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CANADA DEPARTMENT OF MINES Hon. T. A. Crefar, Minister; Charles Camsell, Deputy Minister

BUREAU OF ECONOMIC GEOLOGY GEOLOGICAL SURVEY

MEMOIR 192

Gold Occurrences of Ontario East of Lake Superior

BY E. D. Kindle



OTTAWA J. O. PATENAUDE, I.S.O. PRINTER TO THE KING'S MOST EXCELLENT MAJESTY 1986

Price, 50 cents

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Illustration

Figure 1. Index map showing relative positions of thirty-two gold-bearing areas of Ontario east of lake Superior. At end of report.

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PREFACE

This report has been prepared as far as possible in non-technical language and is designed to afford information desired by prospectors, investors, and others connected with the gold industry. It deals with the geology and mining history of each area in which gold occurs and descriptions are given of the typical gold deposits. Brief accounts of the mining development at the more active properties are also given. For convenience in listing and locating information, both the individual gold areas and the individual mining properties within these areas have been arranged in alphabetical order. The report is essentially a compilation and summary of all the information available on gold occurrences in eastern Ontario, and is based on data available as late as April 1935. The greater part of the information has been derived from reports published by the Ontario Department of Mines, and from the publications of the Geological Survey, Canada. Acknowledgment is made to the mining companies who kindly sent copies of their Annual Reports. The current mining journals and financial papers proved valuable sources of supplementary information regarding development work at many of the properties.

The following related publications contain additional valuable information on gold. (1) Gold Occurrences of Canada, Summary Account, by H. C. Cooke and W. A. Johnston, published by the Geological Survey, Canada (Second edition, 1933). (2) Gold in Canada, by A. H. A. Robinson, published by the Mines Branch, Ottawa (Third edition, 1935).

Canada's total gold production in 1934 was reported as being 2,969,680 ounces, valued at \$61,388,732, with gold at \$20.67 an ounce. The production the previous year was 2,949,309 ounces valued at \$60,967,626. Valued in Canadian funds the 1934 output was worth \$102,453,960 as compared with \$84,350,237 in 1933. Ontario's production for 1934 was placed at 2,106,000 ounces, valued in Canadian funds at \$9,921,963 in excess of that for 1933, the total figures being \$70,966,914 as against \$61,044,951. Although the number of ounces of gold recovered in Ontario in 1934 declined, the quantity of ore treated increased, moving up from 5,621,517 tons during 1933 to 6,504,835 tons in 1934, an increase of almost 14 per cent. This performance indicates the tendency towards increased milling capacities and the treatment of lower grades of ore. At Porcupine the average value a ton of ore treated, at the Canadian price of gold, was \$8.56, at Kirkland Lake \$17.18, in Matachewan \$6.13, and in northwestern Ontario \$4.82. Gold was produced at forty-three mines in Ontario, twenty-nine of which are situated in eastern Ontario and fourteen in western Ontario. The bulk of the production was supplied from the gold-quartz mines at Porcupine and Kirkland lakes, but there was also contribution from the nickel-copper mines of Sudbury district.

The year 1934 was the most active in the history of the province as regards staking and prospecting. A total of 16,888 claims were staked,

twice as many as in 1933 and more than three times as many as in 1932. Diamond drilling operations followed the general trend of increased activity. Holes drilled in Ontario numbered 3,724 with a total core footage of 643,112. The figures for 1933 were 2,692 holes drilled and 389,764 feet of core. During the year Canadian air pilots moved the record-breaking number of 14,441,179 pounds of air freight, comprised principally of mining and prospecting equipment and supplies.

Gold Occurrences of Ontario East of Lake Superior

(1) Abitibi Lake Area

Selected References: Baker, M. B.: Lake Abitibi Area; Ont. Bureau of Mines, vol. 18, pt. 1, pp. 263-283 (1909).

Hopkins, P. E.: Notes on Lake Abitibi Area; Ont. Bureau of Mines, vol. 27,

pt. 1, pp. 200-214 (1918).
Knight, C. W., Burroughs, A. G., Hopkins, P. E., and Parsons, A. L.: Abitibi-Night Hawk Gold Area; Ont. Bureau of Mines, vol. 28, pt. 2, pp. 1-70 (1919).
Map No. 28b: Gold Area between Lakes Abitibi and Night Hawk; Ont. Bureau of Mines, 1919.

SITUATION AND EXTENT

Lake Abitibi crosses the Ontario-Quebec boundary line about 75 miles north of lake Timiskaming. The northern line of the Canadian National railways runs along its north side, thus making the area easily accessible. The lake is made up of two large expanses of water which are known as the Upper or Southern, and Lower or Northern, Abitibi lake. They are connected by a narrows about 4 miles in length and about 200 yards in average width. Upper Abitibi lake extends eastward into Quebec for almost 12 miles. The northern lake is drained by Abitibi river which flows west and then north by way of Iroquois falls.

The area includes all of those townships and intervening areas bordering on either Upper or Lower Abitibi lakes and those townships on the west adjacent to Abitibi river, as far as Iroquois falls.

GEOLOGICAL OUTLINE

The area is underlain chiefly by Keewatin volcanic rocks. These present an endless variety of phases, but pillow lavas and altered diabase are predominant with subordinate amounts of agglomerate, conglomerate, slate, iron formation, dolomite, and hornblende and chlorite schist. The sedimentary rocks and the iron formation are vertical and strike north 70 degrees and 80 degrees east. Narrow quartz stringers in rusty weathering dolomite contain a little gold.

These older rocks are intruded by serpentine, quartz diabase, and gabbro, which, although younger than the Keewatin, are believed to be much older than any other rocks in the area. Diabase on Shaft island is traversed by a quartz vein that carries a little visible gold.

Granite and syenite occur as batholiths, stocks, and dyke-like masses. They are usually quite massive and fresh and resemble the granites in other areas to the south. Gold occurs in a pegmatitic vein on lot 4, con. C. Steele tp., and in a quartz vein cutting the granite in South bay, Lower Abitibi lake.

Quartz and olivine diabase dykes cut all the other rocks in the area. The quartz diabase dykes are believed to be slightly older than the olivine diabase and may be equivalent to the Nipissing diabase at Cobalt. The olivine diabase dykes may be of the same age as similar dykes at Sudbury.

The Pleistocene drift deposits consist of varved clays and sand deposits. These stratified clays are up to 15 feet in thickness and form great banks about the lake. Above the clay are recent accumulations of shell marl and peat. Muskegs occupy the low-lying areas.

HISTORY OF MINING ACTIVITY

Gold was first reported as occurring at lake Abitibi, by R. W. Coulthard,¹ in his report on the exploration survey of northern Ontario in 1900, but the area did not attract attention until 1906 when there was a rush of prospectors into the north as a result of the Cobalt boom. During the summers of 1906 and 1907 every rock outcrop on the shores or islands of the lake was staked. In 1907 Mosher Brothers worked several claims, chief among which was that of Shaft island where a shaft was sunk to 75 feet. The Big Pete Mining Company did some work on a number of claims at Northeast bay. Interest in the area waned in a few years as the veins carried but little gold.

In July 1917, gold was found by John Raty near the centre of Rickard township. The vein was explored by the Mining Corporation in 1918, but the gold ore at depths below 40 feet was very low in grade and the company dropped the property after spending over \$110,000 on development. Other veins were located from time to time in Calvert, Wilkie, and Walker townships, but again the grade was too low to warrant development.

The Raty claim was taken over in 1934 by Rickard Ramore Gold Mines in the hope that the increased price for gold would render the vein profitable. Early in 1935 new vein discoveries were reported on the claims and the shaft is stated to have been dewatered. Wilkie Mines, Shaft Island Gold Mines, and Treasure Island Gold Mines are at present awaiting refinancing to carry out work on their properties.

GOLD DEPOSITS

Four different types of auriferous quartz veins have been found in the vicinity of Abitibi lake as follows:

- Veins in Keewatin greenstones
 Veins in Keewatin rusty-weathering dolomite
 Veins in hornblende granite and syenite
 Veins in quartz diabase

The fourth type, which is one of the most promising, is represented by the Shaft Island deposit. The vein occurs in a dark, massive diabase that is cut by a series of aplite and lamprophyre dykes. Keewatin greenstone is in place at the south end of the island. The vein is vertical, strikes east, and is a few inches to 4 feet wide. A quartz vein on a small island to the southwest may be part of the same vein. The quartz is sugary and

¹ Survey and Exploration of Northern Ontario; Ont. Bureau of Mines, p. 48 (1900).

well banded in many places, and is probably a fissure filling. It is quite strongly mineralized with pyrite, chalcopyrite, and zinc blende. Pyrrhotite and calcite are present in small amounts. Fine gold is visible in many specimens.

W. J. Miller's description of quartz veins in Keewatin rocks on lake Abitibi is as follows.¹

"These rocks here consist essentially of green schists, which are cut by dykes of fine-grained granite or porphyry, varying in width from a few inches to 15 feet or more. They have been shattered, narrow cracks running across them, characteristically tranversely from wall to wall. These cracks are filled with quartz, and there are also at times lenses and irregular masses of quartz, replacing the dyke material, or enclosed between it and the wall-rock. Fragments of the dyke are frequently cemented by the quartz, forming a breccia. The dyke material is at times changed to sericite schist. The dykes have been impregnated with iron pyrites which is now altered, to a considerable extent, to iron oxide. The pyrites appear to be the gold bearer. Colours can be obtained by panning the dykes, but the highest fire assay from samples taken by us gave only \$3.40 per ton. Copper pyrites is at times associated with the iron pyrites."

In adding to this description M. B. Baker (page 270) states that these veins are for the most part merely stringers, and unless many of them can be found so close together that the whole mass can be worked, they will be of little value.

On the west shore of South bay, a quartz vein varying in width from 5 inches to 2 feet occurs in pink hornblendic granite. The vein carries considerable pyrite and chalcopyrite and a picked sample assayed \$4 to the ton in gold (at \$20.67 an ounce) (M. B. Baker, page 270).

An outcrop of rusty weathering dolomite on lots 3 and 4, con. C, Steele tp., attracted strong interest in the early days due to its resemblance to the Larder Lake dolomites. The dolomite band is cut by a porphyritic dyke and small stringers of quartz cut both the dyke and the schistose dolomite. Some stringers extend from one formation across the contact into the one adjoining, but most of them, whether in the dyke or in the schistose dolomite, are cut off at the line of contact. An assay of this deposit showed less than \$1 to the ton (M. B. Baker).

In 1917 a gold discovery was made by John Raty, in Rickard township, about 12 miles west of the lake. The find was examined and reported upon by P. E. Hopkins (page 214) during the early stages of its development.

"Gold was first found near the centre of the claim in a 3-inch quartz vein striking east in a rusty weathered carbonate schist. The main deposit, however, is on the north part of the claim, and strikes east for at least 600 feet. The vein averages about 6 feet in width and dips almost vertically. Quartz, the chief gangue mineral, has a milky appearance. Calcite occurs as a replacement mineral in the wall-rock rather than in the vein itself. Talc and sericite are frequently met with, while feldspar is not so prominent. Next to quartz, pyrite is the most abundant vein mineral, there being also small quantities of copper pyrites, galena, and molybdenite.

¹ Ont. Bureau of Mines, Ann. Rept., vol. XVI, pt. 1, pp. 219-220 (1907).

Molybdic oxide and native copper are secondary minerals near the surface. The gold, which is extremely coarse in places and varies in colour from light to dark yellow, occurs in crushed, dark portions of the quartz with tellurides and other minerals, the gold usually crystallizing out after the tellurides. In the samples examined two tellurides have been identified, viz.: tetradymite (bismuth telluride) and altaite (lead telluride). A silver telluride may be present as considerable silver was found on analysis. The values disappeared at a vertical depth of 40 feet. The magmatic waters connected with the porphyry intrusions may have had much to do with the ore deposition. The wall-rock of the main vein is now a carbonate schist originating probably from a diabase."

Diamond-drill cores showed the veins to be quite extensive, but the values were disappointingly low, with the exception of the high-grade pocket. The altered wall-rocks are not known to contain any gold values.

MINES AND PROSPECTS

The area is not yet a producer of gold. The state of development on the properties that have been most actively explored is given below.

Calvert Claims. In lots 8 and 9, cons. V and VI, Calvert tp. Trenching on quartz veins in 1918.

Critchie and Taylor. Southwest part of Wilkie township. A great deal of surface work was done in 1918.

Big Pete Mining Company, Limited. Four claims on the east shore of Northeast bay, Lower Abitibi lake. In 1908 a shallow shaft was sunk and open-cuts made in exploring schistose dolomite bodies and quartz stringers in Keewatin layas.

Mosher Brothers. West shore of South bay, Lower Abitibi lake. A shaft 13 feet deep was sunk in 1908, on a quartz vein in granite.

O'Neil-Potter Claims. In the southeast part of Coulson township. Open-cuts in quartzite schist containing pyrite and graphite seams.

Patten River. Several claims were staked and surface prospecting done on narrow quartz veins at the 30-foot falls near the mouth of Patten river, in 1913.

Rickard Ramore Gold Mines, Limited. The company is developing the Raty claim located on the south half of the southwest quarter, lot 7, con. IV, Rickard tp. In 1918 the Mining Corporation sank an inclined shaft to a depth of 125 feet and did 700 feet of drifting and crosscutting on the 100-foot level. About \$110,000 was spent on the property before the option was dropped. Early in 1935 the Rickard Ramore operators dewatered the shaft and began diamond drilling.

Shaft Island Gold Mines, Limited. The property includes about 200 acres of land and water in the east-central part of Lower Abitibi lake. In 1907 a shaft was sunk on what is known as Shaft island to a depth of 75 feet. A little work was done on the 45-foot level. Some diamond drilling was reported to have been done in 1933.

Silver Foam Mining Company. The claims are on lot 10, con. II, Walker tp., near Monteith. The company sank a 60-foot inclined shaft and a 60-foot vertical shaft on small quartz veins in pillow lava (prior to 1919).

Treasure Island Gold Mines, Limited. Includes eight claims on Lower Abitibi lake. A shaft was sunk to 45 feet.

Wilkie Mines, Limited. The company owns 520 acres in Wilkie township about 7 miles north of Matheson. Stripping, test pitting, and some diamond drilling.

(2) Ben Nevis Area

Selected References: Gledhill, T. L.: Ben Nevis, Munro, Kamiskotia, and Other Base Metal Areas; Dept. of Mines, vol. 37, pt. III (1928).

Knight, C. W.: Ben Nevis Gold Area; Ont. Dept. of Mines, vol. 29, pt. III, pp. 1-27 (1920).

Map No. 37g: Ben Nevis Area; Ont. Dept. of Mines, 1928.

SITUATION AND EXTENT

Ben Nevis area is situated between Larder Lake area on the south and Lightning River area on the north. It adjoins the boundary line between Ontario and Quebec and its northern border is 12 miles south of Abitibi lake. It includes a block of nine townships, namely Elliott, Tannahill, Dokis, Clifford, Ben Nevis, Pontiac, Arnold, Katrine, and Ossian.

The area is readily accessible from the Nipissing Central railway. Roads lead from Argonaut and Dalby stations. There is a good canoe route from the Argonaut mine.

GEOLOGICAL OUTLINE

The oldest and most extensive formation in the area is the Keewatin which comprises principally basic flows with some tuffs, breccias, and rhyolite flows. The volcanics are part of a great Keewatin mass that extends both east and west from the area. Most of the deposits discovered within the area are of the copper-lead-zinc type with low gold values, but there are also many small gold-bearing quartz veins.

Gabbro masses grading texturally into diabase occur near the head of Verna lake and at the northwest corner of McGarry township, and isolated outcrops of quartz diorite and granodiorite occur in Clifford, Ben Nevis, and Pontiac townships.

Several quartz-bearing diabase dykes with a northerly strike have been mapped, but they are of no economic significance.

Bedrock is generally well exposed except in the western parts of Arnold, Clifford, and Elliott townships where it is concealed by glacial outwash sand-plains, eskers, and kettle lakes. Clay deposits of glacial origin appear in northern Elliott and Tannahill townships and a deep clay soil is found in Katrine and Ossian townships.

HISTORY OF MINING ACTIVITY

In 1907 gold was discovered on claims H.S. 238 and 241 in the southeast part of Katrine township, but the claims were not explored until 1919 when the Nipissing Mining Company optioned the property and carried out an extensive sampling and surface development program. About the same time the Interprovincial Exploration Company explored shear zones on their claims in Ben Nevis township. A shaft was sunk to 325 feet and almost 1,000 feet of lateral work done to develop a lead-zinc ore-body carrying low values in copper, gold, and silver. This property was closed in 1920 and no further work has been done to date.

Walsh-Katrine Gold Mines, Limited, took over the claims previously sampled by the Nipissing Mining Company and explored the veins to a depth of 500 feet, by a shaft. After three years of work, the mine was shut down in 1928. The veins are of the gold-quartz type and carried good values at the surface, but no report is available as to the gold content underground. The property has since been taken over by Northern Metals, Limited, who have planned for some time to install a small mill.

Ossian Mines acquired the Fishley-Hurd claims in 1922 and developed a gold-quartz fissure vein by a shaft, with crosscutting and drifting at a depth of 100 feet. The mine was closed in 1927 but is held by the Ossian Gold Mines who are awaiting an opportunity to reopen the property.

In addition to the quartz veins mentioned there are many that have had little or no work done on them.

GOLD DEPOSITS

Two chief types of deposits have been recognized in the area and have been enumerated by T. L. Gledhill as follows (1928):

"(1) Ore Deposits in Fissure Veins or Linear Zones of Brecciation. These are most important for gold. Such veins display fairly uniform widths and values of ore. Examples are the Harker, Ossian, and Argonaut deposits. Pyrite and chalcopyrite are fairly prominent sulphides.

"(2) Replacement Deposits in Shears or Brecciation Zones. This type is more common in the townships of Clifford, Ben Nevis, Pontiac, and McGarry. Chalcopyrite with molybdenite occurs in Clifford at the Brett-Snipe find; base metals, including galena, sphalerite, and chalcopyrite, on the Interprovincial and Ehrhart groups in Ben Nevis. Base metals also appear in northwestern McGarry."

The main discovery on the Walsh-Katrine claims is near a ridge of pink syenite. There are three parallel brecciated quartz veins; none of which exceeds a few feet in width on the surface. They are spaced too far apart to be mined together. The jointed basalt near the veins is impregnated with pink feldspar, quartz, and epidote. The veins have a northwest strike and a steep dip. The main vein sulphide is pyrite, but some chalcopyrite and a little specular hematite occur with the ore.

The vein at the Ossian mine, from which fair assays of gold were reported in 1928, can be traced for several hundred feet along the surface over claims 11131 and 11132. It has an average width of 4 feet, but in one place near the shaft it is 30 feet wide. The dip is about 55 degrees north and the strike approximately east and west. The rock in which the vein occurs is a Keewatin rhyolite porphyry. Near the vein the rock is schistose, and the planes of schistosity dip southward. Fragments of schist are included in the vein, and are heavily pyritized. The vein quartz has been crushed in places and has a milky white appearance. It contains pyrite and small amounts of sericite and calcite. The vein fissure extends beyond the border of the rhyolite into chlorite schist and there is mineralized only with pyrite.

On both the Ehrhart and Interprovincial Mines properties, mineralized shear zones over widths of as much as 2 feet hold a mixture of galena, sphalerite, chalcopyrite, and arsenopyrite. They yield good assays in zinc and lead, but are low in copper, gold, and silver.

Throughout the area it is found that the chalcopyrite occurring in deposits free of garnets and other contact metamorphic minerals is usually gold bearing. Gold in the sulphide ores is seldom visible to the naked eye.

All of the mineral discoveries in the area have been made in the neighbourhood of the intrusive syenite, granodiorite, or porphyry, and in places the veins can be traced into these rocks.

MINES AND PROSPECTS

The area has been prospected since 1907, but is not yet a producer of gold. The properties that have been most actively explored are listed below.

Alliance Mining and Securities, Limited. The company owns 350 acres in the southeast part of Marriott township at McDiarmid lake. Marriott Mines, the former owners, carried out surface exploration and diamond drilling.

Ben Nevis Mines, Limited. Holdings consist of sixteen claims in north-central Ben Nevis township. Several, rusty, sheared zones in altered dacite were explored. Closed since 1928.

Brett-Trethewey Claims, Clifford township, just north of Verna lake. A sheared zone in basalt mineralized with chalcopyrite, and molybdenite with low gold values, was explored in 1927.

Ehrhart Claims. The claims are north of Captain lake in Ben Nevis township. Mineralized shear zones in dacite were traced by trenching and stripping. Inactive.

Interprovincial Exploration Company, Limited. The company owns a group of twenty-six claims in Ben Nevis township. A shaft was sunk to 346 feet. Crosscutting was done as follows: 34 feet on the 125-foot level; 480 feet on the 225-foot level; and 420 feet on the 325-foot level. The mine was closed in May 1920.

Ossian Gold Mines, Limited. Twenty-three claims southeast of Mist lake in Ossian township. In 1926, 5,000 feet of diamond drilling in nine-teen holes was done on a large quartz vein. In 1926 and 1927 a shaft was sunk to 200 feet and 660 feet of lateral work done on the 100-foot level. Inactive since 1927.

Walsh-Katrine Gold Mines, Limited. The claims are in the southeast corner of Katrine township. By the end of 1928 a shaft had been sunk to 520 feet and stations cut at the 140, 250, 375, and 500-foot horizons. About 2,000 feet of drifting and crosscutting were done. In 1933 the property was taken over by Northern Metals, Limited, who are carrying out further work.

(3) Black River and Goodfish Lake Areas

Selected References: Wright, D. G. H.: The Black River Area; Ont. Dept. of Mines, vol. 30, pt. 6 (1921).

Burroughs, A. G., and Hopkins, P. E.: Goodfish Lake Gold Area; Ont. Bureau of Mines, vol. 35, pp. 260-263 (1916).

Map No. 25F: Goodfish Lake Gold Area; Ont. Bureau of Mines, 1916.

Map No. 30C: Black River area; Ont. Bureau of Mines, 1921.

SITUATION AND EXTENT

Black River area lies about 15 miles southwest of lake Abitibi and is bounded on the south by the Kirkland Lake gold area. It consists of the following townships: Cook, Barnet, Thackery, Black, Benoit, Melba, Bisley, Lee, Maisonville, Bernhardt, and Morrisette. The area is drained by Black river and its tributaries, and has been named after the river. Goodfish lake is situated near the intersections of four townships: Teck, Bernhardt, Morrisette, and Lebel. The mining properties adjacent to the lake comprise the Goodfish Lake gold area, but it is within, and forms a part of, the larger Black River area.

The western part of the area is traversed by the Temiskaming and Northern Ontario railway. The northeast part may be approached by a motor road that runs east from Matheson to Lightning River area, and the southeast part is accessible from Goodfish lake which is connected with Kirkland lake by a road 3 miles long.

GEOLOGICAL OUTLINE

All the rocks of Black River area are Precambrian in age, and dominantly Keewatin. They include basalt, diabase, andesite, grey pillow and amygdaloidal lavas, tuffs, and other volcanic fragmental rocks. They have been tilted into nearly vertical positions, but have retained their massive character and are rarely altered to schists.

East of Nettie lake in Morrisette township there is a small area of schistose sediments composed largely of conglomerate containing waterworn pebbles of greenstone and banded chert. These sediments, along with several scattered outcrops south of Goodfish lake, are the only occurrences in the area of Timiskaming-like rocks.

The Keewatin series has been intruded by dykes and boss-like masses of diabase and lamprophyre dykes whose relationship to the Timiskaming is unknown. The wall-rock of the main ore-body at the Bourkes mine is one of these diabase intrusives. A mica lamprophyre dyke, about 20 feet wide, occurs along the western boundary of Benoit township, about 18 chains north of the southwest corner of the township, and there is a hornblende lamprophyre dyke 50 feet wide on the southern boundary of Melba township about $1\frac{3}{4}$ miles east of the southwest corner. One large stock of granits and several small stocks of granite, syenite, and granodiorite, together with dykes of feldspar porphyry and quartz porphyry, occur in the area. The large stock which is at Winnie lake in the southwest quarter of Bernhardt township has local variations from hornblende granite to pink syenite and to quartz diorite. Most of the numerous porphyry dykes strike east. Quartz porphyry dykes are confined to Goodfish Lake area and here the gold occurs in narrow quartz veins and replacement deposits along the contact of porphyry with other rocks.

The Cobalt series occurs only in scattered outcrops in Black, Benoit, and Lee townships. The Cobalt conglomerate lies unconformably in nearly horizontal positions upon the eroded surface of the Keewatin greenstones and intrusive rocks.

The youngest rocks in the area are greyish green to dark green dykes of quartz and olivine diabase. They are distinguished readily by their ophitic texture and fresh, unaltered appearance. None of the gold occurrences is related in any way to these younger rocks.

HISTORY OF MINING ACTIVITY

Gold was first found at Goodfish lake on the Costello claim, L 2194, in the summer of 1912. During 1915 considerable prospecting was done around the lake on the Costello, Martin, Brennan, Gibson, Potvin, Papassimakes, and other claims, but in 1916 only the La Belle Kirkland mine was operating.

In 1913 gold was discovered in Maisonville township on the Labine-Smith claims, and on claims taken up by the Dane Copper Mining Company. In 1916 promising discoveries were made in the vicinity of Bourkes by A. Skjonsbye, Oscar Anderson, A. Wickstead, and others. Between 1916 and 1920, underground exploration was carried out at the Bourkes, Murray-Mogridge, La Belle Kirkland, Fidelity, Providence, and Goodfish mines, and surface exploration proceeded on many other claims, but most of the deposits explored proved to be too small or low in grade to warrant successful operations, and many of the properties were abandoned.

The Labine-Smith claims, which were worked for a time in 1915 by the Kerr Lake Mining Company, were transferred in 1925 to the Bennett Mining Company. However, results were not encouraging, and the new operators removed their plant in 1927. The Providence mine was dissolved the same year and the property became part of the Goodfish estate. In 1929 both the Golden Summit and Lakeland Gold mines in Maisonville township became active and carried on underground exploration. The Lakeland mine was developed by a shaft to 850 feet, and a 100-ton mill was under construction in 1934, but the mine was forced to close due to lack of money. Both companies planned to resume work in 1935. Operations at the Goodfish mine were suspended in 1929, but in December 1934, the mine was dewatered and resampled. Development work was in progress in January 1935. The Bourkes mine was purchased at a sale in 1933 by Tellaurum Gold Mines and was dewatered and resampled, but results did not encourage further work.

GOLD DEPOSITS

Gold occurs throughout the area in narrow quartz veins of the fissure type and in replacement deposits in shear zones in the Keewatin greenstones. The deposits commonly occur along or near the contact of feldspar or quartz porphyry dykes. The veins do not have a common strike, but most of the fissures strike either east or north. The occurrence, in practically all of the veins, of blotches or stringers of pink orthoclase closely resembling the orthoclase in the intrusive rocks, suggests that the veins may be related to these rocks. Some of the narrow granite porphyry dykes are reported to carry small amounts of gold.

The gold-bearing veins have been subdivided into a variety of types by D. G. H. Wright, as follows:

"(1) Fissure veins containing chiefly calcite, and minor quantities of quartz as gangue, with sphalerite, galena, and other sulphides in subordinate amounts. These deposits are rarely auriferous in economic amounts.

"(2) Quartz veins occupying fissures. These frequently contain pyrite in crystals, and are often auriferous.

"(3) Torsion cracks, which have been subsequently filled by solutions depositing quartz, comprise another class. These usually take the form of short, lenticular splashes of quartz which, unless very numerous, could not constitute an ore-body even though mineralized.

"(4) Joint planes which have been filled with quartz. This type is almost invariably narrow and frequently carries free gold. The horizontal veins, occurring in the vicinity of Bourkes, have been classed with this type.

"(5) Shear zones have been infiltrated with quartz and calcite. The quartz and calcite lenses vary from a fraction of an inch to several inches, or a foot in width. The rock infiltrated by the quartz and calcite-bearing solutions is usually impregnated with iron pyrites. The main vein of the Bourkes Mines, Limited, is considered as one of this class.

"(6) Pyrrhotite and sulphide bodies occupying channels similar to the foregoing. The sulphide bodies are believed to have the same origin as the auriferous quartz deposits, that is to say, to be genetically connected with the Algoman intrusives. Granite or porphyry intrusions were observed in close proximity to these deposits, and in the deposit on the Post claim—No. LL 4868, Morrisette township. The deposit on the footwall had a felsitic border facies 5 feet wide.

"(7) Parallel slip planes coated with quartz and a thin film of molybdenite as in the Goodfish Lake area.

"Veins of the fissure and shear zone types frequently contain brecciations of the wall-rock, the edges of which have either been altered to secondary minerals or partially replaced by sulphides. Secondary minerals such as chlorite and epidote are common."

The gold is present chiefly in the native state, but tellurides have been reported in the main vein at the Bourkes mine and at other localities. Native gold is associated in many places with molybdenite and pyrite. Silver is found at several places in association with galena and sphalerite, and assays up to 57 ounces a ton have been obtained. As the gold in many cases runs in narrow, high-grade streaks and the silicified material between the streaks carries but little gold it is difficult to estimate the value of the deposits and only further development will indicate their importance.

MINES AND PROSPECTS

The area has been prospected since 1912, but is not yet a producer of gold. The following list includes those properties that have been most actively explored.

Anderson Gold Mines, Limited. The property is near Bourkes station, Benoit township. Surface exploration and trenching. (Now inactive.)

Ayoub Claim (L 6075). On the west shore of the northwest arm of Amikougami lake. Stripping and blasting in 1920 revealed free gold in a quartz vein at the lakeside.

Bennett Mining Company, Limited. The company owned a group of claims located in lots 9 and 10, con. II, Maisonville tp. A shaft was sunk in 1926 to a depth of 530 feet on claim 3688, and levels were cut at 125-foot intervals. Crosscutting and drifting were reported early in 1927, but in June the plant was dismantled.

Bergstrand Claim (6850). In the southeast quarter of the south half of lot 11, con. IV, Benoit tp. Trenching and test pitting were done in 1920-21 on gold-bearing veins in diabase and in porphyry dykes.

Bourkes Mine. The property comprises the south half of lot 9, con. II, Benoit tp. Between 1917 and 1920 a shaft was sunk to 400 feet. Lateral work was done as follows: 100-foot level 790 feet, 200-foot level 440 feet, 300-foot level 140 feet, and 400-foot level 255 feet. In 1933 the mine was sold to Tellaurum Gold Mines who dewatered and resampled the workings.

Bourzk Claim (6354). At the north end of the Northwest arm of Amikougami lake in Bernhardt township. Considerable trenching, stripping, and blasting on a vein complex in pillow lava were reported in 1921.

Brett-Trethewey Mines, Limited. The company owns four claims in Barnet township. In 1927, a shaft was sunk to 100 feet with 100 feet of crosscutting. After several thousand feet of surface trenching and test pitting, operations were suspended in 1929.

Bunting Claims (Johnson). On claims 6639 and 6640 on the west half of lot 9, con. I, Benoit tp., test pits have been sunk and stripping done on mineralized veins in greenstone, near dolerite dykes (1920).

Challenger Gold Mining Company, Limited. The group was reported in 1921 to consist of seven claims northwest of Blue mountain and reached by trail from Bourkes. Blasting, stripping, and sampling were done on a quartz-calcite vein.

Cotterill Claims (5309, 5921). The claims comprise the north half of the south half of lot 7, con. I, Benoit tp. Considerable surface trenching and stripping were done and test pits put down on two veins in 1920. 1888-2 Fidelity Mining and Development Company. The claims are situated south of Goodfish lake. On claim L 2845 a shaft was sunk 140 feet, in 1919, on a vein at the contact between basalt and quartz-feldspar porphyry.

Golden Summit Mining Company, Limited. The prospect is in lot 6, con. I, north half, Maisonville tp. In 1921 surface work was done and a shaft sunk for 27 feet. In 1929 a plant was installed and a shaft sunk to 142 feet with crosscutting on the 125-foot level. The shaft was deepened in 1934 and lateral work done on the 125-, 250-, and 375-foot levels.

Goodfish Mining Company, Limited. The company owns the former Brennan, Costello, Martin, and Providence claims on the east shore of Goodfish lake. The No. 1, or Costello, shaft has been carried to 600 feet and 3,300 feet of lateral work done on four levels. No. 2 shaft, located 400 feet west of No. 1, is 80 feet deep, and No. 3 shaft, 1,800 feet north of the Costello vein, has been sunk to 200 feet with a winze to 350 feet. Operations were suspended in 1929, but recommenced late in 1934.

La Belle Kirkland Mines, Limited. This company prior to its dissolution in 1928 owned seven claims south of Goodfish lake. Shaft A, on claim L 1751, was sunk to 340 feet with levels at 100, 270, and 340 feet. Over 1,100 feet of lateral work was done on the second level. Shaft B is 55 feet deep and Shaft C 100 feet deep and on various parts of the property there are test pits and shafts 50 feet or less deep.

Lakeland Gold Mines, Limited. This company owns 1,120 acres about 4 miles from Bourkes station, at Wolfe lake, Maisonville township. Development work done includes sinking of two shafts, one to 850 feet with six levels, and the other to 230 feet with two levels opened up. A new 100-ton daily capacity mill was under construction late in 1933, but the mine closed down in 1934 due to lack of funds.

Lakeview Gold Mines, Limited. The company owns eight claims in Maisonville township. In 1920, camps were built and a plant installed in addition to surface prospecting, but no work has since been done.

Martin (8311 and 8501). About 15 chains east of Nettie lake. Surface work was done along the granite contact in 1920.

McKeen (L 5399). Trenching and blasting along a porphyry greenstone contact on this claim near Goodfish lake were reported in 1920.

