------------|-------------------|
| Surface | 11 |
| Flint | 127 |
| Lime and shale | 365 |
| Niagara lime | 245 |
| Shale | 55 |
| Clinton | 27 |
| Red Medina | 47 |
| Shale | 60 |
| White Medina | 10 |
| Red shale | 2 |

Total depth..... 949

Gas at 807 and 856 to 858 feet.
Fresh water at 57 feet.

LYMBURNER BROS. AND WEBBER

W. L. Schwyer No. 4, lot 1, con. III, Rainham tp.
Completed October 22, 1937.
Producing gas well.
Rock pressure: 450 lbs.

| Formation | Thickness, ft. |
|----------------|-------------------|
| Surface | 12 |
| Flint | 130 |
| Lime and shale | 359 |
| Niagara | 247 |
| Shale | 61 |
| Clinton | 25 |
| Red Medina | 44 |
| Shale | 60 |
| White Medina | 10 |
| Red shale | 3 |

Total depth..... 951

Gas at 819 feet.
Fresh water at 52 feet.

LYMBURNER BROS. AND WEBBER

W. L. Schwyer No. 5, lot 1, con. III, Rainham tp.
Completed November 29, 1937.
Producing gas well.
Rock pressure: 450 lbs.

| Formation | Thickness, ft. |
|----------------|-------------------|
| Surface | 10 |
| Flint | 129 |
| Lime and shale | 358 |
| Niagara | 248 |
| Shale | 63 |
| Clinton | 31 |
| Red Medina | 42 |
| Shale | 60 |
| White Medina | 10 |
| Red shale | 3 |

Total depth..... 954

Gas at 831 and 847 feet.
Fresh water at 38 and 119 feet.

CENTRAL SENECA GAS SYNDICATE

E. Harrison No. 2, lot 19, con. IV, Seneca tp.
Completed February 3, 1937.
Producing gas well.
Rock pressure: 90 lbs.

| Formation | Thickness, ft. |
|-----------------|-------------------|
| Surface | 77 |
| Lime and shale | 48 |
| Niagara | 266 |
| Rochester shale | 29 |
| Clinton | 24 |
| Red Medina | 38 |
| Grey shale | 58 |
| White Medina | 12 |
| Red shale | 38 |

Total depth..... 590

Gas at 442 and 548 feet.
Fresh water at 95 feet.

CENTRAL SENECA GAS SYNDICATE

Smiley No. 7, lot 18, con. IV, Seneca tp.
Completed January 9, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-----------------|-------------------|
| Surface | 56 |
| Lime and shale | 49 |
| Niagara | 210 |
| White lime | 57 |
| Rochester shale | 25 |
| Clinton | 22 |
| Red Medina | 38 |
| Grey shale | 47 |
| White Medina | 18 |
| Red shale | 2 |

Total depth..... 504

Fresh water at 50 feet.

BROADWAY GAS SYNDICATE

C. Dougherty No. 6, lot 21, N. $\frac{1}{2}$, con. VI, Walpole tp.
Completed September 30, 1937.
Producing gas well.
Rock pressure: 400 lbs.

| Formation | Thickness, ft. |
|-----------------|-------------------|
| Surface | 23 |
| Flint | 92 |
| Lime and shale | 350 |
| Niagara | 210 |
| White lime | 73 |
| Rochester shale | 29 |
| Clinton | 25 |
| Red Medina | 47 |
| Grey shale | 48 |
| White Medina | 12 |
| Red shale | 1 |

Total depth..... 910

Gas at 809 and 828 feet.
Fresh water at 80 feet.

BROADWAY GAS SYNDICATE

C. Dougherty No. 7, lot 21, N. $\frac{1}{2}$, con. VI, Walpole tp.
Completed October 26, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-----------------|-------------------|
| Surface | 23 |
| Flint | 92 |
| Lime and shale | 350 |
| Niagara | 210 |
| White lime | 69 |
| Rochester shale | 30 |
| Clinton | 28 |
| Red Medina | 46 |
| Grey shale | 50 |
| White Medina | 12 |
| Red shale | 1 |

Total depth..... 911

Show of gas at 777 and 822 feet.
Fresh water at 80 feet.

BROADWAY GAS SYNDICATE

T. Maxwell No. 4, lot 20, N.W. $\frac{1}{4}$, con. V, Walpole tp.
Completed November 25, 1937.
Producing gas well.
Rock pressure: 360 lbs.

| Formation | Thickness, ft. |
|-----------------|-------------------|
| Surface | 20 |
| Flint | 120 |
| Lime and shale | 345 |
| Niagara | 210 |
| White lime | 67 |
| Rochester shale | 45 |
| Clinton | 28 |
| Red Medina | 40 |
| Grey shale | 53 |
| White Medina | 12 |
| Red shale | 2 |

Total depth..... 942

Gas at 850 feet.
Water at 110 feet.

SIDNEY E. CARTWRIGHT

J. M. Donovan No. 4, lot 11, W. ½, con. VIII,
Walpole tp.

Completed July 8, 1937.

Producing gas well.

Rock pressure: 480 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 15 |
| Flint..... | 69 |
| Lime and shale..... | 360 |
| Niagara..... | 300 |
| Rochester shale..... | 50 |
| Clinton..... | 29 |
| Red Medina..... | 30 |
| Grey shale..... | 56 |
| White Medina..... | 10 |
| Red shale..... | 5 |
| Total depth..... | 924 |

SIDNEY E. CARTWRIGHT

J. A. Fallis No. 1, lot 11, E. ½, con. VIII, Walpole tp.

Completed August 3, 1937.

Dry hole.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 16 |
| Flint..... | 85 |
| Lime and shale..... | 335 |
| Niagara..... | 305 |
| Rochester shale..... | 53 |
| Clinton..... | 27 |
| Red Medina..... | 37 |
| Grey shale..... | 54 |
| White Medina..... | 10 |
| Red shale..... | 3 |
| Total depth..... | 925 |

Black water at 95 feet.

EMPIRE NATURAL GAS, LTD.

W. Jackson No. 3, lot 2, con. II, Walpole tp.

Completed August 25, 1937.

Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 26 |
| Flint..... | 160 |
| Lime and shale..... | 349 |
| Niagara..... | 300 |
| Shale..... | 50 |
| Clinton..... | 25 |
| Red Medina..... | 43 |
| Grey shale..... | 61 |
| White Medina..... | 15 |
| Red shale..... | 1 |
| Total depth..... | 1,030 |

Sulphur water at 90 feet.

EMPIRE NATURAL GAS, LTD.

E. Porritt No. 1, lot 1, con. II, Walpole tp.

Completed September 27, 1937.

Producing gas well.

Rock pressure: 350 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 20 |
| Lime..... | 160 |
| Lime and shale..... | 355 |
| Niagara..... | 300 |
| Shale..... | 47 |
| Clinton..... | 25 |
| Red Medina..... | 43 |
| Grey shale..... | 57 |
| White Medina..... | 15 |
| Red shale..... | 50 |
| Total depth..... | 1,072 |

Gas at 1,030 feet.

Fresh water at 90 feet.

HIAWATHA GAS SYNDICATE

D. Hill No. 2, lot 12, con. IV, Walpole tp.

Completed October 8, 1937.

Producing gas well.

Rock pressure: 190 lbs.

| Formation | Thickness, ft. |
|----------------------------|-------------------|
| Surface..... | 25 |
| Flint..... | 123 |
| Lime and shale..... | 357 |
| Niagara..... | 266 |
| Guelph lime and shale..... | 35 |
| Rochester shale..... | 42 |
| Clinton..... | 28 |
| Red Medina..... | 45 |
| Grey shale..... | 64 |
| White Medina..... | 10 |
| Red shale..... | 5 |

Total depth..... 1,000

Gas at 891 feet.

Sulphur water at 103 and 630 feet.

A. E. HOOVER

W. Hoover No. 1, lot 24, con. IV, Walpole tp.

Completed May 15, 1937.

Producing gas well.

Rock pressure: 325 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 10 |
| Flint..... | 85 |
| Lime and shale..... | 405 |
| Niagara..... | 255 |
| Rochester shale..... | 50 |
| Clinton..... | 29 |
| Red Medina..... | 12 |
| Red shale..... | 33 |
| Grey shale..... | 61 |
| White Medina..... | 8 |
| Red shale..... | 43 |

Total depth..... 991

Gas at 808, 848, and 946 feet.

Fresh water at 60 feet.

A. E. HOOVER

W. Hoover No. 2, lot 24, con. IV, Walpole tp.

Completed June 8, 1937.

Dry hole.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 5 |
| Flint..... | 85 |
| Lime and shale..... | 405 |
| Niagara..... | 245 |
| Rochester shale..... | 62 |
| Clinton..... | 23 |
| Red Medina..... | 3 |
| Red shale..... | 37 |
| Grey shale..... | 61 |
| White Medina..... | 12 |
| Red shale..... | 4 |

Total depth..... 942

Fresh water at 55 feet.

S. McKECHNIE

E. Wright No. 2, lot 15, S.E. ¼, con. VIII, Walpole tp.

Completed February 26, 1937.

Producing gas well.

Rock pressure: 450 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 10 |
| Flint..... | 80 |
| Lime and shale..... | 389 |
| Niagara..... | 265 |
| Shale..... | 44 |
| Clinton..... | 28 |
| Red Medina..... | 38 |
| Grey shale..... | 48 |
| White Medina..... | 9 |
| Red shale..... | 5 |

Total depth..... 916

Black water at 52 feet.

F. W. REICHEL

A. W. Doughty No. 1, lot 9, con. IV, Walpole tp.
Completed January 30, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 34 |
| Flint..... | 140 |
| Lime and shale..... | 341 |
| Niagara..... | 265 |
| Shale..... | 54 |
| Clinton..... | 21 |
| Red Medina..... | 35 |
| Grey shale..... | 60 |
| White Medina..... | 15 |
| Red shale..... | 2 |
| Total depth..... | 967 |

Sulphur water at 90 feet.

F. W. REICHEL

J. B. McKenzie No. 1, lot 4, E. $\frac{1}{2}$, con. IV, Walpole tp.
Completed August 11, 1937.
Producing gas well.
Rock pressure: 475 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 32 |
| Flint..... | 160 |
| Lime and shale..... | 353 |
| Niagara..... | 284 |
| Rochester shale..... | 25 |
| Clinton..... | 26 |
| Red Medina..... | 43 |
| Grey shale..... | 54 |
| White Medina..... | 12 |
| Red shale..... | 1 |
| Total depth..... | 990 |

Gas at 869 and 898 feet.
Water at 80 feet.

F. W. REICHEL

J. B. McKenzie No. 2, lot 4, E. $\frac{1}{2}$, con. IV, Walpole tp.
Completed September 3, 1937.
Producing gas well.
Rock pressure: 475 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 28 |
| Flint..... | 137 |
| Lime and shale..... | 380 |
| Niagara..... | 210 |
| White lime..... | 75 |
| Rochester shale..... | 23 |
| Clinton..... | 25 |
| Red Medina..... | 43 |
| Grey shale..... | 56 |
| White Medina..... | 12 |
| Red shale..... | 1 |
| Total depth..... | 990 |

Gas at 868 and 898 feet.
Water at 165 feet.

F. W. REICHEL

E. Pond No. 4, lot 11, con. V, Walpole tp.
Completed February 27, 1937.
Producing gas well.
Rock pressure: 470 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 20 |
| Flint..... | 120 |
| Lime and shale..... | 360 |
| Niagara..... | 260 |
| Rochester shale..... | 55 |
| Clinton..... | 25 |
| Red Medina..... | 30 |
| Red shale..... | 13 |
| Grey shale..... | 55 |
| White Medina..... | 12 |
| Red shale..... | 4 |
| Total depth..... | 954 |

Gas at 835 and 852 feet.
Fresh water at 45 feet.

F. W. REICHEL

G. Saunders No. 1, lot 5, con. IV, Walpole tp.
Completed December 22, 1937.
Producing gas well.
Rock pressure: 500 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 26 |
| Flint..... | 139 |
| Lime and shale..... | 375 |
| Niagara..... | 265 |
| Rochester shale..... | 43 |
| Clinton..... | 22 |
| Red Medina..... | 20 |
| Red shale..... | 28 |
| Grey shale..... | 55 |
| White Medina..... | 12 |
| Red shale..... | 62 |
| Total depth..... | 1,047 |

Gas at 851, 863, 878, and 983 feet.
Water at 58 feet.

F. W. REICHEL

M. Wood No. 2, lot 9, W. $\frac{1}{2}$, con. IV, Walpole tp.
Completed January 19, 1937.
Dry hole.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 27 |
| Flint..... | 133 |
| Lime and shale..... | 378 |
| Niagara..... | 252 |
| Rochester shale..... | 50 |
| Clinton..... | 26 |
| Red Medina..... | 10 |
| Red shale..... | 30 |
| Grey shale..... | 60 |
| White Medina..... | 12 |
| Red shale..... | 3 |
| Total depth..... | 981 |

Fresh water at 95 feet.

STANDARD GAS AND OIL SYNDICATE

C. Gee No. 7, lot 24, N. $\frac{1}{2}$, con. III, Walpole tp.
Completed November 8, 1937.
Producing gas well.
Rock pressure: 430 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 21 |
| Flint..... | 116 |
| Lime and shale..... | 305 |
| Niagara..... | 258 |
| Shale..... | 55 |
| Clinton..... | 27 |
| Red Medina..... | 42 |
| Grey shale..... | 55 |
| White Medina..... | 17 |
| Red shale..... | 4 |
| Total depth..... | 960 |

Gas at 836 and 874 feet.
Sulphur water at 93 feet.

STANDARD GAS AND OIL SYNDICATE

J. Weaver No. 5, lot 24, con. III, Walpole tp.
Completed July 15, 1937.
Producing gas well.
Rock pressure: 430 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 29 |
| Flint..... | 121 |
| Lime and shale..... | 365 |
| Niagara..... | 260 |
| Shale..... | 54 |
| Clinton..... | 27 |
| Red Medina..... | 42 |
| Grey shale..... | 55 |
| White Medina..... | 20 |
| Red shale..... | 4 |
| Total depth..... | 977 |

Gas at 859 and 869 feet.
Sulphur water at 52 feet.

STANDARD GAS AND OIL SYNDICATE

J. Weaver No. 6, lot 24, con. III, Walpole tp.
Completed September 2, 1937.
Producing gas well.
Rock pressure: 430 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 18 |
| Flint..... | 122 |
| Lime and shale..... | 360 |
| Niagara..... | 248 |
| Shale..... | 60 |
| Clinton..... | 28 |
| Red Medina..... | 42 |
| Grey shale..... | 55 |
| White Medina..... | 20 |
| Red shale..... | 4 |

Total depth..... 957

Gas at 811 and 864 feet.
Fresh water at 42 and 110 feet.

STEWART AND STEWART

A. Stewart No. 1, lot 23, con. IX, Walpole tp.
Completed March 20, 1937.
Dry hole.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 5 |
| Flint..... | 10 |
| Lime and shale..... | 425 |
| Niagara..... | 260 |
| Rochester shale..... | 41 |
| Clinton..... | 32 |
| Red Medina..... | 40 |
| Grey shale..... | 50 |
| White Medina..... | 10 |
| Red shale..... | 2 |

Total depth..... 875

Sulphur water at 45 feet; black water at 500 feet.

STEWART AND STEWART

A. Stewart No. 4, lot 18, con. V, Walpole tp.
Completed November 25, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 7 |
| Flint..... | 138 |
| Lime and shale..... | 345 |
| Niagara..... | 230 |
| Shale and lime..... | 100 |
| Clinton..... | 29 |
| Red Medina..... | 50 |
| Grey shale..... | 64 |
| White Medina..... | 10 |
| Red shale..... | 2 |

Total depth..... 975

Sulphur water at 265 feet; black sulphur water at 735 feet.

VICTORIA GAS CO., LTD.

D. Voakes No. 1, lot 16, E. ½, con. I, Walpole tp.
Completed August 13, 1937.
Dry hole.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 24 |
| Flint..... | 140 |
| Lime and shale..... | 376 |
| Niagara..... | 260 |
| Rochester shale..... | 66 |
| Clinton..... | 27 |
| Red Medina..... | 37 |
| Grey shale..... | 69 |
| White Medina..... | 5 |
| Red shale..... | 5 |

Total depth..... 1,009

Show of gas at 866 to 893 feet.
Black water at 125 feet.

WALPOLE GAS SYNDICATE

C. Best No. 3, lot 19, S. ½, con. VI, Walpole tp.
Completed August 24, 1937.
Dry hole.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 39 |
| Flint..... | 81 |
| Lime and shale..... | 353 |
| Niagara..... | 277 |
| Rochester shale..... | 48 |
| Clinton..... | 27 |
| Red Medina..... | 12 |
| Red shale..... | 33 |
| Grey shale..... | 51 |
| White Medina..... | 10 |
| Red shale..... | 3 |

Total depth..... 934

Fresh water at 55 feet.

WALPOLE GAS SYNDICATE

S. Lint No. 5, lot 18, S. ½, con. VI, Walpole tp.
Completed July 7, 1937.
Dry hole.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 28 |
| Flint..... | 97 |
| Lime and shale..... | 350 |
| Niagara..... | 270 |
| Rochester shale..... | 57 |
| Clinton..... | 25 |
| Red Medina..... | 8 |
| Red shale..... | 32 |
| Grey shale..... | 56 |
| White Medina..... | 7 |
| Red shale..... | 6 |

Total depth..... 936

Show of gas at 812 feet.
Fresh water at 82 feet.

WALPOLE GAS SYNDICATE

S. Lint No. 6, lot 18, S. ½, con. VI, Walpole tp.
Completed August 3, 1937.
Producing gas well.
Rock pressure: 400 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 32 |
| Flint..... | 98 |
| Lime and shale..... | 348 |
| Niagara..... | 267 |
| Rochester shale..... | 53 |
| Clinton..... | 28 |
| Red Medina..... | 25 |
| Red shale..... | 15 |
| Grey shale..... | 60 |
| White Medina..... | 10 |
| Red shale..... | 5 |

Total depth..... 941

Gas at 816 and 842 feet.
Fresh water at 56 feet.

WALPOLE GAS SYNDICATE

W. J. Shuter No. 6, lot 16, N. ½, con. VI, Walpole tp.
Completed November 6, 1937.
Dry hole.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 14 |
| Flint..... | 121 |
| Lime and shale..... | 325 |
| Niagara..... | 276 |
| Rochester shale..... | 54 |
| Clinton..... | 26 |
| Red Medina..... | 12 |
| Red shale..... | 24 |
| Grey shale..... | 62 |
| White Medina..... | 9 |
| Red shale..... | 5 |

Total depth..... 928

Fresh water at 45 feet.

Hastings County

DR. E. M. CAREFOOT

Dr. E. M. Carefoot No. 1, lot 2, con. V, Thurlow tp.
Completed April 2, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 19 |
| Trenton lime..... | 161 |
| Arkose..... | 10 |
| Granite..... | 250 |
| Total depth..... | 440 |

Mineral water at 239, 302, and 432 feet.

DR. E. M. CAREFOOT

Dr. E. M. Carefoot No. 2, lot 2, con. V, Thurlow tp.
Completed August 18, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-----------------------------|-------------------|
| Surface..... | 19 |
| Trenton lime..... | 160 |
| Arkose..... | 12 |
| Pre-Cambrian: | |
| Granite..... | 247 |
| Black and grey granite..... | 87 |
| Granite, all shades..... | 424 |
| Total depth..... | 949 |

Mineral water at 18, 302, and 430 feet.

Kent County

A. R. NELSON

J. Daly No. 1, lot 16, con. B, Camden tp.
Completed April 16, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 79 |
| Top rock..... | 33 |
| Top soap..... | 154 |
| Middle lime..... | 16 |
| Lower soap..... | 24 |
| Black streak..... | 4 |
| Lower lime..... | 135 |
| Total depth..... | 445 |

Fresh water at 8 and 45 feet; salt water at 442 feet.

E. P. ROWE

J. Jinks No. 1, lot 9, con. III, Chatham tp.
Completed August 27, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------------|-------------------|
| Surface..... | 60 |
| Black shale..... | 30 |
| Black shale and soap..... | 7 |
| Soft black shale..... | 54 |
| Soft top rock..... | 10 |
| Total depth..... | 161 |

Show of gas at 90 and 97 feet.
Fresh water at 60 feet.

E. P. ROWE

G. McKinlay No. 1, lot 10, con. I, Chatham tp.
Completed December 6, 1937.
Dry hole.

| Formation | Thickness, ft. |
|--------------------|-------------------|
| Surface..... | 51 |
| Hardpan..... | 19 |
| Black shale..... | 55 |
| Soap..... | 2 |
| Top rock..... | 32 |
| Soap..... | 46 |
| Shell..... | 24 |
| Soap..... | 6 |
| Middle lime..... | 18 |
| Lower soap..... | 29 |
| Lower lime..... | 112 |
| Oriskany sand..... | 3 |
| Total depth..... | 438 |

Fresh water at 70 feet.

E. P. ROWE

F. Weaver No. 1, lot 9, con. II, Chatham tp.
Completed September 30, 1937.
Dry hole.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Clay..... | 67 |
| Black shale..... | 37 |
| Soap..... | 61 |
| Black shale..... | 8 |
| Top rock..... | 37 |
| Soap..... | 55 |
| Shell..... | 5 |
| Soap..... | 61 |
| Shell and hard soap..... | 23 |
| Middle lime..... | 7 |
| Lower soap..... | 32 |
| Black streak..... | 4 |
| Big lime..... | 113 |
| Oriskany sand..... | 4 |
| Total depth..... | 514 |

Show of oil at 397 to 400 feet.
Fresh water at 67 feet.

UNION GAS CO. OF CANADA, LTD.

Brown No. 1, lot 9, S.E. ¼, con. XIII, Chatham tp.
Completed August 6, 1937.
Producing gas well.
Rock pressure: 750 lbs.

| Formation | Thickness, ft. |
|------------------------------------|-------------------|
| Surface..... | 60 |
| Brown shale and soap..... | 205 |
| Lime and shale..... | 182 |
| Grey and brown lime..... | 68 |
| Sharp grey lime..... | 20 |
| Grey lime..... | 15 |
| Brown lime..... | 245 |
| Brown and grey lime..... | 45 |
| Sharp grey lime..... | 95 |
| Brown, and brown and grey lime.... | 115 |
| Blue lime and gypsum..... | 15 |
| Brown and grey lime..... | 55 |
| Blue lime and gypsum..... | 40 |
| Blue lime..... | 45 |
| Brown, blue, and grey lime..... | 150 |
| Blue lime..... | 70 |
| Blue and brown lime..... | 10 |
| Brown lime..... | 45 |
| Grey, brown, and blue lime..... | 115 |
| Brown lime..... | 90 |
| Brown, blue, and grey lime..... | 47 |
| Total depth..... | 1,732 |

Gas at 1,435 to 1,459, 1,465, and 1,470 feet.
Show of oil at 1,720 feet.
Fresh water at 95 feet; sulphur water at 520 feet;
salt water at 1,470 to 1,475 and 1,730 feet.

UNION GAS CO. OF CANADA, LTD.

Carter No. 1, lot 10, S.E. $\frac{1}{4}$, con. XII, Chatham tp.
Completed January 15, 1937.
Producing gas well.
Rock pressure: 750 lbs.

| Formation | Thickness, ft. |
|-------------------------|-------------------|
| Surface | 60 |
| Black shale | 180 |
| Lime and shale | 185 |
| Grey lime | 75 |
| Brown and grey lime | 290 |
| Sharp grey lime | 85 |
| Grey and brown lime | 165 |
| Blue lime and gypsum | 15 |
| Grey lime | 25 |
| Blue lime and gypsum | 10 |
| Grey lime | 10 |
| Blue lime | 95 |
| Brown and grey lime | 160 |
| Blue and grey lime | 75 |
| Brown and grey lime | 70 |
| Blue and blue-grey lime | 70 |
| Brown lime | 20 |
| Grey lime | 197 |

Total depth 1,787

Gas at 1,441, 1,572, 1,575 to 1,578, and 1,578 to 1,583 feet.

Show of oil at 1,605 feet.

Sulphur water at 515 and 550 feet; salt water at 1,605 to 1,610 and 1,620 feet.

UNION GAS CO. OF CANADA, LTD.

Eagleson No. 1, lot 10, W. $\frac{1}{2}$, con. XIII, Chatham tp.
Completed July 1, 1937.
Producing gas well.
Rock pressure: 750 lbs.

| Formation | Thickness, ft. |
|----------------------------|-------------------|
| Surface | 60 |
| Brown shale | 195 |
| Lime and shale | 187 |
| Grey lime | 108 |
| Brown lime | 220 |
| Brown and grey lime | 60 |
| Sharp grey lime | 90 |
| Brown and grey lime | 115 |
| Brown, blue, and grey lime | 45 |
| Blue lime and gypsum | 20 |
| Brown lime | 5 |
| Blue lime and gypsum | 5 |
| Blue, brown, and grey lime | 225 |
| Blue lime | 70 |
| Blue and brown lime | 80 |
| Grey lime | 10 |
| Brown lime | 75 |
| Grey and brown lime | 100 |
| Blue and brown lime | 25 |
| Grey and brown lime | 42 |

Total depth 1,737

Gas at 1,450 to 1,460, 1,460 to 1,470, and 1,588 feet; show of gas at 1,599 feet.

Show of oil at 1,712 feet.

Sulphur water at 515 feet; salt water at 1,480 and 1,712 feet.

UNION GAS CO. OF CANADA, LTD.

F. F. Davis No. 1, lot 12, W. $\frac{1}{2}$, con. XII, Chatham tp.
Completed March 15, 1937.
Dry hole.

| Formation | Thickness, ft. |
|--------------------------------------|-------------------|
| Surface | 60 |
| Brown shale and soap | 190 |
| Lime and shale | 195 |
| Grey lime | 85 |
| Brown and grey lime | 50 |
| Brown lime | 200 |
| Sharp brown and grey lime | 180 |
| Brown lime | 80 |
| Brown and blue lime | 15 |
| Blue lime and gypsum | 10 |
| Blue and brown lime | 20 |
| Blue lime, and brown lime and gypsum | 48 |
| Blue and brown lime | 127 |
| Blue lime and gypsum | 15 |
| Brown, and brown and blue lime | 75 |
| Blue lime | 55 |
| Brown, and grey and blue lime | 40 |
| Brown and grey lime | 90 |
| Blue, grey, and blue lime | 177 |
| Fine grey sand | 6 |

Total depth 1,718

Show of gas at 1,473 and 1,593 feet.

Show of oil at 1,715 feet.

Fresh water at 60 feet; salt water at 1,625 and 1,715 feet.

UNION GAS CO. OF CANADA, LTD.

S. Ewing No. 1, lot 10, E. $\frac{1}{2}$, con. XIII, Chatham tp.
Completed September 30, 1937.
Producing gas well.
Rock pressure: 750 lbs.

| Formation | Thickness, ft. |
|----------------------------|-------------------|
| Surface | 60 |
| Brown and black shale | 200 |
| Lime and shale | 185 |
| Grey and brown lime | 210 |
| Grey lime and gypsum | 40 |
| Grey and brown lime | 110 |
| Sharp grey lime | 140 |
| Brown lime | 25 |
| Blue lime | 10 |
| Brown, grey, and blue lime | 80 |
| Blue lime and gypsum | 5 |
| Grey and brown lime | 25 |
| Blue lime and gypsum | 17 |
| Brown lime | 8 |
| Blue lime | 90 |
| Brown, blue, and grey lime | 280 |
| Grey water sand (lime) | 20 |
| Grey lime | 95 |
| Brown lime | 100 |
| Grey lime | 48 |

Total depth 1,748

Gas at 1,465 to 1,475 and 1,600 feet.

Show of gas at 1,615 feet.

Fresh water at 60 feet; sulphur water at 550 feet; salt water at 1,485 and 1,660 feet.

UNION GAS CO. OF CANADA, LTD.

Fritz No. 1, lot 9, W. ¼, con. XIII, Chatham tp.

Completed October 22, 1937.

Producing gas well.

Rock pressure: 750 lbs.

| Formation | Thickness, ft. |
|----------------------------------|-------------------|
| Surface | 62 |
| Brown shale and soap | 206 |
| Lime and shale | 182 |
| Grey and brown lime | 69 |
| Sharp grey lime | 12 |
| Brown and grey lime | 33 |
| Brown lime | 112 |
| Grey lime | 6 |
| Brown lime | 126 |
| Grey and brown lime | 36 |
| Sharp grey lime | 90 |
| Brown and grey lime | 114 |
| Blue, brown, and grey lime | 30 |
| Blue lime and gypsum | 18 |
| Brown and blue lime | 252 |
| Blue lime | 88 |
| Blue and brown lime | 6 |
| Brown lime | 68 |
| Grey and brown lime | 69 |
| Brown lime | 125 |
| Grey and brown lime | 41 |

Total depth 1,745

Gas at 1,454 to 1,460 feet.

Sulphur water at 519 feet; salt water at 1,472 to 1,478, 1,478 to 1,483, and 1,734 feet.

UNION GAS CO. OF CANADA, LTD.

Langstaff No. 1, lot 7, N. ½, con. XII, Chatham tp.

Completed May 18, 1937.

Dry hole.

| Formation | Thickness, ft. |
|-------------------------------------|-------------------|
| Surface | 55 |
| Brown shale | 110 |
| Lime and shale | 205 |
| Grey and brown lime | 105 |
| Sharp grey and brown lime | 45 |
| Brown lime | 115 |
| Grey and brown lime | 125 |
| Sharp brown and grey lime | 110 |
| Grey, and grey and brown lime | 100 |
| Brown lime | 145 |
| Blue lime and gypsum | 10 |
| Brown, blue, and grey lime | 150 |
| Blue lime and gypsum | 20 |
| Brown and blue lime | 155 |
| Brown lime | 70 |
| Blue lime | 60 |
| Brown, blue, and grey lime | 165 |
| Brown lime | 45 |
| Grey lime | 55 |
| Blue shale | 5 |

Total depth 1,850

Show of gas at 1,588 feet.

Sulphur water at 397 feet; salt water at 1,830 feet.

UNION GAS CO. OF CANADA, LTD.

Johnston Estate No. 1, lot 8, E. ½ of S.E. ¼,
con. XIII, Chatham tp.

Completed September 13, 1937.

Producing gas well.

Rock pressure: 750 lbs.

| Formation | Thickness, ft. |
|----------------------------------|-------------------|
| Surface | 60 |
| Brown shale | 200 |
| Lime and shale | 180 |
| Grey and brown lime | 75 |
| Sharp grey lime | 15 |
| Brown lime | 255 |
| Brown and grey lime | 40 |
| Sharp grey lime | 90 |
| Grey and brown lime | 130 |
| Blue lime | 5 |
| Blue and grey lime | 20 |
| Blue lime and gypsum | 21 |
| Blue lime | 99 |
| Grey, brown, and blue lime | 140 |
| Blue lime | 65 |
| Grey and blue lime | 35 |
| Brown lime | 75 |
| Grey and blue lime | 35 |
| Brown lime | 75 |
| Grey and blue lime | 80 |
| Grey, brown, and blue lime | 180 |
| Grey lime | 80 |
| Grey shale | 5 |

Total depth 1,850

Gas at 1,442 to 1,444 and 1,450 feet.

Sulphur water at 515 feet; salt water at 1,500, 1,740, and 1,835 feet.

UNION GAS CO. OF CANADA, LTD.

McCallum No. 1, lot 10, S. ½, con. XII, Chatham tp.

Completed March 9, 1937.

Producing gas well.

Rock pressure: 750 lbs.

| Formation | Thickness, ft. |
|----------------------------------|-------------------|
| Surface | 55 |
| Black shale | 190 |
| Lime and shale | 173 |
| Grey lime | 107 |
| Brown lime | 90 |
| Grey and brown lime | 165 |
| Sharp grey lime | 90 |
| Brown and grey lime | 115 |
| Blue-grey lime | 30 |
| Brown lime | 15 |
| Blue lime and gypsum | 20 |
| Brown lime | 15 |
| Blue lime and gypsum | 5 |
| Blue lime | 110 |
| Brown, grey, and blue lime | 245 |
| Brown lime | 45 |
| Grey lime | 110 |
| Brown and grey lime | 130 |
| Grey lime | 117 |
| Blue shale | 6 |

Total depth 1,833

Gas at 1,438, 1,448, and 1,455 feet.

Show of gas at 1,428 feet.

Show of oil at 1,675 feet.

Fresh water at 55 feet; sulphur water at 507 and 590 feet; salt water at 1,670 to 1,805 feet.

UNION GAS CO. OF CANADA, LTD.

McCallum No. 1, lot 12, E. ½, con. XII, Chatham tp.
Completed June 10, 1937.
Dry hole.

| Formation | Thickness, ft. |
|----------------------------|-------------------|
| Surface | 50 |
| Black shale and soap | 206 |
| Lime and shale | 179 |
| Grey and brown lime | 110 |
| Brown lime | 110 |
| Grey and brown lime | 135 |
| Sharp grey lime | 140 |
| Brown and grey lime | 140 |
| Blue lime and gypsum | 15 |
| Brown, blue, and grey lime | 135 |
| Blue and grey lime | 120 |
| Brown and grey lime | 50 |
| Blue, grey, and brown lime | 100 |
| Grey lime | 249 |
| Rochester shale | 1 |
| Total depth | 1,840 |

Gas at 1,442, 1,465, and 1,578 feet; gas blew down before completion.
Show of oil at 1,680 feet.

UNION GAS CO. OF CANADA, LTD.

Starks No. 1, lot 9, E. ½ of N.E. ¼, con. XI, Chatham tp.
Completed April 22, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-------------------------------------|-------------------|
| Surface | 50 |
| Black shale | 120 |
| Lime and shale | 202 |
| Grey lime | 63 |
| Brown lime | 15 |
| Grey water sand | 20 |
| Brown lime | 145 |
| Grey and brown lime | 130 |
| Sharp grey lime | 90 |
| Grey and brown lime | 160 |
| Grey lime and gypsum | 5 |
| Grey lime | 40 |
| Grey lime, and blue lime and gypsum | 10 |
| Blue and brown lime | 35 |
| Blue lime and gypsum | 10 |
| Brown lime | 10 |
| Blue lime and gypsum | 10 |
| Blue lime | 100 |
| Grey, blue, and brown lime | 370 |
| Brown lime | 90 |
| Grey and brown lime | 55 |
| Grey lime | 113 |
| Grey shale | 9 |

Total depth 1,852
Show of gas at 1,595 to 1,600 and 1,600 to 1,605 feet.
Fresh water at 50 feet; sulphur water at 460 feet; salt water at 1,600 to 1,605 feet.

LADD AND KNIGHT

E. Jubbville No. 1, lot 2, con. III, Dover tp.
Completed August 7, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-----------------------|-------------------|
| Surface | 70 |
| Soap | 15 |
| Soap and lime shell | 203 |
| Lime | 270 |
| Gypsum | 7 |
| Lime and gypsum | 1,420 |
| Blue shale | 10 |
| Grey shale | 37 |
| Red shale | 43 |
| Grey shale | 39 |
| Clinton | 21 |
| Grey lime | 53 |
| Red shale | 120 |
| Brown shale and shell | 132 |
| Grey shale and shell | 270 |
| Brown shale | 192 |
| Trenton | 411 |

Total depth 3,313
Fresh water at 235 feet; sulphur water at 450 feet; salt water at 425, 1,935, and 1,955 feet.

UNION GAS CO. OF CANADA, LTD.

Brown No. 1, lot 28, E.B.R., Dover tp.
Completed December 21, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-----------------------------------|-------------------|
| Surface | 65 |
| Brown shale and soap | 40 |
| Hamilton | 210 |
| Brown and grey lime | 265 |
| Grey and brown lime and gypsum | 12 |
| Brown lime | 24 |
| Grey lime and gypsum | 6 |
| Brown lime | 90 |
| Brown and grey lime | 30 |
| Sharp grey and brown lime | 240 |
| Brown lime | 114 |
| Grey lime, and blue and grey lime | 12 |
| Blue lime and gypsum | 6 |
| Grey lime | 42 |
| Blue lime | 96 |
| Brown lime, blue and brown lime | 150 |
| Blue lime | 36 |
| Brown and blue lime | 36 |
| Salt and lime | 45 |
| Salt | 103 |
| Salt and brown lime | 68 |
| Brown lime | 120 |
| Brown and grey lime | 6 |
| Grey lime | 24 |
| Brown lime | 57 |

Total depth 1,897
Show of gas at 145 to 150 feet.
Fresh water at 65 feet; sulphur water at 435 feet; salt water at 1,845 and 1,876 feet.

PATRICK FITZPATRICK

C. Austin No. 3, lot 20, con. XV, Orford tp.
Completed October 12, 1937.
Producing oil well.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface | 218 |
| Lime shell | 1 |
| Soap | 11 |
| Middle lime | 4 |
| Lower soap | 36 |
| Dark streak | 4 |
| Grey and brown lime | 136 |
| Oriskany sand | 2 |

Total depth 412
Oil at 284 and 304 to 310 feet.
Fresh water at 86, 160, and 212 feet.

ARTHUR LATHER

W. Mobey No. 6, lot 23, con. XV, Orford tp.
Completed May 3, 1937
Small producing oil well.

| Formation | Thickness, ft. |
|-------------|-------------------|
| Surface | 170 |
| Hardpan | 20 |
| Soap | 45 |
| Middle lime | 2 |
| Lower soap | 26 |
| Lower lime | 97 |

Total depth 360
Oil at 357 feet.

J. W. MURPHY

R. Murphy No. 1, lot 21, con. XV, Orford tp.
Completed June 26, 1937.
Dry hole

| Formation | Thickness, ft. |
|-------------|-------------------|
| Surface | 205 |
| Hardpan | 10 |
| Soap | 30 |
| Middle lime | 10 |
| Soap | 20 |
| Hard streak | 6 |
| Soap | 2 |
| Lower lime | 135 |

Total depth 418
Show of oil at 330 and 395 feet.
Fresh water at 65 feet; salt water at 330 and 395 feet.

AJAX OIL AND GAS CO., LTD.

P. H. Flook No. 1, lot 138, S.T.R., Raleigh tp.

Completed April 29, 1937.

Producing gas well.

Rock pressure: 500 lbs.

| Formation | Thickness, ft. |
|---------------------------|-------------------|
| Surface..... | 195 |
| Soap..... | 143 |
| Grey and brown lime..... | 337 |
| Sharp grey lime..... | 135 |
| Sharp grey sand..... | 35 |
| Sharp grey lime..... | 40 |
| Grey and brown lime..... | 150 |
| Grey lime and gypsum..... | 10 |
| Dark-grey lime..... | 19 |
| Blue and brown lime..... | 105 |
| Grey lime..... | 6 |
| Brown lime..... | 15 |
| Grey and black lime..... | 20 |
| Brown and blue lime..... | 50 |
| Grey and brown lime..... | 40 |
| Blue lime..... | 30 |
| Brown and white lime..... | 10 |
| Brown and grey lime..... | 35 |
| Brown lime and salt..... | 25 |
| Brown and grey lime..... | 138 |

Total depth..... 1,538

Gas at 1,475, 1,511, 1,519, and 1,538 feet.

Sulphur water at 271 feet; black salt water at 530 and 550 feet.

KNIGHT, STOVER AND RAWLINGS

W. Johnston No. 1, lot 6, con. II, Raleigh tp.

Completed December 10, 1937.

Producing gas well.

Rock pressure: 1,100 lbs.

| Formation | Thickness, ft. |
|--------------------------------|-------------------|
| Surface..... | 70 |
| Brown shale..... | 15 |
| Lime, shale, and soap..... | 221 |
| Grey lime..... | 124 |
| Sharp brown lime..... | 40 |
| White water sand..... | 10 |
| Sharp brown lime..... | 20 |
| Brown lime..... | 60 |
| Grey lime and gypsum..... | 10 |
| Brown and grey lime..... | 40 |
| Brown lime..... | 100 |
| Grey lime..... | 25 |
| Sharp grey and brown lime..... | 235 |
| Grey and brown lime..... | 130 |
| Grey lime and gypsum..... | 120 |
| Brown lime..... | 10 |
| Grey lime and gypsum..... | 10 |
| Brown lime..... | 40 |
| Grey lime and gypsum..... | 10 |
| Brown lime..... | 85 |
| Blue shale..... | 75 |
| Grey and brown lime..... | 30 |
| Brown lime..... | 70 |
| Grey and brown lime..... | 90 |
| Brown lime..... | 247 |
| Grey lime..... | 18 |
| Blue shale..... | 20 |
| Clinton..... | 4 |
| Blue shale..... | 11 |
| Red Medina..... | 30 |
| Blue shale..... | 90 |
| White Medina..... | 40 |
| Red shale..... | 260 |
| Blue shale..... | 230 |
| Dark-grey shale..... | 90 |
| Brown shale..... | 125 |
| Trenton lime..... | 395 |

Total depth..... 3,200

Gas at 2,920 and 2,930 feet.

Fresh water at 65 feet; black water at 430, 1,620, and 1,790 feet.

GUBB AND RUSSELL

T. C. Warwick No. 1, lot 135, N.T.R., Raleigh tp.

Completed January 12, 1937.

Dry hole.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Surface..... | 185 |
| Lime and soap..... | 152 |
| Limestone..... | 73 |
| Grey lime..... | 90 |
| Brown and grey lime..... | 55 |
| Brown lime..... | 90 |
| Grey lime..... | 85 |
| White lime..... | 25 |
| Sharp grey lime..... | 75 |
| Grey lime..... | 8 |
| Brown lime..... | 107 |
| Grey and brown lime..... | 70 |
| Blue lime..... | 95 |
| Grey and brown lime..... | 138 |
| Grey dolomite..... | 40 |
| Grey and brown lime..... | 47 |
| Salt..... | 50 |
| Salt and lime shell..... | 84 |
| Salt..... | 1 |
| Brown lime..... | 60 |
| Grey and brown lime..... | 85 |
| Brown lime..... | 25 |

Total depth..... 1,640

Sulphur water at 530 feet.

PRAIRIE GAS AND OIL CO., LTD.

Rozell No. 1, lot 7, con. I, Raleigh tp.

Completed July 31, 1937.

Dry hole (lime test).

| Formation | Thickness, ft. |
|------------------|-------------------|
| Clay..... | 71 |
| Black shale..... | 29 |
| Top rock..... | 30 |
| Soap..... | 43 |
| Shell..... | 1 |
| Soap..... | 20 |
| Lime shell..... | 7 |
| Hard soap..... | 8 |
| Middle lime..... | 6 |
| Lower soap..... | 27 |
| Dark streak..... | 6 |
| Lower lime..... | 4 |

Total depth..... 300

Fresh water at 70 feet.

E. P. ROWE

L. Bruette No. 3, lot 5, con. II, Raleigh tp.
Completed July 29, 1937.
Producing gas well.
Rock pressure: 1,200 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface | 75 |
| Brown shale | 15 |
| Lime and soap | 220 |
| Brown lime | 120 |
| Sharp brown lime | 80 |
| Lime and gypsum | 200 |
| Sharp lime | 275 |
| Brown lime | 115 |
| Grey lime and gypsum | 410 |
| Hard brown lime | 90 |
| Hard grey lime | 70 |
| Hard brown lime | 200 |
| Grey lime | 42 |
| Blue shale | 23 |
| Clinton | 5 |
| Red Medina | 50 |
| Blue shale | 70 |
| White Medina | 35 |
| Red shale | 245 |
| Blue shale | 160 |
| Grey shale | 185 |
| Brown lime | 130 |
| Trenton shelly lime | 15 |
| Trenton lime | 376 |
| Shale | 3 |
| Trenton lime | 38 |

Total depth..... 3,247

Gas at 2,944, 2,965, 3,000, and 3,012 feet.
Fresh water at 75 feet; black water at 480 and 1,710 feet.

UNION GAS CO. OF CANADA, LTD.

G. A. Edwards No. 1, lot 142, T.R., Raleigh tp.
Completed November 6, 1937.
Producing gas well.
Rock pressure: 575 lbs.

| Formation | Thickness, ft. |
|--------------------------------|-------------------|
| Surface | 185 |
| Hamilton | 160 |
| Grey lime | 75 |
| Light-brown lime | 60 |
| Brown and grey lime | 45 |
| Brown lime | 85 |
| Grey lime | 60 |
| Sharp grey lime | 190 |
| Grey and brown lime | 105 |
| Blue and grey lime | 60 |
| Brown lime | 15 |
| Blue lime | 115 |
| Brown lime | 55 |
| Blue, brown, and grey lime | 70 |
| Blue lime | 120 |
| Brown lime | 40 |
| Grey, and brown and grey lime | 70 |
| Brown, and grey and brown lime | 55 |

Total depth..... 1,565

Gas at 1,415, 1,428, 1,435 to 1,440, 1,489, 1,495,
1,513 to 1,519, 1,525 to 1,527, 1,529, 1,535, 1,544,
1,546, 1,549, 1,554, and 1,554 to 1,565 feet.
Sulphur water at 545 to 590 feet.

SALINA GAS CO., LTD.

A. Pepper No. 1, lot 12, con. XV, Raleigh tp.
Completed September 10, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-------------------------|-------------------|
| Surface | 145 |
| Shale | 25 |
| Lime, shale, and soap | 178 |
| Big grey lime | 172 |
| Grey lime | 115 |
| Sharp grey lime | 130 |
| Grey and hard grey lime | 210 |
| Grey and brown lime | 50 |
| Blue lime | 35 |
| Brown lime | 30 |
| Blue lime | 55 |
| Grey and brown lime | 180 |
| Blue lime | 40 |
| Grey and brown lime | 101 |
| Brown lime | 84 |
| Grey lime | 12 |

Total depth..... 1,562

Show of gas at 1,464 feet.
Show of oil at 1,534 and 1,562 feet.
Fresh water at 140 feet; sulphur water at 630 and 805 feet; salt water at 1,562 feet.

UNION GAS CO. OF CANADA, LTD.

Guyett No. 1, lot 143, E. ½, T.R., Raleigh tp.
Completed September 27, 1937.
Producing gas well.
Rock pressure: 578 lbs.

| Formation | Thickness, ft. |
|--------------------------------|-------------------|
| Surface | 180 |
| Hamilton | 100 |
| Grey lime | 265 |
| Brown lime | 55 |
| Grey lime | 35 |
| Sharp grey lime | 175 |
| Brown and grey lime | 210 |
| Grey lime and gypsum | 5 |
| Brown and grey lime | 25 |
| Brown and blue lime | 40 |
| Blue lime | 40 |
| Brown, and blue and brown lime | 100 |
| Brown lime | 80 |
| Blue shale | 45 |
| Blue and brown lime | 40 |
| Brown and grey lime | 90 |
| Brown lime | 65 |
| Grey lime | 20 |

Total depth..... 1,570

Gas at 1,430, 1,475 to 1,480, 1,495, 1,520 to 1,525,
1,530 to 1,535, 1,546, 1,547, 1,550, 1,558, 1,562,
1,564, and 1,567 feet; show of gas at 1,260 feet.
Sulphur water at 500 feet.

UNION GAS CO. OF CANADA, LTD.

Guyett No. 1, lot 144, S. $\frac{1}{2}$, T.R., Raleigh tp.
Completed December 15, 1937.
Dry hole.

| Formation | Thickness, ft. |
|----------------------------|-------------------|
| Surface | 175 |
| Hamilton | 85 |
| Grey lime | 65 |
| Brown lime | 130 |
| Grey and brown lime | 120 |
| Sharp grey lime | 135 |
| Grey and brown lime | 70 |
| Blue lime | 10 |
| Grey and brown lime | 150 |
| Blue and brown lime | 95 |
| Blue and grey lime | 25 |
| Blue lime | 150 |
| Brown and grey lime | 110 |
| Blue lime | 50 |
| Grey lime | 100 |
| Brown and grey lime | 145 |
| Brown and light-brown lime | 55 |
| Grey lime | 103 |

Total depth..... 1,773

Show of gas at 280 to 265 and 295 feet.
Sulphur water at 415 and 675 feet; salt water at 1,745 and 1,760 feet.

UNION GAS CO. OF CANADA, LTD.

Little No. 1, lot 142, T.R., Raleigh tp.
Completed July 22, 1937.
Producing gas well.
Rock pressure: 578 lbs.

| Formation | Thickness, ft. |
|--------------------------------|-------------------|
| Surface | 190 |
| Hamilton | 120 |
| Brown lime | 150 |
| Grey lime | 220 |
| Sharp grey lime | 155 |
| Brown and grey lime | 155 |
| Brown and blue lime | 25 |
| Grey lime | 13 |
| Blue lime | 112 |
| Brown lime | 10 |
| Blue lime and gypsum | 10 |
| Brown lime | 40 |
| Brown, and blue and brown lime | 180 |
| Brown lime | 45 |
| Grey lime | 35 |
| Brown lime | 72 |

Total depth..... 1,532

Gas at 1,397, 1,409, 1,465, 1,498, 1,507, 1,510, 1,514, 1,520, 1,538, and 1,532 feet.
Show of gas at 1,235 to 1,240 feet.
Sulphur water at 530 and 570 feet.

UNION GAS CO. OF CANADA, LTD.

Pardo No. 1, lot 138, W. $\frac{1}{2}$, T.R., Raleigh tp.
Completed October 29, 1937.
Producing gas well.
Rock pressure: 578 lbs.

| Formation | Thickness, ft. |
|--------------------------------|-------------------|
| Surface | 195 |
| Hamilton | 145 |
| Grey lime | 140 |
| Brown lime | 180 |
| Sharp grey lime | 200 |
| Brown lime | 105 |
| Brown and blue lime and gypsum | 30 |
| Grey lime | 25 |
| Blue lime and gypsum | 10 |
| Blue, and brown and blue lime | 15 |
| Brown and blue lime | 30 |
| Blue and grey lime | 60 |
| Brown, and blue and brown lime | 130 |
| Blue lime | 60 |
| Brown, and blue and brown lime | 45 |
| Salt and brown lime | 45 |
| Brown and grey lime | 75 |
| Brown lime | 47 |
| Grey lime | 17 |

Total depth..... 1,554

Gas at 1,537, 1,542, 1,544, 1,546, 1,548, 1,551, and 1,553 feet; show of gas at 400 feet.
Sulphur water at 285, 520, and 535 feet.

UNION GAS CO. OF CANADA, LTD.

Ronson No. 1, lot 144, T.R., Raleigh tp.
Completed December 30, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface | 200 |
| Hamilton | 70 |
| Grey lime | 40 |
| Brown lime | 130 |
| Grey lime | 5 |
| Brown lime | 120 |
| Sharp grey lime | 205 |
| Grey lime | 80 |
| Brown and grey lime | 135 |
| Blue lime | 5 |
| Brown and grey lime | 50 |
| Brown and blue lime | 60 |
| Blue lime | 40 |
| Brown and blue lime | 30 |
| Brown lime | 150 |
| Blue and brown lime | 88 |
| Brown and grey lime | 166 |
| Grey lime | 119 |

Total depth..... 1,693

Show of gas at 185, 305, and 1,545 to 1,551 feet.
Fresh water at 185 feet; sulphur water at 305 feet; salt water at 1,540 and 1,637 feet.

McNAMARA CONSTRUCTION Co., LTD.

W. Reid No. 1, lot 11, N.E. $\frac{1}{4}$, N.M.R.,
Tilbury East tp.

Completed February 2, 1937.
Producing gas and oil well.
Rock pressure: 360 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface | 144 |
| Soap and shell | 98 |
| Grey lime | 200 |
| Brown lime | 105 |
| Grey lime and gypsum | 400 |
| Grey lime and shale | 350 |
| Brown lime | 90 |
| Grey lime | 35 |
| Brown lime | 13 |

Total depth..... 1,435

Gas at 1,420 to 1,425 feet; show of gas at 1,245 feet.
Oil at 1,385 to 1,400 and 1,427 to 1,435 feet; show of oil at 1,365 feet.
Fresh water at 130 feet; salt water at 485, 750, and 1,380 feet.

McNAMARA CONSTRUCTION Co., LTD.

W. Reid No. 2, lot 11, N.E. $\frac{1}{4}$, N.M.R.,
Tilbury East tp.

Completed April 10, 1937.
Producing gas and oil well.
Rock pressure: 360 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface | 140 |
| Soap | 98 |
| Grey lime | 227 |
| Brown lime | 100 |
| Grey lime and gypsum | 285 |
| Lime and shale | 95 |
| Brown lime | 500 |
| Grey lime | 3 |

Total depth..... 1,448

Gas at 1,425 to 1,430 feet; show of gas at 1,256, 1,286 to 1,296, and 1,357 feet.
Oil at 1,430 to 1,440 feet; show of oil at 1,381 feet.
Salt water at 510 and 1,396 feet.

JACK PERDUE

J. Williams No. 1, lot 3, N. ½, con. VIII,
Tilbury East tp.

Completed January 27, 1937.

Producing gas and oil well.

Rock pressure: 125 lbs.

| Formation | Thickness, ft. |
|---------------------------|-------------------|
| Surface..... | 105 |
| Soap..... | 95 |
| Middle lime..... | 28 |
| Soap..... | 31 |
| Big lime..... | 111 |
| Brown lime..... | 30 |
| Light-brown lime..... | 33 |
| Grey lime..... | 7 |
| Brown lime..... | 170 |
| Grey sharp sand..... | 160 |
| Brown lime..... | 100 |
| Grey lime and gypsum..... | 20 |
| Blue lime..... | 130 |
| Brown lime..... | 330 |
| Grey lime..... | 45 |
| Brown lime..... | 40 |
| Brownish-white lime..... | 15 |

Total depth..... 1,450

Gas at 1,435 feet.

Oil at 1,435 feet.

Fresh water at 95 feet; salt water at 540 feet.

STOVER AND RAWLINGS

F. Campbell No. 1, lot 5, con. VIII, Tilbury East tp.

Completed February 11, 1937.

Dry hole.

| Formation | Thickness, ft. |
|----------------------------|-------------------|
| Surface..... | 127 |
| Soap..... | 57 |
| Middle lime..... | 12 |
| Soap..... | 14 |
| Grey lime..... | 75 |
| Dark-grey lime..... | 70 |
| Light-grey lime..... | 45 |
| Brown and grey lime..... | 400 |
| Grey lime and gypsum..... | 22 |
| Grey and brown lime..... | 538 |
| Light-grey water sand..... | 7 |
| White water sand..... | 15 |
| White sand..... | 3 |
| Blue lime..... | 5 |
| White lime..... | 5 |
| Light-brown lime..... | 15 |
| White lime..... | 20 |

Total depth..... 1,430

Show of gas and oil at 1,345 feet.

WALKER AND DRAKE

T. Moffat No. 2, lot 6, con. IX, Tilbury East tp.

Completed August 14, 1937.

Dry hole.

| Formation | Thickness, ft. |
|-----------------|-------------------|
| Surface..... | 170 |
| Top rock..... | 5 |
| Top soap..... | 50 |
| Lower lime..... | 45 |
| Grey lime..... | 100 |
| Sharp sand..... | 22 |
| Grey lime..... | 253 |
| Sharp sand..... | 81 |
| Brown lime..... | 18 |
| Grey lime..... | 486 |
| Brown lime..... | 105 |
| Grey lime..... | 20 |
| Brown lime..... | 78 |
| Grey lime..... | 21 |

Total depth..... 1,454

Show of gas and oil at 1,378 feet.

Fresh water at 140 feet; black salt water at 371 feet;
salt water at 1,452 feet.

DELHI GAS SYNDICATE

C. and A. McRitchie No. 1, lot 16, R.R., Zone tp.

Completed November 6, 1937.

Small producing oil well.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 140 |
| Top soap..... | 94 |
| Middle lime..... | 10 |
| Lower soap..... | 19 |
| Black streak..... | 9 |
| Lower lime..... | 134 |

Total depth..... 406

Oil at 365 to 375 feet.

Fresh water at 16, 60, and 198 feet; salt water at 365
to 375 feet.

DOMESTIC GAS AND OIL Co., LTD.

J. and F. McRoberts No. 2, lot 19, R.R., Zone tp.

Completed January 25, 1937.

Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 165 |
| Soap..... | 19 |
| Middle lime..... | 8 |
| Soap..... | 36 |
| Big lime..... | 152 |

Total depth..... 380

Oil at 260, 302, 330, and 365 feet.

Fresh water at 65 feet.

DOMESTIC GAS AND OIL Co., LTD.

J. and F. McRoberts No. 3, lot 19, W. ½, R.R.,
Zone tp.

Completed June 24, 1937.

Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 158 |
| Soap..... | 28 |
| Middle lime..... | 12 |
| Soap..... | 32 |
| Big lime..... | 164 |

Total depth..... 394

Oil at 260, 330, 365, and 385 feet.

Fresh water at 15, 20, and 102 feet; salt water at 260,
330, and 385 feet.

DOMESTIC GAS AND OIL Co., LTD.

J. and F. McRoberts No. 4, lot 19, W. ½, R.R.,
Zone tp.

Completed August 18, 1937.

Dry hole.

| Formation | Thickness, ft. |
|--------------------|-------------------|
| Surface..... | 150 |
| Top soap..... | 25 |
| Middle lime..... | 15 |
| Lower soap..... | 34 |
| Big lime..... | 196 |
| Lime and sand..... | 7 |

Total depth..... 427

Salt water at 427 feet.

DOMESTIC GAS AND OIL Co., LTD.

J. and F. McRoberts No. 5, lot 19, R.R., Zone tp.

Completed November 4, 1937.

Producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 180 |
| Soap..... | 15 |
| Middle lime..... | 11 |
| Soap..... | 34 |
| Big lime..... | 153 |

Total depth..... 393

Oil at 393 feet.

Fresh water at 60 feet; salt water at 393 feet.

DOMESTIC GAS AND OIL CO., LTD.

Newell No. 1, lot 19, E. ½, R.R., Zone tp.

Completed March 1, 1937.

Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 140 |
| Upper soap..... | 46 |
| Middle lime..... | 8 |
| Lower soap..... | 35 |
| Big lime..... | 169 |

Total depth..... 398

Oil at 260, 345, and 360 feet.

Fresh water at 10 and 60 feet.

DOMESTIC GAS AND OIL CO., LTD.

Newell No. 2, lot 19, E. ½, R.R., Zone tp.

Completed October 2, 1937.

Dry hole.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 190 |
| Middle lime..... | 5 |
| Soap..... | 35 |
| Big lime..... | 186 |

Total depth..... 416

Fresh water at 40 and 60 feet; salt water at 235 to 240 and 330 feet.

FRED M. GROSCHNER

J. Johnston No. 1, lot 7, con. X, Zone tp.

Completed February 26, 1937.

Dry hole.

| Formation | Thickness, ft. |
|--------------------|-------------------|
| Surface..... | 137 |
| Soap..... | 18 |
| Lime shell..... | 3 |
| Soap..... | 54 |
| Middle lime..... | 6 |
| Lower soap..... | 24 |
| Lower lime..... | 176 |
| Oriskany sand..... | 15 |

Total depth..... 433

Fresh water at 137 feet.

E. B. HOLMES

W. Goodyear No. 1, lot 7, con. VIII, Zone tp.

Completed April 15, 1937.

Small producing oil well.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Sand and gravel..... | 21 |
| Clay..... | 124 |
| Gravel..... | 18 |
| Soap..... | 163 |
| Lime..... | 170 |

Total depth..... 380

Oil at 362 feet.

Salt water at 227 feet.

E. B. HOLMES

W. Goodyear No. 2, lot 7, con. VIII, Zone tp.

Completed July 9, 1937.

Small producing oil well.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Sand..... | 22 |
| Clay..... | 68 |
| Gravel and sand..... | 80 |
| Soap..... | 38 |
| Lime..... | 160 |
| Sand..... | 20 |

Total depth..... 388

Oil at 211 and 372 feet.

ROBERT MCCRIE

R. McCrie No. 1, Town of Bothwell, Zone tp.

Completed February 9, 1937.

Dry hole.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 85 |
| Black shale..... | 62 |
| Grey shale..... | 35 |
| Top rock..... | 8 |
| Soap..... | 132 |
| Middle lime..... | 21 |
| Lower soap..... | 22 |
| Black streak..... | 4 |
| Lower lime..... | 136 |
| Sand..... | 6 |

Total depth..... 511

Salt water at 507 feet.

A. WAYMIRE

Cornell No. 1, lot 6, con. V, Zone tp.

Completed November 22, 1937.

Producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 108 |
| Top soap..... | 102 |
| Middle lime..... | 10 |
| Lower soap..... | 27 |
| Dark streak..... | 8 |
| Lower lime..... | 93 |

Total depth..... 348

Oil at 220 to 225, 275 to 280, and 330 to 335 feet.

Fresh water at 12 feet; salt water at 330 to 335 feet.

A. WAYMIRE

Cornell No. 2, lot 6, con. V, Zone tp.

Completed December 1, 1937.

Producing oil well.

| Formation | Thickness, ft. |
|--------------------|-------------------|
| Surface..... | 122 |
| Top soap..... | 83 |
| Middle lime..... | 15 |
| Lime and soap..... | 15 |
| Soap..... | 20 |
| Lower lime..... | 139 |

Total depth..... 394

Oil at 300, 320, and 325 feet.

Fresh water at 82 and 120 feet; salt water at 370 feet.

A. WAYMIRE

O. Jones No. 1, lot 6, con. V, Zone tp.

Completed November 5, 1937.

Producing oil well.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 115 |
| Soap..... | 105 |
| Middle lime..... | 10 |
| Lower soap..... | 20 |
| Black streak..... | 8 |
| Soap streak..... | 4 |
| Lower lime..... | 144 |

Total depth..... 406

Oil at 324 feet.

Fresh water at 18 feet; salt water at 324 feet.

A. WAYMIRE

O. Jones No. 2, lot 6, con. V, Zone tp.
Completed December 14, 1937.
Dry hole.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 105 |
| Top soap..... | 110 |
| Middle lime..... | 15 |
| Lower soap..... | 25 |
| Lower lime..... | 132 |
| Total depth..... | 387 |

Fresh water at 52 feet; salt water at 355 feet.

G. E. WILLITS

D. and J. Ferguson No. 1, lot 7, con. V, Zone tp.
Completed September 4, 1937.
Dry hole.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 75 |
| Top rock..... | 45 |
| Top soap..... | 163 |
| Middle lime..... | 20 |
| Lower soap..... | 21 |
| Dark streak..... | 8 |
| Lower lime..... | 1 |
| Total depth..... | 333 |

Fresh water at 20 and 70 feet.

J. VON BERG

H. Brewer No. 3, lot 19, con. VIII, Zone tp.
Completed February 28, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Sand..... | 18 |
| Clay..... | 36 |
| Gravel..... | 121 |
| Lime shell..... | 5 |
| Quag..... | 28 |
| Lower lime..... | 183 |
| Total depth..... | 391 |

Oil at 383 feet.
Fresh water at 54 feet; salt water at 391 feet.

J. VON BERG

H. Brewer No. 4, lot 19, con. VIII, Zone tp.
Completed April 30, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Top sand..... | 18 |
| Clay..... | 42 |
| Hardpan..... | 10 |
| Gravel and sand..... | 143 |
| Lower lime..... | 167 |
| Total depth..... | 380 |

Oil at 370 to 380 feet.
Salt water at 260 feet.

J. VON BERG

H. Brewer No. 5, lot 19, con. VIII, Zone tp.
Completed July 16, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Top sand..... | 18 |
| Clay..... | 42 |
| Hardpan..... | 20 |
| Gravel and sand..... | 126 |
| Lower lime..... | 179 |
| Total depth..... | 385 |

Oil at 377 to 382 feet.
Salt water at 230 and 280 feet.

J. VON BERG

H. Brewer No. 6, lot 19, con. VIII, Zone tp.
Completed November 28, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 70 |
| Hardpan..... | 5 |
| Gravel and sand..... | 128 |
| Hard streak..... | 4 |
| Soap..... | 2 |
| Lower lime..... | 164 |
| Oil sand..... | 12 |
| Total depth..... | 385 |

Oil at 290 feet.
Salt water at 235, 290, and 365 feet.

Lambton County

SULLIVAN AND WILSON

C. Lucas No. 1, lot 20, E. ½, con. XIV, Brooke tp.
Completed September 25, 1937.
Dry hole.

| Formation | Thickness, ft. |
|--------------------|-------------------|
| Clay..... | 104 |
| Black shale..... | 29 |
| Top lime..... | 78 |
| Soap..... | 74 |
| Soap and lime..... | 7 |
| Soap..... | 41 |
| Middle lime..... | 37 |
| Lower soap..... | 23 |
| Lower lime..... | 94 |
| Total depth..... | 495 |

Fresh water at 104 to 106 feet; salt water at 495 feet.

SULLIVAN AND WILSON

M. McLachlan No. 1, lot 22, con. XIII, Brooke tp.
Completed February 12, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|---------------------------|-------------------|
| Surface..... | 60 |
| Loose black shale..... | 18 |
| Hard black shale..... | 12 |
| Grey and black shale..... | 2 |
| Lime and grey shale..... | 68 |
| Lime..... | 7 |
| Soap..... | 83 |
| Lime..... | 4 |
| Soap and hard streak..... | 24 |
| Dark lime..... | 2 |
| Dark-grey lime..... | 6 |
| Grey lime..... | 38 |
| Total depth..... | 392 |

Gas at 170, 190, 295, 356, and 390 feet.
Oil at 390 feet.
Show of oil at 348 and 375 feet.
Fresh water at 60 to 70 feet.

SULLIVAN AND WILSON

M. McLachlan No. 2, lot 22, con. XIII, Brooke tp.
Completed May 18, 1937.
Producing oil well.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Clay..... | 30 |
| Gravel..... | 10 |
| Clay..... | 26 |
| Black gravel..... | 2 |
| Black shale..... | 22 |
| Top lime..... | 80 |
| Soap..... | 100 |
| Soft lime..... | 8 |
| Soap..... | 20 |
| Middle lime..... | 28 |
| Lower soap..... | 22 |
| Dark lime..... | 8 |
| Lower lime..... | 73 |
| Total depth..... | 429 |

Oil at 420 to 422 feet; show of oil at 405 feet.
Fresh water at 66 feet; salt water at 420 feet.

SULLIVAN AND WILSON

M. McLachlan No. 3, lot 22, con. XIII, Brooke tp.
Completed July 15, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface clay..... | 66 |
| Black gravel..... | 3 |
| Black shale..... | 25 |
| Top rock..... | 77 |
| Soap..... | 104 |
| Lime streak..... | 5 |
| Soap..... | 20 |
| Middle lime..... | 25 |
| Lower soap..... | 21 |
| Delaware..... | 11 |
| Lower lime..... | 112 |
| Total depth..... | 470 |

Fresh water at 70 feet; salt water at 465 feet.

BERT WILSON

A. Gilliland No. 1, lot 22, con. XIII, Brooke tp.
Completed April 15, 1937.
Dry hole.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 64 |
| Black shale..... | 22 |
| Lime..... | 84 |
| Soap..... | 118 |
| Lime..... | 7 |
| Soap..... | 15 |
| Lime..... | 32 |
| Soap..... | 24 |
| Dark lime..... | 8 |
| Lime..... | 101 |
| Total depth..... | 475 |

Fresh water at 60 feet; salt water at 470 feet.

UNION GAS CO. OF CANADA, LTD.

Hornick No. 1, lot 12, con. VIII, Dawn tp.
Completed August 3, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-------------------------------------|-------------------|
| Surface..... | 32 |
| Brown shale..... | 163 |
| Lime and shale..... | 200 |
| Brown lime..... | 75 |
| Grey lime..... | 280 |
| Sharp grey lime..... | 130 |
| Brown lime..... | 5 |
| Grey lime and gypsum..... | 10 |
| Brown, grey, and blue lime..... | 105 |
| Brown and blue lime and gypsum..... | 50 |
| Blue lime..... | 55 |
| Brown, blue, and grey lime..... | 215 |
| Salt and lime shell..... | 35 |
| Salt..... | 70 |
| Salt and lime shell..... | 15 |
| Salt..... | 30 |
| Brown lime..... | 20 |
| Salt..... | 15 |
| Brown and blue lime..... | 45 |
| Grey lime..... | 225 |
| Total depth..... | 1,775 |

Fresh water at 32 feet; sulphur water at 480 and 515 feet; salt water at 1,765 and 1,775 feet.

UNION GAS CO. OF CANADA, LTD.

Fleming No. 1, lot 13, N. ½, con. II, Dawn tp.
Completed February 10, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-------------------------------------|-------------------|
| Surface..... | 55 |
| Brown shale..... | 200 |
| Lime and shale..... | 210 |
| Grey lime..... | 320 |
| Brown lime..... | 45 |
| Sharp grey and brown lime..... | 115 |
| Brown and grey lime..... | 130 |
| Brown lime and gypsum..... | 10 |
| Blue lime..... | 85 |
| Blue and brown lime..... | 25 |
| Brown and grey lime..... | 115 |
| Brown, and blue and brown lime..... | 90 |
| Salt and lime..... | 35 |
| Salt..... | 135 |
| Grey and brown lime..... | 140 |
| Salt..... | 30 |
| Brown lime..... | 115 |
| Grey and brown lime..... | 35 |
| Grey lime..... | 100 |
| Blue shale..... | 12 |
| Total depth..... | 2,002 |

Fresh water at 54 feet; sulphur water at 520 feet; salt water at 1,880 feet.

UNION GAS CO. OF CANADA, LTD.

Johnston No. 1, lot 11, con. VIII, Dawn tp.
Completed May 11, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-------------------------------------|-------------------|
| Surface..... | 33 |
| Brown shale..... | 192 |
| Lime and shale..... | 230 |
| Grey and brown lime..... | 70 |
| Sharp grey lime..... | 50 |
| Brown lime..... | 250 |
| Sharp grey and brown lime..... | 150 |
| Brown lime..... | 105 |
| Grey and brown lime and gypsum..... | 25 |
| Blue lime..... | 85 |
| Brown lime..... | 125 |
| Blue, and blue and brown lime..... | 110 |
| Salt and brown lime..... | 45 |
| Brown lime..... | 45 |
| Grey lime..... | 85 |
| Grey and brown lime..... | 135 |
| Brown lime..... | 75 |
| Grey lime..... | 65 |
| Blue shale..... | 5 |
| Total depth..... | 1,880 |

Small flow of gas at 1,604 feet.
Fresh water at 33 feet; salt water at 1,615, 1,735, and 1,860 feet.

UNION GAS CO. OF CANADA, LTD.
McKinnon No. 1, lot 24, con. IV, Dawn tp.
Completed January 25, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-------------------------------------|-------------------|
| Surface..... | 75 |
| Brown shale..... | 220 |
| Lime and shale..... | 263 |
| Brown lime..... | 312 |
| Brown and grey lime..... | 60 |
| Sharp brown and grey lime..... | 130 |
| Brown lime..... | 75 |
| Brown and grey lime and gypsum..... | 20 |
| Grey lime..... | 20 |
| Grey and blue lime and gypsum..... | 25 |
| Brown, blue, and grey lime..... | 35 |
| Blue lime..... | 80 |
| Brown and blue lime..... | 60 |
| Brown and grey lime..... | 80 |
| Blue lime..... | 60 |
| Brown lime..... | 35 |
| Salt..... | 40 |
| Salt and brown lime..... | 20 |
| Brown, and brown and grey lime..... | 130 |
| Salt..... | 41 |
| Brown lime..... | 184 |
| Grey lime..... | 75 |
| Blue shale..... | 2 |

Total depth..... 1,942
Show of gas at 1,928 to 1,933 feet.
Sulphur water at 670 feet.

B. D. BORNMAN
T. Hastings No. 1, lot 29, E. ½, con. IX,
Enniskillen tp.
Completed January 22, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------------------|-------------------|
| Surface..... | 57 |
| Black shale..... | 52 |
| Top rock..... | 71 |
| Top soap..... | 134 |
| Middle lime..... | 21 |
| Lower soap..... | 36 |
| Lower lime..... | 54 |
| Light- and dark-brown lime..... | 345 |
| Cherty lime..... | 180 |
| Brown lime..... | 30 |
| Shale..... | 5 |
| Brown lime..... | 20 |
| Slaty shale..... | 5 |
| Brown lime..... | 30 |
| Grey lime and gypsum..... | 10 |
| Grey lime..... | 10 |
| Brown lime..... | 35 |
| Hard shale..... | 10 |
| Grey lime..... | 90 |
| Brown lime..... | 35 |
| Brown and grey lime..... | 45 |
| Salt..... | 3 |
| Brown lime..... | 47 |
| Salt..... | 14 |
| Brown lime..... | 6 |
| Salt..... | 15 |
| Brown lime..... | 5 |
| Soft shale..... | 55 |
| Shale and lime streaks..... | 20 |
| Salt..... | 35 |
| Brown lime..... | 5 |
| Salt and lime streaks..... | 175 |
| Brown lime..... | 150 |
| Shale..... | 15 |
| Brown lime..... | 10 |
| Salt..... | 55 |
| Grey lime..... | 5 |
| Brown and grey lime..... | 130 |
| Grey lime..... | 5 |

Total depth..... 2,025
Show of oil at 373, 415 to 420, and 428 to 433 feet.
Fresh water at 57 and 115 feet; salt water at 480 feet.

B. D. BORNMAN
W. Rundle No. 1, lot 29, E. ½, con. VIII,
Enniskillen tp.
Completed January 28, 1937.
Producing oil well.

| Formation | Thickness, ft. |
|--------------------|-------------------|
| Surface..... | 55 |
| Black shale..... | 57 |
| Grey lime..... | 4 |
| Lime and soap..... | 54 |
| Soap..... | 149 |
| Middle lime..... | 17 |
| Soap..... | 30 |
| Soft lime..... | 6 |
| Hard lime..... | 65 |

Total depth..... 437
Oil at 385 and 428 to 431 feet.
Fresh water at 55 feet.

B. D. BORNMAN
W. Rundle No. 2, lot 29, E. ½, con. VIII,
Enniskillen tp.
Completed March 1, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 56 |
| Black shale..... | 59 |
| Lime and soap..... | 57 |
| Soap..... | 149 |
| Middle lime..... | 19 |
| Soap..... | 28 |
| Dark-grey lime..... | 6 |
| Hard grey lime..... | 96 |

Total depth..... 470
Fresh water at 56 feet.

W. J. COLE
W. J. Cole No. 1, lot 10, con. XII, Enniskillen tp.
Completed November 10, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|--------------|-------------------|
| Surface..... | 85 |
| Lime..... | 50 |
| Shale..... | 130 |
| Lime..... | 12 |
| Shale..... | 45 |
| Lime..... | 154 |

Total depth..... 476
Oil at 445 and 460 feet.
Fresh water at 88 feet; salt water at 475 feet.

F. H. EDWARD
F. H. Edward No. 141, lot 11, con. XII,
Enniskillen tp.
Completed February 16, 1937.
Producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 90 |
| Top rock..... | 50 |
| Upper soap..... | 128 |
| Middle lime..... | 15 |
| Lower soap..... | 42 |
| Lower lime..... | 150 |

Total depth..... 475
Oil at 440 and 465 feet.
Fresh water at 110 feet; salt water at 475 to 480 feet.

MACINTOSH OIL AND GAS CO., LTD.
Cox No. 1, lot 14, con. X, Enniskillen tp.
Completed July 10, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 95 |
| Top rock..... | 55 |
| Top soap..... | 130 |
| Middle lime..... | 15 |
| Lower soap..... | 45 |
| Lower lime..... | 125 |

Total depth..... 465
Oil at 405 and 445 to 453 feet.
Fresh water at 95 feet; salt water at 450 feet.

MACINTOSH OIL AND GAS CO., LTD.
I. Kirby No. 1, lot 8, con. XII, Enniskillen tp.
Completed April 5, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 100 |
| Top rock..... | 60 |
| Top soap..... | 125 |
| Middle lime..... | 18 |
| Lower soap..... | 45 |
| Lower lime..... | 120 |

Total depth..... 468
Oil at 448 and 470 feet.

MACINTOSH OIL AND GAS CO., LTD.
I. Kirby No. 2, lot 8, con. XII, Enniskillen tp.
Completed April 20, 1937.
Producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 100 |
| Top rock..... | 60 |
| Top soap..... | 125 |
| Middle lime..... | 18 |
| Lower soap..... | 45 |
| Lower lime..... | 126 |

Total depth..... 474
Oil at 450 to 462 feet.
Fresh water at 105 feet.

MACINTOSH OIL AND GAS CO., LTD.
F. R. MacIntosh No. 1, lot 14, con. X, Enniskillen tp.
Completed September 20, 1937.
Shallow producing oil well.

| Formation | Thickness, ft. |
|----------------------------|-------------------|
| Clay..... | 52 |
| Top rock..... | 68 |
| Soap..... | 133 |
| Middle lime..... | 17 |
| Lower soap..... | 19 |
| Corniferous lime..... | 163 |
| Brown lime..... | 298 |
| Sharp sand..... | 150 |
| Hard dark-grey lime..... | 151 |
| Shaly lime..... | 144 |
| Salt..... | 22 |
| Hard dark-grey lime..... | 33 |
| Salt..... | 39 |
| Lime..... | 4 |
| Salt..... | 23 |
| Grey shale..... | 10 |
| Grey lime..... | 70 |
| Salt..... | 15 |
| Grey lime..... | 5 |
| Salt..... | 6 |
| Lime and shale..... | 102 |
| Salt..... | 32 |
| Lime and salt..... | 48 |
| Salt..... | 187 |
| Salina lime..... | 145 |
| Salt..... | 75 |
| White lime..... | 10 |
| Guelph lime..... | 120 |
| Niagara lime..... | 114 |
| Shale..... | 38 |
| Clinton..... | 5 |
| Red Medina..... | 5 |
| Grey shale..... | 134 |
| Queenston red shale..... | 280 |
| Hudson River shale..... | 189 |
| Utica shale (dark)..... | 220 |
| Trenton (light-grey)..... | 384 |
| Trenton (dark-grey)..... | 102 |
| Trenton (light-grey)..... | 409 |
| Trenton (dark-grey)..... | 53 |
| Chazy light-grey lime..... | 17 |
| Potsdam..... | 20 |
| Granite..... | 4 |

Total depth..... 4,124
Oil at 72 to 75 and 418 to 425 feet.
Fresh water at 52 and 72 to 75 feet; black water at 452 feet.

MACINTOSH OIL AND GAS CO., LTD.
F. R. MacIntosh No. 2, lot 14, con. X, Enniskillen tp.
Completed May 5, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|-----------------------|-------------------|
| Surface..... | 51 |
| Top rock..... | 45 |
| Top soap..... | 130 |
| Middle lime..... | 18 |
| Lower soap..... | 45 |
| Corniferous lime..... | 171 |

Total depth..... 460
Oil at 420 and 438 feet; show of oil at 50 feet.
Fresh water at 100 feet; salt water at 450 feet.

MACINTOSH OIL AND GAS CO., LTD.
F. R. MacIntosh No. 1, lot 15, con. XII, Enniskillen tp.
Completed February 16, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 100 |
| Top rock..... | 45 |
| Top soap..... | 140 |
| Middle lime..... | 18 |
| Lower soap..... | 50 |
| Lower lime..... | 118 |

Total depth..... 471
Oil at 452 and 469 feet.
Fresh water at 98 feet.

MACINTOSH OIL AND GAS CO., LTD.

F. R. MacIntosh No. 2, lot 15, con. XII,
Enniskillen tp.Completed March 11, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 100 |
| Top rock..... | 45 |
| Top soap..... | 140 |
| Middle lime..... | 18 |
| Lower soap..... | 50 |
| Lower lime..... | 127 |

Total depth..... 480

Oil at 458 and 475 feet.

Fresh water at 98 feet.

MACINTOSH OIL AND GAS CO., LTD.

F. R. MacIntosh No. 3, lot 15, con. XII,
Enniskillen tp.Completed March 27, 1937.
Producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 100 |
| Top rock..... | 45 |
| Top soap..... | 140 |
| Middle lime..... | 18 |
| Lower soap..... | 50 |
| Lower lime..... | 123 |

Total depth..... 476

Oil at 452 to 469 feet.

Fresh water at 98 feet.

MACINTOSH OIL AND GAS CO., LTD.

G. Willert No. 2, lot 14, con. X, Enniskillen tp.

Completed January 24, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|----------------------------|-------------------|
| Surface..... | 94 |
| Top rock..... | 40 |
| Upper soap..... | 143 |
| Middle lime..... | 17 |
| Lower soap..... | 40 |
| Lower hard grey lime..... | 76 |
| Brown lime..... | 35 |
| Lime and sand streaks..... | 10 |
| Oil sand..... | 5 |
| Hard grey lime..... | 3 |
| Brown lime..... | 9 |

Total depth..... 472

Fresh water at 96 feet.

H. P. ROSE

H. P. Rose No. 2, lot 14, con. XI, Enniskillen tp.

Completed March 15, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 65 |
| Top rock..... | 50 |
| Top soap..... | 140 |
| Middle lime..... | 25 |
| Lower soap..... | 40 |
| Lower lime..... | 100 |
| Oil sand..... | 15 |
| Lime pocket..... | 20 |

Total depth..... 450

Oil at 425 feet.

Fresh water at 175 feet; salt water at 430 feet.

CAROL SMITH

C. Smith No. 1, lot 10, con. X, Enniskillen tp.

Completed May 13, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 100 |
| Top rock..... | 50 |
| Top soap..... | 140 |
| Middle lime..... | 15 |
| Lower soap..... | 40 |
| Lower lime..... | 135 |

Total depth..... 480

Oil at 410 and 465 feet.

Fresh water at 110 feet.

CAROL SMITH

C. Smith No. 2, lot 10, con. X, Enniskillen tp.

Completed July 8, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 86 |
| Top rock..... | 50 |
| Top soap..... | 140 |
| Middle lime..... | 15 |
| Lower soap..... | 40 |
| Lower lime..... | 138 |

Total depth..... 419

Oil at 400 and 455 feet.