Mosher Claim (5834). About 20 chains east of Lancaster lake, Bernhardt township. Trenching was done, and a test pit sunk on a vein in greenstone in 1920.

Murray-Mogridge Mining Company, Limited. The property comprises ten claims on lots 4 and 5, cons. V and VI, Maisonville tp. Work was first done here in 1913 by the Dane Copper Mining Company. In 1917 the new operators sank a shaft to 227 feet, and did crosscutting and drifting on the 50-, 100-, and 200-foot levels. The property has been idle since 1920. Post Claim No. LL 4868. Near the southern boundary of Morrisette township several test pits and a 50-foot shaft have been sunk on a vein situated near the contact of basalt with quartz porphyry.

Potter (Wickstead-Maloof). The property occupies the northwest quarter of the north half of lot 4, con. I, Benoit tp. In 1920, an inclined shaft was reported sunk to a depth of 40 feet along the dip of a quartz vein in greenstone, on claim 5381.

Scotvold Claims (6184-5835). These claims comprise the southwest quarter of the north half of lot 5, con. I, Benoit tp. Surface work was done along a mineralized lamprophyre dyke.

Soloman Claim (6429). The claim lies on the west side of the northwest arm of Amikougami lake. A 15-foot test pit was sunk in 1920 on a 6- to 10-inch quartz vein in a schistose zone. The vein is stripped at intervals across the claim.

Skjonsbye-Klanderland. This group occupies the north half of lot 2, con. I, Benoit tp. The claims have been prospected by trenching and a 14-foot shaft was sunk on a flat-lying quartz vein in 1920.

Thompson-McLeod. The claims are in the north half of lots 4 and 5, con. III, Benoit tp. An inclined shaft was sunk following a 16-inch vein, cutting a grey lava knoll. From the west side of the knoll an adit was driven along the vein for 60 feet, connecting with the shaft 20 feet below the surface (1920).

Webb Claims. There are six claims in this group in the north half of lot 7, con. I, Benoit tp., and the south half of lot 7, con. 2. Extensive surface work was done and several pits were sunk. A shallow shaft was sunk on a basalt porphyry contact (1920).

(4) Boston Creek Area

Selected References: Burroughs, A. G., and Hopkins, P. E.: Boston Creek Gold Area; Ont. Bureau of Mines, vol. 25 (1916).

Burroughs, A. G., and Hopkins, P. E.: Skead Gold Area; Ont. Dept. of Mines, vol. 30, pt. 6 (1921).

Bell, L. V.: Boston-Skead Gold Copper Area; Ont. Dept. of Mines, vol. 38, pt. 6 (1929).

Map No. 30d: Boston-Skead Gold Area; Ont. Bureau of Mines, 1921.

Map No. 38d: Boston Creek Area; Ont. Dept. of Mines, 1929.

SITUATION

The Boston Creek area is in Timiskaming district about 10 miles south of the producing gold mines of Kirkland lake, and approximately 45 miles north of Cobalt. The area includes Boston, McElroy, Pacaud, Catherine, and Skead townships. Boston and Pacaud townships are traversed by the Temiskaming and Northern Ontario railway and the eastern part of the area is accessible by road from Englehart. A good motor road crosses the northern part of Boston and McElroy townships. 1888-24

GEOLOGICAL OUTLINE

The rocks of the area are all of Precambrian age. They are predominantly Keewatin and consist of volcanic fragmental rocks, basic and acid lava flows, narrow bands of crumpled iron formation, slate-like rocks, and rusty weathering dolomite. These rocks are largely altered to greenstones and contain many of the gold-bearing veins.

A band of Timiskaming sediments extends across part of McElroy township into the northern part of Skead. It consists of highly sheared and schistose greywacke and conglomerate beds downfolded into the Keewatin.

The intrusive rocks include granite and syenite stocks and bosses, dykes of feldspar porphyry, diorite, diorite porphyry, felsite, and lamprophyre. The greater part of Pacaud township is occupied by a batholith of red, hornblende-biotite granite that extends south and west over twelve townships.

Flat-lying beds of conglomerate, greywacke, and quartzite of Cobalt age overlie the older rocks in the eastern part of Skead township. No economic minerals occur in them, and they hide any veins that might be in the underlying Keewatin greenstones.

Dykes and sills of quartz and olivine diabase occur at intervals throughout the area. There are also occasional dyke-like bodies of serpentine.

Gold usually occurs free in quartz veins and veinlets in Keewatin lavas, and in bodies of granite and porphyry. Most of the veins are of the fissure type with a quartz and calcite gangue and associated sulphides, but some are composed dominantly of sulphides.

HISTORY OF MINING ACTIVITY

In 1904 W. A. Parks¹ stated that the high hills along Blanche river were well worth prospecting for gold. The first mining claims were staked in 1906 and 1907 at the time of the Larder Lake gold rush. In 1913, during the activity at Kirkland lake, many claims were restaked and work done on them. A great deal of work was done on the "Kenzie" vein in 1915 and 1916 by the R.A.P. Syndicate and the Boston Creek Mining Company. The gold occurred in spectacular ore shoots in the vein, but these were found to be small in the deeper levels. The apparent success met with in the early development of the "Kenzie" vein attracted wide attention and the area became very active during the next few years. About thirty mining companies carried on development work.

The Barry-Hollinger (Patricia) mine began operations in 1917 and produced \$10,114 in 1918, but the mine buildings and mill were destroyed by fire in 1919. A new mill was built in 1925 and the mine has been a steady producer since that date. The value of bullion produced to the end of 1934 is \$1,347,665.

At the Miller Independence a 250-ton test mill run in 1918 produced \$1,283 in gold and silver. A mill was built in 1927 at the Gold Hill property and \$13,650 in gold and silver recovered by the end of 1928, but

Geol. Surv., Canada, Ann. Rept. 1904, vol. XVI, pt. A, p. 224.

the mine closed down the following year. In 1931 a 50-ton mill was built by Telluride Gold Mines at Skiddoo lake, but it was destroyed by fire the same year, and the property has now been taken over by Smelters Corporation of Canada who are developing it.

In addition to the gold mines the area has attracted attention in recent years by its copper deposits. Exploration at the Amity, Patterson, Trethewey, Ossian, and Mindoka mines has indicated a considerable tonnage. Some high-grade chalcopyrite and bornite ore was shipped in 1928 from the Amity mine, but this type of ore carries little gold.

On the whole the gold-bearing veins have proved disappointing as to size and continuity. Many carry good values but are too small to be mined at a profit. The Barry-Hollinger has been producing for the past ten years on ore that averaged slightly under \$6 in gold a ton. With gold at a premium it is probable that some of the smaller deposits could also be mined profitably.

ORE DEPOSITS

Vein Systems and Minerals. There are four principal types of deposits, as follows:

(1) Fissure veins in the greenstone, granite, and porphyry consisting of quartz and calcite with some pyrite and chalcopyrite, and a little molybdenite, galena, and telluride. Gold occurs in the free state and is partly associated with chalcopyrite rather than pyrite. The Barry-Hollinger, Gold Hill, Hilltop, Grace Lake, Miller Independence, and Ostrom are examples of this type.

(2) Fissure veins heavily mineralized with sulphides, with very little quartz or calcite gangue. The sulphides are dominantly pyrite and chalcopyrite with generally some specularite and molybdenite. The Telluride, Skead Gold, Gold Bank, and Kalyniuk veins are examples of this type.

(3) Replacement veins consisting of quartz and calcite in brecciated greenstone and porphyry. Examples are the calaverite vein on the Miller-Independence and the Kenzie vein of the R.A.P. property.

(4) Stockwork veins consisting of quartz veins with disseminated pyrite and chalcopyrite in granite and porphyry. Molybdenite, bismuthinite, magnetite, and tetradymite also occur in this type. The Charest (L 5305) and Authier (L 4737) both have these stockwork structures. Some of the large veins on the Charest contain coarse feldspar and are pegmatitic in character. The gold is free.

Most of the veins have sharply defined walls. Generally the amount of gold present is dependant upon the amount of quartz in the fractures. At the Barry-Hollinger, the best ore occurs in wide lenses of quartz. Visible gold commonly occurs along dark chloritic streaks in richer parts of the veins, in many places in the form of minute veinlets.

Faulting. Some faulting preceded the deposition of the veins throughout the area. Fracturing followed intrusion of the granite and was influenced by the northwest trend of the Keewatin rocks. The majority of the veins have formed along northwest-trending faults and fissures, but several have a northeast strike. The dip of the veins varies from 20 degrees to vertical, but steep dips are most common. Origin of the Ores. The gold was probably derived from granitic intrusives. The common occurrence of quartz veinlets in the feldspar porphyry and in the granite suggests relationships between these intrusive rocks and the veins. The genetic connexion is most clearly shown by the occurrence of gold in a pegmatitic vein in the granite on the Charest claim, McElroy township.

MINES AND PROSPECTS

The area produced some gold in 1917 and has been a steady producer since 1925. The following list includes those properties that have been most actively explored.

Authier-Charlebois. Claims L 4737 and L 5025 are situated in the southeast corner of Boston township. Considerable trenching and stripping were done in 1915 and pits were put down on mineralized quartz veins that cut both lava and granite.

Barry-Hollinger Mines, Limited. The company owns a producing gold mine near Boston Creek station. The mine is serviced by a threecompartment shaft to 1,000 feet and by a winze to 2,375 feet. There are several miles of underground workings. The milling capacity is rated at 150 tons daily, and up to the end of 1933 gold bullion to the value of \$1,256,526 had been produced.

Barry Webster Gold Mines, Limited. The holdings are in lot 7, con. 5, Skead tp. Pits were sunk on a mineralized chert band prior to 1921.

Bennett-Pacaud Mines, Limited. The claims are situated in the north half of lot 1, con. 6, Pacaud tp. During 1918 and 1919 Allied Gold Mines sank a 100-foot shaft and did some trenching and diamond drilling. Earlier operators had sunk three other shafts of moderate depth. In 1927-28 the new company carried on diamond drilling and surface trenching. Inactive since.

Boston Creek Company. During 1916 the company worked claim L 3665 in Boston township. The adjacent R.A.P. Syndicate's shaft was used. From the 200-foot level a winze was sunk 200 feet and a raise carried to surface. Four levels were established at 100-foot intervals and 1,000 feet of crosscutting and drifting were done. Inactive since 1917.

Boston McCrea Claims. The property lies east of the Barry-Hollinger, in Pacaud township. In 1916 an inclined shaft was sunk in the northeast part of the property and a shaft started to the west near the north line. In 1919 a 60-foot shaft was sunk on the south-central part and 30 feet of crosscutting done in a schisted zone. Some diamond drilling was done in 1928 on the extension of the No. 5 vein at the Barry-Hollinger.

Campbell Claims. These consist of two claims in lot 12, con. VI, Catherine tp. A narrow-veined fracture was traced across the claims by trenching and test pitting prior to 1921. Canoro Gold Copper Mines, Limited. In 1928 this company purchased the Ostrom Gold Mines property, consisting of nineteen claims in Catherine township. Between 1923 and 1928 a shaft was sunk to a depth of 500 feet with stations at 200, 350, and 500 feet. Thirteen hundred feet of drifting and crosscutting were done on the 500-foot level.

Catherine Gold. The claims are in lot 10, con. IV, Catherine tp. Pits were sunk on a porphyry stockwork in the early days.

Cook Claims. On the boundary between Skead and Hearst townships. A number of pits were sunk on a mineralized quartz carbonate vein prior to 1921.

Cotter Claim. Some trenching and diamond drilling were done years ago on quartz veins in lot 2, con. VI, Catherine tp. Diamond drilling was done near the south boundary of the west claim in 1928.

Crawford-Skead Gold Mines, Limited. The holdings consist of two claims in the north part of lots 9 and 10, con. V, Skead tp. A shaft 22 feet deep was sunk on a silicified porphyry lamprophyre contact. Inactive since 1921.

Daley Claim. In the south half of lot 6, con. IV, Catherine tp. Quartz stringers in carbonate rock were explored prior to 1921 by a 12-foot pit and a long open-cut.

De Villiers McBurke. A vein was uncovered at intervals for 1,700 feet on claim No. 9168 in the northwest corner of Rattray township in 1921.

Echo Bay Exploration Company, Limited. The company owns six claims in Skead township, formerly the property of Manor Gold Mines. The former operators sank a shaft 500 feet and did considerable lateral work on the 200- and 475-foot levels until the mine closed down in January 1928.

Fidelity Claims. The property lies north of St. Anthony lake, in Skead township. On claim 238 a shaft was sunk 28 feet in a black chert band carrying quartz stringers and sulphides. Stripping and test pitting were done on bands of iron formation (prior to 1920).

Gold Bank Syndicate. The claims are in lot 7, con. VI, Catherine tp. Several pits were sunk and trenching and stripping were done in 1928.

Gold Hill Mines, Limited. The property is in lots 7, 8, and 9, con. V, Catherine tp. The mine has been developed by a vertical shaft to 1,200 feet and by 7,600 feet of crosscutting and drifting. Diamond drilling totals 3,600 feet. A 75-ton mill was erected in 1927 and produced \$13,650 to the end of 1928. Inactive since July 1929.

Gold Leaf (L 5757). The claim is in lot 2, con. I, Boston tp. A main shaft was sunk 85 feet on a quartz vein in granite. Two shallow shafts were put down 40 feet. Work ceased December 15, 1916.

Gold Ridge Mines, Limited. The claims occupy the north half of lot 7, con. V, Catherine township. Camp buildings were built and a pit sunk 9 feet on sheared andesite. Grace Lake Gold Mines, Limited. The company holds four claims in Skead township, formerly known as the Wisconsin-Skead. A shaft was sunk 530 feet and 1,000 feet of lateral work was done on the 112-foot level, 200 feet on the 329-foot level, and 300 feet on the 494-foot level. Closed November 1928.

Hilltop Gold Mines, Limited. The company owns twelve claims, in lots 10 and 11, cons. V and VI, Catherine tp. A shaft was sunk 680 feet and considerable lateral work was done. The mine closed in August 1928.

Irish (L 2581). Near the south boundary of McElroy township in lot 6. A 440-foot tunnel was driven and a winze was sunk on a white calcite vein. A tunnel was driven 35 feet on a narrow quartz vein.

Judge. There are nine claims in the group in the southwest part of McElroy township. Considerable trenching has been done and test pits have been put down on a big quartz vein.

Kalyniuk. Test pits were sunk on quartz veins cutting diabase on the south half of lot 8, con. II, Catherine tp.

Marsh Mines and Development Company, Limited. In McElroy township a shaft was sunk 80 feet on a massive pyrite vein, near the centre of claim 4410 (prior to 1920).

Martin No. 6263. The claim is on lot 9, con. VI, Skead tp. A shaft and several open-cuts were put down on a porphyry stockwork (1916-20).

McMaster Syndicate. The property is at mileage 157 on the Temiskaming and Northern Ontario railway, Boston township. Work started in 1924. A shaft was sunk 270 feet and 670 feet of crosscutting done on the 250-foot level. In 1927 a new shaft was sunk 250 feet on the west side of the railway and 400 feet of crosscutting was done.

Miller Independence Mines, Limited. The property is in lots 1 and 2, con. VI, Pacaud tp. Work started in 1916 and by 1920 four shafts had been sunk, the deepest being 525 feet. Much crosscutting and drifting were done. In 1918 a test-mill run of 250 tons produced \$1,283 in gold and silver. Diamond drilling has been done in recent years.

Nigger (M.R. 3). The claim is west of St. Anthony lake, Skead township. Pits were sunk on a band of sulphides.

O'Donald Claim. The claim is in lot 4, con. VI, Pacaud tp. Between 1916 and 1920 a shaft was sunk 19 feet on a quartz pyrite vein and a little diamond drilling was done.

Peerless Gold Mines, Limited. The property comprises the former Mondoux claims in McElroy township. On claim 5266 a shaft was sunk and some ore bagged from the 75-foot level. Exploration on the 125- and 250-foot levels was discouraging. Inactive since 1920.

R.A.P. Gold Mining Company of Boston Creek, Limited. The company did development work on the Kenzie vein on claim L 5163 between 1915 and 1918. An inclined shaft was sunk 200 feet and drifting done as follows: on the 100-foot level, 325 feet; 200-foot level, 280 feet. Rodger-Barnett Claims. In lots 4 and 5, con. II, Catherine tp. In 1920 considerable trenching had been done and pits put down on quartz veins cutting altered basalt.

Sampson Claims. These include Nos. 4363 and 4364 on lot 10, con. VI, Skead tp. Trenching and test pitting were done on a porphyry stockwork.

Skead Consolidated Gold Mines, Limited. The company owns fiftyfive claims in Skead township. On lot 29, near Skiddoo lake, there are two shafts each 50 feet deep and one 18 feet deep. On lot 30, twenty-two test pits were sunk from 5 to 18 feet deep. West of Anthony lake three test pits were sunk to 8, 15, and 22 feet and east of the lake fourteen test pits were sunk varying from 8 to 20 feet deep. Inactive since 1922.

Smelters Corporation of Canada, Limited. The property consists of twelve claims at Skiddoo lake, Skead township. It was formerly owned by the Telluride Gold Mines. A shaft was sunk to 400 feet and 2,500 feet of lateral work was done, chiefly on the 125- and 250-foot levels. Some ore was developed and a 50-ton mill was built in 1931, but fire destroyed the mill the same year. Three shallow shafts were also sunk. Active.

Walsh-Taylor Claim. In northeast quarter, south half, lot 5, con. III, Catherine tp. An inclined shaft was put down 30 feet on a veined carbonate band.

Zenith (Claim 6202). In the northwest corner of Skead township. A shaft was sunk 20 feet on a narrow quartz vein. Inactive since 1922.

(5) Bruce Mines Area

Selected References: Knight, C. W.: The North Shore of Lake Huron; Ont. Bureau of Mines, vol. XXIV, pt. 1, pp. 216-241 (1915).

Collins, W. H.: North Shore of Lake Huron; Geol. Surv., Canada, Mem. 143, pp. 116-118 (1925).

Blue, Archibald: Ont. Bureau of Mines, vol. III, pp. 34-35 (1894).

Map No. 1969: Bruce Mines; Geol. Surv., Canada. Issued 1925.

SITUATION AND EXTENT

Bruce Mines area is situated on the north shore of lake Huron, approximately 30 miles east of Sault Ste. Marie. Gold discovery has so far been confined to Galbraith township, but copper deposits for which the area is best known are found throughout an area four townships deep, lake Wakomata, and McMahon township on the north, and Plummer Additional and Day townships on the south, marking its boundaries.

GEOLOGICAL OUTLINE

The oldest rocks are medium-grained, pink granite outcropping to the north and to the southeast of the area. Lying unconformably upon the old granite is a succession of Huronian formations, from the Mississagi quartzite and underlying conglomerate upwards to the Gowganda greywacke and conglomerate and the Lorraine quartzite. Basic intrusives are well represented, the sedimentary formations being pierced by sills, dykes, and boss-like masses of diabase. In the vicinity of Thessalon, greenstone covering an area of 15 square miles overlies Huronian sediments. Dykes of olivine diabase are the youngest intrusives and cut the older formations indiscriminately.

Both copper and gold occurrences are associated with sills and dykes of quartz diabase that have been injected into folded and fractured Huronian sediments.

HISTORY OF MINING ACTIVITY

The most important ore deposit up to the present time is that of Bruce Mines. It was discovered in 1846 and became before 1875 one of the most important copper mines then in existence. The mine closed in 1876, but was reopened and worked again from 1907 until 1909. Over 400,000 tons of ore was raised with a copper production valued at over \$3,500,000. The ore is chalcopyrite carrying traces of gold, in quartz veins with barite and calcite. Other copper mines were worked at intervals in Plummer, Rose, Day, and Gould townships.

Gold was discovered on lot 12, con. III, Galbraith tp., in November 1889, by William Moor. In 1892 the mine was purchased for \$100,000 by the Ophir Gold Mining Company of Duluth. Two shafts were sunk and a 20-stamp mill erected, but the company got into financial difficulties after a few years. In February, 1909, the Havilah Gold Mining Company purchased the mine and worked it until 1912, but it has been idle since that time. The ore raised during 1894 averaged between \$5 and \$6 to the ton.

GOLD DEPOSITS

Reports state that the average copper content of the No. 1 vein on the Wellington and Copper Bay sections at the Bruce Mines workings was $3 \cdot 3$ per cent for an average width of $5\frac{1}{2}$ feet and for 1,800 feet along the vein. Most samples contained only traces of gold, but a few had a high gold content, and one sample assayed $2\frac{1}{2}$ ounces a ton. The Ophir or Havilah mine is the only property in the area at which gold was found in quantities sufficiently abundant to be mined as a gold ore. A description of the occurrence is given by W. H. Collins as follows:

"The gold-bearing veins are situated in a high bluff of Keweenawan diabase to the west and south of which is a flat of Pleistocene lake-clays which has been cleared for farming. A contact between the diabase and Mississagi quartzite, mostly concealed by the clay, corresponds in a general way with the foot of the bluff. The principal vein cuts across the diabase bluff in a direction 15 degrees south of west and continues in that direction across the lower ground to the quartzite contact, where it is said to finger out. This vein is 1,300 feet or more long, from 18 inches to 7 feet wide, and dips about 80 degrees south. Branching away from its north side in the diabase bluff is a series of three smaller, more or less parallel veins, which rise at about 45 degrees to the surface. These lateral veins were known as the ore-chimney. They lie within an arcuate zone not exceeding 43 feet in width and 450 feet in length, both ends of which spring from the main vein. All the veins consist of quartz, of white to bluish grey colour, mingled with a grey carbonate and linear streaks and bands of dark green, chloritic material representing sheared diabase. This gangue is speckled with small patches of chalcopyrite and pyrite, and an occasional particle of free gold. Where exposed to the weather, the corbonate tarnishes to a rich bronze-red, strikingly like the carbonate found at the Crystal mine near lake Wanapitei, which is a mixture of iron and magnesium carbonate (breunerite). Indeed the Havilah and Crystal ore deposits are remarkably alike in composition and geological relationships."

A mill test made on 5,170 pounds of this ore at the School of Mines, Houghton, Michigan, is said to have yielded 9.7 ounces of gold and 6.15ounces of silver, but the average ore was much lower, and the ore raised during 1894 is reported by the Ontario Bureau of Mines to have run between \$5 and \$6 to the ton.

MINES AND PROSPECTS

The area produced a little gold more than twenty years ago. Very few properties have been developed. Those that have received most attention are listed below.

Galbraith (Lot 12, Concession 3). A 50-foot shaft was sunk on a quartz vein near the outlet of lake Ickta prior to 1894.

Havilah or Ophir Mine. The mine is in lot 12, con. III, Galbraith tp. Two shafts were sunk and a 20-stamp mill erected in 1892 by the Ophir Gold Mining Company. In 1909 the Havilah Gold Mining Company secured the property and carried on mining operations until 1912. The vertical 6- by 8-foot shaft was reported to be 100 feet deep and the 6- by 6-foot inclined shaft about 105 feet deep. Four adits were driven into the north face of the diabase bluff, with a view to stoping out the ore chimney. Kirk Gold Mines bought the Havilah mine in 1921 and carried out 180 feet of drifting on the 83-foot level the following year. There are no further reports of activity.

Kirk Gold Mines, Limited. In 1919 the company explored their claim in lot 11, con. V, Aberdeen tp., southeast 40 acres. A shaft was sunk on a quartz vein, on the side of a cliff of diabase. In February 1921, the inclined shaft measured 126 feet, and on the 50-foot level 360 feet of drifting had been done. In 1922 a raise was carried through to the surface and an adit was driven 625 feet along the vein from a point near the shaft.

(6) Cripple Creek Area

Selected References: Bruce, E. L., and Rodgers, W. R.: Cripple Creek Gold Area; Ont. Bureau of Mines, vol. 21, pt. 1, pp. 266-270 (1912).

- Hawley, J. E.: Carscallen, Ogden, Bristol Township; Ont. Dept. of Mines, vol. 35, pt. 6 (1926).
- Map No. 21e: Cripple Creek Area; Ont. Bureau of Mines, 1912.
- Map No. 35g: Township of Carscallen, Bristol, and Ogden; Ont. Bureau of Mines, 1926.

Map No. 40c: Groundhog-Kamiskotia Area; Ont. Dept. of Mines, 1931.

SITUATION

Cripple Creek area lies about 20 miles southwest of Timmins. It includes the townships of Whitesides, Carscallen, Keefer, and Denton, and may be reached from Timmins by way of Mattagami and Redsucker rivers. Cripple creek is a tributary stream draining into Redsucker river in the east part of Denton township. A road from Timmins runs southwest through Mountjoy and Ogden townships and thence west through the centre of Bristol and Carscallen townships and into Whitesides township.

GEOLOGICAL OUTLINE

The oldest rocks are chloritic greenstones generally massive but in some places very schistose. Acid lavas with rhyolitic agglomerate occur in the northeast part of Carscallen township. Banded iron formation, chiefly interbedded chert and magnetite, is found in places.

Two main types of granite occur, a somewhat gneissoid red granite, and a massive, grey, biotite granite. The grey granite is abundant in the centre of the area. There are also small, scattered, intrusive bodies of quartz porphyry, rhyolite porphyry, and granophyre. Dark, basic, gabbroid rocks are abundant in the north part of Carscallen township. The youngest rocks mapped are dykes of quartz diabase.

Quartz veins occur in the rocks of Keewatin age and in the grey biotite granite. The quartz veins in the greenstone have a bluish tinge, whereas those in the granite are white. Assays indicate gold in both types of veins and visible gold is occasionally found.

A great part of the four townships is covered by sandy, stony, or swampy overburden; an occasional hill of clay or sand projects through the poorly drained swamp areas.

HISTORY

South Carscallen and Denton townships were the scene of active prospecting in 1911. Terry Carlton made a discovery on claims known as the Jowsey-Woods, and Walter Kavannaugh and Stanley Ellis discovered the No. 1 vein of the Hazelton Porcupine Gold Mines at Mahoney lake. In 1918 further discoveries were made by James Hazelton and in 1925 Sydney Beanland and Frank Hurst found several, narrow, gold-bearing veins. Extensive surface development by trenches and pits has been done on about fifteen separate properties in the four townships. In 1925 the Hazelton Porcupine Mines carried out a diamond-drilling program on their claims, but the results were discouraging. There has been little activity in the area in recent years.

GOLD DEPOSITS

The veins in the grey biotite granite occur in schistose zones. On claim P 10739 of the Hazelton claims there is an eastward-trending shear zone 8 feet wide dipping steeply to the north in massive, altered granite. J. E. Hawley says, "A shallow pit and shaft on this vein exposed wellmineralized lenses carrying abundant chalcopyrite in which are a few cubes of pyrite. A diamond-drill hole started 125 feet due north of the shaft and drilled at 60 degrees south cut heavily mineralized schist and quartz. The core on assay gave average values of \$1.28 in gold per ton over 8 feet, 20 cents over 5 feet, and 64 cents over 7 feet."

In several places, fractures in banded iron formation contain gold. On the Beanland-Hurst claim (P 11538) wire gold was reported in fractures adjacent to a narrow vein of quartz and calcite which cut iron formation.

Quartz stringers occur in quartz porphyry and rhyolite porphyry dykes and quartz veins occur along the contacts where the dykes intrude Keewatin greenstone. In some places sulphides are abundant in these veins and native gold has been reported.

The granitic portions of the area are not promising for the discovery of large ore-bodies, as the mineralized shear zones are relatively small and discontinuous, and the greater part of the granite is massive. No economic deposits have yet been proved in either greenstone or granite. Unfortunately rock outcrops are scarce, especially in the vicinity of the greenstonegranite contacts.

MINES AND PROSPECTS

The area was actively prospected 10 to 25 years ago. The properties that were most active are listed below.

Aberdeen Syndicate (P 2123-126). Considerable trenching has been done near the centre of these claims in Carscallen township.

Beanland-Hurst (P 11538). The claim is in Carscallen township. Trenching and stripping.

Blackburn Claim. A 20-foot tunnel was driven at the base of a cliff in western Carscallen township, many years ago.

Claim P 2117. In western Cascallen township, a pit was sunk years ago on a mineralized, fractured, and drag-folded band of cherty iron formation.

Claims P 1154, P 1155, P 1233. The claims are in western Carscallen township. Stripping and trenching.

Claims in South Carscallen Township. Pits and shallow shafts were sunk in the early days on small shear zones mineralized with sulphides.

Claim P 7507. Some stripping and trenching have been done on veins in rhyolite quartz porphyry and greenstone.

Fournier (P 10604). In northeastern Carscallen township trenching and test pitting were done.

Hazelton Exploration and Finance Company, Limited. The company owns 800 acres in southern Carscallen township, formerly held by Hazelton Porcupine Gold Mines. The development work consists of 5,000 feet of trenching, 60 feet of shaft sinking, and 2,060 feet of diamond drilling.

Hendrickson Claims. On claims P 10957, P 10959, and P 10960, in eastern Carscallen township, considerable trenching and test pitting have been done. Hughes Claims. Some stripping and trenching were done on claims P 10680 and P 10681 in Carscallen township.

Kamiskotia Minerals Syndicate. The company was formed to develop the Ross property in Whitesides township. One thousand seven hundred feet of diamond drilling was done in 1928.

Union Mine and Trust Company. The company owned four claims in the central part of Whitesides township. A shaft was sunk 230 feet on a mineralized chlorite carbonate schist zone. The property has been idle since 1921.

(7) Grassy-Redstone Area

Selected References: Hopkins, P. E.: Notes on McArthur Township; Ont. Bureau of Mines, vol. 21, pt. 1, pp. 278-280 (1912).

Bruce, E. L.: McArthur, Bartlett, Douglas, and Geikie Townships; Ont. Dept. of Mines, vol. 35, pt. 6 (1926).

Gledhill, T. L.: The Grassy River Area; Ont. Dept. of Mines, vol. 35, pt. 6 (1926).

Map No. 35H: Redstone River Area; Ont. Dept. of Mines. Issued 1926.

Map No. 35J: Grassy River Area; Ont. Dept. of Mines. Issued 1926.

SITUATION AND EXTENT

Grassy-Redstone area comprises a north-south belt of Keewatin greenstones west of Matachewan area and extending from West Shiningtree area on the south to within 6 miles of Porcupine area on the north. The southern part is known more specifically as Grassy River area, and the northern part as Redstone River area. Together they form a section three townships wide and seven townships long, from north to south. The south part of the section is accessible from West Shiningtree and in the north there is an old road from Timmins in addition to the water routes.

GEOLOGICAL OUTLINE

The basement rocks consist of Keewatin basic lava flows, slates, and rhyolitic agglomerates and tuffs, dipping at high angles, and cut by large bodies of granite and feldspar porphyry, and dykes of lamprophyre and diabase. In the southern part of the area are patches of flat-lying slate and conglomerate of the younger Cobalt series.

Small quartz veins carrying small amounts of gold are found in many localities throughout the area. Most of the veins occur near stocks or dykes of feldspar porphyry.

HISTORY OF MINING ACTIVITY

Claims were staked in 1908 on the iron formation east of Muskasenda lake, in the northern part of English township. During the two or three years following the discovery of gold at Porcupine in 1909, prospectors working south discovered gold-bearing quartz veins in McArthur and Bartlett townships. A small rush followed and claims were staked about Telluride, Muskasenda, Kitchiming, Montrose, Dumbell, and Horseshoe lakes. During the summer of 1925 there was much prospecting along Redstone river, north and east of Canoe Shed lake, and north of Dumbell lake in eastern Hutt and Halliday townships, and in Cabot township. Gold was found in small quantities, usually in narrow quartz veins near feldspar porphyries. The most important discoveries were made in the southcentral part of Cabot township, and about one hundred and thirty claims were staked in a belt stretching northeast from the southwest corner of the township. The Porcupine Kirkland Gold Mines did considerable surface work on their claims and reported some very favourable assays. This property is the only one in the area that has attracted much attention during recent years.

GOLD DEPOSITS

In McArthur and Bartlett townships gold is present chiefly in small quartz veins reticulating through the shear zones in porphyry intrusives. Gold-bearing quartz veins also cut iron formation and greenstone. In all these types, the veins contain little sulphide and the gold occurs native in the quartz, and in places is rather coarse. If the veins are genetically related to the porphyries, they came late in the igneous activity, because the porphyries were not only solidified but sheared and altered either before or during the introduction of the veins.

Small quartz veins are quite numerous in the northern part of Grassy River area, especially near Telluride, Muskasenda, and Kitchiming lakes, along the Redstone in Semple and English townships, and from there in a southeast direction to Dumbell lake. The veins on Telluride lake contain pyrite and pyrrhotite; those on Muskasenda are pegmatitic, with prismatic quartz crystals, pink feldspar, and little or no sulphides. Although the latter veins are spectacular in appearance assays show that gold values are very low. Veins with sulphide are also found on Redstone river near Horseshoe lake, and a few quartz veins bordered by carbonated and pyritized greenstone occur near Canoe Shed lake. In the eastern part of Halliday and Hutt townships quartz veins appear in sheared Keewatin rock, but the best assays are only 40 cents a ton in gold.

In the south-central part of Cabot township, gold-bearing quartz veins are associated with pink feldspar and quartz porphyries, on the north side of an east-west ridge. One type is a stockwork of vein quartz in porphyry, and other veins occupy sheared zones in the porphyry. The latter type has much pyrite and molybdenite associated with the gold. The assays are reported to run from \$1 to \$14 a ton. Some of the quartz veins have a greasy lustre and streaked appearance. Two ore samples from the Porcupine-Kirkland claims assayed \$15.40 and \$8.40 in gold a ton. The former was vein quartz with pyrite and the latter was vein quartz with chalcopyrite, galena, pyrrhotite, and pyrite.