Fresh water at 100 feet.

W. VAN ANTWERP

G. Droope No. 2, lot 5, con. XI, Enniskillen tp.

Completed October 12, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 99 |
| Top rock..... | 76 |
| Top soap..... | 140 |
| Middle lime..... | 15 |
| Lower soap..... | 50 |
| Lower lime..... | 105 |

Total depth..... 485

Oil at 445 to 455 feet.

ART WINDER

A. Winder No. 1, lot 11, con. XI, Enniskillen tp.

Completed August 5, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 95 |
| Top rock..... | 50 |
| Top soap..... | 130 |
| Middle lime..... | 15 |
| Lower soap..... | 45 |
| Lower lime..... | 133 |

Total depth..... 468

Oil at 400 and 455 to 465 feet.

Fresh water at 95 feet.

J. ZARB

G. Carlton No. 1, lot 15, E. 1/2, con. XI, Enniskillen tp.

Completed May 6, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 94 |
| Lime..... | 54 |
| Upper shale..... | 144 |
| Middle lime..... | 17 |
| Lower shale..... | 41 |
| Lower lime..... | 130 |

Total depth..... 480

Oil at 368 and 465 feet.

Fresh water at 96 feet.

G. E. AND D. E. WILLITS

A. Shepherd No. 1, lot 18, con. X, Euphemia tp.
Completed February 26, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 108 |
| Top rock..... | 7 |
| Soap..... | 198 |
| Middle lime..... | 14 |
| Lower soap..... | 15 |
| Black streak..... | 5 |
| Lower lime..... | 124 |
| Total depth..... | 472 |

Fresh water at 40 feet; salt water at 446 feet.

CLARE W. BARBER

F. Symington No. 1, lot 8, con. VIII, Plympton tp.
Completed June 28, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Clay..... | 100 |
| Hardpan..... | 8 |
| Black shale..... | 89 |
| Hard streak..... | 5 |
| Hard grey soap..... | 12 |
| Soap..... | 220 |
| Middle lime..... | 8 |
| Lower soap..... | 55 |
| Black streak..... | 5 |
| Lower lime..... | 130 |
| Total depth..... | 610 |

Fresh water at 170 feet; salt water at 610 feet.

B. D. BORNMAN

McIntyre No. 1, lot 24, E. ½, con. IV, Plympton tp.
Completed May 3, 1937.
Dry hole.

| Formation | Thickness, ft. |
|--------------------|-------------------|
| Surface..... | 126 |
| Black shale..... | 79 |
| Lime and soap..... | 85 |
| Soap..... | 126 |
| Middle lime..... | 14 |
| Soap..... | 49 |
| Lime..... | 126 |
| Total depth..... | 605 |

Fresh water at 72 feet; salt water at 600 feet.

W. NEWCOMB

I. Lucas No. 1, lot 19, con. II N., Warwick tp.
Completed December 28, 1937.
Dry hole.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 66 |
| Hardpan..... | 15 |
| Gravel..... | 3 |
| Top rock..... | 146 |
| Top soap..... | 130 |
| Middle lime..... | 15 |
| Lower soap..... | 50 |
| Lower lime..... | 117 |
| Total depth..... | 542 |

Trace of oil at 500 feet.

Fresh water at 33 to 40 and 81 to 84 feet; black water at 640 feet.

Lincoln County

GRIMSBY NATURAL GAS CO., LTD.

C. Killins No. 1, lot 1, con. III, Caistor tp.
Completed November 17, 1937.
Producing gas well.
Rock pressure: 150 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 65 |
| Lime and shale..... | 20 |
| Niagara..... | 190 |
| Shale..... | 56 |
| Clinton..... | 36 |
| Red Medina..... | 28 |
| Shale..... | 70 |
| White Medina..... | 10 |
| Red shale..... | 45 |

Total depth..... 514

Gas at 365, 461, and 468 feet; show of gas at 335 and 380 feet.

Fresh water at 55 feet.

W. McCALLUM

W. McCallum No. 1, lot 26, con. VI, Gainsborough tp.
Completed June 6, 1937.
Producing gas well.
Rock pressure: 115 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 115 |
| Lime..... | 20 |
| Niagara..... | 235 |
| Shale..... | 40 |
| Clinton..... | 35 |
| Red Medina..... | 40 |
| Shale..... | 60 |
| White Medina..... | 10 |

Total depth..... 455

Fresh water at 24 feet.

Manitoulin District

COCKBURN ISLAND SYNDICATE

H. Flood No. 1, lot 20, con. XIII, Cockburn Island tp.
Completed June 30, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---|-------------------|
| Sand and gravel..... | 42 |
| Brown lime..... | 143 |
| Grey lime..... | 62 |
| Soap and streaks of lime..... | 18 |
| Soap and blue lime..... | 30 |
| Grey lime and soap..... | 35 |
| Blue lime and soap..... | 60 |
| Brown lime..... | 90 |
| Grey shale..... | 75 |
| Brown shale and soap..... | 195 |
| Black shale..... | 20 |
| Trenton lime..... | 325 |
| White quartzite, red shale, and green sand..... | 20 |
| White quartzite..... | 5 |
| White quartzite and granite..... | 5 |

Total depth..... 1,125

Fresh water at 40, 126, and 200 feet; salt water at 1,115 feet.

COCKBURN ISLAND SYNDICATE

A. McMillan No. 1, lot 16, con. XII,
Cockburn Island tp.Completed August 30, 1937.
Dry hole.

| Formation | Thickness, ft. |
|----------------------------------|-------------------|
| Sand and gravel | 7 |
| Hardpan | 4 |
| Hard brown lime | 49 |
| Grey lime | 20 |
| Brown lime | 60 |
| Grey lime | 20 |
| Brown lime | 15 |
| Grey lime | 25 |
| Brown lime | 15 |
| Grey lime | 15 |
| Brown lime | 35 |
| Grey lime | 40 |
| Blue shale | 45 |
| Grey lime | 50 |
| Blue shale | 25 |
| Brown lime | 10 |
| Grey lime | 20 |
| Dark-grey lime | 55 |
| Grey lime | 65 |
| Soap | 200 |
| Grey shale and lime streaks | 40 |
| Black shale | 10 |
| Trenton lime | 335 |
| White and green sand and granite | 15 |

Total depth..... 1,175

Small show of gas at 840 and 1,015 feet.

Fresh water at 50, 135, and 250 feet; salt water at
1,020 feet.

Middlesex County

BEATTIE AND MCGILL

J. Beattie No. 1, lot 8, con. II N., Mosa tp.

Completed March 3, 1937.
Dry hole.

| Formation | Thickness, ft. |
|-----------|-------------------|
| Surface | 93 |
| Hardpan | 109 |
| Soap | 103 |

Total depth..... 305

Fresh water at 90 feet.

J. L. DE WITT

A. Downey No. 1, lot 18, range I, Mosa tp.

Completed December 19, 1937.
Dry hole.

| Formation | Thickness, ft. |
|------------------------|-------------------|
| Surface | 100 |
| Petrolia (Upper soap) | 170 |
| Whidder (Middle lime) | 13 |
| Olentangy (Lower soap) | 25 |
| Black streak | 2 |
| Delaware-Onondaga lime | 80 |

Total depth..... 390

Fresh water at 64 feet.

DOMINION PETROLEUM CO., LTD.

J. A. Walker No. 20, lot 6, con. VI, Mosa tp.

Completed October 5, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| No record | 245 |
| Hard grey lime | 10 |
| Soft dark-grey lime | 5 |
| Hard grey lime | 15 |
| Hard dark-grey lime | 5 |
| Hard grey lime | 55 |
| Oil sand | 45 |

Total depth..... 380

Oil at 235, 345, and 360 feet.

Fresh water at 30 and 80 feet.

DOMINION PETROLEUM CO., LTD.

J. A. Walker No. 21, lot 6, con. VI, Mosa tp.

Completed October 29, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|----------------|-------------------|
| Surface | 82 |
| Soap | 123 |
| Grey lime | 145 |
| Lime | 25 |
| Sand and water | 2 |

Total depth..... 377

Oil at 200 and 255 feet.

Fresh water at 15 and 80 feet; salt water at 377 feet.

DOMINION PETROLEUM CO., LTD.

J. A. Walker No. 22, lot 6, con. VI, Mosa tp.

Completed December 4, 1937.
Small producing oil well.

| Formation | Thickness, ft. |
|------------------------|-------------------|
| Surface | 92 |
| Ipperwash (Top rock) | 5 |
| Petrolia (Upper soap) | 117 |
| Whidder (Middle lime) | 12 |
| Olentangy (Lower soap) | 19 |
| Delaware-Onondaga lime | 105 |
| Lime (oil sand) | 15 |

Total depth..... 365

Oil at 230, 350, and 360 feet.

Fresh water at 15 and 85 feet; salt water at 355 feet.

D. CONNOR

W. Knott No. 1, lot 24, S. 1/2, con. B.
North Dorchester tp.Completed November 23, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface | 130 |
| Grey lime | 250 |
| Lime and gypsum | 50 |
| Grey lime | 40 |
| Sharp sand (lime) | 130 |
| Grey and brown lime | 48 |
| Blue shale | 10 |
| Brown lime | 12 |
| Blue shale | 95 |
| Brown and grey lime | 115 |
| Shale and gypsum | 30 |
| Shale and lime | 55 |
| Brown and grey lime | 40 |
| Shale and gypsum | 15 |
| Grey and brown lime | 48 |
| Grey lime | 22 |
| Niagara lime | 232 |
| Blue shale | 46 |
| Clinton | 16 |
| Blue shale | 26 |
| Red Medina | 5 |
| Blue shale | 65 |
| Red shale | 3 |

Total depth..... 1,483

Fresh water at 134 feet; sulphur water at 490 feet.

Norfolk County

TILLSONBURG OIL AND GAS CO., LTD.

W. Hudson No. 1, lot 7, S. $\frac{1}{2}$, con. I, S.T.R.,
Middleton tp.

Completed March 22, 1937.
Dry hole.

| Formation | Thickness ft. |
|-------------------------|------------------|
| Surface..... | 160 |
| Clay..... | 89 |
| Shale and lime..... | 181 |
| Flint..... | 150 |
| Lime and shale..... | 450 |
| Niagara lime..... | 220 |
| Shale..... | 57 |
| Clinton..... | 18 |
| Red and blue shale..... | 35 |

Total depth..... 1,340

Fresh water at 240 feet; sulphur water at 300 feet.

TILLSONBURG OIL AND GAS CO., LTD.

H. Simmons No. 1, lot 7, N.W. $\frac{1}{4}$, con. I, S.T.R.,
Middleton tp.

Completed January 29, 1937.

Producing gas well.
Rock pressure: 175 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 234 |
| Lime and shale..... | 176 |
| Flint..... | 150 |
| Lime and shale..... | 445 |
| Niagara..... | 215 |
| Shale..... | 54 |
| Clinton..... | 30 |
| Red Medina..... | 35 |
| Grey shale..... | 11 |

Total depth..... 1,350

Gas at 1,288 and 1,294 feet.
Fresh water at 238 feet.

W. F. COLBE

W. F. Colbe No. 1, Village of Port Dover,
Woodhouse tp.

Completed April 28, 1937.

Producing gas well.
Rock pressure: 360 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 24 |
| Flint..... | 163 |
| Lime and shale..... | 423 |
| Niagara..... | 252 |
| Blue shale..... | 49 |
| Clinton..... | 31 |
| Red Medina..... | 30 |
| Grey shale..... | 68 |
| White Medina..... | 11 |
| Red shale..... | 50 |

Total depth..... 1,101

Gas at 938 and 1,045 feet.
Fresh water at 54 feet; black water at 140 feet;
sulphur water at 165 feet.

ECONOMY NATURAL GAS SYNDICATE

L. Corbitt No. 3, lot 14, con. I, Woodhouse tp.

Completed January 9, 1937.

Producing gas well.
Rock pressure: 450 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 62 |
| Flint..... | 176 |
| Lime and shale..... | 400 |
| Niagara..... | 265 |
| Blue shale..... | 45 |
| Clinton..... | 21 |
| Red Medina..... | 31 |
| Grey shale..... | 65 |
| White Medina..... | 9 |
| Red shale..... | 1 |

Total depth..... 1,075

Gas at 971 feet.

Sulphur water at 70 feet; black water at 465 feet.

ECONOMY NATURAL GAS SYNDICATE

L. Corbitt No. 4, lot 13, con. I, Woodhouse tp.

Completed March 31, 1937.

Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 76 |
| Flint..... | 159 |
| Lime and shale..... | 400 |
| Niagara..... | 287 |
| Shale..... | 35 |
| Clinton..... | 26 |
| Red Medina..... | 30 |
| Blue shale..... | 75 |
| White Medina..... | 9 |
| Red shale..... | 5 |

Total depth..... 1,102

Fresh water at 112 and 240 feet.

ECONOMY NATURAL GAS SYNDICATE

G. Gamble No. 1, Village of Port Dover,
Woodhouse tp.

Completed February 27, 1937.

Producing gas well.
Rock pressure: 460 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 24 |
| Flint..... | 187 |
| Lime and shale..... | 411 |
| Niagara..... | 245 |
| Blue shale..... | 48 |
| Clinton..... | 26 |
| Red Medina..... | 29 |
| Grey shale..... | 72 |
| White Medina..... | 10 |
| Red shale..... | 45 |

Total depth..... 1,094

Gas at 950 and 1,047 feet.

Fresh water at 62 feet; sulphur water at 85 feet;
black water at 394 feet.

ECONOMY NATURAL GAS SYNDICATE

J. Hudson No. 1, lot 14, con. I, Woodhouse tp.

Completed January 23, 1937.

Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 76 |
| Flint..... | 159 |
| White sand..... | 22 |
| Lime and shale..... | 371 |
| Niagara..... | 290 |
| Shale..... | 43 |
| Clinton..... | 22 |
| Red Medina..... | 28 |
| Blue shale..... | 65 |
| White Medina..... | 14 |
| Red shale..... | 2 |

Total depth..... 1,092

Fresh water at 110 and 320 feet.

T. A. IVEY AND SONS

T. A. Ivey and Sons No. 1, Village of Port Dover,
Woodhouse tp.

Completed July 3, 1937.

Producing gas well.

Rock pressure: 465 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 28 |
| Flint..... | 163 |
| Lime and shale..... | 415 |
| Niagara..... | 254 |
| Blue shale..... | 68 |
| Clinton..... | 28 |
| Red Medina..... | 30 |
| Grey shale..... | 71 |
| White Medina..... | 10 |
| Red shale..... | 3 |

Total depth..... 1,068

Gas at 938 and 978 feet.

Fresh water at 72 feet; black water at 154 feet;
sulphur water at 485 feet.

T. A. IVEY AND SONS

T. A. Ivey and Sons No. 2, Village of Port Dover,
Woodhouse tp.

Completed October 4, 1937.

Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 44 |
| Flint..... | 199 |
| Lime and shale..... | 376 |
| Niagara..... | 252 |
| Blue shale..... | 53 |
| Clinton..... | 21 |
| Red Medina..... | 28 |
| Grey shale..... | 68 |
| White Medina..... | 9 |
| Red shale..... | 4 |

Total depth..... 1,054

Fresh water at 86 feet; black water at 248 feet.

WALTER GAS SYNDICATE, LTD.

N. R. Butler No. 1, lot 12, con. V, Woodhouse tp.

Completed October 15, 1937.

Producing gas well.

Rock pressure: 530 lbs.

| Formation | Thickness, ft. |
|------------------------|-------------------|
| Surface..... | 59 |
| Flint..... | 118 |
| Lime and shale..... | 373 |
| Niagara..... | 320 |
| Rochester..... | 37 |
| Clinton..... | 40 |
| Red Medina..... | 30 |
| Blue shale..... | 52 |
| White Medina sand..... | 10 |
| Red shale..... | 1 |

Total depth..... 1,040

Gas at 909 and 927 feet.

WALTER GAS SYNDICATE, LTD.

J. and A. Chechak No. 1, lot 11, con. V,
Woodhouse tp.

Completed December 8, 1937.

Producing gas well.

Rock pressure: 510 lbs.

| Formation | Thickness, ft. |
|-------------------------------|-------------------|
| Surface..... | 40 |
| Flint..... | 115 |
| Lime and shale..... | 375 |
| Niagara lime..... | 320 |
| Rochester shale..... | 34 |
| Clinton sand..... | 25 |
| Red Medina sand..... | 38 |
| Blue shale..... | 55 |
| Hard and sharp grey sand..... | 10 |
| Red shale..... | 2 |

Total depth..... 1,014

Gas at 886 and 904 feet.

Fresh water at 50 feet; sulphur water at 95 feet.

Oxford County

ADAMS-ALOKA No. 1

J. Humphrey No. 1, lot 26, S. ½, con. XI, Dereham tp.

Completed July 24, 1937.

Producing gas well.

Rock pressure: 450 lbs.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Surface..... | 110 |
| Top rock..... | 90 |
| Brown and grey lime..... | 165 |
| Sharp sand..... | 110 |
| Brown and grey lime..... | 80 |
| Shale and gypsum..... | 75 |
| Brown and grey lime..... | 55 |
| Brown lime..... | 60 |
| Grey shale..... | 70 |
| Brown and grey lime..... | 70 |
| Brown lime..... | 22 |
| Grey lime..... | 29 |

Total depth..... 936

Gas at 207 and 907 to 936 feet.

Show of oil at 630 to 640 feet.

Fresh water at 175 feet; sulphur water at 450 feet.

L. W. ADAMS ET AL.

Colin Hawkins Estate No. 1, lot 18, S. ½, con. XI,
Dereham tp.

Completed April 29, 1937.

Dry hole.

| Formation | Thickness, ft. |
|----------------------------------|-------------------|
| Surface..... | 170 |
| Grey lime..... | 35 |
| Hard brown lime..... | 45 |
| Grey lime..... | 10 |
| White lime..... | 5 |
| Grey lime..... | 15 |
| Brown lime..... | 30 |
| Dark-grey lime..... | 25 |
| Light-grey lime..... | 30 |
| Sharp sand..... | 140 |
| Brown lime..... | 70 |
| Grey shale..... | 105 |
| Brown lime and shale..... | 55 |
| Brown lime..... | 70 |
| Blue lime and shale..... | 80 |
| Brown lime..... | 10 |
| Grey lime..... | 30 |
| Brown and grey lime streaks..... | 270 |
| Blue shale..... | 47 |
| Clinton..... | 22 |
| Blue shale..... | 21 |
| Red Medina..... | 10 |
| Blue shale..... | 33 |
| Grey lime..... | 32 |
| Red shale..... | 2 |

Total depth..... 1,362

Fresh water at 62 feet; sulphur water at 400 feet.

ALOKA-McNIVIN

L. Brown No. 1, lot 26, con. XII, Dereham tp.

Completed November 20, 1937.

Producing gas well.

Rock pressure: 450 lbs.

| Formation | Thickness, ft. |
|----------------------------------|-------------------|
| Surface..... | 175 |
| Top rock..... | 10 |
| Lime and shale..... | 15 |
| Brown and grey lime..... | 165 |
| Flint..... | 118 |
| Brown lime..... | 75 |
| Shale and streaks of gypsum..... | 97 |
| Brown lime..... | 105 |
| Shale and streaks of lime..... | 75 |
| Grey lime..... | 60 |
| Brown lime..... | 20 |
| Guelph..... | 17 |

Total depth..... 932

Gas at 917 and 932 feet.

Fresh water at 200 feet; mineral water at 430 feet.

ALOKA-McNIVIN

C. C. Hawkins No. 6, lot 23, con. XII, Dereham tp.
Completed January 30, 1937.
Producing gas well.
Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|--------------------------------|-------------------|
| Surface..... | 167 |
| Top rock..... | 7 |
| Shale and soap..... | 11 |
| Brown and grey lime..... | 175 |
| Sharp lime..... | 80 |
| Grey lime..... | 30 |
| Brown lime..... | 30 |
| Brown and grey lime..... | 50 |
| Shale and gypsum..... | 100 |
| Lime and streaks of shale..... | 60 |
| Grey lime..... | 40 |
| Lime and streaks of shale..... | 100 |
| Brown lime..... | 50 |
| Guelph lime..... | 15 |

Total depth..... 915

Gas at 900 to 915 feet.

Fresh water at 210 feet; sulphur water at 480 feet.

ALOKA-McNIVIN SCANLON No. 2

A. P. Scanlon No. 5, lot 25, con. XI, Dereham tp.
Completed October 29, 1937.
Producing gas well.
Rock pressure: 450 lbs.

| Formation | Thickness, ft. |
|----------------------------|-------------------|
| Surface..... | 167 |
| Grey shale..... | 33 |
| Brown lime..... | 20 |
| Grey lime..... | 147 |
| Lime and chert..... | 113 |
| Grey lime..... | 55 |
| Shale and grey lime..... | 25 |
| Grey shale and gypsum..... | 80 |
| Brown lime..... | 5 |
| Grey shale and lime..... | 20 |
| Brown lime..... | 85 |
| Grey shale..... | 60 |
| Brown lime..... | 75 |
| Grey lime..... | 30 |
| Brown lime..... | 5 |
| Grey lime..... | 22 |
| Dark-grey lime..... | 2 |

Total depth..... 944

Gas at 920 to 942 feet.

Fresh water at 170 feet.

ALOKA-McNIVIN

R. Hawkins Estate No. 1, lot 25, con. XII,
Dereham tp.

Completed June 10, 1937.
Producing gas well.
Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 172 |
| Top rock..... | 78 |
| Brown lime..... | 50 |
| Grey lime..... | 80 |
| Sharp sand..... | 105 |
| Brown lime..... | 75 |
| Shale..... | 60 |
| Shale and lime..... | 25 |
| Brown lime..... | 95 |
| Grey lime..... | 130 |
| Shale and lime..... | 20 |
| Guelph lime..... | 36 |

Total depth..... 926

Gas at 920 feet.

Fresh water at 200 feet; sulphur water at 485 feet.

ALOKA-McNIVIN SCANLON No. 3

A. P. Scanlon No. 6, lot 25, con. XI, Dereham tp.
Completed November 27, 1938.

Producing gas well.
Rock pressure: 450 lbs.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Surface..... | 171 |
| Shale and lime..... | 59 |
| Brown lime..... | 135 |
| Sharp sand..... | 120 |
| Grey lime..... | 45 |
| Shale and grey lime..... | 20 |
| Brown lime..... | 10 |
| Shale and gypsum..... | 30 |
| Grey shale..... | 50 |
| Brown and grey lime..... | 90 |
| Grey shale..... | 65 |
| Brown lime..... | 10 |
| Brown and grey lime..... | 80 |
| Brown lime..... | 18 |
| Grey lime..... | 35 |

Total depth..... 938

Gas at 920 to 938 feet.

Fresh water at 3 and 175 feet.

ALOKA OIL Co., LTD., No. 1

C. Waterworth No. 3, lot 24, N. ½, con. XII,
Dereham tp.

Completed May 18, 1937.
Producing gas well.
Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|------------------------------|-------------------|
| Surface..... | 170 |
| Brown lime..... | 30 |
| Grey lime..... | 20 |
| Brown lime..... | 10 |
| Grey lime..... | 60 |
| Brown lime..... | 35 |
| Grey lime..... | 45 |
| Lime and chert..... | 110 |
| Brown lime..... | 10 |
| Grey lime..... | 50 |
| Lime, shale, and gypsum..... | 120 |
| Brown lime..... | 90 |
| Grey shaly lime..... | 120 |
| Grey shale..... | 20 |
| Grey lime..... | 18 |
| Brown lime..... | 33 |

Total depth..... 941

Gas at 908 and 936 feet.

Fresh water at 170 feet.

ALOKA-McNIVIN SCANLON No. 1

A. P. Scanlon No. 1, lot 25, con. XI, Dereham tp.

Completed April 22, 1937.
Producing gas well.
Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Surface..... | 170 |
| Top rock..... | 230 |
| Brown and grey lime..... | 140 |
| Sharp sand..... | 115 |
| Brown lime..... | 60 |
| Shale..... | 105 |
| Brown lime..... | 105 |
| Shale and lime..... | 80 |
| Brown lime..... | 35 |
| Grey lime..... | 35 |
| Brown lime..... | 7 |
| Guelph lime..... | 26 |

Total depth..... 938

Gas at 912 to 938 feet.

Fresh water at 178 feet; sulphur water at 460 feet.

ALOKA OIL CO., LTD., GROUP No. 4, HAWKINS No. 2
C. C. Hawkins No. 5, lot 23, con. XII, Dereham tp.
Completed January 12, 1937.
Producing gas well.
Rock pressure: 470 lbs.

| Formation | Thickness, ft. |
|----------------|-------------------|
| Surface | 173 |
| Brown lime | 22 |
| Grey lime | 25 |
| Brown lime | 10 |
| Grey lime | 60 |
| Brown lime | 30 |
| Grey lime | 40 |
| Lime and chert | 130 |
| Brown lime | 15 |
| Lime and shale | 165 |
| Brown lime | 85 |
| Lime and shale | 140 |
| Grey lime | 15 |
| Brown lime | 20 |
| Total depth | 930 |

Gas at 912 and 918 feet.
Fresh water at 173 feet.

ALOKA OIL CO., LTD., GROUP No. 4,
WATERWORTH No. 2
C. Waterworth No. 2, lot 23, N.W. ¼, con. XII,
Dereham tp.

Completed March 15, 1937.
Producing gas well.
Rock pressure: 460 lbs.

| Formation | Thickness, ft. |
|-----------------|-------------------|
| Surface | 162 |
| Brown lime | 33 |
| Grey lime | 20 |
| Brown lime | 60 |
| Grey lime | 40 |
| Brown lime | 50 |
| Lime and chert | 110 |
| Brown lime | 10 |
| Grey lime | 50 |
| Lime and shale | 115 |
| Brown lime | 90 |
| Grey shaly lime | 120 |
| Shale | 25 |
| Brown lime | 30 |
| Total depth | 915 |

Gas at 908 and 915 feet.
Fresh water at 162 feet.

ALOKA OIL CO., LTD., GROUP No. 5,
WATERWORTH No. 1
C. Waterworth No. 4, lot 23, N.W. ¼, con. XII,
Dereham tp.

Completed June 29, 1937.
Producing gas well.
Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|-------------------------|-------------------|
| Surface | 165 |
| Brown lime | 30 |
| Grey lime | 25 |
| Brown lime | 15 |
| Grey lime | 50 |
| Brown lime | 90 |
| Lime and chert | 105 |
| Brown lime | 10 |
| Grey lime | 50 |
| Lime, shale, and gypsum | 125 |
| Brown lime | 85 |
| Grey lime and shale | 120 |
| Grey lime | 20 |
| Brown lime | 45 |
| Total depth | 935 |

Gas at 890 and 935 feet.
Fresh water at 165 feet.

ALOKA OIL CO., LTD., GROUP No. 5,
WATERWORTH No. 2
C. Waterworth No. 5, lot 24, N. ½, con. XII,
Dereham tp.

Completed August 9, 1937.
Producing gas well.
Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|-------------------------|-------------------|
| Surface | 170 |
| Brown lime | 35 |
| Grey lime | 20 |
| Brown lime | 15 |
| Grey lime | 55 |
| Brown lime | 75 |
| Lime and chert | 110 |
| Brown lime | 15 |
| Grey lime | 45 |
| Lime, shale, and gypsum | 125 |
| Brown lime | 85 |
| Grey lime and shale | 125 |
| Grey shale | 10 |
| Grey lime | 20 |
| Brown lime | 36 |

Total depth 941
Gas at 907 and 940 feet.
Fresh water at 170 feet.

ALOKA OIL CO., LTD., GROUP No. 5,
WATERWORTH No. 3
C. Waterworth No. 6, lot 24, N. ½, con. XII,
Dereham tp.

Completed September 18, 1937.
Producing gas well.
Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|-------------------------|-------------------|
| Surface | 169 |
| Brown lime | 26 |
| Grey lime | 20 |
| Brown lime | 75 |
| Grey lime | 40 |
| Brown lime | 35 |
| Lime and chert | 110 |
| Brown lime | 15 |
| Grey lime | 45 |
| Lime, shale, and gypsum | 130 |
| Brown lime | 75 |
| Grey lime and shale | 125 |
| Grey shale | 25 |
| Grey lime | 15 |
| Brown lime | 36 |

Total depth 941
Gas at 905 and 938 feet.
Fresh water at 169 feet.

ALOKA OIL CO., LTD., GROUP No. 5,
WATERWORTH No. 4
C. Waterworth No. 7, lot 23, N. 1, con. XII,
Dereham tp.

Completed November 4, 1937.
Producing gas well.
Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|-------------------------|-------------------|
| Surface | 164 |
| Brown lime | 26 |
| Grey lime | 20 |
| Brown lime | 70 |
| Grey lime | 50 |
| Brown lime | 30 |
| Lime and chert | 110 |
| Brown lime | 15 |
| Lime, shale, and gypsum | 50 |
| Brown lime | 125 |
| Lime and shale | 85 |
| Grey shale | 120 |
| Grey lime | 20 |
| Brown lime | 50 |

Total depth 935
Gas at 908 and 935 feet.
Fresh water at 164 feet.

ALOKA OIL CO., LTD., GROUP NO. 5,
WATERWORTH No. 5

C. Waterworth No. 8, lot 24, N.W. $\frac{1}{4}$, con. XII,
Dereham tp.

Completed December 8, 1937.

Producing gas well.

Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|-------------------------|-------------------|
| Surface | 168 |
| Brown lime | 27 |
| Grey lime | 15 |
| Brown lime | 65 |
| Grey lime | 60 |
| Brown lime | 30 |
| Flint | 110 |
| Brown lime | 60 |
| Lime, shale, and gypsum | 120 |
| Brown lime | 85 |
| Lime and grey shale | 125 |
| Grey shale | 20 |
| Grey lime | 10 |
| Brown lime | 20 |
| Grey lime | 20 |

Total depth..... 935

Gas at 898 and 935 feet.

Fresh water at 168 feet.

CENTRAL PIPE LINE CO., LTD.

J. Clarke No. 1, lot 26, con. XI, Dereham tp.

Completed October 15, 1937.

Producing gas well.

Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|----------------|-------------------|
| Surface | 173 |
| Grey lime | 30 |
| Brown lime | 17 |
| Grey lime | 30 |
| Brown lime | 100 |
| Grey lime | 65 |
| Flint | 70 |
| Brown lime | 35 |
| Grey lime | 40 |
| Lime and shale | 70 |
| Grey lime | 70 |
| Lime and shale | 30 |
| Grey lime | 170 |
| Grey lime | 43 |

Total depth..... 943

Gas at 908, 912, 915, 938, 942, and 943 feet.

Fresh water at 110 and 230 feet.

DEREHAM GAS AND OIL CO., LTD.

A. P. Scanlon No. 2, lot 25, con. XI, Dereham tp.

Completed May 6, 1937.

Dry hole.

| Formation | Thickness, ft. |
|----------------|-------------------|
| Surface | 85 |
| Sand | 107 |
| Sharp sand | 28 |
| Lime and shale | 195 |
| Lime and chert | 120 |
| Lime | 85 |
| Shale | 50 |
| Brown lime | 70 |
| Lime and shale | 122 |
| Guelph lime | 36 |
| Niagara | 12 |

Total depth..... 1,010

Gas at 963 and 972 feet.

Fresh water at 85 feet.

L. W. KIDD

L. Brown No. 1, lot 27, N.W. $\frac{1}{4}$, con. XII,
Dereham tp.

Completed September 16, 1937.

Producing gas well.

Rock pressure: 450 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface | 161 |
| Lime | 209 |
| Flint | 105 |
| Shale | 95 |
| Shale and brown lime | 319 |
| Guelph | 51 |

Total depth..... 940

Gas at 909, 914, 930, and 936 feet.

Fresh water at 161 feet; salt water at 365 feet.

W. C. PATTERSON GAS CO., LTD.

G. Williams No. 2, lot 26, N.E. $\frac{1}{4}$, con. XII,
Dereham tp.

Completed October 20, 1937.

Producing gas well.

Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface | 175 |
| Brown lime | 15 |
| Sharp grey lime | 25 |
| Grey and brown lime | 62 |
| Brown lime | 114 |
| Flint | 89 |
| Lime and shale | 119 |
| Flint | 100 |
| Hard brown lime | 110 |
| Grey lime | 95 |
| Guelph lime | 35 |

Total depth..... 939

Gas at 911, 934, and 939 feet.

Fresh water at 175 feet; sulphur water at 385 feet.

PATTERSON-TRELEAVEN

A. C. Rooke No. 1, lot 22, S. $\frac{1}{2}$, con. XII, Dereham tp.

Completed March 4, 1937.

Producing gas well.

Rock pressure: 480 lbs.

| Formation | Thickness, ft. |
|----------------|-------------------|
| Surface | 185 |
| Brown lime | 215 |
| Sharp sand | 90 |
| Lime and shale | 300 |
| Brown lime | 109 |
| Guelph lime | 50 |

Total depth..... 949

Gas at 927, 936, 941, and 946 feet.

Black water at 186 feet.

PATTERSON-TRELEAVEN

A. C. Rooke No. 2, lot 22, S. $\frac{1}{2}$, con. XII, Dereham tp.

Completed March 15, 1937.

Producing gas well.

Rock pressure: 460 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface | 166 |
| Top rock | 19 |
| Shale and soap | 5 |
| Brown and grey lime | 170 |
| Sharp sand | 110 |
| Brown lime | 70 |
| Shale | 100 |
| Lime | 80 |
| Shale and lime | 20 |
| Shale | 20 |
| Grey lime | 20 |
| Grey and brown lime | 70 |
| Brown lime | 20 |
| Lime | 23 |
| Guelph lime | 35 |

Total depth..... 928

Gas at 893 to 915 and 918 feet.

Fresh water at 210 feet; sulphur water at 490 feet.

PATTERSON-TRELEAVEN

A. C. Rooke No. 3, lot 22, S. $\frac{1}{2}$, con. III, Dereham tp.
Completed April 17, 1937.
Producing gas well.
Rock pressure: 475 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 200 |
| Sharp sand..... | 60 |
| Lime..... | 140 |
| Lime and chert..... | 95 |
| Lime and shale..... | 300 |
| Shale..... | 136 |
| Guelph..... | 36 |
| Total depth..... | 967 |

Gas at 944 feet.

PATTERSON-TRELEAVEN SCANLON No. 1

A. P. Scanlon No. 3, lot 25, con. XI, Dereham tp.
Completed July 21, 1937.
Producing gas well.
Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 168 |
| Lime and shale..... | 207 |
| Flint..... | 105 |
| Lime and shale..... | 422 |
| Guelph lime..... | 28 |
| Total depth..... | 930 |

Gas at 902 to 910 feet.

PATTERSON-TRELEAVEN SCANLON No. 2

A. P. Scanlon No. 4, lot 25, con. XI, Dereham tp.
Completed September 4, 1937.
Producing gas well.
Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 173 |
| Brown lime..... | 202 |
| Lime and chert..... | 112 |
| Lime and shale..... | 430 |
| Guelph lime..... | 37 |
| Total depth..... | 954 |

Gas at 952 feet.

Black water at 317 feet.

PATTERSON-TRELEAVEN WILLIAMS No. 1

G. Williams No. 1, lot 26, N.W. $\frac{1}{4}$, con. XII,
Dereham tp.
Completed September 27, 1937.
Producing gas well.
Rock pressure: 450 lbs.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Surface..... | 173 |
| Sharp grey lime..... | 91 |
| Grey and brown lime..... | 128 |
| Flint..... | 91 |
| Brown lime..... | 19 |
| Shale..... | 130 |
| Brown lime..... | 103 |
| Shale..... | 87 |
| Shale and lime..... | 42 |
| Brown and grey lime..... | 48 |
| Guelph lime..... | 28 |
| Total depth..... | 940 |

Gas at 911, 925, 934, and 939 feet.
Fresh water at 170 feet; sulphur water at 410 feet.

REID-ADAMS DEVELOPMENT Co., LTD., No. 1

T. M. Moore No. 1, lot 27, N.E. $\frac{1}{4}$, con. XII,
Dereham tp.
Completed October 1, 1937.
Producing gas well.
Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|------------------------------|-------------------|
| Surface..... | 172 |
| Brown lime..... | 53 |
| Grey lime..... | 25 |
| Brown lime..... | 45 |
| Grey lime..... | 75 |
| Lime and chert..... | 100 |
| Brown lime..... | 25 |
| Grey lime..... | 50 |
| Lime, shale, and gypsum..... | 120 |
| Brown lime..... | 85 |
| Lime and grey shale..... | 115 |
| Grey shale..... | 25 |
| Grey lime..... | 15 |
| Brown lime..... | 26 |

Total depth..... 931
Gas at 900 and 931 feet.
Fresh water at 200 feet.

A. SMITH

R. Holbrook No. 1, lot 19, con. X, Dereham tp.
Completed September 2, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------------|-------------------|
| Surface..... | 179 |
| Brown and grey lime..... | 196 |
| Flint..... | 127 |
| Gypsum and shale..... | 105 |
| Brown lime..... | 323 |
| Shale..... | 10 |
| Brown and grey shale..... | 53 |
| Niagara..... | 3 |

Total depth..... 996
Fresh water at 180 feet; sulphur water at 250 and 480 feet.

WESTERN ONTARIO NATURAL GAS CO., LTD.

S. Elliott No. 1, lot 24, con. XI, Dereham tp.
Completed February 12, 1937.
Producing gas well.
Rock pressure: 475 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 152 |
| Lime and shale..... | 198 |
| Lime and chert..... | 150 |
| Lime and shale..... | 245 |
| Lime..... | 128 |
| Guelph..... | 34 |

Total depth..... 907
Gas at 905 feet.
Fresh water at 154 feet; sulphur water at 510 feet.

WESTERN ONTARIO NATURAL GAS CO., LTD.

S. Elliott No. 2, lot 24, con. XI, Dereham tp.
Completed March 29, 1937.
Producing gas well.
Rock pressure: 465 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 169 |
| Lime..... | 200 |
| Lime and chert..... | 125 |
| Lime and shale..... | 246 |
| Lime..... | 169 |
| Guelph..... | 18 |

Total depth..... 927
Gas at 919 and 924 feet.

WESTERN ONTARIO NATURAL GAS CO., LTD.
S. Elliott No. 3, lot 24, S. ½, con. XI, Dereham tp.
Completed June 7, 1937.
Producing gas well.
Rock pressure: 460 lbs.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Surface..... | 170 |
| Lime and shale..... | 170 |
| Brown lime..... | 65 |
| Lime and chert..... | 90 |
| Lime and shale..... | 45 |
| Shale and gypsum..... | 160 |
| Brown lime..... | 50 |
| Shale..... | 40 |
| Grey and brown lime..... | 50 |
| Brown lime..... | 15 |
| Grey and brown lime..... | 50 |
| Guelph lime..... | 24 |

Total depth..... 929
Gas at 918, 912 to 916, and 923 to 927 feet.
Fresh water at 175 and 330 feet.

WESTERN ONTARIO NATURAL GAS CO., LTD.
S. Elliott No. 4, lot 24, S. ½, con. XI, Dereham tp.
Completed July 1, 1937.
Producing gas well.
Rock pressure: 460 lbs.

| Formation | Thickness, ft. |
|------------------------------|-------------------|
| Surface..... | 168 |
| Lime and shale..... | 170 |
| Brown lime..... | 60 |
| Flint..... | 100 |
| Lime, shale, and gypsum..... | 125 |
| Hard lime..... | 120 |
| Shale..... | 45 |
| Grey and brown lime..... | 50 |
| Brown lime..... | 20 |
| Grey and brown lime..... | 50 |
| Guelph lime..... | 33 |

Total depth..... 941
Gas at 910 to 912, 915 to 918, and 925 to 941 feet.
Fresh water at 115 and 175 feet.

WESTERN ONTARIO NATURAL GAS CO., LTD.
S. Elliott No. 5, lot 24, con. XI, Dereham tp.
Completed July 22, 1937.
Producing gas well.
Rock pressure: 460 lbs.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Surface..... | 168 |
| Lime and shale..... | 150 |
| Brown lime..... | 37 |
| Lime and chert..... | 120 |
| Lime and shale..... | 140 |
| Brown and grey lime..... | 125 |
| Shale..... | 50 |
| Grey and brown lime..... | 50 |
| Brown lime..... | 65 |
| Guelph lime..... | 27 |

Total depth..... 933
Gas at 910 to 933 feet.
Fresh water at 170 feet.

WESTERN ONTARIO NATURAL GAS CO., LTD.
S. Elliott No. 6, lot 24, con. XI, Dereham tp.
Completed August 19, 1937.
Producing gas well.
Rock pressure: 455 lbs.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Surface..... | 173 |
| Lime and shale..... | 137 |
| Brown lime..... | 50 |
| Flint..... | 100 |
| Lime and shale..... | 150 |
| Brown and grey lime..... | 130 |
| Shale..... | 50 |
| Grey and brown lime..... | 75 |
| Brown lime..... | 35 |
| Guelph lime..... | 10 |

Total depth..... 910
Gas at 903 to 910 feet.
Fresh water at 175 feet.

WESTERN ONTARIO NATURAL GAS CO., LTD.
S. Elliott No. 7, lot 24, con. XI, Dereham tp.
Completed December 15, 1937.
Producing gas well.
Rock pressure: 446 lbs.

| Formation | Thickness, ft. |
|--------------------------|-------------------|
| Surface..... | 168 |
| Lime and shale..... | 142 |
| Brown lime..... | 50 |
| Flint..... | 100 |
| Lime and shale..... | 170 |
| Brown and grey lime..... | 115 |
| Shale..... | 50 |
| Grey and brown lime..... | 75 |
| Brown lime..... | 35 |
| Guelph lime..... | 23 |

Total depth..... 928
Gas at 907 to 917 feet.
Fresh water at 20 and 170 feet.

VOLCANIC GAS AND OIL CO., LTD.
H. Cooper No. 1, lot 35, con. X, East Nissouri tp.
Completed November 13, 1937.
Dry hole.

| Formation | Thickness, ft. |
|--|-------------------|
| Surface..... | 81 |
| Brown, buff, and grey lime..... | 459 |
| Grey and brown lime, grey shale, and gypsum..... | 465 |
| Brown and grey lime..... | 293 |
| Grey shale..... | 27 |
| Brown lime..... | 25 |
| Grey shale..... | 55 |
| Grey lime and shale..... | 30 |
| Brown shale..... | 7 |

Total depth..... 1,442
Fresh water at 68 feet; salt water at 1,070 and 1,145 to 1,150 feet.

Perth County

VOLCANIC GAS AND OIL CO., LTD.
J. Chalmers No. 1, lot 23, con. VIII,
North Easthope tp.
Completed April 23, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---|-------------------|
| Surface..... | 215 |
| Buff and grey lime and chert..... | 175 |
| Argillaceous lime, shale, and some gypsum..... | 370 |
| Grey, brown, and buff, compact to crystalline lime..... | 315 |
| Grey shale..... | 15 |
| Brown and buff, granular to crystalline lime..... | 28 |
| Grey-green, brown, and grey shales..... | 1,095 |
| Grey and brown, compact to shaly limestone..... | 20 |
| Granite..... | 8 |

Total depth..... 2,978
Fresh water at 130, 780 to 785, and 1,050 to 1,058 feet.

VOLCANIC GAS AND OIL CO., LTD.
W. Cook No. 1, lot 28, con. VI, North Easthope tp.
Completed August 6, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---|-------------------|
| Surface..... | 230 |
| Buff and grey cherty lime..... | 135 |
| Brown and grey, compact to granular lime..... | 80 |
| Argillaceous grey lime, shale, and some gypsum..... | 325 |
| Grey, buff, and brown, compact to crystalline lime..... | 340 |
| Buff, granular to crystalline lime..... | 20 |
| Grey shale, fossiliferous lime, and red shale..... | 83 |

Total depth..... 1,223
Fresh water at 230, 820, 852, and 905 to 910 feet.

Prince Edward County

COLLIVER AND LEAVENS

Colliver and Leavens No. 1, lot 697, Town of Picton,
Hallowell tp.

Completed September 3, 1937.

Producing gas well.

Rock pressure: 80 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Shale..... | 170 |
| Trenton lime..... | 330 |
| Total depth..... | 500 |

Gas at 250, 350, 393, 460, and 475 feet.
Surface water at 22 feet; fresh water at 173 feet.

McNINCH AND DEVINE

J. Hubbs No. 1, lot 166, Town of Picton, Hallowell tp.
Completed June 19, 1937.

Producing gas well.

Rock pressure: 70 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Sandy loam..... | 7 |
| Shale..... | 98 |
| Trenton lime..... | 395 |
| Total depth..... | 500 |

Gas at 195, 295, and 455 feet.

McNINCH AND DEVINE

M. Hughes No. 1, lot 703, Town of Picton,
Hallowell tp.

Completed October 25, 1937.

Producing gas well.

Rock pressure: 70 lbs.

| Formation | Thickness, ft. |
|------------------|-------------------|
| Surface..... | 12 |
| Shale..... | 188 |
| Trenton..... | 321 |
| Total depth..... | 521 |

Gas at 250, 290, 390, and 475 feet.
Fresh water at 180 feet.

MAY GOLD AND NATURAL GAS SYNDICATE,
McNINCH AND DEVINE

S. N. Roblin No. 1, lot 226, Town of Picton,
Hallowell tp.

Completed May 18, 1937.

Producing gas well.

Rock pressure: 70 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Sandy loam..... | 8 |
| Shale..... | 87 |
| Trenton lime..... | 405 |
| Total depth..... | 500 |

Gas at 195, 275, and 445 feet.
Fresh water at 12 and 22 feet.

LOTTA BABCOCK

E. Stark No. 1, lot 11, W.L.P., South Marysburgh tp.

Completed February 28, 1937.

Producing gas well.

Rock pressure: 70 lbs.

| Formation | Thickness, ft. |
|----------------------------|-------------------|
| Shale..... | 130 |
| Trenton lime and sand..... | 55 |
| Trenton lime..... | 810 |
| Trenton and granite..... | 5 |
| Total depth..... | 1,000 |

Gas at 250, 375, and 500 feet.

Welland County

CORONATION GAS SYNDICATE

I. S. Eby No. 1, lot 8, W. ½, con. XIV, Bertie tp.

Completed November 2, 1937.

Producing gas well.

Rock pressure: 250 lbs.

| Formation | Thickness, ft. |
|-------------------------|-------------------|
| Surface..... | 56 |
| Salina..... | 280 |
| Guelph and Niagara..... | 210 |
| Rochester..... | 61 |
| Clinton..... | 32 |
| Red Medina..... | 60 |
| Manitoulin..... | 35 |
| White Medina..... | 12 |
| Queenston..... | 74 |
| Total depth..... | 820 |

Gas at 659, 689, and 744 feet.
Fresh water at 40 feet.

CORONATION GAS SYNDICATE

H. J. Fretz No. 1, lot 6, con. XV, Bertie tp.

Completed September 18, 1937.

Producing gas well.

Rock pressure: 165 lbs.

| Formation | Thickness, ft. |
|-------------------------|-------------------|
| Surface..... | 42 |
| Salina..... | 280 |
| Guelph and Niagara..... | 240 |
| Rochester..... | 65 |
| Clinton..... | 32 |
| Red Medina..... | 67 |
| Manitoulin..... | 38 |
| White Medina..... | 8 |
| Queenston..... | 58 |
| Total depth..... | 830 |

Gas at 699 and 771 feet.
Fresh water at 30 feet.

CORONATION GAS SYNDICATE

L. B. Winger No. 1, lot 34, con. III, Bertie tp.

Completed July 2, 1937.

Dry hole.

| Formation | Thickness, ft. |
|-------------------------|-------------------|
| Surface..... | 6 |
| Flint..... | 40 |
| Salina..... | 300 |
| Guelph and Niagara..... | 264 |
| Rochester..... | 100 |
| Clinton..... | 32 |
| Red Medina..... | 60 |
| Manitoulin..... | 50 |
| White Medina..... | 10 |
| Queenston..... | 53 |
| Total depth..... | 915 |

Show of gas at 857 feet.
Fresh water at 35 feet.

CORONATION GAS SYNDICATE

D. T. Zavitz No. 1, lot 34, con. III, Bertie tp.

Completed August 12, 1937.

Producing gas well.

Rock pressure: 75 lbs.

| Formation | Thickness, ft. |
|-------------------------|-------------------|
| Surface..... | 10 |
| Flint..... | 40 |
| Salina..... | 280 |
| Guelph and Niagara..... | 254 |
| Rochester..... | 100 |
| Clinton..... | 32 |
| Red Medina..... | 70 |
| Manitoulin..... | 30 |
| White Medina..... | 20 |
| Queenston..... | 64 |
| Total depth..... | 900 |

Gas at 732, 761, and 831 feet.
Fresh water at 24 feet.

PROVINCIAL GAS CO., LTD.

J. Bittner No. 1, lot 5, con. XIV, Bertie tp.
Completed January 4, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 58 |
| Lime and shale..... | 289 |
| Niagara..... | 215 |
| Blue shale..... | 62 |
| Clinton..... | 28 |
| Red Medina..... | 68 |
| Grey shale..... | 45 |
| White Medina..... | 15 |

Total depth..... 780

Fresh water at 58 feet; black and sulphur water at 510 feet.

PROVINCIAL GAS CO., LTD.

B. Sherk No. 1, lot 6, con. XIV, Bertie tp.
Completed March 1, 1937.
Dry hole.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 54 |
| Lime and shale..... | 304 |
| Niagara..... | 218 |
| Blue shale..... | 59 |
| Clinton..... | 30 |
| Red Medina..... | 70 |
| Grey shale..... | 25 |
| White Medina..... | 16 |
| Red shale..... | 6 |

Total depth..... 782

Fresh water at 54 feet; sulphur water at 90 feet.

FRANK AND HARVEY ROTH

S. Johnstone No. 1, lot 10, con. XII, Bertie tp.
Completed July 16, 1937.
Producing gas well.
Rock pressure: 175 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 40 |
| Lime and shale..... | 250 |
| Niagara..... | 200 |
| Guelph..... | 20 |
| Shale..... | 80 |
| Clinton..... | 34 |
| Red Medina..... | 63 |
| Grey shale..... | 35 |
| White Medina..... | 17 |
| Red shale..... | 14 |

Total depth..... 753

Gas at 612 and 728 feet.
Black water at 85 and 110 feet.

FRANK AND HARVEY ROTH

S. Johnstone No. 2, lot 10, con. XII, Bertie tp.
Completed September 6, 1937.
Producing gas well.
Rock pressure: 160 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 40 |
| Lime and shale..... | 245 |
| Niagara..... | 195 |
| Guelph..... | 20 |
| Shale..... | 78 |
| Clinton..... | 30 |
| Red Medina..... | 63 |
| Grey shale..... | 35 |
| White Medina..... | 15 |
| Red shale..... | 48 |

Total depth..... 769

Gas at 594, 645, and 717 feet.
Fresh water at 33 and 50 feet; black water at 70 feet.

FRANK AND HARVEY ROTH

S. Johnstone No. 3, lot 10, con. XII, Bertie tp.
Completed October 23, 1937.
Producing gas well.
Rock pressure: 130 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 37 |
| Lime and shale..... | 246 |
| Niagara lime..... | 205 |
| Guelph..... | 23 |
| Shale..... | 65 |
| Clinton..... | 30 |
| Red Medina..... | 61 |
| Grey shale..... | 38 |
| White Medina..... | 12 |
| Red shale..... | 2 |

Total depth..... 719

Gas at 582, 608, and 628 feet.
Fresh water at 25 and 40 feet; black water at 65 feet.

JACKSON AND GRAFF SYNDICATE

H. Dunn No. 1, lot 5, E. ½, con. V, Crowland tp.
Completed November 6, 1937.
Producing gas well.
Rock pressure: 150 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 82 |
| Lime and shale..... | 98 |
| Niagara..... | 224 |
| Shale..... | 50 |
| Clinton..... | 35 |
| Red Medina..... | 60 |
| Shale..... | 30 |
| White Medina..... | 28 |
| Red shale..... | 30 |

Total depth..... 637

Gas at 470, 528, and 548 feet.
Fresh water at 60 and 87 feet.

JACKSON AND GRAFF SYNDICATE

E. McCombs No. 1, lot 5, E. ½, con. V, Crowland tp.
Completed October 15, 1937.
Producing gas well.
Rock pressure: 195 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 93 |
| Shale..... | 74 |
| Niagara..... | 230 |
| Shale..... | 52 |
| Clinton..... | 35 |
| Red Medina..... | 68 |
| Shale..... | 30 |
| White Medina..... | 28 |
| Red shale..... | 37 |

Total depth..... 647

Gas at 500 and 582 feet.
Fresh water at 98 feet; black water at 167 feet.

NOTTAWA OIL AND GAS CO., LTD.

A. Minor No. 2, lot 28, S. ½, con. I, Wainfleet tp.
Completed September 15, 1937.
Producing gas well.
Rock pressure: 200 lbs.

| Formation | Thickness, ft. |
|-------------------|-------------------|
| Surface..... | 24 |
| Gravel..... | 10 |
| Quicksand..... | 12 |
| Flint..... | 35 |
| Shale..... | 338 |
| Niagara..... | 215 |
| Shale..... | 30 |
| Clinton..... | 35 |
| Red Medina..... | 45 |
| Shale..... | 42 |
| White Medina..... | 9 |
| Red shale..... | 10 |

Total depth..... 805

Gas at 634 and 669 feet.
Fresh water at 25 feet; black water at 80 feet.

ROMNEY GAS AND OIL CO., LTD.

Carter No. 1, lot 39, con. VI, Wainfleet tp.

Completed January 11, 1937.

Producing gas well.

Rock pressure: 235 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 106 |
| Lime and shale..... | 89 |
| Niagara..... | 225 |
| Shale..... | 55 |
| Clinton..... | 30 |
| Red Medina..... | 40 |
| Grey shale..... | 54 |
| White Medina..... | 16 |
| Red shale..... | 50 |

Total depth..... 665

Gas at 599 to 615 feet.

Fresh water at 112 feet; salt water at 250 feet.

ROMNEY GAS AND OIL CO., LTD.

H. Cohoe No. 1, lot 40, con. VI, Wainfleet tp.

Completed March 20, 1937.

Producing gas well.

Rock pressure: 215 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 110 |
| Lime and shale..... | 82 |
| Niagara..... | 225 |
| Shale..... | 55 |
| Clinton..... | 30 |
| Red Medina..... | 40 |
| Grey shale..... | 52 |
| White Medina..... | 16 |
| Red shale..... | 49 |

Total depth..... 659

Gas at 594 to 610 feet.

Fresh water at 112 feet; salt water at 250 feet.

ROMNEY GAS AND OIL CO., LTD.

Putnam No. 1, lot 39, con. VI, Wainfleet tp.

Completed February 27, 1937.

Producing gas well.

Rock pressure: 235 lbs.

| Formation | Thickness, ft. |
|---------------------|-------------------|
| Surface..... | 112 |
| Lime and shale..... | 79 |
| Niagara..... | 225 |
| Shale..... | 55 |
| Clinton..... | 30 |
| Red Medina..... | 40 |
| Grey shale..... | 54 |
| White Medina..... | 16 |
| Red shale..... | 51 |

Total depth..... 662

Gas at 595 to 611 feet.

Fresh water at 120 feet; salt water at 250 feet.

Wentworth County

O. BELL

O. Bell No. 3, lot 31, con. VIII, Binbrook tp.

Completed January 11, 1937.

Producing gas well.

Rock pressure: 50 lbs.

| Formation | Thickness, ft. |
|---------------------------|-------------------|
| Surface..... | 50 |
| Brown lime and shale..... | 24 |
| Niagara..... | 200 |
| Shale..... | 48 |
| Clinton..... | 30 |
| Red Medina..... | 35 |
| Blue shale..... | 50 |
| White Medina..... | 8 |
| Red shale..... | 50 |

Total depth..... 495

Gas at 326, 362, and 443 feet.

Fresh water at 60 feet.

WRAY PATTERSON

W. Patterson No. 1, lot 22, con. IX, Binbrook tp.

Completed March 31, 1937.

Producing gas well.

Rock pressure: 60 lbs.

| Formation | Thickness, ft. |
|----------------------|-------------------|
| Surface..... | 45 |
| Flint..... | 55 |
| Niagara..... | 200 |
| White lime..... | 22 |
| Rochester shale..... | 16 |
| Clinton..... | 22 |
| Red Medina..... | 42 |
| Grey shale..... | 50 |
| White Medina..... | 12 |
| Red shale..... | 36 |

Total depth..... 500

Gas at 462 feet.

Fresh water at 60 feet.

PETROLEUM IN 1937

By R. B. Harkness

General

For the past three years the production of petroleum in Ontario has been stationary at the high point of 15 years; in 1937 it was 165,205 barrels. The old Petrolia and Oil Springs fields show little change, but the Bothwell field, which is experiencing its second revival since its discovery in 1862, maintains a steady improvement, having increased production 123 per cent. over the low point of 1931 and equalled the production of 1907. The Dover field shows considerable fluctuation; most of the wells are gas wells, but occasionally a pool of oil is encountered. The same is true of Dawn township, where the production of oil is incidental in this gas field.

The value of the oil averages \$2.15 per barrel, or a total of \$356,015. The price of oil has shown a very slight increase for the past five years. All the above details will be found in Tables I and II.

The total number of oil wells in the Province shows a slight increase, in spite of the fact that more wells are abandoned than drilled. This is due to the fact that old and forgotten wells are constantly being found and revived; after they lie idle for a number of years, oil appears to accumulate and, on being pumped, they produce a considerable amount of oil. In Petrolia, this new production from old wells is not maintained as it has been in Bothwell during the past five years. In the latter case it has been remarkable. The field was discovered about the year 1862 and had a tremendous boom at the end of 1866. Approximately 230 wells were producing over an area of about 3,000 acres. In the centre of this area, where the wells were most productive, they were drilled as close as drilling rigs could be placed. At the time of the Fenian Raid in 1866, fearing a rupture between the countries, the American operators left the country, and their properties lay idle. It so happened that this coincided with the opening up of the Petrolia field, which put a veritable flood of oil on the limited market, and the price of oil declined almost to the vanishing point. Most of the wells in the Bothwell field had been drilled into the lower water, and with so many idle wells, the field "went to water." It was closed down until about 1896, when F. J. Carmen opened up the western pool, which has been producing continuously since that date. The revived part of the field is the eastern pool, in the area where Zone, Mosa, Orford, and Aldborough townships meet. Many of the wells opened up in the past five years have been idle since 1866, and most of them have been redrilled as the casing has practically disappeared through corrosion.

Eighteen drilling rigs were in operation in 1937, representing a capital investment of \$40,700. Twenty-eight dry holes and 38 producing oil wells were drilled. The footage of dry holes is 16,320 and of producing wells 18,680, making a total of 36,000 feet drilled. Thirty-two men were employed, who received \$14,250 in wages. These figures are included in the following statistics kindly furnished by the Bureau of Statistics, Ottawa.

The capital invested in producing crude petroleum is \$948,360; the number of employees is 209; and the wages paid, \$142,385.

TABLE I—OIL WELLS AND THEIR PRODUCTION, 1937

| Field | Wells | | | Wells drilled | | Production ¹ | | Gain or loss in 1937 | |
|-------------------------------|----------------|-----------------------|----------------|---------------------|-------|-------------------------|-------------|----------------------|----------------|
| | Oper- ating | Not Oper- ating | Aban- doned | Pro- duc- ing | Dry | | | Gain | Loss |
| Petrolia and Enniskillen.... | 742 | 643 | 11 | 18 | 2 | bbls. 57,959 | gals. 28 | bbls. | bbls. 1,132 |
| Oil Springs..... | 832 | 244 | 14 | ..... | ..... | 33,852 | 26 | 2,058 | ..... |
| Moore tp..... | 47 | 37 | ..... | ..... | ..... | 2,253 | ..... | ..... | 947 |
| Sarnia tp..... | 48 | 45 | 5 | ..... | ..... | 444 | 20 | ..... | 139 |
| Plympton tp..... | 27 | 3 | ..... | ..... | 2 | 236 | 22 | ..... | 11 |
| Bothwell and Thamesville.. | 242 | 100 | 10 | 15 | 9 | 41,108 | 22 | 4,116 | ..... |
| Dover..... | 3 | ..... | ..... | ..... | ..... | 10,498 | 17 | ..... | 5,038 |
| Raleigh and Tilbury East tps. | 1 | ..... | 7 | ..... | 2 | 2,471 | 6 | 1,346 | ..... |
| Onondaga tp..... | 13 | 23 | ..... | ..... | ..... | 728 | 17 | 466 | ..... |
| Mosa tp..... | 92 | 31 | 8 | 3 | 2 | 8,685 | 32 | 504 | ..... |
| Euphemia and Dawn tps.... | 29 | 99 | ..... | ..... | 1 | 5,889 | 29 | 2,282 | ..... |
| Dunwich tp..... | 3 | 87 | 9 | ..... | 1 | 303 | 8 | ..... | 4 |
| Brooke tp..... | 3 | 7 | 4 | 2 | 3 | 772 | 31 | 773 | ..... |
| Chatham tp..... | ..... | ..... | ..... | ..... | 3 | ..... | ..... | ..... | ..... |
| Bosanquet tp..... | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Other fields..... | ..... | ..... | ..... | ..... | 23 | ..... | ..... | ..... | ..... |
| Total..... | 2,082 | 1,321 | 68 | 38 | 28 | 165,205 | 13 | 9,263 | 9,553 |
| | | | | | | | | Net loss 290 | |

¹Information from the Imperial Oil Refineries, Limited.²2 in Cockburn Island; 1 in Warwick township.

TABLE II—OIL PRODUCTION BY FIELDS, 1930-1937

| Field | 1930 | 1931 | 1932 | 1933 | 1934 | 1935 | 1936 | 1937 |
|-------------------------------|-----------|-----------|-----------|-----------|-----------|------------------|------------------|-----------|
| | bbls. | bbls. | bbls. | bbls. | bbls. | bbls. | bbls. | bbls. |
| Petrolia and Enniskillen..... | 55,130 | 57,515 | 58,871 | 57,298 | 57,938 | 59,282 | 59,092 | 57,960 |
| Oil Springs..... | 29,160 | 30,792 | 31,438 | 32,343 | 29,863 | 31,646 | 31,795 | 33,853 |
| Moore tp..... | 1,576 | 3,739 | 3,272 | 2,192 | 2,963 | 3,263 | 3,200 | 2,253 |
| Sarnia tp..... | 1,149 | 1,466 | 1,227 | 2,181 | 825 | 870 | 584 | 445 |
| Plympton tp..... | 296 | 296 | 274 | 211 | 202 | 237 | 248 | 237 |
| Bothwell..... | 21,176 | 18,024 | 19,460 | 22,935 | 32,133 | 34,175 | 36,534 | 40,425 |
| Tilbury East tp.... | 149 | ..... | ..... | ..... | ..... | ..... | ..... | 2,471 |
| Dover tp..... | 457 | 891 | 453 | 763 | 558 | 13,117 | 15,536 | 10,498 |
| Raleigh tp..... | ..... | ..... | ..... | 239 | 264 | 195 | 1,125 | ..... |
| Onondaga tp..... | 231 | 34 | 543 | 946 | 601 | 431 | 262 | 728 |
| Mosa tp..... | 7,166 | 8,517 | 8,429 | 8,168 | 9,031 | 8,788 | 8,182 | 8,686 |
| Thamesville..... | 447 | 462 | 534 | 847 | 614 | 428 | 458 | 683 |
| Euphemia tp..... | ..... | 121 | 496 | 510 | 189 | (¹) | (¹) | 425 |
| Dunwich tp..... | 365 | 507 | 285 | 346 | 283 | 408 | 307 | 303 |
| Brooke tp..... | ..... | ..... | ..... | ..... | 1,941 | 122 | ..... | 773 |
| Dawn tp..... | ..... | ..... | 5,061 | 8,079 | 3,980 | 11,538 | 8,171 | 5,464 |
| Total..... | 117,302 | 122,364 | 130,343 | 136,058 | 141,385 | 165,040 | 165,494 | 165,205 |
| Value..... | \$235,746 | \$219,993 | \$247,468 | \$253,486 | \$299,874 | \$346,156 | \$348,767 | \$356,558 |
| Average price. | \$2.00 | \$1.80 | \$1.89 | \$1.86 | \$2.12 | \$2.10 | \$2.11 | \$2.15 |

¹Included in Dawn township.

Petroleum Refining Operations

Table III gives details of the operation of Ontario refineries for six years, 1931 to 1937. The year 1937 is a peak year in the quantity of crude oil distilled.

Following the previous peak year 1931, the general depression gave the industry a serious setback, but it has more than recovered its position. The products from the crude distilled appear to maintain about the same proportion as heretofore.

Refineries are producing more high-gravity products (butane-pentane) for blending and are importing less "casing-head" gasoline. The use of benzol is on the increase. These products used for blending help to raise the octane index (anti-knock quality) of the gasoline.

TABLE III—PETROLEUM REFINING OPERATIONS, 1932-1937¹

| Schedule | Unit of measure | 1932 | 1933 | 1934 | 1935 | 1936 | 1937 |
|--|---|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Imported crude distilled. | Gallons ² Value..... | 327,524,704 \$19,197,691 | 314,058,338 \$14,904,715 | 307,717,332 \$16,110,251 | 331,461,390 \$16,624,472 | 348,300,425 \$18,694,141 | 376,028,891 \$21,451,421 |
| Imported crude oil distilled not in its natural state. | Gallons..... Value..... | 1,669,675 \$51,092 | 14,815,049 \$966,409 | 27,871,946 \$1,723,943 | 1,629,805 \$140,091 | 33,658 \$2,256 | ..... ..... |
| Canadian crude distilled. | Gallons.... Value..... | 4,704,609 \$290,752 | 4,823,639 \$299,793 | 4,289,702 \$274,888 | 6,321,891 \$408,366 | 5,702,053 \$576,953 | 5,789,224 \$375,181 |
| Percentage of total.... | ..... | 1.43 | 1.45 | 1.26 | 1.87 | 1.63 | 1.52 |
| Total value of crude..... | ..... | \$19,539,535 | \$16,170,917 | \$18,109,082 | \$17,172,929 | \$19,273,344 | \$21,826,602 |
| PRODUCTS | | | | | | | |
| Gasoline: | | | | | | | |
| Straight run..... | Gallons.... Selling value | 61,297,731 \$6,378,577 | 89,429,293 \$7,793,607 | 81,307,756 \$6,231,050 | 85,698,897 \$6,439,916 | 85,931,630 \$6,438,292 | 96,886,558 \$8,050,734 |
| By cracking process. | Gallons.... Selling value | 109,519,770 \$10,672,010 | 70,519,864 \$5,736,708 | 71,949,582 \$4,754,529 | 93,901,122 \$6,745,372 | 98,060,814 \$7,408,888 | 106,605,308 \$8,319,617 |
| Kerosene..... | Gallons.... Selling value | 18,666,252 \$1,736,164 | 26,499,830 \$2,022,408 | 14,208,236 \$1,109,504 | 10,424,545 \$814,344 | 14,209,536 \$1,033,418 | 8,404,621 \$619,542 |
| Lubricating oil..... | Gallons.... Selling value | 14,187,555 \$3,476,341 | 16,299,872 \$2,854,787 | 17,638,490 \$3,695,083 | 16,785,539 \$3,342,280 | 18,380,505 \$3,589,956 | 21,508,488 \$3,766,191 |
| Engine distillate.... | Gallons.... Selling value | 6,098,784 | 8,384,517 | 6,636,041 | 8,567,840 \$452,774 | 6,575,545 \$390,889 | 4,083,648 \$277,227 |
| Solvent naphtha.... | Gallons.... Selling value | \$573,585 | \$490,728 | \$340,237 | 4,003,104 \$282,672 | 3,518,964 \$241,622 | 4,174,508 \$313,585 |
| Gas and fuel oils.... | Gallons.... Selling value | 85,233,170 \$3,550,598 | 93,255,072 \$8,739,400 | 109,379,721 \$5,512,168 | 97,660,669 \$3,158,588 | 97,744,619 \$4,060,529 | 95,630,935 \$4,166,432 |
| Tar..... | Gallons.... Selling value | ..... ..... | ..... ..... | 130,641 \$49,977 | 12,132,400 \$48,529 | ..... ..... | 1,381,625 \$55,265 |
| Grease..... | Pounds.... Selling value | 8,751,758 \$492,339 | 8,342,446 \$357,316 | 8,571,927 \$509,271 | 9,898,844 \$459,595 | 9,652,267 \$455,281 | 11,993,124 \$430,584 |
| Paraffin wax and candles. | Pounds.... Selling value | 9,196,156 \$417,336 | 8,978,068 \$355,323 | 10,656,115 \$476,928 | 11,237,665 \$434,921 | 10,345,569 \$377,928 | 11,696,221 \$391,428 |
| Petroleum coke..... | Short tons.. Value..... | 62,836 \$328,067 | 62,601 \$344,686 | 49,011 \$268,821 | 53,845 \$320,004 | 55,667 \$349,777 | 56,166 \$355,907 |
| Still gas..... | M cu. ft.... Value..... | 1,942,741 \$410,222 | 1,574,451 \$306,984 | 1,498,379 \$281,524 | 2,122,091 \$468,765 | 2,334,401 \$459,587 | 2,407,572 \$523,821 |
| Asphalt..... | Gallons.... Selling value | 6,885,142 \$555,654 | 6,494,707 \$524,532 | 7,946,775 \$712,468 | 6,977,781 \$600,229 | 8,738,564 \$775,198 | 9,384,628 \$737,725 |
| Miscellaneous..... | Value..... | \$222,545 | \$50,498 | \$56,971 | \$95,350 | ..... | \$155,661 |
| Total value of refined products.. | ..... | \$28,814,438 | \$24,824,977 | \$23,998,621 | \$24,664,342 | \$25,581,365 | \$28,163,719 |
| Employees..... | Average No. | 1,937 | 2,036 | 2,047 | 2,012 | 2,004 | 2,065 |
| Capital invested..... | Wages paid.. | \$2,764,208 | \$2,752,718 | \$2,637,213 | \$2,970,360 | \$2,994,706 | \$3,272,974 |
|  | ..... | \$25,732,687 | \$22,947,812 | \$23,579,481 | \$21,367,847 | \$20,441,809 | \$20,032,311 |

¹Information furnished by the Dominion Bureau of Statistics, Ottawa.

²Gallons refer to Imperial gallons.

Refined Products Imported into Ontario

Table IV gives comparative statistics of petroleum refined products imported into Ontario in 1936 and 1937. Nearly all products other than casing-head gasoline show an increase. Motor gasoline shows a decided increase.

Imports of refined products are bound to vary spasmodically from year to year. If a barrel of crude oil is refined, many products are recovered and these must all be sold. If a demand should come for a large quantity of fuel oil, this cannot be met unless the corresponding percentage of gasoline, kerosene, and lubricating oil is disposed of, consequently these extraordinary demands must be met by purchase outside this country.

TABLE IV—PETROLEUM AND REFINED PRODUCTS IMPORTED IN 1936 AND 1937

| Import | 1936 | | 1937 | |
|---|--------------------|---------------------|--------------------|---------------------|
| | Imperial gallons | Value | Imperial gallons | Value |
| CRUDE PETROLEUM FOR REFINING: | | | | |
| Petroleum, 0.790 specific gravity or heavier, for refining..... | 284,518,310 | \$9,505,258 | 345,531,186 | \$12,920,242 |
| Petroleum—tops and blends..... | 377,428 | 26,145 | ..... | ..... |
| Total..... | 284,895,738 | \$9,531,403 | 345,531,186 | \$12,920,242 |
| REFINED PETROLEUM: | | | | |
| For use in concentrating ores..... | 14,683 | \$8,863 | 17,334 | \$8,474 |
| Gasoline lighter than 0.669 specific gravity (casing-head)..... | 2,712,237 | 165,900 | 2,303,621 | 128,686 |
| Gasoline lighter than 0.8235 specific gravity..... | 1,900,348 | 174,896 | 8,138,586 | 660,507 |
| Crude petroleum, n.o.p..... | 17,948 | 1,076 | 24,929 | 3,079 |
| Kerosene and illuminating oils..... | 642,282 | 40,620 | 634,861 | 42,301 |
| Products of petroleum, n.o.p., 0.8235 specific gravity and heavier..... | 349,375 | 31,287 | 565,888 | 64,654 |
| Engine distillate heavier than 0.8017 specific gravity..... | 387,182 | 26,202 | 463,038 | 29,255 |
| Lubricating oils, consisting wholly or in part of petroleum, costing less than 25 cents a gallon..... | 5,340,298 | 823,515 | 5,188,200 | 806,533 |
| Lubricating oils, all other..... | 1,367,048 | 524,015 | 2,103,982 | 772,778 |
| All other oils..... | 116,434 | 49,936 | 80,648 | 35,758 |
| Total..... | 12,847,835 | \$1,846,310 | 19,521,087 | \$2,552,025 |
| PETROLEUM PRODUCTS: | | | | |
| Petroleum grease and lubricating grease, n.o.p..... lbs. | 2,952,542 | \$130,787 | 3,507,474 | \$171,441 |
| Vaseline, toilet and medicinal petroleum..... | ..... | 67,219 | ..... | 140,385 |
| Paraffin wax..... lbs. | 899,922 | 55,629 | 1,353,924 | 67,745 |
| Paraffin wax candles..... lbs. | 130,307 | 22,713 | 113,718 | 18,186 |
| Other petroleum products lighter than 0.8235 specific gravity..... gals. | 1,526,487 | 139,232 | 2,771,931 | 243,984 |
| Total..... | ..... | \$415,573 | ..... | \$641,741 |
| Total value..... | ..... | \$11,793,286 | ..... | \$16,114,008 |
| Total net value of petroleum and refined products imported¹..... | ..... | \$11,793,286 | ..... | \$16,114,008 |
| Duty paid on the above, calculated on the existing tariff schedule..... | ..... | 333,392 | ..... | 463,037 |
| Sales tax at 8 per cent..... | ..... | 727,588 | ..... | 1,326,164 |
| Freight, approximately..... | ..... | 900,000 | ..... | 1,100,000 |
| Total value delivered in Ontario... | ..... | \$13,754,266 | ..... | \$19,003,209 |

¹These statistics are compiled from information furnished through the courtesy of the Department of Customs and Excise.

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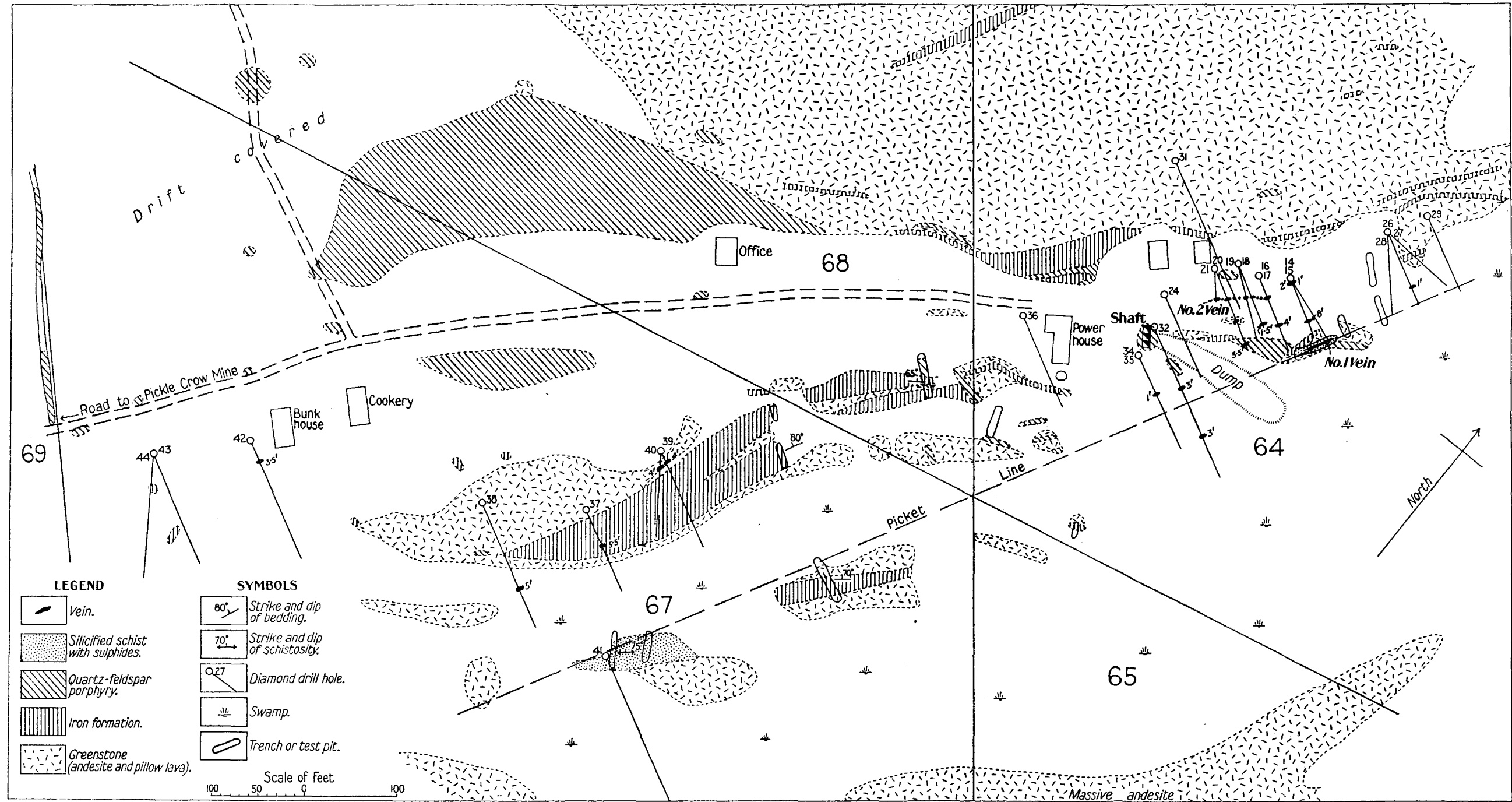


FIG. 5—GEOLOGICAL SKETCH MAP OF THE MAIN SHOWING, ALBANY RIVER MINES.





PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. ROBERT LAURIER, *Minister of Mines*

H. C. RICKABY, *Deputy Minister*

FORTY-SEVENTH ANNUAL REPORT
OF THE
ONTARIO DEPARTMENT OF MINES
BEING
VOL. XLVII, PART VI, 1938

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COLOURED GEOLOGICAL MAP

(In pocket at back of report)

Map No. 47k—Mining Properties near Goldrock, Upper Manitou Lake, District of Kenora, Ontario. Scale, 400 feet to the inch.

Some Gold Deposits near Goldrock, Upper Manitou Lake

By Jas. E. Thomson

Introduction

A few years prior to 1938 there was a revival of interest in a number of mining properties near Goldrock on Upper Manitou (Anzhekumming) lake in the district of Kenora. Goldrock is located about 20 miles south of Wabigoon station on the Canadian Pacific railway and lies at the northern extremity of Upper Manitou lake. It was a small village during the gold-mining boom that commenced in this country about the end of the last century. A 7-mile government road extends from Goldrock to Minnehaha lake, and a motor-boat service

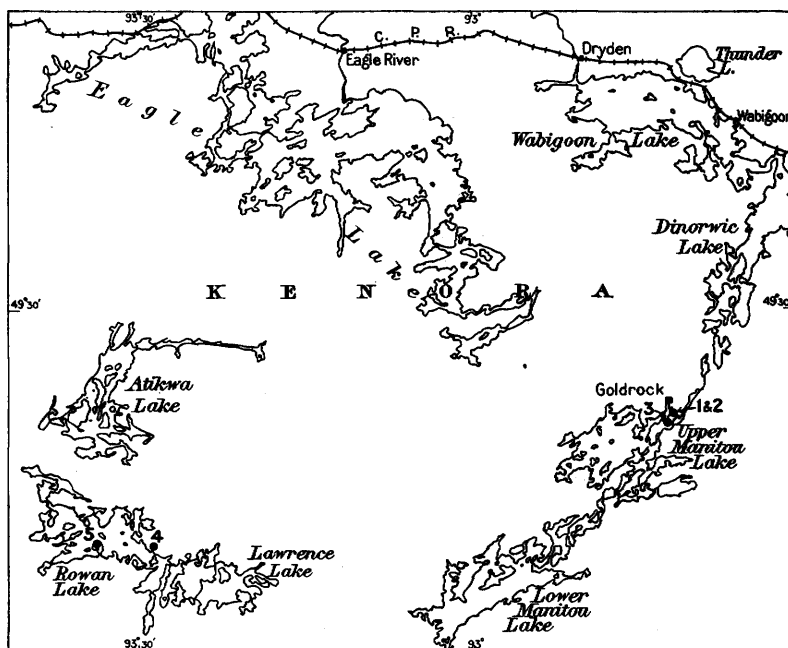


Fig. 1—Key map showing the location of mining properties near Goldrock and at Rowan lake, district of Kenora. Scale, 12 miles to the inch.

REFERENCE

- | | |
|--------------------------|---------------|
| 1. Elora. | 4. Errington. |
| 2. Big Master (Kenwest). | 5. Lakeport. |
| 3. Selby Lake (Kenwest). | |

was maintained in 1937 from this point to Wabigoon during the summer. A winter road connects the mines with the Trans-Canada highway.

Between 1895 and 1912 a number of gold-mining locations near Goldrock were developed spasmodically. Several shafts were sunk and a few stamp mills were installed. The total recorded gold production for the period amounted to \$180,401 and came from the Laurentian and Big Master mines. Following the revaluation of gold in 1933 and 1934 a new interest was taken in the Laurentian, Jubilee, and Big Master mines and adjacent ground. Active development of these properties was resumed in 1934.