The most promising vein in the northern part of the area occurs on the Spence claim (T.R.P. 11209), on the east shore of the second expansion of Triple lake, McArthur township. The vein is lenticular and somewhat irregular, varying from 2 to 5 feet in width, and cuts dense, massive greenstone. It strikes north 65 degrees east and dips 60 degrees south at the surface, but becomes more nearly vertical below. The quartz is white and sugary and metallic minerals are abundant, particularly pyrite, chalcopyrite, pyrrhotite, and a little sphalerite. In 1925, gold was visible in half a dozen places on the surface of the vein, and samples from the dump containing no visible metal gave favourable assay results. Development work has been hindered by thick overburden.

MINES AND PROSPECTS

Many claims have been staked in the area, but little development work has been done. The properties that were most actively explored are listed below.

Beemer Township. At the east end of Telluride lake a number of quartz veins are exposed by old trenches.

Cameron-Porcupine Claims. These claims lie west of Marceau lake in Bartlett township. On claim T.R.P. 8992 a shaft was sunk for 30 feet and some trenching was done.

Clear Lake Claims. In the vicinity of the porphyry ridge south of Clear lake in McArthur township numerous pits were sunk, and considerable stripping and trenching done in the early days.

English Township. Claims have been staked at intervals since 1910 on Muskasenda and Ferrier lakes, and in the southeast part of English township. Considerable surface work was done, but no important discoveries were made.

Harrison Claims. This large group of claims extends eastward from Marceau lake for a distance of 2 miles and runs north into McArthur township. In 1924 a great deal of stripping and other surface exploration work was done. A 50-foot shaft was sunk on a band of iron formation on T.R.P. 10828.

Hewitt Mining Company, Limited. The company purchased a group of claims along the McArthur-Bartlett boundary in 1926. Early in 1927 a pit was sunk to a depth of 30 feet on claim T.R.P. 6057. There are no records of further development work.

Hull Claim. At the 2-mile post on the south line of McArthur township surface work was done on a narrow quartz vein in fine-grained, felsitic rock.

Hutt Township. Considerable prospecting has been done on claims in the vicinity of Canoe Shed lake.

Lohner Claims. These claims (T.R.P. 7716 and 7717) are in Mc-Arthur township, just north of the boundary west of Mountjoy creek. Trenches and shallow test pits were dug many years ago on a quartz vein.

Porcupine-Kirkland Gold Mines, Limited. The company has done considerable surface development work on its group of fourteen claims in south-central Cabot township. In December 1934, it was reported that plans were being made to carry on work at the property. Semple Township. Frank Foisey developed a group of twenty claims in the northeast part of Semple. The main trenches and development are situated 30 chains northwest of the crude dam on the Redstone. The pyrite lenses examined are associated with iron formation.

Spence Claim (T.R.P. 11209). This claim is on the east shore of the second expansion of Triple lake, just north of the narrows in McArthur. In 1925 the vein had been stripped in part and from a test pit 6 feet deep numerous specimens containing free gold were obtained.

(8) Hislop-Beatty-Munro Area

Selected References: Hopkins, P. E.: The Beatty-Munro Gold Area; Ont. Bureau of Mines, vol. 24, pt. 1, pp. 171-184 (1915).

 Knight C. W., Burroughs, A. G., Hopkins, P. E., and Parsons, A. L.: Abitibi-Night Hawk Gold Area; Ont. Bureau of Mines, vol. 28, pt. 2, pp. 53-62 (1919).
 Moore, E. S.: The Ramore Area; Ont. Dept. of Mines, 1935.

Map No. 24A: Beatty-Munro Gold Area; Ont. Bureau of Mines, 1915.

Map No. 28B: Gold Area between Lakes Abitibi and Night Hawk; Ont. Dept. of Mines, 1929.

SITUATION AND EXTENT

The Hislop-Beatty-Munro gold area is situated in northeastern Ontario about 10 miles southwest of lake Abitibi. It lies between the Nighthawk Lake gold area on the west and the Lightning River gold area on the east. On the south side is Black River area. The area is named after the most important townships within which gold has been mined or found. In addition to Hislop, Beatty, and Munro townships the outlying townships of Carr, Bowman, McCann, Playfair, and the southern part of Coulson, are also included. The Temiskaming and Northern Ontario railway passes across the area and runs through Ramore and Matheson, both thriving towns in the centre of farming communities. Good roads connect both Ramore and Matheson with the mining locations.

GEOLOGICAL OUTLINE

The rocks are all Precambrian in age and consist of Keewatin greenstones, Timiskaming sediments, and later diabase and porphyry intrusions. Keewatin rocks are predominant and contain the gold-bearing veins. Most of the rocks are basaltic types which occur in a succession of bands 100 feet or more thick. Ellipsoidal structures and amygdaloidal textures are common, and agglomerate and breccia occur at intervals. Vertical iron formation consisting of alternating bands of sugary quartz and magnetite may be seen at several places in Munro township.

A dyke-like mass of quartz-feldspar porphyry about a quarter of a mile wide extends for 3 miles across concession III, Beatty township, and enters Munro township on the east. Smaller porphyry dykes occur here and there throughout the area and intrude both the Keewatin and the Timiskaming.

A band of Timiskaming sediments consisting of greywacke, slate, quartzite, and a little conglomerate runs northwestward for 9 miles from 18888-3
northwest Guibord to lot 13, con. IV, Beatty tp. The sediments appear to be infolded and to lie unconformably on the Keewatin. They now dip at high angles. A mica lamprophyre dyke similar to those that cut the Timiskaming series at Kirkland lake occurs in lot 2, con. II, Beatty tp.

Several dykes of quartz and olivine diabase strike north across the other formations.

The gold-bearing quartz veins are of the pyritic gold-quartz type with transitions to the arsenical type. Gold occurs in Hislop township in wide sheared and replacement zones in the greenstones. Outcrops are scarce throughout the area due to a heavy overburden of glacial drift.

HISTORY OF MINING ACTIVITY

In 1907 gold was found at Painkiller lake and in 1908 another discovery was made on what became the Munro mine (southeast quarter of the south half of lot 10, con. I, Munro tp.). The Gold Pyramid and Detroit-New Ontario companies located properties adjoining the Munro, and all three produced a little gold, but the plants were burned in 1916. The Croesus discovery in 1914 (north half, lot 10, con. I, Munro tp.) was the most important in the area. The ore from the Croesus was probably the richest ever mined in Ontario. About \$259,953 in gold was produced during the four years of its operation between 1914 and 1918. In 1917 the Hill Gold Mining Company produced \$635, but operations were suspended the following year. Many of the other properties were intermittently operated, but it was not until the gold price increased in 1933 that new interest was shown.

In 1933 Amalgamated Goldfields took over the former Blue Quartz mine and actively developed it. Sinking has been carried to 750 feet and a 25-ton cyanide mill is reported to be operating. Coulson Consolidated Gold Mines are developing the former Beatty and Hattie properties. During 1934 about 1,000 feet of underground work was done and further shaft sinking was planned for 1935. Edgecreek Syndicate were active in 1934 on their Beatty Township property, and Talisman Gold Mines in Guibord township. The Croesus was taken over in 1930 by Munro Croesus Gold Mines. A small mill is used and a little gold has been produced each year.

Throughout the summer and autumn of 1934 Hislop and Playfair townships were the scene of great activity, occasioned by the finding of high-grade float. Intensive diamond drilling and surface work were done by a score of companies including McIntyre, Mining Corporation, Sylvanite, and Noranda, and by December Hollinger was prospecting its property by a shaft, with crosscutting on the 160-foot level. Of the smaller companies, Hislop Gold, Golden Arrow, Vimy Gold, Ramore Gold, and Bowman-Matheson have also been vigorously exploring their claims.

GOLD DEPOSITS

In Beatty and Munro townships, gold occurs in quartz veins of the fissure type in rocks of Keewatin and Timiskaming age. In Munro most of the veins strike nearly east and dip at high angles to the south, but at Painkiller lake some of the veins strike northeastward. Most of the veins are small, rarely over a foot in width, and in places form a stockwork of tiny stringers. The quartz is characteristically much fractured and appears to consist of several generations. There are always small quantities of pyrite, chalcopyrite, pyrrhotite, galena, or arsenopyrite. Tellurides in a very fine state of subdivision have been seen in the goldbearing veins near Painkiller lake, but not in Munro township. The gangue minerals are largely fractured quartz with some carbonate, sericite, and chlorite. Molybdenite occurs on the Abate claim and tourmaline has been found on one claim.

In Hislop and Playfair townships the quartz veins do not carry much gold, but in a number of places over fairly wide zones the greenstones have been fractured, sheared, and mineralized by an abundance of carbonate and fine pyrite. Syenite and feldspar porphyry dykes are in places sufficiently mineralized to constitute low-grade ores.

Diamond drilling at the Hollinger prospect has indicated two orebodies, one about 300 feet long and 50 feet wide assaying 0.2 to 0.25ounce of gold a ton, the other of lower grade, 90 feet wide and of undetermined length. They strike approximately north. At the McIntyre prospect a mineralized zone, about 200 feet wide, in silicified basalt adjacent to a 40-foot syenite dyke, is being tested. The dyke strikes northwest and the gold is found mainly along the northeast side of the zone. Samples taken across the 200-foot zone are very erratic in gold and many sections have little value. It has been traced for only 400 feet as low ground is encountered at both ends. Sampling at the Golden Arrow has indicated an ore shoot 120 feet long and from 10 to 15 feet wide with an average value of \$5 to \$8 a ton (value in 1935), and assays averaging \$4.50 a ton over a width of 3 or 4 feet were obtained from a syenite dyke on the northeast part of the property. Reports from Vimy Gold state that drill-hole intersections were on the whole better than surface sampling, with gold ranging from 0.10 ounce to 7.70 ounces over 5-foot widths. Surface assays over a vein length of 600 feet returned as much as 0.51 ounce a ton over widths of 1 to 4 feet.

The Croesus vein in Munro township strikes north and dips 26 degrees east in fairly massive Keewatin diabase and pillow lava. The quartz vein is about 200 feet long and is somewhat lenticular in form. It varies in width from a few inches on the north to a few feet on the south where it is cut off by a series of east and west faults. A small, faulted part of the vein has been located and was offset to the west. In sinking the shaft in 1914 one piece of ore weighing 765 pounds yielded \$47,000 worth of gold.

The veins at the Coulson Consolidated mine occur in rusty, altered pillow lavas which have been intruded by hornblendite, peridotite, and serpentine. The peridotite is cut by feldspar porphyry, which in turn has been intruded by quartz diabase. The gold-bearing quartz veins are quite numerous, but usually narrow. They vary from 1 inch to 1 foot in width with lengths up to a few hundred feet. Most of them strike northeast and are approximately vertical. The veins carry appreciable amounts of gold and bismuth tellurides, and nearby country rock has been impregnated in places with much pyrrhotite, pyrite, and chalcopyrite.

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Recent information regarding the Amalgamated Goldfields work is not available, but the early work was done on a small quartz vein carrying visible gold, telluride, and pyrite. To the north the vein is covered by a lake. On the adjoining claim to the west a quartz vein 7 feet wide, containing arsenopyrite and pyrite, carries low gold values at the surface.

MINES AND PROSPECTS

Some very rich gold ore was mined in the area prior to 1917, particularly at the Creosus mine. The most actively explored properties are listed below.

Abate Claim. The claim is on lot 4, con. I, Beatty tp. In 1915 the Hudson Bay Mining Company sank a number of pits and did some trenching on mineralized quartz veins in greywacke schist.

Amalgamated Gold Fields Corporation, Limited. The company is developing the former Blue Quartz Gold Mines property, consisting of 600 acres, at Painkiller lake, Beatty township. Prior to 1921 the Santa Lucia Gold Mines and Cartwright Goldfields controlled these claims. Cartwright Goldfields sank a shaft to 100 feet between 1912 and 1914. The Blue Quartz Gold Mines did a great deal of underground work between 1921 and 1928. Amalgamated Goldfields took the property over in 1933 and have been operating the mine since. Development work consists of a main shaft down 500 feet with a winze to 750 feet. Levels are established at 100, 200, 500, 625, and 750 feet with about 11,000 feet of lateral work. A 25-ton cyanide mill is operated intermittently.

American Eagle Mining Company. The claim is situated in the south half of lot 1, con. I, Munro tp. In 1911 a shaft was sunk to 70 feet and 30 feet of drifting and 65 feet of crosscutting done. The mine was closed in 1912 and in 1916 the plant was burned.

Beatty-Waterloo Gold Mines, Limited. The company owns a gold prospect consisting of 152 acres in Beatty township. Surface work only has been done (1932).

Bowman-Matheson Gold Syndicate. The syndicate holds six claims in the south-central part of Bowman township. Two veins had been located in the autumn of 1934 by surface exploration.

Brown-Munro Mines, Limited. The property consists of 110 acres in lot 2, north half of con. I, Munro tp. Between 1916 and 1920 the former Burton-Munro operators sank an inclined shaft to 300 feet with levels at the 150-foot and 300-foot horizons. About 2,000 feet of drifting and crosscutting and 1,000 feet of diamond drilling were done.

Buff-Munro Gold, Limited. The company owns four claims on the north half of lot 7, con. I, Munro tp. Surface trenching and shaft sinking commenced in 1916. The shaft was deepened to 90 feet in 1927 and 40 feet of drifting done. Inactive.

Clifford Gold Mines, Limited. The claims are on the north side of Painkiller lake, in Beatty township. The property was explored in 1924-25 by a shaft to 100 feet and by four diamond drill holes. Inactive. Coulson Consolidated Gold Mines, Limited. The company is developing the old Beatty and Hattie properties on the boundaries between Coulson and Beatty townships. There are three old shafts sunk to depths of 240, 300, and 400 feet, respectively. Operations were resumed in May 1934, and 900 feet of lateral work done by the end of the year. Shaft sinking was planned early in 1935.

Croft-Ramore Gold Syndicate. The property comprises twelve claims in McCann township. Surface exploration was in progress during the autumn of 1934.

Detroit New Ontario. The claim is in the southwest corner of lot 10, con. I, Munro tp. Work commenced here in 1909 with the sinking of a shaft to 80 feet. In 1914 the shaft was down to 100 feet with 200 feet of drifting and crosscutting. Some ore was milled with a small stamp mill, but the plant burned in 1916.

Dunlop Claim. This claim is situated on the south side of Painkiller lake. In 1914 a 20-foot pit was reported to have been sunk on a 7-foot quartz vein.

Edgecreek Consolidated Gold Syndicate, Limited. The syndicate owns 570 acres in Beatty and Munro townships. A shaft was sunk to 22 feet in 1934 and a vigorous diamond drilling campaign was reported late in the year.

Fox-Munroe Mines, Limited. The company owns a prospect comprising 285 acres in Munro township. A shaft was sunk several years ago to 100 feet. Now inactive.

Gold Pyramid. The old Gold Pyramid mine is in lot 11, con. VI, Guibord tp. In 1911 a shaft was sunk and some bullion produced in a 5-stamp mill. The veins are in a quartzite schist. In 1916 the surface plant burned.

Golden Arrow Gold Mines, Limited. The claims are in the southwest corner of Hislop township. Surface trenching and diamond drilling were done in the autumn of 1934.

Hill Gold Mining Company, Limited. The company owns 160 acres, the northwest quarter of the north half of lot 11, con. V, Beatty tp. In 1917 and 1918 a shaft was sunk to 125 feet and a 50-ton ball mill built. Bullion valued at \$635 was recovered from a trial run prior to suspension of operations in the autumn of 1918. The Premier Gold Mining and Exploration Company carried the shaft to 200 feet in 1920 and 450 feet of lateral work was done.

Hislop Gold Mines, Limited. The company is developing a property in the eastern central part of Hislop township. A shaft was sunk 70 feet early in 1934. In the autumn a new find on the west part of the property was under development. Trenching, sampling, and diamond drilling were in progress. An electrical survey was made in 1935.

Hollinger Consolidated Gold Mines, Limited. Hollinger's property is in the southeast part of Hislop township. In 1934 considerable diamond drilling was done, a shaft was sunk to 160 feet, and two ore-bodies explored by crosscutting and drifting. By August 1935, the shaft was completed to a depth of 500 feet and drifting was proceeding on the 150-, 300-, and 450-foot levels. About 1,300 feet of drifting and crosscutting were done on the first level. It is expected that the 100-ton mill now under construction will be in operation early in 1936.

Mayot Claims. The Mayot or Treadwell claims are situated in the southeast corner of lot 9, con. VI, Beatty tp. A 20-foot pit and 32-foot shaft were reported in 1918 to have been sunk on mineralized quartz veins.

McGregor-Hislop Mining Syndicate. The syndicate holds thirty-four claims in the southwest corner of Hislop township. Surface exploration and some diamond drilling were done in 1934.

McIntyre Porcupine Gold Mines. McIntyre controls a large number of claims in Hislop township situated just north of the Hollinger and Mining Corporation claims. An intensive diamond drilling program was in progress during the autumn of 1934 and the winter of 1935, with thirtyeight men employed.

McMaster Claims. In con. V, lot 9, Beatty tp. Surface trenching and test pitting were last reported in 1918.

Mining Corporation of Canada. The company owns a group of claims adjoining Hollinger in the east part of Hislop township. Diamond drilling is planned early in 1935.

Mobb Claim (1187). The claim occupies the northeast quarter of the south half of lot 9, con. IV, Playfair tp. Test pits were sunk on quartz calcite veins in 1909.

Munro Mines. The earliest operations in the area were at this property in the southeast corner of lot 11, con. I, Munro tp. A shaft was sunk 92 feet on a narrow quartz vein in slate and drifting done on the 60-foot level. Operations ceased in 1910.

Munro Croesus Mines, Limited. The property comprises the northeast quarter, north half of lot 10, con. I, Munro tp. Croesus Gold Mines operated the mine from 1914 until 1918. A shaft was sunk to 425 feet with stations every 100 feet, and the upper three levels were mined. With a 50ton Hardinge ball mill, 12,470 ounces or \$259,953 in gold were recovered. The present owners since 1930 have produced a little gold with a small mill.

Noranda Mines, Limited. The company has optioned a group of claims on lots 12 and 13, con. V, Playfair township, known as the Darling. Surface exploration was under way in 1934.

Painkiller Lake Gold Mining Company. The company owned the northwest claim on lot 7, con. VI, Beatty tp. In 1914 a shaft was sunk for 94 feet. Inactive.

Potter Doal Mines, Limited. The company owns forty-one claims in concessions V and VI, Munro township, and concession I, Warden township. Work started in January 1927, and shafts were sunk to 125 and to 200 feet. Copper ore with low gold values was shipped to Noranda in 1929. Now inactive.

Quinn Claims. The claims occupy the north half of lot 1, con. IV, Hislop tp. In 1918 an 85-foot shaft was sunk on a quartz vein in greenstones.

Ramore Gold Mines, Limited. The company owns a number of claims in Playfair township. Four drill holes were drilled on a wide, mineralized zone in 1934.

Robb Montbray Mines, Limited. The company drilled thirteen holes about 600 feet north of the Golden Arrow line late in 1934, but dropped their option.

Sylvanite Gold Mines, Limited. The company owns a number of claims adjoining Vimy mines in Hislop township. Trenching and sampling of quartz veins and shear zones were in progress during 1934.

Talisman Gold Mines, Limited. The company owns six claims on lots 7 and 8, con. VI, Guibord tp. The Gardner Guibord, original owners of the mine, sank a shaft to 125 feet and did some crosscutting on the 100-foot level in 1924. The new owners did considerable underground work in 1934.

Turcott Claim. In the southeast quarter of the south half of lot 6, con. II, Bowman tp., trenching in 1918 disclosed several narrow veins.

Vimy Gold Mines. The Vimy gold mine is in lot 11, con. I, Hislop tp. A 50-ton mill was erected and put into operation in 1935. Ore was drawn from an open-cut where the vein runs through a large hill of greenstone.

(9) Horwood Lake Area

Selected References: Bannerman, H. M.: Mineral Deposits of the Eastern Part of Rush River Map-area, Woman River District, Ontario; Geol. Surv., Canada, Sum. Rept. 1928, pt. C. See also 1929, pt. C.

Laird, H. C.: Notes on Horwood Lake Area; Ont. Dept. of Mines, Preliminary Report, 1935.

Map No. 290A: Rush Lake Sheet; Geol. Surv., Canada. Issued 1933.

Map No. 1933A: Kamiskotia-Ridout Area; Ont. Dept. of Mines. Issued 1933.

SITUATION AND EXTENT

Horwood Lake area adjoins the northeast corner of Swayze area. It includes the unsurveyed territory about Horwood lake and also Keith, Penhorwood, and parts of Ivanhoe and Hardiman townships. The Canadian National Railways line northwest of Sudbury traverses Penhorwood and Keith townships and a good water route leads from Groundhog River station to the scene of most active staking at the southern end of Horwood lake.

GEOLOGICAL OUTLINE

The area occupies the north end of a large body of Keewatin and Timiskaming rocks that extends southwest through the Swayze gold area. This body of rocks is completely surrounded by granite. The area is largely underlain by the Keewatin series. This consists of massive pillow lavas, pyroclastics, iron formation, bands of clastic sediments, bodies of intrusive greenstone, and a few ultrabasic or peridotite dykes. In some places the rocks have been so intensely altered that they are green and greenish grey schists. A large number of dykes and sills of quartz diorite, quartz porphyry, and feldspar porphyry intrude the Keewatin. Gold-bearing quartz veins occur in shear zones and fissures in the Keewatin near the intrusive rocks.

HISTORY OF MINING ACTIVITY

The occurrence of gold-bearing quartz veins in this area was known as early as 1909, but no intensive prospecting seems to have been done until very recently. There was a small staking rush in 1918 following the discovery of gold on the Jessop property. The Nipissing Mines Company, Limited, took an option on this property a few years later, but while they were engaged in testing it, the Spruce Falls Pulp and Paper Company built a dam on Groundhog river which raised the water-level several feet and flooded the showings.

Late in 1933, prospectors working northeast from Swayze found visible gold at the Thorne location, just east of the 24-chain portage on Swayze river. A second small rush followed and about 300 claims were staked about the junction of the south and northeast arms of Horwood lake. During the summer of 1934 visible gold was uncovered on four different groups of claims, in some cases in spectacular quantities. So far operations have been confined largely to surface exploration. In 1935 the Hollinger Mining Company took an option on a large group of these claims.

GOLD DEPOSITS

At the Swayze River property the country rock is mainly greenstone extensively intruded by feldspar porphyry dykes and quartz diorite bosses. The best showing is on the east slope of a prominent north-trending ridge on claim S 24974, where visible gold was found in spectacular quantities in two of the test pits. The greenstone has been folded into small, welldefined folds, and a bedded appearance has developed. Narrow quartz stringers carrying visible gold and some pyrite are found mainly on the flanks of the folds.

On the Horwood Peninsula property a mineralized vein occurs at the northwest corner of claim S 25369. It has been traced from lake-level over a high hill for a distance of about 450 feet. The strike is north 70 degrees west and the dip 70 degrees north. It is mainly a rusty, silicified zone carrying moderate quantities of fine-grained sulphides over an average vein width of somewhat under 3 feet. The best part of the vein is $4\frac{1}{2}$ feet wide over a length of about 100 feet, and carries considerable quantities of fine-grained pyrrhotite and chalcopyrite, with some free gold. The country rock is a massive, pillowed andesite intruded by tongues of porphyry.

Groundhog Gold Mines, Limited. It is reported that the Nipissing Mines Company received encouraging results when developing this property. The vein matter was stated to be of high grade and was stripped for a length of 96 feet. Over this distance it had an average width of nearly 2 feet.

Moramo Gold Syndicate. A shear zone that attains a width in some places of about 66 feet has been traced in a northeast direction for over 1,000 feet. There are several quartz stockworks within this zone and they carry moderate quantities of pyrite, pyrrhotite, and chalcopyrite. Most of the stockwork veins follow the direction of shearing and dip to the north. The country rock for the most part is of massive, pillowed andesite lava. Immediately bordering the vein the wall-rocks have been altered to a carbonated greenstone. Gold values as high as 0.33 ounce a ton over a channel width of 6 feet were found in preliminary sampling tests.

W. E. Smith. In October 1933, Mr. Smith discovered a massive quartz vein in pillowed andesite on the east shore of the lake on what is now claim S 25339. It has an average width of about 30 inches and has been exposed for only 60 feet, the easterly extension from the lake being heavily drift-covered. The strike is north 83 degrees east and the dip is 45 degrees north. The quartz is a dark, smoky variety containing tourmaline, moderate quantities of pyrite, sphalerite, and chalcopyrite, and occasionally some visible gold. Channel samples are stated to have yielded as high as 0.75 ounce of gold a ton over vein width.

Geological conditions are favourable throughout the area for the deposition of gold-bearing veins. Both quartz and sulphide veins have been shown upon preliminary sampling to carry gold in economic quantities. It follows that further prospecting and development work is to be recommended.

MINES AND PROSPECTING

Although the area has been prospected since 1909 it has attracted the attention of mining companies only recently. Below is a list of the properties that have been most active.

Groundhog Gold Mines, Limited. The company has acquired the Jessop-Seery group of twelve claims situated on the east shore of Horwood lake opposite the outlet of Swayze river. A number of years ago the Nipissing Mines Company did considerable work on ground that has since been flooded due to the building of a dam on Groundhog river. Further development work from higher ground is planned by Groundhog Gold Mines.

Lafever-Anderson Claims. During the field season of 1934 six men were engaged in surface exploration on a group of ten claims on the west side of the south arm of Horwood lake.

Moramo Gold Syndicate. The syndicate owns a group of twelve claims on the west side of the south arm of Horwood lake and just north of the north boundary of Dale township. During the summer of 1934 considerable cross-trenching and test pitting were done.

W. E. Smith. The Smith group of twenty-six claims lies on the east side of Horwood lake near the junction of the south and northeast arms. Little work has been done, but a diamond drilling campaign was planned for early in 1935.

G. A. Thorne. The Thorne interests hold two groups of claims, the Swayze River group of twelve claims, and the Horwood Peninsula group of ten claims. The former lies east of the 24-chain portage on Swayze river and north of the 3-mile post on the north boundary of Newton township. During the summer of 1934 a number of test pits were sunk and surface operations disclosed fourteen different quartz leads on this property. On claim S 25369, of the Horwood Peninsula group, ten test pits were sunk on a mineralized break over a distance of 450 feet.

Other Properties. During the summer of 1934 assessment work was performed on the following properties: Campbell-Backman, Gould-Dunn, Landry-Taylor, and C. E. O'Neil. No important discoveries were reported.

(10) Kamiskotia Area

Selected References: Finley, F. L.: Kamiskotia Gold Area; Ont. Dept. of Mines, vol. 34, pt. 6 (1925).

Graham, A. R.: Groundhog-Kamiskotia Area; Ont. Dept. of Mines, vol. 40, pt. 3 (1931).

Map No. 34F: Kamiskotia Lake Gold Area; Ont. Dept. of Mines. Issued 1925. Map No. 1933A: Kamiskotia-Ridout Area; Ont. Dept. of Mines. Issued 1933.

SITUATION AND EXTENT

The Kamiskotia gold area is a group of seven townships in each of which gold has been discovered at intervals since 1910. These townships in approximate order of importance are as follows: Robb, Turnbull, Godfrey, Jamieson, Côté, Byers, and Massey. Kamiskotia lake from which the area is named lies in Robb township. It is located about 15 miles northwest of Timmins and may be reached by way of Mattagami river and Kamiskotia creek.

GEOLOGICAL OUTLINE

The rocks of the area are all Precambrian in age and the proportions are about equal between the Keewatin volcanics and later intrusives. No sedimentary rocks occur except a few chert beds.

The Keewatin rocks occur mainly in Turnbull, Godfrey, and Jamieson townships, though small exposures are numerous in Byers and Côté. They comprise acid and basic flows along with their fragmental phases. These have been closely folded and now occupy vertical, or almost vertical, positions. Both have been rendered more or less schistose, but the acid flows, which are considerably in excess of the basic, were a little less altered.

Three large, boss-like bodies of gabbro have invaded the Keewatin. The first centres about Kamiskotia lake, and the second forms most of the exposures in the west half of Turnbull and the east half of Massey. The third and smaller mass outcrops in concession V, Godfrey township, and extends westward into Turnbull township. Intruding the gabbro and older rocks are many stocks, dykes, and irregularly shaped bodies of granite and other acid rocks. Their wide distribution and the known occurrence of great masses of granite to the south and west suggest that these stocks are the upward cupola-like extensions of an underlying granite batholith.

Gold-bearing quartz veins occur most abundantly in small granite stocks near porphyry dykes. Some veins are well-defined, lenticular bodies, but most occur as reticulating quartz veinlets forming deposits of the stockwork type. The quartz veins are also found in greenstone and gabbro, and rhyolite, but those in rhyolite appear to be barren.

Eighty per cent of the area is covered by sand, gravel, and bouldery deposits of glacial origin.

HISTORY OF MINING ACTIVITY

Intermittent prospecting and development work has been carried on since 1910, and about thirty properties with interesting surface showings of gold-bearing quartz were found. Since 1926 several base metal discoveries were made, the principal ones on the Hollinger claims in Robb and Jamieson townships, a mile north of Kamiskotia lake, and on the Aconda claims in the northern part of Godfrey township.

Between 1926 and 1929 the De Santis Gold Mining Company developed its property in the southwest corner of Turnbull township by a shaft, with 1,000 feet of lateral work on the 125-foot level. On the Aconda (Steep-Shehan) claims, thirteen diamond drill holes were bored in 1928, and a considerable body of auriferous copper and zinc ore was found. The Hollinger sulphide body, which was tested about the same time, carries no gold. On numerous other mining locations development work was confined to surface trenching, test pitting, stripping, and sampling So far no commercial gold quartz ore-bodies have been proved in the area, but at the high prevailing price for gold it may be that the porphyry stockworks can be mined on a large scale at a profit.

GOLD DEPOSITS

Most of the gold-bearing veins occur within or near acid stocks and dykes. Some veins are well-defined lenticular bodies between sheared walls. Others are reticulating quartz veinlets forming deposits of stockwork type. The native gold occurs with pyrite and chalcopyrite, generally in fractures in the quartz, and pyrite also replaces the wall-rock to some extent. Calcite, ankerite, and chlorite are always present, though in very variable amounts. The latter forms streaks or lenses in the veins and cuts the wall-rocks in narrow veinlets. The carbonates in many cases form a selvage on the sides of the veins. Tourmaline, purple fluorite, and specularite occur rarely.

The following descriptions will illustrate in more detail the nature of the various types of deposits.

De Santis. The vein explored by the De Santis Gold Mining Company lies in a small body of granite that intrudes gabbro on the south and is cut by a large diabase dyke on the west. The dyke parallels and is 6 feet distant from the vein, which strikes north 13 degrees west, and dips vertically. At the surface the vein is 170 feet long and 4 feet wide. On the south it pinches out and at the north end breaks into a number of stringers that extend to the edge of the outcrop, a distance of 50 feet. The width widens to 5 feet at the bottom of an 8-foot pit near the centre of the vein. There are no available reports dealing with the development of the vein on the 125-foot level.

Jamieson Claims. Claims P 6501 and 6502 about one-half mile southeast of Kamiskotia lake. The country rock is a gabbro cut by aplite dykes and by still younger dykes of diabase. In parts of the aplite there are numerous, small, branching quartz veins and stringers tending to form deposits of the stockwork type. A good deal of rusty weathering carbonate and chlorite are associated with the quartz, which is mineralized with pyrite and chalcopyrite. Tourmaline is present in the aplite but not in the veins. Native gold occurs in many veins, and some of the showings are spectacular. The pyrite is auriferous and when roasted and panned gives a good tail of fine gold. Small, gold-bearing veins also cut the gabbro adjacent to the aplite dykes.

Luisakoff-Hill. The small granite stock southeast of Kamiskotia hill is cut by quartz stringers, sparsely mineralized with pyrite but containing many small specks of native gold. At several places native gold also occurs in the rock itself. At first sight it would appear to be a primary constituent, but actually it occupies minute fractures. Purple fluorite also occurs under the same conditions, and both were evidently introduced by late emanations of the cooling magma. The small quartz veins show no tendency to follow the joint planes and in some cases are displaced by them for a few inches.

MINES AND PROSPECTS

The area has been prospected since 1910 but is not yet a producer of gold. The most active properties are listed below.

American Porcupine Mining Company. On the Christmas or Herdt claim, P 5489, in the northeast corner of Turnbull township, a 5-foot vein was traced for 300 feet across a gabbro outcrop. A shallow shaft was sunk and buildings erected prior to 1915. The company has been inactive for years.

Big Dutchman Claim. Claim No. P 8955 lies half a mile southwest of Kamiskotia lake. A 5-foot quartz vein occupying a sheared zone in gabbro was traced for 300 feet (1925).

De Santis Gold Mining Company, Limited. In 1920 gold was discovered on claim P 8604 in the southwest corner of Turnbull township. Between 1926 and 1929 a shaft was sunk to 150 feet and the vein explored on the 125-foot level by 1,000 feet of drifting and crosscutting. A shipment of 5,500 pounds of picked ore was made in the winter of 1924 and returned \$140 a ton in gold. Devanney Claim. On claim P 1152 situated three-quarters of a mile northeast of the De Santis, a mineralized sheared zone in diabase has been traced for over 300 feet.

Evans Claim. On claim P 8197 a great deal of trenching has been done on quartz veinlets in quartz porphyry dykes intruding greenstone.

Gibson Claim. A quartz vein in the granite on claim 14611, lying northwest of the Lally, is said to have yielded spectacular gold showings in the early days. Two small shafts were sunk.

Hughes Claims. The property lies along the southeast boundary of Turnbull township. Considerable trenching has been done and gold observed in a quartz stringer cutting quartz porphyry.

Jack Claims. A quartz vein on claim P 8667 in Jamieson township was traced for 120 feet before passing under overburden. In Côté township considerable trenching has been done on claims P 13108-09 and 16851-52 on mineralized schistose porphyry.