The general geology and gold deposits of the Upper Manitou Lake area are discussed in a report issued in 1933.¹ A report on the Laurentian and Big Master mines has been made by Bruce²; this is accompanied by a geological map.

The writer visited the area in October, 1937. He is indebted to the management of the mining companies for access to plans, maps, and records of development. Much of the following information has been obtained from these sources. W. J. McDonough supplied a geological map of part of the underground workings at the Elora mine; this was prepared by A. S. Dadson, geologist. E. K. Fockler, consulting geologist, provided information on developments at the Big Master, and A. C. Billings supplied a survey of claims belonging to Selby Lake Mines. The writer was ably assisted by Geo. B. Scattergood, of Goldrock.

General Geology

The distribution of the various rock formations in the vicinity of the main showings is indicated on the coloured geological map, No. 47k. The country rock is largely volcanics of Keewatin age. These consist of basic lava flows (greenstone) on the eastern claims, and agglomerate and tuff in the vicinity of Goldrock. The greenstone and tuff are interbanded near the Jubilee vein on Elora ground. The lava flows have the composition of andesite and occasionally exhibit pillow structures. Porphyritic horizons in the lava flows are commonly found. These consist of large crystals of feldspar embedded in a fine-grained matrix. The porphyritic rocks are easily recognized and can sometimes be traced for considerable distances so that they serve as marker horizons in the volcanic complex. The interbedded formations strike N.25°-35°E. and have a very steep dip.

The lavas and tuffs are intruded by a few acid and basic dikes. Dikes of fine-grained and somewhat sheared felsite are found at a number of places and are often associated with the gold-bearing veins. They vary in width from a few inches to 70 feet and are light in colour compared with the greenstones. In addition there are dikes of massive quartz porphyry and granite porphyry. On claim H.P. 405 of Selby Lake Mines the quartz porphyry cuts the felsite and so is definitely later in age. A few narrow dark-coloured dikes are classified as lamprophyre. Small diabase dikes cut the older rock formations.

Gold Deposits

From a structural viewpoint, gold is found in two principal types of deposits. These include (1) quartz veins and lenses occupying well-defined sheared zones or "breaks" in greenstone or tuff, and (2) quartz veins and stringers distributed irregularly throughout mineralized felsite dikes.

In the first type of deposit the quartz masses tend to pinch and swell along the sheared zone. The veins all strike around N. 35° E. and have a very steep dip. The "breaks" run about parallel to the strike of the rock formations but occasionally truncate them at low angles, which indicates that they have been produced by faulting movements. Some of the sheared zones have been traced for long distances; for example, the Jubilee "break" has been followed by drilling and surface exposures for about 3½ miles. It is known to extend from claim H.P. 298 north of the Laurentian shaft, southwestward through the Elora and Selby Lake mine workings and across claims of Big Master Consolidated Gold

¹Jas. E. Thomson, "Manitou-Stormy Lakes Area," Ont. Dept. Mines, Vol. XLII, 1933, pt. 4, pp. 1-40.

²E. L. Bruce, Ont. Dept. Mines, Vol. XXXIV, 1925, pt. 6, pp. 34-37.

Mines as far south as Manitou straits. Over the greater part of this distance the "break" follows along the contact between greenstone on the east and agglomerate and tuff on the west. The Jubilee "break" is almost parallel to another strong fault located about three-quarters of a mile to the east. The latter fault has been traced from Kabagukski (Mud) lake southward to Lower Manitou lake, a distance of over 16 miles,¹ but is not known to contain any gold-bearing material.

The second type of deposit is confined to felsite dikes. The showings consist of quartz masses in sheared and fractured zones with pyritized and carbonatized felsite adjacent to the quartz. No. 4 vein of Big Master Consolidated Gold Mines belongs to this group. Felsite dikes also occur along the Elora and Selby Lake vein zones in the underground workings. The association of quartz with these dikes is probably due more to the physical nature of the rock than to any genetic relationship between felsite and vein material. Being a hard competent rock the felsite has yielded to deforming forces by fracturing, whereas the softer greenstones have failed by shearing. This has produced openings for vein deposition in the felsite.

Gold is somewhat erratically distributed throughout a number of the veins in the area. Samples containing spectacular amounts of coarse native gold have sometimes been found in small pockets and lenses at the Laurentian and Elora workings. Owing to the erratic distribution of values over a wide zone at the latter showing, bulk sampling methods have been necessary to estimate the average grade.

Description of Properties²

BIG MASTER CONSOLIDATED GOLD MINES, LIMITED

(Kenwest Gold Mines, Limited)

Big Master Consolidated Gold Mines, Limited, was organized in 1935 to develop a group of claims surrounding the Big Master mine. In 1938 the company held 5 patented and 38 unpatented claims. In July, 1940, the property was purchased by Kenwest Gold Mines, Limited. After distribution of its assets, Big Master Consolidated Gold Mines, Limited, surrendered its charter.

The Big Master mine was operated at intervals from about 1900 to 1906. Between 1902 and 1905 the mine produced bullion valued at \$39,261 from 5,027 tons of ore milled.³ The workings were pumped out for examination in 1911; and, again, in 1916, the mine was examined by the Dominion Reduction Company. In the early days lateral work was done on the No. 3 vein at depths of 75, 175, and 260 feet from the No. 1 shaft. A level at a depth of 75 feet was also opened up on the No. 4 vein from No. 2 shaft.

The present company examined the old mine workings on the No. 3 vein and opened up a new (4th) level at a depth of 350 feet. In addition the No. 4 vein was explored at a depth of 260 feet by means of a crosscut from the No. 3 vein workings. A considerable amount of trenching and surface-drilling was also done. This work traced out the northeasterly continuation of Nos. 3 and 4 veins for a considerable distance.

In 1938 R. J. Jowsey and associates secured an interest in the property, and additional surface-drilling was done. By August, 1938, a total of 115 drill-holes, comprising 19,733 feet, had been put down.

During the winter of 1938-39 Selby Lake Mines, Limited, undertook further

¹See Map No. 42c, Ont. Dept. Mines, Vol. XLII, 1933, pt. 4.

²In the following descriptions, all values are based on gold at \$35.00 per ounce.

³Ont. Dept. Mines, Vol. XLVII, 1938, pt. 1, p. 19.

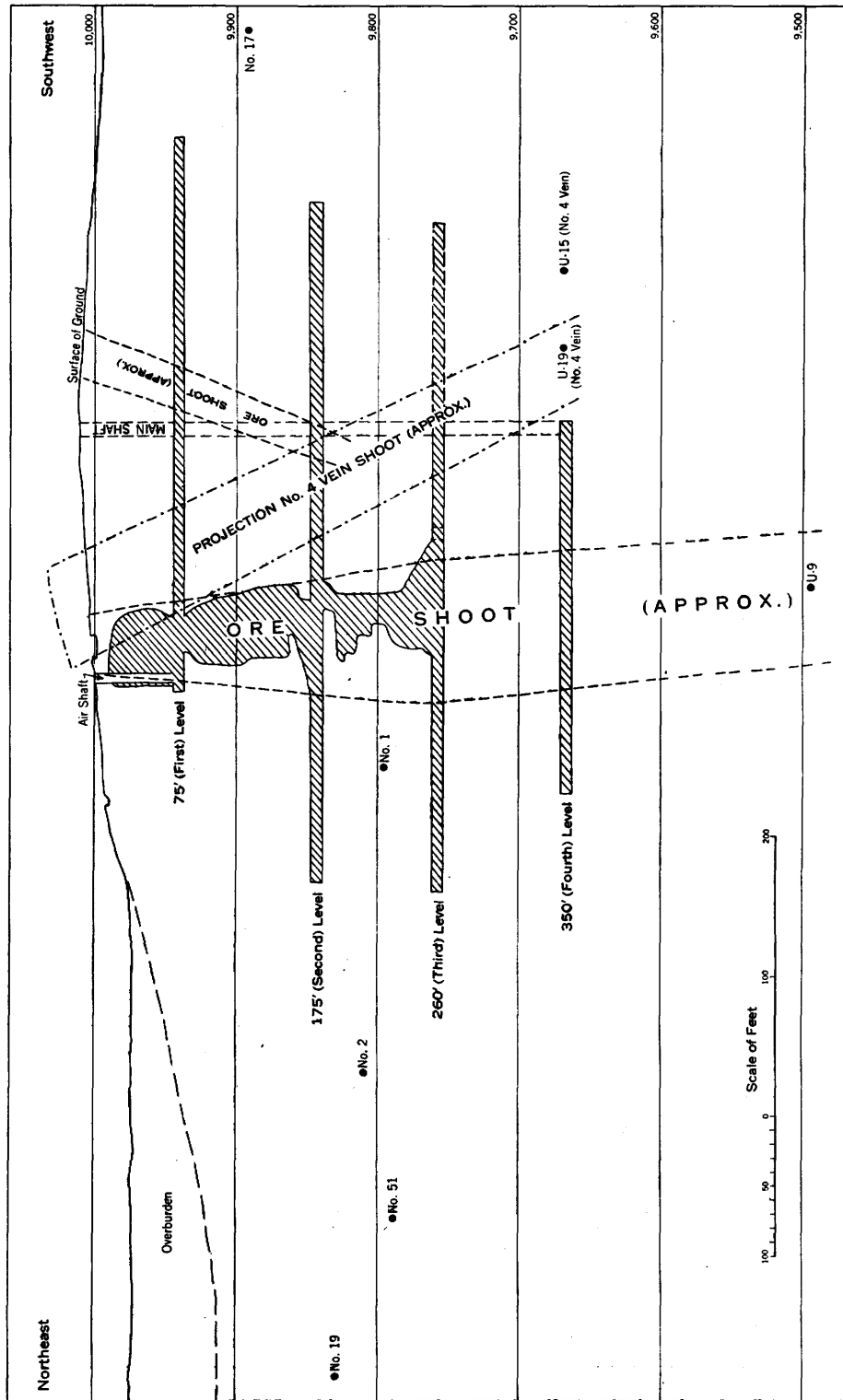


Fig. 2—Longitudinal section on No. 3 vein, Big Master mine. (Data from mine plans, after E. K. Fockler, November, 1937.)

underground development of the mine. For this purpose a mining plant was moved from the adjacent Selby Lake property.

General Geology

In the vicinity of the main workings the exposed rocks are very largely lava flows (greenstone) with about the composition of andesite. Zones of porphyritic lava occur locally and serve as marker horizons. Dikes of felsite and quartz-feldspar porphyry cut the lavas.

Veins

A number of veins have been found on the property. These strike N. 35°-40° E. and are roughly parallel to one another. No. 3 vein has been traced by surface-trenching and diamond-drilling for more than 5,000 feet. On the surface a short section of quartz is exposed north of the shaft; another 140-foot length is exposed in surface trenches located about 1,450 feet northeast of the shaft. The intervening section lies under a swamp and has been explored by drilling. In 1938 the northeasterly extension of No. 3 vein was traced across claims H.P. 368 and 369, but no ore shoots were found in this part of the vein.

No. 4 and No. 5 veins consist of felsite dikes containing quartz stringers and pyrite mineralization. No. 4 vein has been traced by surface work and drilling for a length of about 2,400 feet.

Ore Developments

According to a report prepared by E. K. Fockler, consulting geologist for the company, and presented at the annual meeting in February, 1938, approximately 19,000 tons of ore was indicated in the mine workings to the 500-foot level. This would average \$10.50 (0.30 ounces) per ton in gold.

The results of drilling operations northeast of the mine workings along the No. 3 and No. 4 vein systems are summarized in a report by Mr. Fockler, dated August 23, 1938, as follows:—

Surface drilling has definitely indicated the existence of ore shoots of commercial grade and dimension in the southwestern corner of claim H.P. 367, about a quarter of a mile north of the mine area. Two shoots, apparently separated by about 100 feet of low-grade material, occur on No. 3 vein. A third shoot occurs on No. 4 vein about 350 feet east of the shoots on No. 3 vein. The most southerly extremity of the shoots described is approximately 800 feet northeasterly on strike from the most northerly mine heading.

For convenient references the shoots in question are designated 3C, 3D, and 4C, respectively the number in each case referring to the vein number and the letter to the shoot.

Collectively these three shoots have a total horizontal length of about 500 feet with an average grade of about 0.36 ounces (\$12.00) for an average true width of nearly 3½ feet as indicated by bore-hole intersections.

Dimensions, grade, and tonnage of the respective shoots are summarized as follows:—

| Shoot No. | Approximate length | Average true width | No. of diamond-drill intersections | Grade | | Tonnage | Vertical depth of tonnage block |
|-----------|--------------------|--------------------|------------------------------------|--------|--------------------|---------|---------------------------------|
| | | | | Ounces | Value ¹ | | |
| | feet | feet | | | | | feet |
| 3C..... | 150 | 3.3 | 5 | 0.475 | \$16.63 | 25,000 | 500 |
| 3D..... | 150 | 2.9 | 3 | .58 | 20.30 | 4,500 | 125 |
| 4C..... | 200 | 4.1 | 6 | .21 | 7.35 | 8,500 | 125 |

¹Calculated on gold at \$35.00 per ounce.

By allowing 20 per cent. deduction for dilution in both grade and tonnage Mr. Fockler estimated about 30,000 tons of ore in these three shoots. In addition

there is a surface ore dump of 1,000 tons grading about \$8.75 per ton. Total ore reserves on the property are thus estimated at 50,000 tons with an average grade of about \$12.00 per ton.

ELORA GOLD MINES, LIMITED

Elora Gold Mines, Limited, was organized in 1935 to develop a group of 9 claims, which include the old Laurentian and Jubilee mines. It was privately financed by mining interests, including Thayer Lindsley and associates, R. J. Jowsey, and Anglo-Huronian, Limited. After a considerable amount of surface work and diamond-drilling was done, a shaft was sunk to a depth of 175 feet and the Jubilee vein was explored on the 165-foot level. The old Laurentian stamp mill was reconditioned as a bulk-sampling plant capable of handling 75 tons per day. Owing to the erratic nature of the ore and the fact that most of the values were obtained from native gold in quartz, all development rock from the drift



View of the Elora mine.

and surface open cut was put through the test mill. As mill recovery was not particularly good, the grade was estimated on bullion recovery plus gold values in the tailings.

During the period October 1, 1936, to October 31, 1937, 1,223 feet of drifting and drift-slashing was done on the 165-foot level and a small stope was raised 48.5 feet above the level. In addition, 3,507 feet of surface diamond-drilling was done. According to statistics of the Ontario Department of Mines,¹ during the period of operation in 1936 and 1937 the mine produced 812.6 ounces of gold and 208 ounces of silver, valued at \$28,511, from 10,365 tons of ore milled. The mine was closed down in October, 1937.

During the above-mentioned period of operation no work was done at the old Laurentian mine. This mine was operated from 1906 to 1909, during which period the gold production is reported to have been \$141,140 from 19,950 tons of ore milled.² The ore is reported to have occurred in extremely rich pockets and some gold is thought to have been stolen. A small amount of work was done in

¹Vol. XLVI, 1937, pt. 1, p. 15; Vol. XLVII, 1938, pt. 1, table facing p. 10.

²Ont. Dept. Mines, Vol. XLVII, 1938, pt. 1, p. 26.

1911 and 1913, and in 1916 the Dominion Reduction Company dewatered and sampled the underground workings but their option was not exercised.¹

General Geology

The rocks on the property consist largely of Keewatin lavas (greenstones) of andesitic composition. Horizons of pillow lava and porphyritic andesite occur in the greenstones. West of the Jubilee vein a band of agglomerate and tuff runs in a southwesterly direction along Trafalgar bay, and in the vicinity of the shaft zone there is some interbanding of lava flows and tuffs. Immediately east of the shaft pillow structures in the lavas indicate that the flow tops face east.

The older rocks are cut by acid and basic intrusives. The acid dikes are of two kinds: Fine-grained sheared felsite dikes occur on the surface and underground; there are also syenite porphyry and granite porphyry dikes. The basic dikes have the composition of lamprophyre and diabase.

Veins

The Jubilee vein lies along a strong sheared zone or "break" that has been traced by drilling for about $3\frac{1}{2}$ miles across Elora, Selby Lake, and Big Master ground. In the general vicinity of the Elora shaft the formations on either side of the Jubilee vein show a tendency to converge. This is believed to be due to faulting movements along the Jubilee sheared zone; the fault truncates the strike of the interbanded lavas and tuff at a low angle. The east or hanging-wall side of the sheared zone is bordered by a band of porphyritic andesite. This marker horizon has been traced from the shaft to the southern limit of exploration on the property and for about 1,600 feet northeast of the shaft. On the west, or footwall side, of the Jubilee shear zone the lava flows wedge out towards the south end of the property and are replaced by tuff.

The geology of the Jubilee vein is illustrated in Fig. 3, which is a detailed plan of part of the 165-foot level. The vein dips to the east at 76 to 86 degrees. The lode is composed of veins, lenses, and stringers of quartz, and narrow acid felsite dikes, bordered by chlorite, sericite, and graphitic schists. The schists are carbonatized to some extent. Within the drift, narrow bands of light-coloured sericite schist occur in sharp contact with the dark-grey or black schists. Along the footwall side of the sheared zone the lava is generally brecciated.

The main quartz veins pinch and swell along the strike of the schist; small veins and stringers angle across the schistosity. The quartz is later than the acid dikes. The dark-coloured schist is the host rock of most of the gold-bearing quartz. Pyrite mineralization is quite prominent in the dark-coloured schist but carries only very low values in gold. The vein quartz is white and occasionally banded with tourmaline.

Drag folds occur in the schist and are usually defined by banded pyrite. Drag folds are found in the quartz stringers and may be due to the filling of pre-existing drag-folded structures. The drag folds are probably related to differential movements along the fault zone. In practically all cases the drag folds indicate that the footwall side moved southwest with respect to the hanging wall.

Post-quartz faults with a small displacement cut across the vein zone. These have an almost vertical dip and show a horizontal movement. One set of faults strikes northwest-southeast; the south side of these faults has always moved eastward. The other set strikes slightly north of east, and the south side has moved west. These cross-faults do not seem to have had any influence on the distribution of gold along the sheared zone.

¹E. L. Bruce, op. cit., p. 35.

Ore Developments

Gold occurs mostly in the native state. Small pockets containing spectacular amounts of coarse native gold are occasionally found. Since most of the values are from coarse gold that is erratically distributed, bulk sampling is essential for the estimation of the average grade of the vein material. Gold values are distributed both along the hanging- and foot-wall quartz sections, so that selective mining could only be practised to a limited degree. Mine officials state that experience has indicated that the unmineralized light- and dark-coloured schists and the well-mineralized black schist can all be discarded as waste. The quartz and the mineralized light-coloured schist with quartz stringers, however, must be classed as probable ore.

In December, 1937, W. J. McDonough, general manager of the company, issued a report on ore developments to shareholders. This is based on a report prepared by S. E. Wolfe, consulting engineer for the company. Mr. Wolfe stated that a 648-foot section of the 165-foot level would average 0.134 ounces or \$4.69 per ton across an average width of 10.6 feet. If this length were mined and 20 per cent. sorted out as waste, the mill feed might be raised to \$5.69 per ton. The best ore section averaged 0.129 ounces across 15.2 feet over a length of 365 feet. By adjusting the values over this section to a reduced width of 12.2 feet the grade would be raised to 0.150 ounces per ton. Sorting of 20 per cent. waste rock would increase the grade of probable mill feed in this case to 0.182 ounces or \$6.40 per ton.

Mining operations were carried on for four months during the summer of 1939. Work was confined to the open cut near the Elora shaft. This was deepened throughout and extended from 101 to 268 feet in length. The average width of the vein in the new workings was 7 feet. The ore was treated in the Laurentian mill, and the average grade of the 3,401 tons treated was 0.216 ounces, or \$7.56 per ton.

SELBY LAKE MINES, LIMITED

(Kenwest Gold Mines, Limited)

Selby Lake Mines, Limited, was organized in 1936 to develop a group of three claims that adjoin the Elora and the Big Master mines on the south. The company is privately financed. The property was first developed by surface-trenching and diamond-drilling. In the autumn of 1937 a mining plant was installed and underground work commenced on a vein near the shore of Upper Manitou lake. The shaft was sunk 250 feet and levels were opened at 125 and 250 feet. Most of the drifting is reported to have been done on the 250-foot level.

Early in 1939, Selby Lake Mines secured an interest in Big Master Consolidated Gold Mines and planned to extend the underground workings there. The mining plant was moved from the Selby Lake mine to the Big Master. Later, the Selby Lake property was acquired by Kenwest Gold Mines, Limited.

General Geology

The country rock is largely greenstone. Horizons of porphyritic lava occur locally in the flows and may sometimes be traced for a considerable distance along the strike. A narrow band of agglomerate and tuff occurs along part of the shore line of Upper Manitou lake. The lavas have been intruded by felsite dikes. A massive quartz porphyry dike cuts the felsite on claim H.P. 405. Narrow diabase dikes also occur on the property.

Veins

A number of veins have been found on the claims. They are mostly quartz lenses located along zones of shearing in the greenstone. These all strike north-easterly in about the same direction as veins on the adjoining properties to the north.

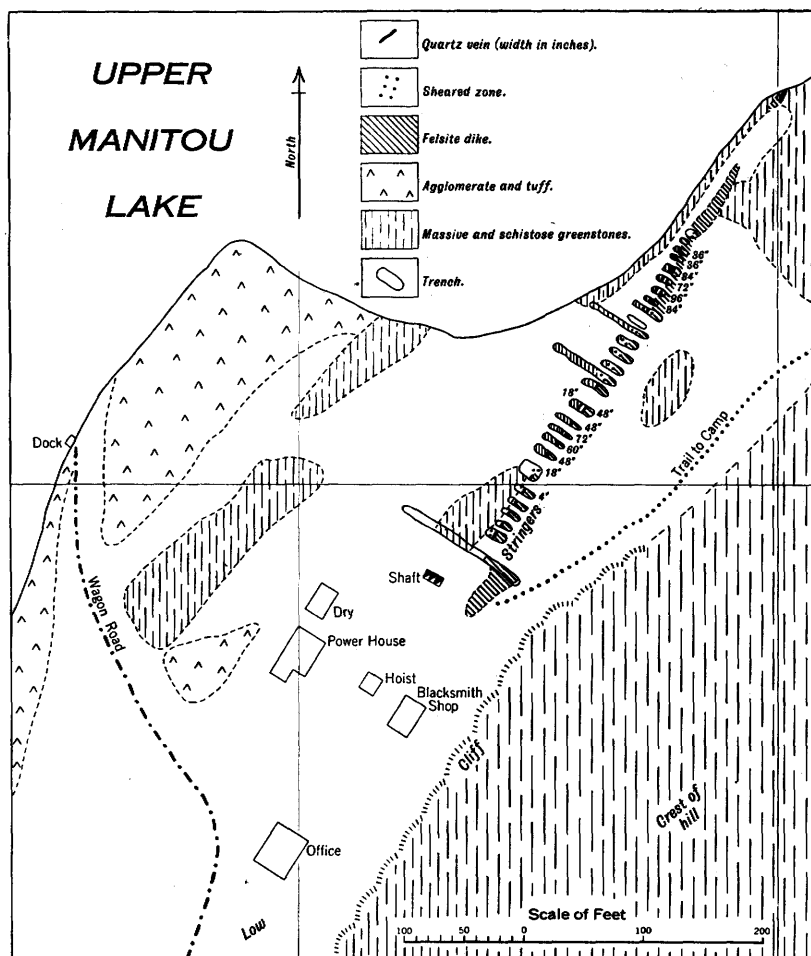


Fig. 4—Geological sketch map of part of the property of Selby Lake Mines, Limited.

Work has been concentrated on a vein located near the lake shore on claim K. 919. On the surface the vein lies along a sheared zone that follows the contact between a felsite dike and greenstone. The sheared zone has been exposed in trenches for a distance of 450 feet southwest from the lake shore. It attains a width of 6 to 8 feet and contains quartz lenses and stringers banded by graphite and chlorite schist. The vein material ranges in width from a few inches to about 8 feet.

No statement of ore developments has been published by the company.

OTHER PROPERTIES

Other groups of mining claims near Goldrock have received attention, and some veins are reported. These were not mapped by the writer. Companies holding ground in this vicinity in 1937 included Horuba Mining Syndicate, Limited; Robin Hood Mining Syndicate; Maniwobic Gold Syndicate; Tecumseh Gold Mines, Limited; and others. G. B. Scattergood also held a group of claims lying west of the Elora mine.

Gold Discoveries at Rowan Lake

By Jas. E. Thomson

Introduction

A gold discovery was made near the east end of Rowan lake, district of Kenora, in October, 1936. This location is about 55 miles southeast of the town of Kenora and about 20 miles east of Whitefish bay on the Lake of the Woods. A staking rush ensued during the winter of 1936-37 and practically all the greenstone belt around the eastern end of Rowan lake was taken up. Development work was done on various groups of claims during the spring and summer of 1937, but no important gold discoveries were made and many of the claims were eventually dropped. The writer visited the area in June, 1937.

Rowan lake is accessible by air from Kenora or Fort Frances. The best canoe route to the lake starts from Sioux narrows on the Kenora-Fort Frances highway or from Whitefish village on Regina bay of the Lake of the Woods. From Whitefish the route is through Dogpaw, Caviar, and Denmark lakes to Rowan lake; this involves only one portage and a "lift-over" at a dam at the outlet of Denmark lake.

A geological map and report on the eastern part of Rowan lake was published in 1935.¹ The western part of the lake and the adjacent country has been described by Burwash.² The country around Rowan lake is largely covered by rock outcrops.

The writer is indebted to Jos. Errington and C. W. Greenland for information and drilling data on the Errington claims. J. G. Cross supplied drilling information on the property of Lakeport Gold Mines, Limited. The writer was ably assisted in the field by A. A. Brant.

Description of Properties³

ERRINGTON CLAIMS

The gold discovery that led to the staking rush into Rowan lake was made by Albert Gauthier, of Kenora, on claims K. 7,181 and 7,183. A group of 53 claims surrounding this showing was taken over by Jos. Errington. These were developed during the early months of 1937 by extensive surface-trenching and diamond-drilling; 27 drill holes, with an aggregate footage of 6,409 feet, were put down along the various showings.

General Geology

The country rock in the vicinity of the main showings is Keewatin greenstone with about the composition of andesite. This rock is fairly massive although local sheared zones occur, and at these points the greenstone has been altered to chlorite schist. A small amount of diorite is associated with the fine-grained lavas. Marker horizons of porphyritic lava containing large crystals of feldspar occur at a few places in the greenstone complex.

The lavas are intruded by narrow dikes of fine-grained acid intrusives. These occasionally exhibit a finely porphyritic texture in hand specimens. This

¹Jas. E. Thomson, "Geology of the Rowan-Straw Lakes Area," Ont. Dept. Mines, Vol. XLIV, 1935, pt. 4, pp. 1-28.

²E. M. Burwash, "Geology of the Kakagi Lake Area," Ont. Dept. Mines, Vol. XLII, 1933, pt. 4, pp. 41-92.

³For the location of the properties described in the following pages, see the key map on page 1.

rock is locally called "porphyry," but more closely resembles the fine-grained intrusive named felsite in some parts of northwestern Ontario. A second type of intrusive consists of dikes of syenite porphyry containing distinct feldspar crystals.

Veins

The quartz veins are often closely associated with the felsite dikes. They generally lie either within the felsite or along the contacts of these dikes with the greenstone, although they sometimes continue for some distance entirely within the greenstone. The felsite dikes are very slightly bent or arched along the strike, and the most important veins occur near the crest of these gentle folds. Sometimes the felsite adjoining the quartz veins is silicified and contains some quartz stringers. The most important showings are indicated in Fig. 1.

No. 1 vein shows discontinuous lenses of quartz over a length of about 400 feet. The quartz would average less than a foot in width. The vein quartz is somewhat banded and is reported to carry some gold.

No. 4 vein is the most important. It has been traced a distance of about 450 feet by surface trenching and drilling. On the surface it consists of two parts separated by a 170-foot section of low ground. The vein lies at or near the contact between felsite and andesite and is from 2 to 15 inches in width. On the northwest side of the depression, where the vein is exposed along a cliff, the felsite adjoining the quartz is much silicified and injected by quartz stringers over a width of 6 feet in places. Near the cliff on the southeastern side of the valley the vein would average about a foot in width but has bulges up to 20 inches. The vein dips very steeply to the north.

There are two varieties of quartz in the vein; one type is white, the other is smoky and contains chloritic inclusions along fracture planes. A small amount of pyrite, pyrrhotite, chalcopyrite, and sphalerite occurs in the darker-coloured quartz, and a little visible gold may be found.

No. 2 vein follows a sheared and fractured zone in andesite and felsite. It consists of a series of quartz stringers, which in places attain a width of about 3 feet. The felsite has fractured more readily than the andesite and in places is brecciated and impregnated by quartz stringers.

Other veins and sheared zones not shown on Fig. 1 were also investigated by surface-trenching and a little drilling.

LAKEPORT GOLD MINES, LIMITED

Lakeport Gold Mines, Limited, was organized in 1936 for the purpose of financing the exploration of a group of 11 claims on Rowan lake. These include the old Monte Cristo mine and the Victor property (claim K. 4,712).

The Monte Cristo mine has been described by Burwash.¹ A later description of the property by the writer is as follows:²—

A number of trenches have been cut across a sheared zone in basaltic lava that runs about parallel to the shore-line. The sheared zone contains soft, fissile chlorite schist, which is highly carbonated in places. Disconnected stringers and lenses of quartz run in all directions through the schist. Some of the quartz masses are 2 to 3 feet in width but seem to have no continuity along the strike. The quartz is white and sugary and contains some carbonates and traces of sulphides. The schist at the vein wall sometimes carries small cubes of pyrite and traces of chalcopyrite. The rock near the showing is basic lava with interbanded sediments to the north. The lava is cut by massive porphyry dikes.

In 1937 a series of 9 drill holes, aggregating about 5,000 feet, was put down along the main zone. In submitting a report to the shareholders of the company

¹E. M. Burwash, op. cit., pp. 86-89.

²Jas. E. Thomson, op. cit., p. 24.

in April, 1938, J. G. Cross, manager of the property, described the results as follows:—

The surface showings where the ore zone crossed a point about 400 feet wide showed considerable promise where explored. Two shallow pits were sunk 350 feet apart and a number of trenches dug along the lode. This work showed widths up to 25 feet of low-grade ore that would run between \$5 and \$6 a ton in gold. There was greater widths of lower grade material that was too low grade to be commercial unless mined in large tonnages. . . .

The results of exploration did not stand up to expectations. The diamond-drilling showed the extension of the mineralized zone to the east and west, but the gold values were disappointing. Diamond-drill holes Nos. 1 and 3, drilled under the best surface showings, showed fair results. The ore zones encountered are given below.

SUMMARY OF RESULTS OF DIAMOND-DRILL HOLES NOS. 1 AND 3

| | Width | Value per ton |
|---------------------------|-------|---------------|
| DIAMOND-DRILL HOLE No. 1: | feet | |
| No. 1 section | 1.8 | \$7.70 |
| No. 2 section | 6.1 | 3.50 |
| No. 3 section | 3.8 | 2.80 |
| No. 4 section | 12.8 | 5.02 |
| DIAMOND-DRILL HOLE No. 3: | | |
| No. 1 section | 15 | 7.35 |
| No. 2 section | 10 | 3.50 |
| No. 3 section | 12.8 | 7.00 |

In regard to the No. 3 section, the core recovery was very poor, but from the fragments recovered we got the \$7 assay, so we cannot be sure if this represents the true value of the section or not.

Diamond-drill hole No. 2 drilled between these sections did not encounter commercial values nor did holes Nos. 4, 5, 6, 7, and 8, drilled to the west and east, covering a total length of about 1,000 feet, including the sections where the values were obtained.

Diamond-drill hole No. 9 drilled 3,000 feet further west for assessment work purposes cut a series of well-mineralized material that showed 5 feet of ore running \$4.20 in gold and an adjoining 5-foot section running \$2.10 in gold.

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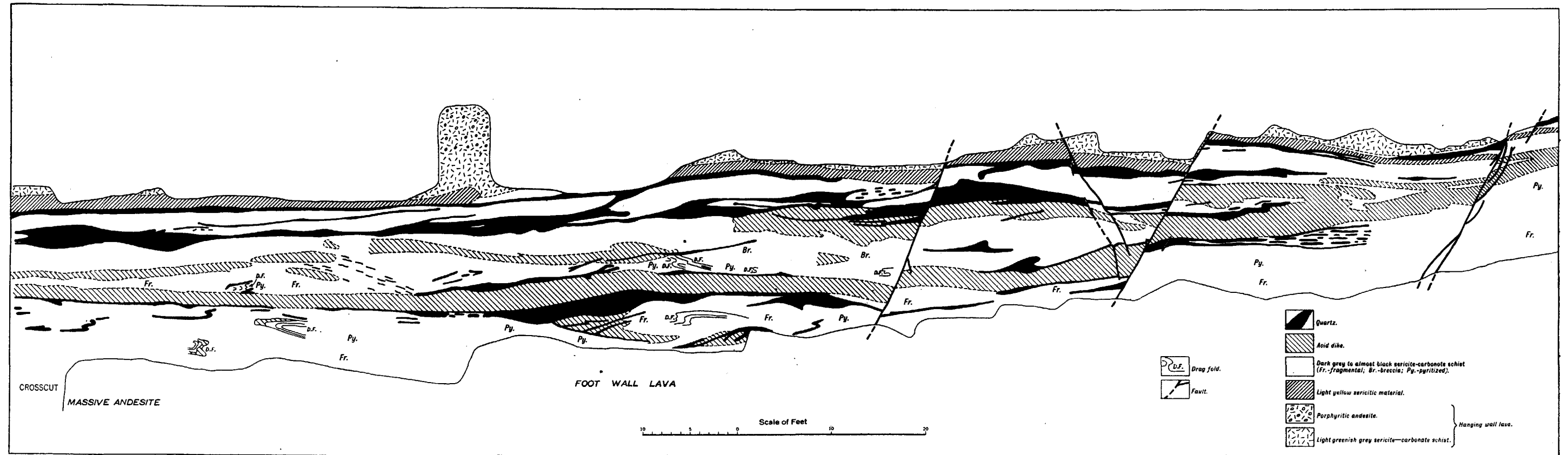


FIG. 3—GEOLOGICAL PLAN OF DRIFT BACK, SOUTH OF THE CROSSCUT ON THE 165-FOOT LEVEL, ELORA MINE.
(Geology from mine plans, after A. S. Dadson, August, 1937.)

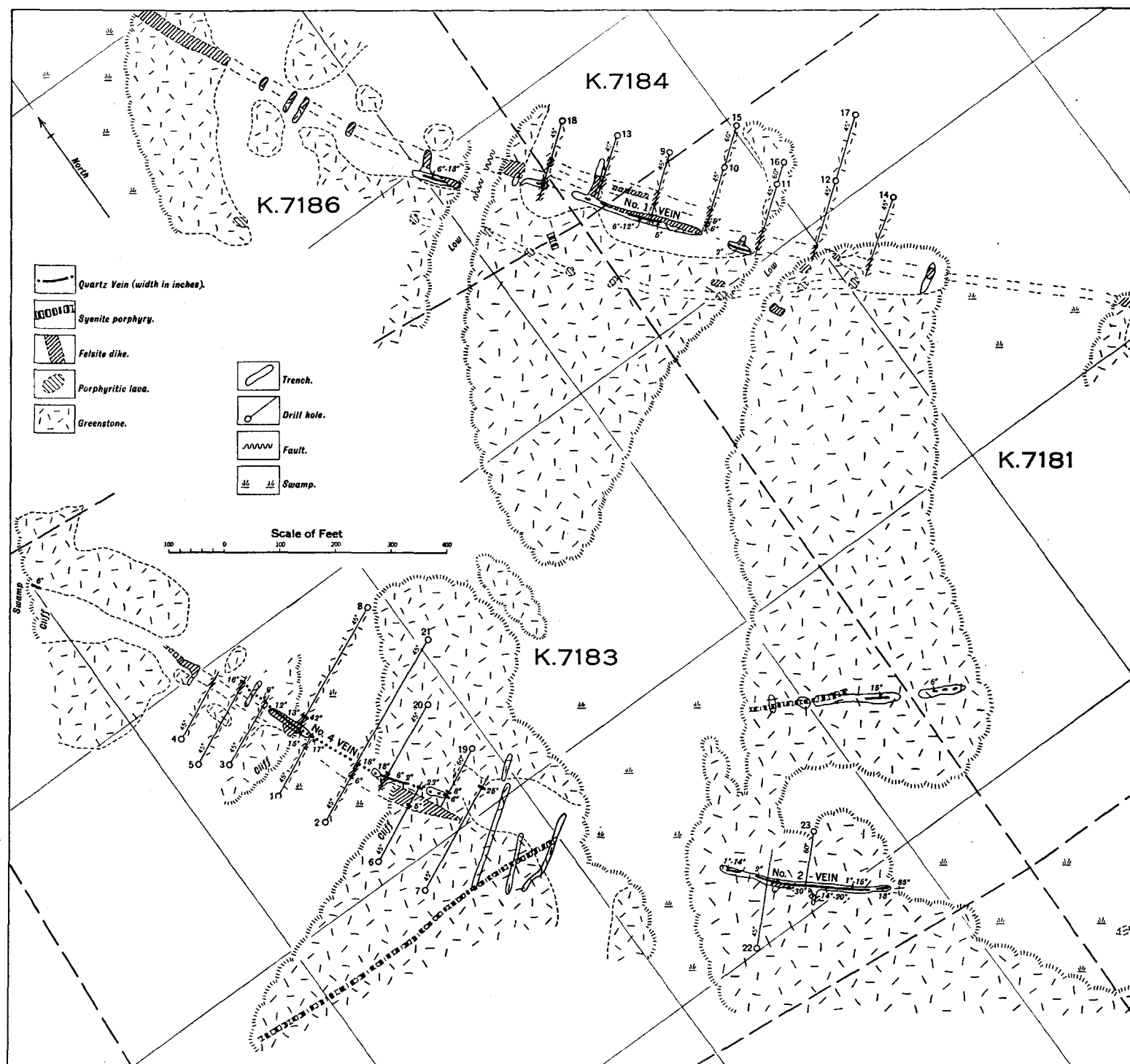


FIG. 1—GEOLOGICAL SKETCH MAP OF THE MAIN SHOWINGS, ERRINGTON CLAIMS, ROWAN LAKE.





PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. PAUL LEDUC, *Minister of Mines*

H. C. RICKABY, *Deputy Minister*

FORTY-SEVENTH ANNUAL REPORT
OF THE
ONTARIO DEPARTMENT OF MINES
BEING
VOL. XLVII, PART VII, 1938

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COLOURED GEOLOGICAL MAPS

(In pocket at back of report)

- Map No. 47f—Sandy Lake Area, District of Kenora (Patricia Portion), Ontario. Scale, 1 mile to the inch.
- Map No. 47g—North Spirit Lake Area, District of Kenora (Patricia Portion), Ontario. Scale, 1 mile to the inch.

Geology of the Sandy Lake Area

By J. Satterly

INTRODUCTION

Sandy lake, which is an expansion of the Severn river, is situated in the Patricia portion of the district of Kenora on latitude $53^{\circ} 00' N.$ and lies between longitude $92^{\circ} 20'$ and $93^{\circ} 40' W.$ Small gold discoveries in the Northwest arm of the lake in July and August, 1936, aroused considerable interest in the area, and by the beginning of the 1937 season nearly a hundred recorded claims had been staked along the Northwest arm and another block of claims on Fishtail

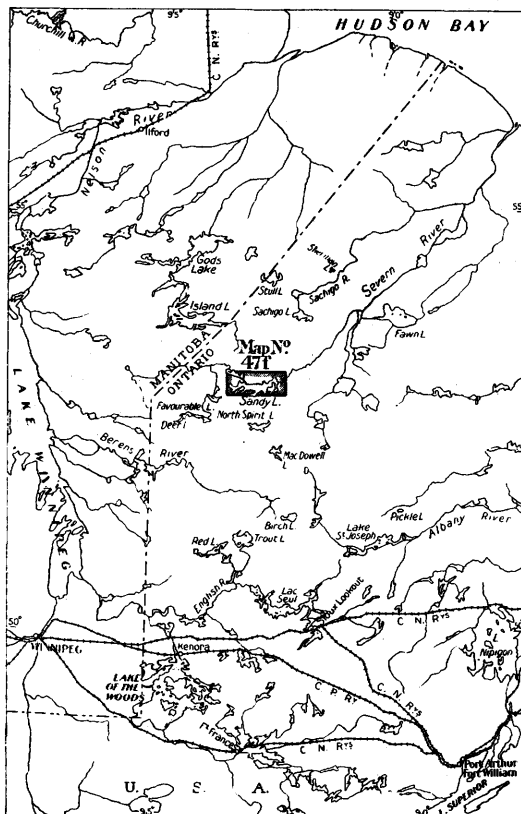


Fig. 1—Key map showing the location of the Sandy Lake area. Scale, 160 miles to the inch.

bay. During the summer several small finds were made, the main activity being on the north shore near Rahill lake, where over 40 claims were staked and recorded, between Fishtail bay and the Hudson's Bay Company post, and between the Northwest arm and Finger lake.

Present indications are that although gold is widely distributed along the whole length of the lake the deposits found to date are either too small or of too low a grade to be of any economic significance.

During the season of 1937 the entire belt of volcanics and sediments and the adjacent granite areas were traversed at half-mile intervals. The contacts

shown on the accompanying map are based on the information derived from these traverses and from a detailed study of the geology along the shores of the lake. Owing to the prevalence of swamp areas, many of the contacts shown are of necessity only approximate.

Acknowledgments

The field assistants attached to the party were G. M. Robson, M. R. Brown, and G. L. Colgrove. To these men the writer is much indebted for their untiring efforts in forwarding the field work at all times. Mr. Robson, as senior assistant, at various times during the season carried on independently and is responsible for the entire mapping of the geology of the south shore of Sandy lake from the old site of the Hudson's Bay Company post¹ east to the outlet of the lake. He also mapped in its entirety the volcanic belt from the new post of the Hudson's Bay Company east to Fishtail bay, and the territory between the Northwest and West arms.

The white residents of the area were most kind to the party at all times. To Father J. Dubeau, Brother J. Dussault, and other members of the Ste. Bernadette Mission in the Northwest arm the party is much indebted for many courtesies and unstinted hospitality. To them and the residents of the Hudson's Bay Company post the party is indebted for handling mail.

The writer wishes to thank the many prospectors on the lake during the 1937 season for their kind hospitality and friendly co-operation, which did much to aid the progress of the field work. Prospectors T. J. C. and Harry Sandborn, Joe Hodgson and Stewart Staunton, D. H. Adams, and Karl Bayly, J. O. Lingman and Jack Lawson, J. A. Tully and P. Burton, C. Libert and A. Zeemel, C. K. Hansen, Allen McDonald, F. C. and Mrs. Bradley, P. White, C. Walters, and E. Shephard, all contributed in many ways.

To G. B. Langford and M. A. Peacock, of the University of Toronto, the writer is indebted for fruitful discussions.

Access and Canoe Routes

The area is most easily reached by airplane from such centres as Sioux Lookout, Kenora, Winnipeg, Berens River, Favourable lake, or Gods lake. Freight rates from Berens River on a full 'plane load are about \$11.00 a hundred-weight. The distance from Sioux Lookout to Ste. Bernadette Mission is 220 miles, and the flight takes a little over two hours.

The canoe routes to Sandy lake have been described by Hurst,² and the reader is referred to his report for details.

Several important routes lead out from Sandy lake. At its east end a portage of 115 chains leads to Rottenfish lake, which is the headwaters of the Sachigo River system of drainage. Rottenfish river drains northwards from this lake into Sachigo lake, and there are reported to be nine short portages on this route.

Bayly river, which empties into the north bay at the east end of Sandy lake, is used as a winter route to Island lake. At the west end of Sandy lake the route to Island lake is by the Severn river, Finger lake, Opasquia lake, and a 4-mile portage to the Sagawitchewan river, which flows northwards past the Indian village of Kechemutakwan through Cocos lake to Sagawitchewan bay of Island lake.

¹The old site of the Hudson's Bay Company outpost is on the south shore of the lake about 5½ miles southeast of the present site.

²M. E. Hurst, "Geology of the Area between Favourable Lake and Sandy Lake," Ont. Dept. Mines, Vol. XXXVIII, 1929, pt. 2, pp. 49-51.

Southwards from Ste. Bernadette Mission, winter trails cut across points of land into Sandborn bay and Rat House bay, and southwest to Favourable and North Spirit lakes.

Routes southeast to the Dawson river leave Sandy lake either direct by a portage of 97 chains or via Niska lake by portages of 37 and 162 chains. From the Dawson river the route to the MacDowell river is believed to ascend the Roseberry river to Roseberry lake and by a chain of lakes to the McCoy river, one of the branches of the MacDowell river.

Previous Work

Sandy lake has undoubtedly been known to the Indians from a very early date. As it forms a part of the Severn River system, it was probably used early in Canadian history by fur-traders. Although the lake is not actually marked on the map accompanying Franklin's "Narrative of a Journey to the Shores of the Polar Sea," 1819-22, the Berens river is shown linked to the Severn river, indicating that it must have been known at that date.

The first report on the lake was made by Low¹ in 1886, and is reproduced in a report of the Ontario Bureau of Mines.² Map No. 1089 of the Geological Survey of Canada, published in 1910, incorporates Low's work in this area. Low noted the presence of Huronian (now called Keewatin) rocks on the lake, and the magnetic attraction along the north shore due to the abundance of iron. In view of the crops so successfully grown at Ste. Bernadette Mission, it is interesting to note his statement that "the greater part of the land . . . would make good farms."

No further work was carried out in the area until the reconnaissance survey by Hurst³ in 1928, when the Northwest arm, West arm, and Rat House bay were mapped.

The base map used by the writer was that compiled in 1929 by the then Topographical Survey of Canada from oblique aerial photographs. This map was found to have a number of minor errors in the shore line, and in places the distances between certain lakes and arms of Sandy lake are incorrectly shown.

Topography

Sandy lake occupies a depression whose limits are in the main due to structural control. The present shore line is the result of a combination of the influence of the underlying rock structure and the masking effect of the glacial deposits. The altitude of the lake as determined by aneroid barometer is about 900 feet above sea-level. The country around the lake when viewed from any commanding height has the even sky-line so characteristic of the pre-Cambrian shield. Whether the peneplaned surface is represented by the low plain with an elevation slightly above that of the lake or a plain now represented by the tops of the concordant summits of the hills is uncertain. If the latter is true then the present hills and ridges are monadnocks, the residual remnants of former high land, which, owing to the harder nature of the rocks composing them, have resisted erosion.

The influence of structure is particularly noticeable in the Northwest and West arms, Sandborn bay, and along the north shore of the main part of the lake to its east end. The curve of the western part of the West arm follows the swing

¹A. P. Low, Geol. Surv. Can., Vol. II, 1886, pt. F, pp. 1-24.

²Vol. XXI, 1912, pt. 2, pp. 94-106.

³M. E. Hurst, op. cit., pp. 49-84.

of the structure from a direction slightly south of west through northwest to north, to northeast, and then back again through north to northwest, like the end of a whiplash.

The West arm, where the topography is extremely rugged, has the finest scenery on the lake. The ridges, hills, and chains of islands made up of pillowed lava are, in part, due to the resistance of this rock to erosion. In some places, the shores of the islands rise sharply to a height of 50 feet above the lake; in others they rise gradually to a height of 100 feet. The range of hills forming the south shore of the narrows near the Hudson's Bay Company post is a continuation of these pillowed lavas and rises to a height of 125 feet above the water. The long, high ridge that forms the north shore of the West arm, west of longitude $93^{\circ} 30' W.$, is composed of amphibolite.



View looking north from the granodiorite ridge over the spruce muskeg traversed by Adams creek, which flows north into the west end of the West arm of Sandy lake.

Pillowed lavas form islands, a long point, and a range of hills in and along the north shore of Sandborn bay at its west end. Elevations range from 50 to 125 feet above the level of the bay. Extensive ridges and low hills of the same rock type or its metamorphosed equivalent occupy the area between the Northwest arm and Finger lake. Eastward these rocks form ranges of hills at intervals along or near the northern contact of the belt of volcanics and culminates in the fine range of hills that forms an arc in the territory north of the Bayly river and west of the Mort river at the northeast end of the lake.

The steep cliffs on the south shore of the western part of Sandborn bay, where a small remnant of lava is in contact with the granite batholith, are probably the result of the hardening produced in the lavas by the contact metamorphism of the granite. Hills, possibly of a similar origin, occur in the lavas adjacent to the granite contact just west of Granite bay.

Along Rat House bay and in the area between it and Sandborn bay, the granite forms hills and knobs rising, it is believed, to the greatest heights in the region, some of these hills being close to 300 feet above the level of the lake. One

very striking knob of granite rises abruptly just east of the narrows in Rat House bay.

The south shore of the main part of Sandy lake is almost entirely underlain by granite and is, on the whole, rocky, but many of the large bays are low and bounded by clay banks or swamp with sand beaches showing in late summer at low water levels. Here and there a few isolated granite hills stand up above the general low relief.

A diorite hill on the southeast shore of the northeastern part of Sandborn bay, rises 230 feet (aneroid) above lake level and has very steep cliffs.

The string of islands in the main part of Sandy lake is part of a sill of resistant diorite, which extends eastwards from Sandborn bay to the granite batholith. The larger islands have considerable stretches of shore underlain by glacial deposits of clay, gravel, or boulders, and are being rapidly eroded by storm waves.

The deposits of glacial origin are largely varved clays. The flat clay areas between the high rock ridges are covered with swamp. Owing to the clay filling between the ridges, what must have been formerly an extremely hummocky and, in the western part of the lake, an extraordinarily rugged country prior to the deposition of the glacial debris is now fairly level. The clay capping frequently forms the shores of bays, and the sand-boulder beaches developed as the result of the erosion of these clay banks gave the lake its name.

Some of the gravel and boulder points on Sandy lake, such as the one in the south bay near the Dawson river and those projecting into Niska lake are eskers or kames.

Areas of sand and gravel, some lobate in shape, were found in the country east of Rottenfish lake. These sand hills rise to heights of probably 100 feet above lake level and may constitute kames or the termini of eskers.

Drainage

Sandy lake is the largest in the Patricia portion of Kenora district, having an east-west length of slightly over 50 miles and a width of from one-half to 4 miles. The western part consists of three finger-like arms, known as the Northwest arm, the West arm, and Rat House bay. The water area of the lake is slightly over 200 square miles. At its outlet at the east end the lake pours over a granite ledge as a 15-foot falls or chute.

The water-level varies considerably. The spring flood level in 1937 was reported to be the highest in ten years. From moss markings it appeared to be about $1\frac{1}{2}$ feet above normal spring-flood level. The water fell 4 feet 2 inches from June 3 to September 15. Much of the water is nearly stagnant in August and excessively dirty. Owing to the abundant deposits of glacial clays around and on the bottom of the lake, the water is a deep yellow-brown colour and objects a few inches below the surface are quite invisible. The opaqueness of the water and the enormous number of reefs near the surface in mid and late summer makes Sandy lake much disliked by the pilots of the various airplane companies.

Three streams empty into the west side of the north-south section of the West arm. The southernmost, Adams creek, drains the South and North Trout lakes. It is believed, however, that the contributions from these streams are limited to spring floods, as much of the water of the West arm seems to be semi-stagnant by late summer.

Rat House bay receives the waters of the Flanagan (Duck) river, which drains North Wind, Whiteloon, Duckling (Duck), North Spirit, Margot, and other lakes, its headwaters being some 50 miles south.

The Dawson river and its important tributary the Roseberry river, which drains Roseberry lake 20 miles south of Sandy lake, empty into the south bay at the east end of Sandy lake. It is reported that they drain a low, flat, swampy area.

Along the north shore the chief rivers emptying into the lake are the Stain, with a tributary draining Kakapitam lake; the Fidler, which drains Fidler lake and an immense swampy area into Fishtail bay; and the Bayly, which drains a large muskeg area into the north arm at the east end of the lake.



Robert Fidler, chief of the Sandy Lake Indians, July 14, 1937.

Inhabitants

Most of the inhabitants of the Sandy Lake area are Indians, who under their chief, Robert Fidler, constitute a body of about one hundred and twenty-five people. During the winter they live in cabins scattered along the Severn river between Finger and Sandy lakes. During the summer part of the band use a camp site on the north shore of Rat House bay not far from the Hudson's Bay Company post. The Indians are stated to be descendants of a mixed stock of Cree and Ojibwa.

Some of the Indians cultivate small gardens, but the majority eke out their existence by fishing during the summer and trapping in the winter.

During the summer of 1937 the Hudson's Bay Company moved its post from the south shore of the lake to the narrows between the West arm and the main body of the lake.

At the east end of the Northwest arm a mission has been established by Father J. Dubeau and Brother J. Dussault.

Natural Resources

Climate

Excellent weather conditions prevailed during the field season of 1937. Rain fell on 23 days out of 104. No frosts occurred until late in August. Owing to the extreme shallowness of Sandy lake, rough water is frequent and may prevail for several days. Night travelling is therefore commonly adopted by prospectors and others on this lake.

Forests

The trees around Sandy lake are mainly of second growth, and comprise jackpine, spruce, and poplar. Big spruce timber is practically absent. The



"Apartments," Indian encampment on the east side of the Severn river at the outlet of Finger lake, June 14, 1937.

Hudson's Bay Company obtained some from an island for their new log cabins, the butt ends of which showed by a count of annual rings that the trees were over 100 years old.

Throughout the area there are small stands of jackpine with butt diameters from 8 to 18 inches. Such a stand occurs on the south shore of the Northwest arm and has been used by the Mission saw-mill for lumber. Much of the lumber is of poor grade, owing to red staining and a spongy texture.

It is understood that most of the Sandy Lake area was swept by fire about fifty years ago. Certain areas between the West arm and Finger lake must have been burnt within the last ten years.

Difficult bush for travelling was encountered between the West arm and Rat House bay, where very thick small spruce is found. Windfall brulé with second-growth alder, willow, poplar, or birch is widespread south of Finger lake between the West and Northwest arms and at the east end of the lake.

Bad swamp areas, which can only be crossed late in the season, are numerous. Many of these consist of various types of small second growth with semi-open to

open moss swamps containing dead birch. Wet tamarac swamp is found in many areas north of Sandy lake.

Spruce muskeg at both low and high levels with frequent "islands" of jack-pine on small outcrops is a common type of bush at the east end of the lake.

Large stands of Balm of Gilead poplar and the common poplar with butt diameters up to a foot are found where a deep soil is present, as in Sandborn bay.

Stands of timber suitable for mining requirements were seen on the West arm, at the outlet of Sandborn bay; just south of Granite bay; on a granite island in the northern part of the West arm; and on the north shore of Sandy lake just southeast of Rahill lake.

Fish and Game

Owing to the muddy waters and the shallowness of Sandy lake the fish are of poor quality during the summer months and can only be taken by net, and then



Fifteen-foot falls, outlet of Sandy lake into the Severn river.

only in certain locations. The fish commonly caught are pike, gold-eye, white-fish, and pickerel. Sturgeon are reported to be not uncommon in the Severn river just below the falls out of Sandy lake, and at a narrows on Finger lake.

Practically no game is found except rabbit, weasel, and muskrat. Bear were seen twice by the party, but no moose were observed.

Duck are not abundant, although mallard, American golden-eye, teal, and fish-duck were seen breeding on the small reedy rivers coming into the West arm. Spruce partridge and ruffed grouse were noted but are not abundant.

Water Powers

The only falls of water are at the outlet of Sandy lake and at a number of rapids on the Severn river downstream from the lake. The falls at the outlet of Sandy lake are over granite capped on either side by unconsolidated sands and gravels of Pleistocene age. It is not thought that more height than the actual 15 feet of the falls would be available for water-power development. Owing to the low, flat nature of the country just below the lake, water-power development of the rapids immediately below the lake does not seem feasible.

Agriculture

On the well-drained clay soils at Ste. Bernadette Mission Father Dubeau and Brother Dussault have been most successful in growing all the common vegetables, such as potatoes, turnips, carrots, beans, peas, and lettuce. Garden flowers, such as cosmos, sunflower, petunia, also bloomed successfully.

Potatoes are grown by some of the Indians in their gardens along the Severn river between Finger and Sandy lakes.

GENERAL GEOLOGY

The underlying bed rock of the area is entirely pre-Cambrian in age. Throughout the region a heavy drift-mantle of Pleistocene age overlies the bed rock with a maximum thickness of 50 feet. Much of the drift is varved clay laid down in a post-glacial lake; towards the east end of Sandy lake the drift consists of sand and boulders as well as clay.

A series of lava flows constitutes the oldest rock assemblage in the area and is lithologically similar to others known to be of Keewatin age. The lavas have, therefore, been assigned to a division named Keewatin type. These lava flows are overlain by a group of sediments, which for reasons given later are believed to belong to the same age and are included under the same heading. Intrusive into these are gabbro-diorites, which are older than the granitic intrusives and have, therefore, been put in a separate group, Post-Keewatin. The granitic intrusives are tentatively classed as Algoman; and the youngest rocks in the area, represented by gabbro, diabase, and basalt dikes, which cut all the older rocks, are classified as Keweenaw.

The following table lists the formations recognized in the area, the youngest being at the top:—

| | |
|--------------------|---|
| PLEISTOCENE: | Varved clay; sand, silt, gravel, and boulders. |
| | <i>Great unconformity</i> |
| PRE-CAMBRIAN | |
| KEWEENAWAN(?): | Gabbro, quartz diabase, basalt. |
| | <i>Intrusive contact</i> |
| ALGOMAN(?): | { Quartz feldspar porphyry, feldspar porphyry, felsite. Pegmatite, aplite. Biotite granodiorite, porphyritic biotite granodiorite, biotite hornblende granodiorite, pink granite. ¹ Biotite tonalite, biotite hornblende tonalite, grey granite (in part gneissic). ¹ Biotite hornblende diorite. |
| | <i>Intrusive contact</i> |
| POST-KEEWATIN(?): | Gabbro-diorite. |
| | <i>Intrusive contact</i> |
| KEEWATIN TYPE: | |
| Sedimentary group: | { Conglomerate; arkose, quartzite; cordierite hornfels; chistolite or andalusite hornfels; biotite-quartz schist; garnet-biotite schist; argillite, slate; iron formation; limestone. |
| | <i>No discordance</i> |
| Volcanic group: | { Dacite porphyry (flows, dikes). Andesite; pillowed andesite and basalt; gabbro-diorite; diabase porphyry; amphibolite; hornblende schist; chlorite schist; talc-antigorite schist; volcanic conglomerate, tuff; iron formation; narrow belts of quartzitic or argillaceous sediments. |

¹The terms grey granite, pink granite, or granite gneiss are used in this report and on the map for granitic intrusives of a grey or pink colour which have not been studied in thin section.

Keewatin Type

VOLCANIC GROUP

Andesite and Basalt

The commonest members of the volcanic group are andesite and basalt, which form a monotonous series of flows throughout the area. The exposures, which frequently exhibit pillow structures, show alignment, and it is thought that at least a dozen flows are present in some sections. These belts of pillowed lavas may represent several horizons or one horizon repeated as a result of folding.

Pillowed lavas or their metamorphosed equivalents occur between the North-west arm and Finger lake and are present all along the north shore of Sandy lake



Pillowed lava, burnt island near the entrance of the West arm, Sandy lake.

They form an arcuate range of hills north and northeast from the Bayly river at the northeast end of the lake. Another belt is well displayed along the south shore and on islands in the West arm and forms one range of hills along the south side of the narrows. A third belt is exposed on the north shore of the western part of Sandborn bay.

Amygdaloidal structures were rarely seen in the flows, having been noticed at only two localities, along the south shore of the West arm and in the northeast bay. Considerable carbonate is present in the lavas in the long narrow bay off the south shore of the West arm.

Owing to the varying degree of regional metamorphism the lavas have been deformed and altered. This metamorphism combined with the effects of the granitic batholith has altered them to amphibolite, feldspar amphibolite, and hornblende schist. Elsewhere they have been altered to chlorite schists or markedly serpentinized. These types are briefly noted in some of the following sections. It is interesting to note that northeast of the Bayly river all gradations

were observed from well-preserved pillow structures in lavas to rocks in which deformation has been so severe that all that remains is ribbon-like bands, the selvages of the original pillows. These ribbon-like bands are a fraction of an inch to 1 inch apart, and the rock might be mistaken for a tuff.

An analysis by the Provincial Assay Office of a specimen of typical pillowed lava is given under No. 1 in Table I. For comparison two analyses of lavas from Ontario localities and two of average basalts from Daly are given.

TABLE I

| | No. 1 | No. 2 | No. 3 | No. 4 | No. 5 |
|--------------------------------------|-----------|-----------|-----------|-----------|-----------|
| | per cent. | per cent. | per cent. | per cent. | per cent. |
| SiO ₂ | 48.28 | 48.70 | 53.90 | 49.06 | 48.80 |
| Al ₂ O ₃ | 13.32 | 15.21 | 19.67 | 15.70 | 13.98 |
| Fe ₂ O ₃ | 1.70 | 4.28 | .71 | 5.38 | 3.59 |
| FeO..... | 10.47 | 8.35 | 10.21 | 6.37 | 9.78 |
| MgO..... | 10.41 | 3.76 | .72 | 6.17 | 6.70 |
| CaO..... | 11.93 | 11.11 | 8.30 | 8.95 | 9.38 |
| Na ₂ O..... | .78 | 3.23 | 2.78 | 3.11 | 2.59 |
| K ₂ O..... | .88 | .59 | .58 | 1.52 | .69 |
| H ₂ O..... | 1.52 | .65 | 1.80 | 1.62 | 1.80 |
| TiO ₂ | .26 | | | 1.36 | 2.19 |
| P ₂ O ₅ | .06 | | | .45 | .33 |
| CO ₂ | .59 | 2.25 | .86 | | |
| MnO..... | | | .32 | .31 | .17 |
| Total..... | 100.20 | | | 100 | 100 |
| Specific gravity..... | 2.916 | | | | |

Sample No. 1—Pillowed basalt, Sandborn bay, Sandy lake.

Sample No. 2—Ellipsoidal greenstone (basalt) from a point 15 chains west of mile post III, north line of Teck township, district of Timiskaming.¹

Sample No. 3—Amygdaloidal greenstone (basalt), Amikoungami lake, 15 chains north of mile post III, north line of Teck township, district of Timiskaming.² This rock shows ellipsoidal structure.

Sample No. 4—Average of 198 analyses of basalts.³

Sample No. 5—Average of 43 analyses of Plateau basalts.⁴

Grey Pillowed Basalt

On the "boot," 2½ miles west of Fishtail point, in the small bay just west of Fishtail point, and on the point itself, pillowed grey basalt flows outcrop, and the three occurrences may represent a single horizon. On Fishtail point one flow 25 feet thick lies south of an 11-foot band of iron formation and another on the north side of this band. In the bay to the west the band of iron formation in the flow is 7 feet in width. On the "boot" the pillows in the flow range from 8 by 12 to 18 by 36 inches and have light-grey, chert-like selvages, one-half to 1 inch in width. The centres of the pillows have a spheroidal texture with dark, indistinct spots from one-tenth to one-fifth of an inch in diameter forming the major part of the rock.

An analysis of this grey pillowed basalt by the Provincial Assay Office is given under No. 1 in Table II; for comparison an analysis of a somewhat similar greyish-green basalt from the Opeepeesway Lake area described by Laird is also given. These lavas also show pillow and spheroidal structures.

¹Ont. Dept. Mines, Vol. XXXII, 1923, pt. 4, p. 8.

²Ibid, p. 8.

³R. A. Daly, "Igneous Rocks and the Depth of the Earth," McGraw-Hill Book Co., New York, 1933, p. 17.

⁴Ibid, p. 17

TABLE II

| | No. 1 | No. 2 |
|--------------------------------------|-----------|-----------|
| | per cent. | per cent. |
| SiO ₂ | 47.13 | 49.3 |
| Al ₂ O ₃ | 18.79 | 14.63 |
| Fe ₂ O ₃ | .89 | 2.63 |
| FeO..... | 19.05 | 9.1 |
| MgO..... | 4.85 | 6.51 |
| CaO..... | 1.6 | 11 |
| Na ₂ O..... | .95 | .19 |
| K ₂ O..... | 1.05 | .3 |
| H ₂ O..... | 4.04 | 3.07 |
| TiO ₂ | 1.2 | .83 |
| P ₂ O ₅ | .1 | .14 |
| CO ₂ | .67 | 2.1 |
| FeS ₂ | .22 | .34 |
| Total..... | 100.54 | 100.14 |
| Specific gravity..... | 3.089 | 3.031 |

Sample No. 1—Grey pillowed basalt, 2½ miles west of Fishtail point, Sandy lake.

Sample No. 2—Basalt, 20 chains east of the 3-mile post, north boundary of Benton township, district of Sudbury.¹

Gabbro-Diorite

Throughout the area, but particularly in that part of the volcanic belt surrounding the north end of the northeast bay of Sandy lake, gabbro or diorite is frequently associated with fine-grained volcanic rocks. In a number of cases, such as those along the north shore of the lake, field evidence suggests that the diorites were the coarse phases, the more slowly cooled central portions of lava flows. Elsewhere, as south of the Bayly river, the frequent occurrence of massive altered diorite close to fine-grained volcanic rocks suggests intrusive relationships, and in one outcrop diorite was found to cut across the shearing in an andesite. Some of these diorites should, perhaps, be placed with the post-Keewatin gabbro-diorites, but sufficient evidence is not available to justify this separation and they have been kept in the volcanic group but distinguished on the map by a special symbol.

A typical specimen from an outcrop half a mile south of the mouth of the Bayly river is a medium-grained, dark- and light-green rock, which when examined in thin section under the microscope was found to consist of hornblende, plagioclase (altered almost completely to epidote or replaced by chlorite), quartz, some biotite, and calcite. It was probably originally a quartz gabbro.

Diabase Porphyry

The diabase porphyry is the so-called "leopard rock." It consists of yellowish-green feldspar phenocrysts set in a fine-grained, green groundmass. The phenocrysts have a maximum diameter of 3 inches but are usually less than 1 inch across. Microscopic study shows that the phenocrysts are now largely represented by a zoisite and white mica aggregate, set in a diabasic groundmass of secondary hornblende (uralitized augite), secondary chlorite, and lath-like or stumpy crystals of labradorite. The rock is, therefore, an altered diabase porphyry.

In the outcrops the feldspar phenocrysts are arranged in rows, or form bands 6 to 48 inches in width, or are so abundant as to constitute a major part of the rock mass. This rock type outcrops at a number of localities along the north

¹Ont. Dept. Mines, Vol. XLIV, 1935, pt. 7, p. 10.

shore of the lake, the westernmost exposure being 5 miles east of the Hudson's Bay Company post, and the easternmost on the island $1\frac{1}{2}$ miles east of the portage to Rahill lake. This rock seems to occur at more than one horizon, i.e. both south and north of the belt of iron formation bands, but it must be lenticular as it was not seen on the west shore of Fishtail bay. At a few localities similar yellowish-green feldspar phenocrysts were seen in the central parts of pillowed lava flows, and the diabase porphyry apparently represents the more slowly cooled central portion of a basaltic flow.

An analysis of a representative sample is given below under No. 1 in Table III, and for comparison analyses of two other similar porphyries from Ontario localities are also given.

TABLE III

| | No. 1 | No. 2 | No. 3 |
|--------------------------------------|-----------|-----------|-----------|
| | per cent. | per cent. | per cent. |
| SiO ₂ | 46.06 | 42.12 | 40.3 |
| Al ₂ O ₃ | 22.38 | 24.95 | 28.94 |
| Fe ₂ O ₃ | 2.04 | 1.94 | 4.7 |
| FeO..... | 5.76 | 5.27 | 1.53 |
| MgO..... | 6.35 | 3.63 | 1.23 |
| CaO..... | 12.2 | 12.2 | 16.2 |
| Na ₂ O..... | 1.3 | 5.46 | 2.71 |
| K ₂ O..... | .78 | .35 | .92 |
| H ₂ O..... | 2.43 | 1.9 | 2.99 |
| TiO ₂ | .25 | .63 | ..... |
| P ₂ O ₅ | .04 | .57 | ..... |
| CO ₂ | .66 | 1.24 | .64 |
| Total..... | 100.08 | 100.26 | 100.16 |
| Specific gravity..... | 2.761 | 2.989 | ..... |

Sample No. 1—Diabase porphyry, Rahill portage, Sandy lake.

Sample No. 2—Feldspar basalt porphyry from Kabikwabik lake.¹

Sample No. 3—"Leopard rock," Cook township.²

A basalt porphyry composed of 80 per cent. feldspar as rounded crystals was seen by the writer north of Fry lake, in the Cat River-Kawinogans Lake area, Patricia portion of Kenora district. The phenocrysts of white feldspar usually range from half an inch to 2 inches in diameter, but occasional crystals measuring $2\frac{1}{2}$ by 4 and 4 by 6 inches were found. In some exposures, the crystals were arranged in rows, as on Sandy lake. A similar rock has been described by Moore.³

Metamorphosed Equivalents

Many of the areas underlain by the volcanic group now consist almost entirely of amphibolite or feldspar amphibolite. In many cases it is now impossible to say whether the amphibolite was derived from an intermediate or basic volcanic or an intrusive. The development of amphibolite seems to be partly due to the proximity of the granite batholiths, but elsewhere may be due to regional metamorphism alone. Amphibolite is the prevailing rock type of the volcanic group in the area between the West arm and Colgrove lake, and north of the north shore between the Stain river and Rahill lake, and is found quite frequently in other areas. Where it is associated with fine-grained volcanics it

¹Ont. Dept. Mines, Vol. XLI, 1932, pt. 6, p. 11.

²Ont. Dept. Mines, Vol. XXX, 1921, pt. 6, p. 42.

³E. S. Moore, Ont. Dept. Mines, Vol. XLV, 1936, pt. 6, pp. 5, 6.

must have developed either from a medium-grained, basic intrusive or the coarse phase of a lava flow.

Hornblende schist and chlorite schist were found at a number of localities where shearing had been intense.

Talc-antigorite schist occurs at two localities in Sandborn bay, on an island in the east bay and on the north shore in the west bay. At the latter locality carbonate is also present, and study of a thin section shows the presence of residual grains of olivine. This speckled, dark-green rock weathers at the surface to a soft, brown material. No evidence other than that derived from microscopic study was found to suggest that these rocks were originally ultra-basic intrusives, and at present it seems best to consider that they represent serpentized volcanic rocks, possibly olivine basalts.



Sheared and drag-folded lavas on an island at the east end of Sandy lake, 4 miles south of the mouth of the Mort river.

Volcanic Conglomerate¹ and Tuff

In the northeast bay at the east end of the lake on two islands, on the points, and in the bush north of the mouth of the Mort river, there are outcrops of volcanic conglomerate, which are believed to represent a single horizon. The total length indicated by these exposures is $4\frac{1}{2}$ miles. The volcanic conglomerate is best exposed on two points in the north end of the bay between the mouths of the Bayly and Mort rivers. Here it consists of subangular to well-rounded fragments, pebble to boulder size, the largest being 12 by 24 and 18 by 24 inches. The fragments consist mainly of a black-speckled, pale-grey to buff acid volcanic; a fine-grained, greyish-green porphyry; and greenstone. Associated with the conglomerate are coarse tuffaceous sediments. On a longer point just south of the exposures described above, banded chert-like fragments are also present in the

¹C K. Wentworth and Howel Williams, "The Classification and Terminology of the Pyroclastic Rocks," National Research Council, Washington, Bull. No. 89, 1932, pp. 45-51; *Definition of Volcanic Conglomerate*—"Sedimentary, coarse pyroclastic material containing an abundance of large, chiefly rounded, waterworn fragments. In most cases they result from the erosion and the deposition of old volcanic rocks, but they may also be formed by volcanic mud flows and by the action of running water on freshly fallen *ejecta*."

conglomerate. On an island $1\frac{1}{4}$ miles south of the mouth of the Bayly river several volcanic conglomerate beds, about 20 feet in width, occur with interbedded tuffs, and also a greywacké bed, in which were found three well-rounded pebbles of white biotite granite. Bounding the volcanic conglomerate beds is andesite, which on the east side grades into a diorite, the coarse phase of a flow. At the south end of an island 1 mile south of that mentioned above, 150 feet of volcanic conglomerate is exposed in contact with pillowed andesite, and some of the conglomerate matrix appears to fill interstices between the pillows. The volcanic conglomerate here consists of subangular to well-rounded fragments, from granule to boulder size, of green, acid, aphanitic volcanic rocks; whitish chert(?); carbonated andesite; and porphyritic rocks in a fine-grained, green matrix. The largest fragment, 12 by 18 inches, is andesite. As on the island to the north the volcanics bounding the band on the east pass into a diorite-like rock.



Volcanic conglomerate, north shore of Sandy lake between the Bayly and Mort rivers.

Highly crumpled and iron-carbonated green schists, with interbedded nuncrumpled bands, 6 to 24 inches in width, of dark-green, fine-grained andesitic tuff(?) form a reef in the northeast bay east and northeast of the above-mentioned islands.

In the West arm tuffs form a 5-foot interbed in andesitic volcanics. They are composed of paper-thin *laminae* and were probably water-lain.

Tuff beds, 6 and 12 inches in width, occur in andesites on the island 4 miles east of the Hudson's Bay Company post.

Sediments

Normal clastic sediments mainly of arenaceous or argillaceous types are very common in certain parts of the area as narrow interbeds in the volcanics. They are particularly abundant along the south shore of the West arm. Although they generally have widths to be measured in tens of feet, they occasionally attain widths of as much as 150 feet. Owing to the almost universal mineralization of pyrite or pyrrhotite, or both, the sedimentary interbeds now form conspicuous rust zones.

On the south shore of the West arm west of Sandborn bay, typical varieties are sugary, white to grey to rusty-weathering, fine-grained quartzites, with bands of garnet amphibolite, garnet-mica schist, biotite-quartz schist, dark-grey biotite-rich schists, pyritized slate, and chert.

Iron Formation

Interbedded between andesitic flows or diorite (amphibolite?) are some half-dozen bands of iron formation. These bands range from a few feet up to 200 feet in width, but average 20 feet, and are particularly abundant along the north shore of the lake from the Hudson's Bay Company post to Fishtail point and were picked up at a few localities eastward on islands and in the northeast arm.

The iron formation is of three types, one composed of interbedded magnetite and white sugary quartz; another of magnetite, chlorite, and blue-grey quartz



Banded iron formation on a small island off Fishtail point, Sandy lake.

bands; and the third of black chert and magnetite. Some of the iron formation is so lean as to be merely a banded grey to black chert. The bands composing the iron formation range from paper-thin films to 1-inch beds.

A typical succession is shown by the exposures from north to south on Fishtail point, which showed the following formations in a total thickness of 1,000 feet.

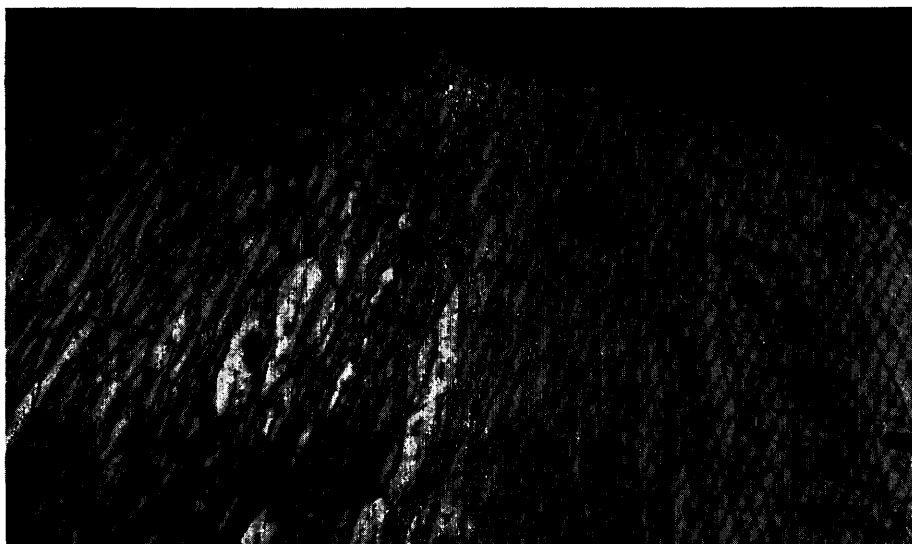
- Black chert iron formation (12 feet).
- Diorite.
- Black chert iron formation and bedded black cherts (200 feet).
- Diorite.
- Iron formation (40 feet).
- Diorite, fine-grained like andesite on south edge becoming coarser northwards.
- Iron formation (100 feet).
- Andesite.
- Iron formation (15 feet).

The succession is continued after a slight gap on the west shore of the bay just west of Fishtail point, with a thickness of 1,100 feet.

Andesite.
Pillowed grey basalt.
Iron formation (11 feet).
Pillowed grey basalt (25 feet).
Andesite.

The diorites listed in the table may represent slowly cooled flows or perhaps sills. Elsewhere on the north shore andesite dikes cut across bands of iron formation and may represent feeders of flows or sills. The writer is still undecided whether or not the association of diorites and iron formation may not be explained by assuming that a given horizon of iron formation has been split up into a number of bands by sill-like injections of diorite.

Narrow bands of banded black chert, which in places attain a width of a few feet, were noted in several localities separating pillowed andesitic flows.



Dacite porphyry showing flow breccia(?) structure, south shore of the Northwest arm, Sandy lake.

Banded, paper-thin, red jasper and black chert form a 2-inch band in black chert iron formation on the chain of islands $2\frac{1}{2}$ miles east of the portage to Rahill lake. This material takes a good polish and can be used as a semi-precious stone.

Dacite Porphyry

A belt of dacite porphyry, a quarter to half a mile in width, has been traced for 7 miles east from the granite contact along the north shore of the Northwest arm of the lake. Numerous dikes of the same rock are present along the north shore of the lake for a further 6 miles. Along the south margin of the mass the outcrops show fragmental structures, the fragments being essentially of the same material as the matrix, and a flow breccia origin seems possible. On the point jutting out from the south shore of the Northwest arm the fragments have weathered out and are well exposed at low water. These fragments are well rounded, and typical measurements of the larger ones are 4 by 24, 9 by 12, and 12 by 36 inches. Owing to metamorphism the fragments have been squeezed, and many are now lenticular or linear in shape, the most elongated fragment

noted being 1 by 30 inches. This particular exposure is probably a volcanic conglomerate derived from the dacite porphyry. In the exposure are frequent interbeds, from 12 to 36 inches in width, of chlorite or hornblende schist, which are believed to represent metamorphosed tuffs. Along the north shore of the Northwest arm similar interbeds of green schist or fine-grained amphibolite occur, and a banded, aphanitic phase of the porphyry seems to be a tuff. These occurrences indicate the existence of many bands of the porphyry, and each of these is considered to be a flow. The succession from north to south, as far as it can be deduced from separated outcrops, is a series of porphyry flows with interbedded acid or intermediate tuffs, with flow breccia(?) near the top, and lastly volcanic conglomerate.

At the west end of the belt where it is cut off by the granite batholith, the rock is folded and the folds are cut off by the granite. This porphyry is, there-



Fold in dacite porphyry with *lit par lit* granitic material, hill west of the Northwest arm, Sandy lake.

fore, placed in the Keewatin-type division. Medium-grained phases represent central parts of thick flows, or possibly related intrusive masses, which occur abundantly as dikes along the north shore of the lake.

The rock is fine- to medium-grained, grey in colour, and characterized by small to large opalescent blue eyes of quartz. Studied microscopically, it is found to consist of quartz, oligoclase, and biotite with accessory apatite, sphene, zircon, secondary epidote, calcite, and chlorite. It is a dacite porphyry. The belt of porphyry is extensively mineralized throughout its length, and practically the whole of its outcrop has been staked. Hydrothermal alteration has changed parts of it to a cream-coloured schist.

An analysis by the Provincial Assay Office of what is considered to be a representative sample is given under No. 1 in Table IV. The analysis would seem to indicate that the rock has undergone considerable hydrothermal alteration. Two analyses by Bruce of altered granite and granite at the Orphan mine, Sturgeon River area, are given in Nos. 2 and 3 for comparison, and it is suggested that the

type of alteration of the dacite porphyry was probably of a similar nature, namely a removal of some alumina, soda, and iron oxides, and perhaps some gain in the amounts of lime and magnesia, and a large gain in potash.

TABLE IV

| | No. 1 | No. 2 | No. 3 |
|--------------------------------------|-----------|-----------|-----------|
| | per cent. | per cent. | per cent. |
| SiO ₂ | 67.33 | 68 | 66.68 |
| Al ₂ O ₃ | 15.8 | 10.95 | 16.33 |
| Fe ₂ O ₃ | 1.5 | 1.31 | 1.85 |
| FeO..... | 2.31 | 1.54 | 2.57 |
| MgO..... | 2.21 | 1.65 | 1.48 |
| CaO..... | 6.27 | 5.49 | 4.12 |
| Na ₂ O..... | .5 | .29 | 2.95 |
| K ₂ O..... | 2.31 | 2.74 | 1.51 |
| H ₂ O..... | .61 | 1.51 | .89 |
| TiO ₂ | .34 | .53 | .62 |
| P ₂ O ₅ | .16 | .17 | .11 |
| CO ₂ | .7 | 3.74 | .71 |
| MnO..... | ..... | .6 | .1 |
| FeS ₂ | .3 | 1.41 | ..... |
| Total..... | 100.34 | 99.93 | 99.92 |
| Specific gravity..... | 2.777 | 2.759 | 2.76 |

Sample No. 1—Dacite porphyry, Northwest arm, Sandy lake.