Jamieson Claims, Robb Township. In 1913 gold showings were found in quartz veinlets cutting aplite dykes on claims P 6501 and 6502. Since then the property has been twice optioned and three shafts were sunk to about 40 feet. Numerous deep trenches have been cut in the drift and many test pits sunk. On the south boundary of Robb township near the fifteenth mile post, several pits have been sunk on a quartz vein in the porphyry on claims P 6009 and 6010.

Godfrey Township. At the northwest edge of the granite stock in concession VI, aplite granite is cut by reticulating quartz stringers bearing auriferous pyrite. Stripping and trenching have been done.

Byers Township. The Jamieson Exploration Company has trenched and blasted a wide mineralization zone in schistose quartz porphyry on claim P 17330 in the northern part of the township.

Labrosse Claim. The largest vein in the area was found on claim P 10758 about a mile south of mount Rutledge. It was stripped for 160 feet along the strike.

Lally Mine. The claim (No. 9779) is situated near the east boundary of Turnbull township, about 3 miles from the north boundary. In 1914, two shafts, 40 and 60 feet in depth, had been sunk and the 60-foot shaft was to be continued to the 100-foot level where drifting was to be done in porphyry cut by quartz veins.

Luisakoff-Hill Claims. These claims lie south of Kamiskotia lake in Robb township. In August 1924, the Homestake Company of South Dakota cut rock trenches and sampled the property carefully.

Luisakauf Claims. Claims P 16861 and 16862 in Côté township were optioned by the Hollinger in 1927. A quartz vein 2 feet wide, contained in carbonate sericite schist, was tested by two shallow diamond drill holes totalling 235 feet. Magavern Claim. In concession IV, Godfrey township, a number of pits were sunk on a quartz vein in the small granophyre stock.

Porcupine Western Gold Mines. The principal showing is on claim 10346 in Turnbull township. Sheared greenstone is cut by quartz stringers containing pyrite. Surface work only was done.

Smith Claim. Two chains east of Keeley lake, on claim P 13942 in Godfrey township, a number of pits were sunk on small quartz veins in rhyolite.

Steep-Shehan Claims (Aconda). These claims are situated in lots 9, 10, and 11, con. III, Godfrey township. In 1927 stripping and trenching on claims 9111, 12049-52, showed copper, zinc, and gold. In 1928 thirteen diamond drill holes were bored totalling 4,500 feet. The main sulphide discovery is on claim No. 12049.

(11) Kenogami Lake Area

Selected References: Cooke, H. C.: Kenogami Lake and Round Lake Areas; Geol. Surv., Canada, Mem. 131 (1922).

Map No. 1926: Kenogami Lake Area; Geol. Surv., Canada, 1922.

Map No. 1927: Round Lake Area; Geol. Surv., Canada, 1922.

SITUATION AND EXTENT

Kenogami Lake area, comprising the townships of Grenfell, Bompas, Holmes, Burt, Eby, Blain, Gross, Flavelle, Otto, and Marquis, occupies the territory intervening between Matachewan and Kirkland Lake areas.

Both the Temiskaming and Northern Ontario railway and the Ferguson highway pass through the northeastern part of the district, making it conveniently accessible. The southwestern corner may be reached by way of Elk Lake and the Matachewan highway.

GEOLOGICAL OUTLINE

Prospecting has been confined to a belt of Keewatin greenstones and sediments that extend eastward in a broad syncline from Matachewan through the townships of Holmes, Burt, Eby, Grenfell, and Otto. Numerous stocks and dykes of igneous rocks of various types, including red syenite porphyry, pink syenite, and dark grey diorite intrude the greenstones in various places and a large, coarse-grained granite batholith flanks the southern part of the area. A large part of Burt, Bompas, and Flavelle townships is underlain by rocks of Cobalt age, consisting of an almost flatlying basal conglomerate with overlying greywacke and quartzite.

The Keewatin lavas are composed largely of basalt and andesite flows, many of them porphyritic. Amygdaloidal textures and pillow structures are common. A number of tuff bands occur and the positions of the chief ones are shown on Maps 1926 and 1927. As a whole the greenstones have been closely folded and the strata thrown into almost vertical, in some cases slightly overturned, attitudes. The tuff bands in Gross, Eby, and Otto townships form part of the south limb of a broad syncline, and the basalt mass around the Burt-Dunmore corner which dips to the south, forms part of the north limb of the syncline.

Gold occurs in quartz veins and in mineralized and silicified shear zones in the greenstones. In Holmes township a brownish dyke of syenite porphyry carries fairly high gold values.

HISTORY OF MINING DEVELOPMENT

At the time of Cooke's geological work in the area in 1919 a number of claims had been staked, but very little work had been done. Some underground work was done at the Baldwin in 1917 and 1918, but no important discoveries were made. Between 1926 and 1928 the Four Nations Reserve Mining Company sank a shaft to 500 feet and explored their property on four levels with 2,500 feet of lateral work, but results did not justify further work and the property was shut down. In 1928 both Grenfell-Kirkland Mines and the Alschbach Gold Mining Company became active anad some underground work was done. Many smaller operators, such as the Matabanick Kirkland, Blanche Bay, and Lady Lou, were actively doing surface work about this time, but there were no outstanding finds.

In 1933 the Kirkland Consolidated Gold Mines put down a shaft to 265 feet on their claims in the north part of Grenfell township and did about 1,000 feet of lateral work on three levels. Underground exploration and diamond drilling were continued late in 1934. Four Nations Consolidated Gold Mines carried out an extensive underground program in 1934 on the former Four Nations Reserve property, but results were again disappointing. The former Baldwin mine was leased in 1934 by the Lucky-Kirkland Gold Mines. According to press reports it was the intention to open the mine early in 1935 and install a small mill for treating the ore. Several properties in the southwest part of the area have received attention during the last two years, but only surface work has been done.

Development work has indicated that the gold is very erratic in distribution and that ore shoots are small.

GOLD DEPOSITS

Cooke described the gold occurrences in 1919 as follows:

"A number of claims have been staked throughout the district on the tuff bands in the Keewatin. Concentrations of sulphides, particularly of pyrite and pyrrhotite, occur in the tuffs here and there, and are said to carry values in gold, silver, platinum, and nickel. Small bodies of these minerals have been found in lot 2, con. I, Burt tp., in lots 11 and 12, con. V, and lot 12, con. IV, Otto tp., and other unprospected bodies were observed by the writer south of Otto lake, in lot 8, con. V, Otto tp.

"The deposits exposed at the surface do not appear to be large. In those south of Otto lake, where exposures are especially good owing to the removal of all vegetable growth by a recent fire, the sulphide impregnation is confined to certain beds, particularly those of coarse tuff, and dies out fairly rapidly along the strike of the beds. In places the impregnation is sufficient to convert the rock into a solid mass of sulphides, but is commonly much less than this. It is doubtful if any of the deposits will develop into working mines, even if the values in them should be high."

Considerable attention has been paid to the southwestern part of Holmes township during the past few years. On the Brookbank claims, a 12-foot dyke of brownish syenite porphyry carries considerable gold, but extensive surface sampling done by the Agaura Exploration Company in 1933 showed the distribution to be very erratic. A well-mineralized quartz vein occurs on the Matt Allen claims in Flavelle township. It has been examined and sampled by several mining companies, but the gold content was found to be too low to be commercial.

Underground work at the Four Nations mine in Grenfell township has disclosed three types of veins in the greenstones as follows:

(1) Quartz veins, lenticular in shape with average widths of about 2 feet and lengths up to 200 feet. The quartz varies from white to bluish grey and in places is sparingly mineralized with pyrite. Gold distribution is very erratic, much of the quartz being barren, and pyrite is not auriferous.

(2) Pink and white calcite veins comparable in size with the quartz veins. Some of these contain a little gold but most of them are barren.

(3) A shear zone having a length of several hundred feet and consisting of thin sands of altered greenstone separated by narrow quartz veinlets and stringers. This shear zone yielded the most consistent assays, the gold content at the present price being about \$7 over a width of 20 feet at two different intersections.

The majority of the veins and also the shear zone have a northeast strike and a steep dip to the south. Slight fault movements occurred along the veins both during and after vein formation.

The Baldwin mine, now being operated by Lucky Kirkland Gold Mines, Limited, is at the western end of the Kirkland Lake Timiskaming syncline. The rocks are Keewatin basalt schists and Timiskaming sediments intruded by syenite and reddish feldspar porphyry dykes. Several, small, gold-bearing veins strike nearly east and west. The gold is extremely fine grained and always occurs with the quartz. The ore resembles that of the outlying Swastika and Kirkland Lake deposits.

Information regarding ore occurrences at the Kirkland Consolidated, Grenfell Kirkland, and Alschbach mines is not available, but as the country rock throughout the northern part of Grenfell township consists of Keewatin greenstones, the veins are probably comparable with those at the Four Nations property.

MINES AND PROSPECTS

The area has been actively explored in recent years but is not yet a producer of gold. The most active properties are listed below.

Algo-Kirk Gold Syndicate. The claims are in Grenfell township. Some surface work has been done. Alschbach Gold Mining Company, Limited. The company owns a group of claims in the north part of Grenfell township. In 1928-29 a shaft was sunk to 160 feet and 200 feet of drifting and crosscutting were done. About 600 feet of drilling was done on the 125-foot level. Work was resumed during the summer of 1934 and the shaft deepened.

Blanche Bay Syndicate. The syndicate owned claims L 6973, 6974, and 8218 near Kenogami station. In 1922 a shaft 22 feet deep was sunk on a vein in greenstone.

Brookbank Claims. The claims are in Holmes township. In 1933 the Agaura Exploration Company optioned the property and did extensive surface sampling.

Cheltonia-Swastika Mines, Limited. The company owns five claims in Eby and Otto townships, on which extensive surface prospecting has been done and about 3,000 feet of diamond drilling completed.

F. Graff. The Graff claims are situated in Burt township just west of the Eby boundary. Considerable surface trenching and sampling on shear zones and quartz veins in greenstone have been done.

Four Nations Consolidated Gold Mines, Limited. The property consists of twelve claims half a mile west of Kenogami station in Grenfell township. Between May 1926, and October 1928, the Four Nations Reserve Mining Company explored the property by a shaft to 526 feet with 2,500 feet of drifting and crosscutting, including a 600-foot crosscut south on the 500-foot level. The new operators worked the property from November 1933 until the summer of 1934. Further crosscutting and drifting were done, including a long drive to the north on the 500-foot level and one diamond drill hole to intersect a series of narrow quartz veins ("bonanza dyke").

Grenfell-Kirkland Mines, Limited. The property comprises five claims near the centre of Grenfell township. In 1914 an open-cut 45 feet long and from 6 to 16 feet deep was made along the vein. In 1928 Grenfell-Kirkland Mines sank a shaft and did a little crosscutting on the 100-foot level.

James Kirkland Mines, Limited. The property consists of nine claims in Grenfell township. Former operators sank a two-compartment shaft to 200 feet and did about 40 feet of drifting. A second shaft is 30 feet deep. A little work was done early in 1934.

Kirkland Consolidated Gold Mines, Limited. The company is developing fourteen claims in Grenfell township about 3 miles southeast of Sesikinika. In 1933 the old shaft on these claims was sunk from 60 feet to 265 feet, and levels established at the 60-, 125-, and 250-foot horizons. Drifting and crosscutting to the extent of 1,000 feet are reported. Underground exploration by diamond drilling was in progress during 1934.

Lady Lou Development and Mining Syndicate. The property consists of 350 acres at the west end of Kenogami lake. Two shafts have been sunk to 43 and 38 feet respectively. Inactive. Lucky-Kirkland Gold Mines, Limited. The company is operating the former Baldwin mine, in the northeast corner of Eby township. Underground work was first done here in 1917-18 when a shaft was sunk to 200 feet. The shaft is now down to 415 feet, with 2,750 feet of lateral work. The mine was dewatered in 1934 and plans made to mine and mill the known ore early in 1935.

Matt Allen. These claims are situated in Flavelle township. A wellmineralized quartz vein has been sampled here by several companies.

Matabanick Kirkland Gold Mines, Limited. The claims are near the junction of Teck, Otto, Grenfell, and Eby townships. In 1929, about 8,000 feet of surface trenching was done and a 50-foot shaft was sunk.

(12) Kirkland Lake Area

Selected References: Bruce, E. L.: "The Swastika Gold Area"; Ont. Bureau of Mines, vol. 21, pt. 1 (1912).

Burroughs, A. G., and Hopkins, P. E.: Kirkland Lake Gold Area; Ont. Bureau of Mines, vol. 23, pt. 2 (1914); Ont. Dept. of Mines, vol. 29, pt. 4 (1920); vol. 32, pt. 4 (1923).

Todd, E. W.: Kirkland Lake Gold Area; Ont. Dept. of Mines, vol. 37, pt. 2 (1928).

"Statistical Reviews" and "Mines of Ontario"; See Ont. Dept. of Mines Reports. Map No. 32E: Kirkland Lake Area; Ont. Dept. of Mines, 1928.

Map Nos. 37A1 to 37F: Geological Maps and Sections of Central Ore Zone and Vicinity; Ont. Dept. of Mines, 1928.

SITUATION AND EXTENT

The Kirkland Lake gold area lies about 15 miles west of the Ontario-Quebec boundary and about midway between lakes Timiskaming and Abitibi. It is confined to part of a synclinal belt for Timiskaming sediments about 2 miles in width which extends across Teck, Lebel, and Gauthier townships into Larder Lake area on the east. The chief producing mines are located within a zone about $\frac{3}{4}$ mile wide and 3 miles long, extending across the eastern and central part of Teck and in a northeasterly direction into the township of Lebel. The town of Kirkland Lake which lies at the centre of the producing zone is the commercial centre of the area. It is served by the Temiskaming and Northern Ontario railway and by an excellent highway.

GEOLOGICAL OUTLINE

The oldest and most extensive formation in the area is the Keewatin, composed of altered lavas and diabase, and minor quantities of iron formation and volcanic tuffs. Rocks of this age do not occur adjacent to the ore zone, but outcrop in large masses a mile to the north and about 2 miles to the southwest of the camp. In the camp itself the producing veins are associated entirely with younger rocks. These are the Timiskaming sediments, a conformable series of conglomerate, greywacke, tuff and lava flows, the volcanic rocks being developed in considerable thickness in Lebel township and eastward towards Larder lake. The Timiskaming rocks occur in the form of a comparatively narrow syncline in the Keewatin basement. This syncline of sediments extends from Matachewan area eastward through Kirkland Lake area and onward into Quebec. In Teck township the syncline is a simple, inclined fold striking northeast and with the axial plane dipping 80 degrees south. On the north limb of the syncline the strata dip about 60 degrees south; on the south side the beds are slightly overturned, dipping from 80 degrees to 85 degrees south. In Lebel township the general strike approaches a more nearly east-west direction and farther east in Gauthier township the band extends in a direction south 60 degrees east. The change in strike seems related to a large boss of granite and syenite which occupies the south part of Lebel township.

The folding of the Timiskaming sediments into synclinal form occurred at a time of igneous activity, the first phase of which was an injection of stocks and dykes of basic syenite resembling lamprophyre. This was followed by dykes and stocks of red syenite which cut both the basic syenite and the sediments. These rocks were cut in turn by sills, dykes, and bosses of feldspar porphyry. The final phase of igneous activity was marked by the intrusion of dykes of mica lamprophyre and diabase.

The producing veins lie in large faults that cut indiscriminately across the Timiskaming sediments and the irregular bodies of basic syenite, red syenite, and feldspar porphyry. The veins are strongest where the movements on the faults have caused much brecciation of the wall-rock. The principal faults strike about north 65 degrees east, and dip steeply to the south.

The best ore is associated with the north or main fault, on which the displacement was greater than on the others, particularly in the central and western part of the camp. The faulting formed brecciated and sheeted zones adjacent to the fault planes. Then deep-seated, mineral-bearing solutions from some underlying igneous mass rose along the channels thus formed. The sheared and brecciated rocks subjected to the attack of hot circulating waters were altered and the openings were filled by gold-bearing quartz and small amounts of chlorite, sericite, tellurides, and sulphides. The gold is invariably associated with quartz, present either in veins or in silicified wall-rocks.

HISTORY

In 1906 there was a gold rush into Larder Lake area. This led to the discovery of gold at Swastika, and many claims were staked nearby, some of them as far east as Kirkland Lake. The claims of the Lucky Cross Mining Company and the Swastika Mining Company were located at that time. Little work was done on any of the claims aside from the Swastika mine and most of the properties reverted to the Crown.

In the autumn of 1911 W. H. Wright discovered gold in quartz veins traversing reddish feldspar porphyry on a portion of what is now the Wright-Hargreaves property at Kirkland Lake. Early in 1912 the goldbearing veins on the Tough-Oakes claims were discovered and a shipment of high-grade gold ore from them in 1913 created a strong interest in the 1888-41 camp. Soon other promising veins were located, on what are now the Toburn, Sylvanite, Lake Shore, Teck-Hughes, and Kirkland Lake gold mining properties. From this time development work progressed very rapidly.

In 1915 a cyanide gold milling plant of 125 tons capacity was put into operation on the Tough-Oakes property, and in 1916 produced gold valued at \$700,000. In 1919 the Kirkland Lake, Lake Shore, and Teck-Hughes gold mines commenced milling operations. The mill at the Wright-Hargreaves mine began production in May 1921. The following year the camp produced gold bullion valued at \$2,162,548. In 1934 the camp's output was valued at almost \$20,800,000 (gold at \$20.67 an ounce).

Today there are nine producing mines within the camp. These are, in relative importance, as follows: Lake Shore, Wright-Hargreaves, Teck-Hughes, Sylvanite, Macassa, Toburn, Kirkland Lake, Moffatt Hall, and Bidgood. There are in addition about a dozen small operators carrying on development work on outlying properties.

During the year 1934 the production from the seven large mines was 981,493 ounces of gold and 185,009 ounces of silver, of which the Lake Shore mine produced 472,768 ounces of gold and 101,501 ounces of silver. The Lake Shore mine since its first production in 1919 has developed and expanded steadily and rapidly until today it is the largest gold producer in North America. It has a milling capacity of 2,500 tons a day. The gold recovery averages \$14 a ton with gold at \$20.67. Underground workings in this mine, including drifts, crosscuts, shafts, and winzes, have a total length of more than 37 miles.

Development work on the 4,450-foot level at the Lake Shore mine indicates high-grade ore at that depth. Likewise, at the Kirkland Lake gold mine, some of the best and largest ore-bodies are reported from the lowest levels, and preparations are under way to commence mining operations at depths greater than one mile. The main shaft has already been put down to 5,850 feet. Good values have also been reported at the Teck-Hughes mine on the lowest level, at a depth of 5,480 feet, and shaft sinking is being continued to a depth of 6,730 feet.

The annual production up to the end of 1935 from the principal mines of the Kirkland Lake belt is given in the accompanying table. The figures include the value of small amounts of silver recovered with the gold. Value of Production (Gold and Silver) by Mines of the Kirkland Lake and Matachewan Areas, 1913-1935

Total value (standard)		**************************************	\$186,941,937
Matachewan area	Mata- chewan Consol.	\$14,006 \$56,318	\$370,914
	Young- David- Bon	\$80, 896	\$501,974
	Ashley	\$61_200 361_200 353_458	\$945,574
Miscel- laneous		\$21, 178 \$10, 052 \$35, 460 730, 452 11, 925 \$467 \$47 \$467 \$467 \$467 \$467 \$467 \$47 \$47 \$47 \$47 \$47 \$47 \$47 \$4	\$257,976
Maccassa		\$76, 202 664, 322 627, 969	\$1,368,613
Argo- naut ³		\$5, 204 \$5, 204 \$1, 20, 512 \$1, 512 \$1, 512 \$1, 512 \$1, 512 \$1, 24, 488 \$1, 381 \$1, 381 \$1, 381 \$1, 381 \$1, 155 \$1, 155\$\$1, 15	\$790, 795
Barry- Hollinger		\$10,114 \$6,263\$6,263 \$6	\$1,432,273
Tough- Oakes Burnside (Toburn) ¹		\$66, 632 117, 643 555, 539 711, 632 711, 632 342, 831 139, 685 139, 685 139, 685 139, 685 139, 685 107, 481 12, 174 12, 174 133, 215 153, 215 154, 215 155, 215, 215, 215, 215	\$4,435,337
Kirkland Lake		\$56, 263 \$56, 263 \$56, 263 286, 203 285, 203 282, 410 282, 410 282, 410 417, 669 524, 326 533, 851 533, 851 534, 851 535, 851 545, 851 555, 855, 855, 855, 855, 855, 855, 855,	\$5,333,862
Sylvanite		\$429,424 728,146 738,146 704,459 901,168 828,195 828,195 828,195 828,195 828,195 828,195 828,195 828,195 828,195	\$7,480,068
Wright- Hargreaves		\$1, 127 468, 151 764, 773 764, 773 764, 773 764, 773 764, 773 764, 773 764, 773 764, 773 764, 773 1, 734, 773 764, 773 1, 734, 773 1, 734, 773 2, 946, 161 1, 734, 753 2, 946, 161 2, 735 2,	\$34, 392, 349
Teck- Hughes		\$66, 722 \$66, 722 \$66, 772 \$775 \$781, 605 \$769, 458 \$769, 458 \$769, 458 \$769, 458 \$10, 020 \$117, 968 \$117, 968 \$117, 968 \$10, 026 \$1, 026 \$1, 028 \$1, 038 \$1, 038\$\$1,	\$47,266,984
Lake Shore		4115, 414 411, 414 411, 414 411, 411, 411 411, 411, 411 411, 611, 108, 725 411, 088, 726 1, 088, 726 1, 088, 726 1, 088, 779 1, 088, 788 1, 088, 788	\$83, 382, 474
Year		1913 1914 1916 1916 1917 1918 1917 1928 1925 1925 1928 1928 1928 1928 1928 1928 1928 1928	Total

¹Renamed the Toburn in 1931. ²Exclusive of copper values. ²Exclusive of copper values. ²Exclusive of copper values. ²Exclusive of copper values. ²Exclusive of constraint. ²Patricia mine, afterwards called **3**7,700; Gold Hill, \$2,784. ²Canadian Associated Goldfields, \$34,505; samples shipped in 1923 and 1926 by the Gold Hill not heretofore reported. ²Canadian Associated Goldfields, \$37,700; Gold Hill, \$12,784. ²Canadian Associated Goldfields, \$37,700; Gold Hill, \$12,784. ²Canadian Associated Goldfields, \$37,700; Gold Hill, \$12,784. ²Canadian Associated Goldfields, \$35,770; Mills, and from scrap machinery, \$5,546. ³Filluride in Skead township. ³Filluride in Skead t

From Bulletin No. 103: Preliminary Report on the Mineral Production of Ontario in 1935, by A. C. Young, Ontario Dept. of Mines.

The slight falling off in the total value of bullion produced since 1932 was due to the mining of low-grade ores at that time to take advantage of the prevailing high price of gold.

GOLD DEPOSITS

Vein Systems. The most productive veins in the camp occur on what is called the north fault or "main break." The south side of this fault moved vertically upward some 2,000 feet with relation to the north side and at the same time was displaced for at least 120 feet to the east, as shown by the dislocation on a diabase dyke at the Teck-Hughes mine. A smaller subsidiary fault called the south fault lies 400 feet to the south at the Lake Shore mine and can be traced eastward across the Wright-Hargreaves property parallel to the main fault. Farther east, as disclosed at the Sylvanite and Toburn mines, both faults split up into a series of smaller ones. To the west, the south fault encounters a large mass of basic rock and becomes very poorly defined.

The main break follows a remarkably straight course striking about north 65 degrees east with an average dip of 85 degrees south and the subsidiary faults are parallel to it and nearby. The mining properties are strung out along this fracture zone for a distance of 14,400 feet and commercial ore shoots have been found along 13,000 feet of this distance.

Because of their brittle nature the Timiskaming conglomerate and the syenite and porphyry intrusives were much brecciated and fractured adjacent to the faults. It is in these fractured zones and along the main planes of movement that the largest and richest ore-bodies occur. Occasionally the ore extends from the foot-wall to the hanging-wall of a fault, but in many cases is found along one of these boundaries or in irregular fissures crossing the walls. Where the country rock is porphyry or red syenite, angular blocks and fragments of these rocks occur cemented together with gold-bearing quartz. In some cases nearly barren rock bordering a fault is intersected by a number of narrow quartzose streaks, 2 or 3 inches wide, which contain a sufficient quantity of gold to make ore over a stoping width. The quartz streaks may run hundreds of dollars, whereas the intervening porphyry will assay but a few cents where it has escaped silicification.

Where a fault split into two branches that united again farther on, the enclosed horse of country rock was in places sufficiently brecciated to allow the penetration of mineralizing solutions throughout the mass. In this way a number of rich ore-bodies over 50 feet wide were formed. Where movement was confined to a single plane the dense clay selvage or gouge formed was impermeable to solutions and no ore was deposited.

Many ore shoots are short and narrow, but where the structure is most favourable they are large. Todd has described an ore shoot 1,500 feet long on the 600-foot level at the Lake Shore mine, and another 1,600 feet long on the 1,000-foot level, with widths ranging from 10 to 45 feet. At the Wright-Hargreaves the ore shoot on the 1,000-foot level was 900 feet long with an average stoping width of 6 feet, although in many places the stoping widths were 15 feet. On the 2,600-foot level of the Kirkland Lake gold mine, about 700 feet of ore was opened up. From the 10th to the 14th levels in the Teck-Hughes mine, the wall-rocks consisted of a most favourable mixture of porphyry and various phases of syenite. Above the 13th level this ground yielded high-grade ore across widths of 20 to 60 feet, for a length of 820 feet.

Wall-rock Alteration. Silicification and vein deposition were accompanied by a pronounced wall-rock alteration. There is a marked bleaching of the original colour caused by the breaking down of the dark minerals to chlorite, carbonates, and sericite. The feldspar phenocrysts were attacked and so corroded as to be unidentifiable in the hand specimen. Carbonates of calcium, magnesium, and iron occur in small veinlets through both the quartz masses and rock adjacent to the veins.

Mineralogy of the Ores. Much of the quartz has a nearly black colour owing to admixture of particles of powdered rock, or to the presence of fine sulphides, tellurides, molybdenite, or chlorite. Tellurides and chalcopyrite are usually restricted to high-grade, dark streaks and bunches in the veins. Molybdenite and graphite are sometimes seen in thin films on slickensided planes where values are high. Most of the native gold occurs in an extremely finely divided condition, although spectacular specimens of coarse gold are also found. Pyrite is present in small amounts, but bears no relation to the gold content. The tellurides, calaverite and petzite, account for considerable gold, particularly at the Wright-Hargreaves, Sylvanite, and Toburn (Tough-Oakes) mines. Silver is present in the native gold in amounts averaging from 4 to 7 per cent. Altaite, a lead telluride, is commonly noticed in the richest shoots in the Lake Shore and Teck-Hughes mines.

Cross Faults. At the Lake Shore and at other mines to the eastward, the veins are crossed and displaced by several north-trending faults. In appearance the cross faults are similar in structure to the main faults, but they are definitely later than the last phases of ore deposition, and are not mineralized. A strong cross fault on the east side of the Lake Shore property has offset the veins east of the fault 600 feet to the north. In addition there are a number of flat faults that strike parallel to the veins and dip at angles less than 45 degrees to the south. The offset along these seldom exceeds 30 feet.

Rock Distribution. The rocks adjoining the veins were the controlling features in vein formation and ore deposition. At the Kirkland Lake and Macassa mines the intrusive rocks consist principally of wide, dykelike bodies of basic syenite, injected parallel to the strike of the sedimentary beds. At the surface the dark syenite has a width of 400 feet and is bounded on the north by conglomerate and on the south by tuffaceous sediments, but on the 1,000-foot level the basic rock is over 1,200 feet wide. There are no outcrops of red syenite at the surface on the Kirkland Lake property, but the mass exposed on the surface of the adjoining Teck-Hughes property pitches downward to the west beneath the basic syenite, on the Kirkland Lake property, and is seen underground on the south side of the fault. Another, larger mass of the red syenite occurs on the north side of the fault in the lower levels of the Kirkland Lake mine below the 1,850-foot level. The commercial ore shoots occur in the parts of the fault zone where red syenite is present on one wall or the other.

At the Teck-Hughes mine the north side of the fault at the surface is bounded by conglomerate which shows in mine workings to a depth of 450 feet. From 450 to 830 feet the rocks are tuffs and below the tuffs are large. dyke-like bodies of basic to acid syenite intruded by masses of porphyry. Red syenite is the principal rock on the south side of the fault at surface, and extends 400 feet east into adjoining Lake Shore property. but is not seen to the east of a small fault. Basic syenite or lamprophyre occurs a short distance to the south on the Teck-Hughes ground and extends to the east, but decreases rapidly in quantity and is represented only by small, irregular outcrops on the eastern half of the Lake Shore property. This change is accompanied by a pinching out of the tuff formation which lies south of the basic syenite, and the appearance of conglomerate. A number of porphyry dykes cut the basic syenite, making angles of about 25 degrees with the main vein. In the Lake Shore mine porphyry dykes gradually increase in size and number to the east until they merge with a boss of porphyry occupying the eastern part of the property. This porphyry boss is largely covered by the lake in the eastern part of the Lake Shore. Underground work has shown an extremely complex structure. The lamprophyre and the red syenite occur in the form of strips and irregular masses separated by bodies of porphyry. Some of the best ore-bodies in the camp were mined on the western half of the Teck-Hughes property where the succession of narrow masses of syenite and porphyry provided a formation that produced exceptionally wide, fractured zones. one of which was 150 feet wide. In the eastern section of the Lake Shore mine the veins are entirely within the porphyry boss and the ore-bodies are narrower.

At the Wright-Hargreaves mine which adjoins the Lake Shore on the east the veins lie entirely within a porphyry boss, 1,350 feet in width. The only other rocks present are conglomerate inclusions in the porphyry. Similarly, at the Sylvanite farther north the principal veins lie in the same large mass of feldspar porphyry.

The main body of porphyry extends through the Sylvanite eastward for 700 feet into the Toburn ground. Porphyry dykes occur east of the boss. Extensive belts of sediments occur both on the north and south sides of the property. In the vicinity of the veins there are bands of greywacke and conglomerate invaded by dykes of the feldspar porphyry. The veins occur both in the porphyry and in the siliceous greywacke and conglomerate. Usually they are along or near the contact of porphyry and conglomerate. There has been little displacement along the veins which may account for the erratic nature of the high-grade ore shoots. There appears to have been an irregular shattering of the porphyry and conglomerate, before mineralization took place, causing a large block of ground to be permeated by small veins and veinlets of gold-bearing quartz.

Several miles farther east at the Bidgood and Moffat-Hall mines the rocks are essentially similar to those in the main camp, except for a boss of quartz diorite about 1,000 feet wide that extends from one property into the other. Veins occur along fractures at the contacts of quartz porphyry with feldspar porphyry. On account of the tough and relatively plastic character of the basic syenite or lamprophyre, fault movement across it did not produce any brecciation, so that faults in this rock are marked by only a single gougefilled fissure. Such breaks were unfavourable for mineral deposition, hence the fault zones in the basic rocks are characteristically barren, but the feldspar porphyry and red syenite, and to a less extent the Timiskaming conglomerate, were brittle rocks readily shattered and brecciated. The irregular fissures and broken rock along the faults provided channels for the circulating mineralizing solutions and the brecciated structure offered the best conditions for rock replacement.

MINES AND PROSPECTS

The area has been prospected since 1906 and has been steadily producing gold since 1913. The Lake Shore mine is now the largest gold producer in North America. Only the most active properties are included in the following list.

Abba Mines, Limited. The claims lie northwest of the Macassa property. In 1928 camps were built and a plant installed. The shaft was sunk to 115 feet.

Bidgood Kirkland Gold Mines, Limited. The property consists of thirteen mining claims in the northeast part of Lebel township. Three shafts were sunk to 925, 825, and 525 feet, respectively, and levels established. In 1934 some crosscutting and drifting were done and further diamond drilling was in progress. Ore from the adjacent Moffat-Hall mine was being treated in the 100-ton mill.

Black Gold Mines, Limited. The claims comprise 190 acres adjoining and south of the Wright-Hargreaves and Toburn. Diamond drilling was done on three veins and a shaft put down 125 feet. One hundred feet of crosscutting and 500 feet of drifting were completed on the 100foot level.

Cambro-Kirkland Mines, Limited. The prospect is in the northcentral part of Lebel township. In 1928 a shaft was sunk 800 feet and levels established at the 350-, 500-, 650-, and 800-foot horizons.

Canadian Kirkland Mines, Limited. The property comprises six claims 1 mile south of Macassa's holdings. Extensive surface trenching and 8,000 feet of diamond drilling were done. The central shaft has a depth of 800 feet with levels at 80-, 250-, 400-, and 800-foot horizons. A crosscut on the bottom level is expected to reach a vein at 860 feet.

Columbus Kirkland Gold Mines, Limited. The claims are on the west side of the northwest arm of Kirkland lake. A shaft was sunk to 50 feet and 28 feet of drifting was done in 1927.

Conroyal Mines, Limited. The prospect comprises six claims in the central part of Lebel township. A shaft was sunk to 550 feet and a winze carried from there to 1,115 feet. Crosscutting reached a vein 1,000 feet

north of the shaft on the 300-foot level, and a vein south of the shaft was also explored. Drifts and crosscuts on the 550-foot level total 1,439 feet. In 1925 and 1926, 3,755 feet of diamond drilling was done.

Continental-Kirkland Mines, Limited. The property consists of twenty-seven claims in a strip striking northeast from the Toburn ground in Lebel township. Considerable surface trenching was done and two shafts were put down. No. 1 shaft on claim L 2557 was sunk to 800 feet and a crosscut driven 750 feet west. No. 2 shaft, three-quarters of a mile southeast on claim L 2807, was put down and considerable drifting and crosscutting were done on the 500-foot level.