Sample No. 2—Altered granite, near the vein, Orphan mine.¹

Sample No. 3—Granite 200 feet from the vein, Orphan mine.²

Dacite porphyry of apparently the same age forms a small mass at the northeast corner of Fishtail bay.

Greenish quartz porphyry dikes, sheared in the same direction as the volcanics but cutting across the regional structure, were found on the island 4 miles east of the Hudson's Bay Company post. These porphyries are believed to belong to the Keewatin-type group. Somewhat similar "old" porphyries were found at a number of other localities on the lake.

SEDIMENTARY GROUP

Although there is structural evidence to indicate that some of the sediments overlie certain members of the volcanic group, there is not sufficient available to prove that these sediments are either younger than all the members of the volcanic group or that there is any pronounced unconformity between them. At the present time, therefore, it would seem desirable to consider the sediments as part of the series to which the volcanic group belongs, which for purposes of this report has been designated as Keewatin-type.

The sediments consist mainly of conglomerate, quartzite, and cordierite hornfels, with lesser amounts of arkose, biotite-quartz schist, andalusite hornfels, iron formation, etc. The main features of the more important types are described in the following paragraphs.

Conglomerate

The conglomerate consists of pebbles and, more rarely, boulders which are mainly of chert but to a lesser extent of granite, diorite, and greenstone. The groundmass as seen under the microscope in thin section is a biotite feldspathic

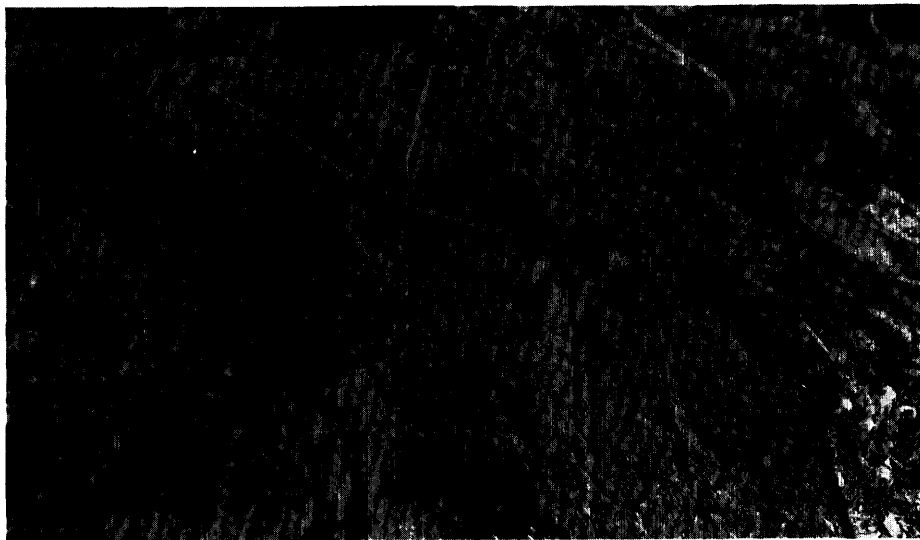
¹Ont. Dept. Mines, Vol. XLV, 1936, pt. 2, p. 50.

²Ibid.

quartzite. Some of the quartz grains in the groundmass are rounded, blue, and opalescent and occasionally reach diameters of 3 millimetres. Pyrite and pyrrhotite may occur in such abundance as to give rise to rusty-weathering varieties.

Quartzite

The quartzite is a dark-grey, fine-grained rock composed of quartz, abundant biotite, and a spotty distribution of blue opalescent grains of quartz from 1 to 3 millimetres in diameter. Pyrrhotite occurs as an accessory mineral. Cross-bedding was observed in only one exposure. As a general rule, bedding is not displayed within the quartzite itself, but owing to the frequent interbedding with the cordierite hornfels the attitude of bedding is quite apparent.



Cordierite hornfels on an island in the main part of Sandy lake, 3 miles from the Hudson's Bay Company post. The cordierite is resistant to weathering and stands out as small lumps. The marks on the hammer handle are an inch apart.

Cordierite-Biotite Hornfels

The cordierite-biotite hornfels is a medium-grained, grey rock composed of rounded to prismatic crystals of cordierite, from 5 by 5 to 5 by 10 millimetres in size, in a groundmass of books of biotite, quartz, etc. Studied in thin section under the microscope the large crystals of cordierite are seen to hold inclusions of quartz, biotite, and sericite, and to show yellow pleochroic haloes around zircon crystals or clusters. Biotite forms reddish-brown flakes showing sieve structure and contains quartz inclusions. The groundmass between the cordierite and biotite consists of a mosaic of quartz grains and minute flakes of sericite, with accessory andalusite, plagioclase, pyrite, pyrrhotite, apatite, and tourmaline.

The cordierite-biotite hornfels represents a shale that has undergone contact metamorphism. It is to be noted that granitic intrusives are present within 1 to 2 miles of all the occurrences of the hornfels. In some of the exposures studied, petrographic evidence shows that the rock has been subjected to a dual metamorphism,¹ first to a thermal (contact) metamorphism with the development of cordierite, and later to regional metamorphism with the development of garnet

¹cf. A. Harker, "Metamorphism," Methuen, London, 1932, p. 338.

(a stress mineral), accompanied by the decomposition of the cordierite to a chlorite-sericite aggregate, which still retains the inclusions of quartz and biotite of the original cordierite. Fresh cordierite was only observed in samples from Sandborn bay, those from the main part of the lake having been altered. Near the diorite sills the cordierite hornfels has been altered to quartz-sericite schist.

The composition of a typical cordierite rock from Sandborn bay with a recast of the analysis into constituent minerals is given in Tables V and VI, and for comparison a number of analyses of shales and another cordierite rock are also included.

TABLE V

| | No. 1 | No. 2 | No. 3 | No. 4 | No. 5 |
|--------------------------------------|-----------|-----------|-----------|-----------|-----------|
| | per cent. | per cent. | per cent. | per cent. | per cent. |
| SiO ₂ | 57.64 | 58.1 | 67.61 | 57.99 | 59.83 |
| Al ₂ O ₃ | 23.29 | 15.4 | 13.2 | 23.42 | 17.47 |
| Fe ₂ O ₃ | .76 | 4.02 | 5.36 | .49 | 4.09 |
| FeO..... | 6.45 | 2.45 | 1.2 | 5.06 | 3.93 |
| MgO..... | 4.1 | 2.44 | 3.2 | 1.2 | 3.7 |
| CaO..... | trace | 3.11 | .11 | 1.65 | .49 |
| Na ₂ O..... | .31 | 1.3 | .67 | 1.32 | 1.08 |
| K ₂ O..... | 3.34 | 3.24 | 4.45 | 3.5 | 4.42 |
| H ₂ O..... | 1.73 | 5 | 3.42 | 3.39 | 3.8 |
| TiO ₂ | .88 | .65 | .56 | .32 | .93 |
| P ₂ O ₅ | .15 | .17 | .05 | | .18 |
| SO ₃ | | .64 | | (S=0.91) | .13 |
| CO ₂ | .68 | 2.63 | | 1.12 | |
| FeS ₂ | .75 | | .03 | | |
| BaO..... | | .05 | .04 | | |
| C..... | | .8 | | | |
| MnO..... | | | .1 | | |
| Total..... | 100.08 | 100 | 100 | 100.37 | 100.05 |
| Specific gravity..... | 2.761 | | | | |

Sample No. 1—Cordierite-biotite-quartz hornfels, Sandborn bay, Sandy lake. Analysis by Provincial Assay Office, 1938.

Sample No. 2—Composite analysis of 78 shales recalculated to 100 per cent.¹

Sample No. 3—Red slate, near Hampton village, New York.²

Sample No. 4—Culm shale, Klausthal, Harz.³

Sample No. 5—Cordierite-quartz-biotite hornfels, Abbenstein (Harz).⁴

TABLE VI

| | Per cent. |
|-----------------|-----------|
| Cordierite..... | 29.91 |
| Quartz..... | 26.22 |
| Biotite..... | 14.81 |
| Sericite..... | 15.97 |
| Paragonite..... | 3.83 |
| Andalusite..... | 4.71 |
| Magnetite..... | 1.16 |
| Ilmenite..... | 1.52 |
| Pyrite..... | .75 |
| Total..... | 98.88 |

The chemical relation of the Sandborn bay rock to the shale-slate group is clearly indicated by the above analyses.

¹F. W. Clarke, "The Data of Geochemistry," U.S. Geol. Surv., Bull. No. 770, 1924, p. 34

²Ibid, p. 554.

³C. E. Tilley, "Contact Metamorphism in the Comrie Area of the Perthshire Highlands," Quart. Jour. Geol. Soc., London, Vol. 80, pt. 1, p. 46 (analysis IX).

⁴Ibid, p. 37 (analysis I).

Chiastolite Hornfels

Chiastolite hornfels is beautifully exposed on the north shore of Rat House bay. Owing to weathering the chiastolite crystals are cream to brown in colour and stand out clearly from the almost black matrix. The crystals, which have a maximum diameter of 1 inch, show the characteristic cross of this mineral species. Associated with the chiastolite-biotite hornfels is cordierite-andalusite hornfels as interbeds. The andalusite forms pale-pink crystals as large as 5 by 20 millimetres.

Limestone

On the south shore of the east bay of Sandborn bay grey, faintly banded, fine-grained crystalline limestone outcrops. It has been considerably drag-folded, the beds being highly contorted. Microscopic study shows it to have recrystallized to a mosaic of calcite, with tremolite and lesser amounts of quartz, zoisite, microcline, and biotite.

Iron Formation

The variety of iron formation found as a member of the sedimentary group is very similar to that found in the volcanic group and is composed of alternating bands of sugary quartz and magnetite. On the south shore of Sandborn bay near the granite the rock consists of alternating bands composed of quartz and tremolite, and tremolite, actinolite, and magnetite, with gradations and variations between these two combinations.

The above types show that the sedimentary assemblage consisted originally of conglomerate, micaceous sandstone, and shale, with lesser amounts of other sediments. The interbedding of these three main varieties indicates oscillating conditions of sedimentation such as prevail in rapid streams in continental areas. The iron formation shows that basins of quiet shallow water existed locally, which gave the conditions necessary for its formation.

From the lithological character of the conglomerate and the abundance of chert pebbles present, it is concluded that much of it was derived through the erosion of a banded cherty iron formation, the chert forming the pebbles, and the iron sand being hydrothermally changed to pyrite or pyrrhotite. The presence, in two exposures, of boulders of chert-pebble conglomerate indicates the existence of older pebble conglomerates. These characters seem in keeping with their structural position.

Sandborn Bay Sediments

Sediments outcrop in the south bay of Sandborn bay and at its east end. The continuity of the belt is interrupted by the presence of three bands of diorite. Sufficient structural data were not found to determine to what degree folding may have repeated horizons.

The sediments consist mainly of interbedded quartzite and cordierite hornfels, with beds of conglomerate, probably lenticular, at several localities. Disseminated sulphides are locally present in such abundance that rusty-weathering rocks are now exposed; identification of the original rock type is almost impossible in such outcrops.

On the west point of the south bay of Sandborn bay a banded chert is exposed with black and white bands heavily mineralized with pyrite, which causes a marked rust zone. This is followed to the south by a conglomerate composed of angular, lenticular fragments of black chert and white chert and pebbles of soft, green rocks (andesite?); medium-grained diorite, 2 by 3 inches; and white, medium-grained granite. Southwards along the shore this chert conglomerate is

well exposed. Ninety per cent. of the fragments are of chert, and amongst them is a banded black and white chert, 1 by 6 inches; a triangular boulder of dirty-white chert, 6 by 18 inches; a boulder of chert-pebble conglomerate, 4 by 10 inches; and pebbles of andesitic(?) composition. The association suggests that the conglomerate is made up of material derived mainly from a banded chert or the chert of a banded iron formation, and that the pyrite now present so abundantly is a later development from iron deposited initially as magnetite sand between the fragments. South of these conglomerates outcrop beautifully banded, grey quartzites, the banding ranging in width from paper-thin to 3 inches. Interbedded banded quartzite and conglomerate occur farther south. Dark-grey, fine-grained andalusite-biotite hornfels showing a banded structure (bedding) occurs interbedded with conglomerate back from the shore near the west point of this small bay. The total width of sediments exposed is slightly over 2,000 feet.

Chert-pebble conglomerate is exposed on a reef one mile southeast of the above-mentioned point, on the island in the bay, and on the southeast shore of this small bay. The last-named exposure is a boulder conglomerate with 1-foot chert boulders and a chert-pebble conglomerate boulder, 2 by 5 feet in dimensions, indicating the existence of a previous chert-pebble conglomerate. All these exposures are heavily stained with rust.

On the east shore of the bay and on the island are excellent exposures of cordierite hornfels interbedded with quartzite and two conglomerate beds.

In the east bay of Sandborn bay the exposures of the sediments are mainly micaceous quartzites with some cordierite hornfels, and on the big hill conglomerate is cut by diorite.

On the main part of the lake the sediments outcrop on islands, and these disconnected, yet aligned series of exposures indicate that the belt extends for 15 miles eastward, the last exposure being on a small island 1 mile due south of Fishtail point, giving a total exposed length of 25 miles.

The sediments consist mainly of interbedded cordierite hornfels and quartzite. The association of these two rock types has resulted in a marked banding, as the bands of cordierite hornfels, ranging in width from a quarter of an inch to 6 inches, occur between beds of micaceous quartzite or its more metamorphosed equivalent, a biotite-quartz schist. The knobby structure of the cordierite hornfels, due to differential weathering, is excellently displayed by many of the island outcrops.

Garnetiferous biotite-quartz schist is present on the south shore of the small island 1 mile south of Fishtail point. On the large island to the west several small sills of diorite occur in the band of sediments, which consists of quartz schists, interbanded slaty and quartzitic sediments, and interbedded quartzite and cordierite hornfels.

On a small island west of the large island mentioned above, quartzitic sediments are followed to the south by banded iron formation exposed on two reefs.

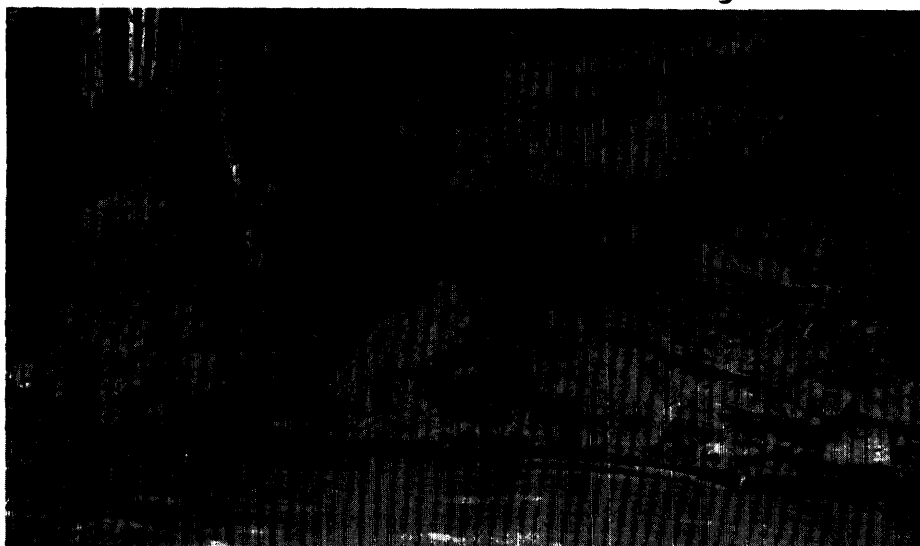
Cordierite hornfels with interbedded quartzite outcrops on two islands just west of longitude 93° 00' W. Some chialtolite was observed. The contact between diorite on the north and sediments on the south is exposed at the west end of the westernmost of the two islands. At the contact the sediments consist of 6 feet of banded light- and dark-grey chert, followed to the south by quartzite, rusty-weathering sediments, and dark-grey, banded hornfels. On the north side of an islet half a mile southeast of this point there are outcrops of diorite and banded impure quartzite with a granule conglomerate lens, 4 by 15 feet in dimensions. The conglomerate contains two elongated, white, medium-grained

granite boulders, 4 by 12 and 7 by 30 inches. The fragments, granule (a quarter to an eighth of an inch) in size, are of rounded white quartz in a chloritic ground-mass.

On the islands and mainland at the mouth of Rat House bay, cordierite hornfels interbedded with quartzite is the prevailing sedimentary type, with a minor amount of arkose on the north side of the belt. On the south side of the belt on the mainland, along a shore line half a mile in length, is the magnificent set of exposures of chialstolite hornfels previously described.

Colgrove Lake Sediments

Sediments outcrop sparingly in an S-shaped belt north of the West arm, on Colgrove lake, and along the north shore of the extreme north end of the West arm.



Small anticline in the sediments on the north shore of the north bay of the West arm, Sandy lake.

On Colgrove lake the sediments are well-bedded with a banding half an inch to 2 inches in width and consist of interbedded dark-grey quartzites and biotite-quartz schists. Locally these sediments contain strings of quartz lenses, 2 by 3 inches in dimensions, parallel to the bedding, or are cut by granite dikes. The sediments on the lake swing from a strike of N. 25° E. to S. 30° E. and have variable dips from flat to 60° E. Drag folds indicate that they are on the west limb of a syncline, whose axis trends S. 30° E. and plunges 15° S.E.

Along the north shore of the bay at the extreme north end of the West arm sediments form a narrow band. They consist mainly of a pebble conglomerate, fine-grained grey quartzite, banded biotite-quartz schist, which in places is garnetiferous. The strike of this band ranges from S. 52° E. to S. 60° E. and the dips range from 50° S.W. through vertical to 65° N. The pebble conglomerate, which is exposed at intervals over a length of 100 chains, is composed of white chert or white sugary quartz pebbles from a quarter of an inch by 2 inches up to 1½ by 3 inches in dimensions. Many of the pebbles are like thin bricks in shape, and it seems most likely that they were derived from the break-up of a banded

iron formation. The matrix consists of quartz and hornblende. This conglomerate is similar to that found on Sandborn bay.

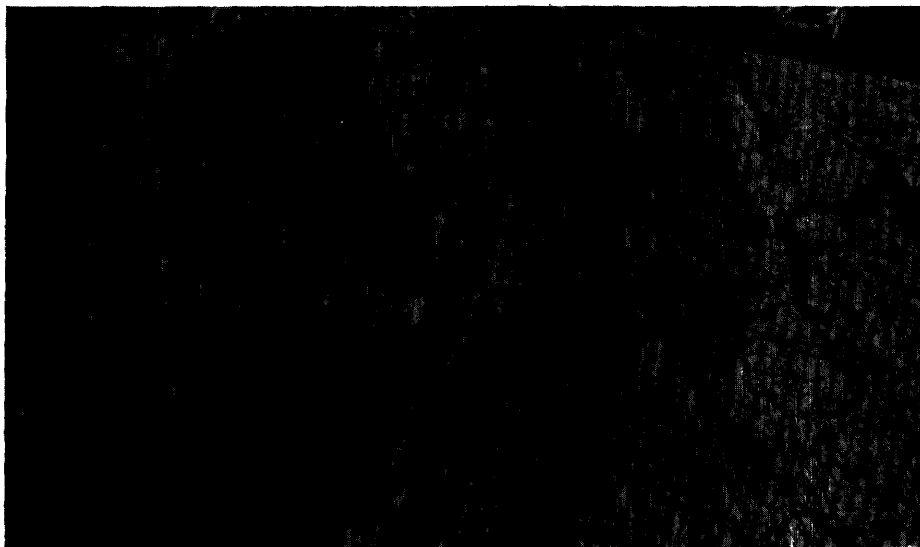
At one locality the sediments are folded into a small anticline, with conglomerate forming the main arch. They are underlain by interbanded impure quartzites and amphibolites, and there is a small saddle of amphibolite at the centre. The axis of this anticline strikes S. 50° E., the north limb strikes S. 40° E. and dips 30° N., and the south limb strikes S. 58° E. and dips 70° S., indicating that the structure plunges southeastward, as does the band of sediments on Colgrove lake. The amphibolites that occur interbanded with these sediments are believed to represent flows, sills, or dikes of metamorphosed basic igneous rocks.

The easterly continuation of this belt of sediments is represented by a lenticular band that outcrops north of the north shore along the eastern part of the West arm, and on a chain of islands extending east-northeast. On the mainland the commonest member of the narrow belt of sediments is a pebble conglomerate. The rock is highly sheared and made up of elongated pebbles with a maximum size of one-half inch by 2 inches. They are composed of glassy quartz, and possibly an altered granite, in a sugary, micaceous groundmass of quartz and biotite. Associated with the conglomerate is a banded, fine-grained, grey siliceous sediment with *lit par lit* granite or pegmatite. These beds strike N. 43° E. and dip 80° S.E.

The sediments outcropping to the northeast form a chain of islands. The exposures on these islands will be described in some detail, as they show the transition between the sediments and volcanics. An island at the northeast end of the chain presents the evidence for the location of the north boundary. Here on the north edge of the island normal, fine-grained andesites carrying a little disseminated pyrite are in conformable contact with banded hornblendic quartzite, followed to the south by garnetiferous quartzite, the last two having a width of 5 feet. Sheared pebble conglomerate, striking N. 51° E. and dipping 70° S., forms the remainder of the island. The pebbles are mostly less than one inch in diameter and show an average elongation of 4 to 1. They are composed mainly of sugary quartz, fine-grained granites, and some aphanitic grey rocks, possibly acid volcanics. Some of the quartz is banded grey and black, a banded chert such as might be derived from a banded iron formation. An interesting feature is the presence of two boulders, one of amphibolite 2½ by 8 inches, the other of white granite 6 by 18 inches. On this island, four other small islands, and one larger one to the southwest, conglomerate is exposed; the sediments are cut by dikes or have *lit par lit* injections of granite, pegmatite, or aplite. The southern contact is also transitional and is exposed on the large island. Here a sheared pebble conglomerate with sugary quartz, glassy quartz, fine-grained granite, and acid volcanic(?) pebbles in a greenish groundmass, which is composed mainly of chlorite and hornblende, is followed to the south by micaceous quartzite with interbeds of grey quartzite, which resist erosion and stand out on a water-etched surface as ribs. This rock in turn grades into banded hornblendic rocks, and these are followed to the south by well-pillowed andesites, which outcrop at the southwest corner of the island. The banded hornblendic rocks represent a transition stage from conditions of volcanism to those of sedimentation, and whether they represent tuffs or tuffaceous sediments cannot be determined. The repetition of these beds on the north and south sides of the conglomerate beds might be construed as indicating the presence of a syncline but may merely indicate the transition into volcanic rocks again. Drag folds on the north edge indicate that the tops face south, but no information as to attitude is available

for the southern half of the band, and the belt may, therefore, be just a sedimentary interbed in a dominantly volcanic series.

Sediments were found on two small islands to the northeast. Biotite-quartz schists with interbeds rich in hornblende outcrop on one. These show a paper-thin to 1-inch banding, and probably represent the transition series of sediments. The other islet is composed of an intensely stretched pebble conglomerate. The pebbles are made up almost entirely of white to greyish, sugary quartz, ranging in size from small lenses half an inch by 1 inch up to stretched lenses a quarter of an inch by 6 inches. One highly altered, medium-grained granitoid pebble was found. The strike of the conglomerate is N. 70° E., and the dip is vertical. The structure swings from east to southeast, and one islet of sediments 2 miles to the



Water-etched surface of brecciated crystalline limestone with one well-defined bed, Severn river, 12 miles below Sandy lake. The contact with the greenstone is one foot to the right of the hammer head. The greenstone contains inclusions of the limestone.

southeast may be a part of this belt. This islet exposes poorly banded, fine-grained to almost aphanitic, grey, siliceous sediments with a 2-foot interbed of fine-grained biotite quartzite. The strike is N. 85° E., and the dip is vertical. Drag folds indicate that the tops face south.

Sediments at East End of Sandy Lake

At the east end of the lake, on four islands and the mainland to the northeast, well-bedded quartzites are exposed. They are a grey, gritty variety with opalescent grains of quartz from a twentieth to a tenth of an inch in diameter. Occasional pebbles of black chert or aphanitic volcanic rock have maximum dimensions of half an inch by 2 inches. Finer-grained quartzites occur as interbeds. On the mainland the quartzites have been intruded by various porphyries and in places it is difficult to differentiate between the two rock types.

Severn River Sediments

On the Severn river about 12 miles below the falls at the outlet of Sandy lake, volcanics and sediments outcrop. The sediments consist of andalusite-

biotite hornfels and grey limestone. The limestone is in contact with greenstone, which contains abundant irregular limestone xenoliths as large as 6 by 24 inches. The limestone has been partially brecciated, but where the bedding is preserved it is well displayed owing to differential weathering. If the greenstone is an altered andesitic volcanic, then the limestone is pre-volcanic in age.

Post-Keewatin(?)

Diorite occurs at a large number of localities throughout the area, but in few places has it been possible to be certain of its age relations to the members of the volcanic or sedimentary groups.

The major occurrences consist of one large and several small sills lying parallel to the regional structure. The large sill has been traced from the 230-foot hill on Sandborn bay eastwards through a chain of islands to an island off Fishtail bay, a total distance of 23 miles.

The large sill has a surface width of approximately 30 chains and is best exposed on the 230-foot hill on the south shore of the east bay of Sandborn bay. On one of the islands in the main part of the lake it reaches a maximum width of 50 chains. On the hill on Sandborn bay, it varies from an almost coarse grained, grey rock, with dark-green hornblende crystals as large as 5 by 5 millimetres, to marginal phases, which are fine-grained and dark-green in colour. Under the microscope in thin section the essential minerals are seen to be basic andesine and hornblende with accessory quartz, sphene, titanomagnetite, apatite, and biotite. It is, therefore, a diorite. Specimens from the smaller sill-like masses are fine-grained and dark-green in colour like the marginal phases of the large sill. These sills range from 5 to 10 chains in surface width. Where they are close to granitic intrusives, microscopic examination shows that they have been metamorphosed, as indicated by the sieve structure in the hornblende, and they would more properly be called plagioclase amphibolites.

Along part of the north shore of Sandborn bay and at one locality inland, a coarse-grained diorite is found with hornblende crystals having a maximum diameter of 6 millimetres. A sample from the west point at the outlet of the bay is a uraltized quartz gabbro, which has lithological affinities with the rocks forming the hill in the east bay of Sandborn bay. The finer-grained marginal(?) phases of this rock are so similar to the coarse phases of the andesitic flows that it was found almost impossible to fix the boundaries of these masses with any degree of certainty. It is suggested that these northern masses represent the large sill repeated owing to anticlinal folding.

The age of the large sill is fairly well defined. On Sandborn bay it cuts off a narrow band of conglomerate, and on the main part of the lake is cut into and off by the granitic intrusives of the batholith of the south shore. Its age is, therefore, post-sedimentary and pre-Algoman.

Many diorite occurrences were seen in the country north and south of the Bayly river, but owing to lack of data, except at one occurrence, it is impossible to state whether the diorites represent intrusives or coarse phases of lava flows. In the one occurrence mentioned, diorite was seen to cut across the shearing in the andesite. The strike of the diorite-andesite contact is N. 90° E., and the strike of the shearing in the andesite is N. 50° E. A medium-grained rock typical of this area was studied microscopically and appears to have been a quartz gabbro originally, although at present the primary minerals are represented by such alteration products as chlorite, epidote-zoisite, calcite, and hornblende.

Algoman(?)

GRANITIC INTRUSIVES

Although no detailed examination of the granitic rocks was made, eighteen typical specimens from various localities have been examined microscopically. Eleven of these are from the south shore between the site of the old Hudson's Bay Company post and the east end of the lake and are believed to comprise a fairly representative suite from the batholiths. The types represented are granodiorite, tonalite, and diorite. It would appear that the dominant type is a biotite tonalite, which by differentiation has given rise to a more acid phase of granodiorite; whereas the diorite represents either an early basic phase of the differentiation or a hybrid type developed by assimilation of volcanic material. Practically every gradation is found between these types.

The biotite tonalites are typically massive, fine- to medium-grained, light- to dark-grey, granitoid rocks. Five thin sections under the microscope showed oligoclase, quartz, and greenish-brown biotite. The approximate modal range of composition based on four sections is: oligoclase, 66 to 76 per cent.; quartz, 17 to 27 per cent.; and biotite, 5 to 10 per cent. One specimen represents a more basic type and has the following approximate composition: oligoclase, 47 per cent.; quartz, 30 per cent.; biotite, 23 per cent. Accessory minerals present are sphene, apatite, epidote, magnetite, and minor amounts of secondary calcite and potash feldspar. Biotite tonalites are well represented by exposures along the south shore of the lake, in Granite bay, and elsewhere.

By the additional presence of hornblende the biotite tonalites become biotite-hornblende tonalites and by decrease in quartz content, typical diorites. Some of these are believed, from the position of their outcrop, to be hybrid types, as they form the contact phases of the granitic intrusives. The biotite-hornblende tonalites have the following approximate composition; plagioclase, 57 to 67 per cent.; quartz, 16 to 17 per cent.; and biotite plus hornblende, 17 to 26 per cent. They are dark-grey, fine- to medium-grained, at times porphyritic, with plagioclase phenocrysts 2 millimetres in diameter; whereas the diorites are dark-green and fine- to medium-grained, and appear in thin section to be more altered than the tonalites, suggesting that they are older or, at least, an earlier phase of the granitic intrusives. Biotite-hornblende tonalites are present on the south shore, and occur as a contact phase of the granitic batholith on the south shore at the west end of the West arm. Diorite is also found on the south shore west and north of the portage to Niska lake and may possibly represent contaminated tonalite or an earlier differentiate of the tonalite batholith. The accessory minerals in these types are sphene, apatite, epidote, and magnetite, as found in the tonalites.

The more acid phase of the granitic intrusives is represented by granodiorite. In the eastern part of the lake on islands south of the portage to Rahill lake and on an island north of the portage to Niska lake a coarse porphyritic biotite granodiorite is exposed. The crystals of brick-red feldspar have a maximum size of 10 by 50 millimetres and are set in a matrix of grey quartz up to 12 millimetres in diameter, white feldspar, and clusters of biotite. In thin section the phenocrysts of red feldspar are seen to be microcline. White oligoclase, greenish-brown biotite, and aggregates of quartz showing undulose extinction surround the phenocrysts. Quartz stringers occur in the microcline, and closely spaced microscopic fractures in the microcline combined with other evidences of crushing indicate that the rocks have undergone considerable strain. A typical modal

analysis of this type shows microcline, 36 per cent.; oligoclase, 37 per cent.; quartz, 22 per cent.; and biotite, 5 per cent. Accessory minerals are sphene, apatite, epidote, and magnetite.

Biotite granodiorites varying from unfoliated to slightly foliated, fine- to medium-grained, and cream, pink and grey, to pink in colour occur in all the granitic areas examined. From evidence presented later they appear to form the batholith adjacent to the north boundary of the volcanics from Finger lake east to the Bayly river, and a mass extending southeast from the islands south of the Rahill lake portage through Niska lake and across the Dawson river. Some are practically devoid of ferromagnesian minerals, and by increase in ferromagnesian content and decrease in potash feldspar these rocks pass over into tonalites. The range of composition as seen in five thin sections of biotite granodiorites is: plagioclase, 40 to 57 per cent.; microcline, 13 to 15 per cent.; quartz, 27 to 41 per cent.; and biotite, 1 to 6 per cent. Accessory minerals are apatite, epidote, magnetite, and sphene, although the last-named is sometimes absent. These rocks are the so-called pink granites. The pink and grey type is a biotite-hornblende granodiorite and is abundant in the West arm, where it is cut by the pink type. Biotite granodiorite was found at various places along the south shore from Rat House bay to the east end of the lake.

West Arm-Finger Lake

Between the West arm and Finger lake the outcrops of the granitic intrusives are mainly of the grey type, and a characteristic feature of this area is the abundance of coarse, pink pegmatite, which is present as dikes in practically every outcrop. Locally, some pink biotite granite is present. South of the Mission pinkish-grey granite is the prevailing type and is occasionally cut by coarse pegmatite dikes. This rock is probably a granodiorite and perhaps related to the batholith flanking the belt of volcanics on the north.

West Shore of West Arm and Islands

The west shore of the West arm presents an intermingling of grey and pink granites, as seen in the area between Sandborn and Rat House bays. Along some stretches of the shore grey biotite granite predominates, in others the pink; but in all cases the pink granite cuts the grey granite and is, therefore, apparently younger. In some of the outcrops pink granite or pink pegmatite is present abundantly as stringers, dikelets, dikes, and irregular masses cutting the grey granite. Similar relations were observed at the north end of this arm, and at some localities on the east shore of the north-south part of this arm, where granite interfingers with the volcanics. It is believed that all the grey granites are tonalites. The pink variety has frequently a low to negligible percentage of ferromagnesian minerals, and a specimen taken from the long ridge on Adams creek would technically be known as a leucogranodiorite. This possibly represents the northeastern extremity of a granodiorite batholith, and the area described above, a mixed zone formed adjacent to the boundaries of the batholith.

Rat House Bay

Away from the contacts with the country rock the granitic intrusives are medium-grained, foliated to massive, grey, pink, or grey and pink biotite granites. The two varieties, grey and pink, are often intimately associated, and quite frequently the outcrop presents a complex mixture of pink granite, grey granite, pink pegmatite, and greenstone inclusions. This mixture is present all along the shores of Rat House bay; in places one variety is more prominent than the other,

and the contamination due to the proximity of greenstone material is equally variable.

At a point 3 miles northeast of the narrows, at the outlet of the triangular part of Rat House bay, on both the north and south shores a coarse, grey granite shows a highly developed sheeting, the flat sheets of granite being spaced 2 feet apart; but in a zone 1 to 4 feet in thickness, which consists of fine-grained, grey biotite granite, the sheeting is spaced more closely, at intervals of half an inch to 2 inches.

Coarse- to medium-grained, pink and grey biotite granite, weathering pinkish, is the prevailing type in the 3 miles to the narrows. Secondary(?) epidote is sufficiently abundant to be quite apparent in the outcrops. Dikes of coarse, pink pegmatite are common.

The south shore of Rat House bay is characterized by the abundance of greenstone schlieren and inclusions in foliated grey granite with pegmatite as dikelets and *lit par lit*. The abundance of greenstone material strongly suggests that the axis of Rat House bay represents the site of some former syncline of volcanics, the base of which lay at no great height above the present land surface.

In the area between Rat House and Sandborn bays the outcrops show a frequent intermixing of both pink and grey granites cut by pink pegmatite dikes. Biotite-hornblende granite occurs in a number of localities and is probably due to the assimilation of volcanic material.

Along the south shore of Sandborn bay, where the contact between the granite batholith and the volcanic assemblage is exposed at frequent intervals, a variety of rock types were found. The low hill at the narrows at the west end of the bay is a white-weathering, coarse granite. East along the south shore coarse-grained, blue-grey, massive biotite granite outcrops. Back of the cliff-like outcrop of volcanics $1\frac{1}{2}$ miles east of the narrows at the west end of the bay the granite is foliated and has a vertical jointing parallel to the structure of the volcanics. In the small bay east of this cliff-like outcrop a greenish granite porphyry or granite outcrops $1\frac{1}{2}$ chains south of the contact, and the rock at the contact is characterized by small, jasper-red feldspar phenocrysts. A quarter of a mile farther east pinkish granite occurs at the contact, but within a few feet passes into normal, white-weathering, coarse, grey biotite granite.

In the northeastern part of Sandborn bay on the north shore, granite forms an arcuate area, with a maximum width of 3 chains, surrounded by coarse amphibolite on the land side and has an exposed width along the shore of approximately 10 chains. It is a coarse-grained, grey biotite granite with a hornblende pegmatite as a contact phase next to the amphibolite. The development of this hornblende pegmatite shows very clearly how great the assimilation of volcanic material can be under favourable circumstances.

Granite Bay

The mass on Granite bay is best exposed on the shores, and on the hills just southwest of the bay; there are a few outcrops in the area to the southeast and one on the main part of Sandy lake.

On Granite bay the rock is normally a grey, medium-grained, fairly massive biotite tonalite cut by 1- to 2-inch dikelets of aplite and pegmatite. Occasionally, rounded inclusions of greenstone from 1 to 4 inches in diameter are present. Near the contact with the volcanics on the west shore of the bay angular fragments of greenstone from 1 to 12 inches in diameter occur in the tonalite. On the southwest shore the tonalite is cut by a small basalt dike.

In the bush southwest of Granite bay a few small outcrops were found. One

was a massive biotite hornblende granite; another, biotite granite; and the third, a medium-grained, slightly foliated, chloritized biotite(?) syenite. On the main part of Sandy lake the single outcrop observed is a creamy-white, coarse-grained, massive, chloritized biotite granite.

These outcrops indicate the presence of a mass that consists of biotite tonalite and its allied phases, and appears to represent a satellitic stock related to the tonalite batholith of the southern and western parts of the lake.

South Shore, Adjacent Islands, and Niska Lake

Along the south shore from the site of the old post of the Hudson's Bay Company eastward to the portage to Niska lake, and on the islands adjacent to that shore, the prevailing granitic intrusive is a grey biotite granite. The varieties that have been studied in thin section under the microscope are biotite tonalites. The outcrops are frequently cut by or have *lit par lit* injections of pink pegmatite; and locally there is present some pink granite, which was in every case younger than the grey variety.

Diorite was observed at two places, on a point 6 miles west of the portage to Niska lake and on an island 2 miles slightly west of north of the same portage. As noted, the diorite appears to be a basic phase of the biotite tonalite.

East from the portage to Niska lake, and on Niska lake itself, pink biotite granodiorite is the common granitoid type, and phases of it, as seen on the islands south of the Rahill lake portage, are coarse-grained and porphyritic with phenocrysts of microcline up to half an inch by 2 inches in dimensions. This type is cut by dikelets of pink aplite. Pink granite also outcrops southwest of the narrow belt of volcanics that crosses the bay into which the Dawson river empties. These outcrops suggest the presence of a granodiorite mass with its long axis oriented in a northwest-southeast direction.

Finger Lake, Kakapitam Lake, Rahill Lake, Bayly River

On Finger lake both pink and grey granites occur and are frequently cut by pink pegmatite dikes. East from the Severn river past Kakapitam lake to Rahill lake only a few exposures of granitic intrusives were observed, owing to the extensive swamps and muskegs. On the Severn river and just east of it some coarse-grained phases of the granitic intrusives were found. These are pink, porphyritic biotite granites, which have phenocrysts of feldspar with a maximum diameter of half an inch. On the west shore of Kakapitam lake a coarse, pink biotite granite is exposed, and north of the Fidler river there are outcrops of pink, fine- to medium-grained biotite granite. The isolated outcrop between Fishtail bay and Rahill lake is a pink, porphyritic, biotite-poor granite with half-inch pink feldspar phenocrysts. The range of hills north of Rahill lake and outcrops to the northeast are composed mainly of pink biotite granite with marginal hornblende syenite phases. Some of the granite is porphyritic.

North of the Bayly river the granitic intrusives near or at the contact with the volcanics are grey, porphyritic biotite granite cut by pink granite dikes. Two miles north of the mouth of the Mort river there is believed to be a tongue of granite splitting the belt of volcanics. Only one large outcrop is known in this area, and it is a medium-grained, white-weathering, pink, biotite-poor granite.

The above summary shows an overwhelming predominance of pink granites in this stretch of territory. As such types from other localities that have been studied microscopically are found to be granodiorites in composition, this batholithic area is, therefore, considered to be mainly of granodioritic composition.

Rottenfish Lake Area

The granitoid rocks adjacent to the belt of volcanics east of the northeast arm of Sandy lake are grey, massive, medium-grained biotite hornblende or hornblende types, probably tonalites, and it appears that the presence of hornblende is characteristic of the marginal phase of the batholith. Some of the phases are low in or lack quartz and are probably diorites. The actual contact between the batholith and the belt of volcanics was seen towards the north end of the mapped area, and at that place the grain of the granitic intrusive remained medium-grained right to the actual contact. In this marginal area there is only a minor amount of pink pegmatite occurring as dikes.

On Sandy lake where the contact is again exposed, the marginal phase of the batholith is a banded, dark-grey, porphyritic biotite granite gneiss with *lit par lit* stringers and dikelets of pink pegmatite.

In the few outcrops observed on Rottenfish lake and the country to the east, the granitic intrusives are in part highly gneissic or extremely foliated, and it is thought that some of these igneous rocks are probably considerably older than the Algonian type. A typical outcrop is represented by a low hill east of Rottenfish lake, which is a well-banded, injected granite gneiss, consisting of bands of medium-grained, pink, ferromagnesian-poor granite, with a maximum width of 2 feet, as *lit par lit* in a biotite augen granite gneiss, the whole cut by pink pegmatite dikelets lying parallel to or across the gneissic structure.

West of the south end of Rottenfish lake, there is a foliated, medium-grained, chloritized biotite granite with pink feldspar augens 3 millimetres in diameter. On the east and west shores half a mile south of the outlet of the lake, foliated, grey and pink, aphanitic to fine-grained acid gneisses with bands of dark-green or grey hornblende feldspar porphyries occur. At the extreme north end of the lake and just west of the river are several outcrops. One forms a ridge rising about 40 feet above the river and consists of a fine-grained, white leucogranite and granite gneiss with linear inclusions. Somewhat similar acid, white-weathering, grey, highly sheared, fine-grained leucogranite outcrops in the bush to the west and is associated with highly sheared and minutely crenulated, dark-grey porphyritic granite gneiss.

The granitic intrusives found outcropping along the shores of the narrow part of Sandy lake for 8 miles above the falls at its outlet are massive, medium-grained, pink biotite granites or grey and pink biotite granite gneiss, frequently showing a marked twisting of the bands or minor drag folds and crumpling. Both varieties are cut by numerous dikelets or have *lit par lit* injections of pink pegmatite.

This area is one of some complexity, and although many of the granitic intrusives may be confidently assigned to the two main batholithic varieties the presence of certain gneisses strongly suggests the existence of older granitic rocks.

Economic Importance of the Intrusives

The relative economic significance of the granodiorite and tonalite batholiths is of some importance. The occurrence of gold at a number of localities along the north shore of the lake and the showings near Rahill lake off the north end of a smaller granodiorite batholith suggest but do not prove that the granodiorite came from the gold-bearing magma of the region. Hurst¹ has drawn attention to the economic significance of the more acid granites in the Favourable Lake area. If only the acid granites were the source of ore deposition, then the lack

¹M. E. Hurst, op. cit., pp. 65, 66.

of economic mineralization adjacent to the Granite bay stock of grey biotite tonalite and in the West arm, where the volcanics and associated sediments are enclosed by a batholith mainly composed of the grey granite (tonalite), is accounted for.

PEGMATITE, APLITE

As mentioned in the previous section dikes of pegmatite are abundant throughout many of the batholithic areas, and were also found at some localities in the belts of volcanics close to the granitic masses. Aplite, while not so abundant, is not uncommon. No special study was made of the pegmatites or aplites. They are nearly all pink in colour and vary considerably in the grain size of their constituent minerals. One specimen from the south shore was examined microscopically and was determined to be an alaskite. It occurred as a dike cutting grey granite (tonalite).

PORPHYRIES, FELSITE

Porphyries, presumably of Algonian age, are not widespread. They occur in two areas, at the outlet of Granite bay and on the narrows west of the Hudson's Bay Company post, and at the east end of Sandy lake. As previously mentioned, a large number of sheared porphyries are present in the area and these have been described under the section dealing with the Keewatin-type rocks.

At the outlet of Granite bay and along the narrows are a number of small dikes of quartz feldspar or feldspar porphyry. A number of the dikes trend nearly north and south, but others have various strikes. They range in width from a few feet to 75 feet. These porphyries are fresh-looking, fine-grained, grey rocks with blue-grey feldspar phenocrysts 1 by 3 to 5 by 7 millimetres in size. They are tonalite or dacite porphyries.

At the east end of the lake a number of different types of porphyries cut sedimentary rocks. They range from aphanitic to medium-grained types. Some of these rocks may be older porphyries and should possibly be classed with the Keewatin-type. A fresh rock outcropping as a dike in the same locality is very similar to those found in the narrows near Granite bay. When studied microscopically it is found to be dacite porphyry. It consists of blue quartz eyes and white feldspar phenocrysts in a dark-grey, aphanitic groundmass. Other types represented are buff-coloured, quartz-eye porphyries and white porphyries with grey quartz eyes. At the southeast end of this area, the porphyries form the major part of a *lit par lit* injected zone, which appears to have been andesitic volcanics, traces of which remain as bands from a few feet up to 20 feet in width.

Throughout the area a number of buff-coloured, white-weathering, aphanitic acid dikes were observed cutting the members of the volcanic or sedimentary groups. These dikes may be rhyolitic in composition, but owing to their very fine grain and alteration it is impossible to determine their true composition, and for the purpose of this report they are classified as felsite.

Keweenawan(?)

Igneous rocks lithologically similar to Keweenawan types elsewhere in the shield were found at a few localities in the area. All are dikes, and the most important are located as follows: (1) Northwest arm, (2) crossing the West arm, (3) crossing the south shore at about the middle of the lake, and (4) on the "boot" west of Fishtail point. A number of smaller aphanitic dikes were also found.

The dike in the Northwest arm has an average width of 150 feet, strikes N. 5° E., with a vertical dip, and cuts dacite porphyry, andesite, and probably

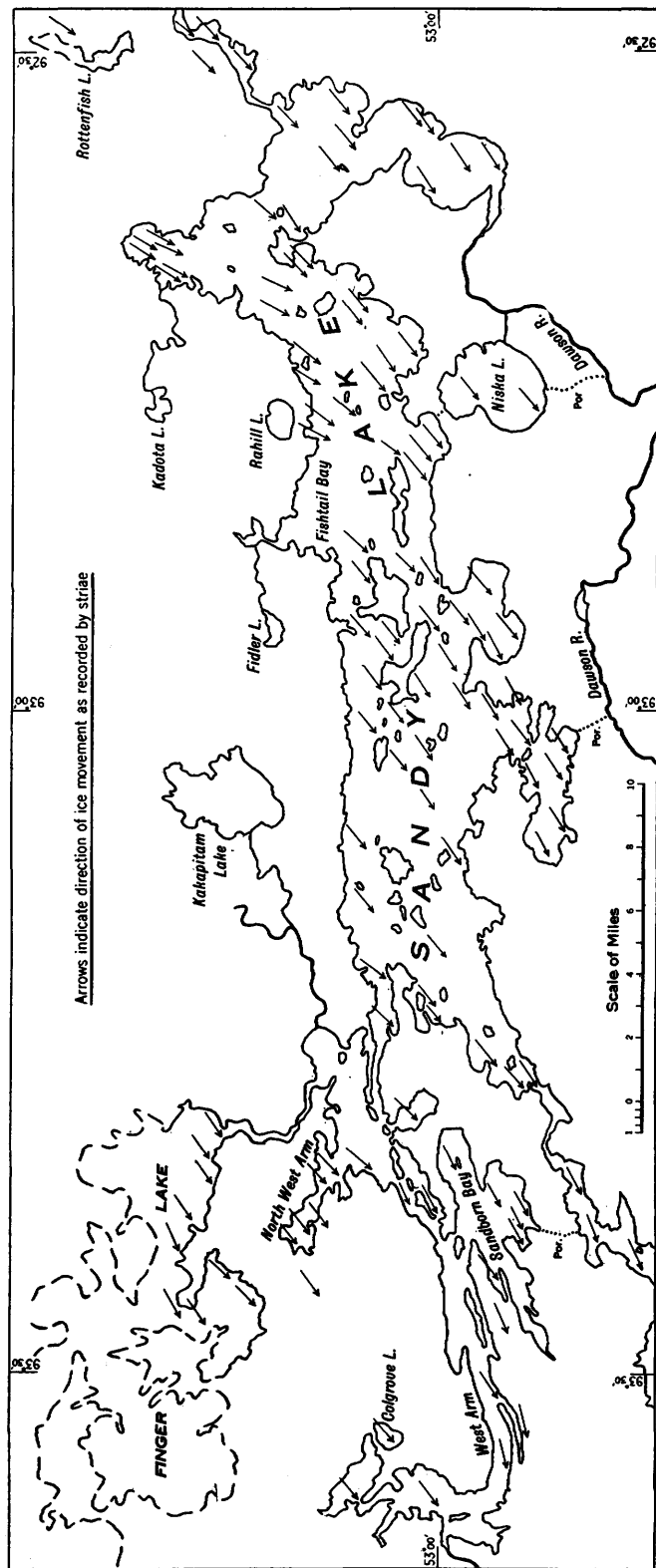


Fig. 2—Sketch map of Sandy lake showing the movement of the continental glacier as indicated by striae.

the tonalite. It is a dark brownish-green rock of medium grain, which under the microscope is seen to consist of plagioclase and augite in about equal amounts, with the following accessory minerals: ilmenite showing grid texture and alteration to leucoxene, red-brown biotite, epidote, and apatite. The rock has been considerably altered, the plagioclase crystals being crowded with grains of zoisite. Chlorite replaces the groundmass and some of the augite and plagioclase.

Crossing the West arm and trending N. 5° E. to N. 15° E. a gabbro dike has been picked up at intervals over a distance of about 4 miles. The width averages 100 to 130 feet, but the outcrop at its southern extremity shows a width of only 60 feet. The dike cuts and shows chilled margins against granite and sheared andesite. The contact with the granite is especially well displayed in a small bay of the West arm. The dike is lithologically similar to the one described in the Northwest arm.

On the south shore of the lake about 9 miles west of the portage to Niska lake two exposures indicate a dike 2 chains in width, trending N. 25° E. The rock is dark-green and fine-grained, and the microscope shows it to be a fairly fresh and very typical Keweenaw type of quartz diabase, such as could be matched in the Cobalt area or elsewhere. The minerals present are labradorite, augite, and micrographic intergrowths of quartz and an alkali feldspar, with iron ore as an accessory mineral.

About a mile east of the dike described above, a small, dark-green aphanitic dike 10 feet in width, striking S. 10° E., cuts the tonalite. Microscopically, it is seen to consist of small phenocrysts (half a millimetre in diameter) of augite, plagioclase, titaniferous iron ore, and a little pyrite. The rock is a porphyritic basalt and is probably related to the quartz diabase dike just described. Somewhat similar narrow, greenish, aphanitic dikes, 1 to 5 feet in width, were seen to cut tonalite and pegmatite dikes in Granite bay. The dikes have strikes of S. 62° E., S. 5° W., and S. 25° E., and steep to vertical dips.

One other diabase dike was found near the north shore of the lake in the heel portion of the "boot," 2½ miles west of Fishtail point. This dike cuts andesite and iron formation, varies in width, and is somewhat difficult to trace. It does not outcrop along the shore. It is rusty-weathering and very similar to the quartz diabase dike from the south shore described above.

On a burnt rock ridge at the northeast side of Fishtail bay, a 3- to 4-foot irregular dike composed of porphyritic quartz basalt cuts a metamorphosed andesite and Keewatin-type porphyry.

Pleistocene

Sandy lake during Pleistocene times was covered by the continental glacier, and on its retreat a large lake was formed in which varved clays were deposited. These varved clays as now exposed in the banks on the lake have thicknesses from a few feet up to 25 feet. Diamond-drilling by Prospectors Airways Company, Limited, in the Northwest arm showed thicknesses of 13 to 41 feet of clay, and in a number of cases this clay was underlain by 1 to 9 feet of gravel before bed rock was reached. On Rat House bay near the main part of Sandy lake, bed rock was found in one place to be overlain by 2 feet of sand, then by varved silts, which passed upwards into typical varved clays, the whole having a thickness of 20 feet.

The varves range from half an inch to 2 inches in thickness. Taking the greater thickness of the varves and a total thickness of 40 feet of clay, it is ap-

parent that the post-glacial lake existed for 240 years, a figure in keeping with that noted by the writer in the Sachigo River area.¹

The movement of the continental glacier (see Fig. 2), as indicated by glacial striae, based on an average of 110 readings, was S. 50° W. This figure applies to the whole lake except the east end; from the Rahill lake portage northeastwards into the north arm 18 readings of striae indicate that the movement was in a direction S. 32° W. Farther east in the country just east of Rottenfish lake, the striae, as indicated by 14 readings, trend S. 44° W.

At some localities readings were obtained very much "off" from the average, and in a number of cases these can be definitely assigned to the control exerted by the underlying rock structure, the directions of the striae and structure being essentially parallel. Such cases are found in the West arm.

In Sandborn bay striae on vertical cliff faces and on the under side of overhanging rock masses strongly suggest the existence of deep valleys prior to glaciation.

The figure of S. 32° W., obtained as an average for the Rahill lake-Bayly river part of the lake, may be correlated with the influence of the underlying rock structure, which has the same trend. This parallelism can only be accounted for by assuming that the ice followed a channel way already parallel to the rock structure, as the ice movement in the area to the east was S. 44° W.; it must also have been deflected more to the south in this one area, since in the bay into which the Dawson river flows the movement is S. 53° W., which is very close to the regional trend.

Toward the east end of the lake the glacial deposits consist of sand, gravel, and boulders, as well as varved clay. East of Rottenfish lake, gravel-sand ridges or hills have, in part, lobate margins and may represent kame deposits. A number of small boulder ridges, such as those on Niska lake and the Dawson river bay are possibly portions of eskers.

STRUCTURAL GEOLOGY

Folding

Throughout the area members of the volcanic and sedimentary groups have been tightly folded and now stand with steep to vertical dips.

On Sandy lake, owing to the varying degrees of metamorphism, criteria for the determination of the attitude of the strata or flows are rarely available for interpretation. At some localities, apparently undisturbed pillow structures in the lavas were used to determine structure, but for the most part the attitudes of minor drag folds were the only sources of information available.

In the area underlain by the volcanic group between the Northwest arm and Finger lake, drag-folding in the dacite porphyry on a hill just west of the west end of the Northwest arm indicate that the outcrop is on the south limb of a syncline plunging S. 65° E. The dips of the flows are vertical or 85° S., indicating a tightly-folded syncline with a slight overturning of the southern limb. Where the syncline is truncated abruptly by the granitic batholith to the northwest, the flows have attitudes parallel to the contact, with dips of 65° to 75° S.E. The granite batholith to the south of this area would, therefore, occupy the core of an anticline, which noses out at the junction of the Northwest and West arms.

The area of Keewatin-type rocks occupying the West arm consists mainly of volcanics with a narrow belt of sediments. At the junction of the Northwest and

¹J. Satterly, Ont. Dept. Mines, Vol. XLVI, 1937, pt. 4, p. 25.

West arms drag folds in the volcanics north of the sediments show that the tops face south. In the centre of the belt west of the outlet of Sandborn bay, pillow shapes show that the tops face north. On Colgrove lake, drag folds in the sedimentary schists indicate the presence of a syncline whose axis trends S. 30° E., with a low plunge of 15° S.E. On the south shore of the bay at the extreme north end of the West arm, a drag fold shows that a syncline lies to the north and plunges steeply southeast. These four determinations seem to show that the narrow belt of sediments probably represents the site of a synclinal trough. The rocks are tightly folded and in the eastern part of the belt have in the main steep dips; but north and south of Colgrove lake, the dips average 45 to 60 degrees. In the extreme north bay of the West arm the structure is probably more complicated, the frequent occurrence of sediments strongly suggesting repeated minor folding. This syncline peters out to the east in the bay south of the mouth of the Stain river; to the west it is cut off by the granite batholith.

In Sandborn bay structural data were only found in members of the sedimentary group. Cross-bedding in a quartzite bed and drag-folding in a limestone bed indicate that the tops face south. The axis of the syncline trends N. 75° E. and plunges steeply east. In the iron formation on the south shore of the bay, drag folds suggest that the tops are to the north, the axis of the synclinal fold trending S. 65° E. and plunging steeply northwest.

Owing to the presence of the gabbro-diorite sills, the structure may be more complex and more than one fold may be present. It would appear that there is a syncline of sediments with part of the south limb cut out by the granitic batholith. Across the whole belt of sediments the bedding dips 60° to 85° N., so that the north limb of the syncline is markedly overturned. The patches of sediments on the chain of islands in the centre of the lake as far east as Fishtail point may represent the extension of the axial portion of the fold. Two determinations show that the sedimentary beds have their tops facing north.

No data are available for the section between the West arm and the southern part of Sandborn bay, but from the above data it is inferred that there is an anticlinal structure and that the pillowed lavas present in Sandborn bay represent the same horizon as that in the West arm, repeated by folding. It is further inferred that the Granite bay tonalite mass occupies a domed part of this anticlinal fold. This doming is well shown by the attitude of the volcanic rocks, which swings from a strike of northwest to north to northeast around the west edge of the tonalite mass. It is not known whether this anticline continues eastward, but the small mass of tonalite south of the "boot," 2½ miles west of Fishtail point would, on the assumption of its continuance, occupy the site of a dome similar to that of Granite bay.

In Fishtail bay, pillow lava shapes indicate that the tops face south. No data for structural determination were found eastwards or westwards to the mouth of the Stain river. On the east shore and on islands of the northeast bay three determinations on pillow shapes, one of which showed the pillows passing into a coarse-grained flow to the east, indicated that the tops face west to northwest. As the belt of iron formation present in this part of the lake lies southeast of the belt of pillowed lavas, but is believed to be the same belt of iron formation as that exposed along the north shore of the lake west from Fishtail point, it is inferred that a synclinal axis lies in the water and trends southward from the mouth of the Mort river, swinging to the southwest and finally west and passing just north of Fishtail point. Strikes and dips in the lavas north of the Mort river conform to this interpretation of the structure, and the strikes swing around the granite mass with dips steeply to the east, north, and west. The granitic

mass has possibly been intruded along the synclinal axis, but more detailed work may find further data to form a basis for other interpretations.

The above structural interpretations are summed up in Figure 3, which indicates the positions as deduced by the writer for the anticlinal and synclinal axes.

Fracturing and Shearing

Stresses in an east-west direction have resulted in the development of fractures or shear zones, or in drag folds with vertical axes.

The fractures indicate that the movement was such that the north side was displaced eastward with respect to the south side of a given rock mass. The fractures so developed trend N. 20° E. to N. 60° E. A few of these fractures have been filled by quartz veins or dike rocks. Fracturing along these lines of weakness was repeated more than once, as evidenced by the shattering or crushing of the filling material.

Many minor drag folds throughout the area have steep to vertical dips and from their shape indicate that the north side has moved east relative to the south side, the movement being one with a horizontal component and a negligible vertical component. These vertical drag folds are believed to be due to stresses later than those that caused the folding of the members of the volcanic and sedimentary groups.

Where the rocks were incompetent, stresses resulted in shearing; and shear zones parallel to the structure of the metamorphosed lavas are very abundant along the north shore of the lake.

ECONOMIC GEOLOGY

During the summer of 1937, Sandy lake was actively prospected. The various types of mineralization found may be summarized as follows:—

1. Quartz veins, with or without tourmaline, showing varying amounts of sulphides (pyrite, pyrrhotite, chalcopyrite, sphalerite, galena), usually narrow and frequently showing visible gold.
2. Mineralized porphyry or rhyolite dikes.
3. Silicified zones in porphyry.
4. Calcite quartz veins in the volcanics.
5. Shatter or crush zones along fractures, or in dikes following fractures, trending N. 20° E. to N. 60° E. across the volcanics.
6. Shear zones in the volcanics or along contacts between members of the volcanic group and other rocks.
7. Rust zones in sedimentary interbeds in the volcanic group, or at certain horizons in the sedimentary group. The sulphide may be pyrite or pyrrhotite.
8. Mineralized iron formation.

Prospecting Possibilities

The discoveries indicate that gold is widely distributed on Sandy lake. The belt is a long one, and it would appear likely that its possibilities have not been entirely revealed. At the present time the showings lack either values or widths to make them deposits of economic importance. Further prospecting of the area underlain by the dacite porphyry in the Northwest arm may uncover economic mineralization. The most likely type of occurrence would appear to be quartz veins filling fractures that cut across the regional structure of the volcanics. It does not seem likely that mineralized shear zones in either the volcanic or sedimentary groups will prove important economically.

Clay Deposits

In this report mention has been made of the extensive deposits of glacial varved clays on Sandy lake. The deposits range in thickness from a few feet up to a known maximum of 41 feet.

Hurst¹ submitted a sample of the varved clay from a typical exposure on the north side of the West arm of Sandy lake to R. T. Montgomery, of the Ceramics Department, University of Toronto, and the latter's report is repeated here:—

This clay is grey in the dry state and fine-grained, and contains no stones. Water required for plasticity is 34 per cent., giving a very smooth plastic mass, rather sticky if a slight excess of water is used, and so fine grained that it dries with difficulty. It would probably give trouble in rapid commercial drying.

A sieve test gave a residue of only 0.15 per cent. on a 200-mesh screen. This residue was composed mostly of roots and plant remains with a little silica sand and miscellaneous rock fragments. The fusion temperature or pyrometric cone equivalent is 2,138° F. or cone 2, giving a dark-brown fused mass. Test with acid indicates a rather high percentage of lime. The drying shrinkage is 11.1 per cent., which is quite high. A normal shrinkage for this type of clay is from 6 to 8 per cent. This means that in working, a non-plastic, such as sand, would probably be necessary to reduce the shrinkage and allow safe drying. The clay burns to a buff colour because of the high lime content, and at cone 6 or 1,900° F. the burning shrinkage is 0.8 per cent. The low burning shrinkage is due to the lime.

This clay is probably of glacial origin as suggested. It would be classed as a young, impure surface clay. It could probably be manufactured into buff common or possibly face brick and drain tile. It would require sand or other non-plastic to give a suitable body. Unless it is near some centre of population it would have very little economic value.

DESCRIPTION OF PROPERTIES

Dubeau-Dussault

The Dubeau-Dussault group consists of 5 recorded claims, Pa. 3,158-3,162, and is located on the north shore of the Northwest arm of Sandy lake. This group, along with the Sandborn group, was optioned to the Prospectors Airways Company, Limited, in the autumn of 1936. The company did 1,500 feet of drilling from the ice in the spring of 1937. Results were disappointing, and the option was dropped.

There are two showings, both located on claim Pa. 3,158. The country rock is the somewhat sheared dacite porphyry, which locally shows a fragmental structure. The strike of the shearing in the porphyry is S. 53° E., and the dip 85° N.E. to vertical. At the shore the porphyry is cut by a 4- to 6-inch quartz vein striking N. 33° W. Trenching for 40 feet northwest along the strike exposes the vein, and it has been picked up again in a small bay at 55 to 80 feet from its first exposure. At these points its width is 6 inches and 3 inches, respectively. The vein consists of sugary, white quartz showing a poorly banded structure due to streaks of biotite schist. Mineralization is sparse, being confined to small cubes of pyrite. A character sample of this vein material assayed 0.39 ounces of gold per ton. Very high assay values are reported, as locally visible gold is present.

The other showing, approximately 300 feet west of the first, is a silicified zone in the porphyry. Drilling by the Prospectors Airways Company indicated a lenticular silicified zone with a maximum width of about 15 feet. Sugary, white quartz mineralized with pyrite formed from 10 to 50 per cent. of the zone, and the gold content is reported to have ranged from a trace to a high of 0.18 ounces per ton. The trend of this zone as indicated by the drilling is approximately north and south, and the length may be 100 feet.

¹M. E. Hurst, Ont. Dept. Mines, Vol. XXXVIII, 1929, pt. 2, p. 84.

Sandborn

The Sandborn group consists of 18 recorded claims, Pa. 2,965-2,981 and 3,030 in the Northwest arm of Sandy lake. There are two showings. This group was under option to the Prospectors Airways Company, but the option was dropped in July, 1937.

Cream-coloured, soft-weathering dacite schists, striking S. 75° E. and dipping 85° N., outcrop on claims Pa. 2,969 and 2,966 on the north shore of the Northwest arm. In these schists, parallel to the schistosity, a 5- to 6-inch cherty, blue-grey quartz vein carries a minor amount of pyrrhotite and pyrite in fractures. An assay of the quartz gave 0.03 ounces of gold per ton. For a width of 63 feet immediately south of this occurrence are alternating bands of grey and cream-coloured dacites. The last 10 feet are rusty-weathering and contain disseminated pyrite. A grab sample taken by the writer assayed 0.04 ounces of gold per ton. The cream-coloured dacite schists contain quartz-eye remnants and are believed to represent zones of the grey dacite that have been intensely altered by hydrothermal action.

On claim Pa. 2,974, at the mouth of a small stream at the extreme west end of the Northwest arm, a silicified zone has been trenched on the east and west sides of the stream. The country rock is an amphibolite representing a metamorphosed andesitic volcanic. On the east side a silicified breccia zone 7 feet in width trends S. 75° E., with a vertical dip. The quartz is sugary white and carries a little coarse pyrrhotite and pyrite, and chlorite cements the quartz fragments. A character sample of this material assayed 0.02 ounces of gold per ton. On the west side of the stream, on the above-mentioned strike, a siliceous, dark-grey biotite-quartz schist forms a 4-foot interbed in the amphibolite. In this interbed lenses and ribbons of greyish, sugary quartz occur parallel to the schistosity, which strikes S. 75° E. A little pyrite is present in the quartz and in the schist. An assay of this material showed only a trace of gold per ton.

Tully-Burton

The Tully-Burton group consists of 14 recorded claims, Pa. 3,041-3,051 and 3,146-3,148, situated between the west end of the Northwest arm of Sandy lake and Finger lake. There are two showings, the more important one being on claim Pa. 3,049. The country rock is a metamorphosed pillowed andesite forming a prominent east-west ridge. The showing is a mineralized silicified zone lying just south and west of the ridge. The zone has been trenched along the strike at 30, 130, and 210 feet west from the first trench. These trenches expose a banded chlorite-magnetite rock carrying lenses and ribbons of whitish and greyish to black quartz mineralized with splashes of pyrite and fine disseminated pyrrhotite. The zone ranges in width from 12 to 30 feet and is probably a variety of iron formation. Panning of the surface material was reported to show much visible gold. Grab samples taken by the writer from the above-mentioned trenches assayed 0.13, 0.02, 0.06, and 0.05 ounces of gold per ton.

The other showing is on claim Pa. 3,042 and consists of a quartz vein, which has been trenched for 90 feet. The country rock is a quartz-eye porphyry. The vein strikes north-south and ranges in width from 2 to 4 feet. The quartz is glassy-white and shows no sulphide. An assay for gold on a grab sample taken by the writer gave only 0.02 ounces per ton. The porphyry on the east side of the vein is slightly mineralized with coarse pyrite and is reported to pan gold. None, however, was found on assay of a grab sample taken by the writer.

Moar

The Moar group consists of 3 claims, Pa. 3,241-3,243. The showing is a highly silicified and heavily mineralized zone in dacite porphyry on the shore of the Northwest arm of Sandy lake on claim Pa. 3,241. The sulphide is pyrite, which occurs as coarse splashes, and the width of the zone is approximately 10 feet. A grab sample of this material assayed 0.01 ounces of gold per ton. The deposit was drilled in the spring of 1937.

Dubeau Galena Showing

On an island just southwest of the mouth of the Stain river, $2\frac{1}{2}$ miles east of the Mission, there is a small galena showing. Dacite porphyry and greenstone outcrop on the island. Galena is present at several places, and galena-sphalerite float can be seen along the shores at low-water level. On the north side a silicified greenstone shows irregular lenses and stringers of rusty, sugary quartz carrying some pyrite and, locally, a considerable amount of friable galena. The deposit is very small and may indicate that perhaps more mineral may be present in the lake to the northwest. A grab sample of the quartz carrying galena assayed 0.03 ounces of gold per ton.

Walters-Shephard

The Walters-Shephard group consists of 6 claims staked on the "boot," a point on the north shore of Sandy lake approximately 3 miles west of Fishtail point.

The country rock is a pillowed andesite with interbedded iron formation and grey pillowed basalt. The regional strike is approximately east-west with a vertical dip. Cutting across the structure is a glassy, grey to white quartz vein, which has been traced by intermittent stripping for a length of about 400 feet. The trend of the vein varies from N. 40° E. to N. 55° E. One test pit, 4 by 12 feet and 1 foot in depth, exposes a 30-inch shattered zone in the pillowed andesite. Here the quartz vein, which ranges from 3 to 9 inches in width, lies on or close to the north wall of this zone. Mineralization in the vein is sparse, there being a little chalcopyrite and pyrite present as splashes and streaks. Visible gold was shown to the writer but is apparently scarce. Assays are reported to have been low. The vein peters out to the northeast against a band of iron formation.

White

Two showings are present on the White group. One of these occurs in a group of 16 recorded claims, Pa. 3,818-3,833, located on the west side of Fishtail bay on the north shore of Sandy lake. The country rock is a fine-grained, fairly massive andesite. On claim Pa. 3,822 at the shore a fracture zone with a maximum width of 15 feet, trending N. 28° W., occurs in the andesite. The fractures in this zone, which are mostly only a fraction of an inch in width, are filled with white calcite, and in one place in the centre there is a lenticular vein of coarse, pearl-grey calcite, with a maximum width of 6 inches. Pyrite is found sparingly as cubes and as a fine dissemination. In one pit the fractured andesite is cemented with glassy-white quartz forming a vein 6 to 9 inches in width. The quartz is heavily mineralized with pyrite, some sphalerite, and a very little galena. A grab sample of the best-looking material assayed 1.25 ounces of gold per ton. Much higher gold values are reported. The showing has been exposed by stripping, shallow trenches, and test pits spaced over a distance of 200 feet.

The other showing is in the northeast corner of Fishtail bay. The find is on a burnt rock ridge, which consists of massive, medium-grained amphibolite (metamorphosed andesite) intruded by a grey, fine-grained, white-weathering quartz-feldspar porphyry. Cutting both the amphibolite and the porphyry is a 3- to 4-foot irregular dike of Keweenawan basalt porphyry. Crossing this ridge is a fracture trending N. 20° E., which has been traced for 10 chains by small test pits and trenching and cuts across both the quartz-feldspar porphyry and the amphibolite. There may be some displacement along the fracture. Grey to white quartz fills the fracture and occasionally attains a width of 6 inches. Sulphide mineralization in the quartz is negligible, except on the vein walls, where pyrite, pyrrhotite, and chalcopyrite occur as irregular splashes and specks. The writer understands that gold was panned along the entire length of this fracture-filling.

Hansen

A group of 8 recorded claims, Pa. 4,081–4,088, was staked by C. K. Hansen in July, 1937, on the north shore of Sandy lake, south of Rahill lake. The showing is on claim Pa. 4,081, on the top of a burnt hill about one mile west of Rahill's old cabin.

The burnt hill exposes pillowed andesite cut by a number of narrow, dark-grey rhyolite or rhyolite porphyry dikes. The find consists of a mineralized shattered zone within or close to one of the rhyolite dikes. Stripping over a length of 95 feet and 9 test pits seems to indicate a continuous mineralized zone, 300 feet long and ranging in width from less than 1 inch up to 4 feet. From south to north the first 150 feet is a heavily mineralized zone from a fraction of an inch to 3 feet in width; for the remainder of the exposed length mineralized rhyolite constitutes the showing. The general trend of the zone curves from N. 20° E., for the first 50 feet, to N. 35° E., for the next 50 feet, to N. 50° E., for the last 200 feet. The dip is vertical. The mineralization is slight to heavy and consists of fine disseminated to coarse pyrite. Quartz is present in parts of the zone. Some sphalerite is present in the mineralized rhyolite. A grab sample of this material assayed 0.11 ounces of gold per ton. The andesitic wall rock is quite frequently mineralized with fine pyrrhotite and, more rarely, with chalcopyrite. Widths up to 3 feet were observed.

Adams

Two groups of recorded claims have been staked by D. H. Adams and C. K. Bayly on the north shore of Sandy lake, near Rahill lake. One of these groups consists of 10 recorded claims, Pa. 4,053–4,056, 4,059–4,063, and 4,068; and the other of 6 recorded claims, Pa. 4,055, 4,057, 4,058, 4,064, 4,066, and 4,067. The only showing is on claim Pa. 4,081. Trenching and test-pitting indicate a length of approximately 450 feet. The showing appears to be a mineralized shattered zone in a rhyolite dike, although little or no trace of rhyolite remains. The dike and mineralized zone trend S. 25° W. to S. 45° W. and cut across the structure of the pillowed andesites, which trend in an east-west direction. The mineralized zone ranges from 2 to 30 inches in width and pinches out in some places. Near the boundary line between the Hansen and Adams claims, i.e. the line between claims Pa. 4,068 and 4,081, the crushed rhyolite is heavily mineralized with pyrite and a lesser amount of sphalerite. A grab sample of this material assayed 0.10 ounces of gold per ton. To the south the sulphide mineralization is heavier, and in some of the test pits practically solid pyrite is present in widths up to 6 inches. Quartz occurs in some of the pits. It is reported that the best assays

were obtained when quartz and sphalerite were present in the samples. Very low gold values are reported from the solid sulphide sections.

Three claims have been staked by D. H. Adams and C. K. Bayly on an island just off the north shore of Sandy lake, about $1\frac{1}{2}$ miles east of the Rahill lake portage. These claims adjoin the recorded claims Pa. 4,067 and 4,057. The country rock is andesite, locally showing pillow structure. On the south side of the island the fracturing in the andesite trends N. 50° - 70° E. and S. 55° E., and a 6- to 12-inch quartz vein follows a zigzag course for 31 feet. A carbonated, slightly mineralized, greenish-grey quartz porphyry dike, trending N. 45° E. and approximately 15 feet in width, cuts the andesite and is cut by the quartz vein. The quartz is glassy-white to grey in colour and is locally mineralized with coarse pyrite. In places small vugs are present in the quartz, and these are lined with pyrite. Most of the quartz is barren, but one edge of the vein will pan gold, and it is understood that this section of the vein gave good assays. Narrow stringers of quartz occur sparingly in the porphyry and contain a minor amount of chalcopyrite. Trenching and test-pitting were in progress in mid-September, 1937.

Other Mineralization

In a band of iron formation interbedded in a grey pillowed lava in the small bay just west of Fishtail point a considerable amount of chocolate-brown sphalerite and secondary quartz is present. A sample assayed for gold gave 0.08 ounces per ton.

Samples of the mineralized sedimentary interbeds found in the volcanics on the West arm of Sandy lake assayed a trace to 0.02 ounces of gold per ton.

Geology of the North Spirit Lake Area

By J. D. Bateman

INTRODUCTION

North Spirit lake lies in the Patricia portion of the district of Kenora between north latitudes $52^{\circ} 10'$ and $52^{\circ} 35'$ N. and longitudes $92^{\circ} 35'$ and $93^{\circ} 20'$ W. It is approximately 170 miles north of Sioux Lookout or Hudson on the transcontinental line of the Canadian National railway, and 40 miles southeast of Favourable lake, where an underground mining operation is now proceeding at the property of Berens River Mines.

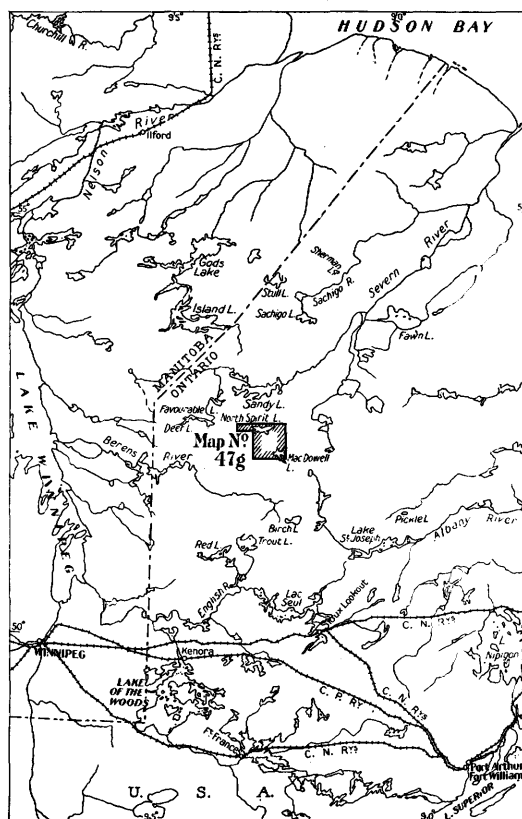


Fig. 1—Key map showing the location of the North Spirit Lake area. Scale, 160 miles to the inch.

As a result of reports of discoveries of gold-bearing arsenopyrite made in the vicinity of North Spirit lake in the early spring of 1936, the area was visited by representatives of a number of exploration and mining companies, and several groups of claims were staked, for the most part adjacent to the original discoveries. Subsequent investigations by prospectors disclosed a broad belt of sedimentary and volcanic rocks extending for some distance southeast of North Spirit lake.

In 1937 the writer, with three assistants, made a general reconnaissance geological survey of the area, the party being engaged in the field for almost four

months, from early June until late September. The work resulted in defining the North Spirit Lake area as a sedimentary-volcanic belt, extending southeast of North Spirit lake, through Hewitt lake to MacDowell lake, a distance of 22 miles, and averaging 5 to 8 miles in width. Northwest of North Spirit lake the sediments extend as a narrow belt for at least 20 miles and pass south of the Favourable lake belt of volcanic-sedimentary rocks mapped by M. E. Hurst in 1928.¹ The North Spirit lake sedimentary-volcanic belt thus has a total length of at least 42 miles and has not yet been delimited to the northwest. It may connect with an extensive area of volcanics that is reported by prospectors and Indians to lie west of North Spirit lake and south of Favourable lake. The boundaries of the North Spirit lake area are geological, as the sedimentary-volcanic belt is surrounded by granite and granite gneiss.

Advance copies of maps issued by the Topographical Survey, Department of Mines and Resources, were used as base maps. These were constructed from east-west vertical air-photograph sections through the central and southern part of North Spirit lake, and from oblique aerial photograph sections for the remainder of the area. The photographs were taken by the Royal Canadian Air Force. Some additions and corrections were made to the base maps. The shore geology of the waterways was recorded in detail, and the intervening sections were covered by pace-and-compass traverses. The extensive magnetic iron formation east of South bay in North Spirit lake disturbs compass readings for a radius of about 6 miles, and the complex geology of that section was mapped with difficulty.

Acknowledgments

During the summer the party was dependent on the efficient and punctual aircraft transportation service provided by General Airways, Limited, and the many courtesies extended by the late J. H. McCoy, and by E. Waller and G. C. Nickels, pilots of that company, are gratefully acknowledged. The party is also indebted to officials of Spirit Lake Gold Mines for the use of their comfortable camp buildings as a headquarters during the summer and, in particular, to T. W. MacDowell and V. E. C. Odium, president and general manager, respectively, for their generous assistance in providing the writer with information concerning development work at the company's property and other data pertinent to the field work. Grateful acknowledgment is made to officials of the Prospectors Airways Company and the Mining Corporation of Canada for supplying the writer with geological maps and reports on the holdings of these companies in the North Spirit Lake area. The writer would also like to thank Professors Adolph Knopf and A. M. Bateman of the Department of Geology, Yale University, for their advice during the preparation of this report.

John Low, Cameron Robertson, and H. S. Armstrong, as assistants, rendered efficient and energetic service and did much to advance the work of the season. Mr. Low is responsible for most of the mapping northwest of North Spirit lake, done while the writer was engaged in another area during the latter part of September.

Access

North Spirit lake, which is some 13 miles long and 2 to 3 miles wide, may be reached from Sandy lake, into which it drains by the Flanagan (Duck) river through Tallrice, Whiteloon, and North Wind lakes, by a good water route along

¹M. E. Hurst, "Geology of the Area between Favourable Lake and Sandy Lake," Ont. Dept. Mines, Vol. XXXVIII, 1929, pt. 2.

which there are 13 short portages, the trip requiring about 3 days. There is also a canoe route from the south, passing north from Cat lake through Sucker lake, Tutu river, and MacDowell lake to North Spirit lake. Since travel over this route entails about 70 portages, some of which are as long as 5 miles, it is impracticable for the transportation of supplies.

The most suitable means of transportation to North Spirit lake is by airplane from Sioux Lookout or Hudson, the 170-mile trip taking about 1½ hours. The charges for air freighting from Sioux Lookout to North Spirit lake, from figures furnished by General Airways, are 9½ cents per pound and, for the return trip, 4½ to 5 cents per pound. Similarly the passenger fare is \$30 per person to North Spirit lake and \$20 to Sioux Lookout. These figures are the minimum rates and apply only to a "pay load."

Previous Exploration

Owing to the isolation of North Spirit lake and its remoteness from ordinary travel routes, there are only meagre references to it in the literature of the region, and there is no record of the lake having been visited by any of the early explorers. The nearest area in which geological mapping has been carried out is the area between Favourable and Sandy lakes,¹ which lies 40 miles to the northwest. A geological survey of the Sandy lake volcanic-sedimentary belt was made by J. Satterly² during the summer of 1937. There is a span of 70 miles to the south of North Spirit lake in which no geological mapping has been carried out. The first definite reference to the lake was made by Hurst in 1929, who stated:³—

Duck [Flanagan] river is the largest tributary of the Severn within the area investigated. It empties into Rat House bay of Sandy lake and drains North Wind, Duck [Duckling], and many other lakes stretching for miles to the south and east. This is the route most commonly followed by prospectors in reaching the area of greenstones which outcrop in the vicinity of Spirit (Fairy) [North Spirit] lake, some 40 or 50 miles southeast of Setting Net lake.