Dominion Kirkland Gold Mines, Limited. A property of 78 acres extent, in lot 5, con. I, Teck tp. Surface work was done on claims 5939 and 7015 in 1923.

Federal Kirkland Mining Company, Limited. The company owns 300 acres just north of the Sylvanite claims in Teck and Lebel townships. Surface trenching was done and a shaft put down 735 feet. Levels were established at 200, 400, 500, and 700 feet. Operations were suspended in 1928.

Golden Gate Mining Company, Limited. The property lies a half mile east of Swastika. The Lucky Cross owners sank a shaft for 200 feet and did lateral work in 1911 and 1912. Some gold was produced with a small stamp mill in 1913. In 1916 the mine was dewatered and further lateral work done. In 1922-23 the Kirkland Gateway owners deepened the shaft to 360 feet and did some crosscutting and drifting on the 350foot level.

Glenora Gold Mines, Limited. The claims are situated east of the Toburn. A great deal of surface trenching has been completed. Underground exploration of veins is planned. Five men were engaged in surface work in 1934.

Goldbanks Kirkland Mines, Limited. The property comprises 135 acres located $2\frac{1}{2}$ miles west of the Macassa, Teck township. Development work in 1931 was as follows: surface trenching 1,100 feet, shaft sinking 72 feet, crosscutting on the 50-foot level 52 feet.

Harvey Kirkland Mines, Limited. There are six claims in the group, south of Gull lake, Lebel township. In 1923-24 a shaft was sunk 420 feet and 700 feet of crosscutting and drifting performed on the 200- and 400-foot levels. In 1925, 2,300 feet of diamond drilling was done.

Iroquois Kirkland Mines Corporation, Limited. Work was done on 66 acres adjacent to the northeast shore of Kirkland lake; about 1,400 feet of trenching and open-pit work and 3,000 feet of diamond drilling were completed.

Kirkland Gold Belt Mines, Limited. The property consists of 292 acres in the east-central part of Lebel township. A shaft was sunk to 750 feet and levels established at 125-foot intervals. About 2,800 feet of lateral work was completed and some ore blocked out. In 1934 the property was taken over by Morris Kirkland Gold Mines, Limited, who recommenced development work.

Kirkland Gold Rand, Limited. The company owns eight claims, about 1,500 feet southeast of the Lake Shore. Ontario Kirkland operators produced \$10,082 from the mine in 1921. Montreal-Ontario Company located further ore by drilling in 1923. The Kirkland Rand Company worked the mine from 1924 until 1927. A shaft was sunk to 800 feet, and levels established at 125-foot intervals. Kirkland Premier mines put a winze down in 1927 to 1,050 feet. Further diamond drilling, crosscutting, and drifting were done.

Kirkland-Hudson Bay Gold Mines, Limited. The prospect comprises 185 acres, adjoining the southeast boundary of Lake Shore property. Surface exploration consists of 10,330 feet of trenching and considerable diamond drilling. A crosscut on the 2,700-foot level was carried 500 feet into the company's territory from Lake Shore ground. Diamond drilling was performed from the 1,500-foot level of the Wright-Hargreaves mine and from the 1,000-foot level of the Lake Shore mine.

Kirkland Hunton Mines, Limited. The property consists of 80 acres lying south of the Teck-Hughes boundary. A shaft was sunk 675 feet and levels established at 125-foot intervals. In 1927 a winze was put down to 1,250 feet and a 130-foot crosscut driven. About 1,050 feet of drifts and crosscuts were driven on the 675-foot level and 4,000 feet of diamond drilling was performed, principally on the 375-foot level.

Kirkland Lake Gold Mining Company, Limited. The company owns 172 acres on the main break, adjoining the west boundary of the Teck-Hughes property. The mine has produced about \$5,000,000 in gold since 1919. A cyanide mill of 160 tons daily capacity is in use. The main shaft has been sunk to 5,850 feet and the mine is being developed and explored at depth.

Kirkland Townsite Gold Mines, Limited. The property comprises four claims directly south of the Wright-Hargreaves. A shaft was sunk 700 feet and levels established at 125-foot intervals; about 840 feet of diamond drilling was done in 1927. The two-compartment shaft was enlarged down to the 150-foot level and buildings were erected in 1931.

Lakeside Kirkland Gold Mines, Limited. The company owns the former Queen Lebel property of 265 acres on Gull lake, Lebel township. A shaft was sunk to 320 feet and 600 feet of drifting was done on the 300foot level. Diamond drilling and underground development were in progress during 1934.

Lake Shore Mines, Limited. The company owns 171 acres along the main break in the centre of the mining camp. It is the largest gold producer on the continent. The output varies between \$10,000,000 and \$12,000,000 a year. Dividends of \$6,000,000 were paid by the company during each of the last three years. The mine is serviced by three shafts, the deepest level being at 4,450 feet. There are more than 37 miles of underground workings. A cyanide mill of 2,500 tons daily capacity is employed.

Lebel Lode, Limited. The property comprises 173 acres located about 2 miles northeast of Kirkland Lake. Surface trenching amounting to 150,000 feet and 3,500 feet of diamond drilling are reported. The depth of the shaft is 35 feet. A surface plant was erected.

Lebel Oro Mines, Limited. The claims comprise 222 acres at Mud lake in Lebel township. A shaft was put down and work done on two levels.

Macassa Mines, Limited. The mining property lies west of the Kirkland Lake gold mine. Production commenced in 1933. The main shaft has reached a depth of 2,500 feet and underground development is well advanced. A 200-ton daily capacity mill is in operation.

Minaker Kirkland Gold Mines, Limited. The property consists of four claims adjoining Lake Shore ground. A shaft was put down 175 feet. At present inactive.

Moffatt-Hall Mines, Limited. A mining property of fifteen claims in Lebel township adjoining the Bidgood. The mine produced about \$25,000 in gold during the first six months of 1934. The shaft is down to 600 feet and development work has been done on various levels. The ore is treated at the Bidgood-Kirkland mill.

Regal Kirkland Gold Mines, Limited. The company owns 195 acres in the centre of Lebel township. The Pawnee-Kirkland operators sank a shaft in 1927 to a depth of 750 feet. Levels were established and considerable development work accomplished. Inactive since 1928.

Sylvanite Gold Mines, Limited. The property consists of five claims situated between the Wright-Hargreaves and Toburn mines. A 350-ton daily capacity mill is in operation and the mine has produced over \$6,000,000 in gold since production started in 1927. The main shaft has reached a depth of 3,642 feet. The total footage of underground workings to date is about 18 miles.

Teck-Hughes Gold Mines, Limited. The Teck-Hughes property of sixteen claims is on the main fault zone between the Kirkland Lake and Lake Shore properties. The mine has been in continuous production since 1917 and has produced approximately 42,000,000 in gold and silver. The mine is serviced by three shafts and plans are laid for development to 6,730 feet. During 1934 the mine workings in the ore zone were deepened from 5,074 feet to 5,735 feet. The mill is at present treating 1,050tons of ore a day.

Teckotto Gold Mines, Limited. The company has acquired 390 acres in Teck and Otto townships south of Swastika—formerly the property of the Swastika Mines. The property was first staked in 1906 and produced some bullion in 1912. A 3-compartment shaft was sunk to a depth of 420 feet and 2,400 feet of crosscutting, drifting, and raising completed.

Toburn Gold Mines, Limited. The mining property comprises ten claims, and was previously known as the Tough-Oakes-Burnside mine. The property was the earliest producer in the area. Present operations are conducted through the old Burnside No. 3 shaft which has been deepened to 1,850 feet. A 100-ton daily capacity mill is in operation. Production to date amounts to about \$4,000,000.

Trout Creek Gold Mining Company, Limited. The company owns four claims in Teck township northeast from Swastika. Surface exploration and 3,000 feet of diamond drilling were done in 1928, and a shaft was sunk to 85 feet. Work was done on the 76-foot level during 1931 and 1934.

Wright-Hargreaves Mines, Limited. The property consists of 152 acres lying between the Lake Shore and Sylvanite mines. Since 1921 the Wright-Hargreaves mine has shown a steadily increasing rate of production and now ranks third in value of production at Kirkland lake. The cyanide mill is operating at the rate of 1,000 tons a day. Recent development work has been chiefly between the 2,250- and 4,000-foot levels.

(13) Larder Lake Area

Selected References: Wilson, M. E.: Larder Lake District; Geol. Surv., Canada, Mem. 17-E (1912).

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Cooke, H. C.: Argonaut Gold Mine and Further Developments at Larder Lake; Geol. Surv., Canada, Sum. Rept. 1925, pt. C, pp. 12-19.

Map No. 33B: Larder Lake Area; Ont. Dept. of Mines, 1924.

Map No. 1932: Larder Lake Area, McVittie and McGarry Townships; Geol. Surv., Canada, 1922.

Map No. 1934a: Abitibi-Timiskaming Area; Ont. Dept. of Mines, 1934.

SITUATION AND ACCESS

The Larder Lake gold area includes McVittie, McGarry, Hearst, and McFadden townships, which border upon Larder lake, together with a part of Gauthier township. The Ontario and Quebec boundary forms the east boundaries of McGarry and McFadden townships.

The area is accessible by railway, motor car, or canoe. The Nipissing Central railway from Kirkland Lake to Rouyn and Noranda traverses the northern part of the area, and the Noranda road follows a somewhat parallel route through McVittie and McGarry townships. It connects with the Ferguson highway at Dane. Larder lake was formerly reached by the well-known canoe route from lake Timiskaming to Abitibi by way of lake Opasatika in Quebec. The route from Opasatika lake to Larder lake is by way of the eastern extremity of Raven lake.

GEOLOGICAL OUTLINE

Rocks of Keewatin age occur throughout the northern part of McVittie and McGarry townships. They underlie the greater part of Hearst township and extend into the southwestern corner of McFadden township. They consist chiefly of flows of basaltic lava, with some porphyritic andesite. A fairly thick band of slaty tuffs, chert, and iron formation occurs south of Pancake lake. The ore-bodies of the Crown Reserve and Associated Goldfields are largely enclosed in these black, slaty tuffs. Folding has converted the basalts and other rocks into schists, particularly at the contacts of flows and of the Keewatin and Timiskaming series.

The Timiskaming series extends across the area along the north shore of Larder lake. The series is composed of a conglomerate member at the base, overlain by sandy greywackes, several bands of black slates, and flows of trachyte and basalt. These sediments form part of a narrow band that extends almost continuously from Kenogami station on the west nearly to Bell river on the east, and passes through Swastika, Kirkland Lake, Lake Fortune, Rouyn, and Harricanaw. A small parallel band of these sediments outcrops in McElroy and Hearst townships.

Throughout Gauthier, McVittie, and McGarry townships great flows of lava were poured out during the Timiskaming period. The principal type is a soda trachyte, a flow rock of about the same composition as an alkaline syenite. A basaltic type lies along the northeast arm of Larder lake.

Intrusive rocks have a wide distribution in the area. They are represented by lamphophyre, diorite, diorite porphyry, syenite porphyry, granite, granite porphyry, quartz porphyry, aplite, and pegmatite in the form of stocks and dykes. Some of the acid dykes are cut by quartz veins and stringers that carry sulphides and some free gold.

Most of McFadden township is covered by sediments of the Cobalt series, consisting of greywacke, arkose, and slate. The basal conglomerate contains pebbles of all the older rocks including the Keewatin, Timiskaming, and the various intrusives, and it lies flat on the truncated edges of the older rocks. The series has been gently folded. The bedding planes are rarely more than 10 or 15 degrees from horizontal.

Rock exposures are abundant throughout the area, except in the southwest part of McVittie township and in northeast McGarry where large sand and gravel areas are found. In the vicinity of Pancake lake, drilling indicated 100 feet of drift above the glaciated bedrock.

Carbonate Rocks. In many parts of the area, and particularly in the vicinity of Larder lake, large masses and bands of carbonate rocks are found. They are usually brown, rusty weathering bands up to 300 feet or more in width. They may be several miles in length. In many localities the fresh rock has a bright green appearance, due to an abundance of green, chrome-bearing mica. The rock is ankerite in composition, but is popularly known as dolomite.

The dolomite bands represent altered phases of the various rocks that they intersect. Keewatin basalt, Timiskaming basalt, black slate, sandy greywacke, conglomerate, and diorite porphyry have all suffered alteration, resulting in the formation of dolomite. The larger dolomite bodies are usually cut by a network of quartz and calcite veins, most of which are less than 2 inches in width, and which carry free gold and some pyrite, but the pyrite is not auriferous. Large masses of this rock will average between \$1 and \$2 a ton in gold (at \$20.67), and in a few places small but spectacularly rich shoots have been found. It is to these rocks that the greater part of the prospecting and mining activity of the area has been confined.

HISTORY OF DEVELOPMENT

It was not until the discovery of silver ores at Cobalt in 1903 that the district attracted attention. In 1906 a gold discovery was made by Dr. Reddick on Larder lake. News of the find caused a stampede of prospectors into the area during the late autumn and winter, and large numbers of claims were staked in the district, from some of which specimens carrying visible gold were obtained. Over forty mining companies, with a total capitalization of nearly \$100,000,000, were organized during the winter of 1906 for the purpose of prospecting and developing the claims. During the following summer large sums of money were spent, but the results were disappointing.

Most of the early work was done on stockwork deposits, consisting of quartz veins in silicified dolomite. It was found that the quartz was only locally gold-bearing, and when gold was present it was almost always the coarse, visible variety.

On the Reddick property about 100 tons of ore was run through a 20-stamp mill, in 1908, and a small production recorded. A 30-stamp mill was completed in 1913 on the Harris-Maxwell claims and some ore run through. Development continued until 1922 when the erratic nature of the deposits was disclosed and the mine was abandoned. Many other properties had a similar history.

In 1914 the Costello vein, which is a different type of leposit, being on a fault of strong continuity, was discovered at Pancake lake by Jack Costello. Development work was carried out by the Associated Goldfields and the Crown Reserve mining companies. In 1926 a mill was built by Associated Goldfields and the mine produced \$52,295 in gold and silver prior to suspension of activity in March 1928. The Crown Reserve operators did a great deal of underground work and found much low-grade ore, but closed the mine in December 1928.

In 1912 gold was found on the west shore of Beaverhouse lake, in Gauthier township. For some time the property was developed by "La Mine d'or Huronia." In 1919 the Argonaut Gold Mines leased the property and built a 15-stamp mill. In 1923 a new 200-ton mill was erected and put into operation. Over a period of nine years the mine produced about \$800,000 in gold, silver, and copper. The property was closed in 1928 on failure to find expected ore in the bottom levels of the mine. The Argonaut mine produced more than all the other mines in Larder Lake area.

Since 1928 almost nothing has been done at Larder lake, as the majority of the deposits had proved to be too erratic in gold and too small in extent to warrant further money being spent. In 1932 the Canadian Reserve mine was formed to mine and mill ore developed at the old Crown Reserve and Associated Goldfields mines, but nothing was done. In 1935 these mines were taken over by Omega Gold Mines. Underground work was carried out and a 300-ton mill was put into operation late in the year.

ORE DEPOSITS

Carbonate Gold-bearing Formation. It is for the wide distribution of the secondary carbonate rocks that the district is noted. These dolomite and ankerite zones are cut by innumerable anastomosing and intersecting veinlets of quartz or of quartz and calcite, from a few inches to several feet in width. Exploratory work has shown that these veins seldom carry more than \$2 or \$3 to the ton, although locally coarse gold and high assays may be encountered. Hopkins states that small, mediumgrade ore shoots do occur, as on the 83-foot level of the Reddick mine and on the 500-foot level of the Harris-Maxwell, but they are isolated, with little to indicate where they will be found and what will be their extent. The passage from ore into material altogether or nearly barren is indicated only by the disappearance of visible gold and by low assays, but not by any change in the general appearance of the deposit.

Mill tests made in 1907 on 1,500 pounds of ore from an open-cut on the Harris-Maxwell property returned \$13.20 to the ton, but a mill run of 230 tons from the same open-cut, made by the Lucky Boy Mining Company in 1909, averaged only 45 cents to the ton. A third mill test from another surface showing gave \$2.20 a ton. On the Reddick property a mill run of 100 tons from an open-cut, in 1908, yielded \$10 to \$12 a ton; but on further exploration in 1909 it was found that assay samples taken from a drift at the 83-foot level directly below the open-cut returned only a few cents in gold. This lack of continuity of ore values in the carbonate type of deposit was found to be general throughout the area.

Mineralogy of the Ore. On the 500-foot level of the Harris-Maxwell mine a small but rich ore shoot was found in green dolomite, containing a great deal of fuchsite and cut by quartz stringers carrying much tourmaline and pyrite. The zone was 10 feet wide and contained visible gold, some of it quite coarse. The gold was usually accompanied by much fine galena. According to H. C. Cooke,¹ the gold in the dolomite bodies occurs wholly in the free state, and there is no connexion between the concentration of pyrite, the only sulphide in the rock, and its gold content. The pyrite was deposited during the later stages of dolomitization, along with quartz, calcite, and fuchsite. The gold is present as thin leaflets along numerous fine fractures in the quartz, so that the gold is, therefore, later in age than the pyrite and quartz.

Origin of Carbonate Bands. The dolomite bands were primarily bands of schist formed by the faulting or shearing of the original rock along fairly straight and continuous zones. Dolomitization of these zones followed the liberation of large quantities of carbonated solutions from some deepseated igneous mass. The quartz porphyry dykes of the area, in contact with dolomitized rocks, are believed to be late injections from the same magma.

Mineral Deposits in Dykes. There were a number of claims staked on mineralized aplite, syenite, and porphyry dykes. At the Gold King, numerous flat, parallel quartz veins, carrying pyrite, chalcopyrite, specular

¹ Geol. Surv., Canada, Mem. 131, p. 60.

hematite, and gold, were found in acid, aplitic porphyry. Test pits made in an altered feldspar porphyry stockwork on the Thib claim showed much pyrite and chalcopyrite and some coarse gold. On the Arthur Costello claims there is a red feldspar porphyry dyke, much fractured and cut by quartz and calcite veinlets, with some pyrite and specular hematite. Some of the fresh material yielded small amounts of gold. There are several irregular dykes of aplite, syenite, and porphyry on the McLaren claim. They also are cut by quartz stringers and contain pyrite and specular hematite and some green carbonate. Samples across considerable widths yielded about \$1 in gold a ton.

Deposits in Keewatin Volcanic Rocks. The Costello vein is a lens of ore with a proved length of more than 900 feet and a maximum width of 40 feet. It strikes north 55 degrees east and dips 60 degrees south. It lies in grey to black tuffs and altered lavas of the Keewatin series. These rocks were cut by veinlets of quartz and calcite, impregnated with much pyrite and mispickel, and replaced by quartz, calcite, reddish feldspar, iron oxide, and other vein-forming minerals. A large fault roughly parallels the vein, cutting it in places, and appears to have cut it off entirely at a depth of about 750 feet.

One large and several small bodies of low-grade ore were developed along the vein by Associated Goldfields and Crown Reserve mining companies. Assay returns averaged between \$4 and \$8 to the ton. Similar values were found on two adjacent subsidiary veins on the Crown Reserve property. Ore of good milling grade may be obtained here over stoping width, and the poorer parts of the vein may be left as pillars.

The ore-bodies at the Argonaut mine are described by H. C. Cooke¹ as follows:

"The ore-bodies are of two main types. That on which the bulk of the work has been concentrated is a vein of chalcopyrite, quartz, and calcite, striking north 30 degrees to 60 degrees east, dipping about 60 degrees northwest, and raking 65 degrees northeast. The vein is a long, narrow lens, with a maximum width of about 1 foot, and up to 300 feet in length. Ore of commercial grade is mined over the greater part of this length. Near the ends of the lens, where the width thins to a few inches, the bulk of the vein material is quartz and calcite; but in the wider central parts the amount of chalcopyrite is very large, and many lenses of almost solid chalcopyrite are present. The gold values accompany the chalcopyrite, which, when pure, is said to run as high as \$200 a ton.

"A second and apparently different type of vein has been found at the extreme north end of the 350- and 500-foot levels. This vein strikes north 10 degrees to 15 degrees east, dips vertically between the two levels, and has a maximum width of 4 to 5 feet. It consists almost wholly of a dark grey, fine-grained calcite, that in places forms a matrix enclosing fragments of an earlier, light brown, barren vein of oligoclase, $Ab_{85}An_{15}$, now largely replaced by calcite. The later vein of dark calcite contains albite and graphite, together with values in gold that run \$40 to \$60 a ton. Free gold has been found in it, but the manner of occurrence of the bulk of the gold values is unknown."

¹ Geol. Surv., Canada, Sum. Rept. 1923, pt. C I, p. 47. 18888-5

The rocks around the mine are Keewatin lavas, basalts, and trachytes, intruded by dykes of quartz diorite and syenite porphyry. The syenite porphyry is younger than the quartz diorite. The main dyke of quartz diorite in the mine is 75 feet wide, strikes almost due north, and dips 80 degrees west. It is bordered by a wide zone of red albitized country rock and has a chilled edge 10 feet or more thick of hard, black, brittle glass. H. C. Cooke¹ has shown that the composition of the veins varies with their proximity to the heated zone near the dyke. The veins within the heated zone consist mainly of magnetite and chalcopyrite, with more or less actinolite and pistacite. Where such veins pass out of the zone of red albitized rock near the dyke they are edged by rims of red albitized rock of varying widths, evidently formed by solutions emanating from the veins. A little farther away the country rock is not albitized, but red albite was deposited as the outer rim of the vein itself, and is accompanied by more or less red calcite. Still farther away there is no magnetite, only a little albite, grey calcite instead of red calcite, and much brownish or dark-coloured quartz. Still farther away quartz is less abundant and whiter, and the proportion of white calcite greater. Chalcopyrite is also more abundant, and forms solid lenses of ore. The ore lenses rake toward the quartz diorite dyke and accordingly become richer in magnetite with depth, exactly as the veins do laterally.

In summing up the ore genesis at the Argonaut mine Cooke states²:

"The auriferous copper ores are genetically connected with the intrusion of the later quartz diorite. The dyke itself did not give rise to the ores, but it did heat the rocks through which it ascended and thus render it possible for the hot ore-bearing solutions to rise to their present level before being cooled sufficiently to precipitate their contents. Moreover, the rapidity with which the solution followed the intrusion of the dyke, before cooling of the dyke was complete, points to the conclusion that they originated in the same reservoir of fluid magma from which the dyke itself was extruded."

MINES AND PROSPECTS

The area has been prospected since 1906 and considerable development work was done in the early days. Production of gold has been intermittent. The following list includes the most active properties.

Argonaut Consolidated Mines, Limited. The property is located in the northeast part of Gauthier township. A vertical shaft was sunk 500 feet and a winze carried to 1,250 feet. Several thousand feet of drifting, crosscutting, and stoping were done, and bullion valued at \$789,093 was recovered. Inactive since 1928.

Arthur Costello Claims. Several pits have been sunk on a mineralized, red feldspar porphyry dyke near Monacle lake, McVittie township (1924).

Bear Lake Claims. A 90-foot shaft and several pits were made on dolomite exposures near the south end of Bear lake in McVittie township, in the early days.

¹ Geol. Surv., Canada, Sum. Rept. 1923, pt. C I, p. 55.

² Geol. Surv., Canada, Sum. Rept. 1925, pt. C, p. 15.

Big Pete Canadian Mines, Limited. The claim is about a mile north of the Reddick. Exploratory diamond drilling was done on claim H.F. 31, in Keewatin slate, prior to 1912.

Canadian Associated Goldfields, Limited. The company's major operations were at Pancake lake, adjoining the Crown Reserve property. A shaft was sunk 1,000 feet to develop the Costello vein. Much crosscutting and drifting were done and a mill built. During 1927 and until March 21, 1928, when the mine shut down, bullion was produced to the value of \$52,295.

Canadian Reserve Mines, Limited. The company was formed in 1932 to operate the Costello claims at Pancake lake, formerly prospected by Canadian Associated Goldfields and the Crown Reserve Consolidated Mines.

Carr Claim. The claim is just east of the "Costello vein" claims. In 1922-23 several diamond drill holes were put down in an effort to locate the easterly extension of the Costello vein.

Chesterville Larder Lake Gold Mining Company, Limited. The claims are adjacent to the Reddick group on the northeast arm of Larder lake. Two 30-foot shafts were sunk in 1907 on claim H.F. 404 and two pits were sunk on H.F. 405. A little surface work was done in 1923.

Cockshutt-McCallum Claims. The claims lie northeast of Barber lake in McGarry township. A deep pit was sunk on crushed mineralized quartz in Keewatin basalt.

Cook Claims. These were located along the boundary between Hearst and Skead townships. A trench 100 feet long and 6 feet deep was blasted out across a stockwork structure in porphyry and rusty carbonate.

Crown Reserve Consolidated Mines, Limited. The company did much development work on the Costello vein adjoining Associated Goldfields at Pancake lake. A shaft was put down 1,200 feet and over 2 miles of crosscutting and drifting were done on the various levels. Diamond drilling amounted to about 12,000 feet. Operations ceased in December 1928.

Elstone-Dunkin Claims. The claims are located in the central part of Gauthier township. Cross-trenching in 1916 exposed a mineralized porphyry greenstone contact.

Gold King Claims. These are located on a peninsula close to Larder city. A tunnel was driven 50 feet through Keewatin to intersect veined porphyry.

Harris-Maxwell Claims. The property consists of two claims on the northwest shore of Larder lake at Larder city. The claims were developed by Associated Goldfields, who sank a shaft 500 feet and built a stamp mill. About 3,000 feet of drifting and crosscutting were done on the 320- and 420-foot levels, together with some diamond drilling. A small amount of gold was recovered. Inactive since 1922.

18888-51

Imerson Claims. The claims are located south of Pancake lake. Several companies have optioned the claims and attempted to locate the west extension of the Costello vein by diamond drilling (1922-24).

Johnson Claim. The claim is about one mile east of the old Crown Reserve shaft. Diamond drilling was done in 1922 by Coniagas interests.

Kerr-Addison Claims. The claims are located about the centre of McGarry township adjoining the Reddick claims. A 3-compartment shaft was sunk by Associated Goldfields to 500 feet and considerable drifting, crosscutting, and diamond drilling performed. Inactive since 1921.

Larder Combined Claims. The claims are located on Sharp creek, Hearst township. Two shallow shafts and several test pits were sunk on sulphide veins in iron formation.

Lincoln-Nipissing Development Company. The claims are in lot 5, con. VI, Skead tp. Several trenches and a shallow shaft were put down by this company, on the band of ferruginous dolomite, prior to 1912.

McDermand Mining Company, Limited. The company owns six claims in McVittie township at Malone lake. Considerable stripping and trenching have been done and test pits from 4 to 30 feet put down. Inactive since 1929.

Martin-Bird Claims. On this Hearst Township property a great deal of trenching was done and a shaft sunk to 125 feet during 1934.

Mitchell-Hearst Gold Syndicate, Limited. The property comprises 565 acres in Hearst township, staked in 1923. Surface trenching and channel sampling have been done.

Murphy Mines, Limited. The claims comprise 310 acres located in the eastern part of Gauthier township. Two shafts were sunk to 125 and 650 feet, respectively, and considerable crosscutting done. Operations ceased in 1931.

Northland Gold Mines, Limited. The property consists of twenty claims north of the railway in Gauthier township. A shaft was sunk 1,000 feet and crosscutting and drifting carried out at various levels. A second shaft was sunk only 60 feet and 350 feet of drifting was done. Several thousand feet of diamond drilling was performed.

Olivet Gold Mines, Limited. Approximately 2,000 feet of trenching and 100 feet of test pitting were done on this property in Gauthier township, in 1928.

Omega Gold Mines, Limited. Omega Mines, financed by Castle-Trethewey Mines, took over the Crown Reserve and Associated Goldfields properties early in 1935. Underground work was continued and a 300-ton mill constructed.

Oriole Mines, Limited. The company owns 320 acres in Gauthier township, adjoining the Murphy claims. Surface exploration, trenching, and diamond drilling have been done. Urquhart-Costello Claim. In 1908 the Proprietary Mining Company produced 31 ounces of gold and silver from claim C.E. 37, located southeast of Barber lake.

Reddick Claims. There are seven claims in the group, located on the northeast arm of Larder lake. A 90-foot shaft was put down and 1,000 feet of lateral work done on the 83-foot level. Numerous test pits were sunk and diamond drilling was done. A 20-stamp mill was built, but little gold was produced. Inactive since 1921.

Ritchie Gold Mines, Limited. The claims are located in Gauthier township south of the railway. A 500-foot shaft was sunk and levels established at 125-foot intervals. About 1,150 feet of lateral work and 5,000 feet of diamond drilling were done.

Shaver Claims. Considerable development work was done on a band of dolomite and a number of small quartz veins, on claims L 5413 and 5414 in McGarry township, prior to 1922.

Sheldon, Averall, and Lucy Claims. Trenching and stripping were done and open-cuts made on bands of dolomite cutting basalt on four claims in McGarry township (prior to 1922).

Thib Claim. The claim is at Enright point on Larder lake. Test pits and open-cuts were made in an altered porphyry stockwork containing sulphides and a little free gold.

Tournenie Mining Company. The company owned a large number of claims in the vicinity of the north shore of Larder lake. In 1907 a stamp mill was erected on claim C.E. 33 by the Proprietary Company, but it was never put into operation.

(14) Lightning River Area

Selected References: Burroughs, A. G., Knight, C. W., Hopkins, P. E., Parsons, A. L.: Ont. Dept. of Mines, vol. 28, pt. 2, pp. 44-52 (1919).

Knight, C. W.: Lightning River Gold Area; Ont. Dept. of Mines, vol. 33, pt. 3 (1924).

Gledhill, T. L.: Lightning River Gold Area; Ont. Dept. of Mines, vol. 34, pt. 6 (1925).

Map No. 34A: Part of the Lightning River Area; Ont. Dept. of Mines, 1925.

SITUATION

The area derives its name from Lightning river, which flows north into lower lake Abitibi, and includes Garrison, Harker, and Holloway townships, situated about 6 miles south of the lake. A good auto road runs easterly from the town of Matheson, on the Temiskaming and Northern Ontario railway, to the centre of Garrison township, a distance of about 25 miles. From there winter roads penetrate both Harker and Holloway townships. Cheap transportation is afforded by an excellent water route from La Reine, Quebec, whence launches can descend the Okikodosik river, cross lake Abitibi, and ascend Lightning river for about 6 miles. However, camp supplies and machinery are ordinarily brought in by winter road from Ramore on the Temiskaming and Northern Ontario railway
GEOLOGICAL OUTLINE

The greater part of the area is underlain by Keewatin lavas. In the northern part of Garrison, Harker, and Holloway townships a band of Timiskaming sediments, consisting of slate, greywacke, and conglomerate, runs east and west. On the north side of Teddy Bear valley, both the greenstone and the sedimentary series have been greatly sheared and folded.

A large boss of granite occupies the central part of Garrison township, and a small boss of pink syenite about half a mile wide occurs in the southeastern corner of Harker township. Syenite and feldspar porphyry dykes are fairly widespread and may have been the source of the gold-bearing solutions. There are a number of lamprophyre dykes, which are usually confined to mineralized faults.

The youngest rocks of the area consist of narrow dykes of quartz and olivine diabase with a general northerly strike.

Many parts of the area are covered by a heavy overburden of clay, sand, and gravel. The Timiskaming sediments are largely covered by glacial clays.

The principal gold occurrences are in the Keewatin rocks, but some occur in porphyry dykes. The mineralization is of the auriferous pyrite type.

HISTORY OF MINING ACTIVITY

Among the pioneer prospectors who explored the area in 1907 and 1908 are Russell Cryderman, Wm. Cooper, and Wm. Woodney. In the year 1917 Messrs. Howey, Cochenour, and Williams discovered gold-bearing quartz on what became known as the Cochenour claim (No. 7135). During the next few years much work was done and many claims were staked. By 1922 a total of three hundred and twenty-three mining claims had been staked in Harker and Holloway townships.

In February 1922, Wm. S. Seagers discovered a hill of fine-grained basalt cut by numerous, small, quartz veins that carry native gold. The claim was worked for a time by the Abitibi Mines, but in 1929 the Teddy Bear Valley Mines took over the property. The latter company now owns thirty-seven claims in the northwest part of Holloway township. Development recommenced during the summer of 1934.

In 1924 a vein was found in the southeast part of Harker township. It was reported to be over 3,000 feet in length and 6 to 10 feet wide. Harker Gold Mines acquired the property and explored the vein by a shaft 1,000 feet deep, with lateral workings at four levels, but the mine closed in 1929 as the short sections of ore developed were believed to be insufficient to warrant operations at a profit.

On the whole the majority of the gold occurrences in Lightning River area have never advanced beyond the prospect stage.

GOLD DEPOSITS

There are many different types of gold deposits in Lightning River area. They may be summarized as follows:

- (1) Gold-bearing quartz veins in massive, altered basalt.
- (2) Gold-pyrite in sheared zones in basalt.
- (3) Gold-pyrite in fault breccia zones in basalt.
- (4) Gold-pyrite along the contacts of syenite and feldspar porphyry dykes with greenstone schists.
- (5) Gold-pyrite in sheared and altered Timiskaming sediments.

As there are no producing mines in the area, the following geological descriptions are only of the most important properties and claims.

Seagers Claim. The country rock on claim 10080 is a fine-grained, brown-weathering basalt, impregnated with fine-grained pyrite. The basalt is intersected by numerous quartz veins varying in width from 1 inch to 2 or 3 feet. Several rich specimens of native gold were taken from a narrow vein on the hillside.