Discoveries of gold and silver-lead-zinc in the Favourable Lake area in 1927 and 1928 led to an influx of prospectors into the region, some of whom were led to North Spirit lake by Indians, who reported mineralization in greenstones on the south shore of the lake. Among the prospectors visiting North Spirit lake in 1928 was A. F. Hewitt, discoverer of the Argosy gold mine, who was shown mineralized occurrences in the South bay section of the lake by James Linklater, one of the North Spirit Lake Indians. Specimens taken out at that time did not yield encouraging assays, but, in 1936, after obtaining financial backing through the Derby Gold Syndicate (now Spirit Lake Gold Mines, Limited), Mr. Hewitt returned and investigated some arsenopyrite occurrences, one of which turned out to be richly gold-bearing.

Inhabitants

The only permanent white resident in the area is a trapper, Ole Mattson, who lives on MacDowell lake, near the entrance to Annas lake.

The North Spirit Lake band of Indians, comprising 6 or 7 families, numbers about 50 persons. These, together with an additional 40 Indians from Duckling (Duck) lake and Whiteloon lake, constitute the permanent population of the area. The North Spirit Lake band is part of the Deer Lake or Sandy Lake tribe of Saulteaux Indians, descendants of Ojibway stock.

In 1936 the Hudson's Bay Company established a winter outpost from the Deer Lake post, near the west end of North Spirit lake on the south shore. The

¹M. E. Hurst, op. cit.

²See pages 1 to 43 of this volume.

³M. E. Hurst, op. cit., p. 53.

post is open only during the trapping season, from late September until June, the supplies being brought in by the Indians themselves from Deer lake.

Natural Resources

Soil and Climate

There is little soil within the area that could be made immediately available for agricultural purposes. Much of the rock surface is covered by a thin mantle of boulder clay, and the numerous rock outcrops and abundance of boulders would soon discourage any attempts at cultivation. In the southern part of the area, between Hewitt and MacDowell lakes, the soil becomes sandier and the proportion of boulders increases, partly owing to boulder moraines. Parts of the low muskeg areas could, however, be drained and might be suitable for limited agricultural purposes.

In 1937 there were no frosts between June 7 and August 9, and the weather during that time was, for the most part, warm throughout the night as well as the day. In 1936 North Spirit lake became ice-bound between October 31 and November 4, the ice remaining until May 17, 1937. On June 6 the temperature of the lake was recorded as 48° F. and gradually rose to about 60° F. early in August.

Weather records from January to September, 1937, show that the winds are predominantly from the west and are accompanied by high barometric pressures and clear weather. East winds of more than 24 hours' duration are accompanied by lower barometric pressures and usually indicate approaching rains. The lowest recorded pressures accompanied thunder showers from the southwest. The minimum pressure recorded was 28.26 inches; the maximum 29.36 inches (aneroid readings). Changes of half an inch within 24-hour periods were not infrequent.

Precipitation in the summer of 1937 was moderate and was distributed in the early part of June, the latter part of August and September. There was almost no rainfall from the latter part of June until the end of July, although electrical storms were numerous. The winters are reported to be cold and severe.

In summary, the climate is vigorous and cyclonic with rapid changes in temperature, barometric pressure, and wind direction within short periods. The soil is poor; the growing season is short and only suited to the more hardy types of plants.

Fur-bearing Animals, Fish, and Game

Fur-bearing animals are moderately plentiful, although by no means abundant, throughout the region. Fox is the most common catch of the Indian trappers; about three-quarters of these are red fox and the remainder black and silver. Fisher and weasel are also taken, but there are few mink and no martin. Muskrat are scarce. Beaver are almost unknown in the area, although fresh cuttings were observed in one locality.

All the waters in the area abound in pickerel and northern pike, which may easily be caught with a hook and line. Lake trout are found in Nemakwis lake, which is clear in contrast to other waters, most of which are tinted a deep brown, although not turbid. In North Spirit lake and the larger waters the Indians net whitefish and the common sucker. No sturgeon are reported in the area.

Moose and bear are the only large animals in the region. A few black bear roam in the open burns extending from Hewitt to MacDowell lake and in the burns west of Tallrice lake. Moose, although not plentiful, may be found between North Spirit and Hewitt lakes and east of North Spirit lake. There are no deer

nor woodland caribou within the area. Rabbits are plentiful and are snared by the Indians during the summer. Spruce hen and ruffed grouse are abundant. Some of the grassy bays offer breeding places for a few wild ducks.

Forests and Timber

With a few exceptions, only the low-lying muskeg and spruce swamp areas within the area have escaped the ravages of forest fires. Most of the sections east, north, and west of North Spirit lake, the region about Margot lake, and the area extending from Hewitt to MacDowell lakes have been burned in recent years. In 1937 there were a number of forest fires in the region, of which the most serious burned a section west of South bay in North Spirit lake. The area lies far to the north of the districts patrolled by the Ontario Forestry Branch. It is thought that lightning is the chief cause of forest fires in the area since, after the passing of electrical storms, smoke could often be seen rising from new centres.

In most of the older burned sections there is a vigorous new growth of small jackpine and poplar, and in the extensive muskeg areas stunted black spruce and small tamarac grow abundantly, but the maximum diameter of these is 8 inches. Along the banks of the larger streams, on some of the islands of North Spirit lake, and on parts of the lake shore, there are a few stands of large white spruce and large poplar suitable for mining purposes.

In summary, spruce and jackpine are the most abundant conifers, the latter growing extensively on the sandy and rocky areas. Balsam and tamarac are subordinate, and there are no red pine, white pine, or cedar within the area. Birch and poplar are the most common deciduous trees, the latter being the most abundant. Balm of Gilead grow on some of the stream banks. Raspberry and blueberry bushes are common in the burned areas, but the fruit does not mature until the middle of August. Tag alder grows abundantly in the low areas and about the shores of the waterways. Labrador tea is the most profuse of the lower bushes. Fifty-five species of flora were identified during the summer by H. S. Armstrong.

Water Powers

The only practicable source of hydro-electric power within the area lies west of the outlet of North Spirit lake. The lake spills over a short 3-foot fall at the extreme west end, the water falling a further 13 feet over a 10-chain rapids half a mile to the west. Three miles farther west there is a waterfall having a straight 8-foot drop, and a short distance west there is another 7-foot fall over a 10-chain rapids. Thus within a distance of 4 to 5 miles there is a total drop of some 30 feet. Between this point and Rat House bay of Sandy lake there is a further drop in the river, estimated at 120 feet. If the plans of Berens River Mines to build a dam on the Flanagan river south of Rat House bay are completed, additional storage dams will be required north of the outlet of Whiteloon lake and between Margot and North Spirit lakes. In this way the level of North Spirit lake will not be altered.

In the year 1936-1937 the maximum natural difference in the water level of North Spirit lake was 6 feet 3 inches. Low water was recorded about the middle of April and high water on May 15, before the ice had broken. The only important flow of water into North Spirit lake comes from the Flanagan (Disbrowe) river, which drains Margot lake. Early in August, when the water level of North Spirit lake was only 1½ feet higher than the April low, there was a flow of water 4 feet deep and 75 feet wide over the 8-foot falls four miles west of the lake. Sufficient power might be developed here for a small-scale mining operation.

Drainage

Although North Spirit lake is beyond the southern limit of the Hudson Bay lowlands, it lies in part of the great peneplaned area that extends for hundreds of miles north of the height-of-land to the waters of Hudson bay. The average elevation of the area is estimated to be 1,150 feet above sea-level, and the elevation of North Spirit lake about 1,080 feet. Owing to seasonal changes in water level the character of the shore contours of North Spirit lake varies somewhat, and late in the summer the low water level exposes many reefs in different parts of the lake.

The area is one of the headwater tributary systems of the Severn river, which flows northeast into Hudson bay. The extreme southern part is drained by MacDowell lake, the waters of which are discharged into the Severn river by an



Eight-foot falls on the Flanagan (Spirit) river, 4 miles west of the outlet of North Spirit lake.

eastern route. The Flanagan river, which empties into Sandy lake, drains the remainder of the area. It rises southwest of Margot lake, draining a large section of the country to the south and west and discharging its waters into the south side of Margot lake. It drains north from Margot lake to North Spirit lake, from the west end of which it flows northwest into Tallrice lake, and then swings north into Whiteloon lake. From this lake it cascades over a series of rapids and falls, and continues through North Wind lake and into Rat House bay of Sandy lake.

Topography

Although the region is one of gentle relief, the low, rolling character of the land surface is obscured for the most part by a dense forest growth. Only in the open burns and on the broader lakes is the relief evident. Low hills and ridges in general do not rise more than 100 feet above the mean elevation, and they are characterized by an accordance of summits. The eastern part of the area and the section northwest of Tallrice lake show the greatest relief. The highest hills

occur at the east end of North Spirit lake, in the vicinity of Nemakwis lake and in the region about Atikamik lake; but even here the maximum relief does not exceed 175 feet. Bed-rock relief, which is much sharper than that of the general topography, is modified by the occupation of the deeper valleys with lakes and glacial debris.

In general, the area is one of low rock ridges interspersed with muskeg and spruce swamp, the most extensive muskeg area lying between South bay and Hewitt lake, but for the most part muskegs occur in the narrow depressions between low ridges.

The present topographical features are the combined effect of pre-glacial erosion and glaciation. The regional trend of bedding and foliation planes in the sedimentary-volcanic belt is northwest-southeast, whereas the direction of ice movement was from northeast to southwest, crossing the structure at right angles. The shore contours of many of the lakes are definitely related to geological structures, particularly those that might induce lines of weakness in the rocks. The low, steep cliffs of foliated rocks that occur on the shores of some of the lakes owe their topographic expression to the rock structure; whereas the smooth flat outcrops that rise gently from the water about the shores are the product of glacial smoothing. Thus the shores of portions of North Spirit, Little Hewitt, Wapisipi, Makataiamik, and Atikamik lakes are controlled by lines of weakness due to shearing and foliation within the rocks. The elbow shape of Hewitt lake is the result of a local change in the strike of foliation, with which each arm of the lake is parallel. The shore contours of the eastern part of Margot lake, Nipa lake, and the northern section of MacDowell lake coincide with concordant granite-sedimentary contacts.

The fine stream patterns of the small creeks that drain the muskeg sections of the area are consequent on the glacial mantle over which they meander, and have no relation to rock structure. The larger streams, such as the Flanagan river, have built stratified clay deposits immediately adjacent to their banks and any relation to geological structure is obscured.

The topographic prominences of "W" island, "X" island, and Bijou point owe their existence to the massive stock of diorite that outcrops in the South bay section. The present configuration of the islands and point are due in part to the major directions of jointing within the stock (see Fig. 2 on page 63).

The lake depressions and stream courses that lie in the relatively structureless granite encircling the sedimentary-volcanic belt tend, on the other hand, to coincide with the direction of glacial movement, producing a northeast-southwest elongation to many of the waterways. The lake basins owe their origin to glacial excavation.

It is concluded that the topographic expression within the sedimentary-volcanic belt resulting from glaciation is subordinate to that dependent on structure, although the structure may have locally controlled the direction of ice movement to some extent. This implies the existence of a pre-glacial topography that has been modified, but not eradicated, by glacial action.

GENERAL GEOLOGY

All the consolidated rocks of the North Spirit Lake area, with the possible exception of a few post-granite diabase dikes, are early pre-Cambrian (Archean) in age. The formations consist of closely folded volcanics and sedimentary strata distinguished respectively by prominent iron formation and conglomerate formation. Accompanying and following the deformation of these rocks there were

injected extensive granite bodies of batholithic dimensions, so that the North Spirit lake volcanic and sedimentary rocks now occur as a deeply entrenched linear belt in the extensive granite and granite gneiss that underlies the greater part of Northwestern Ontario.

The name "Keewatin type" has been given to the volcanic and iron formations, and "Timiskaming type" to the conglomerate and other sedimentary formations. This is not meant to imply any correlation with other formations called Keewatin and Timiskaming, but merely that in lithological character and structural relations, the formations herein described resemble those called respectively Keewatin and Timiskaming in other parts of the province. The Keewatin and Timiskaming types are not separated by a marked unconformity.

Table of Geological Formations

| | |
|---------------------------------|--|
| QUATERNARY | Stratified river clay; peat. Boulder clay, sand, and gravel (till); boulder moraines. |
| RECENT: | |
| PLEISTOCENE: | |
| | <i>Great unconformity</i> |
| PRE-CAMBRIAN | { Diabase dikes. <i>Intrusive contact</i> Rhyolite porphyry dikes; felsite dikes; feldspar porphyry dikes. Pegmatite dikes. Massive pink to grey granite and monzonite, locally syenitic and porphyritic; granodiorite gneiss. Diorite; andesite porphyry. |
| POST-TIMISKAMING(?) INTRUSIVES: | |
| TIMISKAMING TYPE: | <i>Intrusive contact</i> { Sedimentary Formation: Interbedded greywacké, slate, and arkose, locally altered to amphibolite, phyllite, mica schist, and sericite schist; slaty iron formation; quartzite; chert; conglomerate; crystalline limestone, hornfels; garnetiferous and andalusite schists and gneisses; minor volcanics. Chert pebble conglomerate; grey granite pebble and cobble conglomerate. |
| KEEWATIN TYPE: | { Iron formation. Volcanic Formation: Massive to schistose greenstone; chlorite schist; pillow lava; amygdaloidal lava, flow breccia, and amphibolite, representing former basaltic to andesitic effusives; trachyte and meso-type effusives; rhyolite and rhyolite flow breccia; minor sediments and iron formation. |

Keewatin Type

Volcanic Formation

There are three principal areas of volcanic rocks in the region, in addition to some minor flows intercalated with the sedimentary members. The lithologic types are chiefly represented by fine-grained, dark-green, massive to schistose rocks termed greenstones. They are extensively altered to chlorite schists and contain narrow zones of rusty-weathering carbonates. In the vicinity of granite contacts they have been amphibolitized. The steep folding of the volcanic rocks was accompanied by considerable drag-folding, and the flows are so sheared that original structures, for the most part, have been obliterated. Some pillow structures and amygdaloidal horizons in these rocks were, however, observed in a few places.

Eastern Belt.—The most extensive area of volcanic rocks borders the sediments on the north and east. At the east end of North Spirit lake the volcanics have been exposed over a width of some 4 miles, but the true thickness of the formation here has been greatly exaggerated by folding. Extending south the belt narrows and becomes discontinuous, and is generally less than half a mile in width. The original width of the belt is not known, as it is bordered along its east side by intrusive granite. The flows comprising this belt represent the oldest rocks in the area.



Pillow lava in which pillows are sheathed in felsite from solutions derived from the intrusion of an adjacent dike. Note the glacial striae crossing the picture from right to left.

Most of the islands lying to the north and northeast of Prospair point in North Spirit lake are underlain by pillow lava. The bun-shaped pillows are somewhat elongated, the long dimension of the pillow ranging from 2 to 4 feet, whereas the distance from bottom to top of the pillow does not, in general, exceed 12 inches. Associated with the pillows are narrow bands of stretched amygdaloids, some 4 inches wide. On one of the small islands off Prospair point the pillow lavas are cut by a rhyolite porphyry dike, from which solutions have sheathed the adjacent pillows with light-coloured, fine-grained felsite borders. Microscopic examination of material from the central part of the dike, which is at least 30 feet wide, shows it to consist of sparse phenocrysts of altered albite

and clear "bird's eyes" of quartz set in an aphanitic matrix. A sample from the contact of the dike compared with the material sheathing the pillows shows that they are identical, consisting of a very fine grained mosaic of quartz and feldspar.

In the central part of the flows, as seen on some of the islands, pillows are not developed and the rock is coarser-grained, resembling a fine-grained gabbro or dolerite. The pillowed horizons are altered to soft chlorite schists.

South of Makataiamik lake the volcanics have suffered much less deformation than in the vicinity of North Spirit lake and, at their western extremity, occur intercalated with conglomerate beds. Across the east of the conglomerate, pillows were observed in one flow over a width of 400 feet. At the west end of the flow, near the conglomerate contact, the pillows are small and well-defined, the dimensions being about 7 by 10 inches; to the east, they become less distinct



Weathered amygdaloidal pillow lava south of Tahoe lake.

and larger, about 2 by 1 feet. The top of the flow faces west. Farther east, near the contact of the volcanics with granite, the former are altered to amphibolite and amphibolite schists.

Central Belt.—A second belt of volcanic rocks extends south of the diorite stock in North Spirit lake, outcrops in the vicinity of the northeast arm of Hewitt lake, and attains its best development south of Tahoe lake. North of Hewitt lake the rocks comprising this belt consist mostly of chlorite schists, some flow breccias, and mesotype effusives. Near Hewitt lake the volcanics have been so severely deformed and metamorphosed that original structures are entirely obliterated, and the origin of the rocks is obscure. South of Tahoe lake there are extensive outcrops of volcanics showing well-preserved structures. Most of the rocks here are made up of amygdaloidal pillow lavas, in which the larger pillows are characterized by a concentration of amygdules in a zone near the periphery, whereas the amygdules in the smaller pillows occupy the centre. Intercalated with the flows of pillow lava are narrow andesitic flow breccias characterized by rounded to angular fragments.

Thin sections of the rock comprising the pillow lava show that it is made up essentially of chlorite and calcite with some epidote and residuals of plagioclase feldspar. This rock is interpreted as being a former basalt. Associated with the basic flows are some narrow rhyolite flows, which are characteristically brecciated, and some trachytes showing poorly developed pillow structure. The rhyolite flows, commonly less than 50 feet in thickness, are characterized by abundant subangular rhyolite fragments up to 18 inches in diameter set in a sheared rhyolitic matrix, which contains some chlorite and epidote.



Iron formation outcropping on an island northeast of Prospair point; pseudo cross-bedding is produced by slipping along bedding-planes during folding. The light layers are silica; the dark ones, magnetite. The small spots are raindrops.

Western Belt.—The third volcanic belt, which is the smallest in extent, outcrops in the vicinity of Little Hewitt lake and extends discontinuously southeast adjacent to the western granite boundary of the area. Owing to the extensive amphibolitization of both sediments and volcanics south of Hewitt creek, it is difficult to distinguish between them. The volcanics at Little Hewitt lake consist of chlorite and biotite schists associated with small amounts of trachyte and rhyolite. Some of the chlorite schists on the north shore of the lake show a poorly developed pillow structure.

Sedimentary Iron Formation

A number of belts and lenticular-shaped bodies of magnetic iron formation occur within and adjacent to the volcanic rocks in many parts of the area. Characteristically the iron formation occupies a position between the volcanics and the clastic sediments. It is younger in age than most of the volcanic formations but is older than the conglomerate and sedimentary formations and is

distinct from the slaty iron formation or ferruginous slates that comprise minor members of the sediments.

The most extensive belt of iron formation occurs in the vicinity of South bay, passes through North Spirit lake east of Prospair point, south through Wapisipi lake, and outcrops discontinuously to the south adjacent to the volcanics along the eastern margin of the sedimentary belt. Between North Spirit lake and Wapisipi lake it attains a width of more than 2,600 feet, but the true thickness is



Hand specimen showing drag fold in iron formation. The horizontal surface is on a plane with the page; the fold axis is vertical. The coin is a one-cent piece.

considerably less as much drag-folding has taken place. This body is so strongly magnetic that compass readings are unreliable within a radius of some 5 miles from Prospair point.

The iron formation consists essentially of interlayered chert and magnetite, the layers ranging in thickness from less than an eighth of an inch to 3 inches and averaging about a third of an inch. The chert varies from light to dark in colour and is characterized by very fine, parallel bedding lines. Locally, both magnetite and chert layers contain slaty material.

The beds have been subjected to much drag-folding, both internally and together with other formations, so that they tend to occur as S-shaped and reverse S-shaped lenses. The linear discontinuity of the iron formation beds may be due to either deposition in limited sedimentary basins or separation into

lenses by drag-folding. Probably both these factors play a part in producing the present character of the beds. Near Hewitt lake there are extensive outcrops of interbedded dark and light chert, similar to that which occurs in the iron formation, but containing little or no iron.

At the northeast end of North Spirit lake there are outcrops of beds, about 200 feet in width, of highly magnetic iron formation, which consist of alternate layers of magnetite and chert up to 2 inches in thickness. The estimated magnetite content of these beds approximates 40 per cent.



Conglomerate on one of the north-central islands of North Spirit lake. The longer axes of the pebbles plunge 40 to 60 degrees from the horizontal in an easterly direction (towards the bottom of the photograph).

Iron formation similar to that described as occurring in the vicinity of Prospair point is found within or adjacent to volcanic rocks in many other parts of the area. Microscopic examination of the chert layers show them to consist of mosaics of very fine grained quartz; whereas polished sections of the magnetite layers show from 30 to 90 per cent. magnetite distributed in non-opaque material.

Timiskaming Type

Conglomerate Formation

Extensive beds of conglomerate, variable in character but persistent in length, occur along the northeast margin of the sedimentary rocks adjacent to the volcanic and iron formations. The conglomerate formation attains its

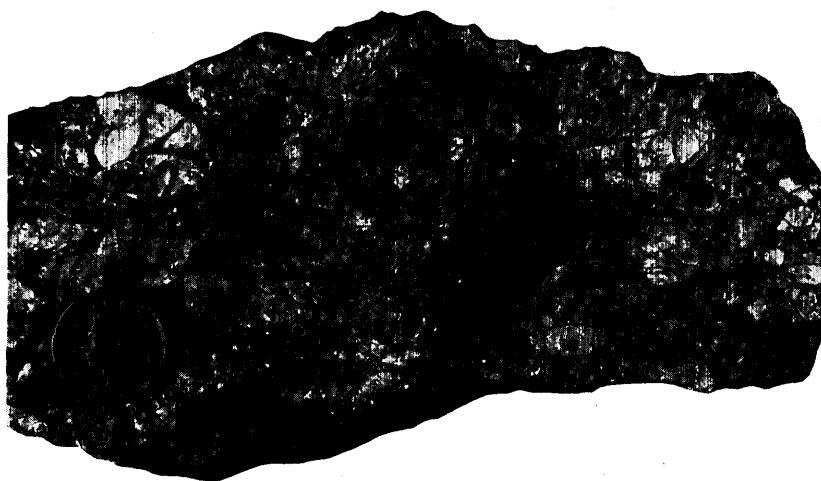
greatest thickness in the north-central islands of North Spirit lake, in the vicinity of Prospair point, and south of Makataiamik lake. At the last locality the formation is approximately 7,000 feet wide. It consists of pebble and cobble horizons from 4 to 200 feet thick in an arkosic or quartzitic matrix. No individual beds of conglomerate having a true width of more than 200 to 300 feet were observed. The average width of the pebble beds is about 30 feet. Since the



Stretched chert pebble from conglomerate formation on Prospair point.
The pebble is $5\frac{1}{2}$ inches long.

folding is not complicated south of Makataiamik lake, the true thickness of the formation at this point is probably close to 7,000 feet.

North-Central Islands of North Spirit Lake.—The conglomerates that outcrop in this locality consist, for the most part, of sparse pebbles of chert and grey granite in a sericite schist matrix. Where the conglomerates are less deformed the matrix proves to be a brown, sandy arkose.



Hand specimen showing the horizontal surface of a closely packed chert pebble conglomerate from Prospair point. The coin is a one-cent piece.

The beds have been foliated, the direction of shearing being east and west, and the pebbles are moderately elongated, the average plunge of the longest axes being 40° E. The mean axes are parallel to the planes of foliation, and the short axes normal to the direction of shear. The arkosic matrix contains rounded grains of quartz up to a quarter of an inch in diameter, and under the microscope these are shown to be drawn out into fractured quartz lenses surrounded by sericite.

Prospair Point.—In the vicinity of Prospair point the conglomerate beds have been severely deformed and drag-folded together with rusty-weathering greywacké and ferruginous slate. The beds consist essentially of well-sorted and well-sized, closely packed chert pebbles. The ratio of stretching is estimated as being from 3 to 1 to 6 to 1. There are, in addition, greenstone pebbles that have been almost obliterated by stretching, as well as pebbles and cobbles of grey quartz monzonite, which are comparatively undeformed. Under the microscope the quartz monzonite pebbles are seen to consist of equal amounts of oligoclase and potash feldspar, about 30 per cent. quartz, and almost no ferromagnesian constituents.

In this locality the longest axes of the pebbles are oriented either vertically or with steep plunges to the southeast or northwest. The pebbles are characteristically stretched into shapes of carrots and beets. Those composed of chert are identical in character to the material comprising the chert layers in the iron formation and are thought to have been derived from its erosion.



Side view of the specimen shown in the bottom photograph on page 57, oriented with respect to its position in the field and showing the vertical elongation of the pebbles.

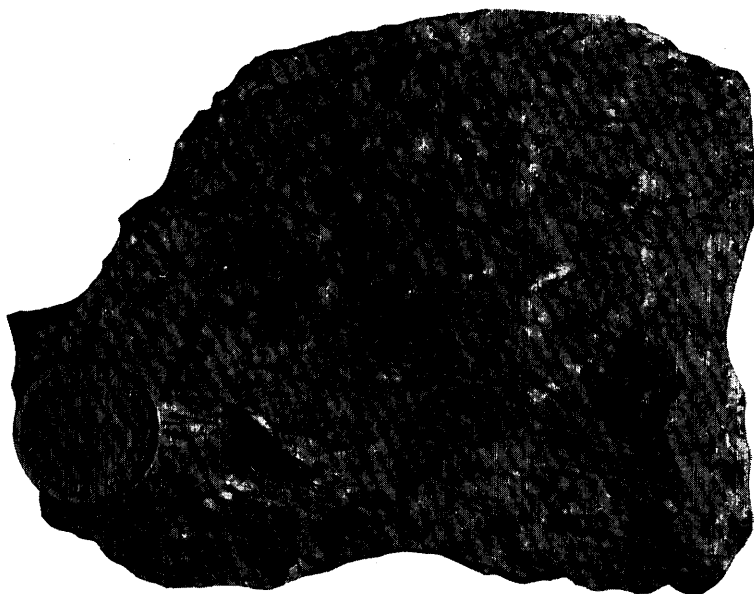
South of Makataiamik Lake.—The conglomerate formation attains a remarkable development in this locality where, as previously mentioned, there is a section up to 7,000 feet or more in width consisting of pebble and cobble horizons from 4 to 100 feet wide, averaging 20 to 30 feet in width and spaced 20 to 30 feet apart. Most of the horizons consist of massive, well-rounded quartz and chert pebbles up to 3 inches in diameter, 3- to 10-inch granite cobbles, and a few granite boulders up to 30 inches. The pebbles are enclosed in a well-bedded quartzite matrix, which varies from material so fine-grained that it is chert-like to coarse, angular quartzite, the particles of which are as much as half an inch in diameter. The bedded sediments between the pebble horizons consist of graded quartzite similar to that which constitutes the matrix of the conglomerates.

Near the east margin of the conglomerate formation narrow basic flows occur interbedded with the pebble horizons, and the proportion of greenstone and iron formation pebbles in the conglomerate beds is notably greater. At the east limit of the conglomerate formation, adjacent to the volcanics, the beds consist entirely of greenstone pebbles lithologically similar to the adjacent pillow lava. The conglomerate formation is younger than both the iron formation and the eastern

belt of volcanics. South of Makataiamik lake the volcanics have suffered less deformation than elsewhere, and the beds have not been subjected to drag-folding.

Sedimentary Formation

The major part of the area is underlain by a series of steeply folded, drag-folded, foliated and otherwise metamorphosed fine-grained sediments made up, for the most part, of impure greywacké and slate. In general, the rocks are well bedded, but this feature has been obscured in many parts of the area by the deformation that accompanied folding. In addition to slate and greywacké there are smaller amounts of arkose, quartzite, and crystalline limestone, as well as metamorphic equivalents of these and mixtures of these rock types.



Hand specimen of garnetiferous phyllite from the west end of North Spirit lake. The coin is a one-cent piece.

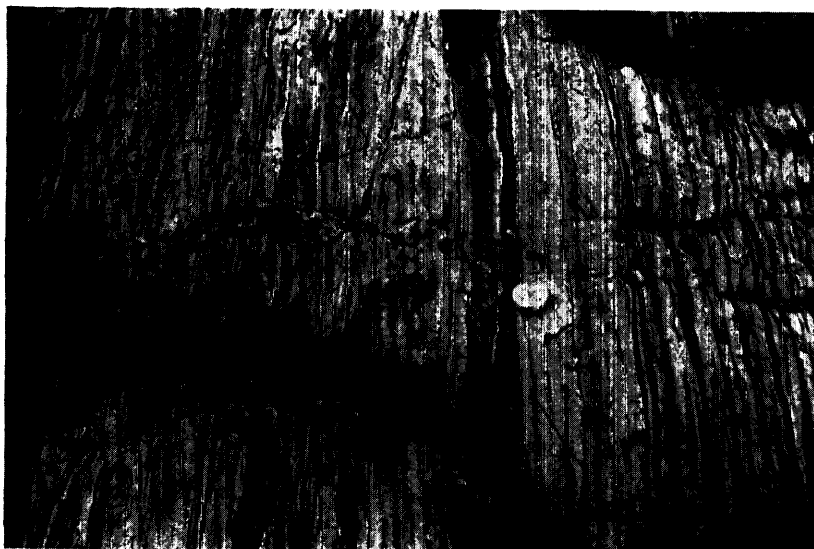
Arenaceous Sediments.—Except for the quartzite that makes up the matrix of the southern part of the conglomerate formation, only a few of the greywacké beds that are relatively free from ferromagnesian and argillaceous impurities might be termed quartzites.

The arkose, which grades into greywacké on the one hand and quartzite on the other, has already been described as making up the matrix of the northern part of the conglomerate formation. In the north-central islands of North Spirit lake the conglomerate formation passes towards the south into an arkose facies. The feldspar grains have been smeared out during folding and are largely converted to sericite, so that these rocks are now essentially sericite schists.

The dominant sandy sedimentary type that underlies a large section of the area extending south of North Spirit lake to Hewitt lake is greywacké. The rock occurs in beds from an eighth of an inch to 2 feet thick, but averages less than 6 inches. The beds consist essentially of quartz with minor amounts of feldspar and biotite, the latter oriented parallel to the planes of foliation. There is generally some argillaceous material present.

The effect of folding on the quartzites, arkoses, and greywackés is seen by the cataclastic deformation of the larger grains of quartz, which are drawn out into broken lenticles, and by the conversion of the feldspars to sericite. Where deformation has been more severe there has been a general recrystallization and reorganization of the rock constituents, and near granite contacts the arenaceous sediments have, in some instances, been amphibolitized.

Argillaceous Sediments.—On the south shore of North Spirit lake and in the bottom of South bay there are considerable areas underlain by drag-folded sericite slates, in which the slaty cleavage is generally divergent from the direction of bedding. Since the slates have proved most susceptible to metamorphism they are represented in most other parts of the area by phyllites and mica schists.



Interbedded greywacké and argillaceous material typical of the fine-grained bedded sediments of the North Spirit Lake area.

The narrow sedimentary belt extending northwest of North Spirit lake and through Tallrice lake is underlain principally by phyllites. They have the appearance of very fine grained micaceous rocks, which resemble slaty schists and, in the vicinity of intrusive granites, contain small garnets that give the rock a spotted appearance.

In the vicinity of Margot lake and in the area between Margot and North Spirit lakes the slates and phyllites have been altered to fine-grained mica schists and coarse-grained garnetiferous biotite gneisses by intrusive granites. Under the microscope these rocks are shown to be composed principally of biotite and quartz. The argillaceous sediments at granite contacts near Margot lake and Atikamik lake are characterized in some localities by large crystals of andalusite, cordierite, sillimanite, and chialstolite in a finer-grained matrix. In some cases bedding is still preserved.

Crystalline Limestone.—Since crystalline limestone of sedimentary origin is not common in the Archean rocks of northwestern Ontario, its presence here

is a matter of interest. In the region about Hewitt lake there is a marked change in the character of the sedimentary rocks, the shores about the northwest arm and south end of the lake being underlain by crystalline limestone interbedded with impure calcareous material. On the northeast arm of the lake limestone occurs thinly interbedded with layers of amphibolite. Other dark, fine-grained interbedded material is seen under the microscope to consist of hornblende and epidote with smaller amounts of secondary andesine, clino-pyroxene, zoisite, and titanite. Some dense, finely laminated, chert-like rocks associated with the limestone are interpreted as hornfels.

Structure of the North Spirit Lake Series

The regional trend of the sedimentary-volcanic belt is northwest-southeast, and this is the prevalent direction of foliation as well as bedding within the sedimentary members. In the central part of North Spirit lake the direction of bedding swings sharply from an easterly to a southeasterly strike, and it is at this point that there is a marked divergence between the direction of foliation and bedding. The dip of the planes of bedding and schistosity is close to vertical, although there is a general tendency towards steep southerly dips throughout the region. Along the strike there is an easterly plunge to the structure, which varies in amount from place to place and is marked in the vicinity of Prospair point by vertical fold axes.

The structure in the northern and eastern part of the area is that of the north limb of a steeply southeastward-plunging syncline. Two determinations made from bottom accommodation of the pillows in the eastern belt of volcanics indicate that the tops of the flows face southwest; thus most of the sedimentary iron formation in this belt, which lies to the southwest of the volcanics, is presumed to be younger.

The conglomerate formation contains pebbles of both the volcanic and iron formation that lie to the east of it and is doubtless younger. In common with many other ancient pre-Cambrian sediments the conglomerate contains pebbles of an older granite or quartz monzonite, which has not been found in place. The chert pebbles, which occur abundantly in the conglomerate, are thought to have been derived from the chert layers in the iron formation. The greywacké on Prospair point contains an appreciable content of iron as seen by the presence of rusty-weathering carbonates, and the slate at the same locality is of a ferruginous variety. The iron in both instances may have been derived from the iron formation.

The matrix of the conglomerate north of Opwagan lake is essentially an arkose, while to the south it is made up principally of quartzite. At two localities a regular imbrication of the pebbles in southeastward-striking beds of conglomerate was observed, in which the pebbles shingled over each other towards the south. It is thought the source of the sediments lies to the north of North Spirit lake.

The contact of the conglomerate with the volcanics south of Makataiamik lake is characterized by a zone in which basic flows occur intercalated with pebble horizons, the strike of the flows coinciding with that of the conglomerate beds. Since there is no complicated folding in this locality, it is evident there is no angular unconformity between the volcanics and conglomerate; thus the passage of the Keewatin-type into the Timiskaming-type rocks represents a gradual change from vulcanism to sedimentation. Since no iron formation was found to occur between the volcanics and sediments at this locality, it is presumed to have

been deposited in local basins. Furthermore, the close association of volcanic flows with sedimentary iron formation, as well as the intercalation of flows with conglomerate, suggests that the flows may have had a subaqueous origin in shallow bodies of water.

A study of the graded beds within the sediments that pass through North Spirit lake showed the tops of the beds facing south-southwest in 11 out of 13 instances, the two exceptions being reversed arms of drag folds. This was supported by two additional determinations made from cross-bedding. Unfortunately no suitable beds for similar determinations were found in other parts of the area.

Thus far the geological series shows an orderly succession from northeast to southwest across the eastern belt of volcanics, iron formation, conglomerate formation, and part of the sediments; but whether the ubiquitous greenstones and associated iron formations that comprise the central and western volcanic belts are repetitions of the eastern belt produced by folding, or whether they are the result of later periods of volcanic activity, is not known. A single determination of bottom accommodation of the pillows in the central belt would indicate that the tops of the flows face east, but on the other hand there is no repetition of the conglomerate formation in other parts of the area.

One of the structural features of the area is the change in regional pitch of the fold axis along the sedimentary-volcanic belt. From the west end of North Spirit lake to Prospair point the southeasterly plunge of the structure steepens from 30 degrees until, at the latter locality, it is vertical and even reversed. Continuing south towards Atikamik lake the plunge gradually flattens out again to about 30 degrees or less. Determinations of pitch were made from the direction of elongation of the stretched pebbles in the conglomerates, inclination of stretched pillows, orientation of tabular minerals, and plunge of the axes of minor drag folds.

Even though there is a local divergence between the directions of bedding and schistosity, the general coincidence of these features throughout the area is thought to be due to slipping along bedding planes during folding.

Post-Timiskaming(?) Intrusives

There are two distinct types of granitic rocks in the North Spirit Lake area, one apparently intrusive into the other, but both probably belonging to the same general period of granitic invasion. The existence of a still older granite is evident from the large number of quartz monzonite cobbles in the conglomerate formation, although this older granite has not yet been identified in place.

Granodiorite Gneiss

The older granitic type is best developed near the west end of North Spirit lake and in the vicinity of Margot lake, where it encircles the sediments. The rock is a grey, gneissic quartz monzonite or granodiorite in which the amount of oligoclase equals or exceeds the amount of potash feldspar. The dominant ferromagnesian mineral is biotite. The rock is fresh-appearing under the microscope, although there has been some albitization of the potash feldspars. The principal feature of this granitic type is that it is found only bordering the sediments and, characteristically, the gneissic structure is concordant with the bedding or foliation within the sediments; in some instances it occurs as *lit par lit* injections within the sediments. In contrast with the younger granite this type has not produced any appreciable contact metamorphic effect on the sediments, nor does it appear to have any related dikes or pegmatites.

Diorite

One of the largest intrusive bodies occurring within the sedimentary-volcanic belt is the diorite stock that outcrops in the South bay section. It was in this body, which is approximately $1\frac{1}{2}$ miles in diameter, that the original gold-bearing arsenopyrite discovery was made. The stock is intrusive into a series of folded, interbedded sediments and volcanics, in which it has produced a narrow aureole of amphibolites and mica schists by contact metamorphism. The diorite weathers

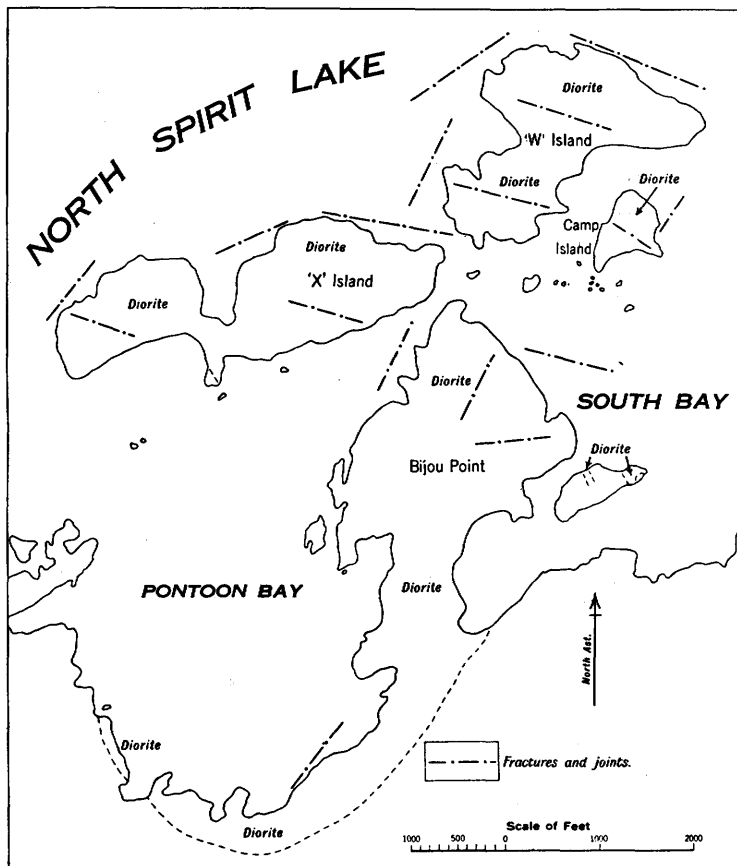


Fig. 2—Diagram showing the principal directions of fracturing and jointing in the diorite stock, south-central part of North Spirit lake.

from buff to grey in colour, is medium-grained and well-jointed, and although it is generally massive it has a local indistinct gneissic structure. It is composed essentially of altered sodic andesine and small amounts of potash feldspar and biotite, most of which has gone over to epidote. Some parts of the stock contain up to 15 per cent. quartz, most of which is secondary.

The stock is intersected by a northwest-southeast master set of joints in a nearly vertical plane and by two minor sets, one striking northeast-southwest with steep dips and the other striking northwest-southeast with flat, south-westerly dips. Narrow shear zones have been localized along some of the joints; neither jointing nor shearing, however, have produced any persistent fractures

within the stock. The jointing to some extent controls the shapes of "W" and "X" islands and Bijou point.

Since the diorite is not found in contact with any other intrusives, its age with respect to the granitic rocks is not known. On the basis of comparative deformation it is thought to be older than the massive younger granite and probably older than the granodiorite gneiss. Less than a mile south of the stock two or three small bodies of similar diorite and diorite porphyry occur, and another body of unknown extent was observed between Hewitt and Atikamik lakes.

Granite

The great areas of granite that surround the sedimentary-volcanic belt are, in general, pink, coarse-grained, and massive. This granite tends to cut the older rocks; but where the granite parallels the sediments it may have a narrow gneissic facies. The granite consists of a number of types, characterized by syenitic, porphyritic, and pegmatitic facies, some of which may be of different ages. It has produced extensive contact metamorphism on both the sediments and volcanics and is accompanied by the injection of numerous pegmatite and porphyry dikes.

North of Nemakwis lake the granite is grey, high in ferromagnesian minerals, and low in quartz, whereas southeast of Makataiamik lake it is very coarse grained and porphyritic, with phenocrysts of pink feldspar up to 2 inches in length. For the most part the granite occurs as normal pink and grey types in which the potash feldspar dominates over oligoclase. Biotite is the dominant primary ferromagnesian mineral, although hornblende is present in some granites. In all cases the biotite and hornblende have been extensively altered to epidote, and the plagioclase feldspars in particular have been appreciably saussuritized with the development of sericite, zoisite, albite, and calcite.

Granite Pegmatite Dikes

Within the margins of the massive pink granite and in the adjacent sediments and volcanics, there are numerous pegmatite dikes up to 200 feet in width. They are most abundant north of North Spirit lake, near the tongue of granite that extends east of Margot lake, and in the southern part of the area north of MacDowell lake.

The pegmatites are characteristically pink, flesh-coloured, or grey. The pink pegmatites occur as dikes or, more commonly, as pink pegmatitic facies near granite contacts.

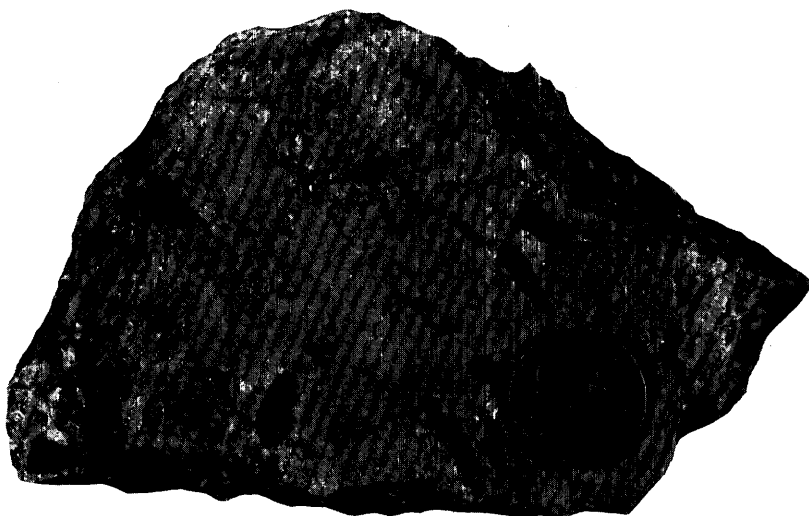
The flesh-coloured pegmatites, such as those that occur at the west end of Atikamik lake, are characterized by graphic intergrowths of microcline, oligoclase, and quartz, as well as muscovite, which occurs in pseudo-hexagonal plates up to 3 inches in diameter. The pink and flesh-coloured pegmatites have not produced a strong metamorphic effect on the intruded rocks.

The grey pegmatites are abundant in the vicinity of Margot lake and are composed of microcline, albite, and quartz; they contain, in addition, biotite, muscovite, pyroxene, tourmaline, and garnet and have produced tourmaline and garnet in the adjacent mica schists. The tourmaline crystals in the dikes are found enclosing microcline and quartz and are thought to have been formed by replacement. Cross-sections of crystals examined under the microscope show a zoned structure. The contact-metamorphic effect of this type of pegmatite is marked.

Rhyolite Porphyry, Felsite, Feldspar Porphyry

About the periphery of the tongue of granite that extends towards Prospair point from the east end of North Spirit lake there are a number of small acidic dikes intrusive into the volcanics, iron formation, and sediments. The centres of the wider dikes, in which the rock is medium-grained, are characterized by sparsely distributed phenocrysts of quartz and residuals of feldspar phenocrysts. These have been termed rhyolite porphyry dikes, and the narrower dikes, which are finer-grained samples of these, have been called felsites. Narrow zones of rusty-weathering carbonates are visible adjacent to joint planes in the dikes, and thin sections show a considerable amount of secondary calcite.

About the shores of Wapisipi lake there is a number of feldspar porphyry dikes in which phenocrysts of oligoclase and andesine occur embedded in an



Hand specimen of grey pegmatite showing black tourmaline crystals developed by replacement. The coin is a one-cent piece.

aphanitic matrix. In the Hewitt lake section there is also a number of feldspar porphyry dikes that have suffered some shearing. The feldspar phenocrysts are andesine, and the rock might be more properly called an andesite porphyry.

Diabase Dikes

The youngest consolidated rocks in the area comprise a few diabase dikes, which cut the granite and sediments near Margot lake and at the west end of North Spirit lake. The dikes have a maximum width of 150 feet; the central parts resemble a fresh, medium-grained gabbro, whereas the chilled edge is basaltic. Under the microscope they are seen to be composed essentially of laths of labradorite with interstitial pyroxene and a small amount of quartz forming a subophitic texture.

Deformation and Metamorphism

There are two distinct types of metamorphism in the sedimentary and volcanic rocks. The first consists of the changes brought about by deformation

as a result of folding movements; and the second is the result of contact metamorphism of the sediments and volcanics, produced by the intrusion of granite bodies. The deformation of the rocks was probably accompanied by the intrusion of the peripheral granodiorite gneiss but was prior to the time of intrusion of the massive pink and grey granites as shown by the contact metamorphism of the previously deformed rock formations.



Andalusite gneiss developed from contact metamorphism of argillaceous sediments west of Atikamik lake. The white spots are porphyroblasts of chiastolite up to $1\frac{1}{2}$ inches in length.

Deformation

Strata that were once horizontal have been so folded that the bedding planes are now vertical. Accompanying the major folding movements was considerable drag-folding within the different formations. The severity of the folding produced long S-shaped forms to parts of many formations and resulted in a discontinuity of others.

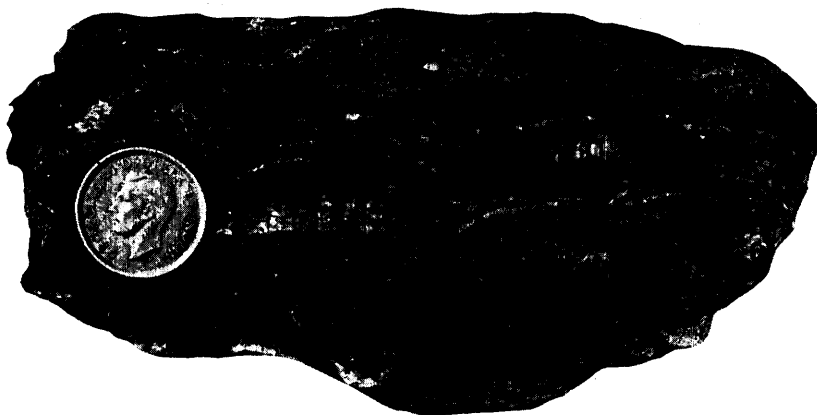
Deformation has locally obliterated primary flow structures in the volcanics as well as bedding in the sediments. The most important effect of folding movements on the rock types has been the reorganization and recrystallization of the component minerals accompanied by cataclastic deformation of the coarser, clastic sediments. The argillaceous sediments have been converted to slates and,

where more severely deformed, phyllites have been formed. The most notable effect in the conglomerate beds has been the stretching of the pebbles, and the longer axes of the stretched pebbles may lie at any angle to the bedding. The general effect of folding on the volcanic rocks has been the production of chlorite schists.

Local zones of shearing and faulting occur in the vicinity of volcanic-sedimentary contacts, and where the shearing has been intense the greenstones have been altered to talc schists. Some of the volcanic-sedimentary boundaries may represent the trace of thrust faults. Much of the local thickening of the formations is attributed to crinkling of the rocks into small isoclinal folds.

Contact Metamorphism

Contact metamorphism, particularly that produced by the transgressive granites, has produced a variety of metamorphic rock types, the most common



Porphyroblastic cordierite and sillimanite schist characterized by remarkably large porphyroblasts of sillimanite. The coin is a one-cent piece.

being an amphibolite facies in the sedimentary and volcanic formations adjacent to granite contacts. The development of massive amphibolites and amphibolite schists has taken place with the preservation of primary structures such as bedding; in fact, selective amphibolitization of susceptible alternate beds has, in some instances, produced a more distinct bedding than was formerly evident. The amphibolites, which are best developed in the southwestern and southeastern parts of the area, are made up of metamorphic amphiboles with lesser amounts of quartz and feldspar, biotite and calcite. Laths of amphibole up to half an inch in length were observed in some places. All of the sedimentary rock types, in addition to the basic volcanics, appear to have suffered amphibolitization in some localities.

Another result of contact metamorphism, which has been effective for the most part on the argillaceous members of the sediments, is the development of fine-grained mica schists and medium-grained biotite gneisses, such as those that are found in the Margot lake section. In addition to biotite the mica schists and gneisses may contain porphyroblasts of garnet. In the Margot lake section there are also a number of mica schist inclusions in the granite; these are generally garnetiferous and oriented with flat, southerly dips, although the strike is in con-

formity with the regional structure. Some of these inclusions are hundreds of feet in length.

Accompanying the metamorphic changes, particularly in the neighbourhood of pegmatitic intrusions, andalusite is developed by the reorganization of mineral constituents. When metamorphism reaches a stage where there is a total reorganization, the bedding is commonly obliterated. West of Atikamik lake a brown-weathering andalusite-biotite gneiss has been produced by contact metamorphism. The rock is characterized by large and profuse porphyroblasts of chiastolite up to $1\frac{1}{2}$ inches in length.



Glacially grooved and smoothed rocks on one of the north-central islands of North Spirit lake.

Chert-like hornfelses have been produced by contact metamorphism of lime-alumina rocks associated with the limestone at Hewitt lake. The greywackés and other sediments high in quartz have been least affected by contact metamorphism.

Pleistocene

Ice-sheets of continental proportions passed over the area in Pleistocene time, the direction of movement of the last glacial advance being from northeast to southwest. The principal effect of glaciation has been the planing off of weathered rock surfaces, rounding of the hilltops, and modification of relief by the filling-in of the deeper depressions with till. The glacial mantle consists almost entirely of boulder clay with some sand and gravel lenses. The material is relatively fresh and unweathered. No glacial lake clays were seen within the area, nor was more than one age of till observed. The abundance of rock exposures suggests that this mantle is ordinarily thin, but in the higher parts of the area between Hewitt lake and MacDowell lake there are a number of east-west-trending stony morainic ridges and fewer bed rock outcrops.

No suitable exposures for taking determinations on the strike of the glacial striae were found in the southern part of the area, but in the vicinity of North Spirit lake 110 observations fell within the limits of S. 34° W. to S. 50° W. Although the trend of striae is northeast-southwest the stoss slopes of a few north-south-trending asymmetric ridges, such as occur on "W" island, invariably face the east rather than the northeast. Projection of the striae would indicate movement from a Labradorian centre.

No positive evidence was found in support of a Patrician (pre-Labradorian) centre of ice accumulation supposed to have been located some 75 miles east of North Spirit lake. Since there is only one set of striae and one layer of till within the area, it is presumed that any evidence of former glaciation has been removed by the last ice movement.¹

The unconsolidated material that lies above the bed rock beneath the lake in South bay is well sorted and stratified. The following section taken from diamond-drill cores in that part of the lake is the composite of a number of borings:

| | |
|-------------------------|------------------|
| Surface to 40 feet..... | Water. |
| 40 to 80 feet..... | Clay. |
| 80 to 110 feet..... | Sand and gravel. |
| 110 feet..... | Bed rock. |

An examination of the material showed the sand and clay to be well sorted, although there is a transition zone between them; similarly the sand passes into gravel at the base. The clay shows a poorly defined stratification.

ECONOMIC GEOLOGY

Gold

Owing to the remoteness of the area the only mineral of economic significance discovered up to the present time is gold. The principal gold discoveries were made in the east margin of the diorite stock that outcrops in the South bay section of North Spirit lake, and to the east of the stock on Prospair point. In this locality mineralized occurrences fall into two groups:—

1. The first type occurs in narrow, irregular joints in the eastern part of the diorite stock that have been filled with massive and disseminated arsenopyrite associated with tourmaline-quartz stringers and minor amounts of pyrite, chalcopyrite, and pyrrhotite. The coarse, massive arsenopyrite type of mineralization yields the highest values in gold, some extraordinarily high assays being obtained. Development work has, to date, not defined any zone of mineralization in the diorite sufficiently persistent in length and width to contain an economic ore body.

2. The second type occurs in conglomerate beds on the east shore of South bay and on Prospair point, where the conglomerates are drag-folded together with rusty-weathering greywacké and ferruginous slate. In this locality the greywacké and sericite matrix between closely packed chert pebbles in the conglomerate contains disseminated pyrite and small amounts of pyrrhotite, chalcopyrite, and arsenopyrite. Most of the samples taken for assay from this type of occurrence yielded less than 0.03 ounces in gold per ton, although values up to 0.15 ounces have been obtained.

Gold has also been discovered associated with sulphide mineralization in a silicified shear zone in drag-folded sediments on the northeast arm of Hewitt lake. At the 8-foot falls, 4 miles west of the outlet of North Spirit lake, gold has been

¹J. B. Tyrrell, "The Patrician Glacier South of Hudson Bay," Internat. Geol. Cong., 12th Sess., Canada, 1913, pp. 523-534.

found associated with pyrite in quartz stringers that fill fractures in drag-folded phyllite. A recent discovery of gold-bearing arsenopyrite associated with quartz in a slaty schist was made near Pakeagama lake, about 12 miles west of North Spirit lake.

Quartz veins are numerous throughout the area, but for the most part these are barren. Narrow shear zones and carbonate zones, some containing sulphide mineralization, are not uncommon and occur in many parts of the area, particularly in the vicinity of contacts between sediments and volcanics.

In general, both from lithological and structural considerations, the area is favourable for the occurrence of gold deposits of economic importance. No systematic prospecting was carried on during the summer of 1937, and most prospecting activities to date have been confined to sections near some of the larger lakes, so that a large portion of the area is still virgin prospecting territory. All the gold discoveries made to date, with two or three minor exceptions, have been found associated with arsenopyrite. The presence of this mineral appears to be the best indicator for gold in the region, but the prospector is advised not to overlook other sulphides in his search.

Lime

On the south shore and northwest arm of Hewitt lake a number of beds of crystalline limestone occur infolded with other sediments. Portions of some of the beds are more than 99 per cent. calcite and, therefore, of sufficient purity to provide lime for metallurgical purposes in any local mining operations.

Iron

The iron formation in the vicinity of Prospair point and at the northeast end of North Spirit lake contain the highest iron content of the different beds of iron formation examined throughout the area. In these localities parts of some of the beds contain up to 50 per cent. magnetite, much of which is amenable to concentration by magnetic methods. There is a large tonnage of low-grade iron ore which, owing to the remoteness of the region, has no economic significance at the present time.

DESCRIPTION OF PROPERTIES

Spirit Lake Gold Mines, Limited

History

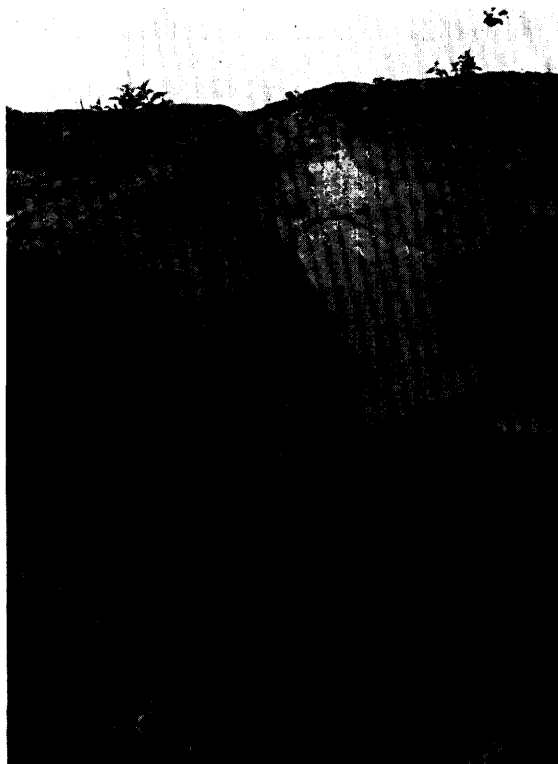
Spirit Lake Gold Mines, Limited, was incorporated in 1936 to develop the original claims staked in April of that year by prospectors financed by the Derby Gold Syndicate, under the leadership of A. F. Hewitt. The property consists of 96 claims in the South bay section of the lake, the greater part of which covers water locations. During the summer of 1936 a programme of trenching and test-pitting was carried out by representatives of Interlac Gold, Limited, under Mr. Hewitt. In September, after the appointment of V. E. C. Odum as resident manager, a programme of diamond-drilling was commenced and continued until May, 1937. During the winter a geophysical survey was made of part of the water locations in South bay. Permanent camp buildings, capable of housing 40 men, have been constructed. The company has been inactive since June, 1937.

Mineralization

The principal geological feature of the property is an irregularly shaped stock of medium-grained diorite, which intrudes a folded series of impure slates and

greywackés together with greenstones. The stock is probably not more than $1\frac{1}{2}$ miles in diameter, but its shape is not known, as the periphery of all but a small portion lies beneath the lake. The geophysical survey was undertaken to locate the eastern contact of the stock.

The three principal loci of mineralization on the property are: (1) the Camp Island and "W" Island sections near the northeastern margin of the diorite stock; (2) "A" section, which lies at a volcanic-sedimentary contact with a small



Fracture in massive diorite on Camp island filled with solid arsenopyrite with an average width of 8 inches.

andesite porphyry body 5,000 feet south of Camp island; and (3) "J" and "T" sections, which occur in conglomerate beds on the east shore of South bay, 10,000 to 11,000 feet east of Camp island.

Camp Island and "W" Island Sections

Mineral occurrences in this vicinity are characterized by gold-bearing arsenopyrite filling short, narrow, irregular fractures (joints) in the diorite. On Camp island there is an irregular fracture zone about 50 feet wide, striking northeast, which has been traced for some 500 feet beneath the lake. This zone consists of 2- to 3-inch, irregularly dipping tourmaline-quartz stringers associated with fine-grained massive arsenopyrite in strongly fractured diorite. The stringers, however, are not closely spaced, and the diorite between them carries no mineralization. Two hundred and fifty feet north of this zone there is a parallel fracture,

averaging 8 inches in width and traced for 60 feet, which is filled with solid arsenopyrite. A specimen of the mineralized material yielded 0.25 ounces in gold per ton.

On "W" island, over a width of 275 feet, there occur at least three narrow mineralized zones having a rough northwest-southeast trend, normal to the mineralized fractures on Camp island. The trends of the mineralized zones coincide with the directions of jointing in the stock. The zones outcrop near the shore of the island and strike into the water; they have been traced into the island for some 200 feet, but appear to have no continuity. Diamond-drill holes indicate that, although irregular, these fractures extend at least some 750 feet southeast of the island.

The mineralized zones rake to the southeast at an angle of about 30 degrees. The fractures, which vary from 2 to 12 inches in width, occur in otherwise massive diorite and are irregular in both strike and dip. Each of the zones is characterized by massive arsenopyrite, which fills the fracture and occurs as a disseminated replacement in the wall rock for 6 inches to 1 foot on either side. Narrow tourmaline-quartz stringers, which vary from half an inch to 3 inches in width, also carry arsenopyrite and are associated with the massive sulphides in the fractures. In addition the zones contain small amounts of pyrite, chalcopyrite, magnetite, and epidote. The diorite in the vicinity of the fractures has been metasomatically altered, whereas the walls of the fractures have been hydrothermally altered to dark-green chlorite and have been partially bleached. The following chemical analyses are given of these two altered products of the diorite in order to indicate the intensity of chemical changes produced by mineralizing solutions.

| | Altered diorite | Wall rock |
|--------------------------------------|-----------------|-----------|
| | per cent. | per cent. |
| SiO ₂ | 57.28 | 54.87 |
| Al ₂ O ₃ | 15.48 | 18.08 |
| Fe ₂ O ₃ | 5.69 | 1.82 |
| FeO..... | 2.58 | 4.86 |
| MgO..... | 2.78 | 2.69 |
| CaO..... | 3.68 | 4.41 |
| Na ₂ O..... | 2.38 | 1.88 |
| K ₂ O..... | 4.76 | 6.64 |
| H ₂ O..... | 1.66 | 1.41 |
| TiO ₂ | 0.64 | 0.79 |
| P ₂ O ₅ | 0.35 | 0.39 |
| CO ₂ | 2.09 | 2.21 |
| FeS ₂ | 0.88 | trace |
| Total..... | 100.25 | 100.05 |
| Specific gravity..... | 2.798 | 2.87 |

Analyses by Provincial Assay Office; W. F. Green, analyst.

The metasomatically altered diorite, in thin sections, differed from the fresh diorite in that there was a considerable amount of secondary biotite and muscovite (up to 20 per cent.), as well as albitization of potash feldspars and introduction of allanite and tourmaline. These changes show an appreciable increase in potash and soda. The more intense hydrothermal alteration resulted in a further increase in potash but decrease in soda; ferrous iron increased with a corresponding decrease in ferric iron.

Development work has been concentrated on the Camp island and "W" island sections, but up to the present time no zones of commercial lengths or

widths have been defined. A 202-pound specimen of massive, mineralized material from the "W" Island location sent to the Mines Branch, Department of Mines and Natural Resources, Ottawa, for laboratory testing purposes, yielded 2.35 ounces in gold per ton. The specimen was found to contain 21.83 per cent. arsenic or the equivalent of 47.5 per cent. arsenopyrite. Assays of the disseminated mineralization in the wall rock yield negligible values in gold. Studies indicated that the gold is present largely with the arsenopyrite, coating crystals and grains and within fractures in them. There does not appear to be any

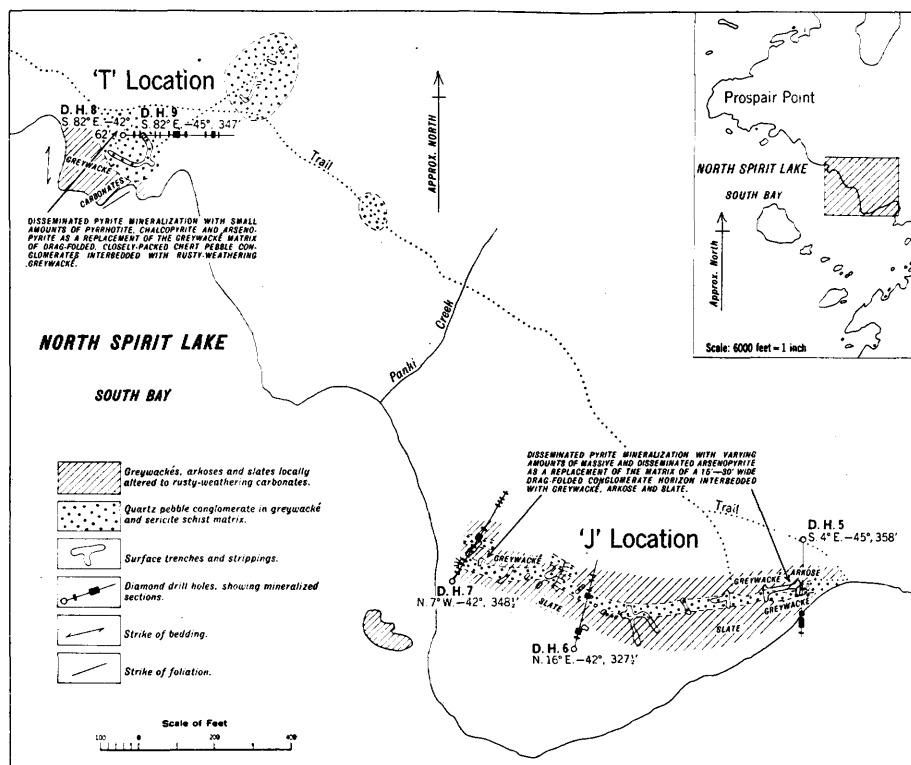


Fig. 5—Plan showing geology, prospect workings, and diamond-drill holes, "J" and "T" sections, Spirit Lake Gold Mines.

relation of gold content to the tourmaline-quartz stringers. A mineralographic examination of three polished specimens from "W" island location, which assayed 0.83, 0.87, and 2.38 ounces in gold per ton showed visible gold only in the first one. In this case the gold occurred as very fine micro-seams between arsenopyrite crystal boundaries.

"A" Location

Approximately 1 mile south of Camp island, mineralization was found at the contact of a small andesite porphyry body across an outcrop of greenstone and greywacké. The discovery consists of a 4- to 6-inch massive arsenopyrite vein filling a fracture in the porphyry adjacent to the volcanic-sedimentary contact. Narrow parallel quartz stringers carrying arsenopyrite occur here over a width of 25 feet. A small zone of pyrite mineralization was found 100 feet south in quartz stringers in bedded greywacké.

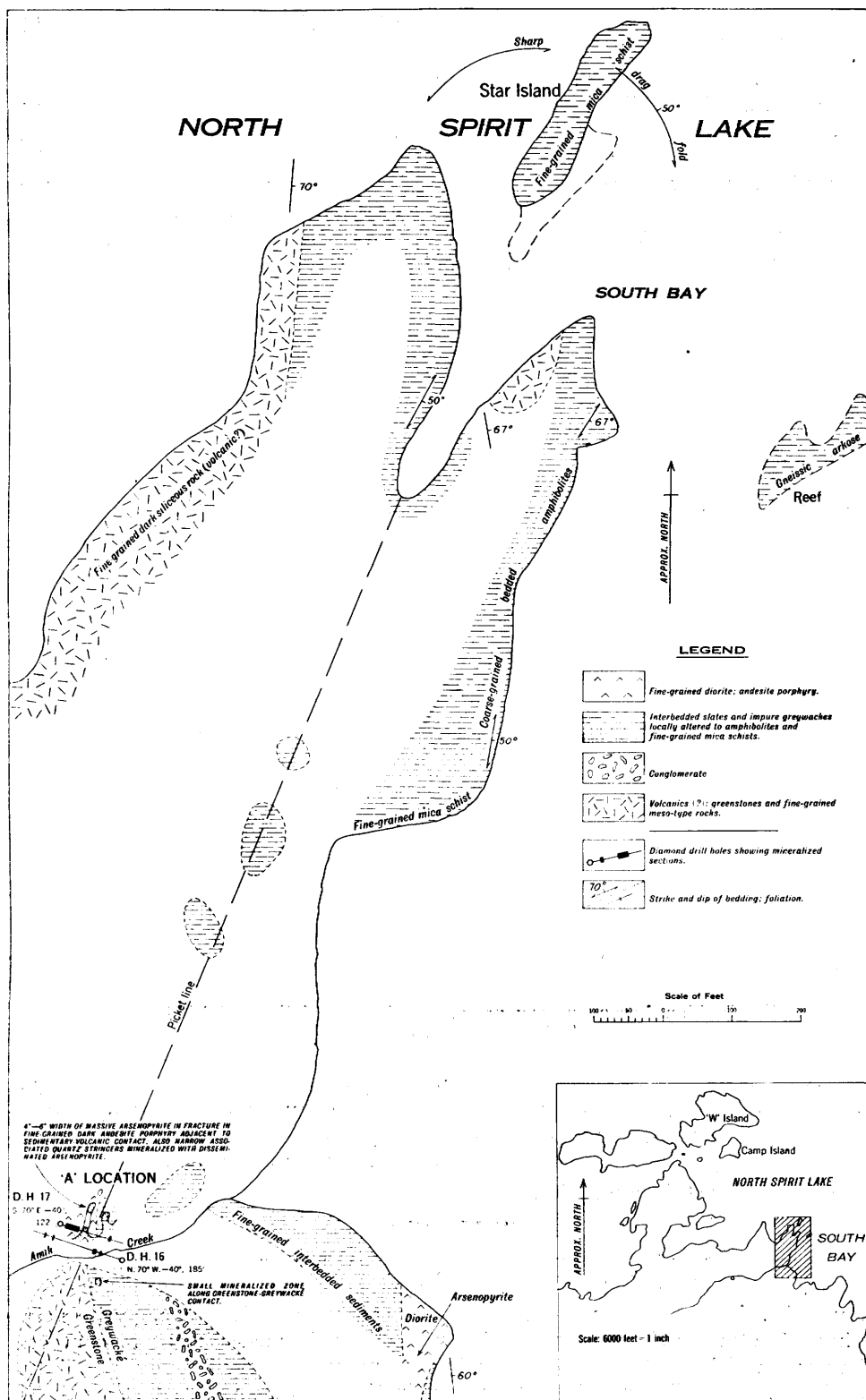


Fig. 6—Geological sketch map showing prospect workings and diamond-drill holes, "A" location, Spirit Lake Gold Mines.

A 28-pound specimen of mineralized material from "A" location was reported by the Mines Branch, Ottawa, as carrying 0.11 ounces in gold per ton and 72 per cent. arsenopyrite. A comparison of this analysis with the one from "W" location suggests that there is no constant relation in the ratio of gold to arsenopyrite. Mineralographic examination of a polished specimen carrying 0.12 ounces in gold per ton did not show any gold. Although some encouraging assays were obtained, development work failed to show any persistent length to the fractures at this location.

"J" and "T" Locations

"J" location, which lies 2 miles east of Camp island, on the east shore of South bay, is situated in a mineralized chert pebble conglomerate bed interbedded with rusty-weathering greywacké, arkosic quartzite, and slate. The mineralization consists of pyrite, varying amounts of arsenopyrite, and minor amounts of pyrrhotite and chalcopyrite, which occur as a replacement of the matrix between the pebbles of the conglomerate. The conglomerate bed ranges in width from 15 to 25 feet and was traced in a northwesterly direction for some 500 feet. Most of the assays, according to company reports, yielded less than 0.04 ounces in gold per ton.

"T" location, which lies approximately 1,000 feet north of "J," occurs in a thick conglomerate formation drag-folded with sediments that have been altered to rusty-weathering carbonates. Irregular pyrite mineralization occurs as a replacement of the slaty and sericitic matrix of the conglomerate. Low values in gold have been reported.

Development

Mineralized zones on the property have been probed by more than 30 diamond-drill holes ranging from 120 to 630 feet in length, with a total length of more than 8,000 feet. Except for 2 holes at "A," one at "T," and 3 at "J" locations, drilling has been confined to the Camp and "W" island sections. The results of drill-holes in irregular fractures such as these have been inconclusive.

The development was planned to search beneath the lake by diamond-drill for the eastern diorite-sediments contact in order to search for fractures more persistent than those that occur within the diorite itself. In February, 1937, a geophysical survey was undertaken to locate the eastern contact of the diorite beneath the lake. The survey, which was conducted by Hans Lundberg, Limited, covered an area of 230 acres extending east and southeast of Camp island. The results are shown in Fig. 3 (see insert facing page 70).

Fig. 6 shows the supposed contact drawn on the basis of the geophysical results whereas the actual contact, determined from a detailed examination of rock outcrops, is seen to lie more than 2,000 feet to the west.

Prospectors Airways Company, Limited

Representatives of the Prospectors Airways Company, Limited, staked a block of 15 claims adjoining the "J" and "T" sections of Spirit Lake Gold Mines on the northeast. A detailed geological map of the claims was made under the direction of J. E. Hawley and three zones of mineralization were examined, two of which were in conglomerate and the third in rusty-weathering greywacké.

The property is underlain by a vertically plunging drag-folded series of conglomerates interbedded with slates, slaty iron formation, and rusty-weathering greywacké. Surface stripping was carried out at 3 locations on Prospair point; and shallow test pits were sunk in small mineralized zones at locations Nos. 1

and 2. The mineralization at locations Nos. 1 and 3 consists of sparse, disseminated pyrite with small amounts of chalcopyrite, pyrrhotite, and arsenopyrite in the sericite matrix between closely packed chert pebbles in the conglomerate. Twenty-one samples from location No. 1 are reported to have yielded

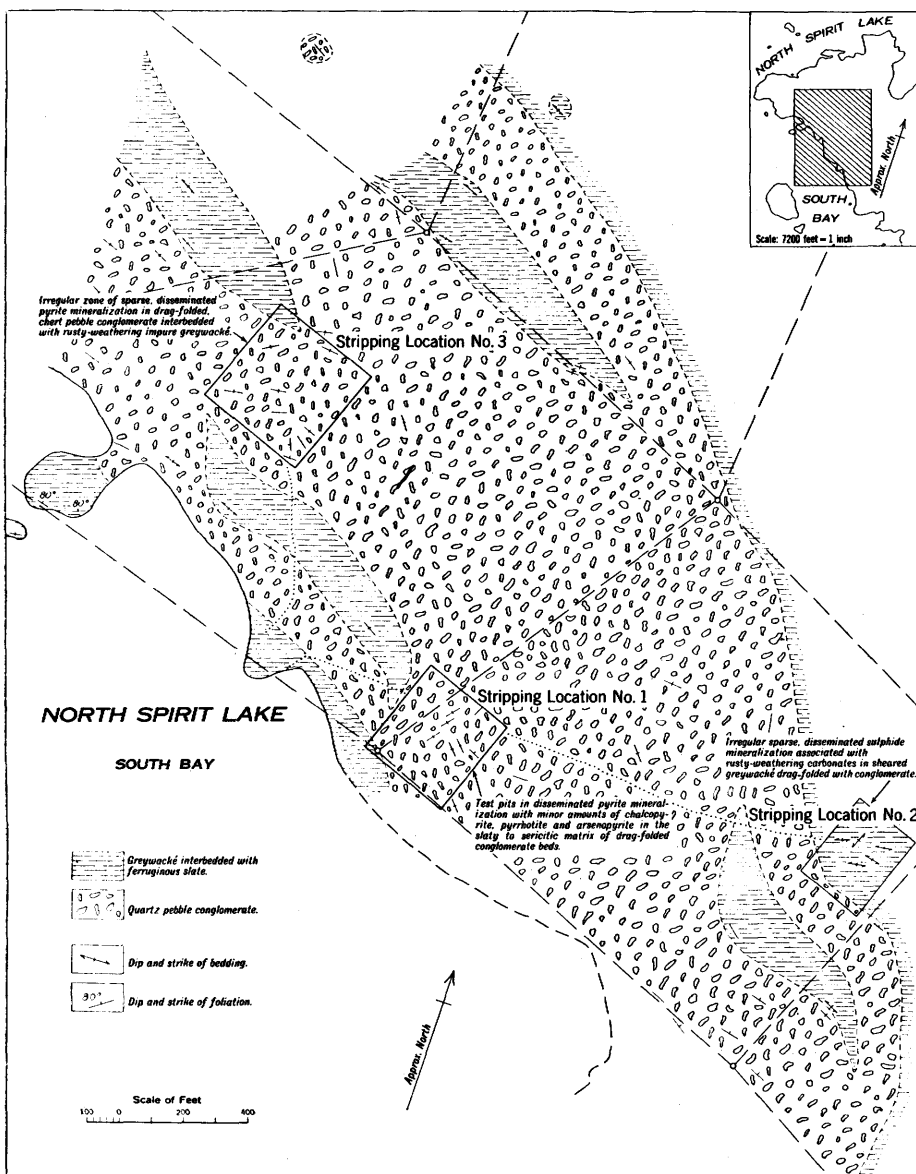


Fig. 7—Plan showing geology and surface-stripping locations on part of the Prospectors Airways claims, North Spirit lake.

less than 0.03 ounces in gold per ton. At location No. 2 sparse disseminated sulphide mineralization is associated with rusty-weathering carbonated sediments. Eleven specimens from this location are reported by the company to have yielded less than 0.03 ounces in gold per ton. Gold is reported to have been

panned from the oxidized surface of a band of cherty iron formation at this location.

Interlac Gold, Limited

Interlac Gold, Limited, hold a group of claims adjoining the "J" and "T" sections of Spirit Lake Gold Mines on the southeast. Gold has been discovered on the prominent point at the southeast end of South bay in an occurrence consisting of a small mineralized zone in a complex east-plunging drag fold of siliceous material interbedded with slate and greywacké. Mineralization consists of massive and disseminated arsenopyrite with small amounts of pyrite and chalcopyrite associated with actinolite. Two shallow test pits have opened up the discovery for an east-west length of 20 feet and a width of 15 feet. A grab sample is reported to have assayed 0.3 ounces in gold per ton, and a chip sample across 7 feet taken by the writer returned 0.07 ounces.

Keefe Group

A group of claims on the southwest side of South bay adjoining those of Spirit Lake Gold Mines on the south was staked on behalf of William Keefe of Sioux Lookout. A geophysical survey of part of the property was made in the summer of 1937 by Hans Lundberg, Limited. No mineralized occurrences have been reported.

Mining Corporation of Canada, Limited

Prospectors for the Mining Corporation of Canada, Limited, staked a group of 12 claims in 1936 on the northeast shore of the northeast arm of Hewitt lake, as the result of obtaining gold in pannings from an exposure of rusty schist. The occurrence consists of a siliceous shear zone in drag-folded garnetiferous sediments near a contact with greenstone. Trenching failed to disclose any persistence to the zone, which outcrops as a low rusty cliff, about 20 feet wide, at the lake shore, striking slightly south of east. Mineralization consists of disseminated pyrite with minor amounts of arsenopyrite and pyrrhotite in fine-grained, chert-like, siliceous material. Three grab samples are reported by the company to have given 0.29 ounces, 0.81 ounces, and 0.14 ounces per ton. Subsequent check sampling failed to yield more than 0.10 ounces per ton in 17 samples. A grab sample taken by the writer returned 0.07 ounces per ton.

Wynne Claims

In the summer of 1937, two groups of claims were staked by C. Wynne, representing J. D. Kennedy, manager of San Antonio Gold Mines, in the vicinity of Pakeagama lake, which lies 12 miles west of North Spirit lake and 2 miles west of Tallrice lake. This was the result of Wynne having been taken during the summer to a showing of gold-bearing arsenopyrite by James Linklater, an Indian.

There are two zones of mineralization. The first, on which 3 claims were staked, lies 25 chains to the north of Pakeagama lake. Grab samples yielding 0.21 ounces, 0.14 ounces, 0.15 ounces, and 0.07 ounces per ton are reported by Wynne to have been obtained from this zone. The second zone, on which two claims were staked, lies on the southwest shore of the lake. At this locality 3 mineralized veins up to 200 feet in length have been reported, the mineralization consisting of pyrite and arsenopyrite in irregular quartz stringers filling a shear zone in schistose, slaty sediments.

Other Properties

A number of groups of claims in addition to those mentioned have been staked, for the most part in the South bay section of the area, but these are not known to contain mineralized occurrences.

Recent Developments in the Favourable Lake Area

By J. D. Bateman

Introduction

The Favourable Lake area lies between latitudes 52° 45' and 53° 00' N. and longitudes 93° 30' and 94° 00' W., in the Patricia portion of Kenora district in northwestern Ontario. The lake is located approximately 210 miles north-north-west of Hudson or Sioux Lookout on the transcontinental line of the Canadian National Railways and 135 miles east of Berens River Post on Lake Winnipeg.

The earliest reliable reference to the volcanic and sedimentary rocks at Favourable lake dates back to a reconnaissance exploration of the country between Lake Winnipeg and Hudson bay (via the Berens and Severn rivers) in 1886, by A. P. Low,¹ who stated:—

The Huronian [now called Keewatin] rocks were first observed in Favourable lake, where they consist of chloritic and altered hornblende rocks, with talc and hydro-mica schists.

It was not until 1925, however, when G. V. Douglas² reported on a reconnaissance trip of the water routes between Red lake and Favourable lake, that the mineral-bearing potentialities of the area were considered.

Subsequent prospecting activities in the fall of 1927 led to the discovery of native gold and, later, of gold-silver-lead-zinc occurrences in the vicinity of Favourable lake. The area was examined by M. E. Hurst³ in 1928, and developments up to 1929 are recorded in his report. Surface trenching and diamond-drilling on a number of claims at that time failed to disclose any ore bodies of commercial importance, and, with minor exceptions, prospecting activities in the area ceased. With a lowering of the cost of airplane transportation and the increased price for gold, interest in the area was revived in 1936, with the formation of Berens River Mines, Limited, to develop the former property of the Favourable Lake Mining and Exploration Company. In September, 1937, the writer spent 10 days in the area, during which time the property of Berens River Mines was examined in addition to two other small prospects.

Acknowledgments

The writer is indebted to H. De Witt Smith, of the Newmont Mining Corporation, and to M. D. Banghart, general manager, and B. R. Frisbee, engineer, at Berens River Mines, for their friendly co-operation, which has made this report possible. In particular, the writer would like to express his thanks to P. C. Benedict, geologist of the Newmont Mining Corporation, whose stimulating discussions and keen observations were of the greatest help to the writer.

Berens River Mines, Limited

HISTORY AND DEVELOPMENT

Berens River Mines, Limited, which is one of the most northerly underground mining operations in Ontario, is of particular interest owing to the fact that a complete mining plant and all supplies have been moved to the property by means of airplanes. The unusual metallic assemblage, gold-silver-lead-zinc, makes it unique among present mining developments in the province. The

¹Geol. Surv. Can., Vol. II, pt. F, 1887, p. 17; reprint, Ont. Bur. Mines, Vol. XXI, 1912, pt. 2, p. 105.

²Ont. Dept. Mines, Vol. XXXV, 1926, pt. 4, pp. 1-21.

³Ont. Dept. Mines, Vol. XXXVIII, 1929, pt. 2, pp. 49-84.

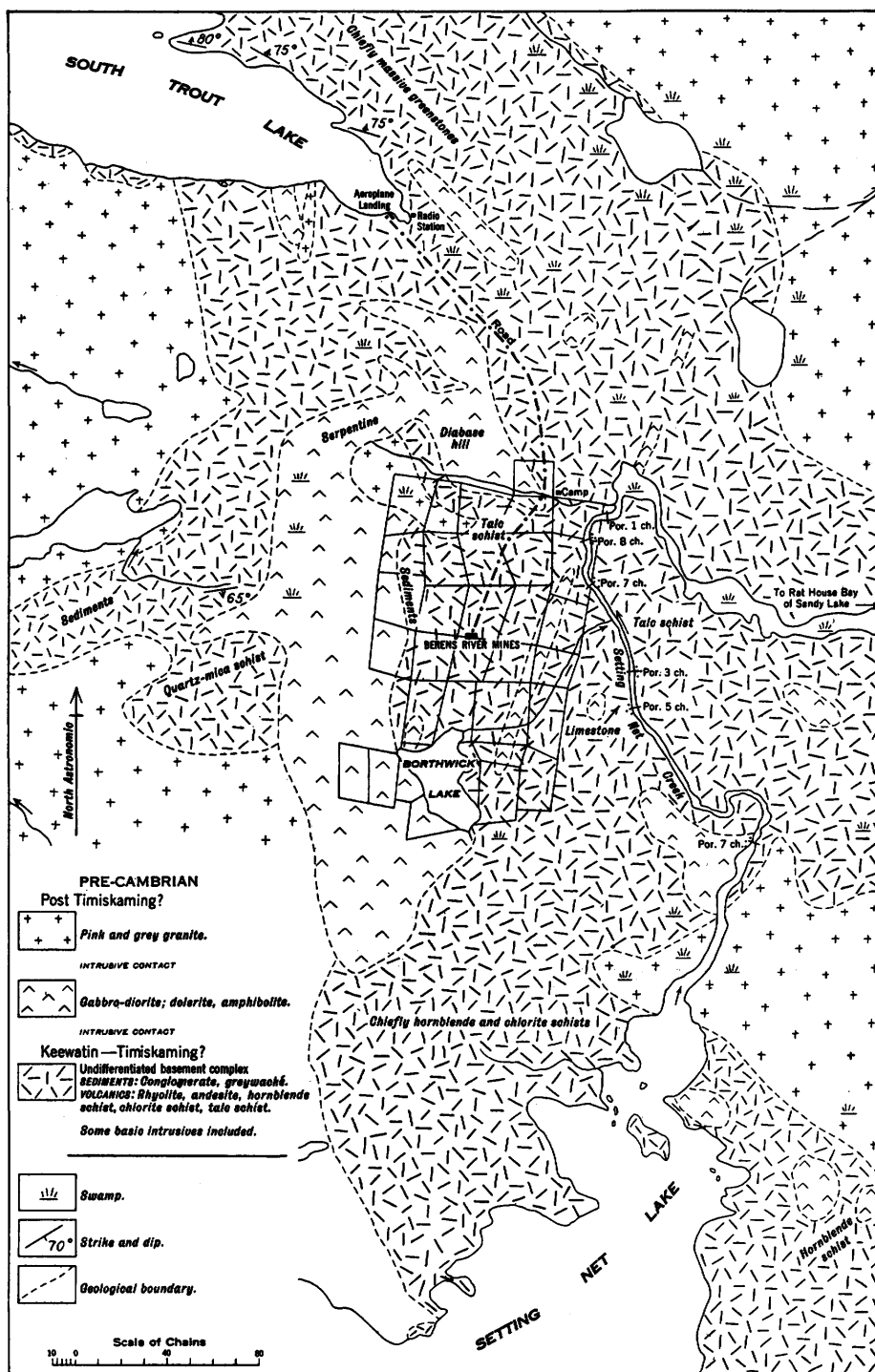


Fig. 1—Geological sketch map showing the location of the property of Berens River Mines, Limited, with respect to the Favourable lake volcanic-sedimentary belt. (Geology after M. E. Hurst, 1929.)

property lies within the Favourable lake volcanic-sedimentary belt, some 6 miles east of Favourable lake and $2\frac{1}{2}$ miles southeast of South Trout lake.

The original discovery was made by K. C. Murray, of Winnipeg, who, in 1927, staked the 9 claims (Pa. 112-120) that constitute the nucleus of the present property. At that time F. M. Connell, J. H. C. Waite, and associates, organized the Favourable Lake Mining and Exploration Company to develop the discovery, and 21 additional claims (Pa. 2,164-2,184) were added to the property. The discovery consisted of four mineralized zones, trending east-west, from 600 to 800 feet apart. Zones Nos. 1 and 3 were diamond-drilled, the work being completed in July, 1929, at which time operations were discontinued. Approximately \$100,000 was expended on the property in 1928 and 1929.

In July, 1936, the property was taken over by the Newmont Mining Corporation, and a subsidiary, Berens River Mines, Limited, was formed to carry on development.

In 1937, three additional claims, Pa. 3,267-3,269, were located by the present company, and six claims, Pa. 2,513, 2,514, 2,519, 2,520, 2,540, and 2,548, were acquired by stockholders and donated to the company. The property thus consists of 39 claims containing approximately 1,556 acres.

Transportation

Equipment, supplies, and men are transported from Winnipeg to Berens River Post on boats operated on Lake Winnipeg by the Selkirk Navigation Company. The fare from Winnipeg to Berens River is \$7.00 and the rate for freight is \$7.00 per ton.

Supplies are flown from Berens River, 145 miles east to South Trout lake, in planes operated by Wings, Limited.

The following prices quoted for air transportation are part of a contract in existence during the summer of 1937 between the mine and Wings, Limited, and may vary somewhat depending on the loads carried and the number of special trips required.

| | Freight | Passengers | |
|--|---------|------------|------------|
| | per ton | one way | round trip |
| Berens River to South Trout lake..... | \$145 | \$25 | ..... |
| Lac du Bonnet to South Trout lake..... | 250 | 45 | \$81 |
| Winnipeg to South Trout lake..... | 300 | 50 | 90 |

A comparison of these figures with those quoted by Hurst¹ demonstrates the remarkable decrease in freight and passenger rates since 1928. Passenger rates at that time were \$145 for the 188-mile trip from Goldpines to Favourable lake, and freight rates \$1,000 per ton.

A bush road has been constructed from the landing base at South Trout lake to the property $2\frac{1}{2}$ miles southeast.

Construction of a mill and power plant will require some 2,000 tons of equipment and supplies. In order to transport this material, the company is building a winter road from Berens River Post to the mine property. The road will cover about 100 miles of land and 80 miles of waterways, and it is estimated that freight could be transported by tractors for about 25 cents per ton per mile.

Communication

Wings, Limited, maintain a radio station at South Trout lake, in order to contact the company stations at Berens River Post and Lac du Bonnet. In

¹M. E. Hurst, op. cit., p. 51.

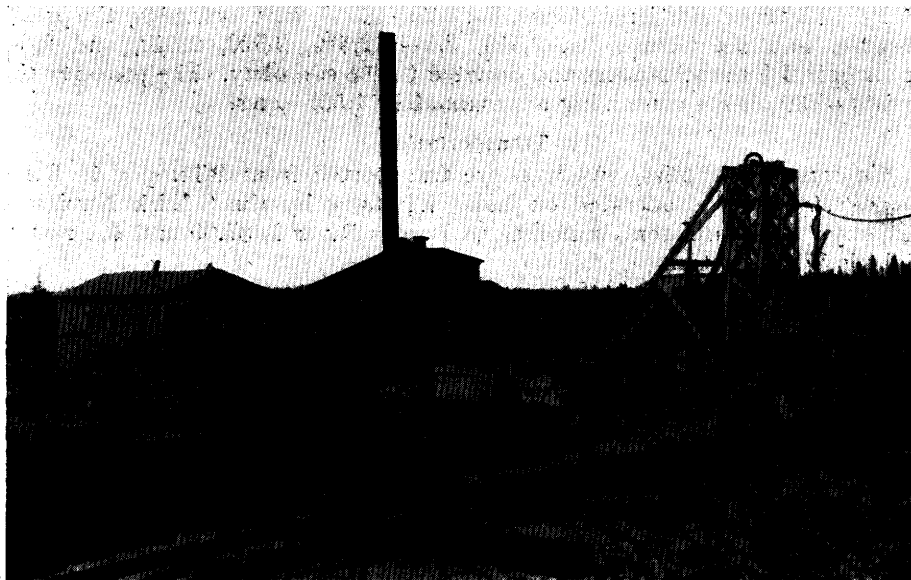
addition a small 5-watt transmitter is operated at the property for communication with the landing base.

Equipment

The property is equipped with a complete mining plant and camp accommodation for 70 men. At present the plant is operated by steam generated from wood-burning boilers. The company has constructed a saw-mill with a capacity of 5,000 feet of lumber per day.

Power

The company is developing its own hydro-electric power on the Flanagan (Duck) river, 8 miles east of the property. A dam site has been surveyed on the upper falls between North Wind lake and Rat House bay of Sandy lake; and an



Mining plant at the Berens River mine.

8½-mile power line survey has been made from that point to the property. The dam site is located above a 48-foot fall in the river near the outlet of North Wind lake, the projected power plant lying 800 feet to the west. At this locality there is a potential 4,000 horse-power, of which 1,600 horse-power will be required initially for development. One and a half miles farther north on the river there is another fall of 25 feet, which could supply an additional 2,000 horse-power. In order to ensure a sufficient flow of water at all seasons, two diversion dams will be required, one at the outlet of Margot lake in the North Spirit Lake area, and the other 3 miles north of Whiteloon lake at Johnston rapids. In this way the level of North Spirit lake will not be altered.

The cost of placing two 800-horsepower turbines in operation, which would deliver an estimated 1,350 horse-power to the mine, is figured at \$268,000; power could be produced at a cost of about \$15 per horsepower year. This would be sufficient for a mining and milling operation of 200 to 250 tons per day.

Development

In 1928 and 1929, former operators probed the Nos. 1 and 3 zones with 35 diamond-drill holes having a total length of 5,389 feet. From January to August, 1936, 23 holes totalling 8,794 feet were drilled. With the exception of 3 assessment core-holes, this work was confined to the No. 1 zone.

Further drilling has been done by the present company on the No. 1 zone both from surface and underground.

The sinking of a 3-compartment shaft was started on January 20, 1937, and completed to a depth of 400 feet by May 4. By September 15, 2,600 feet of lateral work and 100 feet of raising had been completed on the 250- and 375-foot levels. On September 15, lateral work was temporarily discontinued; the shaft was completed to 515 feet by October 6. Lateral work on the 500-foot level consisted of a 202-foot crosscut south of the shaft, 820 feet of drifting, and 195 feet of additional short crosscuts, which were completed by January 15, 1938. During this period 700 feet of additional lateral work was accomplished, principally on the 375-foot level. On January 23, underground exploration was discontinued and the mine allowed to fill with water.

GEOLOGY

General

The property of Berens River Mines lies in the granite-bordered Favourable lake volcanic-sedimentary belt (Keewatin-Timiskaming?), to the east of a large mass of altered pre-granite gabbro. A small body of monzonite lies half a mile north of the mine, and a larger-sized body of pink granite outcrops 2 miles to the southeast. Half a mile east of the shaft there is a long north-south-striking dolerite dike cut by an east-west-striking andesite dike 2 feet in width. A narrow east-west-striking felsite dike, parallel to the No. 2 zone, is the nearest known intrusive to the shaft.

The following table gives the formations that outcrop on the property:—

Table of Formations

| | |
|-------------------------|---|
| LATER INTRUSIVES: | Felsite and andesite dikes, porphyry, monzonite. <i>Intrusive contact</i> |
| PRE-GRANITE INTRUSIVES: | { Gabbro-diorite, dolerite. Diabase, locally altered to amphibolite. <i>Intrusive contact and intense folding</i> |
| SEDIMENTS: | { Chert, iron formation, slate. Greywacké and undifferentiated metasediments. Conglomerate. |
| VOLCANICS: | Rhyolite, andesite, chlorite schist, and greenstone. |

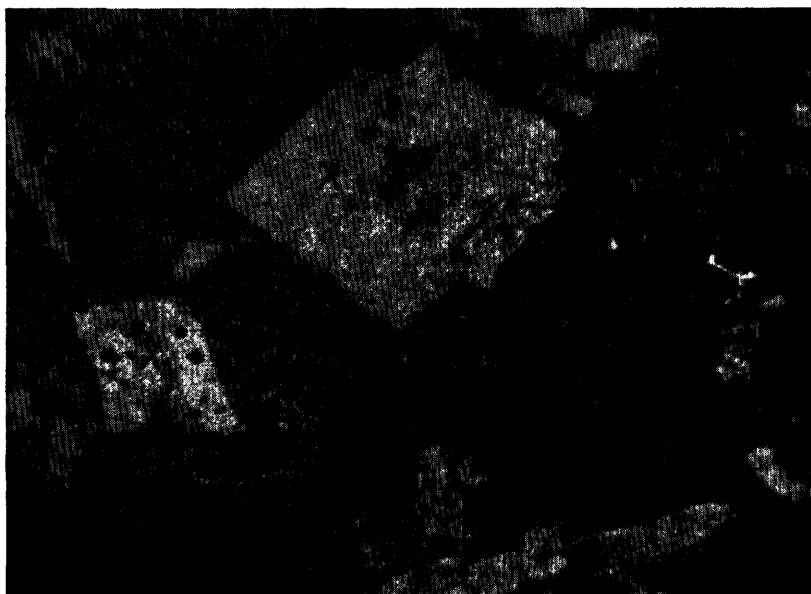
Most of the property is underlain by a series of closely folded sediments and volcanics, which represent the oldest formations in the area. The trend of these formations is roughly north and south, and the planes of foliation, where evident, are vertical.

The Nos. 1, 2, 3, and 4 zones occur as east-west fractures in what is believed to be a series of north-south-striking, almost vertical, siliceous or rhyolitic flows. A hundred feet to the west of the No. 1 zone is a north-south-striking conglomerate bed containing pebbles of the volcanics. This would suggest that the conglomerate is the basal member of the sediments lying to the west, and that the tops of the formations face west at this locality. A diamond-drill hole at the

west end of No. 1 zone indicates that the volcanics-conglomerate contact dips about 50° E., suggesting that the beds have been overturned.

Petrology of the Country Rocks

The rhyolite flows in the vicinity of the shaft have been altered so much that nearly all primary structures and textures have been obliterated. An underground examination of the rock types shows that they are mostly very fine grained, massive, and buff-coloured; local areas show a granular texture, and in many places the rocks have a brecciated appearance. There are less extensive exposures of a dark-coloured, siliceous rock, which contains megascopically visible garnet.



Photomicrograph of a thin section of light-coloured country rock from the Berens River mine. The angular white areas (X) represent probable feldspar phenocrysts, now entirely replaced by a very fine grained mosaic of quartz grains; the groundmass is sericite; the black areas and specks are pyrite. ($\times 20$.)

These rocks, when viewed under the microscope, show intense metasomatic alteration. They are composed essentially of quartz with minor amounts of sericite, chlorite, and carbonate, and variable amounts of biotite, garnet, and pyrite. The quartz, which constitutes 80 per cent. of the light-coloured varieties and 50 to 60 per cent. of the dark-coloured rock types, occurs in four ways: (1) as the microcrystalline groundmass of the rock; (2) as clusters of small grains; (3) as mosaics of quartz grains, which have replaced former angular fragments or feldspar phenocrysts; and (4) as veinlets. Sericite comprises about 15 per cent. of the sections as fine, micaceous shreds. The light-coloured rock type contains less than 1 per cent. biotite; but the dark-coloured type contains up to 15 per cent. biotite, which is the cause of its dark colour; this type also contains some garnet. All the rocks contain a small amount of pyrite (see photomicrograph above).

Much of the quartz and all of the remaining constituents of these rocks are secondary, having been produced by thermal metasomatism.

If these rocks are correctly interpreted as former siliceous flows, it appears that they have undergone more or less silicification and pyritization, but secondary biotite and garnet have developed in some flows and not in others, owing either to chemical or physical differences in the original rocks, no vestige of which now remains. The widespread silicification and development of so much secondary biotite as well as garnet and pyrite in the wall rock suggests that a rather intense high-temperature metasomatism preceded the introduction of the ore minerals.

There is no apparent relationship of either the pattern of the fracture system occupied by the veins or the character of the mineralization in the ore bodies to the different rock types, both passing from one to the other without change. Any former schistosity in these rocks has been obliterated by subsequent silicification.

Structure of the Veins

The regional trend of the folded sedimentary and volcanic rocks, as well as the pre-granite basic intrusives, is north and south; but the trend of the younger andesite and felsite dikes, as well as the veins, is east and west, transverse to the regional trend. These transverse fractures are later than the basic intrusives and may be connected with the intrusion of the massive granitic rocks that outcrop to the north and south of the mine. The fractures bear no relation to the regional folding, as this occurred prior to the basic intrusions. The localization of the alteration of the country rock and of the ore minerals was caused by these fractures, whose formation must have accompanied or preceded the intrusion of an igneous body, which may be the granite already mentioned.

The No. 1 zone, which has been opened up by underground operations, varies in strike from east-west to S. 70° E., with an average dip of 60° S. The veins occur as short, narrow, silicified zones, which range from tabular to lenticular in form and are either parallel or *en échelon* in arrangement. The ore shoots in the veins are between 60 and 350 feet long and range from 3 to 25 feet in width.

A structural feature, which was not recognized until the veins had been opened up by underground development, is their displacement by a number of post-ore faults. These are narrow northwestward-striking reverse or thrust faults, which have an average dip of less than 50° N.E. This explains the fact that, although the veins dip 60° S., the ore bodies are almost vertically above each other on different levels. From surface to the 500-foot level, four major faults have been delineated, and diamond-drilling has indicated another reverse fault of this type between the 500- and 650-foot horizons. There are, in addition, a number of minor faults of various strikes and dips, which displace the veins several inches or a few feet at the most; but the horizontal displacement of each of the major faults varies from 30 to 80 feet. The fault zones are very narrow and free from gouge or breccia, and can only be discerned with difficulty. Since the ground is "tight," dilution due to faulting should not be appreciable, although the displacements will complicate stoping operations to some extent.

The major fault problems of the ore body have been capably solved by P. C. Benedict, to whom the writer is indebted for information. Mr. Benedict states in part:¹—

Their strike [the faults] is nearly parallel with the veins, their dip almost at right angles to them. Consequently the faults are much more obvious and their importance much more determinable in a raise than in a drift. . . . In a surprisingly large number of instances the displacement appears to be about the same as the distance between adjacent veins, so that it will occasionally be possible to start a stope on one vein and carry right through the fault and on up to the next level on a different vein.

¹Personal communication.

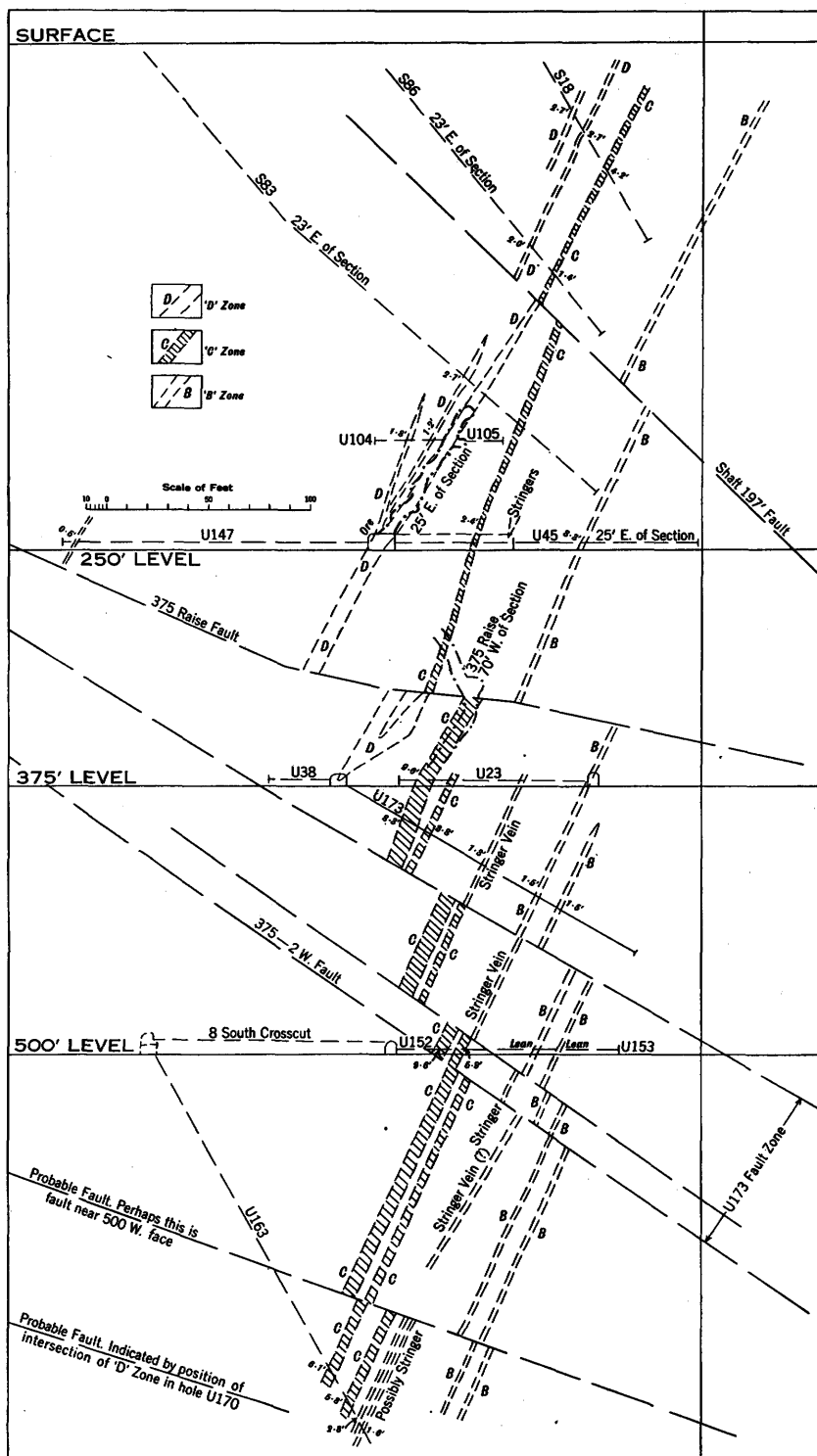


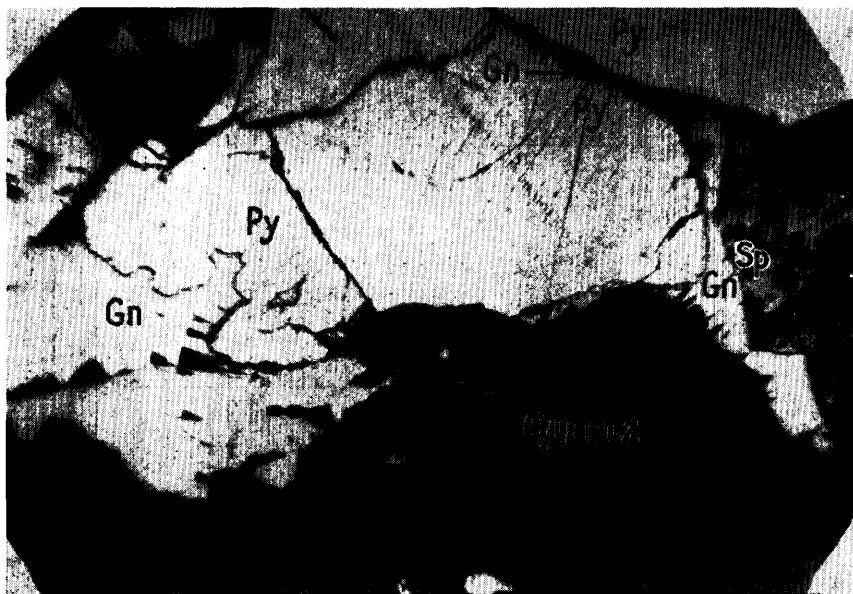
Fig. 4—Vertical section 250 feet east of the shaft, Berens River mine, showing displacement of veins by reverse faults. (After P. C. Benedict.)

The recognition of these faults explains the difficulty experienced by former operators in attempting to correlate core sections from surface diamond-drill holes.

The displacement on the faults tends to throw the ore to the east with depth, and since the ore extends as far east on the 500- as on the 250-foot level, the ore bodies may have a slight westerly rake.

Mineralization of the Veins

The ore shoots are fracture fillings and replacements in a strongly silicified zone, which contains sparsely distributed, unreplaced residuals of country rock. The silicified zone consists of quartz-actinolite veins formed by replacement of the wall rock, the localization of the zone being due to the original fractures along which rose the solutions that caused the extensive alteration of the country rock.



Photomicrograph of a polished section of ore from the Berens River mine, showing the relation of galena (Gn) to pyrite; the light-grey area at the right is sphalerite (Sp); the lower grey portion is quartz. ($\times 100$.)

At a later date the quartz-actinolite veins were fractured and the ore-bearing constituents were introduced as partial replacements of the quartz-actinolite and, in part, as open-space fillings. The ore shoots are thus veins within veins.

Thin sections of the quartz-actinolite material shows a quartz content of at least two generations, which varies from less than 20 per cent. to more than 90 per cent, but is generally the dominant gangue mineral; the actinolite content varies from 5 to 30 per cent. and the carbonate from 5 to 40 per cent. There are, in addition, small amounts of pyrite, garnet, and secondary iron-bearing chlorite. The quartz of the first generation is fine-grained and sugary in contrast to the later quartz, which occurs as open-space fillings and is euhedral and glassy. The later generation of quartz was accompanied by carbonate, primary chlorite, and a complex assemblage of sulphides, as well as gold and silver. A still later generation of quartz is found in narrow, undisplaced quartz stringers, which cut across the faults.

The ubiquitous pyrite belongs to two generations; the first accompanied the metasomatic replacement of the silicified zone and country rock and is invariably isotropic in character. The second generation is associated with the ore minerals along with the first generation and is slightly, but distinctly anisotropic under reflected polarized light. The relative proportions of these two ages of pyrite cannot be determined.

The metallic minerals in the ore body, which are present in a ratio of about 3 to 7 with the gangue, are, in order of relative abundance: pyrite (much of which belongs to an early generation), sphalerite, galena (which may belong to more

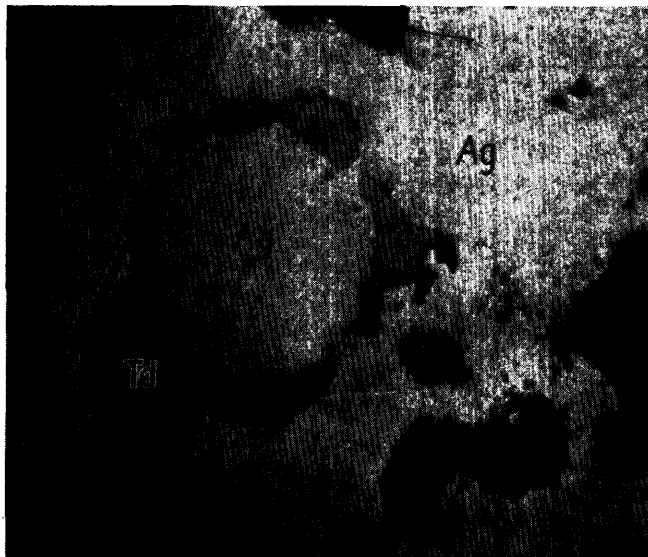


Photomicrograph of a polished section of ore from the Berens River mine, showing the relation of galena (Gn) to sphalerite (Sp); the dark-grey areas are quartz. Note the euhedral crystal of pyrite. ($\times 46$.)

than one generation), pyrrhotite, chalcopyrite, tetrahedrite, native silver, ruby silver, and gold. Pyrite, sphalerite, and galena are widely distributed in the veins and constitute more than 95 per cent. of the metallic minerals, the galena being subordinate. Pyrrhotite, chalcopyrite, and tetrahedrite are present in local occurrences. Arsenopyrite is sparse. Ruby silver is confined to the planes of narrow fractures and is perhaps supergene. A few occurrences of native silver are reported, but most of the silver in the ore is contained in galena; etching reactions suggest that the native silver may be supergene. No visible gold has been observed or reported.

Microscopic examination of polished sections of the ore revealed the following relationships: (1) The pyrite is euhedral, may be enclosed by other sulphides or gangue, and in some instances is partially replaced by galena (see photomicrograph on page 88). (2) Galena and sphalerite are intimately associated with each

other, one enclosing the other, but with a general tendency for the sphalerite to embay the galena (see photomicrograph on page 89). (3) Most of the tetrahedrite observed was associated with native silver, in which it forms atolls (see photomicrograph below). (4) Intimate intergrowths of chalcopyrite in sphalerite were observed (see photomicrograph on page 91), the chalcopyrite apparently oriented along cleavage planes in the sphalerite; such a texture has been interpreted as either due to unmixing or to replacement,¹ but the intimate relationship of these two minerals observed in sections from other parts of the veins suggests that they are contemporaneous and that the texture is due to unmixing of a solid solution. (5) Chalcopyrite and pyrrhotite are commonly in close association, but the pyrrhotite may also occur as islands in sphalerite.



Photomicrograph of a polished section of ore from the Berens River mine, showing the atoll-like structure of tetrahedrite (Td) in native silver (Ag); the black areas are gangue. ($\times 100$.)

The time of formation of all the sulphide minerals, with the possible exception of pyrite, appears to be approximately contemporaneous. The gold is apparently associated with the sulphides.

Field and mineralographic studies indicate the following succession of mineralization:—

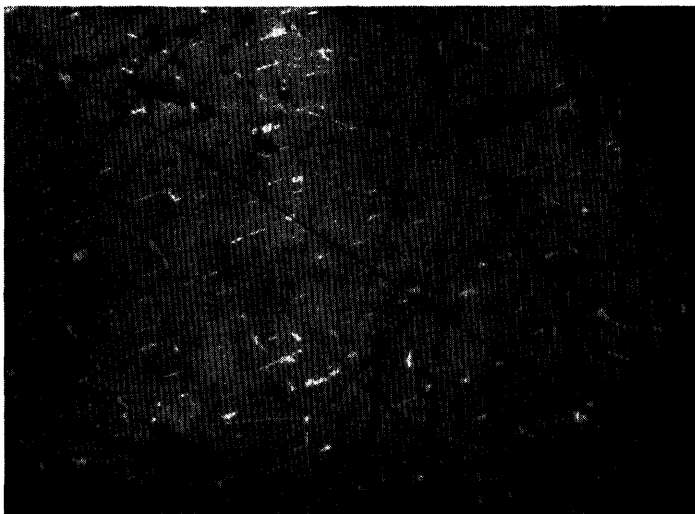
1. Metasomatic replacement localized along a fracture zone, which resulted in almost complete silicification of the zone, partial silicification of the adjacent country rock, and development of secondary biotite, garnet, and pyrite in the country rock, as well as actinolite, garnet, and pyrite in the silicified zone.
2. Fracturing of the silicified zone.
3. Introduction of pyrite, arsenopyrite, pyrrhotite, galena, sphalerite, chalcopyrite, tetrahedrite, and gold(?), accompanied by quartz, carbonate, and primary chlorite as open-space fillings, and partial replacement of the fractured silicified zone.

¹E. S. Bastin, L. C. Graton, Waldemar Lindgren, W. H. Newhouse, G. M. Schwartz, and M. N. Short, "Criteria of Age Relations of Minerals, with Especial Reference to Polished Sections of Ores," *Econ. Geol.*, Vol. XXVI, 1931, pp. 561-610.

4. Displacement of the veins by low-angle reverse faults.
5. Post-fault quartz stringers intersecting both faults and veins.
6. Formation of ruby silver and possibly native silver as supergene(?) minerals.

Character of the Ore Shoots

The ore zones appear to have definite walls, the lowering of values in both the hanging wall and footwall being abrupt and the area on either side of the commercial parts of the veins being commonly filled with non-commercial quartz stringers. Pyrite is abundantly disseminated in both the commercial and non-commercial parts of the veins as well as in the wall rock, but bears no relationship to the gold content. The non-commercial parts of the veins contain unreplaced country rock residuals.



Photomicrograph of a polished section of ore from the Berens River mine, showing chalcopyrite (white) oriented along probable cleavage planes of sphalerite (grey); this texture is interpreted as being due to unmixing of a solid solution and, therefore, indicating contemporaneous deposition. ($\times 100$.)

In many instances the hanging-wall side of the veins locally contain a higher sulphide content accompanied by increased quantities of gold and silver, whereas the footwall side may be principally quartz-actinolite vein material. Sphalerite, with the exception of pyrite, is the most abundant metallic mineral in the ore shoots and, locally, galena is quantitatively important. The presence of sphalerite and galena commonly indicate ore tenor, but there is no relationship between the proportions of these sulphides and the precious metal content. Native gold was not observed in polished sections of the ore. The microscopic examination conducted by the Mines Branch, Department of Mines and Resources, did not reveal any gold. The explanation is offered that, since the gold is comparatively free-milling, "it might lie in narrow stringers or streaks and might be relatively coarse."¹

Development work on the 250-foot level revealed 1,040 feet of ore in 7 shoots, averaging 7.4 feet in width. On the 375-foot level, 772 linear feet of ore, averaging

¹Personal communication.

5.6 feet in width, have been developed. The 500-foot level, which is not yet fully developed, contains an indicated 3,711 square feet of ore in four shoots, compared with 4,317 square feet in five shoots on the 375-foot level. Diamond-drilling, spaced to cover a length of 220 feet along the strike, has indicated economic mineralization to a depth of 650 feet.

The management's estimate of probable ore is as follows:—

| | Width | Length | Area | Tons | Grade | |
|--------------------------|-------|--------|---------|---------|--------|--------|
| | | | | | Gold | Silver |
| | feet | feet | sq. ft. | | ounces | ounces |
| Shallow drilling..... | 10.1 | 840 | 8,484 | 115,000 | 0.27 | 13.6 |
| 250-foot level..... | 7.4 | 1,040 | 7,704 | 112,000 | .30 | 14.6 |
| 375-foot level..... | 5.6 | 772 | 4,317 | 49,000 | .36 | 22.3 |
| 500-foot level..... | 8.3 | 450 | 3,711 | 42,000 | .35 | 19.8 |
| Totals and averages..... | 7.8 | 775 | 6,064 | 318,000 | 0.31 | 16.4 |

Metallurgical tests on the ore have indicated that 96 per cent. of the gold and 75 per cent. of the silver can be recovered by cyanidation after grinding to 75 per cent. minus 200 mesh.

Wentricia Mines, Limited

Wentricia Mines, Limited, holds two groups of claims in the Favourable Lake area. The first group consists of 6 claims, Pa. 2,459–2,464, adjoining the property of Berens River Mines on the northeast; and the second, a group of 12 claims, Pa. 2,465–2,476, lies to the west of the Berens River property and includes the old Zionne showing.

The Zionne showing, described by M. E. Hurst,¹ consists of a narrow, cherty slate zone of sulphide mineralization in an amphibolitized basic intrusive. The zone was probed by a 60-foot diamond-drill hole in July, 1937, K. C. Murray being in charge of the work. A second 60-foot hole was placed to pick up a new gold discovery a short distance east, which consists of a narrow short quartz lens containing pyrite, pyrrhotite, and chalcopyrite, associated with actinolite in an altered basic intrusive. The writer was able to pan colours from surface material at this location. A third diamond-drill hole, 90 feet in length, was located in a silicified zone near the west boundary of the claims of Berens River Mines. The three holes gave inconclusive or negative results.

Other Claims

At the time of the writer's visit, four men were carrying out a programme of assessment work on a group of 18 claims known as the Graves, Macdonald, and Sternberg group, Pa. 3,471–3,488, K. C. Murray being in charge of the work. No mineral occurrences of economic importance were reported.

¹Ont. Dept. Mines, Vol. XXXVIII, 1929, pt. 2, pp. 81, 82.

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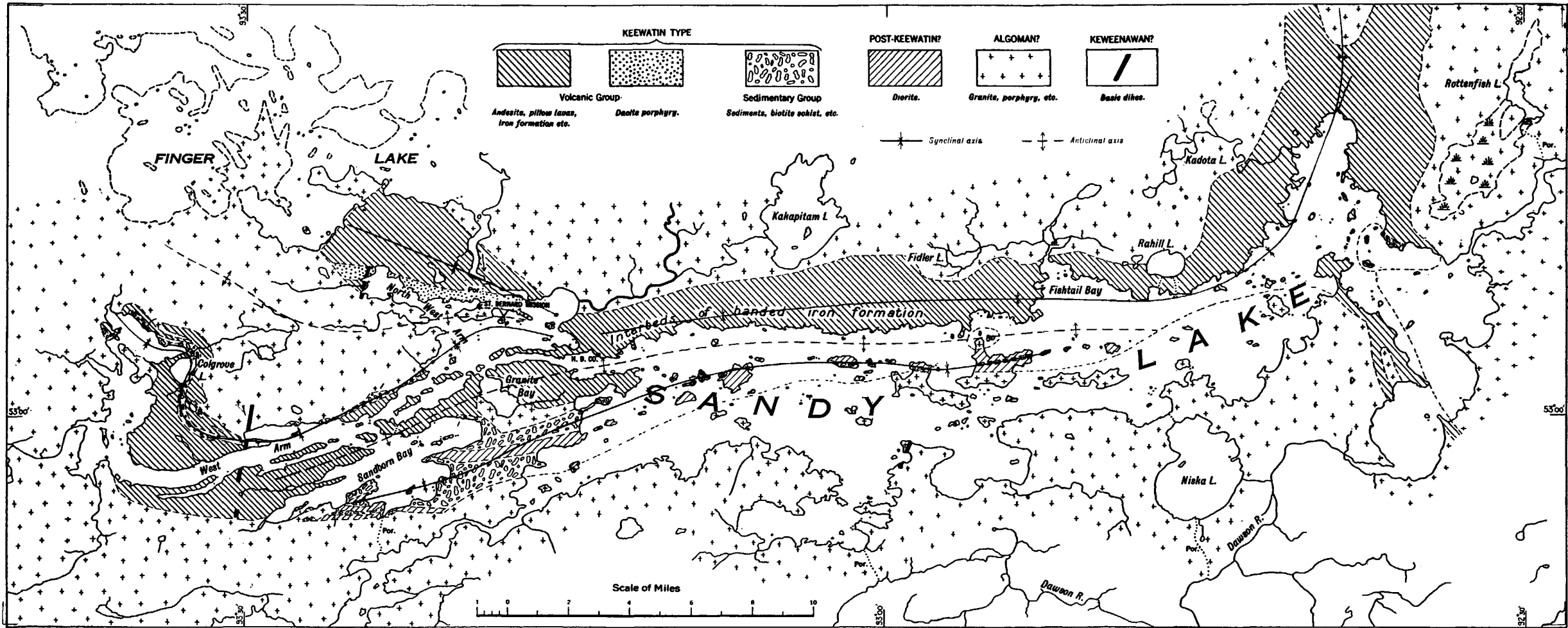


FIG. 3—INTERPRETATION OF THE GEOLOGICAL STRUCTURE ON SANDY LAKE.

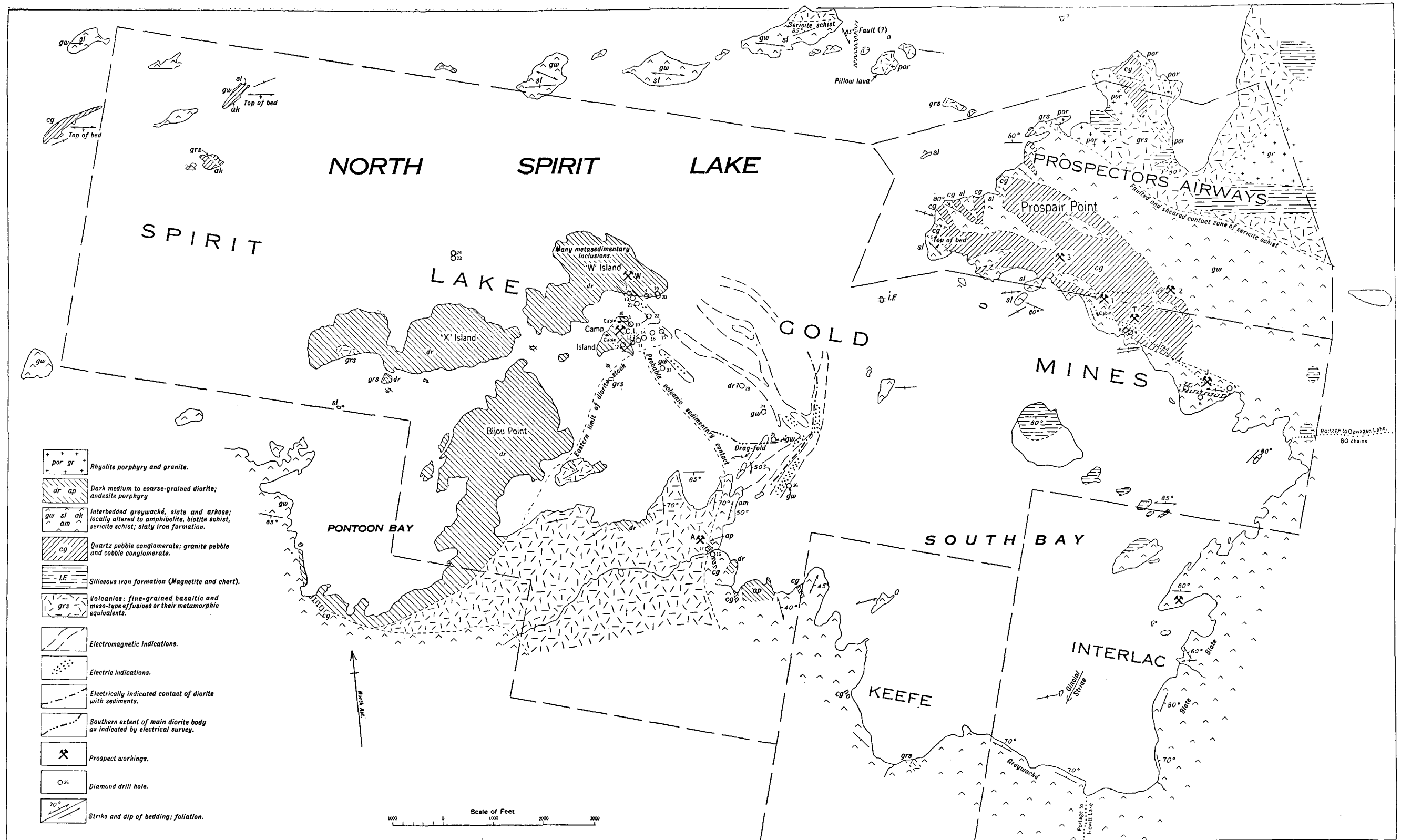


FIG. 3—GEOLOGICAL SKETCH MAP SHOWING PROSPECT WORKINGS, DIAMOND-DRILL HOLES, RESULTS OF GEOPHYSICAL SURVEY, AND PRINCIPAL CLAIM LOCATIONS, SOUTH BAY SECTION, NORTH SPIRIT LAKE.

FIG. 4—PLAN SHOWING GEOLOGY, PROSPECT WORKINGS, AND RESULTS OF DIAMOND-DRILL HOLES, CAMP ISLAND AND "W" ISLAND SECTIONS, SPIRIT LAKE GOLD MINES.

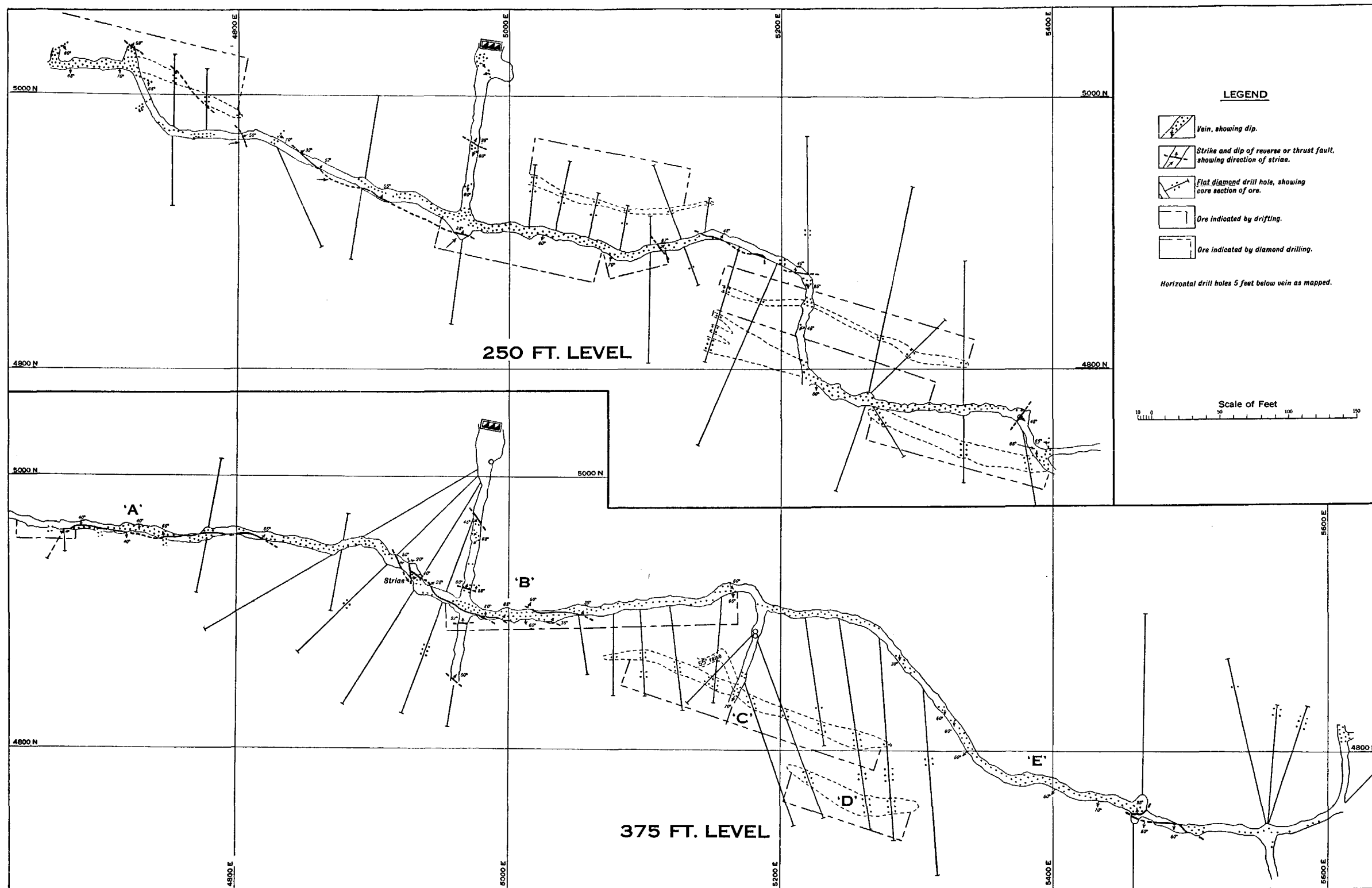


FIG. 3—PLAN SHOWING DIAMOND-DRILL HOLES AND UNDERGROUND DEVELOPMENT UP TO OCTOBER 1, 1937, ON THE 250- AND 375-FOOT LEVELS, BERENS RIVER MINE.

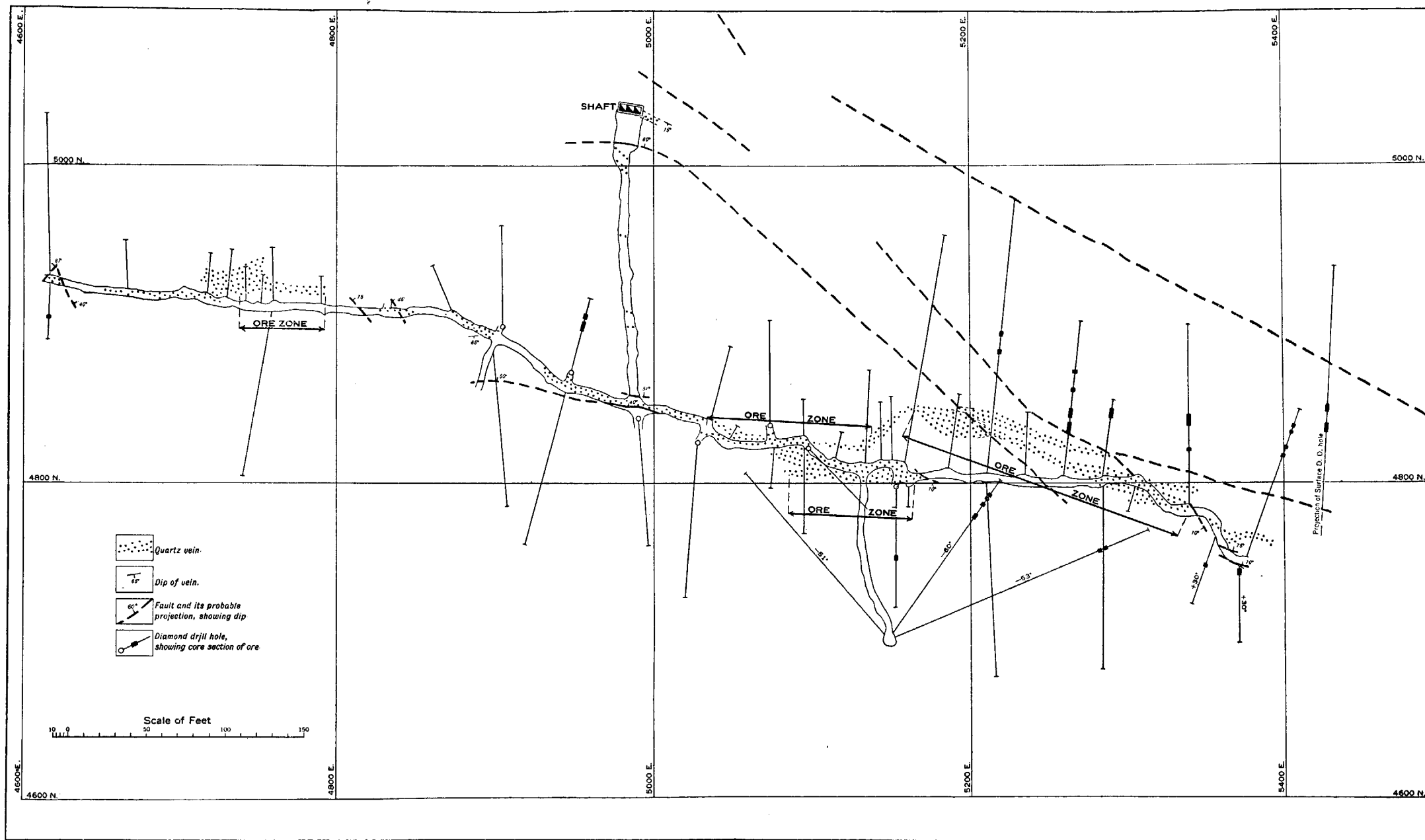


FIG. 5—PLAN SHOWING DIAMOND-DRILL HOLES AND DEVELOPMENT UP TO MARCH 31, 1938, ON THE 500-FOOT LEVEL, BERENS RIVER MINE.





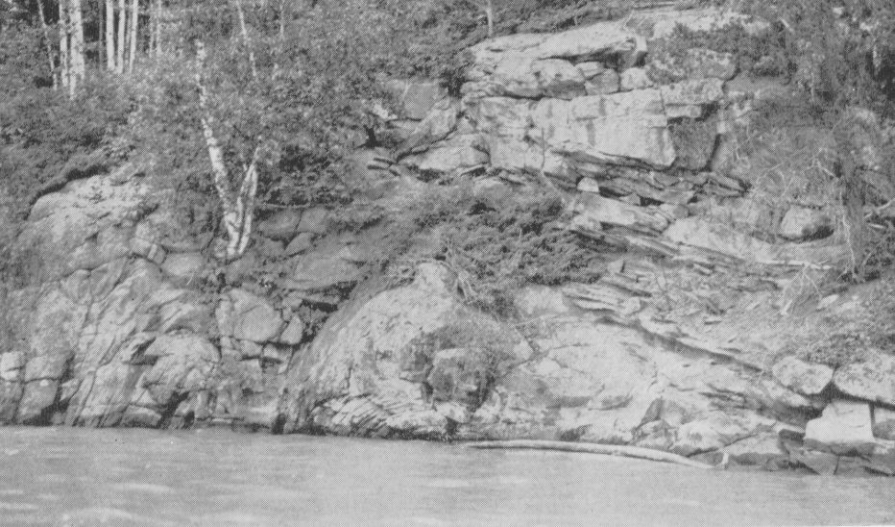






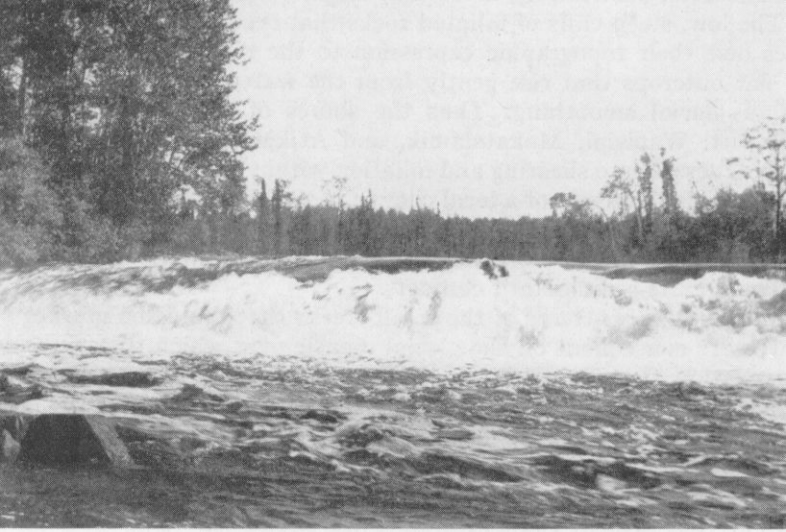










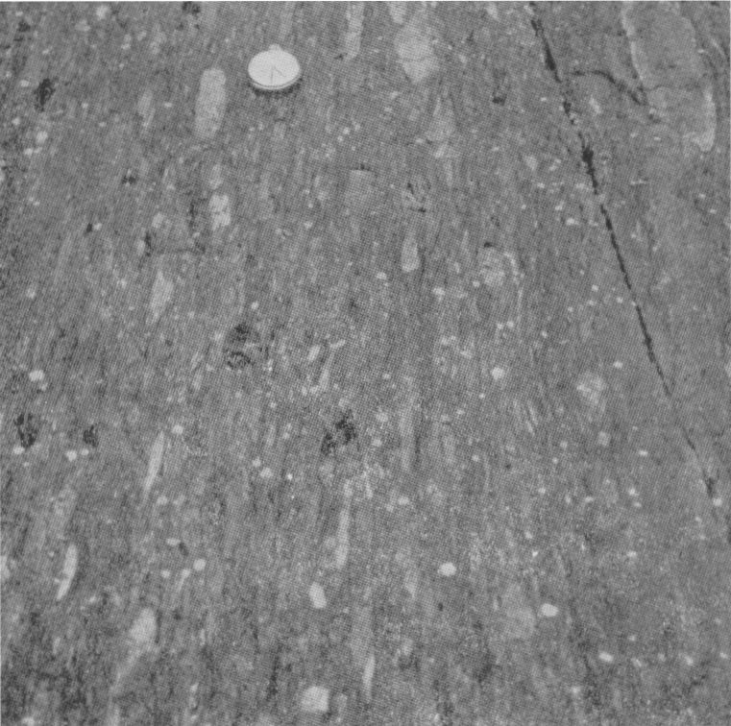




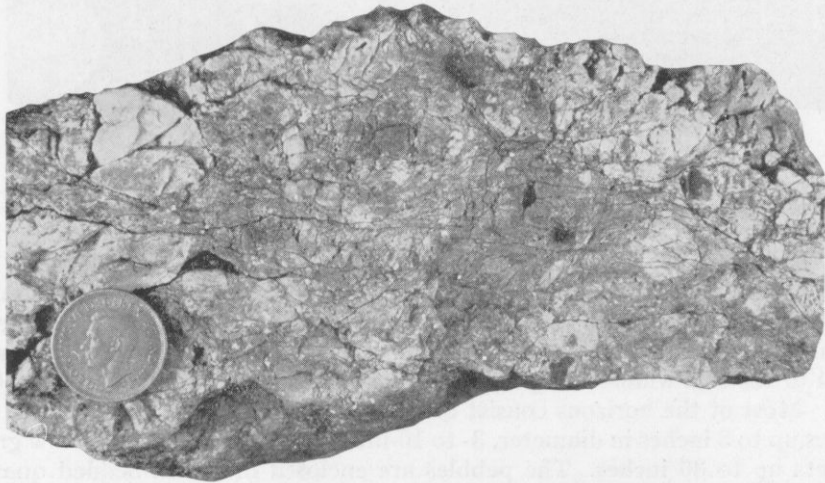


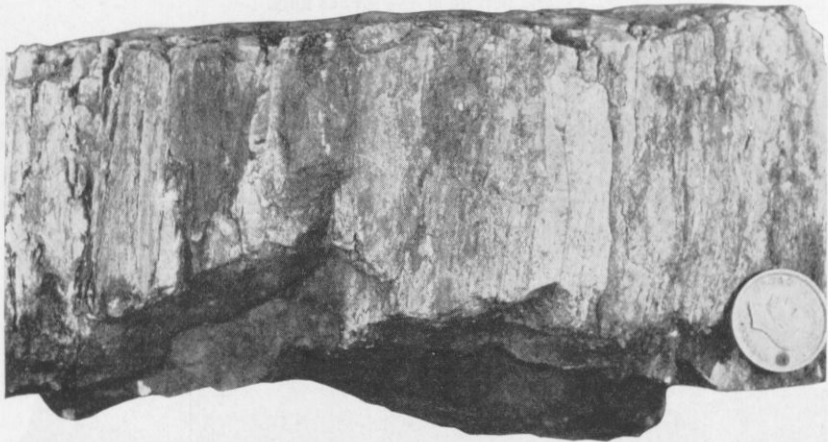


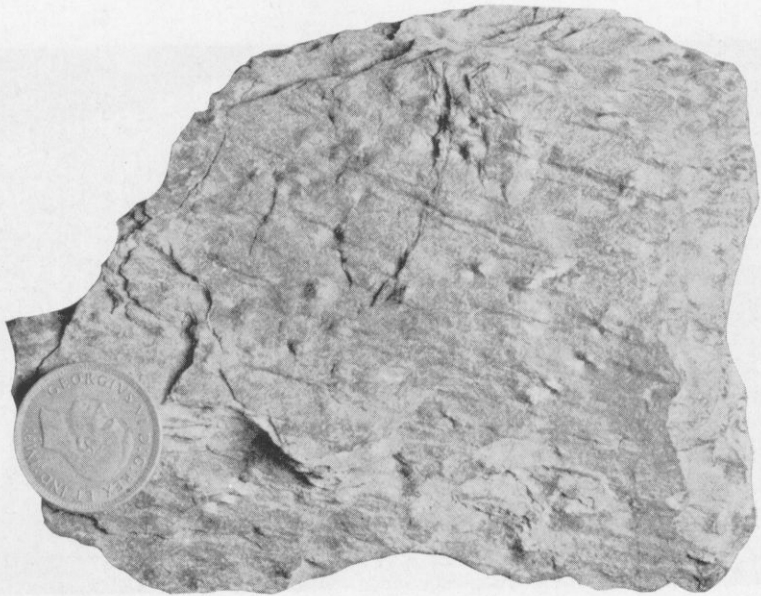










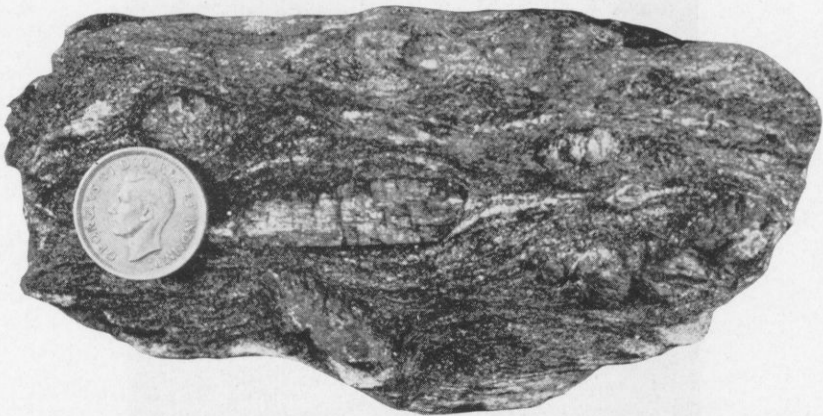












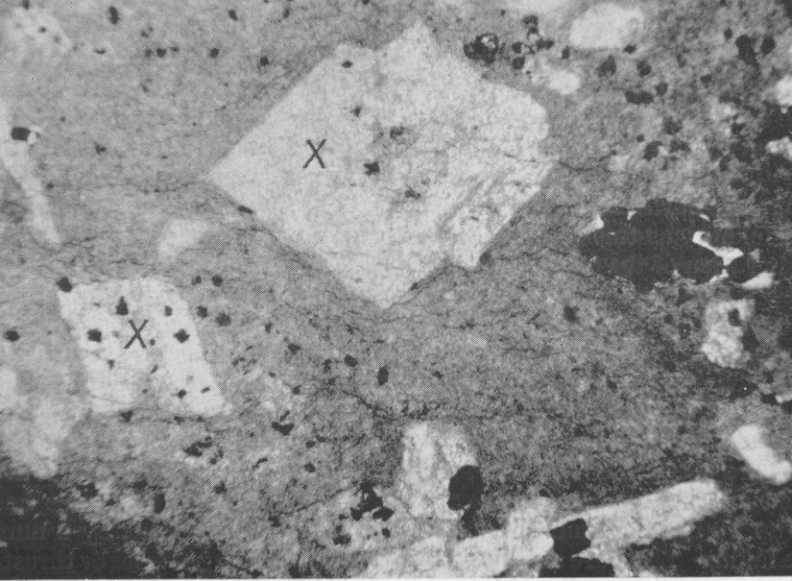


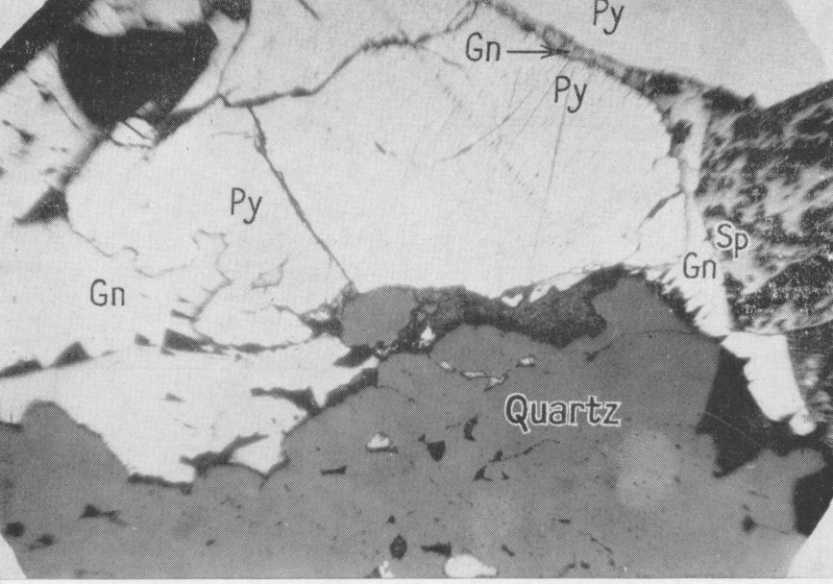












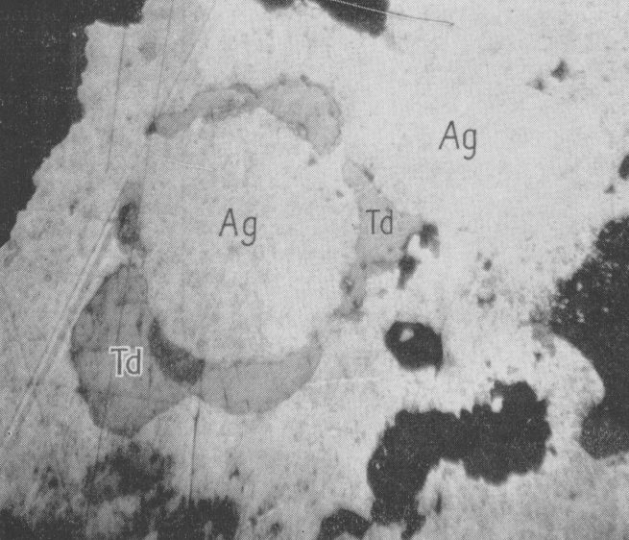
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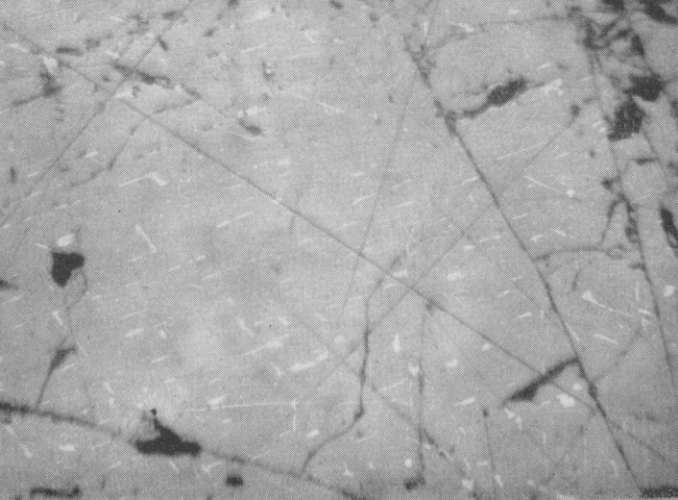
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PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. PAUL LEDUC, *Minister of Mines*

H. C. RICKABY, *Deputy Minister*

FORTY-SEVENTH ANNUAL REPORT
OF THE
ONTARIO DEPARTMENT OF MINES
BEING
VOL. XLVII, PART VIII, 1938

Geology of the South Onaman Area

By

W. W. MOORHOUSE

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1939



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COLOURED GEOLOGICAL MAP

(In pocket at back of report)

Map No. 47h—South Onaman Area, District of Thunder Bay, Ontario. Scale, 1 mile to the inch.

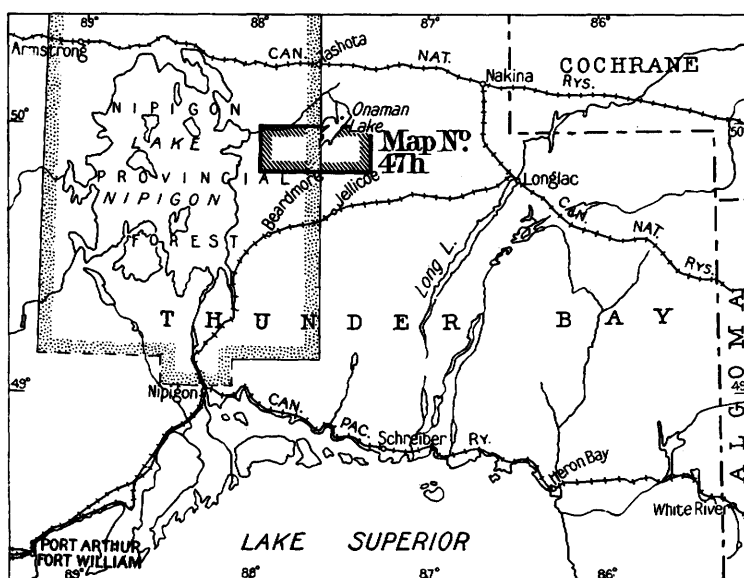
Geology of the South Onaman Area

By W. W. Moorhouse

INTRODUCTION

The South Onaman area is located about 8 miles east of Lake Nipigon in the district of Thunder Bay. It is bounded on the south by the north boundaries of the townships of Lapierre, Rickaby, Elmhirst and Pifher and extends north to Conglomerate lake and the Onaman river. Its western boundary runs through the east end of North Wind lake.

Although the Sturgeon River area immediately to the south has been extensively prospected, and it has been known for some time that the Kowkash-Ogoki area to the north contains widely distributed occurrences of gold, the area



Key map showing the location of the South Onaman area, district of Thunder Bay. Scale, 50 miles to the inch.

under discussion has not been so thoroughly examined. Only along its northern border, south from Conglomerate lake where the Kowkash-Ogoki area¹ overlaps it, has any extensive geological mapping or much careful prospecting been done.

The information that forms the basis of this report and the accompanying map was obtained from pace-and-compass surveys carried wherever possible across the strike, at intervals of one-quarter of a mile. The aerial map, prepared by the Topographical and Air Surveys Bureau, Department of Mines and Resources, Ottawa, was used as a base for these surveys.

An attempt has been made in the preparation of the map to indicate the size, shape, and distribution of the outcrops, but in many cases areas shown as solid rock consist of numerous outcrops separated by drift or swamp and too small to be plotted individually.

¹Ont. Bur. Mines, Vol. XL, 1931, pt. 4, map No. 40f.

Acknowledgments

The co-operation of the various companies and operators in the area is gratefully acknowledged.

The writer is indebted to P. E. Hopkins and T. A. Johnson for information concerning the properties in which they are interested, in particular their Tashota property, on which a report by J. D. Wright was made available to the writer.

The information concerning the property of Tashota Goldfields, Limited, has been supplied through the courtesy of H. H. Vaughan, formerly president of the company, and W. A. RuKeyser, who acted in the capacity of consulting engineer. The co-operation of the staff at the mine, especially J. A. King and Russ Wyman, was also much appreciated.

P. W. Meahan, manager at the Wascanna at the time of the writer's visit, kindly supplied most of the data included concerning that property. Plans of the workings and further information were furnished through the kindness of H. T. Leslie, of Wascanna Mines, Limited.

The assistance of S. Dodds, Bob McCombe, W. Pauloski, G. P. Tuffey, and other prospectors in the area in accumulating material for this report is gratefully acknowledged.

The writer also wishes to express his appreciation of the efficient services of the other members of the party, O. A. Seeber, R. D. Hindson, and E. M. Olson. Mr. Seeber did the mapping of most of the southern part of the area.

Means of Access

The South Onaman area is not easily accessible. Its southern part may be reached from Jellicoe by way of the Sturgeon river. Access to the most easterly part is by way of the Atigogama Lake route to the north boundaries of Lapierre and Rickaby townships. The central section, including O'Neil, Fairview, Castlewood, and Crooked Green lakes, is reached by taking the Sturgeon river down to the Seven Foot falls and then travelling up through Wilkinson lake. Just north of the north boundary of Rickaby township the route diverges, one branch leading northeast to O'Neil lake, the other connecting, through Pinel creek, Pinel lake, and Olson lake, with Fairview lake and the lakes to the west. The western extremity of the area is reached from Lake Nipigon by way of the North Wind river and North Wind lake.

The northern part of the area may be reached from Lake Nipigon by paddling up the Onaman river, a rather rapid and treacherous stream for the inexperienced, or from Paska, near Tashota, on the northern line of the Canadian National railway, by way of the North Onaman river, a difficult and little used route. Access to this section may also be had by winter road from Tashota.

Previous Work

Hitherto very little geological work has been done in this area. Some work was done along the south shore of Conglomerate lake and the Onaman river by Gledhill and Kindle, and Gledhill's map of the Tashota-Onaman River area suggests the distribution of the principal rock types along the canoe routes. Beyond this, not much has been recorded.

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- P. E. HOPKINS, "The Kowkash Gold Area (Second Report)," Ont. Bur. Mines, Vol. XXVI, 1917, pp. 190-226.
- T. L. GLEDHILL, "Tashota-Onaman Gold Area (District of Thunder Bay)," Ont. Dept. Mines, Vol. XXXIV, 1925, pt. 6, pp. 65-85.
- L. F. KINDLE, "Kowkash-Ogoki Gold Area, District of Thunder Bay," Ont. Dept. Mines, Vol. XL, 1931, pt. 4, pp. 55-104.

Natural Resources

The South Onaman area is for the most part fairly heavily wooded. Much of the forest growth consists of spruce of moderate size. Jackpine, poplar, birch, and balsam are also abundant in the well-drained drift areas and ridges. In the swamps, cedar and spruce abound, and tamarac and stunted spruce are scattered over the more open muskegs.

Little if any lumbering has been done in the area, and although there are many fine stands of timber, they are generally rather local and scattered.

The forest has been extensively denuded by fires. Large belts of *brulé* occur north of Lapierre township, between O'Neil lake and Onaman lake, and west of Con lake.

Game, including moose, bear, deer, and beaver, is fairly abundant. Many of the lakes are rather poorly stocked with fish, with the exception of pike. Onaman lake, however, contains abundant pickerel and is also exploited commercially for whitefish.

Topography

The topographical relief of the South Onaman area is never great and often monotonously low. The highest elevations in the area, between Crooked Green and North Wind lakes, do not rise much more than 300 feet above the general level of the country.

The only prominent elevations in the eastern part of the area are the rock ridges and the drift hills along the south shore of Altitude lake. Farther west, north of Rickaby and Elmhirst townships, small lakes are very numerous. In this section rock is not abundant; but to the northwest, outcrops are numerous, though low and small. West of Con lake ridges of massive sedimentary rocks rise to considerable heights out of low and swampy terrains.

Between Fairview and Crooked Green lakes to the south and Conglomerate lake to the north, no lakes of any size occur. This area is drained by meandering streams, which flow through valleys having a marked parallelism to structural lines. There are large areas of swamp in this section and to the south of Fairview lake, which in many instances apparently obscure the most severely deformed zones of Keewatin and Timiskaming rocks.

Throughout the region a parallelism between topography and structure is apparent. Reference to the map will indicate many cases in which lines of drainage follow the general trend of schistosity and sometimes mark the more important structural breaks. Grasser and Pontoon lakes are illustrations of this tendency.

Various creeks and lakes, such as Conglomerate lake and Con creek, trace more or less closely the contact between greenstone and sediments. The boundary between greenstone and granite is also frequently marked by strings of ponds and lakes, as, for instance, south of O'Neil lake, or by creeks, such as the one half a mile west of mile LIX, east boundary of the Nipigon Provincial Forest.

The topographical map alone indicates fairly well the location of the main batholithic areas of granite. Lakes and streams located within them have a general northeasterly trend, whereas those located in regions underlain by Keewatin and Timiskaming formations parallel the local structural lines.

Glacial Geology

The most recent geological event which left its mark on the area was the Pleistocene glaciation. This modified the topography of the rock surface and mantled it with a fairly continuous layer of till and lake deposits.

Erosional Features

The glacial erosion has shaped the rock outcrops into smoothly rounded *roche moutonnée* forms. The direction of ice movement, as indicated by glacial striae, varies from N. 20° E. to S. 85° E., the most frequent being N. 65° E. The long axes of the outcrops trend in this direction.

It has already been pointed out that the drainage pattern in areas of greenstone and sediments has been determined by local structural lines rather than by the direction of glacial movement. On the other hand, in the larger granite areas where the rocks are uniformly massive, the lakes and streams trend northeast-southwest, parallel to the direction of glacial movement.

Depositional Features

The Pleistocene glaciation left a cover of ground moraine, terminal moraine, esker, outwash and lake clays over the area. These deposits are of varying thicknesses.

The mantle of till, which is probably the most extensive of the above types, is generally greyish and silty and contains varying quantities of boulders and pebbles. Its appearance suggests that it has been markedly modified by water.

The most distinctive terminal moraine may be traced from a point a mile west of mile LVII on the Nipigon Provincial Forest boundary westward to Con creek; and it probably continues to the point where heavy glacial deposits are found just south of Conglomerate lake. A large sandy outwash extends south from the foot of the moraine. Other thick accumulations of drift, often of a morainal nature, are found throughout the area.

Eskers are not uncommon and frequently parallel the courses of the present streams. Ridges of fine silt, resembling eskers, are abundant in the southwest bay of Onaman lake.

Varved clays are found along the Onaman river. Exposures west of Conglomerate lake are somewhat oxidized and consist of light-yellowish bands, one-half to 2½ inches thick, alternating with dark-buff bands having a uniform thickness of half an inch. Similar clays may be seen on Castlewood creek near its junction with Martin creek. Coarsely varved, contorted clay was also noted in trenching west of Conglomerate lake, some distance south of the Onaman river. The presence of these clays, and the prevailing monotonous topography in the northwestern part of the area, suggests that this section, with a strip extending up the Onaman river, was covered by a post-glacial lake.

GENERAL GEOLOGY

The consolidated rocks in the South Onaman area are pre-Cambrian in age. The formations recognized are comparable to those found in the Sturgeon River area to the south.¹

The oldest rocks recognized are altered basic and intermediate lavas with related intrusives, tuffs, and sediments. They are considered to be Keewatin in age. Younger than these are Timiskaming-type deposits of conglomerate, quartzite, greywacké, and slate similar to those found in the Sturgeon River area. Intruding the Keewatin, and probably younger than the sediments, are a series of granitic intrusives, which may be tentatively classed as Algoman. Diabase dikes, probably of Keweenawan age, cut all these formations.

The pre-Cambrian is overlain by unconsolidated glacial, lake, stream, and swamp deposits of varying thicknesses.

¹E. L. Bruce, Ont. Dept. Mines, Vol. XLV, 1936, pt. 2, p. 8.

H. C. Laird, *ibid*, p. 68.

Table of Formations

| | |
|--------------------------|---|
| QUATERNARY | |
| RECENT: | Clay, peat. |
| PLEISTOCENE: | Gravel, sand, clay, till. |
| <i>Unconformity</i> | |
| PRE-CAMBRIAN | |
| KEWEENAWAN(?): | Diabase dikes. |
| <i>Intrusive contact</i> | |
| ALGOMAN(?): | { Pegmatite dikes. |
| | { Quartz and feldspar porphyry dikes. |
| | { Lamprophyre dikes. |
| | { Granite, syenite, granodiorite, granite porphyry. |
| | { Diorite and quartz diorite (in part older than the granite). |
| <i>Intrusive contact</i> | |
| TIMISKAMING(?): | Conglomerate, arkosic quartzite, greywacké, slate, tuff. |
| KEEWATIN: | { Iron formation. |
| | { Diorite, diabase. |
| | { Lavas (acid, intermediate, and basic), agglomerate, tuff, derived |
| | { schists. |

Keewatin Series

The Keewatin is the oldest and most complex series in the area. It comprises intermediate and basic flows, intrusives, tuffs, iron formation, and small amounts of true sediments. The relative ages of these members are not known.

The lavas form the most important part of the series. They consist chiefly of flows of basic and intermediate compositions. Acid volcanics are of relatively rare occurrence.

These rocks are more or less metamorphosed. Although the amount of change they have undergone may vary from place to place, they have apparently been altered by the same processes everywhere, so that they exhibit an almost monotonous uniformity in their mineral composition. Examination under the microscope shows that, of the original constituents, pyroxene has been replaced by hornblende; the feldspars by sericite, epidote, clinozoisite, albite, and carbonate; and hornblende and biotite by chlorite and epidote. Silicification is very general, and has often been followed by the introduction of carbonate. These changes have so obscured the original character of the rocks that their exact classification is uncertain.

Basic Lavas

The most characteristic of the Keewatin rocks are the basic lavas. In mapping, this classification was applied to rocks of a dominantly chloritic or hornblendic composition, fairly dark in colour, and of varying texture. They prevail in most of the Keewatin areas except for an extensive belt of intermediate lavas that almost completely surrounds Castlewood lake.

As originally crystallized, the basic lavas varied from coarse- to fine-grained, depending on their location in and the thickness of a given flow. Most commonly, the texture thus produced has been preserved. But an originally coarse-grained gabbro, diabase, or diorite may in some cases have its texture obliterated by the development of fine-grained alteration products and by shearing. Conversely, fine-grained types may be recrystallized, by the proximity of granitic intrusions, to rocks of a porphyritic or coarsely granular habit.

Porphyritic texture is frequently observed in the basic lavas. In many cases, this appears to have resulted from the formation of metacrysts under the influence of magmatic heat and solutions. Numerous cases of this were observed north and west of Castlewood lake, just north of Castlewood creek in the northwest corner

of the area, south of Ballina lake, and north of the Lapierre township boundary. This texture may also be original, as may be true of the massive basic flows south of Onaman lake.

Ellipsoidal lavas were observed in several localities. The ellipsoids show considerable variation in size, some being as much as a yard in diameter, others 6 inches. In most cases they have been so sheared as to have little structural significance. Ropy tops of flows have generally been obliterated by shearing, but a few were found.

The presence of white cherty masses up to 3 or 4 inches in diameter was noted in a number of outcrops of medium-grained intermediate to basic flows. These masses are irregular in outline, with fairly sharp boundaries. They are possibly segregations of acid material, though they may represent acid tuffaceous fragments engulfed in the lava.

While no accurate measurements were made of their thickness, some of the basic flows are of considerable size. Evidence of this is found in the coarse textures that prevail in some of them. All coarse rocks of this type, however, cannot be interpreted simply as thick extrusives.