Meridian Claim. The ore-body is a shear zone in basalt, which has been well impregnated with pyrite and fine, native gold. This zone averages 3 to 4 feet in width, but in places is 5 or 6 feet wide. In 1922 a test on 1,820 pounds of the ore returned 0.7 ounce in gold and 4.6 ounces of silver a ton.

The eastern part of the shear zone extends into the Taylor Horne claim, No. 7261, where a quartz vein 6 to 8 inches wide occurs within the schistose zone. Some native gold was found in the vein along with pyrite, chalcopyrite, zinc blende, and galena. Selected material assayed \$4.40 in gold.

Harker Gold Mines. The vein structure as determined by diamond drilling is over 3,000 feet in length. It lies between fault walls and is composed of brecciated basalt, replaced by pyrite, gold, silica, feldspar, and carbonate. Native gold is visible as fine rosettes in the siliceous parts of the vein and local patches of mauve-coloured vein material yield high values. A narrow lamprophyre dyke follows along the break, and faults the quartz veins in places.

"A specimen of well-pyritized basalt from the Harker Gold Mines vein, when analysed by the Provincial Assayer, was found to carry \$51.40in gold per ton (gold at \$20.67). Another sample of grey feldspar porphyry, impregnated with fine pyrite crystals, carries 80 cents in gold per ton. This rock forms a dyke parallel with and close to the mineral vein. There is no doubt that the gold mineralization belongs to the period of granitic intrusion."¹

O'Neill (11312). On this claim Keewatin greenstones and rhyolites are cut by feldspar porphyry dykes. Narrow deposits of gold-bearing pyrite occur along the borders of the dykes.

McDermott (11381 and 11382). On the south side of Teddy Bear valley a number of synciet dykes intrude greenstone schists parallel to

¹ Ont. Dept. of Mines, vol. 34, pt. 6 (1925).

the schistosity. The schists have been mineralized with gold and pyrite for variable distances from their contacts with the dykes. A specimen of the fine-grained, pyritized basalt on assay gave \$8.20 a ton in gold (gold at \$20.67).

Lightning River Group. On the old Cochenour claim (7135), the goldbearing quartz vein discovered in 1917 is a foot in width. It is bordered by fractured basalt and contains visible gold, galena, sphalerite, and pyrite. An inclined shaft showed that the vein did not penetrate underlying rhyolite.

Mining Corporation of Canada (10476, etc.). The Timiskaming sediments, consisting of sheared and carbonated greywackes and slates, have been explored over a few acres in the northwest part of Holloway township. The greywacke has been drag-folded and broken into an overlapping series of lenses a fraction of an inch wide. The material between the lenses is well mineralized with gold-bearing pyrite.

MINES AND PROSPECTS

. The area has not yet become a gold producer. The following list shows the nature of the work done on the more active properties.

East Remo (8246). The claim is in the northwest part of Holloway township. A tunnel was driven for 35 feet through carbonated schist.

Jacobs and O'Neill (11009-12 and 11386). The claims are south of Teddy Bear creek, Holloway township. In 1922 a shaft was sunk 22 feet on a porphyry dyke and 500 feet of stripping done.

Harker Gold Mines, Limited. The property consists of eighteen claims in southeast Harker. Between March 1924 and October 1929, a shaft was sunk 1,000 feet and crosscutting and drifting done on the 250-, 375-, 500-, and 1,000-foot horizons. A prospect shaft 58 feet deep was sunk about 2,000 feet west of the main shaft and surface trenching was done.

Hurd (L7312). The claim is in the southeast part of Harker township. Trenching and blasting were done, in 1918, for 50 feet along the vein.

Imperial Reserve (13408). Some trenching was done on pyritized schist in the north-central part of Harker township.

Lightning River Gold Mines. The claims include the former Cochenour (No. 7135) in the south of Holloway township. An inclined shaft was sunk 75 feet along the vein.

McDermott Gold Mines, Limited. Eight claims in Teddy Bear valley are owned by the company. Trenching was reported in 1925 across syenite dykes cutting greenstone.

Meridian (7247). The claim is along the southeast border of Harker township. Some trenching was done and a shaft sunk 48 feet. Inactive since 1925.

Mining Corporation of Canada, Limited. On claim 10476 in the northwest part of Holloway township considerable trenching and sampling were done in 1924.

Ontario Cryderman Gold Mines, Limited. The property consists of fourteen claims located in Harker township. Some diamond drilling was done during 1933 and a vein system traced for 1,800 feet, by trenching.

O'Neill (11312). The claim is south of Teddy Bear creek, in Holloway township. Some stripping was done and test pits made (1924).

Potter, R. S. These claims are in the southeast part of Garrison township. A 3-foot quartz vein was traced 100 feet by trenching through heavy overburden.

Roche (11290). The claim is in the north part of Harker township. Stripping, trenching, and blasting were reported in 1924, on an altered zone.

Taylor-Horne (7261). The claim adjoins the Meridian on the west boundary of Holloway township. Several pits were sunk.

Teddy Bear Valley Mines, Limited. This property is situated in the basin of Teddy Bear creek, Holloway township. There are thirty-seven claims, including the Manwell, Seagers, and Munton claims. Between 1922 and 1929 the latter were worked by the Abitibi Mines, camps were built, and a shaft sunk to 180 feet. The new owners commenced work in 1934 and by the end of the year had sunk the shaft below 300 feet, with 500 feet of crosscutting done on the 150- and 275-foot levels.

West Remo (8247). Some surface work was done in the early days on this claim, in the northwest part of Holloway township.

(15) Matachewan Area

- Selected References: Cooke, H. C.: Geology of Matachewan Area; Geol. Surv., Canada, Mem. 115 (1919).
 - Rickaby, H. C.: Bannockburn Gold Area; Ont. Dept. of Mines, vol. 41, pt. 2 (1932).
 - Dyer, W. S.: Powell and Cairo Townships; Ont. Dept. of Mines, vol. 44, pt. 2 (1935).
 - Map No. 41A: Bannockburn Gold Area; Ont. Dept. of Mines, 1932.
 - Map No. 1793: Matachewan Sheet; Geol. Surv., Canada, 1920.

Map No. 44A: Powell and Cairo Townships; Ont. Dept. of Mines, 1935.

SITUATION AND AREA

The Matachewan gold area lies about 20 miles northwest of the town of Elk Lake and approximately 40 miles southwest of Kirkland Lake. It includes sixteen townships. There are four tiers of townships, named from left to right as follows: Cleaver, McNeil, Robertson, and Sheba; Hincks, Argyle, Baden, and Alma; Montrose, Bannockburn, Powell, and Cairo; Midlothian, Doon, Yarrow, and Kimberley. The first-named tier of townships is the northernmost and the others follow southward in the order named.

MEANS OF ACCESS

The nearest railway station is Elk Lake and a good motor route connects this town with the Young Davidson and Matachewan Consolidated mines, 30 miles to the northwest in Powell township. The road continues northwest and crosses the west branch of Montreal river south of the mouth of Powell creek, and then runs west to the Ashley mine in the northwest part of Bannockburn township. A rough road leads north into McNeil township from the Ashley property.

Motor launches ply Montreal river between the mines and Elk Lake, but the route is slow on account of two portages, one of which is 10 chains in length, the other 3 miles. A good cance route into the northern part of the area is by way of Nighthawk lake and either Whitefish or Nighthawk rivers.

GEOLOGICAL OUTLINE

About one-half of Matachewan area is underlain by Keewatin volcanic rocks which include basalts, andesites, and rhyolites with their associated tuffs. Their greatest development is in the northern half of the area. The rhyolite is found mainly in Midlothian, Montrose, and Bannockburn townships, and there are a number of small occurrences of iron formation in the northern part of Montrose township. All of the Keewatin rocks have been highly folded and they dip at steep angles.

In a great many places the greenstones are intruded by dykes and stocks of peridotite and pyroxenite. Some asbestos occurs in these rocks on the north arm of Lloyd lake and at Rahn lake.

Two synclinal bands of Timiskaming sediments have been mapped by Dyer, extending from west to east across Powell township and into Cairo township. These bands have an average width of about 1½ miles. The southern band is largely composed of conglomerate and quartzite, and the northerly band is composed of banded quartzites and argillites. A narrow, anticlinal belt of Keewatin volcanics lies between the synclinal sedimentary bands, and strong north-south faults interrupt the synclines on both branches of Montreal river. The southern syncline has been overturned so that the strata dip 70 degrees to the south; otherwise both the Timiskaming and Keewatin have nearly vertical dips. A synclinal belt of rocks in Midlothian and Montrose townships,

A synclinal belt of rocks in Midlothian and Montrose townships, composed of alternate beds of granite and greenstone conglomerates with overlying beds of grit and arkose, has been termed the Kiask series by H. C. Cooke. They are folded along an axis striking north 70 degrees east and the nose of the syncline at the west end plunges east at a high angle. This syncline is succeeded on the north by an anticline of andesite lava which occupies Montrose and Hincks townships. An anticlinal fold striking north 10 degrees west and plunging to the south at a low angle occurs along the Montrose-Bannockburn boundary. In general the axes of all the major folds trend about north 70 degrees east and the crossfolding strikes north 10 degrees west.

The Kiask series lies on the eroded surface of the rhyolite and andesite flows, but there is no angular unconformity.

Granite forms a large proportion of the rocks in the eastern part of the area, but only a small proportion in the west half. Large parts of Kimberley and Yarrow townships are underlain by granite, and a red hornblende syenite occupies 12 square miles in the northeastern part of Cairo township. There is a third large body occupying the northeast part of Baden, and extending north into Robertson and Sheba townships. A great many dykes and stock-like masses of porphyry and syenite of greatly varied types and sizes are widely distributed throughout the area and are always present in the vicinity of the ore-bodies. Felsite dykes with goldbearing quartz veinlets occur in Cleaver and McNeil townships.

The Cobalt series of almost flat-lying basal conglomerates, with, in places, argillites, greywacke, and arkose, occurs chiefly in Doon, and the southern parts of Montrose, Bannockburn, and Powell townships. There are belts of the series in Kimberley and Yarrow townships and in the northwest part of the area. None of the Lorrain quartzite, typical of the upper Cobalt in other areas, has been found here. Gold occurrences in the Cobalt sediments are unknown in the area.

Diabase dykes that cut all the rocks older than the Cobalt are quite numerous. They run for long distances in a direction about due north and attain widths up to 700 feet. They are overlain by the Cobalt series. A dyke of the later diabase can be seen cutting the Cobalt conglomerate, south of the highway about one-quarter of a mile west of Moyneur's hotel, and a large sill of the same rock is mapped in Kimberley township. Olivine diabase dykes are known to occur in Montrose and Hincks townships.

Some parts of the area are rather heavily drift covered. There are large areas with heavy deposits of boulder clay, and between the morainic belts are outwash plains of sand and gravel. Glacial and post-glacial lake and stream deposits form a minor proportion of the drift.

Gold occurrences are numerous in the area and are of a variety of types as follows:

- (1) Quartz veinlets in dykes and stocks of red feldspar porphyry (Young Davidson).
- (2) Replacement deposits in silicified schist associated with pegmatites (Matachewan Consolidated).
- (3) Quartz fissure veins in greenstone (Ashley).
- (4) Quartz fissure veins in granite and syenite (Thesaurus).
- (5) Quartz veinlets in felsite dykes.

HISTORY OF MINING DEVELOPMENT

Prospecting for gold in Matachewan area began as early as 1909 and during the next few years staking was done in the western parts of Midlothian and Montrose townships. H. Minard worked a claim near the forks of Montreal river, but nothing was found of importance on any of these claims and they were abandoned.

In the autumn of 1916 gold was found on what are now the Young Davidson claims, in an irregular mass of quartz and rusty weathered schist. Early in 1917 gold was discovered in the reddish porphyry on both the Davidson and Otisse claims. The report of the new finds caused a rush of prospectors into the new field and soon most of Powell township between the forks of Montreal river and the west branch of the river was staked. Other prospectors working east and north staked many claims in Cairo, Alma, and Baden townships.

Three Indians, named Isador, Micmack, and Tom Fox, discovered gold in 1923 in McNeil township. This led to the staking of about four hundred claims in McNeil and Cleaver townships. The gold showings were in quartz veinlets cutting felsite dykes. Development work soon proved these deposits to be low grade, and interest waned.

A rich, gold-bearing quartz vein was discovered in the autumn of 1930 by B. Ashley and enthusiasm was revived throughout the entire district. Renewed prospecting activity took place, particularly throughout Argyle, Bannockburn, Hincks, and Montrose townships. The Ashley Gold Mining Corporation, controlled by the Mining Corporation of Canada, took over the Ashley claims in 1931 and quickly developed the prospect into a producing mine. Production commenced in September 1932, with a mill handling 125 tons of ore a day. In 1933 the mine produced bullion valued at \$497,969.

The property of the Matachewan Consolidated Gold Mines was first prospected in 1917-18 by the Colorado Ontario Development Company. A shaft was sunk and diamond drilling done. In 1924 the Porcupine Goldfields Development and Finance Company optioned both the Young Davidson and the Matachewan Consolidated groups of claims. A shaft was sunk to 200 feet on the former and about 7,000 feet of drilling done, and 5,500 feet of drilling was done on the Matachewan Consolidated property. The latter property was acquired by the present owners in 1932 with the financial backing of Ventures, Limited. Operations underground on the 170-foot level were resumed in 1933 and much ore developed. A 100-ton cyanide mill was built and gold production commenced in December 1934.

In February 1933, the Hollinger Consolidated Gold Mines acquired the Davidson property, on which a large-tonnage, low-grade deposit had been proved. A subsidiary company, the Young Davidson, was formed to operate the claims. It was decided to mine the ore by open-pit methods and a 600-ton daily capacity mill was rapidly completed to handle the ore. Initial production began in November 1934 with an output of \$70,000.

In addition to the three producing mines in the area, twenty or more properties are being actively developed.

GOLD DEPOSITS

The Young Davidson and Matachewan Consolidated mines adjoin one another, north of Davidson creek in the southeast part of Powell township. They are situated along the south border of a synclinal belt of Timiskaming sediments where a series of granite porphyry intrusions of various sizes are arranged along a line striking north 77 degrees east. The porphyry occurs along this line in the form of stocks and dykes. On the north are the conglomerate and greywacke beds of the Timiskaming and on the south side are the sheared tuffs of the Keewatin. The Young Davidson ore-body is in the westernmost body of porphyry, on claims 5374 and 5372. This porphyry mass is about 1,000 feet long and 400 feet wide. On the south and west, across Davidson creek, it is hidden by the overlying Cobalt series. On claims 5380 and 5379 of the Matachewan Consolidated there is another boss-shaped body of feldspar porphyry, one of the largest in the district, with a length of somewhat more than half a mile and width of 500 to 600 feet.

In the vicinity of the porphyry mass there are numerous dykes and veins into the older schists. They vary in width from 10 feet or more to small stringers and their outcrops are usually lenticular in shape. The large dykes are parallel to the strike of the enclosing schists and tuffs. They are often true apophyses or offshoots from the main porphyry body. Others more siliceous are termed "grey porphyry," and still others are pegmatites. The smaller veins vary in composition from pegmatites composed of equal parts of quartz and feldspar through all gradations of composition to small veins of pure quartz. These dykes and veins are numerous in the vicinity of the porphyry and with few exceptions all are found within 1,000 feet from the porphyry.

Young Davidson Ore-body. The ore-body has been described by Cooke as follows:

"The porphyry is cut by a multitude of veinlets of auriferous quartz, mostly less than one-quarter inch in thickness and spaced at intervals of approximately a foot. The porphyry has thus the character of a stockwork, although the veins in the main are not reticulating but possess a subparallel arrangement evidently the result of jointing according to a definite system. Such jointing and enrichment have taken place mainly in the coarser grained, more slowly crystallized phases, located in general towards the centre of the intrusive. Where the grain is finer, jointing and enrichment have not occurred. . . The gold is found principally in the narrow veins of quartz that intersect the porphyry, but grains of gold have occasionally been found within the porphyry itself although never more than a few inches from a veinlet. It is evident, therefore, that the gold was introduced by the solutions which also deposited the quartz."

The ore-body is about 500 feet by 300 feet on the surface, and the grade averages about one-tenth of an ounce of gold a ton.

A microscopic examination of the ore discloses orthoclase crystals set in a groundmass of smaller feldspar crystals, with a few flakes of chlorite and scattered crystals of apatite. Calcite is very abundant and is secondary. Quartz occurs in small secondary masses and in the veinlets. Cubes and irregular grains of pyrite with an oxidized surface of limonite are common in the porphyry and also in the quartz veinlets. A little gold occurs in grains of pyrite, but most of it is in the quartz near the wallrock. The quartz veinlets contain clear, secondary plagioclase and microcline moulded on the older feldspar of the porphyry. Chalcopyrite is occasionally seen in small amounts.

Matachewan Consolidated Ore-bodies. On these claims the ore-bodies are found in lenticular masses in the schists surrounding the porphyry. The ore-bodies occur on both sides of pegmatite dykes near which the tuffaceous beds have been altered to a mixture of calcite, sericite, and albite. A typical ore-body described by Cooke¹ has at the centre a siliceous pegmatite about 3 feet wide. On the south side of the pegmatite there is a band of altered and mineralized rock about 3 feet wide, and on the north side this zone is $1\frac{1}{2}$ feet wide. An outer zone of rock, altered but not mineralized, surrounds the altered and mineralized zone; this is possibly 6 feet wide on the north and less than a foot on the south side. The boundary line between the light grey, altered rock and dark green, country rock is a fairly rapid change over an inch or two. One of the largest orebodies of this type has at its centre a pegmatite vein 4 feet in width. This vein lies parallel to the bedding and the mineralized zone is approximately 12 to 15 feet wide on the southeast side and 7 or 8 feet on the northwest side. Beyond the mineralized zone the schist is only slightly altered. This was the highest grade lens of ore on the property at that time, averaging from \$12 to \$15 in gold a ton.

A somewhat different type of ore-body occurs in two dykes of what are locally called "grey porphyry"; they are intermediate in composition between a pegmatite and red porphyry. These dykes are about 100 feet long and 10 to 20 feet wide, and contain sufficient auriferous pyrite to yield gold returns varying from \$3 to \$50 a ton, with an average of about \$10. The rhyolite tuff around and between the dykes has been slightly altered and somewhat pyritized over a distance varying from 10 to 25 feet from dykes, but the gold tenor is low, averaging about \$2 a ton or less.

A study of the ore-bodies in the area, by Cooke,¹ led to the following conclusions:

(1) "The ore-bodies have been formed by solutions emanating from the dyke or vein at their centres. These solutions have altered and mineralized the country rocks.

(2) "The tuffs may have been more easily altered and mineralized than the altered basalts.

(3) "The extent of the mineralization and alteration is related to the size and the composition of the central dyke or vein. The strongest alterative and pyritizing effects have been exercised by the pegmatites, whereas the effects of the end members of the series, the porphyry dykes and the quartz veins, have been slight. The pegmatites containing 23 to 50 per cent of feldspar appear to have produced the most powerful mineralization and alteration. Other things being equal the extent of alteration and mineralization is roughly proportional to the size of the dyke or vein.

(4) "The gold content of the dyke and vein-forming solutions was also dependant on their composition. The pyrite deposited by the dykes of red porphyry contains very low values. Grey porphyry dykes carry more gold, sufficient to give good values within the dykes themselves, but not apparently to mineralize the surrounding rocks very highly. Pegmatites appear to have carried the maximum of gold, which they deposited as auriferous pyrite both in the veins and in the altered wall-rocks; whereas the solutions forming the pure quartz veins carried little gold."

¹ Geol. Surv., Canada, Mem. 115.

Ashley Ore-body. The Ashley vein is of the fissure type, consisting of a series of more or less connected lenses of quartz cutting Keewatin greenstones. The main vein strikes north 10 degrees west and dips about 50 degrees west. Diamond drilling has shown that there are several veins containing gold quartz and these have been traced in a north-south line for over 1,200 feet. The vein is quite persistent, but is rarely more than 2 feet wide. In some places it splits into two or more parallel veins and in other places it may narrow to a few inches, but only for short distances.

The country rock consists chiefly of basalt flows showing good pillow structures; the flows are standing on edge and strike northeast. A dyke of porphyritic granite outcrops about 400 feet north of the shaft and two small dykes of mica lamprophyre cut the lava and also cut a small diorite mass. At a point 750 feet west and 150 feet north of the shaft a diamond drill hole sunk for over 600 feet remained in porphyry throughout its length. A second hole located 200 feet south of the other showed several narrow porphyry dykes.

Mineralogy. The minerals present in the main vein include pyrite, galena, sphalerite, chalcopyrite, altaite, native gold, and specularite. They usually occur along fine fractures in the quartz. Reddish coloured orthoclase is almost invariably present within the vein. The pyrite is coarse grained and its presence is generally an indication of high-grade ore. Native gold is present as fine particles associated with pyrite and altaite. The greenstones bordering the main vein have been replaced by ankerite and fine pyrite, but rarely do they carry sufficient gold to make ore. The hanging-wall displays extreme brecciation and carbonatization and the footwall alteration consists of silicification, carbonatization, and pyritization. The average grade of the ore developed, calculated to a width of 30 inches, is 0.35 ounce to 0.4 ounce a ton.

Faulting. A prominent mud seam on the hanging-wall side of the vein shows that there has been movement subsequent to the formation of the vein, but the actual displacement is small. Between the 500- and 600-foot levels a major fault was encountered, striking northeast and dipping 45 degrees to the east, that displaced the Ashley vein 200 feet to the west. The vein on the 625-foot level is cut off by a second major fault that lies almost parallel to the Ashley vein. Drifting north on the 500-foot level the faulted section of the vein was reached at a distance of 700 feet.

Origin of the Veins. The intrusion and consolidation of the porphyries and porphyritic granite were followed by the development of fractures in a north-south direction. Hydrothermal solutions rose along the fractures, deposited quartz, and replaced the wall-rocks by carbonates, chiefly ankerite and pyrite. Later, the fracture was reopened and the circulating solutions deposited more quartz along the vein along with the pyrite, galena, sphalerite, altaite, and native gold. Still later, movement formed the mud seam and gave rise to the two large faults that have offset the vein at depth.

Other Veins in Greenstone. Many gold-bearing quartz veins of the fissure type in greenstones, similar in most respects to the Ashley vein, have been found throughout the area.

At the present time one of this type is being drilled on claim 8193, known as the French property. It is a narrow quartz vein striking northeast and cutting massive tuffs. Good values have been obtained on the surface over narrow widths.

On claim 8205, about three-quarters of a mile northwest of the Ashley mine, is the Garvey vein. It strikes about east and dips 20 degrees north. The vein is concealed where it is crossed by a small creek in a gully, but the west, exposed part has a length of 110 feet of quartz with a maximum width of 18 inches, and the eastern part is exposed for 200 feet with a vein width of about 12 inches. The country rock is fine-grained basalt that has been fractured and replaced by pyrite and carbonates. Pyrite, galena, native gold, and specularite occur along fractures in the vein quartz. This vein was explored by four shallow diamond drill holes, but the cores failed to indicate minable widths of ore.

About half a mile west of the north end of Matachewan lake, the Baden Syndicate found six veins in andesite and andesite tuffs. The No. 6 vein, traced for more than 100 feet, is mineralized with pyrite and chalcopyrite and a little fine gold at the west end.

A vein at the Aldermac property, claim 8374, Bannockburn township, was uncovered for a distance of 125 feet with widths up to 2 feet. The quartz is heavily mineralized with pyrite.

In Hincks township the Mining Corporation of Canada explored the claims of the McGill Gold Mines by trenching and diamond drilling. A number of veins were found in basalt and andesite near dykes of porphyry, but the values were low in most of them.

Other interesting deposits occur at the Central Matachewan property, the Montrose Syndicate, the Fox claims, the Galer claims, Lelievier claims, and claims G.G. 5911 to 5909, prospected by the Tump Line Syndicate.

Quartz Veins in Granite

In many parts of the area gold-bearing quartz veins have been found in the granite. On the Thesaurus property, on claim M.R. 5868, the veins consist of narrow parallel bands of quartz up to 15 inches in width, across an average width of $2\frac{1}{2}$ feet, cutting a hornblende-mica granite. Low values in gold were obtained in the veins throughout the workings. The veins occur in sheared zones in the granite.

On the Thompson claims, in Argyle township, a quartz vein 30 inches wide and mineralized with pyrite, chalcopyrite, and molybdenite occurs in a sheared zone in a medium coarse-grained hornblende granite. A channel sample across 3 feet at the bottom of the pit is said to have assayed \$4.80 a ton in gold.

Near the east boundary of Hincks township a lens-shaped body of granite about ½ mile long and 650 feet wide has been prospected by McCollum Gold Mines. Several veins have been found, one of which is a quartz vein a foot wide striking north and dipping 35 degrees west. The vein has been traced 600 feet through granite into the greenstones on the south and is mineralized with coarse pyrite and a little specularite. Two grab samples assayed \$25 and \$8.20 a ton in gold.

On the Hurd property, in the west part of Baden township, a dyke of quartz-feldspar porphyry 10 to 30 feet wide cuts the greenstones. This

dyke has been sheared and mineralized with pyrite and carbonates, and in places contains numerous, small, irregular quartz veins. Diamond drill cores from twelve holes, put down over a distance of 2,200 feet along the porphyry, returned only low gold values.

GOLD OCCURRENCES IN FELSITE DYKES

In McNeil and Cleaver townships gold is found on at least twenty different claims, in quartz veinlets in felsite dykes. Most of these dykes strike east and the gold-bearing veinlets run across the dykes. As a rule the felsite dykes contain much pyrite. Visible gold occurs adjacent to the pyrite cubes in the quartz veinlets. The dykes average from 8 to 15 feet in width. Occasionally the quartz veins pass from the felsite into the adjoining Keewatin rocks for several hundred feet. In one case on claim 9815 gold nuggets as large as beans were found in a lenticular quartz vein, from 1 to 6 inches wide, in the Keewatin.

Most of the veins are too small to work separately, but may be sufficiently numerous in places to permit mining the whole dyke as a lowgrade ore-body.

MINES AND PROSPECTS

The area began producing gold in 1932. Many properties have been developed by mining companies. The nature of the work done on the more active properties is shown below.

Aldermac Claims. The property consists of fourteen claims situated along the south bay of Ashley lake, Bannockburn township. Trenching in 1932 uncovered a quartz vein cutting andesite over a length of 125 feet.

Arbade Gold Mines, Limited. The claims total 3,000 acres, in Argyle and Baden townships. In 1933 a shaft was sunk for 56 feet and diamond drilling done.

Ashley Gold Mining Corporation, Limited. The property comprises eighteen claims located astride the boundary of Bannockburn and Argyle townships. Shaft sinking and development work commenced in 1930. A mill with a rated capacity of 125 tons a day was built in 1932 and production started in September of that year. During 1933, 37,975 tons of ore was treated with an average grade of 0.456 ounce a ton. The mine is now developed to 750 feet with levels every 125 feet.

Baden Syndicate. This group of ten claims is in the northwest part of Baden township. On claims M.R. 7915 and 8155 trenching was done and test pits sunk. Diamond drilling of the No. 6 vein, in 1934, indicated excellent values over 2-foot widths.

Bloom Lake Consolidated Mines, Limited. The company owns 440 acres in Powell township and 280 acres in Cairo township. Surface exploration and test pitting have been done.

British Matachewan Gold Mines, Limited. Three diamond drill holes were put down on claims north of the Davidson property, in 1923. *Brookbank Claim.* Claim 17801 lies in the southeast corner of Alma township. Several pits were sunk in 1917 on a narrow quartz vein cutting red syenite.

Central Matachewan Mining Corporation, Limited. The company owns 500 acres in Powell township and 500 acres in Baden township. Surface trenching has been done on both properties and six shallow diamond drill holes have been put down in Powell township.

Chief Claim. Claim 17310 is one-quarter mile west of the 2-mile post on the east boundary of Alma township. Pits were sunk in 1917 on a narrow quartz vein cutting granite.

Claims G.G. 5911-9. The claims are in the southwest part of Montrose township. In 1931 surface trenching was done by the Tump Line Syndicate on a sulphide deposit in iron formation.

Claims M.R. 7318, 7319. These claims are 2 miles north and 1 mile east of the southwest corner of Baden township. Trenching and stripping were done on a 2-foot quartz vein cutting schist.

Craig Claims. The claims are situated about 3 miles north of Fox rapids in Cairo township. A shaft was sunk, in 1918, to 60 feet on a wide quartz vein in brecciated syenite.

Fox Claims. Several pits were put down in 1932 on claims 7487 and 8325, about a mile northwest of Tom Fox lake, Argyle township. The rock is andesite, sheared and altered to carbonate schist.

French Claims. Diamond drilling was done during 1934 by Hollinger interests on claim 8193, in the north part of Baden township.

Galer Claims. The group comprises nine claims in the northeast part of Bannockburn township. In 1932 trenching on claim 8485 uncovered several quartz veins in schist over a distance of 300 feet.

Hilltop Gold Mines, Limited. Some surface work was done on a group of thirteen claims, located in Argyle township.

Hollinger-O'Connell Gold Mines, Limited. The claims comprise 180 acres in Powell township. A vein was traced for 400 feet by surface trenching and stripping.

Hurd Claims. The property consists of four claims, located 1 mile east of the 3-mile post of the west boundary of Baden township. A sheared and mineralized porphyry dyke cutting andesite was traced by trenching and stripping for over 3,000 feet. In 1931 Arno Mines put down twelve diamond drill holes, totalling 2,000 feet, along the dyke.

L.B. United Mines, Limited. The company owns 800 acres in Powell township. Several veins have been traced by surface trenching.

Lelievier Claims. This group of nine claims lies east of Dara lake in Montrose township. Surface trenching disclosed large quartz lenses, in 1931. Margo Gold Mines, Limited. The company recently acquired a group of claims in the southwest part of Cairo township. So far work has consisted of trenching and stripping.

Matachewan Consolidated Mines. The mining property consists of twenty-one claims in Powell township, acquired in 1932. Previous owners had sunk a shaft on claim 5379 to 170 feet, with 1,000 feet of lateral work and 14,300 feet of diamond drilling performed. Operations were resumed in 1933 and several thousand feet of drifting and crosscutting done on the 170-foot level, in addition to further diamond drilling. A 100-ton mill was built in 1934 and the first bullion produced in December.

Matachewan Pioneer Syndicate. The syndicate has been doing surface work on their claims near Matachewan townsite. The rocks are greenstones with bands of iron formation.

McCollum Gold Mines, Limited. There are eighteen claims in the group, near the east boundary of Hincks township. Surface trenching completed in 1932 disclosed a vein 12 inches wide in granite on claim 8167.

McGill Gold Mines, Limited. The property comprises the former Davidson and Speers Syndicate claims, located 3 miles northwest of the Ashley mine in Hincks township. Quartz veins in andesite and basalt were explored by surface trenching and diamond drilling in 1931.

McNeil Mining Syndicate. In 1923 the syndicate acquired the Jowsey-Segsworth group of twenty claims in McNeil township. Test pitting and trenching were done and in 1925 two shafts were sunk to 65 and to 95 feet, respectively, on mineralized felsite dykes. Bulk sampling was reported in 1934.

Montrose Syndicate. This group of eighteen claims is situated along the boundary between Hincks and Montrose townships. A great deal of stripping and trenching were done in exploring sheared zones in greenstone.

Newcastle Oil and Mining Company, Limited. The company is doing surface trenching on three claims in Alma township and six claims in Cairo township.

Nugold Mining Corporation, Limited. The Matachewan claims are in Kimberley township. A shallow shaft was sunk in 1934 on a big quartz vein.

O'Connell Gold Mines, Limited. This company holds 250 acres in Powell and Cairo townships. About 5,000 feet of trenching was done and 3,000 feet of diamond drilling. Mine buildings were recently built and the shaft has been sunk below 100 feet.

O'Connor Claims. On claim 10247, in Cleaver township, surface work has disclosed gold-bearing veinlets cutting narrow syenite dykes. A pit was sunk on claim 10243, on an altered mineralized iron formation band. 18888-61 Oliver Gold Mines Syndicate. There are nine claims in the group, in the southeast part of McNeil township. Surface work was in progress during 1934.

Oliver-Tough Claims. There are thirty claims near the centre of Hincks township on which surface work was done in 1931. Trenching and stripping to locate the source of large masses of float found only narrow veins and porphyry dykes.

Sourdough Syndicate. The property consists of eleven claims adjoining the Ashley in Bannockburn township. Some surface work and 1,000 feet of diamond drilling were done.

Thesaurus Gold Mines, Limited. The mining property is at the head of Matachewan lake in Baden township. A shaft was started in 1921 and sunk to 300 feet, and 227 feet of drifting done on the bottom level. The mine closed down in November, 1924, but was pumped out and resampled in 1934.

Thompson Claims. The claims are in Argyle township near the 3¹/₂-mile post of the east boundary. Pits put down in 1932 disclosed a mineralized quartz vein, cutting granite.

Woman River Syndicate. The claims are in the southeast corner of Baden township. Considerable surface work was carried out during 1934.

Young-Davidson Mines, Limited. The claims comprise 163 acres, in the southeast part of Powell township. Prior to 1925 the Porcupine Goldfields operators did 17,702 feet of diamond drilling and sank a shaft to a depth of 200 feet. About 2,000 feet of lateral work was done on the 100and 200-foot levels. Work recommenced in 1933 and a new, complete mining plant was erected. Ore is being mined from open-pits by aid of electric shovels and the newly built cyanide mill handles 600 tons of ore a day. The initial production in November 1934 was almost \$70,000.

(16) Michipicoten and Goudreau Areas

Selected References: Collins, W. H., Quirke, T. T., Thomson, E.: Michipicoten Iron Ranges; Geol. Surv., Canada, Mem. 147 (1926).

Gledhill, T. L.: Michipicoten and Goudreau-Lochalsh Gold Areas; Ont. Dept. of Mines, vol. 36, pt. II (1927).

Moore, E. S.: Goudreau and Michipicoten Gold Areas; Ont. Dept. of Mines, vol. 40, pt. 4, pp. 1-54 (1931).

Map No. 1972: Michipicoten Area; Geol. Surv., Canada. Issued 1923.

Map No. 2050: Missinaibi Area; Geol. Surv., Canada. Issued 1925.

Map No. 40E: Goudreau Gold Area; Ont. Dept. of Mines. Issued 1931.

SITUATION AND EXTENT

Michipicoten gold area borders on the northeast shore of lake Superior and is situated a few miles east of Michipicoten Harbour. It is included for the most part in township 29, range 23. The most promising gold finds extend in a belt northward from High falls on Michipicoten river to Mackey point on Wawa lake. Goudreau gold area is situated about 15 miles north of Wawa lake. The principal mineralized zone is about 4 miles wide and stretches 15 miles northeast and 7 miles southwest from the village of Goudreau, a station on the Algoma Central and Hudson Bay railway.

GEOLOGICAL OUTLINE

The principal geological features of Michipicoten and Goudreau areas are similar. The same series of rocks occur in both areas, but there are a few marked differences in the character of some of the igneous rocks, and the Doré conglomerate which occurs abundantly in Michipicoten is relatively rare in Goudreau district.

The Keewatin formations are widely distributed and apparently of great thickness. The principal rocks are basic to intermediate lavas and evidently the more acid flows were extruded first. The stratigraphic relations of the lavas with respect to the iron formation are as follows, in order from bottom to top: acid lava or tuff, carbonate, pyrite, banded iron formation, and basic lava. Iron ranges are very numerous, but they differ from the typical banded jasper ranges of other localities in that they contain great quantities of siderite and pyrite along the banded silica.

The Doré series, which outcrops north of Michipicoten Harbour and in narrow belts northwest of Goudreau, consists principally of a thick conglomerate member, with greywacke beds. The series is considered as possibly Timiskaming in age and infolded into the Keewatin.

The Keewatin and Doré formations are intruded by a complex group of igneous rocks. These intrusions are of all sizes and range from great batholiths of granite to small dykes of aplite and lamprophyre. The varieties of rock include granite, porphyritic granite, syenite, granodiorite porphyrite, quartz porphyry, feldspar porphyry, alaskite, aplite, and lamprophyre.

Gold is particularly widely distributed in Michipicoten-Goudreau region, but so far no large ore deposits have been proved to exist. Goldbearing quartz veins occur in the sheared parts of the greenstones and acid lavas and in the sheared and brecciated parts of the intrusives.

HISTORY OF MINING ACTIVITY

Gold was discovered as early as 1896 at the Emily prospect on Dog lake and in 1897 Wm. Teddy, an Indian, found gold on Wawa lake. Many claims were staked south of Wawa lake and as early as 1900 attempts were made to mine the gold quartz veins at the Grace, Kitchigami, Norwalk, Mariposa, Golden Reed, Minto, Hornblende, and Ganley properties. Goudreau and the surrounding country became known as a gold camp in 1918 following the discovery of gold near Webb lake, 8 miles east of Goudreau, on claims staked for pyrite. During the next few years a large number of claims were staked in a belt ranging from 1 to 6 miles wide and extending east and west for a distance of about 25 miles. This activity resulted in renewed interest in the Michipicoten section and between 1920 and 1930 a great deal of underground exploration was done.

In 1934 a real mining boom developed in Michipicoten and Goudreau areas, occasioned by the high prevailing prices for gold. It was estimated early in 1935 that about seven hundred men were employed in the district and about fifteen mines and prospects were being actively worked. The largest mine, the Parkhill, is developed to a depth of 1,200 feet and is equipped with a 100-ton mill. This mine produced \$185,901 during 1934. The Minto mine produced \$101,610, and the Algoma Summit production during the last quarter of the year was \$2,979 (gold at \$20.67). Other mining companies actively engaged in development work at this time are: Atnel Mines, Darwin, Hillside, Wa Wa Goldfields, Consolidated Smelters, Milmac, Soocana, Stanley, Algold, Orecana Trusts (Kozak), Cline, and L. B. United (Centennial). According to the Mining Recorder at Sault Ste. Marie there were 8,456 claims registered in Algoma district up to the end of 1934 and most of these claims are in the Michipicoten and Goudreau-Lochalsh fields.

GOLD DEPOSITS

The various types of gold deposits in this district have been described by E. S. Moore as follows:

"The gold deposits all have the general form of veins, which vary greatly in width from point to point. The ore-bodies are in lenses, and values increase or decrease abruptly in most cases. Some of them are true fissures with distinct walls; others grade into the country rock by replacement of the walls with quartz and ankerite. Where the walls consist of schists the mineralization may extend into the schists for several feet on either side of the vein. Quartz is the most common gangue mineral, but some veins consist chiefly of carbonate with a little quartz and native In many cases the gold occurs in stringers of quartz cutting the gold. carbonate. The better values occur with the quartz gangue. Specks of native gold are frequently found in veins in which carbonate is predominant, but the ore is not of commercial grade. Tourmaline is one of the most common accessory minerals in the veins, and some veins contain little but tourmaline and quartz. Pyrite is found in practically all veins, and pyrrhotite and arsenopyrite occur in a few. Chlorite is a constituent of a number of veins. Carbonization of the wall-rock is a very common feature of many of the veins, particularly in the acid formations. Where the acid rocks are sheared, sericite schist is a typical wall-rock. Biotite has been formed by replacement in the walls of many veins, especially in the intermediate rocks.

"The veins occur in the sheared parts of the greenstones and acid lavas, and in the sheared and brecciated parts of the Algoman intrusives. The majority of the gold deposits are in the Algoman intrusions, because these fractured more readily than the Keewatin formations. On the McCarthy-Webb property, for example, the ore occurs in zones in the porphyry where shearing has been more intense than in the intrusion as a whole. In these zones extensive silicification and sericitization have occurred. Some porphyry dykes are so impregnated with quartz that they are mistaken by prospectors for quartz veins. They may even carry gold, but this is distributed so irregularly that it is of no commercial importance.

"Many of the veins show evidence of fracturing and faulting on a small scale following mineralization. This is well illustrated on the Minto property where the vein has been displaced at a number of points and intruded by lamprophyre dykes." Parkhill Mine. The veins at the Parkhill mine consist principally of quartz with some carbonate and contain pyrite, pyrrhotite, chalcopyrite, a little arsenopyrite, and native gold. They are contained in Keewatin greenstones. The main vein has a width of about 4 feet of solid quartz. Lenses of good ore alternate with barren sections both at the surface and underground. The gold recovery a ton during 1934 was reported as \$9.56, with gold valued at \$20.67.

Minto Mine. The Minto vein averages from 5 to 6 feet in width and consists of quartz and ankerite gangue containing pyrite, chalcopyrite, and pyrrhotite. Native gold is rarely seen. Some parts of the vein consist of solid sulphides. At the Jubilee deposit several large lenses of quartz were found. One of these contained 35,000 tons of ore carrying \$7 in gold. The lens was about 250 feet long, 75 feet wide, and extended to a depth of 250 feet. Another body on the 3rd level, about 100 feet long and 4 feet wide, carried \$9 a ton. There was a great deal of shearing along the Jubilee break subsequent to ore deposition and this resulted in the breaking and displacement of some of the quartz bodies. The Jubilee and Minto veins dip vertically, but the Ganley vein at the Cooper shaft dips at about 45 degrees northeast. It has a width of 4 feet and is said to average about \$10 a ton in gold.

Algoma Summit (McCarthy-Webb-Goudreau). The gold-bearing veins are confined to easterly trending shear zones in quartz diorite and they dip north at about 70 degrees. Gold occurs in quartz and also in fine-grained pyrite. The minerals are accompanied by tourmaline and by hydrothermal alteration in the shear zones. A smaller set of north-trending veins intersects the vein system. These veins are white and glassy, have few sulphides, and contain large quantities of black tourmaline in the form of thin, parallel seams filling fractures in the quartz parallel to the vein walls. A hand specimen of mineralized schist from an east-west shear zone carried \$30.20 a ton when assayed by the Provincial Assayer.

Darwin (Grace Mine). The main vein situated on claim D.J. 7 is bordered by diorite porphyry, which has been jointed, crushed, and altered near the vein. To the north, greenstone schist is more abundant. The vein ranges in width from a few inches to 5 feet with an average of about $2\frac{1}{2}$ feet. It strikes north 15 degrees west and dips 70 degrees east. At the surface the vein can be traced for only 200 feet and it appears to terminate at a cross dyke of lamprophyre, but the faulted and sheared structure on the strike of the vein may be traced several hundred feet farther. In the vein the quartz has been intensely crushed and sheared and the porphyry wall-rock has been replaced by pyrite, pyrrhotite, arsenopyrite, chalcopyrite, and native gold. Spectacular specimens of native gold are said to have been obtained from the vein at the surface. The vein was stoped from the 200-foot level to the surface some time prior to 1912. The old assay charts show that the ore was sporadically distributed. The average assay of ore found in the mine in 1901 was reported as \$12 a ton.

Origin of the Ores. The gold deposits are all found in quartz fissure veins or in mineralized shear zones. The character of the ore and the size and shape of the ore shoots were largely dependent upon the susceptibility of the country rock formations to fissuring and replacement. Ore deposition occurred through the agency of aqueous mineral-laden solutions. The presence of pyrrhotite, tourmaline, arsenopyrite, and biotite in the goldquartz veins indicates high temperature at the time of mineralization.

MINES AND PROSPECTS

The area has been prospected since 1896. Early attempts at mining were unsuccessful, but gold is now being produced. The nature of the development on the more active properties is shown below.

Algold Mines, Limited. The company owns the old Porter property 4 miles west of Goudreau station. Former owners sank two shafts, 400 and 200 feet deep, connected by drifts on the 200-foot level. Considerable surface work was done in addition to lateral work on four levels. The mine was equipped with two mills, one of 40 and one of 10 tons capacity. Diamond drilling operations were reported under way early in March 1935.

Algoma Summit Gold Mines, Limited. In June 1934, the McCarthy-Webb-Goudreau property was acquired—approximately 280 acres 4 miles northeast of Goudreau station. Extensive sampling and test pitting were done and a number of diamond drill holes were bored. A 24-ton capacity sampling mill is on the property. Shaft sinking was under way early in 1935. During 1934, 421 tons of ore was milled, with a recovery of \$7.07 a ton (gold at \$20.67).

Andargo Group. On the old tote road between Wawa and Hawk lakes, northwest of the Gibson iron group, a zone mineralized with chalcopyrite carrying values in gold and silver was developed for a time by the Coniagas Mining Company.

Atnel Mines, Limited. The property comprises 450 acres about 8 miles east of the Parkhill mine. Surface stripping and diamond drilling were done in 1934.

Banville-Page. On claim 532 at the north end of Rowan lake, in township 28, range 26. Surface work was reported in 1927 on a band of iron formation cut by quartz stringers.

T. T. Barnes, Township 28, Range 26. These claims lie just east of Irene lake. Considerable trenching and stripping were done on claim A.C. 570 and several mineralized bands were found at the contact of the granodiorite boss.

Brandt Group. These claims are situated about 1 mile southwest of Goudreau. In 1926 surface exploration was done and several shear zones containing gold-bearing quartz were discovered.

Brighton Group. Some exploration work was done on claim A.C. 451, located half a mile southwest of the west end of Murphy lake. Small, irregular quartz lenses in Keewatin rocks were found. Centennial Gold Mines, Limited. The company owns the former Kitchigami mine north of High Falls, in township 29, range 22. The Kithigami Gold Mining Company sank a shaft to 110 feet in 1904 and did some drifting on the 100-foot level. The Braddock Development Company erected a small mill and carried out some further work in 1909. During the summer of 1934 the shaft was deepened to 125 feet. In March 1935, L.B. United Mines were engaged in sampling the property in expectation of taking it over.

Cline Mines, Limited. The Cline property is situated at Cline lake, township 48, range 27. In 1920 surface operations revealed visible gold in narrow quartz veins cutting Keewatin schists. Between 1924 and 1927 Clines Canadian Gold Mines sank two shafts, No. 1 shaft to a depth of 140 feet with 90 feet of lateral work on the 80-foot level, and No. 2 shaft to a depth of 215 feet with 52 feet of crosscutting on the 100-foot level and 40 feet of crosscutting on the 200-foot level. In 1927-28 Cline Mines sank a new shaft to 115 feet. Further operations were under way in 1934.

Cooper Mine. The Cooper property is situated about 1.7 miles northeast of the Minto mine and 1 mile south of Wawa lake. The Cooper and Ganley veins were first explored by trenching and diamond drilling in 1926 and a small, inclined shaft was sunk on the latter. Minto Gold Mines now own the property and did further work during 1934.

Cora Mine. The old Cora shaft, situated at the north end of Jubilee lake on claim 2489, was sunk during the years 1898-1902 on a continuation of the Jubilee vein.

Darwin Gold Mines, Limited. The property was formerly known as the Grace mine. It is located about 4 miles southeast of Wawa and comprises thirty-one claims. The mine was first worked by the Algoma Commercial Company, started in July 1900. A shaft was sunk to 300 feet with levels at 100-foot intervals. About 800 feet of lateral work was done and some gold was produced prior to the failure of the company in 1903. The 10-stamp mill was operated again for a short time in 1908. During the years 1926-29 the Power and Mines Corporation developed the property. The shaft was deepened to 443 feet and 1,782 feet of additional drifting, crosscutting, and raising were completed. The mine was taken over in 1934 by Darwin Gold Mines who are actively developing it to the production stage.

Edwards Group. There are seven claims in the group, situated about half a mile east of Pine lake in township 48, range 27. On claim 3559 a test pit and trenches were dug on a mineralized zone. Hollinger Gold Mines optioned the property during 1925-26.

Emily Mine, Dog Lake. Gold was first found at the Emily mine on Dog lake in 1896. The claims lie about 5 miles southwest of Missanabie station across Dog lake. In 1901 and 1902 the Algoma Commercial Company sank a shaft to a depth of 56 feet on claim 1114 and bored three diamond drill holes. The rusty quartz vein was traced for several hundred feet.

Farquhar Group. These claims lie on the south side of the Gutcher Lake granodiorite boss, about half a mile west of Murphy lake. The main vein system has been stripped along the north boundary of claim A.C. 442.

Gananoque Claim. During the years 1897 to 1900 the Gananoque Gold Mining Company developed claim No. 128, located 3 miles east of Michipicoten city. An adit was driven 53 feet along the vein, and a second one was carried 20 feet to intersect the vein.

Golden Reed Mining Company. The claims are situated near Leroy lake in the southeast part of township 29, range 23. The company sank a 50-foot shaft on a quartz vein in 1907 and treated the ore in a small 3-stamp mill the following year. Some of the ore came from a 30-foot adit driven west on the vein from near the collar of the main shaft.

Goudreau Gold Mine. The Goudreau mine is situated on the north side of Murphy lake near the centre of township 28, range 26. Shaft sinking began in 1922 and mining operations continued until May 31, 1926. A mill was built in 1925 and operated during the first five months of 1926. No. 1 shaft was sunk to a depth of 425 feet and No. 2 shaft to 200 feet. About 2,800 feet of drifting and crosscutting were done on the 100-, 200-, and 400-foot levels. The property has been diamond drilled and explored by very large test pits.

Gutcher Claim. On claim A.C. 549, at Gutcher lake, township 28, range 26, surface work has exposed two veins.

Hillside Gold Mines, Limited. Press reports late in 1934 stated that this company was developing a property adjoining Wa Wa Goldfields. An adit was being driven, and a 15-ton mill was to be installed.

Hornblende Vein. The Hornblende vein is on claim No. 84, situated about 1 mile southeast of Wawa. In the early days Peter Nissen built a trial battery of two stamps, invented by himself, and worked the vein for a short time.

Huronian Belt. Some surface exploration was done by the Huronian Belt Company near the northwest corner of claim No. 2183, situated south of the Cline property, township 48, range 27. Several trenches and a test pit were dug.

Johnson Claims. The claims lie in township 47, range 27, about 2 miles south of Lochalsh station. Surface work has been done on several shear zones and small quartz veins.

Jubilee Mine. The mine is situated at Jubilee lake, about $\frac{1}{2}$ mile north of the Minto and 1 mile south of the west end of Wawa lake. Between December 1927 and April 1930, the mine was developed by an inclined shaft sunk to 546 feet. Levels were established at 185, 285, 410, and 535 feet. A 125-foot winze ran down to the 5th level and about 8,000 feet of drifting and crosscutting were done on the 2nd, 3rd, 4th, and 5th levels. A number of diamond drill holes were bored. In 1934 Minto Gold Mines, who own the Jubilee, carried on mining operations and treated the ore in the Minto mill. Kozak Property. This group of claims lies between the railroad and Kozak lake, in township 28, range 26. Nipissing Mining Company trenched the showings in 1927. Orecana Trusts, Limited, were developing the property during 1934. The Northern Miner reported that a shaft had been sunk to 100 feet. Veins and stringers of sulphides occur in Keewatin feldspar porphyry.

Kremzar Property. A group of sixteen claims between Goudreau lake and Miller lake in township 49, range 27, is known as the Kremzar. Surface exploration revealed ore lenses and in 1930 M. J. O'Brien optioned the property and initiated a diamond drilling campaign. Five holes were bored, totalling about 4,000 feet. Since then Kremzar Gold Mines have done further work.

Laccolith Mining Company. Two large groups of claims are held, one near Michipicoten Mission, where cabins were built and some diamond drilling done, and the other along the east border of township 29, range 23. The work at the mission was done at the contact of a granitic boss with greenstone. On the eastern group north of Leroy lake small quartz veins in greenstone were trenched.

Leroy Gold Syndicate. The syndicate owns 400 acres lying about 1 mile east of the Parkhill mine. In 1934 the syndicate reported two shafts sunk to depths of 95 and 40 feet, respectively.

Mackey Point. Mackey point, on the south shore of Wawa lake, was the scene of the first gold discovery in the area, in 1897. Several shafts were sunk and considerable trenching done prior to 1900. Further surface stripping was done during the summer of 1928 by the Mackey Point Syndicate. Consolidated Smelters was reported to be working underground at Mackey point during 1934.

McCauley. Claim A.C. 473 lies north of Perry lake in township 28, range 26. A quartz and carbonate vein in basic schist has been stripped and trenched for a short distance.

Michael Syndicate. The syndicate controls the McFadden group of seven claims, the Quartzite group of eight claims, and the Chitty group of five claims. These are situated in townships 48 and 49 along the northern side of the mineral belt around Maskinonge lake and southwest corner of Miller lake. Much trenching and test pitting have been done on the McFadden group. A 21-foot shaft was sunk on a brecciated fault zone in greenstone.

Michagami Amalgamated Gold Syndicate. The syndicate was organized to develop a group of claims situated northeast of the Minto mine. Only surface work has been done.

Michipicoten Gold Mines, Limited. Two properties are held, one adjoining the Stanley Gold Mines and the other adjoining Parkhill Gold Mines. An old shaft on one of these properties is reported to have been sunk to 100 feet. A number of veins have been traced on the surface. Milmac Mines, Limited. The company is developing the Stenabaugh vein on claim 3723. The prospect lies about 5 miles due south of Wawa. Trenching and test pitting have been done. A 500-foot shaft is proposed.

Minto Gold Mines, Limited. The property is at Minto lake about 2 miles southeast of Wawa. It was first prospected between May 1898 and June 1900, when the Wawa Gold Mining Company sank an inclined shaft on the vein to a depth of 130 feet. The mine was reopened in 1926 and operated intermittently until the present time. At the No. 1 shaft about 1,700 feet of drifting was done on the 100-foot level. At the new main shaft the vein is developed and being mined on the 120-, 220-, and 320-foot levels. A 90-ton mill built in 1931 is in operation. Production in 1934 amounted to \$101,610 with a recovery of \$4.58 a ton, gold at \$20.67.

Murray Algoma Mining Company, Limited. This property comprises 800 acres about $1\frac{1}{2}$ miles from Hawk Junction. Some diamond drilling was done and surface work is reported to be under way.

Norwalk Mine. This property, consisting of seventeen claims, is situated about 2 miles south of the Darwin mine. The mine was first worked between 1901 and 1903 by the Manxman Gold Mining Company. A shaft was sunk and a 10-stamp mill ran for a time, fed on ore from an open-cut. In 1909 the Norwalk Mining Company deepened the shaft and did about 150 feet of drifting on the 100- and 200-foot levels. The Grace Mining Company secured the property and continued underground work early in 1920. The mill ran for three weeks in February. When work ceased the shaft on claim B.Y. 58 was down to a depth of 254 feet with 100 feet of drifting on the 110-foot level and 120 feet of drifting on the 200-foot level. On claim B.Y. 62, a shaft was sunk to 128 feet with a 50-foot crosscut at the 50-foot horizon.

Parkhill Gold Mines, Limited. The property includes the former Mariposa and Longbottom groups of claims, in township 29, range 23. Shaft sinking on claim 3124 began in May 1930, and by November 1934, had been completed to a depth of 1,200 feet with levels at 125, 250, 375, 500, 615, 740, 860, 1,000, and 1,200 feet. A mill having an initial capacity of 50 tons daily was increased to 100 tons capacity in 1933. During 1934, a total of 19,431 tons of ore was milled with a recovery of \$185,901 (gold at \$20.67).

On the Mariposa claims an inclined shaft was sunk on claim J.D. 1 in 1902. Some drifting was done on the 200-foot level, but since then the property has lain idle.

Reid (A.C. 2301). The Reid discovery is about $2\frac{1}{4}$ miles northwest by trail from Hawk Junction. A number of large veins were reported to have been stripped in 1930.

Soocana Mining Company, Limited. The company holds 480 acres in three blocks near Hawk Junction. The claims are under option from the Holdsworth Gold Mining Company. Each group is developed by a shallow shaft and surface work. The company contemplates building a mill. Stanley Gold Mines, Limited. The company is developing eight claims in township 29, range 23, about 5 miles east of Wawa station. Surface trenching and stripping, some diamond drilling, and the sinking of a shaft to 265 feet have been completed. Levels were opened up at the 125- and 250-foot levels.

Sunrise Mine. Several mineralized quartz veins occur in diorite near the northeast corner of claim Y 330, in township 29. The property is reached by a road running east from the Minto mine. In 1903 an inclined shaft was sunk to 100 feet on the vein and soon afterwards a new vertical shaft was started. Evidently no work has been done since that time.

Valenti Group. This group of eight claims is situated a short distance northeast of High Falls, township 29, range 22. Several pits have been sunk and trenching and sampling carried out on well-mineralized quartz veins in basic schist.

War Eagle. The War Eagle claims are situated south of the Darwin mine in township 29, range 23. A great deal of stripping and test pitting have been done and several well-mineralized quartz veins were sampled.

Wa Wa Gold Fields, Limited. The company is developing one of the old properties on which a shaft was sunk and other underground work done in the early days of the camp.

Weary Willie. On claim 3396, situated on the north bank of Michipicoten river, a quartz vein staked in the early days has been stripped and a small test pit sunk on it.

Willis Vein. Near the centre of claim 3290, on low ground, an old 60-foot shaft was sunk in 1900 on a bluish quartz-ankerite vein in sheared Keewatin rocks.

(17) Nighthawk Lake Area

Selected References: Hopkins, P. E.: Night Hawk Lake Gold Area; Ont. Dept. of Mines, vol. 33, pt. 3 (1924).

Laird, H. C.: German-Currie Area; Ont. Dept. of Mines, vol. 40, pt. 3 (1931).

Map No. 33c: Night Hawk Peninsular Area; Ont. Dept. of Mines, 1924.

Map No. 40b: German-Currie Area; Ont. Dept. of Mines, 1931.

Map No. 33d: Murphy, Hoyle, and Matheson townships; Ont. Dept. of Mines, 1924.

SITUATION

The Nighthawk Lake gold area surrounds Nighthawk lake approximately 10 miles east of Porcupine. The lake lies chiefly in Cody, Macklem, and Carmen townships. It is accessible by motor-boat from Connaught station on the Porcupine branch of the Temiskaming and Northern Ontario railway. The road connecting Connaught station with the Ferguson highway at Shillington post office passes within 2 miles of Northeast bay.

GEOLOGICAL OUTLINE

The shores of the lake are covered for the most part with 25 feet or more of stratified clay and sand, but the area as a whole is believed to be underlain by rocks of Keewatin age. Outcrops are chiefly confined to the wave-washed shores and islands of the northeastern part of the lake.

Basic lavas showing pillow and amygdaloidal structures are common. These greenish rocks contain large percentages of chlorite, carbonate, and serpentine, and in many places are very schistose. A peculiar serpentinechlorite-carbonate schist occurs along the shore to the northwest of Gold island and on the north side of East peninsula. These are thought to be altered and schistose peridotites.

On North peninsula there is a wide distribution of rusty weathering, brown, grey, blue, and green carbonate schists, which contain up to 90 per cent of dolomite or other carbonate. They are cut by irregular quartz veins that carry gold.

A continuation of the Timiskaming sedimentary band from Porcupine extends east along the north shore of Nighthawk lake for 2 miles. The rocks consist of alternating beds of greywacke and conglomerate striking east and dipping 85 degrees north.

The Keewatin is cut by numerous small dykes of granite, granophyre, aplite, and porphyry. It was in the quartz veinlets in pinkish aplite dykes on Gold island that gold was first found in the area.

The granitic rocks have been intruded by dykes of porphyritic diabase. These are cut by reddish weathering dykes of olivine diabase.

HISTORY

Gold was first discovered on Gold island in 1907 by two Finnish prospectors, Victor Manson and Harry Benella. Two shallow shafts were sunk and a small mill erected, which burned in 1908. In 1917 work was done on Bald island. A 50-foot shaft was sunk and a crosscut driven north to intersect a vein. In 1921 the Night Hawk Peninsular Mining Company did extensive diamond drilling on Gold island but dropped their option soon afterwards. In 1923, 1,000 feet of diamond drilling was done on the neighbouring O'Connor claims in the vicinity of a 40-foot shaft. In 1930 Jas. G. Cameron optioned the Gold Island claims and did further work.

The claims of the Night Hawk Peninsular Mining Company were staked in 1907 by Chas. Auer soon after the discovery on Gold island. Two years later, gold was found in a quartz vein where the shaft is now located on the No. 1 vein. During 1916-17 a shaft was put down about 80 feet and some drifting done. A little later A. R. Globe and J. Callinan obtained an option and development work soon brought the property into the producing stage. A 100-ton mill was installed and production started in 1924. In three years the mine produced \$566,885 in gold. The mine was closed down in 1926.

Gold was reported on the Murr and Carveth claims in Thomas township in 1924. In 1929 a spectacular showing of gold was made on the farm of J. Anderson in the north half of lot 6, concession VI, Currie township, about 12 miles east of the lake, but the gold occurred in a few small pockets in a quartz vein 2 feet wide, and was soon completely removed.

ORE DEPOSITS

The No. 1 vein at the Night Hawk Peninsular mine is a quartz vein about 20 feet wide and 200 feet long. It occurs along the contact between black serpentine-chlorite-carbonate schist and greenish carbonate schist. The quartz is highly brecciated and gold may be seen in veinlets of almost transparent quartz.

On the lower levels of the mine, veins 2, 3, 4, 5, 6, and 7 have been developed for a considerable length in the carbonate-schist zone. These veins are of a different type. They consist largely of mineralized schist with irregular quartz masses similar in character to the ores of the Porcupine camp. No. 4 vein is 18 feet wide in one place. It consists largely of white quartz. There are small lenses of quartz in the schist and numerous veinlets of very fine-grained pyrite. No. 7 ore deposit is siliceous carbonate impregnated with pyrite and quartz.

On the Gold Island claims gold occurs in narrow quartz stringers cutting red aplite dykes. Cubes of pyrite are abundant in the aplite and nests of tourmaline occur in the quartz in some places. Assays made in 1930, from two representative dyke samples, gave values of \$3.40 and \$2.80, respectively, over a width of 40 feet. At that time it was not felt that this low-grade ore would allow a profit above initial expenditure and subsequent operating costs. Consequently, no further work was done. But with gold at \$35 an ounce it is probable that these deposits will receive further attention.

In Currie township on the Reid property prospect pits revealed small lenses and discontinuous stringers of quartz in closely sheared and highly altered Keewatin pillow lavas. Silicified parts of the zone gave values up to \$4.17 a ton from hand-picked specimens. In places the quartz is clouded with chloritic and aplitic material with fine iron sulphides.

The gold occurrence on the Anderson property was in a quartz vein about 2 feet wide along a faulted zone in the Keewatin greenstone. A specimen of the vein matter away from the free gold pockets gave negative assays. The quartz vein and the silicified wall-rock both contain fine iron sulphides, with small quantities of zinc blende, galena, chalcopyrite, bornite, and garnet.

In the central part of Thomas township a mineralized felsite dyke cuts Keewatin rocks on the Carveth claim. Tuffs and green carbonateserpentine-chlorite schists near the dyke have been impregnated with quartz and pyrite. The gold occurs chiefly in the felsite dyke and quartz veinlets.

MINES AND PROSPECTS

The area has been prospected since 1907 and has produced a little gold. The nature of the work done on the more active properties is given below.

Anderson Claims. The property is in lot 6, con. VI, Currie tp. A great deal of surface work was done on the vein and all high-grade material removed.

Carveth Claims. On claim P 7583 in the central part of Thomas township a 25-foot shaft was sunk on a felsite dyke, and considerable diamond drilling done. A track was laid to Whitefish river for handling freight (1924).

Gold Island Claims. Shafts were sunk to 50 feet on both Gold and Bald islands and from the latter a crosscut run 50 feet north. Considerable surface trenching and diamond drilling were done on both island and mainland.

O'Connor Claims. On North peninsula shafts were put down to 25 and 40 feet, and 1,000 feet of diamond drilling done on P 6140. A 30-foot shaft was sunk on the north shore of East peninsula.

Porcupine Miracle Mining Company, Limited. The property is near the southern end of Nighthawk lake in Langmuir township. Two shafts were sunk to depths of 200 and 70 feet, respectively. About 300 feet of drifting was done on the 105-foot level. A 60-ton ball mill was built. Operations ceased on December 1, 1915.

Porcupine Peninsular Gold Mines, Limited. The property is on the north peninsula of Nighthawk lake. It was formerly operated by Night Hawk Peninsular Mines. A shaft was sunk 1,000 feet and 4,500 feet of lateral work done. A 100-ton mill was in operation from 1924 until 1926 and produced \$566,885 in gold. During the autumn of 1934 an intensive diamond drilling program was carried out.

Samuel Reid Claims. On lots 5 and 6, con. II, Currie tp., prospect pits have been sunk and considerable surface trenching done.

(18) Oba Area

Selected References: Maynard, J. E.: Oba Area, District of Algoma; Ont. Dept. of Mines, vol. 38, pt. 6, 1929, pp. 114-125.

Map No. 38C: Oba Area; Ont. Dept. of Mines. Issued 1929 to accompany report by J. E. Maynard.

SITUATION AND EXTENT

Oba area takes in parts of twelve townships located adjacent to the village of Oba, which is situated at the junction of the Canadian National and the Algoma Central and Hudson Bay railways, approximately 80 miles northeast of Michipicoten Harbour on lake Superior. The gold occurrences are confined principally to Hawkins and Walls townships.

GEOLOGICAL OUTLINE

A highly schistose belt of Keewatin greenstones, more than a mile wide and bordered by granite, passes through Walls and Hawkins townships and continues southwest through Kabinakagami lake. This schist complex is bordered and intruded by granite and granodiorite and their corresponding gneisses. There is in addition a grey biotite and hornblende gneiss which may be older than the schist complex. In Walls and Hawkins townships there are numerous aplite dykes cutting the younger granite and schist complex. The dykes were intruded parallel to the strike of the schistosity and have formed a lit-par-lit structure. In many cases the aplite has been wholly or partly replaced by gold-bearing quartz veins.

HISTORY OF MINING ACTIVITY

The first gold discovery was made in 1923 by G. Taylor while timber cruising in Hawkins township, but it was not until September 1925 that the discovery claim was staked. This stimulated a mild interest in the area and several groups of claims were staked during the next few years in Hawkins, Walls, and Lizar townships. In 1934 Joseph Errington became interested in the Dubroy claims in Hawkins township and Hollinger Consolidated Gold Mines took an option on the Taylor-Trowse-Glick group. These claims are now being drilled and sampled to test the worth of the deposits.

GOLD DEPOSITS

The country rock in which the gold-bearing veins are situated is a well-banded mica and hornblende schist, cut parallel to the planes of schistosity by narrow dykes of slightly banded aplite. Both the basic schist and the aplite have been replaced by quartz.

On claim S.S.M. 4687 (Dubroy) the mineralized zone is reported to be about 400 feet wide. The veins range in width from 1 to 12 inches, strike east 12 degrees south, and dip 85 degrees north. The average distance between veins is about 65 feet. Native gold can be seen or panned at many places along the vein. The gold is associated with pyrite, chalcopyrite, and galena, and in places with a little pyrrhotite. Parts of the vein containing much galena are also rich in gold.

On claim S.S.M. 4310 (Taylor) there are three veins along the face of a steep bluff. The veins strike east 10 degrees north, dip 80 degrees north, and are about 100 feet apart. They were described in 1929 by Maynard as follows:

"No. 1 vein is 2 feet wide and is exposed for 50 feet. The vein material is quartz well mineralized with pyrite, chalcopyrite, and galena. No native gold can be seen, but it can be panned without difficulty. Two small veinlets occur just to the north of this main vein and are similarly mineralized. Both walls of this vein, where exposed, are in biotite schist. Just 5 inches to the south, however, a 5-inch dyke of aplite occurs. Where this vein is exposed to the west on the top of the hill the north wall is an aplite dyke 5 inches wide.