Typical fine-grained, sheared greenstones show the same general mineral composition throughout the area. A characteristic specimen taken a mile west of mile LIX, east boundary of the Nipigon Provincial Forest, was seen under the microscope to be composed of quartz, clinozoisite, chlorite, magnetite (ilmenite?), carbonate, and a few remnants of feldspar.

The normal Keewatin basic rocks are rather extensively affected by the proximity of granitic intrusions. The first result seems to be the development of large, scattered patches of ragged hornblende. As the intrusive is approached and the effects become more severe, the reconstitution of the invaded rock is more complete, and minerals such as epidote and hornblende are more coarsely crystalline. This type of recrystallization, to hornblendic rocks, is abundant along the contact of the great granite batholith in the northeastern part of the area.

Coarse Flows and Intrusives

Some of the coarse-grained Keewatin rocks are quite conformable with adjacent flows, but others are bounded by intrusive contacts, radically discordant with the prevailing structure. Unfortunately it is usually impossible to trace these intrusives for any distance, and most of them are not differentiated on the map. The typically diabasic rocks just north of Eastbrook lake and those about a mile west of mile LVIII on the east boundary of the Nipigon Provincial Forest were recognizable for some distance.

Intermediate and Acid Lavas

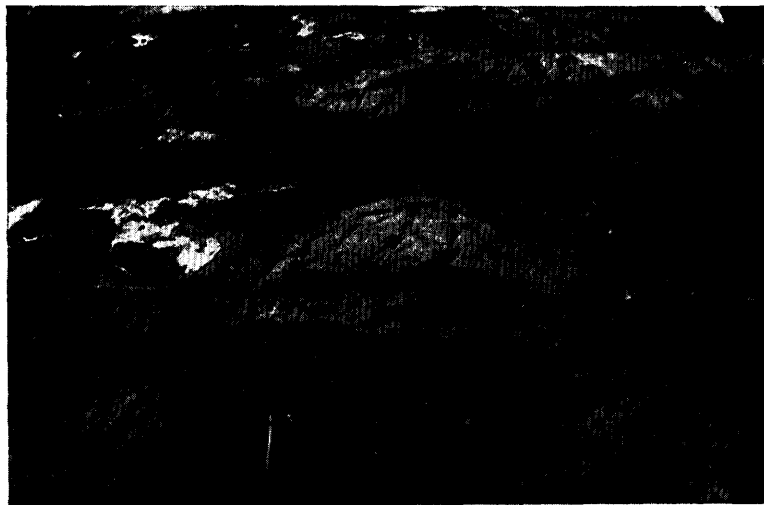
Intermediate and acid lavas are widely distributed throughout the area. They are most abundant in a large section surrounding Castlewood lake that extends as far west as the meridian of Crooked Green lake and as far east as the east boundary of the Nipigon Provincial Forest. They are also widespread in the eastern part of the area north of Lapierre township.

These rocks range in texture from very fine grained and massive to coarse-grained, and exhibit a variety of structures, being occasionally ellipsoidal and amygdaloidal and frequently vesicular and fragmental. The representatives of this group recognized north of Lapierre township are further characterized by the frequent development of poorly formed metacrysts of feldspar and needles of hornblende, and by the fact that they have been minutely fractured, the fractures being sealed by granitic or siliceous material, which stands up as slight ridges on the weathered surface.

These phases of the Keewatin weather fairly white, and on the fresh surface grade from light-green through grey to black. They contain the same minerals as the more basic lavas, though the proportions are different. Feldspar, epidote, and clinozoisite predominate over ferromagnesian minerals, of which chlorite is the most common.

Mention should be made of one peculiar vesicular, light-weathering rock occurring south of Onaman lake in close association with the granite. It is composed almost entirely of white mica, a little amphibole, and an abundance of leucoxene grains.

True acid flows are of rare occurrence in the area. A rather persistent quartz porphyry band extending eastward from Eastbrook lake was interpreted as Keewatin, though this classification is open to doubt.



Volcanic structures in recrystallized intermediate lava, a quarter of a mile north of mile II, north boundary of Lapierre township.

Tuffs

Tuffaceous members of the Keewatin series play a part of undetermined importance. Various types of rock have been classed as tuffaceous in the field, but, in the cases in which thin sections were made of them, this interpretation has not always been confirmed. Some are probably simply porphyritic flows.

Tuffs, however, were discovered by microscopic study of specimens from outcrops southeast of Conglomerate lake, at the contact of greenstone and sediments, and along the south shore of Grasser lake near the east end. A more exhaustive investigation of this nature would probably reveal more tuffaceous members than are now recognized.

North of Lapierre and Rickaby townships, the Keewatin is notable for its volcanic fragmentals, which occur in zones which may be traced for some miles. This is especially true of the intermediate members of the series.

Sediments

Sedimentary rocks, which may possibly be Keewatin, have been observed associated with the lavas. Good examples of these are found along the trail between Oasis lake and Final lake and in the greenstones about a mile south of

the Onaman river just west of Conglomerate lake. A peculiar series of banded cherty and carbonate rocks a few chains southeast of Grasser lake, and certain sheared, in places cherty bands in the Keewatin southwest of Con lake probably belong with this group. As far as could be determined, these are not extensive enough to warrant separation as a definite member or formation.

One sedimentary type, the iron formation, is of sufficient importance to deserve mention and mapping. It is thought that this member is not limited to any given horizon, but occurs sporadically throughout the area. Its most extensive development is just south of Grasser and Pontoon lakes, where there are at least three extensive bands, one running northwest from the south side of the west end of Pontoon lake, a second a short distance south of Grasser lake, and a third, more or less in line with the first, at the west end of Grasser lake. It is possible that all three were originally part of one zone, whose central part has been faulted south of the other two. A comparison of several cross-sections of the ferriferous zone shows considerable variation in character within short distances along the strike.

In the first band, just southwest of Pontoon lake, the iron formation has been exposed for a width of 40 to 50 feet by trenching. From north to south it is composed of banded cherty silica and magnetite, vein quartz, carbonate rock carrying thin lenses of magnetite, banded siliceous rock, and sheared, soft chloritic streaks.

Several smaller zones were also noted: one three-quarters of a mile north of Pontoon lake, another on Con creek about a mile west of the boundary of the Nipigon Provincial Forest and a few chains west of the cabin, and a third on the trail leading north from the cabin.

It seems likely that the iron formation was formed in temporary local basins during the time the lavas were being extruded. Schistose chloritic material may represent tuffaceous particles deposited during the period of accumulation of the silica and magnetite.

Timiskaming(?) Series

The sedimentary rocks exposed in the area are confined to a narrow belt which parallels the Onaman river and Conglomerate lake from the western edge of the area to a point about a mile east of Conglomerate lake, where it swings sharply south, following the course of Con creek for about 3 miles. It then turns southeastward crossing the east boundary of the Nipigon Provincial Forest just south of mile LIV. The belt, slightly displaced by faulting, or a similar parallel zone continues for a short distance southeastward to a point south of Grasser lake.

From a lithological point of view these rocks offer considerable difficulties. While some members are easily recognizable, others are sheared and chloritic or sericitic, so that they cannot be distinguished with certainty from Keewatin types.

Conglomerate

The most typical member of the series is the conglomerate. It is found throughout the length of the belt, though it is not known to favour any particular horizon in the stratigraphic sequence.

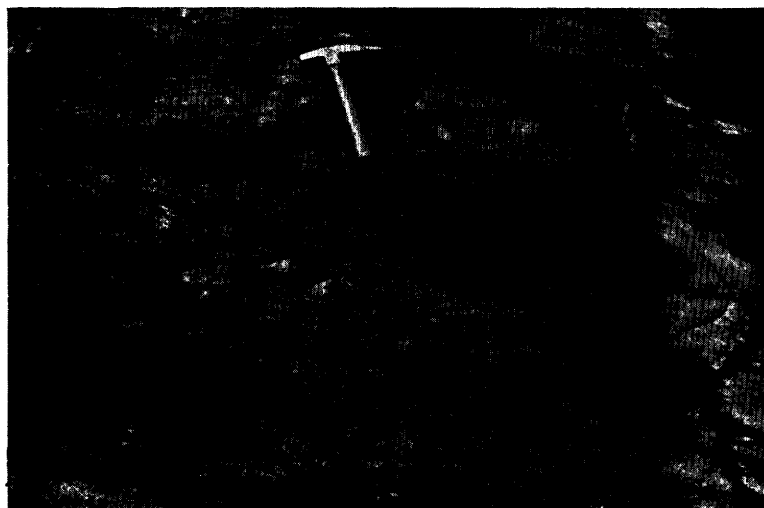
Boulders observed in the conglomerate are usually fairly well rounded and almost invariably somewhat elongated owing to shearing. They are composed chiefly of coarse granite, porphyry, greenstone, quartz, and chert. Jasper was nowhere observed. A thin section taken from a granite boulder in the conglomerate showed no more alteration than the other granites observed in the area.

The matrix of the conglomerate is extremely variable. South of Grasser lake, it is sheared and chloritic. Without the presence of pebbles of granite and quartz,

it would undoubtedly be classed as sheared greenstone. This chloritic matrix is also present in conglomerate outcrops west of Con lake, but farther north it is supplanted by a groundmass of arkosic quartzite consisting of oblong grains of feldspar and strained granules of quartz embedded in chlorite.

Arkosic Quartzite

The rock type most characteristic of the sedimentary section in this locality is a coarse, massive, arkosic quartzite, which on the fresh surface weathers much like a coarse porphyry. The main body of the rock appears to be feldspathic, enclosing eyes of quartz, which are sometimes of considerable size and bluish in colour. In thin section the feldspars are more or less sericitized and rounded, and the quartz grains are angular to subangular.



Cross-bedding in arkosic quartzite (facing west). The strike is N. 35° W.

The arkosic quartzite is remarkably uniform in composition and appearance, but in a few outcrops it grades into impure quartzite and greywacké by a decrease in the proportion of feldspar and an increase in the amount of dark material.

Strings of boulders are sometimes observed in the quartzite. It is interesting to note that in an outcrop southeast of Conglomerate lake well-rounded boulders of granite are almost indistinguishable from the feldspathic matrix that envelops them.

It is only in this arkosic quartzite and in the conglomerate that bedding can certainly be recognized as distinct from shearing. Cross-bedding was observed only once, in the quartzite. A peculiar feature, common to both, is the universal occurrence of small lenses of soft, greenish material, which weather out readily on the surface of the outcrop and are often cut by fracture cleavage on a tiny scale.

Slate and Tuff(?)

Along the south border of the Conglomerate lake belt of sediments is a series of rocks which are tentively included in the Timiskaming but may, in part at least, be Keewatin. They are generally sheared and are either green and chloritic or black and heavily carbonated. They are typically composed of minute, angular grains of quartz, chlorite, mica, and carbonate. In thin section they show a

variety of structures, sometimes banded (bedded?) on a microscopic scale, sometimes foliated and crumpled, sometimes massive. These rocks may be tuffs.

The slaty rocks found in abundance on the south shore of Conglomerate lake are of the same mineralogical composition. They are similar in appearance, but more obviously sedimentary. They are chloritic and contain fragments of the Keewatin rocks and large clastic grains and lenses of quartz.

It is quite possible that some of the formations classified in the field as greenstone, because of their sheared, chloritic habit, may belong to this sedimentary series. The interbedding of greenstone with arkose and conglomerate,



Peculiar sedimentary structures in conglomerate
one mile west of Con lake (facing east).

shown on the map $2\frac{1}{2}$ miles west of mile LVI, east boundary of the Nipigon Provincial Forest, may be an incorrect interpretation of the lithology. A similar error may have been made in mapping as sediments the isolated outcrop shown on the map between mile LVII and the main zone.

It should be pointed out that no carbonate rocks of sedimentary origin were discovered in the area. The carbonate, which is so abundant in most of the types described, is thought to be secondary, as it seems to replace or cut all other minerals.

Origin

The materials composing the sediments have been derived from Keewatin and granitic rocks. In some parts of the sedimentary belt, the principal constituents have come from the former series. Thus, along the south shore of Conglomerate lake, the finer-grained types and the matrix of the conglomerate are markedly chloritic in character. The same is true of the groundmass of the conglomerate south of Grasser lake. In the most typical sedimentary outcrops,

however, northwest of Con lake, the source of most of the Timiskaming rocks has been exclusively granite, and the arkosic quartzite resembles strikingly a porphyritic igneous rock.

The coarse grain and unaltered character of the clastics derived primarily from granitic rocks, the apparent absence of concentrations of heavy minerals in noticeable streaks or beds, and the horizontal discontinuity of the different lithological types clearly indicate that the sands and gravels from which they were formed were deposited rapidly, without any prolonged exposure to weathering or sorting, in local basins near their source.



Peculiar sedimentary structures in conglomerate one mile west of Con lake (facing west).

The sedimentary structures also indicate the eddying turbulent nature of the currents depositing the clastics. This is especially true of the outcrop of conglomerate located west of Con lake. The boulders in this exposure are associated with tails of granite-like material interfingering, away from the boulders, with the fine, chloritic matrix of the rock. These strings are believed to be lenses of feldspathic sand deposited by active currents in the lee of the boulders. Owing to their original composition and to metamorphism, they appear granitic and even, in places, continuous with the granite boulders which they accompany. If they were formed as sand deposits in the lee of the boulders, the dominant currents must have been from the east. Since only a horizontal section of these structures was available and since the beds are vertical or nearly so, it is difficult to say where these materials came from.

The origin of the sediments is obscure. The greatest development of conglomerate, however, is on the east side of the sedimentary zone west and northwest of Con lake. The boulders of the conglomerate in that vicinity are also larger than elsewhere. In one outcrop of conglomerate, a sharply angular fragment of

iron formation was discovered. The angularity suggests local derivation, and the only magnetite bands near by capable of giving the type of boulder noted are east of the sedimentary belt. Mention has already been made of the indication given by structures in the outcrop west of Con lake that the currents which formed them were from the east. Finally the fact that the greatest development of arkosic quartzite is just west of the conglomerates indicates a gradual decrease in the transporting power of the currents away from the source of the materials. This accumulation of evidence, while not conclusive, at least points to an eastward source of the Timiskaming.

Relationship of the Sediments and the Keewatin

The sediments are believed to be, on the whole, younger than the Keewatin. Evidence in this direction will be enumerated in connection with the discussion on structural geology.

Indications as to whether the sediments are conformable on the Keewatin are not abundant. The absence of well-defined bedding in the Keewatin near the contact prevents any positive statement.

Three miles east of mile LVI, Nipigon Provincial Forest boundary, however, bands of conglomerate and arkose, the latter not more than half a chain wide, are interbedded with sheared, chloritic rocks, which, in the field, were interpreted as Keewatin. Also, about $1\frac{1}{2}$ miles west of Con lake, quartzite and sheared, banded, chloritic rock, which in thin section resembles greenstone, have been minutely folded and crenulated with apparently complete parallelism. Unfortunately, in neither case is the identification of the chloritic rocks as Keewatin beyond question.

Algoman(?) Intrusives

The variety and number of intrusives in the South Onaman area is notable. The predominant type is granite, but it is accompanied also by syenites, diorites, granodiorites, quartz diorites, and related rocks, as well as by numerous dikes of granite, granite porphyry, aplite, quartz and feldspar porphyry, and lamprophyre.

The map area is bounded on the east, northeast, and southwest by masses of granitic rocks, which are of batholithic dimensions. Two minor granite intrusives occur within the area, one $1\frac{1}{2}$ miles southeast of Conglomerate lake, the other between the first one and Castlewood lake.

A large mass of dominantly dioritic rocks, roughly circular in shape, is located between Crooked Green lake and North Wind lake. Diorites of a similar nature extend a short distance into the area from Elmhirst township and from the Atigogama lake intrusive in Rickaby township.

Granites

The main granite area to the east and northeast has only been investigated at its borders. It is usually a medium-grained, normal biotite granite, although in a few places near its contact with the older rocks it is distinctly porphyritic. Gneissoid facies have also been observed east of the southeast bay of Onaman lake. Shearing is prominent in some places, as along the west shore of Con lake and at about mile LVI on the east boundary of the Nipigon Provincial Forest.

A feature of this granite is the great development, especially in the vicinity of Onaman lake, of inclusions and hybrid facies, which may be found as much as 2 miles within the granite. Inclusions of greenstone and diorite are usually angular and are found in varying degrees of assimilation.

In contrast to this, the small isolated area of granite southeast of Conglomerate lake is uniformly coarse and more or less porphyritic, showing no

evidence of change due to the proximity of the contact nor any trace of inclusions. It is a normal biotite granite.

The larger area north of Castlewood lake is more variable. Some outcrops at its northeastern end are true granite; others along the north and east boundary of the intrusive are more properly designated as syenites and diorites. Inclusions of greenstone in the very middle of the mass suggest that the plane of erosion has intersected it just below its roof. With it are associated two rather peculiar types, which may be contact phases or related intrusives. One of these appears to be composed of grains of olivine, more or less altered, with much phlogopite enveloped in what appear to be huge altered hornblende crystals. The other is made up entirely of augite, with a little apatite.

Diorites and Related Rocks

The diorite area west of Crooked Green lake varies in appearance. In places, as along the eastern contact near Crooked Green lake, it is fine-grained and distinguished with difficulty from the lavas. Usually it is granular in texture, dark in colour, with or without blue eyes and splashes of quartz. It may be black and entirely hornblendic, as in one or two outcrops along the trail west from Crooked Green lake, or white and feldspathic with irregular hornblende grains scattered through it, as is the case in a high rocky hill $2\frac{1}{2}$ miles west of the lake. In places, the intrusive is apparently a granite. The relations between the dioritic and granitic phases are not known.

In thin section, these rocks are composed of feldspar, hornblende, biotite, remnants of pyroxene, and considerable quartz, and are accordingly designated quartz diorites. The feldspars are so highly altered that it is usually impossible to determine their original character. Much, if not all the hornblende is a result of the alteration of pyroxene, which is rarely preserved.

There are a number of areas of greenstone rather irregularly distributed throughout the diorite. Their presence indicates that the roof of the intrusive mass lay but little above the present surface. It seems likely, especially in view of the presence of granite within the diorite itself, that the diorite actually represents the contact phase of an underlying mass of granite which erosion has not yet revealed. This question, in relation to similar rocks in the Sturgeon River area, has been considered in some detail by E. L. Bruce.¹

Zones of diorite are also dotted in the Keewatin in other parts of the area. One fairly extensive band, which may possibly be a sill, was traced northeast of Castlewood lake. It is uncertain whether these are all related to the Algonian intrusives, or whether some at least are Keewatin in age.

Diorites also occur within the granite. These bodies are of variable grain, sometimes rather coarse and usually rich in hornblende. They are most abundant in the broad peninsula at the south end of Onaman lake. They are apparently older than the granite and occur frequently as angular inclusions. They are cut by dikes of pegmatite and aplite.

Granite Dikes

Granite dikes are quite common in the vicinity of the granitic bodies. This is especially true in the greenstones north of Castlewood creek. North of North Wind lake extensive granite intrusions have taken place. One and a half miles north of the lake, a dike cuts the greenstone in an east-west direction and forms, literally, a breccia of greenstone fragments, cemented by the granite.

These dikes are uniformly pink in colour and vary in texture from fine and aplitic to fairly coarse, sometimes porphyritic.

¹E. L. Bruce, Ont. Dept. Mines, Vol. XLV, 1936, pt. 2, p. 26.

Porphyry Dikes

In general the porphyry dikes appear to contain both quartz and feldspar phenocrysts in a dark-grey, aphanitic groundmass, which weathers white. They are narrow for the most part, usually 2 to 3 feet wide, though they may be as much as a chain in width. They appear to favour zones of shearing in the vicinity of intrusives, and are found in abundance in the shear zones south of Grasser lake and on the Kenty find south of Conglomerate lake.

Porphyry dikes occur along the heavily carbonated shear zone at the contact between the Timiskaming and Keewatin, $1\frac{1}{4}$ miles west of the Nipigon Provincial Forest boundary. In thin section these porphyries consist of subangular or rounded quartz grains embedded in a matrix of matted sericite and quartz. They are not only highly altered themselves, but are associated with an extensive alteration of the surrounding Keewatin. Tourmaline was observed in one outcrop of the altered porphyry. The possibility that some of these highly metamorphosed types may have originally been arkoses and not porphyries must not be overlooked.

Lamprophyre

A rather peculiar type of rock, probably a lamprophyre, is found cutting the sediments along the shore of Conglomerate lake and in one of the shear zones on the old Kenty find south of the lake. It has a granulated, salt-and-pepper appearance, and weathers very rapidly. The dikes are very irregular in shape, often curved, suggesting that the fractures they occupy have a tensional origin. Microscopic study indicated that the lamprophyre was originally a kersantite.

Relationships

All the igneous types mentioned are known to be intrusive into the Keewatin. On the other hand, they were nowhere observed in contact with the recognized Timiskaming. The only evidence suggesting the greater age of the latter is the shape of the sedimentary belt, which appears to be closely related to the distribution of the granite bodies, and the presence of porphyry intrusives in zones of shearing along the contact of Timiskaming and Keewatin.

If the intrusives are really younger, some source must be found for the granite boulders and feldspathic members characteristic of the Timiskaming. No evidence was obtained on which to base the establishment of two ages of granite, and yet a fairly local derivation seems required for the sediments to account for their textural and structural peculiarities. It is tentatively suggested that the intrusion of the Algoman persisted over a sufficiently prolonged period to permit the erosion of the upper, solidified portions of the batholith or batholiths, while at greater depth vulcanism was still going on.

The relations of the various Algoman intrusives are also not always clear. It is certain that some at least of the hybrid and contact diorites crystallized earlier than the true granite. Whether this is also true of the large diorite areas outside the batholithic masses is not clear. If they represent contact or border phases of underlying granite batholiths they must be slightly earlier in crystallization than the bulk of the intrusives beneath them. Some evidence of gradation between the two types was seen northwest of Crooked Green lake.

The relations of the dike rocks to the diorite and granite could not be ascertained. The latter is extensively cut by pegmatite and aplite dikes but was not observed in contact with porphyry or lamprophyre.

Keweenawan

The rocks previously described have been cut by a few diabase dikes, which generally trend north. Four large dikes are known, one at mile I, north boundary

of Lapierre township, a second on the west shore of Onaman lake, a third southeast of the east end of Conglomerate lake, and a fourth south of Martin creek. Other smaller ones, not always with the same dominant trend, were encountered. In thin section, the first and last cited proved to be quartz diabases.

STRUCTURAL GEOLOGY

Folding

The folding to which the rocks in the area have been subjected appears to have been isoclinal. For the most part, there is little divergence from the vertical in dips measured throughout the area. Such divergences as were noted cannot be used in locating the folds because the rocks in such highly deformed areas are frequently overturned. It is also impossible to determine the number of folds into which the Keewatin and Timiskaming have been thrown, owing to the absence of recognizable key horizons and because of the lateral discontinuity of beds and flows.

It is thought, however, that the sediments occupy a faulted, synclinal zone. This is the type of structure in which the Keewatin and Timiskaming commonly occur. The chief evidences for this are several dragfolds near and in the zone and the presence of fragments of Keewatin in the sediments. In the Timiskaming along the south shore of Conglomerate lake, a band of rusty, cherty quartz near the south contact of the sediments is overlain to the north by a bed containing pebbles of the same material, indicating that the tops of the beds face inwards towards the centre of the sedimentary belt. The relations of fracture cleavage and bedding east of Conglomerate lake confirm this evidence.

Schistosity

While certain zones have been more highly sheared than others, the Keewatin and Timiskaming, except for massive outcrops of quartzite, all exhibit flow cleavage. In the northwestern part of the area, the trend of the schistosity is roughly east-west. Just east of Conglomerate lake it turns south, and three miles south of this lake, it swings southeast and continues into the section north of Lapierre township, where it turns northeast and then east. At the eastern boundary of the area, the trend is finally north-south. In the southwestern part of the area, as far east as the east end of Castlewood lake, the direction of schistosity is southwest.

Several zones of intense shearing are found in the area. In three instances, south of Grasser lake, south of Conglomerate lake, and about a mile west of the Nipigon Provincial Forest boundary near the north boundary of the area, these zones are associated with the intrusion of porphyry dikes. In all cases, silicification and carbonatization are invariably associated with the shearing. It is certain that other zones of shearing occur, but they are probably obscured by drift, swamp, or water.

Fracture cleavage has been noted in some localities in zones of severe deformation and in incompetent interbeds in otherwise massive sediments.

Faulting

Faulting is probably far more prevalent than the map indicates. A clearly defined fault occurs along the line of drainage west from Bieber lake, paralleling the contact of the granite and greenstone. Evidence south of Altitude lake seems to indicate a downward and westward movement of the north side. As indicated by the drainage, this fault may extend some distance northwestward. These

faults occur in wide zones of shearing and not along sharply defined fractures. At least one and possibly two similar lines of lakes and streams lie south of and parallel to this zone.

Another fault extends northeastward from the east end of Grasser lake and may account for the occurrence of the iron formation there. Conglomerate lake is also believed to occupy a fault zone, for strong slickensides may be observed on the steep cliff-like walls of greenstone on the north side of the lake. These slickensides suggest a dominantly vertical movement in which the north block probably moved upwards, resulting in the obliteration of the north limb of the sedimentary belt that occupies the south shore of the lake.



Fault surface south of the west end of Altitude lake.

Cross-faulting has probably affected the sedimentary syncline and may also be the cause of the sharp-angled bend east of Conglomerate lake, where its trend changes from east-west to north-south.

Structures of the Igneous Rocks

The intrusives in the South Onaman area show several peculiarities which give some indication as to the conditions under which they were formed. That the rocks into which they were intruded were at the time of intrusion in a yielding, almost plastic state and under considerable stress is indicated by the fact that in many places the porphyries have a lenticular shape and are often numerous and so small as to give the impression of a conglomerate. The shearing of the greenstone wraps conformably around them. *Lit par lit* injections occur on a small scale in the greenstones near the granite contacts.

The parallelism of the schistosity and bedding with the outlines of the intrusive bodies and batholiths and the characteristic irregularity of the resulting structural lines is clearly seen on the map. This irregularity is in marked contrast to the uniformity of the structure in those sections of the Sturgeon River area in which large igneous masses are absent. The conclusion seems logical that the irregularity of the structure is due to the forces of intrusion. The fact, however, that inclusions of schist in the intrusives have, in some cases at least, schistosity

parallel to the regional trends in the nearby intruded rock argues against this inference.

The presence of wide zones of inclusions and hybrid types in certain of the intrusive masses is good evidence that the slope of the contact between the granite and the older rock is rather gentle. This characteristic is common to most of the granite areas. A notable exception is the small one south of Conglomerate lake. The possibility may be entertained that it has been faulted up above its original position in the crust.



Lit par lit structure of inclusion in granite
south of Onaman lake.

At all events, the varying percentages of inclusions and hybrid facies throughout the area probably indicates that the top of the granite batholith that underlies the area as a whole has an uneven upper surface. The present plane of erosion has intersected this surface wherever granitic rocks are now exposed.

HISTORICAL GEOLOGY

The oldest rocks outcropping in the area are the Keewatin greenstones. It has already been noted that the various members of the series, basic, intermediate, and acid flows, tuffs, intrusives, and sediments, could not be assigned to any definite stratigraphic position.

Following the main period of volcanic accumulation, the dominantly sedimentary series of conglomerate, arkosic quartzite, greywackés, and slates was deposited. It is possible that the sediments are conformable with the basic lavas, at least in part, and even interbedded with them, though the sediments are predominantly younger than the volcanics.

Some reference has already been made to the relationship between intrusives and sediments. At least two possibilities suggest themselves. Either there have been two ages of igneous activity, the one preceding, the other succeeding the formation of the sedimentary series, or there has been only one great period of intrusion, during part of which the sediments were deposited. In the event that the former is true, then the first (Laurentian) batholith has been destroyed by the second (Algoman) or can not be differentiated from it.

The last decipherable event of pre-Cambrian time was the intrusion of diabase dikes, supposedly of Keweenawan age. The only recognizable development since the pre-Cambrian was the modification of the land surface, through erosion and deposition, by the Pleistocene glaciation.

ECONOMIC GEOLOGY

Within the map area, no deposits of the economic minerals have been carried beyond the prospect stage, though traces of gold and other metals have been found rather widely distributed throughout it, usually in small quantities. In the vicinity of the area, only one property, that of Tashota Goldfields, produced gold in any quantity.

The principal useful and precious metals that have been discovered in and near the area include gold, silver, lead and zinc, and molybdenum.

Molybdenum

Molybdenite has been known for some time in the vicinity of North Wind lake, according to Gledhill.¹ The writer was also informed that a molybdenite vein had been staked some years ago by J. Rolandson in the vicinity of Crooked Green lake.

Heavy molybdenite float has been found east of Conglomerate lake, and flakes of it are reported from the Kenty find to the south. Another occurrence was discovered in drilling at the granite contact where it crosses the east boundary of the Nipigon Provincial Forest south of the Onaman river. Flakes of molybdenite were found in the drill-cores in sheared, highly altered granite.

Silver-Lead-Zinc

Within the area surveyed, no deposits containing minerals of the silver-lead-zinc group in any quantity are known, though Gledhill² reports sphalerite from North Wind lake. But to the east, south of the Onaman river, high assays in silver were obtained from two recent discoveries.

W. Middleton

The Middleton find, made in the summer of 1937, is located on claim T.B. 24,188, east of MacDonald lake and south of the Onaman river.

The country rock consists of chlorite schists with a regional trend northeast and southwest. In the vicinity of the prospect, however, the direction of shearing is rather variable; and in the area, about 40 feet square, in which the mineralization is developed, the schist is so much contorted that it breaks up into slender prismatic slivers. Miniature drags also may be observed in the highly disturbed area. This zone is terminated at its west end by what appears to be a fault. The fault was marked by an actual opening, into which powder could be shoved, for blasting, without preliminary drilling.

¹T. L. Gledhill, Ont. Dept. Mines, Vol. XXXIV, 1925, pt. 6, p. 67.

²Ibid.

Silicification in the mineralized area took the form of quartz lenses up to 12 inches wide, milky white, and usually free from metallic minerals. The heavy sulphide appears to favour highly silicified schist rather than the quartz itself.

The chief metallic minerals are pyrite, galena, sphalerite, chalcopyrite, and argentite. In polished section, a mineral resembling tetrahedrite was observed. Gangue minerals include quartz, large white flakes of mica, greenish talc, chlorite, cream-coloured carbonate (which seems to be associated with the sphalerite), white carbonate, and feldspar. In places, galena and sphalerite are abundant.

It is reported that grab samples have yielded as much as 192 ounces of silver and a little gold. The values terminate at the fault and have not been traced in any direction beyond the circumscribed area mentioned, although the prospect has been almost encircled by trenching. The property is owned by T. A. Johnson and W. Middleton.

W. Pauloski

The W. Pauloski discovery is located on claim K.K. 2,573 on the winter road leading west from the property of Tashota Goldfields, 45 chains east of the east boundary of the Nipigon Provincial Forest. It consists of a series of quartz lenses and silicified shear zones in greenstone and a sheared, light-weathering, porphyritic rock, probably altered greenstone.

The shear zone strikes N. 82° E., and has been traced for about 300 feet. The maximum width of any one quartz lens is about 18 inches. The dip appears to be north.

The quartz is milky and well fractured, and carries pyrite as cubes and splashes. Galena occurs as masses and stringers in chloritic inclusions in the quartz and in the country rock. Irregular cubes of pyrite occur in the galena. A polished section in the massive galena revealed the presence of sphalerite as well as galena and pyrite. Values in gold and silver are reported, but the small size of the deposit prohibited further work.

Gold

Gold has been found in small quantities in several parts of the area, chiefly in silicified shear zones in greenstone. As stated before, none of the finds have been carried beyond the prospect stage.

S. Dodds

The S. Dodds find is located eight chains south of the north boundary of Elmhirst township, some 28 chains west of mile II, on a group of 6 claims, T.B. 24,914-24,919.

Some gold values were obtained by S. Dodds, working for P. E. Hopkins, from a silicified shear zone in diorite. The shear zone strikes N. 50° W. It has been stripped for 90 feet and ranges in width from 1 inch to 3 feet.

The chief sulphide present is pyrite. A little copper stain and magnetite were also noted. Silver sulphides are reported. The quartz is not abundant, but is well fractured, with inclusions of chloritic material, in whose vicinity it tends to be dark-bluish in colour. Other minerals include yellow and white carbonate and pink feldspar, the last-mentioned occurring as a 3-inch dikelet at the north end of the shear zone. Work was also done on a 16-foot mass of quartz, which failed to give good values.

Ballina Lake

Considerable work was done on a zone of quartz stringers at the contact of granite and greenstone, south of Ballina lake. The stringers are from half an inch

to 9 inches wide, of glassy, sometimes rusty quartz. The chief sulphide is pyrite, very coarsely crystallized. It is understood that values were not encouraging. The writer was informed, however, that more interesting results were obtained from a quartz vein which disappears under Ballina lake itself. It is reported that the property is held by J. J. Green.

McCombe Brothers

During the summer of 1936 extensive trenching was carried out by the McCombe brothers on a band of magnetic iron formation on a block of 18 claims extending south from the south side of Pontoon lake and the southeast corner of Grasser lake.

Mineralization includes magnetite, sulphides (chiefly pyrite), both massive and disseminated, and quartz. The quartz is of two ages, original granular silica and introduced quartz. It is reported that values were, in general, low.

Coyle Lake Syndicate

Work was done by the Coyle Lake Syndicate on a band of iron formation south of Grasser lake. Geological conditions are similar to those on the McCombe property. It is understood that no values of importance were discovered.

Kenty

The old Kenty find is located on claim K.K. 800, about a mile south of the east end of Conglomerate lake. The main deposit consists of a series of lenticular silicified shear zones associated with lenticular porphyry intrusions in recrystallized greenstones. About 100 yards farther south is a second, smaller zone of shearing and silicification, with associated porphyry intrusions and a lamprophyre dike.

Carbonatization accompanied the extensive silicification. The chief mineral is pyrite, which occurs in chloritic areas in the quartz and in the wall rock. Molybdenite and native gold are reported.¹

Morecroft and Downey

Chas. Morecroft and Patrick Downey did some work on a large quartz vein in the vicinity of the old Wells-Johnson find, a mile or so east of the Nipigon Provincial Forest boundary.

T. A. Johnson

Trenching and drilling was carried out in the early summer of 1937 on a narrow shear zone in otherwise massive diorite (Keewatin?) and greenstone schist on the Johnson claim, K.K. 2,766, which is located just outside the map area to the north.

The general trend of the silicified zone, which lies about 20 chains west of the Nipigon Forest boundary between miles LXI and LXII, appeared to be N. 48° W.; the length exposed is about 70 feet. The actual shear planes of the country rock appear to make an angle of about 5 degrees with the general direction of the mineralized zone. The maximum width of shearing was 5½ feet, where the coarse and fine grained types of the country rock come in contact. The quartz, in blebs and strings, is rusty, granulated, and dirty. Pyrite, tellurides, and fine visible gold occur in quartz and schist. A polished section of this material indicated the presence of pyrrhotite, chalcopyrite, and native gold. Associated with these is a silvery-white mineral, which is possibly the telluride sylvanite.

The writer was informed by P. E. Hopkins and T. A. Johnson that grab samples of schist, with telluride, gave values as high as 19 ounces of gold per ton. Six shallow drill-holes under the lenticular shear zone gave low assays. One or

¹T. L. Gledhill, Ont. Dept. Mines, Vol. XXXIV, 1925, pt. 6, p. 82.

two other breaks were explored in the neighbourhood of the telluride find, but results were not encouraging.

Two claims west of this prospect, a considerable amount of work was done on shear zones and veins in Keewatin lavas intruded by irregular bodies and dikes of porphyry. Nothing of importance was discovered.

G. Brennan

The G. Brennan property includes a group of claims just south of the boundary between the Kowkash and Port Arthur mining divisions some 2 miles east of Humboldt bay, Lake Nipigon. Work was done during the summer of 1937 on the find, which was made by G. Brennan in the fall of 1936. The writer was unable to visit the property, but he is informed that it is located in sheared greenstone intruded by porphyry about 30 chains south of the granite contact. It is understood that the principal showing is a narrow quartz vein, which averages one foot in width and is more than a thousand feet long. The vein runs parallel to a porphyry dike. Arsenopyrite occurs in the vein, and a picked sample is reported to have given encouraging values.

Tashota Goldfields, Limited

The only property supplied with mining and milling equipment in the immediate vicinity of the South Onaman area is that of Tashota Goldfields, at present closed down. It is located about 14 miles south of the town of Tashota, about $1\frac{1}{2}$ miles south of the Onaman river and about $3\frac{1}{2}$ miles northwest of Onaman lake. It lies outside the map area but was briefly visited in the late summer of 1937. The property comprises a block of 12 unsurveyed claims, including K.K. 522-526, 535-537, 563, 565, 2,169.

The first discovery of gold there, in rather spectacular amounts, was made by J. McKechnie in August, 1923. In 1924 the find was optioned to the Nipissing Mining Company, Limited, for drilling. In 1927 a company, headed by H. H. Vaughan, of Montreal, was formed to operate the deposit. In 1929 operations were suspended, but under the stimulus of the increased price of gold, were renewed in February, 1934, under the direction of Minefinders, Limited. In 1936, Minefinders terminated their connection with the enterprise.

Power is supplied to the property by a Diesel plant, fuel for which is freighted in along the winter road from Tashota. The mine has been opened up on five levels from the surface to the 325-foot level; there is a winze between the 325- and 625-foot levels. It is equipped with a mill, which was being operated at about 70 tons per day until the suspension of operations in October, 1937.

General Geology.—The property is located on a narrow belt of greenstone, about $2\frac{1}{2}$ miles wide, near the south contact with the granite. In the vicinity of the property the Keewatin comprises chiefly pillow lavas, intermediate to basic flows, tuffs and coarser amphibolites, diorites and quartz diorites, which are in part intrusive. Just north of the main break is a bed of dragfolded, banded cherty sediments also of Keewatin age.

The above formations have been rather widely intruded by narrow dikes of quartz, feldspar, and quartz-feldspar porphyry. These are highly sheared, especially, according to Kindle,¹ along their borders. Porphyry is closely associated with the ore. Thus the main "A" ore body is followed from the surface to the 625-foot level by an irregular porphyry body. Kindle² quotes W. A. Coughlan, then resident engineer, as stating that there is a lowering in gold values near the porphyry. The writer is informed that in the upper levels the matrix of the porphyry

¹L. F. Kindle, Ont. Dept. Mines, Vol. XL, 1931, pt. 4, p. 91.

²Ibid., p. 92.

encountered in mining and development is rather dark coloured, while in the lower levels the intrusive becomes lighter-coloured, sheared, chloritic, and sericitic. Tests made on these lighter porphyries indicated the fairly uniform occurrence of gold to the amount of 0.05 ounces, according to Russ Wyman, geologist at the mine at the time of the writer's visit.

In addition to the foregoing, appreciable outcrops of granite are found within 800 yards of the mine, and one or two small ones lie within 300 yards. The latter appear somewhat sheared and gneissic; the former, medium-grained, massive, with a fairly large proportion of dark mineral.



Shaft, Tashota Goldfields, Limited.

These formations are cut by a diabase dike about 60 feet wide. This may be a continuation of a similar dike that outcrops on the west shore of Onaman lake.

In the immediate vicinity of the mine, the regional trend of bedding and schistosity in the Keewatin is slightly north of west. In the northern part of the property the trend is south of west. In both cases, the dip is uniformly north.

Ore Bodies.—The ore is made up of lenses and stringers of quartz and associated schist. Four zones, the "A," "B," "D," and "G," have been partially developed. A fifth zone, the "H," has also been located at the west end of the property. W. A. RuKeyser, consulting engineer at the property when it was visited, believes that the "A" (easternmost), "D," and "G" (westernmost) ore bodies are the faulted segments of a once continuous break. He also considers the "H" zone, which lies west of the "G" zone and which has been traced by drilling

and trenching to the western boundary of the property, to be part of the same break.

The ore zones have been cut by a thrust fault dipping 27° N.E. and striking N. 43° W. This fault intersects the "A" vein at the 425-foot level, displacing the vein 42 feet to the north.

The chief production of the mine has come from the "A" ore body, which is about 200 feet long. At the surface, widths were around 3 feet. At the 625-foot level, the average width is 57 inches. At 720 feet and 925 feet, widths, determined by drilling, are 6.6 feet and 13.1 feet, respectively. Values above the thrust fault averaged 0.4 ounces in gold per ton; below it they averaged 0.16 ounces per ton. The deep drill-hole to 925 feet, however, gave an average value of 0.33 ounces per ton over a true width of 13.1 feet. The ore zone dips 70° N. and in the upper levels rakes at 68° W. It has now been practically mined out above the 625-foot level. The above figures were supplied to the writer by Mr. RuKeyser.

Parallel to the "A" zone and some 200 feet south of it is the smaller, less important "B" zone. It has the same dip and rake.

Some 320 feet southeast of "A" is the "D" zone, which is about 115 feet long on the second level. At that horizon, its average width is 6 feet. It rakes 64° W. and dips 74° N. This zone has also been intersected on the 625-foot level. The "G" ore body lies still farther west of the "D," and on the second level averages 6 feet in width.

Mineralization.—The ore occurs in quartz and schist. The quartz has apparently been deposited throughout the period of mineralization. Other gangue minerals besides the quartz are epidote, zoisite, carbonate, biotite, sericite, and chlorite. The metallic minerals consist primarily of pyrrhotite, chalcopyrite, and magnetite, together with a little pyrite. Bismuthinite occurs in quantity in places, and since it is carried into the bricks during amalgamation may decrease their fineness to as low as 500. Argentite also is said to occur, and Kindle¹ reports the occurrence of tellurides in small amounts. The gold occurs in the native state, but is principally associated with the chalcopyrite. Massive pyrrhotite, which is encountered from time to time, does not make ore.

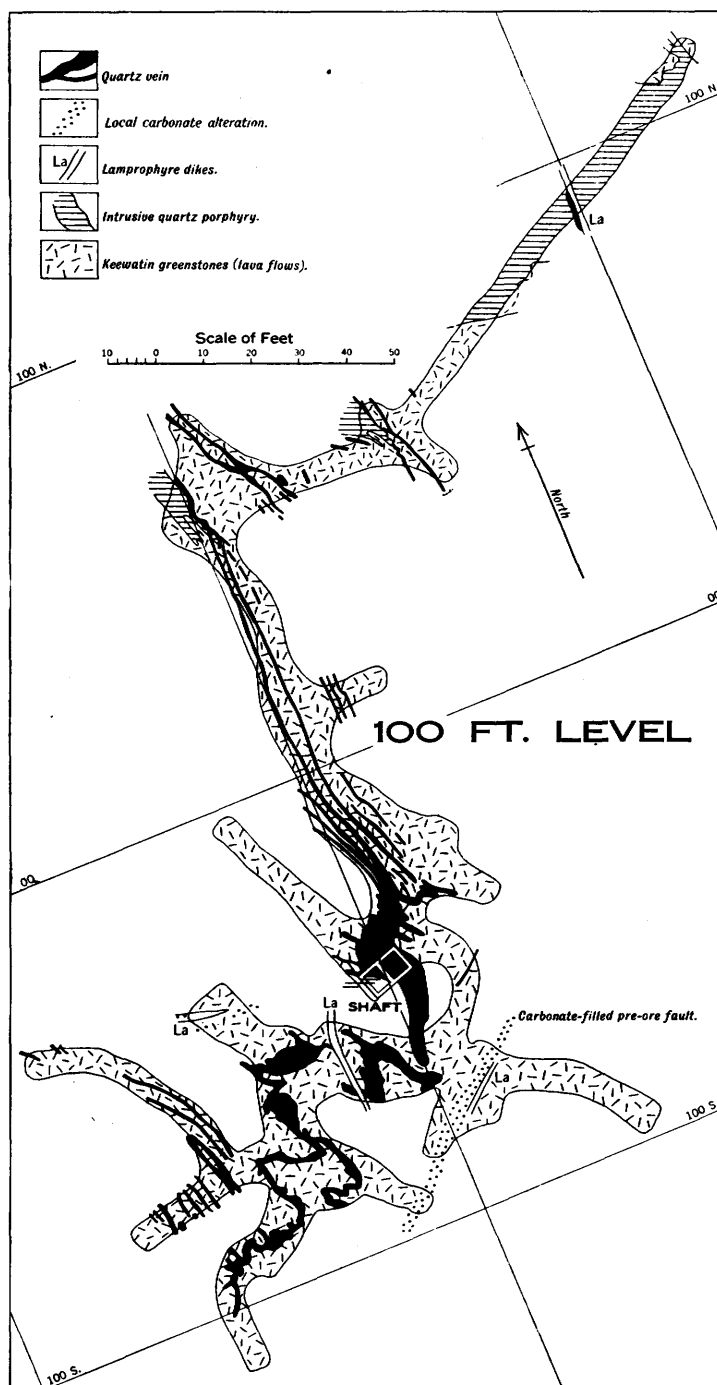
In the early stages of the development of the mine some trouble was experienced in extracting the gold. The metallurgical problem, however, was solved, and it was found possible to recover regularly about 92 per cent. of the gold. The free-milling gold was recovered by amalgamation, and a flotation concentrate containing copper, gold, and silver was shipped to the United States Metals Refining Company for treatment. Total production costs over a six months' period, when the mine was operating regularly, are reported to have been about \$7.50 per ton.

Production.—According to H. H. Vaughan, 50,872 tons of ore were milled from the beginning of operations at the treating plant to the end of 1937, and 13,269 ounces of gold, 18,006 ounces of silver, and 507,770 pounds of copper were recovered.

Wascanna Mines, Limited

The Wascanna property, which includes the old Tash-Orn holdings, is located 1½ miles southeast of the town of Tashota and comprises the following claims: K.K. 2,667–2,672, 2,638, 2,639, 385, 2,694–2,696, and T.B. 2,892. It is supplied with excellent new buildings and an up-to-date power plant. Underground work was carried on from the old shaft during 1937, but was suspended in the fall of that year in order that surface diamond-drilling might be undertaken.

¹L. F. Kindle, op. cit., p. 92.



Geological plan of the 100-foot level, property of Wascanna Mines, Limited, July 29, 1937. (From plan by F. S. Miller after H. T. Leslie.)

Late in 1936, a geophysical survey was made by Hans Lundberg of some of the claims. The property is operated by the Fort Rouille Mining Corporation, Limited.

General Geology.—The country rock at the Wascanna is largely Keewatin greenstone, including much ellipsoidal lava. In the Keewatin there also occurs iron formation in considerable amount, as well as banded cherty silica. These rocks have been rather extensively intruded by narrow, medium- to fine-grained, sometimes highly sheared, siliceous quartz-feldspar porphyry. Lamprophyres have also been intersected in the shaft. Still later than these are diabase dikes of Keweenawan(?) age. The general regional trend of schistosity appears to be north-south.

Ore Bodies.—The old Tash-Orn shaft was originally sunk to a depth of 142 feet. The present operators have continued down to the 300-foot level, where lateral work was being carried on at the time of the writer's visit, in September, 1937. The shaft was sunk on a large lens of quartz, which tapers out northward into parallel, narrow stringers. The same general arrangement is shown on the 100- and 200-foot levels underground. The southern termination of the lens of quartz is formed by two intersecting faults. These faults, believed to be older than the mineralizing solutions, are filled with brown-coloured carbonate and lenses of quartz, which may show some values, according to P. W. Meahan, manager at the property at the time of the writer's visit.

The faults bear a close relationship to the ore; the greatest widths of quartz and the best values occur near them, and both values and widths of the stringers to the north of the lens decrease away from the faults. Thus the main lens may be as wide as 15 feet near the fault, but it tapers out to 5 feet of narrow stringers, 1 to 5 inches wide. On the first level the main lens has the appearance of being dragfolded, but in its contortions it cuts across the shearing in the schist.

Mineralization includes pyrite, chalcopyrite, and native gold. Hopkins¹ also reports pyrrhotite. Gangue minerals, besides quartz, include tourmaline and white mica flakes. According to Hopkins,² the gold occurs in fractures filled with crushed quartz, calcite, talc, and chlorite. The quartz is well fractured and milky.

H. T. Leslie, of Wascanna Mines, Limited, informed the writer that on the first level a zone 120 feet long averaged 0.36 ounces over an average width of 7½ feet. On the 200- and 300-foot levels, however, the values are reported to be very erratic. Widths and values on these levels apparently decrease rapidly away from the faults. Hopkins³ states that a shipment of 700 pounds of ore averaged \$20.00 per ton (old price).

Surface Work.—Surface work has also been carried out in various other parts of the property. Systematic sampling on a highly sheared and contorted silicified zone in greenstone on claim K.K. 2,667 gave for the most part only traces, though two samples went as high as 0.19 ounces and 0.25 ounces per ton, according to Mr. Leslie. Work has also been done on a 6-foot band of rusty, sheared, mineralized, silicified iron formation on claim K.K. 2,668.

Hopkins-Johnson-Burt

The Hopkins-Johnson-Burt property, which lies outside the map area on the Canadian National railway a quarter of a mile east of Tashota, includes claims K.K. 2,219, 2,389–2,391, 2,441, 417, 328, 61, and 2,206, held under option, and

¹P. E. Hopkins, Ont. Dept. Mines, Vol. XXVI, 1917, p. 218.

²Ibid, p. 220.

³Ibid, p. 218.

the staked claims K.K. 2,689, 2,973, 2,576, and 2,691-2,693. The property was trenched and drilled during the summer and fall of 1936 and the winter of 1937.

The principal formations outcropping are greenstone schists and associated iron formation, intruded by diorite, quartz porphyry, lamprophyre, feldspar porphyry, and quartz veins.

The ore zones so far located on the property are the Fraser vein, the New vein, Trench No. 1 veins, and iron formation west of the Fraser vein.

The principal gangue mineral is quartz, which occurs in veins and stringers, usually fine-grained but sugary in the iron formation. Two ages of quartz are reported in one of the shoots in the Trench No. 1 veins. Chloritic streaks occur in places in the quartz.

Metallic minerals include pyrite, pyrrhotite, magnetite, usually with chalcopyrite, and visible gold.

At present the most important vein is the Fraser, which has been followed by drilling for 325 feet in a northwesterly direction. The dip is 65° N.E. The sulphides mentioned are all present, and some banded magnetite occurs along the hanging-wall side. According to J. D. Wright, who made a report on the property, the drilling over a length of 325 feet indicates an average width of 6 feet 7 inches, carrying 0.16 ounces per ton in gold. An ore zone west of the Fraser vein occurs in greenstone near diorite and possibly in the diorite itself, and has been traced by drilling for a length of 150 feet, parallel to and 50 feet west of the Fraser vein. Sampling from this zone by Dr. Wright gave values as high as 0.37 ounces per ton across 2½ feet.

The New vein, which carries pyrite, pyrrhotite, and magnetite in chloritic quartz, gave values on surface of 0.49 ounces per ton over 3 feet 8 inches for a length of 70 feet, according to Dr. Wright.

In the Trench No. 1 veins, two ore shoots are separated by a dike of diorite about 15 feet in width. These shoots have apparently been displaced by a low-angle fault. Dr. Wright reports that the shoot south of the dike has been traced for 35 feet and yielded an average of 0.28 ounces gold per ton over 8 feet; the north zone, located on the nose of a porphyry dike gave on surface, 0.69 ounces gold per ton over 3 feet for a length of 60 feet. It is in the latter vein that the two ages of quartz, one coarse, milky white, and barren, and the other fine-grained and mineralized, are found.

The iron formation 300 feet west of the Fraser vein has been cut by a network of quartz stringers and is mineralized by the usual sulphides. An average gold content of 0.11 ounces gold per ton over 4 feet 8 inches for a length of 300 feet is reported.

RECOMMENDATIONS TO PROSPECTORS

The area has not been extensively prospected. This fact, together with the geology, suggests that more work might profitably be done there. It is thought that promising localities for exploration are the sheared, porphyry-intruded schists south of Pontoon and Grasser lakes and extending northwestward from the latter, and the heavily sheared, carbonated zone between Con creek and the east boundary of the Nipigon Provincial Forest. It is interesting to note that the greenstones and porphyries along this zone exhibit similar alteration to that observed in the country rock of the Pauloski and Middleton silver-lead-zinc finds. Unfortunately so much of the zone is covered by drift that a satisfactory examination could probably only be carried out by diamond-drilling.

The vicinity of the small granite intrusives should also be suitable places in which to search for ore deposits. The area southeast of the granite body, 1½ miles

southeast of Conglomerate lake, would seem to be favourable. There, fairly massive, unsheared, probably rather competent sedimentary formations have been pinched between the stock and the main granite batholith to the east. No mineralization of importance, however, was observed in traversing. Other sections on the rim of this and similar stocks also deserve attention.

Molybdenite is widely distributed, and a search along sheared, silicified zones within and near the contacts of the granite and diorite bodies, large and small, might reveal economic concentrations of the mineral. It must be emphasized, however, that the relative inaccessibility of much of the area requires that any prospects must be fairly high grade to ensure profitable exploitation.

Such prospecting as has been done has revealed the widespread occurrence of gold and other metals in small quantities. While this is in a sense an encouraging feature, it also may simply indicate that no major structural channels were available at the time the ore-bearing solutions were introduced and the mineralization may have been disseminated throughout the country, being nowhere sufficiently concentrated to give commercial deposits. It is felt, however, that the area has not been sufficiently explored to preclude the reasonable likelihood of further discoveries.

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PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. PAUL LEDUC, *Minister of Mines*

H. C. RICKABY, *Deputy Minister*

FORTY-SEVENTH ANNUAL REPORT

OF THE

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BEING

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The Southwestern Part of the Schreiber Area, by G. A. Harcourt - 1-28

The Northeastern Part of the Schreiber Area, by M. W. Bartley - 29-40

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COLOURED GEOLOGICAL MAP (In pocket at back of report)

Map No. 47j—Schreiber Area, District of Thunder Bay, Ontario. Scale, half a mile to the inch.



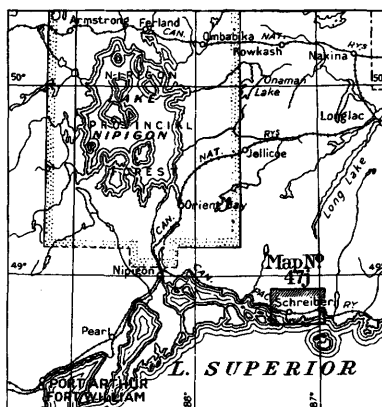
Schreiber peninsula from the west on the shore of Lake Superior. The hills rise nearly 1,000 feet above the lake.

The Southwestern Part of the Schreiber Area

By G. A. Harcourt

INTRODUCTION

During the field season of 1936, a geological examination was made of the southeastern part of the Schreiber area. Schreiber is a divisional point on the Canadian Pacific railway, located 133 miles east of Port Arthur and about one and a half miles inland from the north shore of Lake Superior. The Trans-Canada highway, now under construction, crosses the area mapped. Between Port Arthur and Schreiber the highway is completed except for a bridge over the Nipigon river, where cars are now taken across by rail. Schreiber may thus be reached by rail on the C.P.R., by boat on Lake Superior, or by motor on the highway approaching from the west.



Key map showing the location of the Schreiber area. Scale, 70 miles to the inch.

The area mapped extends 6 miles east of Schreiber to the Aguasabon (Black) river and 4 miles west to Horn. The east boundary follows the Aguasabon river from the shore of Lake Superior north to north latitude $48^{\circ}50'$ and then runs northwest to Ellis lake. The north boundary runs west from Ellis lake through Big Bruin (Bear) lake to the north end of Walker lake. A topographical map of the area prepared from aerial photographs by the Ontario Forestry Branch was used as a base for the geological map. Geological observations have been tied in almost wholly by means of pace-and-compass traverses checked at numerous points by reference to aerial photographs. In general, traverses were run 20 chains apart except where the complexity of the geology required more detailed mapping. Where this was the case, traverses were run 5 or 10 chains apart as deemed necessary. Outstanding structures were traced continuously as far as possible.

Acknowledgments

In the field M. W. Bartley, H. W. Salter, and E. B. Owen rendered able assistance. Credit must be given Mr. Bartley especially, who was responsible for much of the geological mapping. All the notes on the work done during 1937 at

the various mines were written by Mr. Bartley, who visited them during the course of his work on the northeastern part of the area¹ during that summer. He also contributed the sketch maps accompanying the descriptions of the Schreiber Pyramid and Cook Lake properties.

The writer takes this opportunity to express his appreciation to mining officials and operators in the area for their active interest in facilitating the work necessary for this report. Special acknowledgment is made to G. H. Reid, of Schreiber, for assistance in many ways throughout the season.

Previous Geological Work

The Schreiber area is included in a report by W. H. Collins² and in the map (No. 964), on a scale of 8 miles to the inch, which accompanies his report. It is also included in a report by P. E. Hopkins³ and in the map (No. 30a), on a



Goose lake and Cook lake looking south toward Schreiber. The level of Cook lake has been raised by a dam at its far end to provide a water reservoir for the town.

scale of one mile to the inch, which accompanies his report. The geology of this area is mentioned briefly by T. L. Tanton⁴ in a report on the Nipigon-Schreiber district.

History and Development

The Schreiber area is one of Ontario's oldest mining camps. The Martin locations Nos. 1 and 2, now part of the property belonging to North Shores Mines (1936), Limited, were surveyed in 1872 before the construction of the Canadian Pacific railway. Since this early date the area has been prospected in spasmodic fashion for gold, silver, copper, and iron, and for sulphides suitable for the recovery of sulphur. Much of the area has been staked and restaked

¹M. W. Bartley, "The Northeastern Part of the Schreiber Area," pp. 29 to 40 of this volume.

²W. H. Collins, "Report on the Region Lying North of Lake Superior between the Pic and Nipigon Rivers," Geol. Surv. Can., Pub. No. 1081, 1909.

³P. E. Hopkins, "Schreiber-Duck Lake Area," Ont. Dept. Mines, Vol. XXX, 1921, pt. 4, pp. 1-26.

⁴T. L. Tanton, "Nipigon-Schreiber District, Ontario," Geol. Surv. Can., Sum. Rept. 1920, pt. D, pp. 2-7.

several times. In 1896, gold was found on the Otisse property (claim T.B. 3,412), and in 1898 on the McKellar property (claim B.J. 122). Interest in the area lagged for the next twenty years but was renewed in 1919 by a gold discovery on the Otisse property, which again stimulated interest in the McKellar property. In recent years prospecting for gold has been more intensive and has been rewarded by the discovery of a number of occurrences of native gold. Several mining companies have been formed to develop these discoveries, among them North Shores Mines working the old McKellar property, which is actively mining and producing gold.



Straight shore line of Lake Superior east of Worthington bay. In the foreground is the mill of the North Shores Mines.

Several bodies of massive sulphides have been discovered but have not been worked, except for the Morley property, from which a trial shipment of pyrite was made in 1897.

General Character of the Area¹

The area, like much of the north shore of Lake Superior, is characterized by considerable relief. Schreiber peninsula is bounded on the east and west by cliffs 200 to 300 feet high, falling sheer to the lake. Half a mile inland the land rises nearly 1,000 feet above the lake level. Further inland about Schreiber the hills

¹Wherever the word "area" is used in this report without any descriptive qualification, it refers to the southwestern part of the Schreiber map area (No. 47j accompanying this report) as described in the second paragraph on page 1.

rise 300 to 500 feet above the lakes and streams. Lakes in the area are small and are connected by small streams abounding in rapids and falls. The hills, valleys, lakes, and rivers of the area make a strikingly angular pattern, which stands out clearly in aerial photographs and which are the result of parallel faults striking northwest and northeast. Most of the valleys are developed along fault planes and are occupied by elongated lakes or straight-flowing creeks. Many of the numerous cliffs in the area are the result of this faulting. Glaciation has subdued this rugged topography by rounding off and scouring the hills.

The area is nearly all outcrop with the exception of sand flats and beach gravels in the valley in which Schreiber is located and the area about Bluejay. In general, the hills are covered only by a thin layer of moss, with spruce, poplar, and birch growing in soil collected in every crevice and slight depression in the rock surface.



Pillow lava on the shore of Lake Superior just west of Schreiber Beach. Pillows are exposed in three planes, at right angles to one another. The foreground is flat and parallel to the plane of the flow. The pillow outlines on this surface are roughly circular. The attitude of the flow is indicated in vertical sections by pillow outlines having the characteristic horns.

Transportation

The mining properties about Schreiber are served by a government road, which runs from Schreiber east to Bluejay. This road will soon be superseded by a section of the new Trans-Canada highway, which at this point is 90 per cent. complete. From the old road a private road has been built by North Shores Mines one and a half miles south to the shore of Lake Superior, where their mill is located, and from there to the mine adit, three-quarters of a mile to the northwest. Mill and heavy equipment were delivered to the present site on the shore of Lake Superior by scow.

The Harkness-Hays property and the Gold Range property are served by the government motor road east of Schreiber. The new highway crosses between the mills and camps of these two properties.

Schreiber-Pyramid Gold Mines, Limited, have recently cleared a wagon road from the government road at Gold Range 3 miles north to their property.

The Derragh property is reached by a wagon road branching from the government road at mile 113 on the Canadian Pacific railway. This is an old timber road and except for the crossing of Big Duck creek could easily be put into shape for wagon haulage, since it is all on sand flats.

Numerous foot-paths and trails kept in good repair by continuous use make it possible to go from one part of the area to another fairly directly over the hills instead of by roads, which in general are circuitous.

GENERAL GEOLOGY

The consolidated rocks of the area are all pre-Cambrian. The oldest of these are Keewatin in age and consist of a series of volcanic flows including basalt, andesite, rhyolite, and their pyroclastic equivalents, tuffs, agglomerates, and breccias. Interbedded with the volcanics are lenticular sedimentary deposits and narrow but persistent bands of iron formation. The Keewatin formation is intruded in a complex fashion by diorite, which is found as irregular masses throughout the area. The Keewatin is also intruded by large masses of coarse-grained hornblende syenite. The occurrence of the syenite differs from that of the diorite in that it intrudes the Keewatin in a regular manner from three sides. The syenite in the area mapped is a part of a large batholith in which the volcanics remain as a roof pendant. The Animikie formation consisting of conglomerate, iron formation, and shale was deposited upon the eroded surface of upturned volcanic flows and upon the weathered surface of diorite and syenite. These sediments occur only as small remnants on the shore of Lake Superior west of Schreiber. The Keweenawan is represented in this area only by dikes of quartz and olivine diabase, which are numerous in the south part, striking parallel to the shore of Lake Superior.

The general geology is summarized in the table below:—

| | |
|---------------------------|---|
| QUARTERNARY | |
| PLEISTOCENE: | Sands, gravel, etc. |
| | <i>Great unconformity</i> |
| PRE-CAMBRIAN | |
| KEEWEENAWAN: | Diabase dikes. |
| | <i>Intrusive contact</i> |
| ANIMIKIE: | Black shale, iron formation, conglomerate. |
| | <i>Great unconformity</i> |
| ALGOMAN: | Lamprophyre. Quartz and feldspar porphyries. Syenite, granite. |
| | <i>Intrusive contact(?)</i> |
| POST-KEEWATIN INTRUSIVES: | Diorite, gabbro. |
| | <i>Intrusive contact</i> |
| KEEWATIN: | { Banded cherts and iron formation. Chlorite, carbonate, and sericite schists. Conglomerate, quartzite, greywacké, limestone. Andesite-rhyolite agglomerates and tuffs. Basalt, andesite, dacite, and rhyolite flows. |

Keewatin

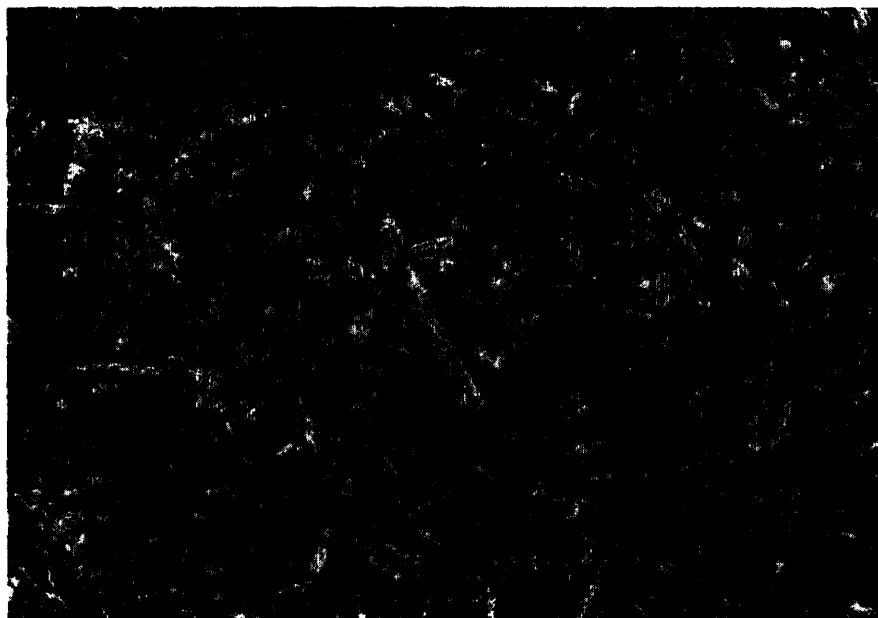
Roughly, the Keewatin extends as a band 3 to 5 miles wide from Horn on the west to and beyond the east margin of the area at the Aguasabon river. The Algonian intrusives invade this band from the south, north, and west, forming a

continuous boundary on each side except where a strip of Keewatin extends northward between Beaver and Big Bruin lakes and a smaller one runs northwest from Goose lake.

The Keewatin contains a considerable number of rock types. It is essentially a volcanic formation, but interbedded with the volcanics there are sedimentary members, including conglomerate, quartzite, greywacké, and limestone. In addition, there are numerous persistent horizons of banded iron formation.

Andesite

The volcanic flows of the Keewatin include basalt, andesite, and rhyolite. Basalt is not abundant; andesite is widespread. The andesite found in this area



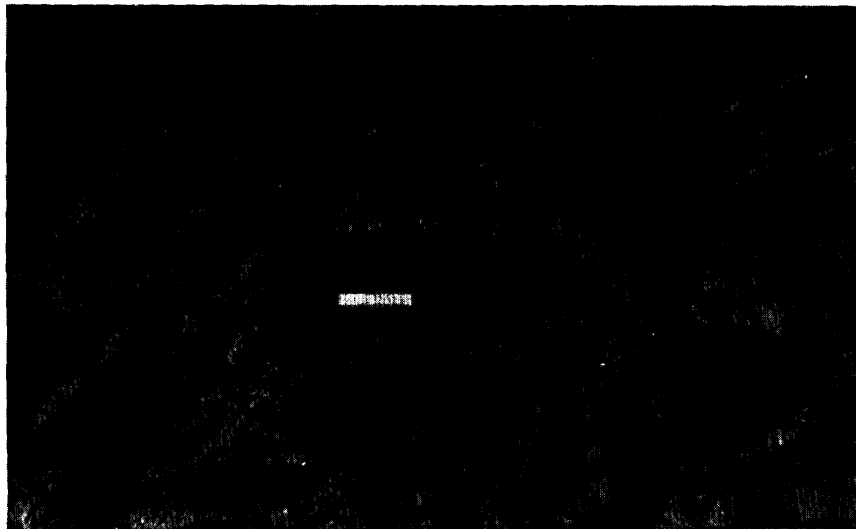
Photomicrograph of a specimen of typical andesite showing altered feldspar laths in a groundmass composed of fine feldspar and hornblende with a large proportion of chlorite. (X 43.)

has not been altered as much as similar rock in numerous other pre-Cambrian areas. In general, the rocks are fine-grained, dark-green to black in colour, and hard and dense. The original texture of these rocks may frequently be seen by examining the weathered surface. The fine-grained, dark groundmass has weathered and been removed more rapidly than the tiny feldspar laths, which consequently stand out in relief. A photomicrograph of a specimen of typical andesite is shown above. In it may be seen feldspar laths in a groundmass of hornblende, feldspar, and chlorite. The feldspar is altered, but not beyond recognition, and the texture of the rock although masked by alteration is still easily discernible.

Such is the condition of the andesites in general. Locally, however, these rocks have been altered profoundly. This is the case where they are broken by major faults. For several hundred feet from such faults they have been carbonatized to such an extent that the original constituents can no longer be recognized. Again, in a zone extending from Von lake northeast across Fog creek the andesites have been both sheared and carbonatized.

Although the andesites are in general fine-grained, coarse facies are found associated with some of the thicker flows. These coarse varieties may easily be confused with diorite or gabbro. The problem of their differentiation will be discussed in the section on diorite.

Pillow structures in the andesites are particularly well developed, preserved, and displayed about Schreiber, and are common throughout the area. In general, the pillows have not been deformed; they show normal elongation and typical structures. Not infrequently exposures are encountered where favourable jointing displays the pillows in three dimensions, and the original attitude of the flow is readily seen. The photograph on page 4 shows such a display of pillows on the shore of Lake Superior just west of Schreiber Beach. Along the highway from Schreiber to Lamont lake, pillows may be seen in nearly every rock cut.



Carbonatized rims of pillows, which stand out in relief on weathering, on the shore of Lake Superior half a mile west of Schreiber Beach.
The white marker is a 6-inch rule.

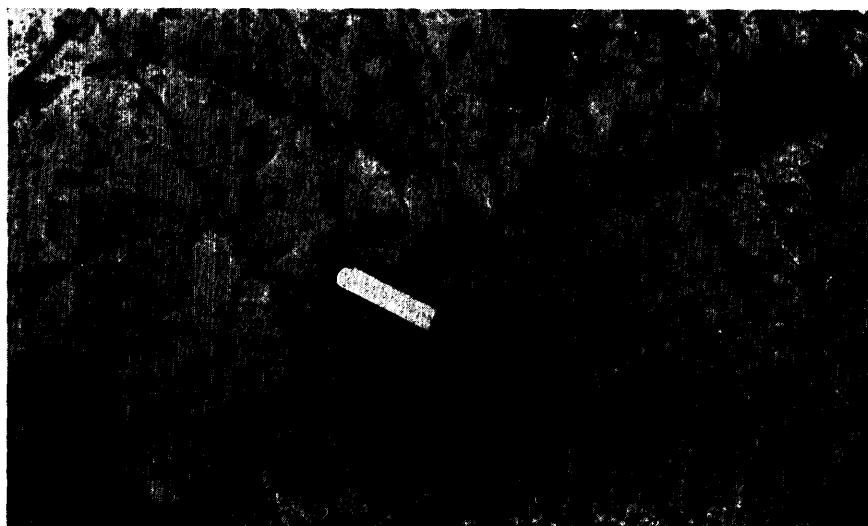
Where carbonate solutions have reached pillow lavas the alteration has been most intense at the margin of the pillows, forming a dense, fine-grained carbonate shell up to 2 inches in thickness. Such rims are more resistant to erosion than the interior portions, which have been only partly altered, and consequently stand out as ridges about pillows.

Rhyolite

Rhyolites make up a considerable part of the Keewatin formation, but they are not as widespread as the andesite flows. They are more or less segregated from the andesites but interfinger with them. They occur west of Schreiber north and south of the Canadian Pacific railway, south of Schreiber to Lake Superior, and northeast to the Harkness-Hays property. Rhyolite flows within the andesite areas are rare; they occur as narrow lenticular bands. The rhyolite flows are not thick and show a great range in their appearance and characteristics as contrasted to the almost monotonous uniformity of the intermediate flow rocks. The rhyolites range in colour through white, grey and green, to black. In texture they range from uniformly fine-grained homogeneous rocks to coarsely porphyritic.

The phenocrysts are hornblende crystals in some cases but more frequently feldspar. Numerous volcanic breccias occur composed of large angular fragments of rhyolite cemented by similar rhyolite differing slightly in colour or texture. Thinly bedded rhyolitic tuffs and agglomerates are associated with the rhyolite flows, and indicate the trend of these lavas.

Like the andesites, these rocks have not in general been sheared or highly deformed although tilted and folded with the rest of the Keewatin. The large feldspar phenocrysts have been altered considerably, so that in thin section they are so clouded as to render the identification of the feldspar difficult or impossible. Some of these feldspar porphyries present a curious appearance in the field. The phenocrysts have irregular, indistinct outlines and suggest fragments rather than euhedral crystals. In thin section this is seen to be due to the alteration products of the phenocrysts spreading out beyond the boundaries of the original crystals.



Rhyolite agglomerate in the southern part of claim B.J. 123
on the shore of Lake Superior.

Pyroclastics

Most of the pyroclastic rocks are associated with rhyolite flows and are composed of rhyolite fragments and cement. The fragments range from small angular particles in tuffs to blocks several feet across in coarse breccias. Agglomerates made up of round rhyolite fragments one inch to one foot in diameter in rhyolite cement are common. Many rhyolite agglomerates and breccias can be recognized as such only where the rock has been washed clean by wave action. Since fragments and matrix are very similar, the weathering is identical and frequently the internal structure is so similar that the contact between fragment and matrix cannot be seen on a freshly broken surface. The photograph above illustrates such a rhyolite agglomerate washed clean on the shore of Lake Superior. The clastic nature of this rock could not be recognized even in the bare shoreline outcrops above the continuous vigorous action of the waves.

Another type of agglomerate occurs with the andesite flows. This is composed of andesite containing round or elongated fragments of grey rhyolite. The fragments are elongated in the plane of the flow and in places make up nearly 50 per

cent. of the rock. These agglomerates are easily recognized since the fragments stand out in relief on the weathered surface. A band of such rocks is particularly well exposed north of Goose lake. This type of agglomerate has been included on the map with the intermediate to basic Keewatin rocks.

Sediments

Normal sediments occur as lenses within the Keewatin half a mile to one and a half miles west of Schreiber. A lenticular band extends northwest from mile 1 on the railway curving to the west before pinching out. This band occurs between



Contortions within a straight band of iron formation on claim T.B. 3,351.

two andesite flows, both of which show pillow structure. The conglomerate has a maximum width of 2 chains and dips 55° N. About half a mile north of this conglomerate there is another larger lens of sediments containing conglomerate, quartzite, and a few beds of limestone. This lens is more closely folded than the previously mentioned one but has a similar dip. It is exposed discontinuously for one and a half miles along its length. About one mile east of Schreiber on the railway another small area of sediments consists of highly contorted impure limestone and siliceous shales.

Iron Formation

Iron formation occurs at a number of horizons in the Keewatin as bands ranging in width from 10 feet to 5 chains. Some of the narrow bands are sur-

prisingly persistent and, although contorted in the detail of their internal structure, run straight for long distances. A persistent band of this type under a chain in width occurs north of Hollinger lake. The wider bands occur along the highway between Schreiber and Walker lake and on the east side of the townsite of Schreiber. North of the Gold Range property there are 8 or 9 parallel bands of iron formation, all one chain or under in width, which run across a group of about twelve claims. Many other bands were found which were not traced for any distance.

These bands are distinctly sedimentary structures. They consist of layers of chert 1 to 2 inches wide alternating with chloritic layers of similar width. The chert varies in colour from white to black. The alternating layers are dark-green and frequently schistose and carry considerable magnetite. Some of the layers are nearly pure magnetite; others appear to be composed of the disintegration products of greenstone with only a small proportion of magnetite. Certain bands have associated with them massive beds of white quartz, which upon slight weathering develops a granular structure giving rise to the term "sugar quartz." The photograph on page 9 shows the typical contortion within a narrow band of iron formation, which as a whole occurs as a uniformly straight band. Within the wider bands of iron formation, such as that on the east boundary of the townsite of Schreiber, contortion is lacking and the beds dip uniformly to the northeast at 55 degrees.

The bands of iron formation are units resistant to processes of erosion and have a tendency to stand slightly above the surrounding rock surface. They are consequently prominent features easily picked up in traversing. Where fractured the bands frequently contain sulphides.

Explosion Breccia

On claim T.B. 3,411 north of the Gold Range property, an outcrop of conglomerate or pseudo-conglomerate 1 chain by 2 chains in area is apparently completely isolated from other sediments. The rock is made up of fragments of rhyolite, greenstone, iron formation, and granite, some apparently well rounded, others sharply angular. The rock is intruded by a body of lamprophyre on one side and is surrounded by grey rhyolite. A polished slab of the rock shows that the fragments are nearly all angular and that at least some of the round surfaces are due to a conchoidal fracture in the fragments. The matrix is now composed very largely of quartz and sulphides, which penetrate fractures crossing the fragments. It is conceivable that the rock is the result of explosive volcanic activity, or it may be a partially exposed lens of conglomerate.

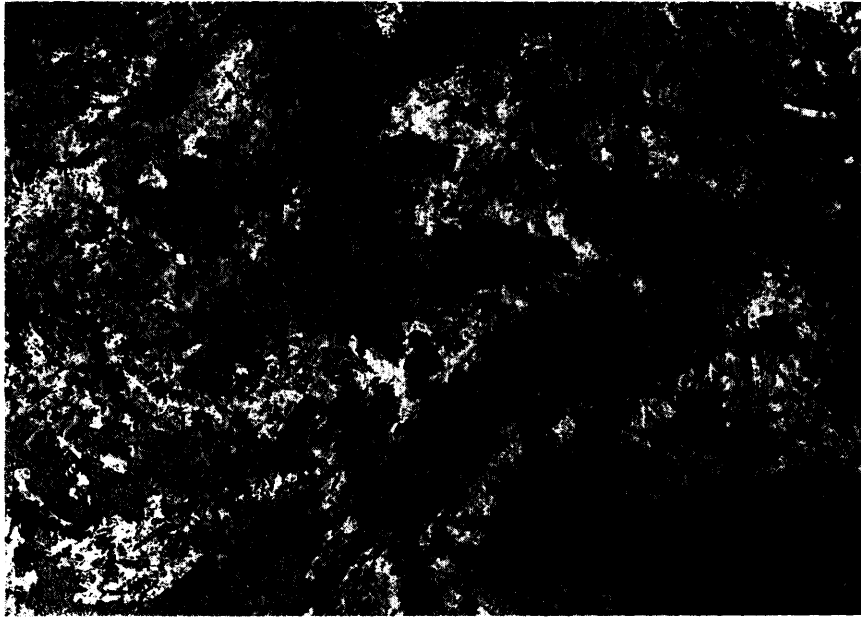
Patches or narrow bands of sediments have been found in a number of isolated spots where they could not be traced. A small outcrop of garnetiferous gneiss occurs on the north side of the railway $3\frac{1}{2}$ miles west of Schreiber.

Amphibolite

Associated with the andesite flows there is a coarse-grained basic rock composed very largely of hornblende crystals one-quarter to three-eighths of an inch across. In the hand specimen the coarseness of the grain is striking; the excellent cleavage of the coarse grains is apparent, but good cleavage surfaces have an unusual mottled appearance. In thin section the hornblende crystals are seen to be incomplete. They have a worm-eaten appearance, being full of more or less round areas composed largely of altered feldspar. The hornblende itself is strik-

ingly fresh, whereas the other constituents have been altered almost beyond recognition. There seems to be little doubt from the evidence afforded by thin sections that the hornblende developed, long after the original rock had solidified, by a recrystallization of the elements originally present.

This rock is found close to Lake Superior on the north side of the fault that runs through the big bend in the railway 5 miles west of Schreiber. A similar rock with the hornblende developed as more distinct phenocrysts occurs on the property of Schreiber Pyramid. It is bounded on the north by a shear zone containing their No. 2 showing and grades southward into more normal andesite. A band of iron formation less than 20 feet wide crosses a part of this amphibolite. On the north side of the shear zone mentioned there is perfectly normal ellipsoidal



Photomicrograph of amphibolite showing secondary hornblende developed in a highly altered Keewatin flow rock.

andesite. The shear zone itself appears to have been developed along a narrow band of slaty sediments which extends northwest for a quarter of a mile to a small lake, beyond which it could not be picked up.

The abrupt change from amphibolite to normal pillow lavas in a distance of 20 to 30 feet must be due to a displacement of some proportion along the shear zone. The presence of a band of iron formation within the amphibolite, conformable to the general structure, eliminates the possibility of the amphibolite being an intrusive. If it is a flow, it can hardly have been a special variety particularly susceptible to alteration, since it occurs both before and after the deposition of the band of sedimentary iron formation. It is concluded, therefore, that the amphibolites of this type found in the area have been developed from normal andesite flows. The localization of this alteration must be related to the existence of channelways along which such solutions could migrate; otherwise all the rocks of similar composition would be altered in the same manner.

Post-Keewatin Diorite

Throughout the area a coarse-grained basic rock is encountered which intrudes the Keewatin formation, crosscutting structures in erratic fashion. The rock corresponds to a diorite in composition and has been mapped as a separate unit as far as possible. It is difficult in many cases to define the limits of these bodies of diorite because they have been found to be extremely irregular in surface outline, extending as swelling and pinching fingers into the Keewatin. Although the rock is medium- to coarse-grained, the coarser phases of andesite approach it in texture and appearance. In fact, the possibility of the diorite being merely a phase of the flows complexly extruded must be considered. It is well known that lava flows are frequently complex structures forming crusts, partly solidifying



Photomicrograph of a specimen of diorite from the shore of Lake Superior on claim T.B. 3,782, showing hornblende (dark) and feldspar (light). ($\times 36$.)

then breaking through and flowing farther. If by such a process a thick assemblage were built up, the final result might well show a coarse-grained rock intrusive into a fine-grained one. This process may account for some of the rock mapped as diorite but only a small part of it, because it does not account for the crosscutting of pre-existing structures. It could account for diorite crosscutting pillow lavas but not iron formation and sediments, unless one postulates a sill which broke through to the surface; in which case the rock is still an intrusive.

The diorite is in about the same state of preservation as the andesites of the Keewatin. Locally it has been sheared or highly carbonatized as are the andesites and is then indistinguishable from them.

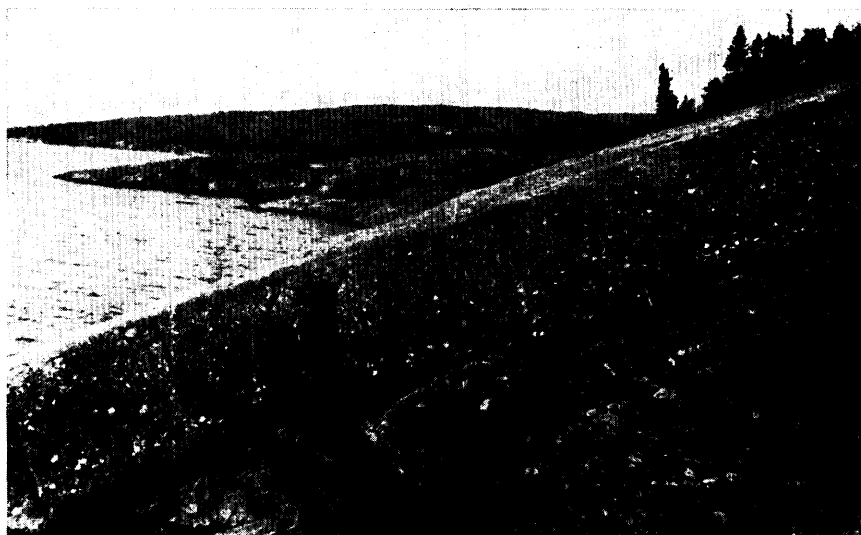
The diorites present still another problem in the distinction between them and the amphibolites discussed above. The typical amphibolite described is a distinctive rock, but no doubt there are many intermediate phases in its development which in the field, at least, would resemble the diorite in texture. The best

guide in this respect is the fresh character of the hornblende in the recrystallized rock contrasted to the altered nature of the matrix. The diorite tends to be equigranular or granitoid in texture with the ferromagnesian minerals altered to chlorite to a considerable extent.

The diorite is cut by syenite and porphyritic dikes of Algoman age. It is thus pre-Algoman and post-Keewatin in age. From the extent to which it is altered, however, it is believed to be closely related to the Keewatin.

Algoman

Algoman intrusives are represented in the area by coarse-grained hornblende syenite intruding the Keewatin band from both sides and by many dikes. The syenite was not traversed other than to establish details of its contact with the Keewatin, which had previously been located by Hopkins.



Animikie conglomerate on the shore of Lake Superior one mile west of Schreiber Beach.

A body of syenite occurs within the Keewatin on the west side of Schreiber peninsula. This was traversed in a few places and found to vary from a typical syenite on its east side to granite on the west next to the lake shore. The change is a gradual one across this distance of three-quarters of a mile, quartz gradually increasing toward the west.

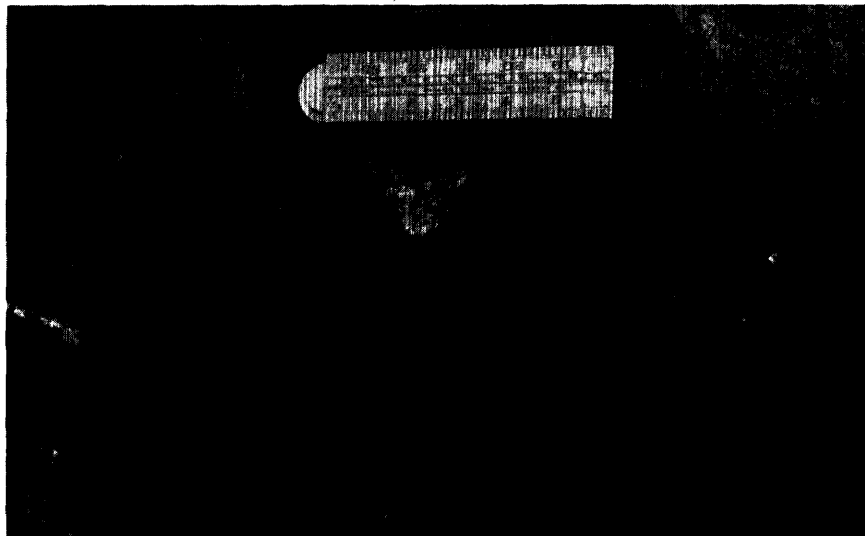
Associated with the syenite are numerous dikes crosscutting the older rocks. Close to the contact with the syenite, dikes are abundant, striking in all directions and having all attitudes from nearly flat to vertical. The dikes are predominantly syenitic here, but feldspar porphyries, quartz porphyries, and lamprophyre dikes are also numerous. Farther removed from the contact there is not such an abundance of dikes but they are still numerous. Along the southern contact of the Keewatin area south of the highway there are several larger bodies of quartz porphyry in form more like small stocks than dikes.

Animikie Sediments

Animikie sediments occur only in a few small outcrops along the shore of Lake Superior west of Schreiber. In these outcrops the sediments consist of a

basal conglomerate resting upon the weathered surface of Keewatin lavas and Algoman syenite. Above the conglomerate there is a thin layer of jasper and black chert overlain by black slates. The sediments dip 5° to 10° S.

Between the Keewatin pillow lavas and the conglomerate proper there is a thickness of some 3 to 6 feet of shaly material, which is not bedded. This material represents disintegrated pillow lava and soil developed on this surface. In cliff sections the various stages in the development of this soil may be observed. In the first stage, the margins of the pillows have been attacked by surface disintegration leaving the interior of the pillow still unaffected. As the alteration extends inward, what remains of the solid pillow resembles a boulder in glacial clay. In the final stage the pillow is completely disintegrated to a more or less homogeneous shaly material. On top of this soil rests the basal conglomerate



Concentric pre-Animikie weathering in a dike occurring on the shore of Lake Superior about a mile west of Schreiber Beach.

composed of heterogeneous pebbles from 1 to 2 inches in diameter. One of the best localities to see these relations is on the lake shore half a mile east of the small island south of Horn.

This fossil soil is eroded more rapidly by wave action than the conglomerate, thus leaving the latter almost loose as though it had been pushed or had slid into its present position (see photograph on page 13).

Just east of the mouth of the creek flowing from Ronge lake there is a shore outcrop of this fossil soil from which the conglomerate has been removed. The outcrop may be seen in the photograph as a point running out into the lake. Several dikes cross the outcrop. They are from 2 to 3 feet wide and exhibit a curious concentric weathering, illustrated in the photograph above. Traced beyond the old erosion surface into the Keewatin lava flows these dikes appear to be quite homogeneous.

Nothing that the writer could interpret as evidence of organic remains was discovered. The use of the term "soil" is, therefore, questionable; regolith would apply better. In the iron formation on the shore by the island referred to above,

fractures are filled with anthraxolite and quartz. Tanton¹ has reported this occurrence and another farther to the west and attributed its origin to bituminous shales in the Animikie sediments.

Keweenaw

All the previously described rocks are cut by dikes of quartz and olivine diabase. Most of them strike slightly south of east, parallel to the general trend of the shore of Lake Superior in the area. They all dip steeply, most of them around 80°N., but some dip south at a similar angle.



A Keweenaw diabase dike showing typical jointing and the manner in which these rocks stand above adjacent Keewatin rocks.

All dikes encountered have a characteristic pattern of joints consisting of three sets: two perpendicular to each other and to the plane of the dike, and a third set parallel to the plane of the dike. The spacing is generally such that fractures parallel to the plane of the dike are most prominent and form the long side of massive rectangular blocks. This set of fractures can thus be recognized and may be relied upon for an approximate strike and dip where the boundaries of the dike are not exposed.

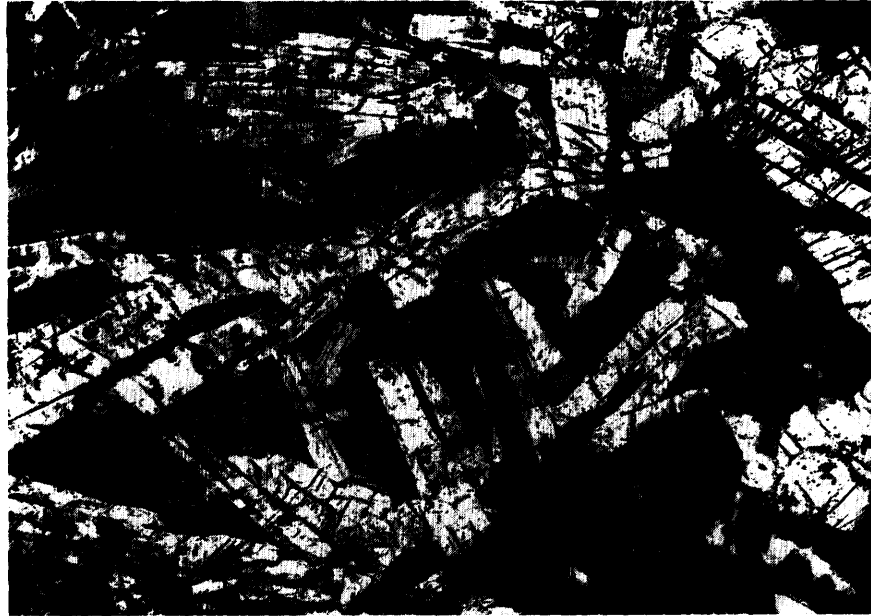
Compared with the Keewatin rocks, the diabase is a fresh, tough rock resistant to weathering and generally stands above the softer rocks as illustrated in the photograph above. But wherever the terrain directs flowing water toward a dike, erosion is accelerated by the jointing, with the frequent result that instead of

¹T. L. Tanton, *op. cit.*, p. 6.

a ridge the position of the dike is marked by a deep, clean-cut chasm. The olivine diabase disintegrates more rapidly than the quartz variety.

Just south of the railway at mileage $1\frac{3}{4}$ west of Schreiber, a prominent hill surrounded by cliffs and talus is composed of coarse basic rock corresponding in composition to a meta-gabbro. The mineral constituents, labradorite, olivine, pyroxene, uralite, magnetite, and quartz, are as little altered as the constituents of the diabase, and it is believed that this rock should be correlated with the Keweenawan.

The form of this body, whether a stock, pipe, or remnant of a sill or flow, could not be determined since it is isolated by talus from the other rocks. Its very coarse texture suggests that it may be a remnant of a thick flow or sill, but no other such remnants were discovered to substantiate this conjecture.



Photomicrograph of olivine diabase with an ophitic texture, showing feldspar (light) pyroxene (grey), and olivine (dark). ($\times 50$.)

STRUCTURAL GEOLOGY

The Keewatin formation as represented in the area mapped is far from being a simple structural unit. The various layers that make up the formation were once uniform, continuous, and approximately horizontal. Since the time of their emplacement they have been tilted, folded, and dislocated by faults, intruded by batholithic masses, and metamorphosed by deep burial. Almost everywhere the formation dips at 45 to 60 degrees to the northeast or northwest, indicating folding on a large scale. In a general way the strike is east and west, but cross-folding has further complicated and contorted the structure. The intrusion of diorite has interrupted the continuity of the flows and beds, making it impossible to trace units continuously. The intrusion of Algonian syenite has completely obliterated large parts of the older formations and left only a ragged remnant. It is the structure of this remnant that is of particular interest and importance with respect to the localization of ore deposits. The remnant itself and the

intrusives have been subjected to differential stresses, which were released by major fracturing and movement of the material on one side with respect to the other. Faults of this type have broken the Keewatin into large blocks, which are displaced with respect to one another to such an extent that it is at present almost impossible to identify small structural units that might be common to two adjacent blocks. Each block presents a separate structural problem that must be solved before the original attitude of the blocks can be determined and reconstructed like a three-dimensional jig-saw puzzle. To accomplish this would require a great deal more information than is at present available.

Although individual units have not been recognized in adjacent fault blocks, the rhyolites as a whole form a somewhat discontinuous band from Horn on the west to Big Duck creek on the east. The broad band of iron formation in Schreiber townsite and the iron formation exposed along the highway to Walker lake are believed to be equivalent. The bands are somewhat similar lithologically and occur at the north boundary of the rhyolite. There is, however, a mass of intrusive diorite and three well-marked faults between the two occurrences.

The most complete section of Keewatin is exposed between Collingwood (Flint) bay and the syenite contact north of Cook lake. On a line between these two points the structure is clear south of the highway because of the distinctly banded character of the rocks. Here the rocks all dip and face to the north as determined by the attitude of the pillow lavas and gradation in grain size in the sediments. North of the highway the rocks are massive andesites intruded by diorite except for a band of agglomerate toward the syenite contact. The agglomerate has an attitude similar to the rocks south of the highway. The general trend of the Keewatin is slightly south of east and the conclusion has been reached that these rocks represent the folded south limb of a major syncline formerly extending to the north. A fault block northeast of the Gold Range property, in which the structure curves around toward the north, is the only discordant evidence on this point, but being a fault block of cross-folded structure this discordance may not be as significant as it appears.

The major faults of the area displace Algonian syenite and related dikes. Some of the faults displace Keweenawan diabase dikes, and the main period of faulting is, therefore, believed to be late pre-Cambrian or much later in age.

The shearing east of Von lake has not been satisfactorily dated, since only Keewatin volcanics and diorite occur in the zone.

Faults and fractures that are pre-Keweenawan and closely related to Algonian in age are known to occur in many parts of the area. The best examples are the gold quartz veins at the North Shores and Gold Range properties, which are intersected by diabase dikes and numerous porphyry and lamprophyre dikes, which followed fractures existing at the time of the consolidation of the Algonian intrusives.

ECONOMIC GEOLOGY

Gold

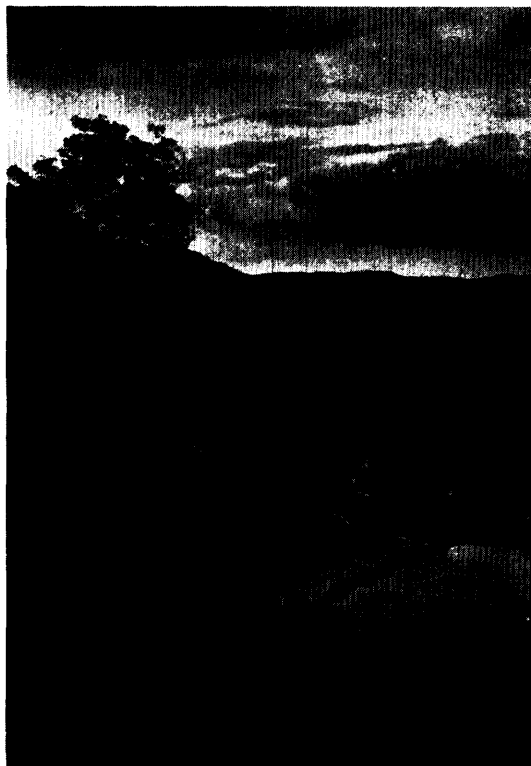
The gold deposits of the region are characteristically narrow quartz veins occupying fissures in Keewatin rocks or, as at the North Shores property, in a marginal part of Algonian syenite. In general, the veins are straight and continuous, and some are sufficiently high-grade to warrant mining in spite of their narrow width. Associated with the veins are carbonates and sulphides, including pyrite, chalcopyrite, sphalerite, and pyrrhotite. Magnetite and tellurides also occur. In many occurrences the gold occurs as the native element in coarse grains easily seen with the naked eye or with the aid of a small lens, but in other

occurrences it is fine and is rarely seen. The gold is closely associated with pyrite at several properties, occurring as specks within the grains of sulphide. At the North Shores mine the gold is more closely associated with a telluride than with pyrite but frequently is found as tiny fragmentary veinlets within quartz that is free from sulphides or other ore minerals.

Gold is found in shear zones on the Schreiber Pyramid and Derraugh properties.

NORTH SHORES MINES (1936), LIMITED

The property of North Shores Mines (1936), Limited, was formerly known as the McKellar-Longworth, and has been described by Hopkins.¹ It is located



Worthington bay and the mill of North Shores Mines, Limited.

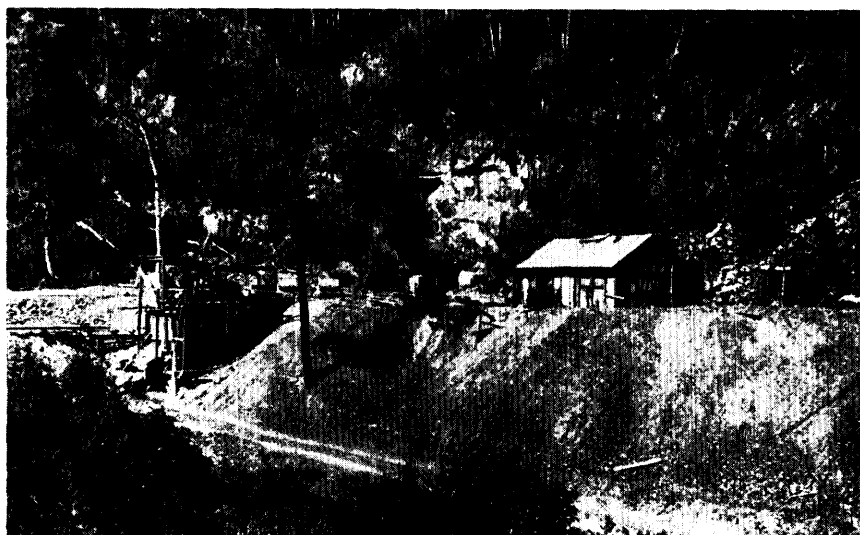
about $2\frac{1}{2}$ miles south of Schreiber. The claim on which the deposit now being worked is located was patented in 1903 by the McKellar brothers of Fort William. In 1934 a company named North Shores Gold Mines, Limited, constructed a 25-ton mill on the shore of Lake Superior at the bottom of Worthington bay and commenced mining operations. The property is now actively worked by North Shores Mines (1936), Limited. Hand-sorted ore is hauled by truck from the mine adit some 500 feet above the lake to the mill, where the gold is recovered in an amalgam and a heavy concentrate. During 1935, 834 ounces of gold were recovered from 1,404 tons of ore milled.

¹P. E. Hopkins, op. cit., pp. 12-14.

The gold occurs in a quartz vein striking E. 10° S. across a hill rising about 650 feet above Lake Superior in the northwest quarter of claim B.J. 122. The vein dips 50° to 55° S. In width the vein is variable but averages less than 1 foot.

During the summer of 1936 the deposit was being worked from adits driven along the strike of the vein into the hill from the west side on the west boundary of claim B.J. 122. The vein is exposed by stripping at a number of places across the hill and an adit was driven in the early days on a vein which was believed to be the same structure as that on the other side of the hill 1,600 feet to the east. Diamond-drilling during the summer has confirmed this belief and has indicated a displacement of the eastern part of the vein of some 40 feet. It has also indicated a continuance of the high grade and a slightly better average width.

The wall rock is syenite, somewhat variable in colour and texture, grading from pink to grey and from medium- to fine-grained. In places the wall rock is

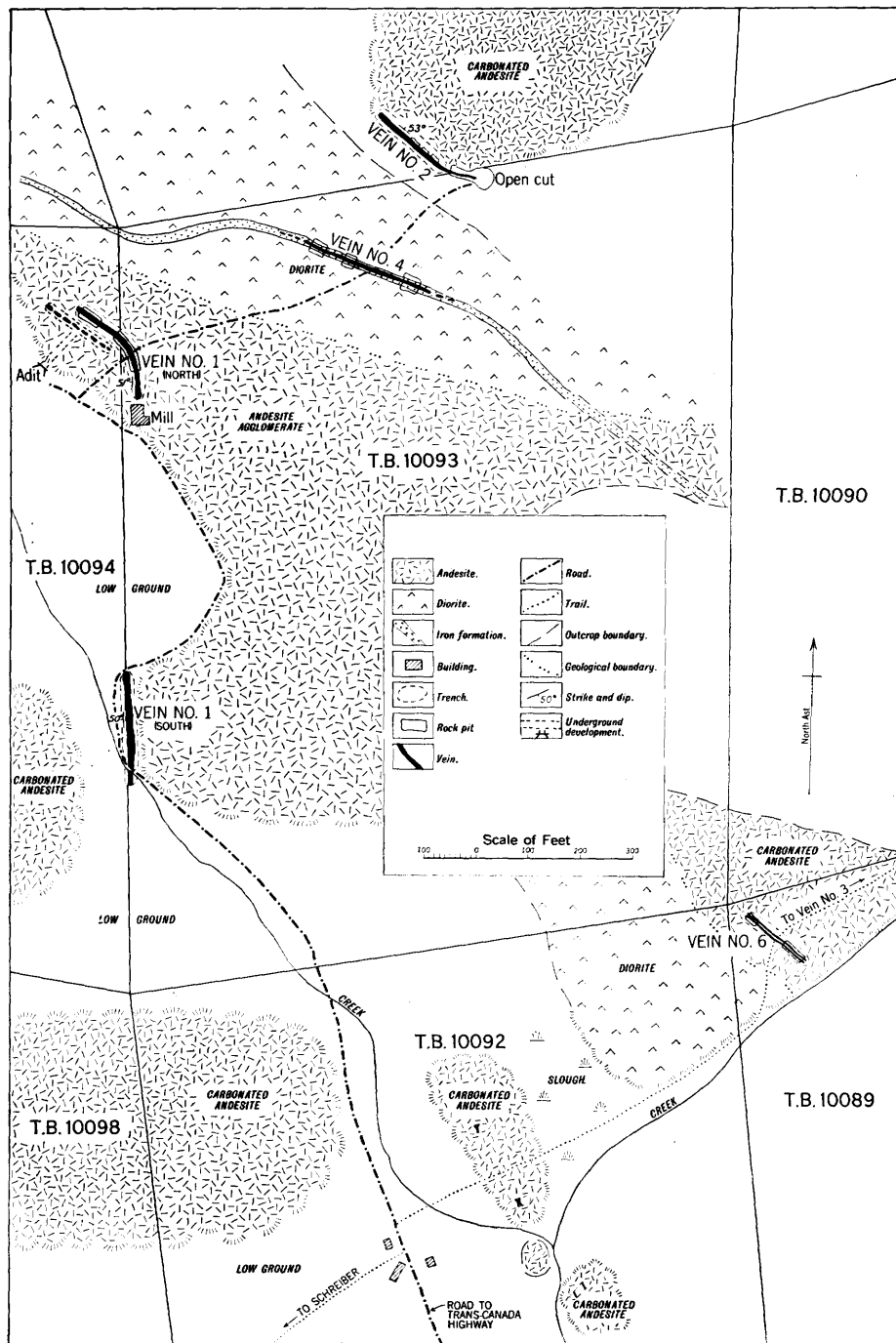


The upper adit of the North Shores mine on the west boundary of claim B.J. 122.

rhyolite, which has been highly altered by the syenite intrusion so that it is almost indistinguishable from a fine syenite. The wall rock is very sparingly mineralized and does not make ore. Hand-sorting is carried out at the adit entrance, and only the quartz and fine material is sent to the mill.

The vein is cut by a diabase dike toward the west side of the claim. Porphyry and lamprophyre dikes occur in the vicinity but not in contact with the vein as at present exposed.

A major fault striking north and south across the area runs along the west boundary of the claim. At the north boundary of the area this fault displaces the syenite-greenstone contact in such fashion as to show an apparent horizontal displacement of about 14 chains, east side north. The actual displacement is not known. A vertical fault marked by some 4 feet of gouge, striking N. 50° W., is exposed in the lower adit close to the west boundary of the claim. On the east side of the hill across which the vein runs there is apparently a fault running north-west, beyond which the diabase dike referred to above has not been identified.



Geological sketch map of the Schreiber Pyramid claims
(Kenecho Gold Mines, Limited).

Native gold in particles large enough to be easily seen in hand specimens are not abundant in this vein. The sulphides pyrite, chalcopyrite, and pyrrhotite, which occur sparingly in the quartz and wall rock, are apparently no indication of values. Rich ore shoots contain practically no sulphides, but they do contain grains and very small specks of a metallic, grey, cleavable mineral resembling galena in colour. This mineral is the bismuth telluride, tetradyrite, $\text{Bi}_2(\text{Te},\text{S})_3$. It occurs scattered through the white quartz in minute specks easily overlooked, but native gold has been found to be associated with it in specks of much smaller size. Other tellurides were not seen in the few polished sections of the ore prepared nor in the vein itself.

During the summer of 1937, a continuation of the main vein was opened up on the lower level through the adit driven from the east side of the property. The vein was followed intermittently for 950 feet into the hillside. It has been faulted off in several places, alternately displaced north and south. The average width of the vein is the same as in the upper levels, about 10 inches, but it bulges in places to 2 feet. These wider portions are reported to carry the best values and may constitute ore shoots. Stopes were opened on these to provide ore for the mill.

Late in the fall, operations were temporarily suspended.

SCHREIBER PYRAMID GOLD MINES, LIMITED

The property of Schreiber Pyramid Gold Mines, Limited, is located about $3\frac{1}{2}$ miles northeast of Schreiber by overland trail and 7 miles by road via the Gold Range property. The property may also be reached by canoe through Cook and Hollinger lakes to the trail at the south end of Hollinger lake.

Trenching on this property has exposed two occurrences of gold. No. 1 vein is exposed in two pits about 1,000 feet apart. In both these pits the quartz vein contains pyrite, chalcopyrite, and numerous showings of native gold. The vein is just under a foot in width, strikes N. 5° W., and dips 50° to 55° W. It cuts across basic Keewatin flows to the southwest of a mass of amphibolite, which outcrops in a band striking northwest. Although the two vein exposures are a considerable distance apart, they are believed to be the same structure because of their alignment, their attitude, and the fact that the vein in each exposure occurs on the east contact of a lamprophyre dike 2 feet wide.

No. 2 vein is exposed about 500 feet northeast of the northerly exposure of No. 1 vein. It is 10 inches wide, strikes roughly N. 45° W., and dips 45° N.E. The quartz is coarse-grained and contains some pyrite, chalcopyrite, and tourmaline in radiating groups. It is crossed by veinlets of calcite containing galena and sphalerite. Stripping has indicated a length of 250 feet. The vein occurs in andesite pillow lava on the north side of the amphibolite mentioned above. Between the amphibolite and the andesite there is a shear zone dipping 80° N. which appears to have been developed along a narrow band of sediments. Trenching along this shear zone immediately south of the vein has disclosed mineralization 5 to 6 feet wide consisting of massive bands of pyrite, pyrrhotite, chalcopyrite, and sphalerite. It is reported that a considerable amount of native gold has been removed from the rusty outcrop in this shear zone.

A camp was in process of construction during the summer of 1936, and a diamond-drilling campaign was started to determine the continuity and extent of the deposits.

During the winter of 1936-37, a small test mill was erected on the property to treat bulk samples from vein No. 2. This vein was open-cut to a depth of about 40 feet for a distance of 50 feet. On surface the vein appeared strong, and good

values were reported. At depth, however, the vein pinched out, and work was suspended. Following this development, underground investigation of vein No. 1 was undertaken. A short adit was driven northeast into the hill to intersect the vein at a depth of 50 feet. Where the vein was encountered, it was found to be narrow and irregular. Short drifts were driven northwest and southeast along the vein but were soon discontinued when the vein narrowed to a few inches.

In the summer of 1937, the property was taken over by Kenecho Gold Mines, Limited. Prospecting on the southeastern part of the property uncovered three mineralized zones reported to carry values over narrow widths.

GOLD RANGE MINES, LIMITED

The property of Gold Range Mines, Limited, lies on the north side of the Canadian Pacific railway, $2\frac{1}{2}$ miles east of Schreiber.

During the summer of 1936, work was being done to test out several veins exposed on a cliff face striking N. 65° E. parallel to this cliff. Four veins have been disclosed on the hillside, and an adit is being driven at the base of the cliff to intersect them. An adit 500 feet east of the present workings driven 135 feet into the diorite cliff crossed a few narrow stringers of white quartz and calcite.

The country rock here is Keewatin pillow lava intruded by diorite, syenite, and porphyry and diabase dikes. The contact of a large body of syenite extending south to Lake Superior lies 500 feet to the south of the adit. Most of the dikes are older than the veins, but the diabase cuts across all the other structures. This dike strikes northwest between the old adit mentioned above and the present workings.

The vein seen at the mouth of the new adit consists of narrow stringers of coarse white quartz containing occasional large cubes of pyrite. The vein is composite, being made up of branching veinlets occupying fractures in a shattered zone in diorite. The veinlets are less than 2 inches wide, but the wall rock is well mineralized for several inches from the veins. Native gold is found in the coarse quartz of the veins.

Fifty feet to the north a parallel vein less than a foot in width, dipping 85° N., follows the contact of a 2-foot lamprophyre dike. This vein extends across the adjacent claim line into the Harkness-Hays property. The vein carries cubes of pyrite with a maximum diameter of one inch, some of which contain visible gold.

Narrow quartz veins have been found 200 and 300 feet north of the south vein. To the south on the north margin of the highway there is a 25-foot shaft on another vein. This old shaft was being pumped out at the time the property was visited in the summer of 1936. In the collar the vein was 2 to 3 inches wide, striking N. 35° E. across diorite. The bottom of the shaft is said to show a greater width of quartz, which yields gold on assay.

JEDDER GOLD MINES, LIMITED

The property of Jedder Gold Mines, Limited, lies about 5 miles east of Schreiber and 2 miles north of mile 113 on the railway. It was staked by J. E. Derragh and was purchased by the present company from the Derragh Exploration Syndicate in November, 1936.

The Derragh Syndicate did considerable stripping on a break striking S. 60° W. parallel to the edge of the hills. This is also parallel to the syenite contact and not far removed from it, as may be judged from the numerous granite, syenite, porphyry, pegmatite, and aplite dikes and by the alteration of the Keewatin lavas. The dip is steeply to the north, 85 degrees and greater.

This shear zone has apparently localized the intrusion of several dikes. It is closely followed by a dike of feldspar porphyry. At other places for varying distances it is followed by a granite dike, 1 foot in width and somewhat pegmatitic in character, and by smaller porphyry dikes and aplite stringers. The shear zone has also been followed by a quartz vein, which is closely associated with the granite dike. The quartz occurs as stringers and lenses in the shear zone and in places as a well-defined vein with a maximum width of 14 inches. The quartz is well mineralized with pyrite, chalcopyrite, and galena. A chip sample across 14 inches of quartz taken by the writer from a pit on the north side of a shear zone 10 chains west of the cabin on this property was assayed by the Provincial Assay Office and gave 2.19 ounces per ton in gold. A grab sample of material taken by the writer from the shear zone extending 5 feet to the south gave 1.31 ounces per ton in gold.

During the spring of 1937, Jedder Gold Mines undertook a campaign of diamond-drilling, but the results were discouraging. Surface sampling was reported to have indicated a 500-foot section averaging 0.23 ounces per ton in gold over an average width of 1.5 feet. The drilling, however, did not substantiate these values, and the property at present is inactive.

HARKNESS-HAYS GOLD MINES, LIMITED

The property of Harkness-Hays Gold Mines, Limited, is located immediately west of the Gold Range property.

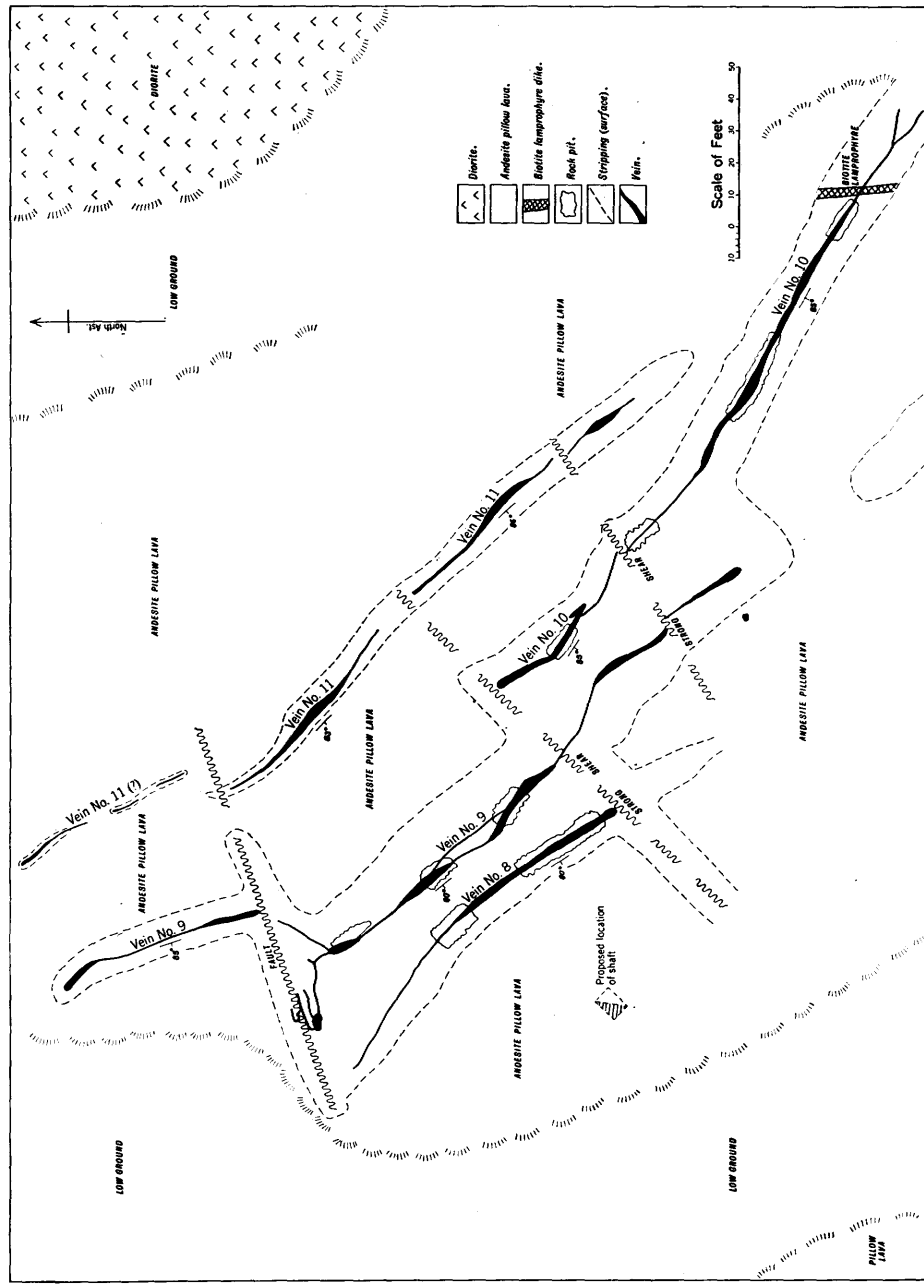
A narrow quartz vein occupying a fracture zone in altered pillow lava has been opened up by stripping on the surface and by adits from the side of the hill 60 and 180 feet beneath the exposures on the top of the hill. The vein strikes N. 30° E. and dips steeply to the northwest. It has been traced for 300 feet. The vein carries coarse pyrite, frequently in well-developed cubes, which occasionally contain visible gold. A small mill has been installed, but the property was not active during the summer of 1936.

COOK LAKE GOLD MINES, LIMITED

Johnston-McKenna Property

The Johnston-McKenna property is located west of the Schreiber Pyramid on Big Duck creek. On claim T. B. 13,128, a series of large fragments of quartz veins have been found which have apparently slumped down the hill, forming part of the upper bank on the west side of Big Duck creek. The slumped material contains fragments of well-mineralized quartz with an indicated width of about 18 inches, from which high assays in gold have been reported. Stripping on the hillside has uncovered several quartz veins, lenticular in shape, averaging somewhat less than 18 inches in width. One of these veins close to the float carries a little pyrite and chalcopyrite, and may be the vein from which the fragments have broken away. The country rock is andesite. To the west of the vein mentioned there is an outcrop of a moderately coarse basic rock, which resembles the intrusive diorite of the area but in this case may be a coarse phase of andesite. The hillside is covered with 2 to 3 feet of soil with scattered knolls of rock projecting through.

In October, 1936, Cook Lake Gold Mines, Limited, was incorporated to develop this property and the McKenna-McCann property. The main vein, which is 2.5 feet wide and is in a tight fault striking N. 65° E. and dipping 45° N., was trenched for a distance of 100 feet and then lost under the heavy overburden. Small gash veins, striking generally southeast, and branching off from the fault zone, are very narrow and pinch out within short distances.



Geological sketch map of the showings on the McKenna-McCann property of Cook Lake Gold Mines, Limited.

A short adit, driven south into the side of the hill for 250 feet, intersected the main vein at a depth of 50 feet from the surface. The vein had narrowed to 8 inches but appeared strong and well mineralized with pyrite, galena, chalcopyrite, and coarse native gold. Drifts running east and west followed the vein for 70 and 50 feet, respectively. At the ends of the drifts, the quartz narrowed down to minute stringers. A bulk sample of 5 tons from the vein underground was reported to have assayed 0.81 ounces per ton in gold.

Work was discontinued on this property and the equipment was transferred to the adjoining McKenna-McCann group.

McKenna-McCann Property

The McKenna-McCann property is located a quarter of a mile west of Big Duck creek between Hollinger lake and the Schreiber Pyramid showings.

In the fall of 1936, Cook Lake Gold Mines was organized to develop this and the adjoining Johnston-McKenna property. Work is being concentrated on the main showing on this property, which consists of four parallel quartz veins about 15 feet apart. The general strike of the vein system is N. 50° W. and the dip is 65°-70° S.W. Surface stripping and rock trenching have established an over-all length of 600 feet. The wall rock is massive, carbonatized pillow lava intruded on the north side by diorite. Narrow shear zones have been the channels for the quartz veins. A 3-foot biotite lamprophyre dike cuts across the east end of the zone.

The veins have been designated from southwest to northeast as Nos. 8, 9, 10, and 11. They are arranged *en échelon* and tend to pinch and swell along the strike, alternately appearing as stringers in a narrow shear zone and then swelling to 2 and 3 feet for short distances. The quartz is milky and very brittle with a scattered mineralization of pyrite, chalcopyrite, galena, and a considerable amount of fine native gold. The gold is most prominent along minute fractures in the quartz, appearing as a film on the fracture faces.

Vein No. 8 has been exposed by stripping and trenching for 100 feet. The average width is 20 inches. A chip sample across 2 feet of quartz assayed 0.15 ounces per ton in gold. A bulk sample taken over a mining width from a rock trench was reported to average 0.57 ounces per ton in gold.

Veins Nos. 9 and 10 are similar in character and mineralization to No. 8 with lengths of 180 and 210 feet, respectively. The average widths are 10 and 13 inches. A probable extension of No. 9 has been traced for 200 feet in a northerly direction and seems to be identical in character to the others. Surface sampling of a 100-foot section of No. 9 was reported by the management to average 0.256 ounces per ton in gold over 1.17 feet. A second section of 70 feet showed poor values. A bulk sample of the 100-foot section, represented by 12 tons of mine-run ore, gave a reported return of 0.82 ounces per ton in gold. Vein No. 10 revealed some spectacular high-grade ore near the intersection with the lamprophyre and gave a reported return of 0.538 ounces per ton in gold from a sample over an average width of 1.13 feet for a length of 130 feet. A 5-ton bulk sample taken from a rock pit on the vein averaged 1.13 ounces per ton in gold. The No. 11 vein had not been sampled at the time of the writer's¹ visit to the property in 1937.

OTISSE

The Otisse property is described by Hopkins² in his report on the Schreiber-Duck Lake area. Gold was found in 1896 on claim No. 3,412 northeast of the

¹M. W. Bartlev.

²P. E. Hopkins, op. cit., p. 16.

Gold Range property. The gold occurs in quartz, which fills fractures in a band of iron formation extending northeast across the claim. In 1898 two shafts 1,000 feet apart were sunk to depths of 39 and 52 feet on the iron formation, which is almost vertical in attitude. The band was also stripped of its overburden in a number of places. No further stripping was done until the summer of 1936.

The iron formation is the usual banded material with a large proportion of chert. It is approximately 1 chain wide with rhyolite on the north side and basalt on the south. On the south side of the iron formation a quartz porphyry dike outcrops parallel to it across the claim. Numerous other porphyry dikes occur on each side of the iron formation. A 2-foot lamprophyre dike occurs within the band, striking parallel to it for some distance.

At the collar of the northeast shaft the chert is fractured and impregnated with quartz as irregular veinlets. Some of this quartz is well mineralized with pyrite, chalcopyrite, and a little galena. A grab sample of well-mineralized quartz taken by the writer and assayed by the Provincial Assay Office gave 0.20 ounces gold per ton. Stringers of massive sulphides, one-quarter to one-half inch in width, also occur in the iron formation but yield no gold. The shafts were full of water when visited in 1936, but A. B. Willmott¹ reports:—

No. 1 [shaft] was down 34 feet and showed a band of quartz 4 feet wide mixed with a little schist. No. 2 shaft, situated on a hill, has been sunk for 30 feet. . . . The quartz is blue-grey in colour, with considerable pyrite and a little visible gold. . . . A little pyrrhotite is seen in the quartz. A mill test of one ton made at Kingston gave \$15.53 as the value of the free gold and concentrates. A sample taken for assay gave \$15.00 per ton at the School of Science.

SINGLETON AND GRAY

On claim B.G.5 just east of the Otisse property two narrow vertical breaks cross andesite on the west bank of Big Duck creek. They strike N. 60° E. and are about 130 feet apart. The north occurrence is exposed in a pit which shows a fracture zone on the margin of a mass of porphyry. The fracturing extends into the porphyry but has little mineralization or quartz associated with it here. In the greenstone the fracturing is wider, and each fracture has associated with it a marginal zone of alteration 2 to 3 inches wide composed of fine quartz, sericite, and sulphides, with some gold. A grab sample of this material taken by the writer and assayed by the Provincial Assay Office ran 0.06 ounces per ton in gold. This well-mineralized part is only 6 feet long. To the west the fracturing crosses porphyry and is barren; to the east it narrows before extending beneath the deep overburden of the creek bed.

The south occurrence consists of a quartz vein 2 inches or less in width, which in at least one place carries native gold. A similar quartz vein 1 to 2 inches wide occurs near the south boundary of claim T. B. 10,893 and contains pyrite, chalcopyrite, galena, and a grey telluride. A chip sample of the vein material taken from the dump was submitted to the Provincial Assay Office and gave 0.63 ounces per ton in gold.

Silver

Silver has been reported from two occurrences in the Schreiber area.

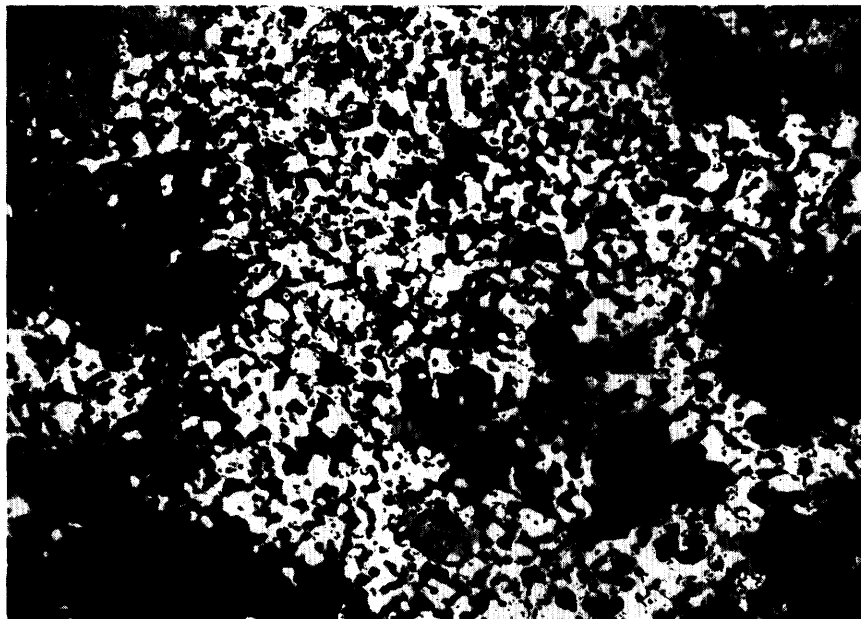
On claim R. 606 about 1½ miles south of Schreiber a fracture strikes N. 10° E. across an altered rhyolite agglomerate. The fracture, which has been stripped for 225 feet, is occupied by a vein composed of calcite, bands of massive sphalerite, galena, and chalcopyrite. The vein has a maximum width of one foot and pinches out at each end. A grab sample of the material assayed 5 ounces silver and 0.53 ounces gold. During the summer of 1936 the P.A.L. Exploration Company prospected in the vicinity of this occurrence.

¹Ont. Bur. Mines, Vol. VII, 1898, pt. 2, p. 134.

On claim T.B. 4,769, about a mile south of Schreiber, a similar carbonate vein containing a considerable amount of galena was discovered by George Singleton and Robert Gray. The vein is narrow and has not been exposed along the strike; it is said to yield silver on assay.

Sulphide Bodies

Massive bodies of sulphides occur at several points in the area. They are, in nearly all cases, associated with iron formation that has been shattered by differential movement.



Photomicrograph of a polished section of pyrrhotite (white) replacing the constituents of an andesite and yielding a graphic pattern, from the Mudge property. ($\times 145$.)

Morley

The Morley property is described by Hopkins¹ as follows:—

The Morley pyrite prospect, R. 606, lies one and one-half miles southeast of Schreiber station, and one and one-half miles north of Lake Superior. A prospector named Morley sold the claim in the spring of 1897 to the Davis Sulphur Ore Company of New York, who did considerable work during the year and made a trial shipment which gave good satisfaction. The deposit consists of pyrite and pyrrhotite in a Keewatin pinkish felsite, near which is Keewatin iron formation, and a dike of Algoman quartz porphyry, all of which have been cut by a Keweenawan diabase dike. To the south of the diabase dike pits have been sunk on sugary iron formation, but no solid iron pyrites was encountered. The main deposit strikes a little west of north and dips about 65° to the east. A trench reveals a lens of pure iron pyrites about fifty feet long and three feet wide, with a similar sized lens of pyrrhotite adjoining it on the west or foot-wall side. The pyrrhotite contains a little pyrite and chalcopyrite. Twenty-five feet to the east and further down the hill-side, a shaft, now filled with water, has been sunk on a parallel lens. At the bottom of the hill a short tunnel has been driven into the felsite containing disseminated pyrrhotite. A little further north-east on a creek bank a pit has been put down on graphitic schist. About 200 tons of pyrite of good grade is piled in one dump and considerable pyrrhotite occurs in other parts of the dumps. The property is referred to by J. A. Bow, A. B. Willmott, and E. L. Fraleck respectively in certain reports of the the Ontario Bureau of Mines.²

¹P. E. Hopkins, op. cit., pp. 24, 25.

²Ont. Bur. Mines, Vol. VII, 1898, pt. 1, pp. 78, 80; *ibid*, pt. 2, p. 134; Vol. XVI, 1907, p. 177.

Nothing had been done on this deposit since it was visited by Hopkins. At the present time it is not easy to see the relationship of the sulphides to the country rocks because of the growth of vegetation since the property was prospected.

Mudge

A body of sulphides occurs on the south side of the portage between Cook and Hollinger lakes. The property was prospected many years ago, and the old workings have been obscured. Hopkins¹ describes the occurrence as follows:—

The Mudge claim, T.B. 1,048, on the northeast end of Cook lake and one mile north of Schreiber, was formerly a portion of the Otisse pyrite claim, 776 X, referred to by E. L. Fraleck on page 177 of his report as follows:²—

"A heavy fahlband strikes east and west for about a mile. The gossan capping had in several places been removed and test pits sunk. The largest of these was about 12 feet deep and 12 feet long across the strike of the deposit, which is here seen to consist of a very fine grained mixture of pyrite, pyrrhotite and silica (banded). An average sample of the dump yielded 32.26 per cent. of sulphur."

The pyrite formation gives way in places along the strike to iron formation, banded magnetite and quartz, on either side of which is Keewatin pillow lava impregnated with calcite.

A polished section of sulphides from a pit 15 chains from Hollinger lake revealed pyrrhotite evenly distributed through an andesitic rock in such a way as to form a graphic pattern. There is a considerable amount of magnetite associated with the pyrrhotite in this sample.

Other Occurrences

Disseminated sulphides and small massive bodies occur at a number of locations. The sulphides are chiefly pyrite and pyrrhotite.

1. On the south side of the highway, about a quarter of a mile east of Walker lake, pyrrhotite, pyrite, and magnetite replace bands in iron formation and fill fractures across it.

2. About a mile south of this occurrence similar massive sulphides replace iron formation outcropping on the north side of a small lake.

3. Massive sulphides occur on the south slope of a hill just southeast of Walker lake. The sulphides replace porphyritic rhyolite in a zone striking nearly east and west.

4. A body of sulphides occurs in rhyolite on claim T.B. 2,381 about 2 miles east of Schreiber just north of the railway.

5. On claim T.B. 3,327, west of the Harkness-Hays mill, Keewatin andesite is impregnated with sulphides occurring as disseminated particles and small irregular veinlets.

6. At a number of points on Schreiber peninsula massive grey rhyolite has specks of pyrite evenly dispersed through it. On the North Shores property a body of rhyolite of this type is reported to give low assays for gold.

¹P. E. Hopkins, op. cit., p. 25.

²"Iron Pyrites in Ontario," Ont. Bur. Mines, Vol. XVI, 1907. p. 177.

The Northeastern Part of the Schreiber Area

By M. W. Bartley

INTRODUCTION

During the field season of 1937, a geological examination was made of the northern and eastern parts of the Schreiber area. The survey was a continuation of the investigation commenced by G. A. Harcourt¹ in 1936. The area mapped extends from a point 3 miles west of Lyne (Lynx) lake to a line running north from Noslo on the Canadian Pacific railway to Owl creek. The southwestern boundary follows the Aguasabon (Black) river to north latitude 48° 50', where it turns northwest to Ellis lake, and then west through Big Bruin (Bear) lake to Selim (Whitesand) lake. It includes a complete survey across the west and east greenstone belts, which are separated by a nose of granite and syenite in the vicinity of McQuaig and Ellis lakes.

A base map was prepared from aerial photographs supplied by the Ontario Forestry Branch, and traverses were tied to surveyed points wherever possible. The geological data was obtained from shore-line work and pace-and-compass traverses at 20-chain intervals through the bush.

Acknowledgments

The writer wishes to express his appreciation to the various individuals who gave assistance and information during the season. Special acknowledgment for many courtesies is due the various mining organizations within the area and to the prospectors who provided information regarding water routes and trails. Able assistance was rendered in the field by M. A. Bews, J. E. S. Milne, and A. S. MacLaren. Mr. Bews acted as senior assistant and did a considerable part of the geological mapping. Assays were made by the staff of the Provincial Assay Office.

Previous Work

The Schreiber area is included in a report by W. H. Collins² and on the map, No. 964, accompanying his report. The western and central parts are included in reports by T. L. Tanton³ and P. E. Hopkins.⁴

History and Development

In the past, prospecting has been confined almost exclusively to the region to the south, near the town of Schreiber, and to the greenstone belt in the Big Duck lake section. The latter locality is some 6 miles north of the Schreiber map area. Some years ago, a few claims were located along a band of pyritic iron formation and porphyry north of Victoria lake. The gold values obtained were low, and the investigation was subsequently discontinued. During the past season, interest was again aroused by the discovery of gold on the west side of Little Bruin (Little Bear) lake. As a result of this discovery, staking and prospecting rapidly extended westward to Victoria and Longworth lakes.

¹G. A. Harcourt, "The Southeastern Part of the Schreiber Area," pp. 1 to 28 of this volume.

²W. H. Collins, "Report on the Region Lying North of Lake Superior between the Pic and Nipigon Rivers, Ontario," Geol. Surv. Can., Pub. No. 1081, 1909.

³T. L. Tanton, "Nipigon-Schreiber District, Ontario," Geol. Surv. Can., Sum. Rept. 1920, pt. D, pp. 2-7.

⁴P. E. Hopkins, "Schreiber-Duck Lake Area," Ont. Dept. Mines, Vol. XXX, 1921, pt. 4, pp. 1-26.

Topography

The country as a whole is very rugged, like much of the country along the north shore of Lake Superior. Hills rise as much as 800 feet above the lake level, and there are many deep valleys and sheer cliffs. Farther to the north, approaching the height-of-land, the topography tends to level off. Local sand flats cover wide areas, the largest extending from 2 miles south of the Aguasabon river to the Canadian Pacific railway. The valley of the Aguasabon river is filled with stratified sand and gravel of glacio-fluvial origin. Locally sand banks 60 feet in height rise above the river. There are many small lakes in the area,¹ usually quite shallow and connected by small creeks characterized by many rapids and falls. The Aguasabon river in its meandering course drops 400 feet in 20 miles, from



Sand bank, Aguasabon river.

the mouth of Owl creek to Lake Superior. Big Duck creek is little better than intermittent rapids for the greater part of its course.

Rock exposures are numerous, the greater part of the area being entirely bare or covered by a light mantle of moss and soil.

Access

From Schreiber, the western part of the map area can be reached by automobile along the Trans-Canada highway as far as the south end of Selim lake. From here a good canoe route leads through Selim and Lyne lakes to Rhea (Ross) lake. During the spring and early summer of 1937, Cook Lake Gold Mines, Limited, completed a road from Schreiber to their property, 3½ miles to the north, which gives easy access to the Big Duck creek canoe route to Maude lake. An old wagon road from Schreiber to Big Duck lake provides the second route to the central part of the map area. By means of truck, over the unfinished

¹Wherever the word "area" is used in this report without any descriptive qualification, it refers to the northeastern part of the Schreiber map area (No. 47j accompanying this report) as described in the first paragraph on page 29.

Trans-Canada highway, the Aguasabon river is accessible from Schreiber and transportation by canoe is possible as far as Owl lake.

Natural Resources

Large tracts of spruce and balsam, suitable for pulp-wood, are situated close to the Aguasabon river, in the eastern part of the Schreiber area. The proposed Long Lac conversion project will greatly facilitate transportation and will open up areas now inaccessible. The western part of the area also has good stands of pulp-wood, but transportation facilities are at present inadequate for their development.

The lakes abound in brook, grey, brown, and lake trout. Moose, red deer, and caribou are reported to be plentiful in the outlying parts of the area.

GENERAL GEOLOGY

All the consolidated rocks in the area are pre-Cambrian in age. Their range extends from early Keewatin to Keweenawan and they are represented by lava flows and a variety of intrusives. More than half the map area is underlain by lavas which have been classed as Keewatin. These have been steeply folded and in places are extensively sheared and carbonatized. Intrusions of post-Keewatin diorite and gabbro, Algoman syenite, granite, and related dikes, followed by Keweenawan diabase have been injected into the earlier rocks. Repeated faulting has further complicated the sequence.

The whole surface has been deeply glaciated and the debris covers the bed rock in a number of localities.

Table of Formations

| | |
|-------------------|---|
| QUATERNARY | |
| PLEISTOCENE: | Glacial clay, sand, and gravel. |
| | <i>Great unconformity</i> |
| PRE-CAMBRIAN | |
| KEWEENAWAN: | Diabase dikes and sills(?). |
| | <i>Intrusive contact</i> |
| ALGOMAN: | { Lamprophyre. Quartz porphyry and feldspar porphyry dikes, granite porphyry. Hornblende granite, hornblende syenite. |
| | <i>Intrusive contact(?)</i> |
| POST-KEEWATIN(?): | Diorite and gabbro. |
| | <i>Intrusive contact</i> |
| KEEWATIN: | { Iron formation. Chlorite and sericite schists. Andesite-rhyolite agglomerates, tuffs, and breccia. Andesite, rhyolite, and dacite flows. |

Keewatin Series

The Keewatin series, for convenience, has been divided into three groups: (1) basic lavas, (2) acid volcanics, and (3) pyroclastics or fragmentals. In some parts of the area, these early rocks have their original characteristics quite well preserved, but in many places they have undergone an intense degree of alteration due to folding, igneous intrusion, and the action of later carbonate and silica emanations. The metamorphosed phases of the various rocks are represented by schists, coarse- and fine-grained amphibolites, amygdaloidal lavas, and carbonate rocks.

The various members of the Keewatin series are irregularly distributed, and there is little evidence that any one group occupies a particular stratigraphic horizon in the complex. The only exception to this may be the rhyolite porphyry and tuffs, in the cases where they occupy a peripheral position around the basic lavas which are adjacent to the syenite and granite contacts. The coarser pyroclastics are haphazardly distributed throughout the greenstone belts, usually closely associated with pillow structures. The acid flow rocks occur in small, lenticular outcrops.

Basic Lavas

The greater part of the Keewatin series consists of dark-green andesitic lavas. They are typically fine- to medium-grained, dense, and hard, but when examined in thin section show some alteration with the development of chlorite and the corroding of feldspars.

Throughout the area, the typical lava and the matrix of the basic pyroclastics is a homogeneous, holocrystalline aggregate of hornblende, andesine, augite, chlorite, and minor quantities of epidote, magnetite, and sericite. It weathers to light-green or grey, depending on the amount of carbonate present. Well-developed laths of feldspar and rods of hornblende are frequently present. Large areas of the massive and schistose basic lavas have been carbonatized. This carbonatization is closely associated with major faults, as seen in the vicinity of the Aguasabon river and Big Duck creek.

The lava presents a zonal arrangement of alternating massive and schistose rock, frequently with interbedded tuffaceous members. Shearing stresses during the folding of the rocks locally transformed them to chlorite and hornblende schists. Narrow bands of fissile chlorite schist were developed between areas of massive, competent andesite. Zones of intense shearing were found west of Lyne lake and in the northeastern part of the map area, near the upper stretch of the Aguasabon river. Near the north granite-greenstone contact east and west of Maude lake, and close to the south contact of the granite south of the Aguasabon river, the flows are intensely deformed and altered, resulting in closely laminated chlorite and biotite schists with associated coarse-grained, massive amphibolite. The amphibolite appears to be the result of recrystallization.

Altered pillow lavas in disconnected bands occur throughout the Keewatin belt. The pillows vary in length from a few inches to 6 feet. The majority of those examined were too badly distorted to be of any assistance in determining structure. Many of the pillow structures are amygdaloidal, exhibiting well-formed amygdules throughout, with a general concentration near the rims of the ellipsoids. In a very few places, notably between Big Duck creek and Victoria lake, tops are well displayed, with a breccia zone separating them from the overlying massive andesite.

Extensive bodies of amygdaloidal, massive lava occur north of the Aguasabon river. The amygdules consist of carbonate and quartz in a matrix of soft carbonate rock. The size of the amygdules varies considerably, with a maximum diameter of a quarter of an inch. Thin sections revealed amygdules of shattered quartz, calcite, and siderite embedded in a fine-grained matrix of acid plagioclase, hornblende, chlorite, quartz, and much carbonate. In a number of the quartz amygdules, grains of magnetite have been imprisoned, giving the filling a dirty appearance.

Small areas of "dioritic" andesite associated with the fine-grained members are common within the greenstone complex. In many cases the coarse-textured rock grades laterally into typical lava. It is then interpreted as being the central part of a flow that has cooled more slowly than the margins, resulting in

a crystallization of the constituent minerals. In a very few instances, this dioritic phase grades into typical pillow lava.

Eruptive andesite porphyry is abundant immediately south of Lower lake. The rock weathers greenish-grey with either greenish feldspar phenocrysts or well-formed rods of hornblende set in relief against the fine groundmass. In some exposures both types of phenocrysts are present. Under the microscope, the feldspar phenocrysts were found to be well-crystallized andesine in a groundmass of hornblende, fine andesine, chlorite saussurite, and occasionally quartz. Magnetite and epidote are generally present as accessories.

Acid Volcanics

Most of the acid lavas are rhyolite or rhyolite porphyries, but certain bands in which oligoclase feldspar predominates have been determined as dacites. They all occur as small lenses or bands, interbedded with the basic members of the Keewatin series. This type of rock is characteristically lighter in colour than the basic flows, ranging from pink through grey to cream-white, although black or dark varieties are sometimes present. Where carbonatization has not penetrated deeply, the rocks are very hard and dense and exhibit a conchoidal fracture.

An interesting occurrence of the acid volcanics was found along the contact of the granite and greenstone in the vicinity of Lyne lake, northwest of Goose lake, and at the northern extremity of the eastern section. Narrow bands of acid tuff were found interbedded with these lavas. Relatively large areas of rhyolite and associated acid extrusives occur south of Rhea lake and along the north boundary of the eastern section between Ellis lake and the Aguasabon river.

The extrusive acid porphyries contain phenocrysts of quartz, feldspar, and hornblende embedded in a matrix of quartz and feldspar with minor amounts of sericite and calcite. It is only on the evidence of field relationships that the extrusive porphyries can be distinguished from their intrusive equivalents. Typically the bands of acid rock are composed of alternate zones of lava, porphyry, and tuffaceous material.

Where shearing has occurred, the rocks have weathered deeply, leaving a capping of greenish-white material. Finely laminated sericite and talc schists give way to foliated quartz-muscovite schists spotted with augens of quartz. The feldspars are usually corroded or completely decomposed to kaolin.

Pyroclastics

Zones of fragmental rock of varied texture, composition, and origin are common among the lavas. They consist of agglomerates, massive tuffs, volcanic breccias, and their schistose equivalents. These are intimately associated with the other rock types and are interbedded with basic and acid flows. The largest band of andesite agglomerate extends from the region between the Aguasabon river and Ellis lake north and northeast to Lower lake. Only the occasional thin flow breaks the monotony of the fragmental rock. The other extreme shows narrow bands of agglomerate or tuff cradled between large areas of andesite. Intermittent bands of acid and basic tuffs and agglomerates are common in the rhyolite areas.

The typical agglomerate consists of light-coloured fragments, in places porphyritic in texture, in a darker, fine-grained matrix. Most of the fragments are ellipsoidal to rounded in outline. In some outcrops they are massive, and the slightly more schistose matrix curves around them. Less commonly, the rock becomes a contorted chlorite schist, and the fragments are drawn-out lenses. The light-coloured inclusions show a great range in size, but are rather uniformly

acid in composition. Often vesicular masses are found, and these are thought to be bombs.

The tuffaceous rocks show much more variation in mineralogical character. Both basic and acid tuffs were found in alternating bands. Gradations from agglomerate to tuff were noted in many cases. The more prominent tuffaceous bands are acidic with angular fragments of rhyolite, quartz, and feldspar. Narrow lenticular bands appear between extensive flows and are often represented by garnetiferous zones in schistose areas.

It was impossible to map all these separately. On the map they have been distinguished by letters from lavas of similar composition.

The intimate association of volcanic fragmentals with the lavas seems to indicate that at various intervals during Keewatin time, rock fragments and volcanic ash were ejected from the same source as the molten lava, causing an intermingling of the flows and pyroclastics. Some of the fragments in the agglomerate are pebble-like in appearance and might be termed volcanic conglomerate.

Iron Formation

Very few outcrops of typical banded iron formation were found in the area. Wherever this formation was encountered, the bands were narrow and discontinuous. It was impossible to trace any one band more than a few chains. North of Victoria lake several outcrops of banded sugar quartz and pyrite were found. The pyrite appeared to be later and introduced.

Post-Keewatin(?)

The Keewatin rocks have been intruded by diorite and gabbro in stocks of varying sizes. The larger bodies are irregular in shape and coarse- to medium-textured. The dark- and light-coloured minerals are present in approximately equal amounts. The largest mass of diorite is located west of Maude lake close to the granite contact. The intrusives vary laterally in texture from medium, through coarse, to porphyritic, and in composition from diorite to gabbro. Normally the intrusive is massive, cutting across structures, but locally it may be highly sheared in the direction of schistosity of the older andesite and can only be distinguished with difficulty from the coarse flow rock. No doubt a part of the rock mapped as coarse lava because it was regarded as the centre of a flow may actually be intrusive diorite; owing to the altered condition and the difficulty in securing contacts, it was impossible to differentiate them.

The diorites and gabbros clearly intrude the Keewatin. The evidence for intrusion of the Algoman syenite and granite into these basic rocks is not conclusive. In the Kirkland Lake area, according to A. W. Derby,¹ similar basic intrusives are actually early phases of the Algoman period. This might well be the case with the diorites and gabbros in the Schreiber area.

Algoman

Hornblende Granite and Syenite

The rocks correlated definitely with the Algoman are hornblende syenite and granite, granite porphyry, quartz and feldspar porphyry, and lamprophyre dikes. Hornblende syenite occupies the cores of the batholiths which invaded the greenstone belts from all sides. The intrusive is characteristically coarse-grained and pink in colour, hornblende predominating over biotite. Gneissic and

¹A. W. Derby, unpublished thesis, University of Toronto.

lit par lit structures are entirely lacking. In many places along the contacts, the syenite grades into hornblende granite, in which the feldspars show very little alteration. Northwest of Selim lake and on the east shores of Ellis and Davidson lakes, the contact phase is syenite porphyry. Well-defined phenocrysts of orthoclase have a maximum length of one inch. In practically all cases, the contact with the Keewatin is sharp and well defined. In a few isolated places, granitization has extended into the greenstone for a few feet. The largest mass of granite was found around Lyne lake extending northwest between Selim and Hornblende lakes.

Porphyries

The association, composition, and geological setting of the porphyries show that they are closely related to the syenite and were probably derived from the same parent magma. They occur as dikes and stocks. The dikes range in width from a few inches up to 100 feet. A quartz porphyry dike 25 feet wide, striking generally east-west, was traced intermittently from Maude lake to Ansell lake and eastward for a mile and a quarter, a total distance of $2\frac{1}{4}$ miles. The largest stock of porphyry occurs north of Victoria lake, occupying an irregularly shaped area $1\frac{1}{2}$ miles long and a quarter of a mile wide. Phenocrysts of well-formed blue or milky quartz crystals and pink or white tabular crystals of feldspar are set in a rather fine grained groundmass of orthoclase, albite, quartz, sericite, and carbonate. Some hornblende is usually present, and it may show slight alteration to chlorite. The granite porphyry dikes have a holocrystalline groundmass of medium coarse texture with larger phenocrysts of glassy quartz. Most of the dikes are massive, but others have undergone shearing stresses with the result that many peculiar types of acid schist have developed. Where the rocks are partially obscured by drift, it is sometimes difficult to distinguish them from sheared porphyritic rhyolites or trachytes. A short distance southeast of the long bay in Rhea lake, test pits were sunk on a mineralized porphyry dike. Low gold values were obtained, but the deposit was non-commercial.

Lamprophyre Dikes

Dikes of lamprophyric character occur in the lavas and granite. They are usually narrow, fine-grained or porphyritic, and dark in colour. The fine-grained variety under the microscope appears equigranular and consists of fine hornblende, chlorite, residual biotite, and acid plagioclase, with a little quartz. The porphyritic dikes have phenocrysts of biotite or hornblende in a matrix of fine hornblende, orthoclase or acid plagioclase, and chlorite, with accessory magnetite.

Keweenawan

The Keweenawan igneous period is represented by diabase dikes and sills. Included in this group are some quartz and olivine types, but they are subordinate to the normal diabase. The rocks are fresh and resistant, standing out as distinct ridges above the softer carbonate lavas or appearing as trough-like valleys where they intrude siliceous formations.

The dikes cut all the previous formations and, where they are not offset by late faults, can be traced for great distances. An intermittent exposure of diabase extends from Owl creek south and southwest in an arc to Bews lake. From the plan of its intrusion, the diabase appears to be a sill or a ring dike. The number of diabase intrusions decreases northward. It is striking that there is an accompanying marked decrease in the number of faults.

The mineralogy of the diabase has been discussed in detail by Harcourt.¹

¹Pages 15 and 16.

Pleistocene and Recent

Over most of the area the drift mantle is shallow. It is covered mainly by thick moss and swamp ground. In the valley of the Aguasabon river and the region extending from 2 miles south of the Aguasabon river to the Canadian Pacific railway, there are thick deposits of sand and gravel of fluvio-glacial origin. These have been reworked and sorted by river action. Numerous old meanders and ox-bows are preserved, marking former river channels. The large drift area covering the southern granite mass appears to be an outwash deposit.

STRUCTURAL GEOLOGY

The Keewatin assemblage of lavas and related rocks have been compressed into steeply dipping folds and intruded by batholithic masses of syenite from all sides. Contemporaneous and subsequent faulting further complicated the structures. Only the deeply infolded parts of these formations have escaped erosion. The folding determined the general strike of the formations and the direction of schistosity. This deformation was followed by later fracturing and the introduction of quartz veins.

Owing to the highly metamorphosed condition of the Keewatin rocks and the absence of distinguishable horizon markers, very little information regarding the broad structural features could be obtained. Throughout the area, the flows are almost vertical; in some places they must be overturned. Dips vary in most cases from 60° N. to vertical.

In general the extreme western part of the area, west of Lyne lake, is represented by a highly sheared roof pendant; the central and eastern sections appear to be the remnants of the north limb of the east-west trending syncline described by Harcourt.¹

Faults of various ages and all degrees of intensity dissect the greenstone belts in jig-saw pattern. Large blocks have been displaced and rotated so that each block has its own direction of shearing and secondary faults. In a number of places, diabase dikes have been displaced for considerable distances, indicating that the faulting continued at least until late Keweenawan time.

ECONOMIC GEOLOGY

Only two mineral deposits of interest have been found in the area. One, the Little Bear, is a high-grade gold showing; the other is a nickel-copper deposit, now owned by Nicopor Mines, Limited. Gold, zinc, and molybdenite were discovered in the adjoining areas as far back as 1895, and the properties have been worked intermittently ever since.

Both of the above-mentioned mineral occurrences are on the margin of the Algoman syenite intrusion, and there is little doubt but what their source was in the Algoman magma.

Prospecting Conditions

In estimating the mineral possibilities of an older mining area such as the Schreiber, there is always the tendency to consider that it was quite thoroughly prospected during previous periods of mining activity. It is true that there has been sporadic prospecting in the country, carried on over a period of years, but old properties are continually being revived and new deposits are being discovered. The area still deserves detailed examination by prospectors and field engineers.

¹Page 17.

Most of the gold deposits in the Schreiber area have been found in the greenstone complex at or near the contact with the Algoman intrusives. The abundance of faulting and the localization of shearing makes for favourable prospecting ground. The central and western parts with their diversified rock sequence and abundance of porphyry provide conditions favourable for ore deposition.

Description of Properties

LITTLE BEAR

Late in the summer of 1937, a small high-grade gold showing was discovered on the west side of Little Bruin lake, near its outlet. Surface prospecting revealed a narrow vein averaging 6 inches in width and carrying erratic gold values over a length of 200 feet. The vein strikes N. 50° W., dips 75° S.W., and occurs in sheared brown-grey rhyolite near the contact of the granite and the greenstone. It appears to be filling a tension fracture, which has cut across the main shear zone at a high angle.

The cherty quartz is mineralized with massive sphalerite and chalcopyrite, finer pyrite, galena, and native gold. The gold is light-yellow in colour and is intimately associated with the pyrite. The shear zone is heavily mineralized with massive sulphides, but no visible gold was noted. During the summer of 1937, trenching and test-pitting were being carried on in an endeavour to learn the full extent of the break.

NICOPOR MINES, LIMITED

The property of Nicopor Mines, Limited, which is under option to Cook Lake Gold Mines, Limited, is situated approximately 1½ miles east of Rhea lake. The main showing was developed by surface-trenching and diamond-drilling a few years ago, but nothing further was done until the summer of 1937. The showing consists of a mineralized zone along the granite-andesite contact. The host rock is an amphibolite, which has been traversed by a 3-foot "vein dike" of massive sulphides with disseminated sulphides impregnating the wall for 10 feet on each side. The mineralized zone strikes parallel to the granite contact in a south to southwesterly direction for approximately 300 feet and dips vertically.

The mineralization consists of pyrite, chalcopyrite, and nickeliferous pyrrhotite under a heavy capping of gossan. This same mineralization extends into the wall rock. Two grab samples of the massive sulphides were assayed and gave values of 1.07 per cent. copper with 4.32 per cent. nickel, and 0.10 per cent. copper with 4.88 per cent. nickel. Low gold values were found in both.

During the late autumn, a magnetic survey was made of the property in an endeavour to trace the extension of the ore body under the heavy overburden to the north and south.

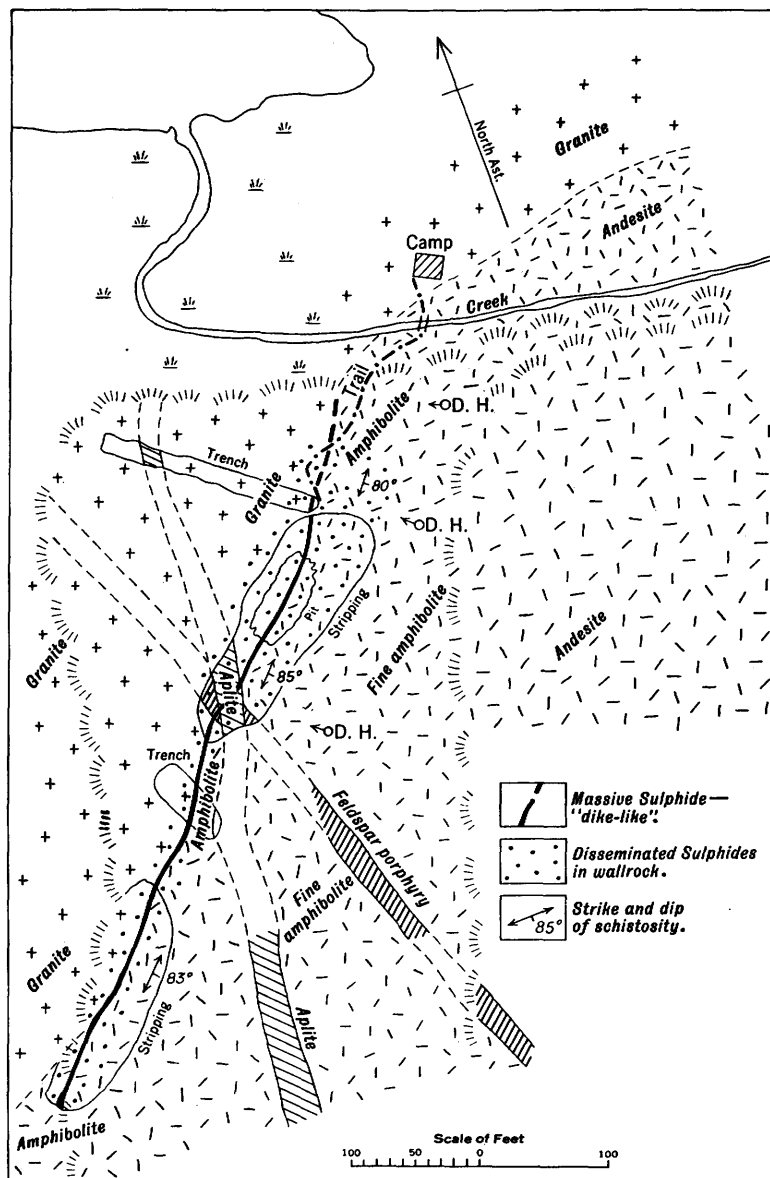
Properties outside the Area

EMPRESS CONSOLIDATED GOLD MINES, LIMITED

The Empress mine was discovered in 1895 and operated as a producing mine until 1900. The property has changed hands many times and has had a varied history. The present company, Empress Consolidated Gold Mines, Limited, has been developing a group of claims located approximately 4 miles northwest of the head of Jackfish bay on the north shore of Lake Superior.

The country rock is composed of basic and acid flows with interbedded tuffs and agglomerates. Granite intrudes the flows a short distance to the southeast of

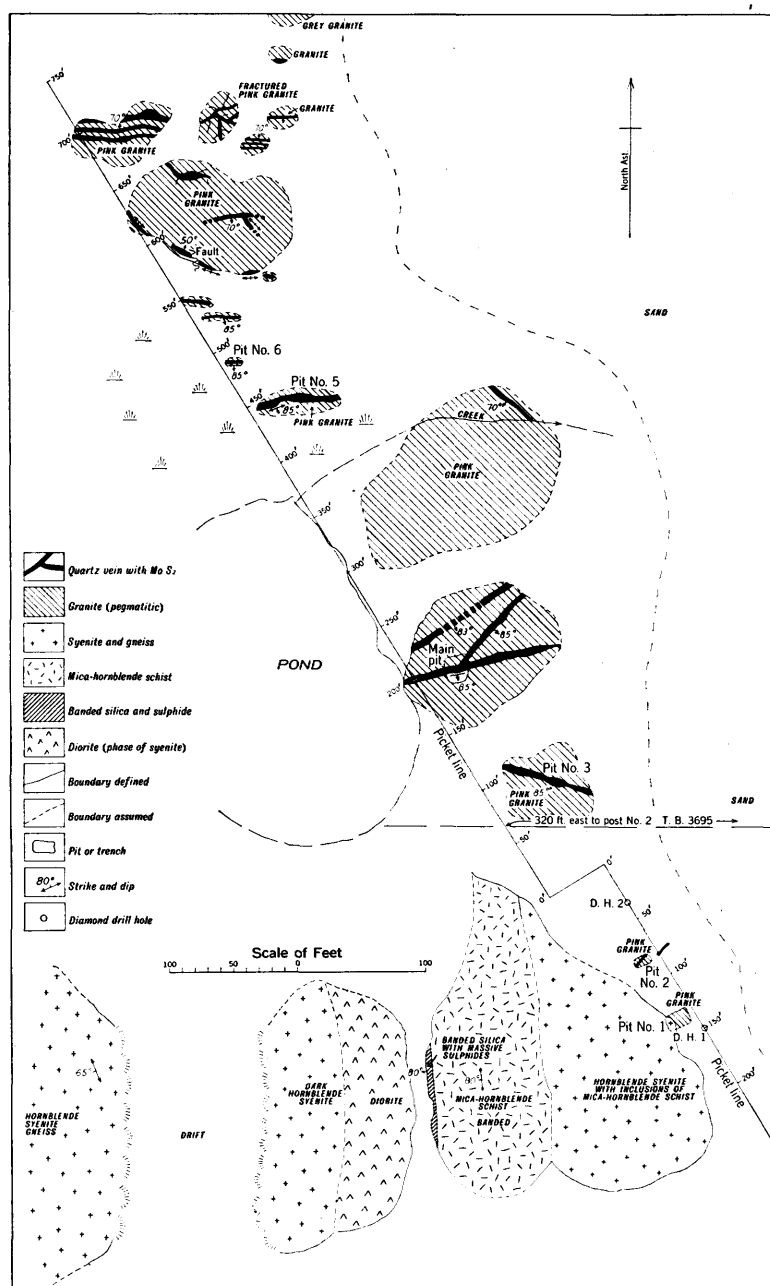
the property. Stringers of quartz, which run through the schisted rock parallel to the schistosity, are heavily mineralized with pyrite, chalcopyrite, galena, sphalerite, and pyrrhotite. Spots of native gold were noted both on surface and in the underground workings.



Geological sketch map of the main showing on the property of Nicopor Mines, Limited.

There are two distinct and separate vein zones: a northern zone, narrow but well mineralized; and a wide southern zone with a little less mineralization. The north zone is lenticular in shape, ranging from a few inches to 3 feet in width and averaging about 2 feet over the whole length of 500 feet. The wall rock is a series

of interbanded tuffs and agglomerates. The zone has been stripped and trenched for the whole length, and a short adit was driven into the hillside to intersect the



Geological sketch map of the Owl Lake molybdenite property.

downward extension of the lode. The southern zone consists of three distinct veins, which pinch and swell along their strike and are separated by sheared lavas and tuffs. The intervening rock is highly silicified and contains many con-

necting quartz stringers. It averages 25 feet in width and has been traced by trenching and hydraulic stripping for about 1,500 feet. The mineralization is the same as in the northern zone but is notable because the greatest mineralization is found in the wall rock and around inclusions of the wall in the quartz. An adit, called the lower adit, was driven north into the hill to intersect this second zone. It has a total length of 425 feet with drifts along the three veins 220, 260, and 360 feet from the portal. The intervening rock is heavily mineralized and intersected by a network of quartz stringers. A winze was put down from the first drift and a sublevel started. Stopes were cut in the other drifts, one of which is 25 feet wide.

The property has been examined at various times by independent investigators, but the results obtained were not consistent. Chip samples taken by the writer from the underground workings showed good values in gold. The property has been diamond-drilled by several companies, but the results obtained were erratic and conflicting.

OWL LAKE MOLYBDENITE

The Owl Lake molybdenite property consists of claims T.B. 3,694 and 3,695, approximately 3 miles north of the junction of Owl creek and the Aguasabon river. The mineralized zone consists of a plug-like body of granite intruding syenite gneiss and hornblende schists. The schists appear to have been derived from andesite tuffs.

The granite is pegmatitic in character, consisting principally of quartz and feldspar with a predominance of quartz. The veins are glassy quartz and vary in strike, but the main veins have a general east-west trend and dip steeply to the south. They range in width from a few inches to 3 feet, and the maximum length is 100 feet. The zone has a length of 700 feet from north to south. To the north, the veins become shorter and narrower. The mineralization is quite uniform and plentiful, consisting of pyrite, molybdenite, and molybdite. The occurrence of the molybdenite is very general, as it is found in the veins, at the contact of the quartz and granite, in the granite as a rock mineral, in the fractures in the granite, and along the cleavage planes of some of the feldspars.

The showing was explored by trenching and stripping over the whole length of the intrusive and by a series of diamond-drill holes put down to ascertain the extension and values at depth. The drilling results indicated the mineral to be so scattered that the average content was less than 1 per cent. molybdenum. A grab sample of the quartz taken by the writer and assayed by the Provincial Assay Office gave 1.68 per cent. molybdenum and 0.03 ounces per ton in gold.

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