"No. 2 vein, upon which a test pit 4 feet deep has been sunk, consists of a series of quartz stringers in a sheared zone in the biotite schist, which is about 2 feet wide. It is mineralized with quartz, pyrite, and galena. Visible gold is quite abundant.

"No. 3 vein is exposed on the east side of the bluff. It varies from 8 to 12 inches in width. A more highly schisted zone of the country rock, 4 inches wide, occurs on each side of it. The vein minerals are quartz, pyrite, and gold. Native gold is not abundant, but it can be panned without difficulty."

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The basic schists, aplites, and quartz veins are all cut by massive, north-trending pegmatite dykes, and all four are traversed by late Precambrian diabase dykes.

MINES AND PROSPECTS

The first claims were staked in 1925. Very little development work has been done. The more active claims are listed below.

Dubroy Claims. The Dubroy claims are situated east of Langdon, in Hawkins township. During the autumn of 1934 J. Errington started an exploration and sampling program, which was continued in 1935.

Lizar Township. In 1928 a group of twenty-one claims was staked on the west shore of Kabinakagami lake. Surface trenching and stripping are reported on ore showings confined to a shear zone in greenstone.

Taylor-Trowse-Glick Group. This group of claims is east of Langdon, in Hawkins township, and adjoins the Dubroy group on the east. Stripping and test pitting on claim S.S.M. 4310 were reported in 1928. Hollinger Consolidated Gold Mines optioned the claims in 1934 and commenced diamond drilling and rock trenching.

(19) Panache Lake Area

Selected References: Collins, W. H.: North Shore of Lake Huron; Geol. Surv., Canada, Mem. 143 (1925).

Moore, E. S.: Ore Deposits near the North Shore of Lake Huron; Ont. Dept. of Mines, vol. 38, pt. 7, 1929.

Map No. 2173: Panache Sheet; Geol. Surv., Canada. Issued 1929.

Maps: Espanola and Copper Cliff Sheets; Geol. Surv., Canada, 1936.

SITUATION AND EXTENT

Panache lake is situated roughly 25 miles southwest of Sudbury. It is a large lake dotted with islands and deeply embayed, with an approximate length of 20 miles from east to west and a maximum width from north to south of 6 miles. The area includes those townships in the immediate neighbourhood of the lake and takes in Long Lake, Shakespeare, Howry Creek, and Mongowin Township gold occurrences. The area may be conveniently referred to as a block, seven townships in length from east to west and three townships in width from north to south, with townships 67, 69, Shakespeare, and McKinnon at the four corners.

GEOLOGICAL OUTLINE

The basement rocks of the area consist of a complex association of lava flows, basic intrusives, pyroclastics, and sediments (Sudbury series), now extremely folded and altered to green schists. A band of this Keewatin type of rocks extends in a northeast direction through Webbwood, Espanola, and Nairn stations on the Canadian Pacific railway.

Overlying the ancient altered schists and greenstones, and in faulted contact with them, are two series of steeply tilted, and in many places faulted, Huronian sediments. The lower series, the Bruce series, is represented by the Mississagi quartzite and basal conglomerate, the Bruce conglomerate, the Bruce limestone, the Espanola greywacke, the Espanola limestone, and the Serpent quartzite. In the Cobalt series there are slate conglomerate, beach-like conglomerate, and well-bedded slates, which are collectively classified as the Gowganda formation.

The Huronian sediments are cut by numerous diabase dykes and sills which occur throughout the whole district. On the northwest and along the south and east sides of the area, from Killarney towards Sudbury, sediments and diabase are folded, faulted, and altered, and are invaded by intrusive granite batholiths.

The gold occurrences are mainly of the quartz fissure vein type and the gold is associated with arsenopyrite. Most of the veins are in the Huronian sediments, but some are in the intrusive diabase. At Long lake an arsenical ore-body occurs as a replacement of an arkosic phase of the Mississagi quartzite.

HISTORY OF MINING ACTIVITY

The first gold discovery in the area was made on the site of the Shakespeare gold mine. The property was operated from 1903 until 1907 and produced some gold. Exploratory work was done on the adjoining Avon property in 1904, but no ore was found. The Shakespeare mine has been idle since 1907, but plans were made by Ensign Gold Mines to reopen the property in 1935.

The Long Lake mine, situated at the foot of Long lake in township 69, was operated by the Canadian Exploration Company from 1908 until 1916. The mine was developed to 345 feet to the point where the orebody was cut off by a fault. About \$800,000 in gold was recovered. Prospecting was carried on to the south and west during the next few years and in 1920 and 1921 there was a great deal of activity in townships 11 and Mongowin. Underground work was done by Bousquet Gold Mines, Majestic Gold Mines, and the Howrey Creek Mining Corporation, but all three properties were shut down in 1923. McMillan Gold Mines were active, developing their property at Moyle lake between 1926 and 1930, but aside from this operation little was done during the ten years from 1923 to 1933.

The renewed interest in gold mining, owing to the prevailing high price of gold, has stimulated activity in the area during the last few years. McMillan Gold Mines installed a 125-ton mill at their property and gold production started in the autumn of 1934. From 90 to 100 tons of ore are being mined and milled here a day, the mill feed running from 0.25 to 0.3 ounce in gold a ton. Up to the end of January 1935 the company had produced about 3,750 ounces of gold. Bousquet Gold Mines has developed considerable ore since resuming work late in 1933 and in 1935 finances for deeper exploration were supplied by Anglo Huronian, Limited. Bob Tough Gold Mines explored a property in McKinnon township in 1934 and shaft sinking was reported early in 1935. A 40-ton capacity mill was put into operation by Fox Lake Gold Mines in March 1935, but only ore from the surface was being treated at that time.

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There are a number of other active companies holding property for development. They include Miller Bay Gold Mines, Goodwin Gold Mines, Mongowin Mining Syndicate, Carruthers Gold Mining Syndicate, and the Marsh Lake Gold Mining Syndicate.

GOLD DEPOSITS

Gold occurs under several different conditions in the Huronian sediments as follows:

- (1) In quartz veins mineralized with small amounts of chalcopyrite.
- (2) In quartz veins well mineralized with arsenopyrite, with minor amounts of other sulphides, i.e. Shakespeare mine, McMillan mine, Bousquet mine, etc.
- (3) As quartz-arsenopyrite replacement deposits in arkosic quartzite, i.e. Long Lake mine.

The deposits of economic importance are those in which arsenopyrite is abundant.

McMillan Mine. E. S. Moore described the property in 1929 as follows:

"The mine is located on the Gowganda formation, which in this area consists of quartzite and schistose argillite. There are many irregularities in the distribution of the two rocks, and the veins run from one to the other, but they tend to follow the steeply dipping argillite bands and the contact between the two rocks. The Gowganda formation has been intruded by a number of diabase dykes and sills, and the dykes affect the underground workings in deflecting the veins. A large olivine diabase dyke crosses the property east of the mine, but does not materially affect the ore deposits.

"The ore minerals are arsenopyrite, which is abundant, pyrrhotite, chalcopyrite, and pyrite. These occur in a quartz and chlorite gangue. The order of formation of the minerals in the veins has been chlorite, quartz, arsenopyrite, pyrite, pyrrhotite, and chalcopyrite. There may have been more than one generation of quartz. It has generally been considered that the arsenopyrite is the sulphide that carries the gold It was shown that arsenopyrite carried most gold, but that the other sulphides carried lesser quantities. Gold was found in all the sulphides, but the coarsely crystallized pyrite found in vugs in the mine was barren."

Long Lake Mine. The geological features near the mine are shown on the Copper Cliff sheet and they were described by W. H. Collins in 1925.

"The mine is situated on the main line, or zone, of contact between the Huronian sediments and the intrusive Killarney granite. It lies near the middle of a wedge-shaped salient of Mississagi quartzite 2,000 feet wide that protrudes into the granites. This quartzite tongue is also intruded by an irregularly linear, possibly sill-shaped, mass of diorite older than the granite. The ore-body occurs in a mass of the quartzite which is either partly or entirely enclosed by the diorite. Several dykes of olivine diabase intersect all these formations.

"The ore-body is merely a part of the Mississagi quartzite that was impregnated with mispickel, pyrite, and other metal-bearing minerals. It has no definite walls. Mining operations were stopped in 1916 only when the gold values in the quartzite became too low to be profitably recovered. The body mined out is a stout chimney-shaped mass, roughly elliptical in horizontal cross-section, with diameters of about 150 and 250 feet. It pitches steeply towards the southwest to an extreme depth of 340 feet, at which it is sliced off obliquely by the fault mentioned above."

The fault mentioned strikes northeastward across claims W.D. 602 and S 1100. The fault dips at 45 degrees to the east at the surface, and starts in diorite, but about 40 feet down it meets the quartzite and there steepens to about 70 degrees. Prominent striations and gouge on the fault walls show that the west or foot-wall side of the fault, which holds the faulted part of the ore-body, has moved downward and southward in relation to the hanging or east wall.

Values ranging from \$8 to \$11 a ton were obtained from the ore raised. Little if any of the gold was visible. The typical ore was quartzite impregnated with a fine dust of arsenopyrite and pyrite particles, and according to J. A. Dresser¹ these ore minerals had replaced the feldspars in the quartzite, the ore-body coinciding with a particularly feldspathic part of the Mississagi formation.

Howry Creek Prospects. There are a number of properties in the vicinity of Howry creek, the Bousquet mine being the best known of these. Regarding these gold occurrences Collins states:

"There are two somewhat dissimilar types of ore deposit. The first type includes all but one of the ore-bodies. These are well-defined quartz veins, from 1 inch to 6 feet in width, and up to 350 feet in length. They strike east and west like the sedimentary formations and dip about vertically. One of them cuts across a body of late Precambrian diabase, but the others are in the Huronian sediments. They consist of white quartz and ankerite carrying arsenopyrite, pyrite, free gold, and occasionally specularite, but in very different proportions. Some are virtually barren quartz veins; others, as the Bousquet vein, contain as much massive arsenopyrite as gangue, besides considerable proportions of ankerite and pyrite. The wall-rock, especially if it be greywacke or conglomerate, is bleached, heavily impregnated with ankerite, and slightly mineralized with the same ore minerals as the vein-stuff for 2 or 3 feet on each side. Gold values range from nil to \$8 or \$10 and in occasional samples are very much higher.

"The deposit in mining claims 3180-81-82 is a schistified zone in Cobalt conglomerate which has been impregnated with ankerite and pyrite and filled with a plexus of veinlets similar in composition to the larger veins. The mineralized zone is 40 feet or more wide, and is said to extend east and west for half a mile. Apparently the mineralizing agents were the same as those that filled the larger veins, but the sheared conglomerate formation was incapable of forming large impervious fissures. Instead of the vein material being confined in one well-defined fissure it saturated and percolated through the country rock. In consequence, the mineral values are lower than in the veins."

¹ Collins, W. H.: Geol. Surv., Canada, Mem. 43, p. 122 (1925).

Shakespeare Mine. The rock constituting most of the ridge on which all the workings are located is described by E. S. Moore as an impure vitreous quartzite of the Sudbury series interbedded with streaks and bands of schistose greywacke. The quartzite is highly recrystallized, much more so than the later quartzites, and in many places it is difficult to distinguish it from vein quartz. Diabase occurs on the southeast side and around the small lake south of the mine. A hill of greenstone, probably of Keewatin age, outcrops northeast of the mine north of a wide valley filled with sand and drift. On the north side of the greenstone there is a large area of coarse-grained, pink Killarney granite.

The lode apparently consists of stringers of dark quartz running parallel with the strike of the quartzite, the whole folded and bulged into a lens between the main shaft and the mouth of the tunnel leading into it (60 feet). There are also streaks of rusted schist in the quartzite close to the shaft. The gold was deposited both in the vein quartz and along the walls in the schist. It evidently occurred in the free state as early reports stated that some of the finds of the yellow metal were equal in size and value to the best that the western Ontario gold areas offered. The ore-body was described as being 250 feet long and 50 feet wide. In 1929 Moore collected several samples from the property for assay and found that they contained no gold. This rather supports the view that the bulk of the vein quartz is barren and that gold occurs only in an erratic manner as coarse native gold.

MINES AND PROSPECTS

Gold has been produced intermittently since 1903. The nature of the work done on the more active properties is shown below.

Avon Mine. In 1904 this old property comprised concession I, north half lot 4, south half lot 4, concession II, and southeast quarter of south half, lot 5. A tunnel 200 feet in length was driven southeast across a rock ridge of about one-quarter mile northeast of the adjoining Shakespeare mine.

Bedard's Claim. The claim is situated on the south shore of lake Panache about one-half mile east of the boundary line between townships 83 and 75. Test pitting was reported in 1914, to have been done on narrow quartz veins at a quartzite and limestone contact.

Big Lake Mining Company. The company holds twenty claims in McKinnon township, adjoining the McMillan property on the west side. In 1928 an attempt was made to find the west continuation of the McMillan vein. Several trenches and pits have been dug and a shallow shaft sunk on showings of chalcopyrite and pyrite in quartz cutting quartzite and conglomerate near diabase intrusions.

Bob Tough Gold Mines, Limited. The company controls a group of claims in lots 4, 5, and 6, con. III, McKinnon tp., on the north shore of Moose lake. Early in 1934 about 2,500 feet of diamond drilling was done on a mineralized shear zone in quartzite. Shaft sinking was reported under way in September.

Bousquet Gold Mines, Limited. The property is situated at the east end of Charlton lake near the centre of township 11. In 1920-21 a shaft was sunk and 280 feet of lateral work done on the 100-foot level. Late in 1933 work was resumed and the shaft deepened. The vein was followed on the 150-foot level for about 450 feet. In March 1935, an ore length of 167 feet was reported on the 300-foot level and arrangements were made to sink the shaft to 600 feet.

Carruthers Gold Mining Syndicate. The claims under development are about 1 mile northeast of the McMillan Gold Mines in Mongowin township. A vein has been traced across the property by surface trenching.

Clarence Property. The claims are at Leech lake in township 90. A vein running south to Harwood lake had been trenched and a 14-foot shaft sunk.

Ensign Gold Mines, Limited. The company owns the old Shakespeare mine, situated in lot 5, con. I, Shakespeare tp., about $1\frac{1}{2}$ miles northeast of Webbwood. Gold was found here in 1903 and development was immediately commenced. A shaft was sunk and levels established on the 50-, 88-, 128-, 175-, and 227-foot levels. A 10-stamp mill was operated for a time and in 1905 produced as high as \$7,000 a month. The mine has been inactive since the autumn of 1907. Ensign Gold Mines expect to reopen the mine in 1935.

Foster Township. A short distance north of the east end of Stratton lake there is an old shaft on a large quartz lode about 60 feet in width. On the south shore of Stratton lake there are trenches and pits and a shaft 12 feet deep on a 150-foot stretch of vein.

Fox Lake Gold Mines, Limited. This property consists of a group of nine claims forming part of lots 5 and 6, con. IV, Mongowin tp. A 35-foot shaft and a number of test pits have been sunk on a wide, honeycombed, quartz carbonate zone. In March 1935, a 40-ton mill was installed and treatment of a surface oxidized zone was begun. The gossan zone has a thickness of 20 feet or more.

Goodwin Gold Mines, Limited. The company has been recently formed to develop a group of eleven claims adjoining Bousquet Gold Mines in township 11. Surface exploration, stripping, and trenching have been done.

Harmer Property. In lot 2, con. III, Shakespeare tp., some work has been done on quartz veins in gabbro and mica schist.

Jewel Gold and Copper Mining Company, Limited. The company was formed to work some veins in lots 11 and 12, con. I, Shakespeare tp. Surface prospecting was done in the spring of 1921.

Long Lake Mine. The mine is situated about one mile south of the foot of Long lake, in township 69, and is 6 miles northeast of Panache lake. The Canadian Exploration Company worked the mine for eight years, starting in 1908. A shaft was sunk for 225 feet and an inclined winze carried from the second level to 345 feet. From the 80-, 180-, 260-, and

330-foot levels a complex of drifts and stopes was made within the orebody and a glory-hole 100 feet in diameter was mined out to the second level. The ore was treated in a 20-stamp mill handling up to 140 tons a day. About \$800,000 in gold was recovered up to the time the plant was shut down in 1916. The property was taken over in 1933 by Lebel Oro Mines, Limited. During 1934 a 200-ton capacity mill was installed to treat the tailings from the old dump.

Majestic Gold Mines, Limited. The mine is situated east of the McMillan in Mongowin township. Underground development work done prior to suspension of operations in 1933 consists of a shaft sunk to 228 feet, with approximately 480 feet of crosscutting and drifting done on the 100- and 200-foot levels.

Marsh Lake Gold Mining Syndicate. The syndicate controls eighteen claims in Mongowin township, situated about one-half mile northeast of McMillan Gold Mines. A shallow shaft has been sunk and the vein stripped for 575 feet.

McMillan Gold Mines, Limited. The property is in lot 11, con. III, Mongowin tp., at the northwest end of Moyle lake. Diamond drilling was first done by the company in 1926 and shaft sinking was begun in the spring of 1927. Underground work was carried out chiefly on the 325-, 425-, and 525-foot levels until the mine was closed in 1930. Operations were resumed in 1933 and the shaft deepened to 650 feet. In 1935 a winze was sunk and levels established at 750 and 875 feet. About 8,000 feet of drifting and crosscutting have been done on five levels. In August 1934 a 125-ton mill was installed and has been in operation since that date. During the first fifteen months of operation thirty-nine gold bricks were produced, having a total value of approximately \$317,000.

Miller Bay Gold Mines, Limited. The company has acquired the claims formerly owned by Howrey Creek Mining Corporation. They are situated on the north side of Howry creek, about 6 miles east of Willisville, in township 11. In 1920-21 the former owners drove an adit 428 feet, but at the vein intersection only a tight fracture in quartzite was found. Then a shaft was sunk for 50 feet on the vein, about 110 feet east of the line of the adit. The property was inactive during 1933-34.

Mongowin Mining Syndicate. Six claims situated in Mongowin township are held by the syndicate. Surface exploration has been done.

Murdock Claim. It was reported in 1913 that on this location in township 11 a band of rusty quartz 6 feet wide had been stripped for 25 yards and a shallow pit sunk on the deposit.

(20) Parry Sound Area

Selected References: Blue, A.: Ont. Bureau of Mines, vol. 4, pp. 98-100 (1894). Coleman, A. P.: Ont. Bureau of Mines, vol. 8, pp. 259-262 (1898).

Ont. Bureau of Mines, vol. 9, pp. 259-262 (1900).

The town of Parry Sound lies on the east shore of Georgian bay, in McDougall township. In Foley, the adjoining township on the south, a small gold mine was worked about thirty-five years ago. Small goldbearing deposits were prospected about the same time in the bordering townships of Cowper and Christie.

The rocks of the district are composed chiefly of granite and gneiss with small areas of diorite and gabbro. There are also considerable areas of recrystallized sediments such as quartzite and greywacke which are transformed into garnetiferous schists and gneisses. The latter resemble rocks of the Grenville series. Quartz veins are fairly common, but most of them carry gold values too low to be of economic importance.

Gold was first discovered at the McGowan property in 1894 and the showings incited considerable prospecting throughout the district. Numerous small veins were found, but none was of sufficient merit to encourage underground work except at the McGowan. A number of small copper lodes were also found and some ore was mined at the Boyne mine on lot 35, con. IX, Foley tp.

At the McGowan mine the gold occurs in a series of parallel veins and stringers in a sheared diorite schist. The veins strike about north 70 degrees east and dip from 40 degrees to 50 degrees south. The gold occurs as small nuggets and scales in vitreous quartz and is associated with chalcopyrite, chalcocite, bornite, and oxidation products of these minerals. The gold occurs both in the quartz and in the sulphides. A test run of 24 tons of ore, made in July 1899, carried \$5 in gold a ton and about 15 per cent copper. Rock from the inclined shaft was reported to have yielded from 2 to $6\frac{1}{2}$ per cent copper and from 0.19 to 0.25 ounce of gold a ton.

MINES AND PROSPECTS

A small gold mine was operated for a short time many years ago. The more active properties are listed below.

Beatty and Wilcox Mine. The property is situated about a mile from Georgian bay, in lot 10, con. V, Cowper tp. A shallow shaft was sunk on the vein in 1897 and considerable surface trenching and test pitting were done.

Elmsdale. An irregular quartz vein in black diorite schist near Elmsdale station in Perry township was developed in 1899.

Mackenzie Township. A number of pits were sunk on an 8-foot quartz vein, in 1899.

McGowan Mine. Gold was found in lot 146, con. IV, Foley tp., in 1894. The McGowan Gold Mining Company worked the vein on a small scale for three years and secured some rich ore from open-cuts. In 1898
the Parry Sound Copper Mining Company took over the mine. An inclined shaft 100 feet long was sunk and a vertical shaft was put down to 87 feet, with a level at 77 feet. In 1902 the crosscut was reported to have been driven 130 feet and to have intersected a 3-foot vein of bornite at 70 feet. A 10-stamp mill was operated for a short time.

(21) Porcupine Area

Selected References: Burroughs, A. G.: "The Porcupine Gold Area"; Ont. Bureau of Mines, vol. 20, pt. 2, 1911; vol. 21, 1912; vol. 24, pt. 3, 1915; Ont. Dept. of Mines, vol. 33, pt. 2, 1924.

Graton, L. C., and McKinstry, H. E.: "Outstanding Features of Hollinger Geology"; Can. Min. and Met. Bull., No. 249, Jan. 1933.

"Statistical Reviews" and "Mines of Ontario"; See Ont. Dept. of Mines reports. Hawley, J. E.: "Ogden, Bristol, and Carscallen Townships"; Ont. Dept. of Mines, vol. 35, pt. 6, 1926.

Map No. 33a: Part of the Porcupine Gold Area; Ont. Dept. of Mines, 1924.

Map No. 35g: Townships of Carscallen, Bristol, and Ogden; Ont. Dept. of Mines, 1926.

Map No. 1931a: Porcupine-Shiningtree Area; Ont. Dept. of Mines, 1931.

LOCATION AND ACCESS

The Porcupine gold area occupies part of the Mattagami River drainage basin in northeastern Ontario and comprises approximately 250 square miles, including the townships of Tisdale, Whitney, Shaw, Deloro, Ogden, Bristol, and Mountjoy. The township of Tisdale, in which most of the producing mines are located, is about 40 miles southwest of Cochrane and 60 miles northwest of Kirkland Lake.

The town of Timmins lies on the west boundary of Tisdale township, adjacent to the Hollinger mine. Schumacher is near the McIntyre mine at Pearl lake. South Porcupine is about 2 miles east of Dome mines on the boundary between Tisdale and Whitney townships, at the west end of Porcupine lake. The larger town of Porcupine is 2 miles away, at the northeast end of the lake.

The district is served by a branch line of the Temiskaming and Northern Ontario railway, connexion being made at Porquis Junction 30 miles northeast of Porcupine. The distance from Toronto to Porcupine by train is about 485 miles. A road completed in recent years makes the district accessible by motor car.

GEOLOGICAL OUTLINE

The Keewatin greenstones are the oldest and most widespread rocks in the area. A band of Timiskaming sediments outcrops on the northwest side of the Dome mine and extends in a northeasterly direction. These formations are intruded by light-coloured varieties of quartz and feldspar porphyry. In addition, there are basic masses of intrusive rock now altered largely to serpentine. Granite, granite porphyry, and quartz monzonite outcrop in Whitney, Deloro, and Shaw townships. The youngest rocks are dykes of quartz and olivine diabase. The Keewatin consists mainly of lavas of varied composition, together with fragmental volcanic rocks, tuffs, banded iron formation, and carbonate rocks. The series was folded and eroded prior to the deposition of greywacke, slate, quartzite, and conglomerate of Timiskaming age. Following the intrusion of the porphyry these formations were subjected to intense folding, and later the greater part of the Timiskaming series was removed by erosion, leaving only the deepest parts of synclinal belts in the enclosing greenstone. The syncline of sediments near the Dome mine plunges east. The synclinal belt, marked here and there by the occurrence of Timiskaming sediments, continues east through Munro township and Lightning River area into Quebec.

At the time of folding, some of the rocks of the district were rendered quite schistose, the planes of schistosity striking approximately north 80 degrees east. In some zones, as in the vicinity of the Hollinger and Dome mines, shearing is particularly strong. The gold deposits occur in these bands of strongly sheared rock. The ore deposits may be related genetically to the intrusions of quartz monzonite in the area.

Veins within the porphyry are for the most part low grade or barren. Most of the ore occurs in veins in the greenstone, but at the Dome mine large masses and "domes" of quartz were mined from the conglomerate and greywacke of the Timiskaming series.

The region is largely covered with boulder clay, varved clay, sand, gravel, and peat.

HISTORY OF MINING ACTIVITY

In 1896 the district was reported by E. M. Burwash to show promise as a gold field. Again, in 1899, the area was spoken of by Dr. Parks as one that would reward the prospector.¹

An old Hudson's Bay Company portage route connecting Nighthawk lake and Mattagami river included Miller, Gillies, Pearl, and Porcupine lakes, and thus passed close to some of the Hollinger veins. Prospectors using this route in 1906 did some work on a vein near Miller lake, but became discouraged and abandoned it.

In 1908 H. F. Hunter discovered gold on the northeast shore of Porcupine lake. In 1909 George Bannerman found gold north of Porcupine lake on a property afterwards known as the Scottish Ontario. Later in the year, John S. Wilson staked "a large outcropping of quartz with spectacular showings of gold," the vein being 100 feet in places. This became the Dome mines.

At about the same time Benjamin Hollinger staked a number of claims near Pearl lake. These claims comprised the original Hollinger mine. The adjoining Acme group and other claims, now the property of the Hollinger Consolidated Mines, were staked by John Miller and Alex Gillies.

News of the gold discoveries caused a great rush into Porcupine area, and the ground was staked for miles around during the autumn of 1909 and the following winter.

Fortunately the pioneer development work fell into the hands of two strong financial groups experienced in the handling of mining properties.

¹ Ont. Bureau of Mines, 1896 and 1899.

The Hollinger mine was developed by the Timmins-McMartin-Dunlop Syndicate, later the Canadian Mining and Finance Company, Limited; and the Dome mine by the Canadian Copper Company and allied interests. At the Hollinger mine a 2-stamp Tremaine mill was put into early operation and produced 1,733 ounces of gold in 1910. During the same year 214 ounces of gold and 19 ounces of silver were recovered at the Dome mine.

A newly built 30-stamp mill at the Hollinger mine was destroyed by a forest fire in May 1911. On July 11, a second great fire completely wiped out the surface structure at all the mines and destroyed the town of South Porcupine. The north part of Porcupine was also burned and seventy-one persons lost their lives. However, great strides were made the following year. A 300-ton mill was put into operation at the Dome mines in March 1912, and one at the Hollinger mine in June of the same year. The milling process was a combination of amalgamation and cyanidation of the ores. McIntyre-Porcupine Mines got under way the same year, commencing with a 10-stamp amalgamation and concentration mill, which was replaced in 1913 by a 150-ton mill. On the Vipond claims, some bullion was produced in 1911 with a 1-stamp Nissen mill. After the great fire a new 100-ton mill was installed. The bullion produced from these four mines amounted to \$1,740,596 for 1912.

From this time development and expansion went on extremely rapidly at the various mines. Milling capacities were gradually increased and the most modern equipment was installed. As the ores are medium to low grade, large-scale operations were resorted to as being most economical in winning the gold.

The Hollinger mine stands out today as the major producer in the camp. More ore has been mined and more gold produced there than in any other mine in Canada. This great mine has a rated milling capacity of 6,000 tons a day. During 1933 the actual rate of milling averaged 4,758 tons of ore a day. The mine is serviced by four central shafts, a 6-compartment vertical shaft used for hoisting all ore, and three 3-compartment vertical shafts used for men and materials. The Schumacher shaft is 4,040 feet deep and is the deepest of these shafts. The total length of underground workings in the mine is over 150 miles. For the most part shrinkage stoping has been employed in mining, but slice and fill methods are becoming more popular at depth.

Development work at the McIntyre mine has shown that the veins persist to depths greater than a mile. Good vein widths were recently encountered on the 5,375-foot level. Ore is being mined on this property from various levels for about a mile along the strike of the veins.

Since 1910 the Hollinger has produced over \$200,000,000 in gold and silver. The next two large mines, the Dome and McIntyre, are far behind with about \$70,000,000 each. The Anglo-Huronian (Vipond) has produced bullion valued at about \$8,000,000 and the Coniaurum over \$5,000,000. Among a dozen smaller operators the Buffalo Ankerite, the Marbuan (March), and the Paymaster mines show promise of increased production. The total value of bullion produced by mines of the Porcupine belt up to the end of 1935 amounted to \$369,660,838. The production of the individual mines is shown in the accompanying table. Value of Production (Gold and Silver) by Mines of the Porcupine Belt, 1910-1935*

Rea and Newray	688185 81205,2858 91,5467	\$147,076
Pay- master	\$2,800 \$3,551 133,0251 183,0251 183,2271 183,271 183,271 183,271 183,271	\$761,252
Schu- macher ⁴	\$48, 236 \$48, 236 192, 842 192, 842 192, 842	\$564, 894
Night Hawk Peninsular	\$288, 515 106, 947 111, 154	\$566,885
Marbuan (March) ³	\$11,055 \$11,055 \$19,339 133,873 236,825 206,262 78,835 78,835 168,454	\$1,261,034
Buffalo Ankerite ³	\$140,588 339,005 339,005 71,689 71,687 878 878 426,549	\$2,573,122
West Dome Lake	\$102,880 16,814 16,814 16,814 144,745 23,910 47,163 758 220,758 758 758 758 758 758 758 758	\$1,114,821
Porcupine Crown and Northcrown	N.C. Poroupine Crown 8235 8255 8255 927 77 97 927 935 935 935 935 935 935 935 935	\$2, 871, 847
Coniaurum	\$2200,5584 \$2200,5584 \$635,485 \$631,085 \$681,085 \$689,992 \$688,424	\$5,161,516
Vipond ¹	\$5, 160 16, 255 16, 255 176, 605 176, 605 209, 573 823, 873 555, 379 555, 379555, 379 555, 379555, 379 555, 379 555, 379555, 379 555, 379 555, 3	\$7,811,079
McIntyre	2367, 659 249, 166 549, 166 749, 166 7549, 166 7549, 166 7549, 166 7549, 166 7549, 166 1, 778, 114 1, 578, 434 1, 578, 434 1, 578, 434 2, 021, 389 3, 865, 270 2, 021, 388 3, 865, 270 4, 256, 578 4, 566, 5785, 578 5, 578 5, 578, 5785, 578 5, 578 5, 578 5, 578 5, 5785, 578 5, 578 5, 578 5, 578 5, 578 5, 5785, 578 5, 578 5, 578 5, 57885,	\$70,750,046
Dome	4 , 275 4 , 275 4 , 275 1 , 232, 125 1 , 232, 225 1 , 232, 232 1 , 230, 237 1 , 230, 231 1 , 230, 231 1 , 230, 231 2 , 230, 233 4 , 377, 144 4 , 376, 523 3 , 510, 507 3 , 510, 507 5 , 507 5	\$168,017,351
Hollinger	 \$31, 104 \$31, 104 \$6, 000 181, 986, 015 5, 0719, 955 5, 0719, 955 5, 0719, 955 5, 0719, 955 6, 2219, 665 6, 722, 2366 6, 722, 2366 6, 732, 3719, 665 6, 732, 373 9, 957, 333, 958 9, 971, 747 8, 671, 747 	\$207,262,982
Year	1910 1911 1914 1914 1915 1915 1916 1916 1925 1925 1925 1925 1925 1925 1926 1925 1926 1926 1926 1926 1926 1926 1926 1926	Total

•Young, A. C.: "Preliminary Report on the Mineral Production of Ontario in 1985"; Ont. Dept. of Mines, Bull. 103. Charged to Anglo-Huronian, Limited, October 16, 1983. Formerly Ankerite: remaned Buffalo Ankerite in 1932. The March was remamed the Marbuan in 1934; the Buffalo Ankerite operated the Marbuan mill in 1933, treating 2,800 tons from the dump of the New York Porcupine Od Minesed by the Hollinger in 1932.

SRea.

ovewnay. "Total value of bullion in 1927 was \$57,919. Figures shown in above table allow for a reduction of \$52,667, due to an erroneous return made in 1925.

Value of Production (Gold and Silver) by Mines of the Porcupine Belt, 1910-1935-Continued

Total value (standard)	\$ 35, 54 15, 453 15, 453 15, 453 15, 453 15, 453 15, 453 17, 495 177, 554 177, 554	\$369, 660, 83
Miscel- laneous	**************************************	\$561,037
Hughes	068	\$30
De Santis	\$146	\$11,962
Tommy Burns		\$289
Gold Reef	\$1,547 5883	\$2,135
Porphyry Hill	\$4,200 2,036	\$6, 236
Porcupine Pet	\$5,000 5,551	\$10,551
Scottish- Ontario	\$5,893 6,795	\$13, 575
Preston and Clifton	ut 15, 212 011110 5, 270	\$30,477
David- son	\$15, 579 27, 089 11, 246	\$53, 914
Porcupine United	\$44,285 \$66,9135 5,439	\$106,637
Year	1910 1912 1913 1914 1914 1916 1916 1916 1916 1916 1916	Total

Preston.

²Huddlestone and Cline.

Mncludes "high-grade" recovered from W. P. Wilson.

Blue Quartz.

⁶High-grade recovered.

^eHigh-grade recovered. ⁷Munro Crossus, \$3,955; and miscellaneous, \$32,159. ⁸Hayden, \$1,497; Munro Crossus, \$5,722; J. Spence, \$2,515; and miscellaneous, \$29,206.

⁹Canusa.

¹⁰Treated in Hayden mill. ¹¹Hayden, \$2,516; New York Porcupine, \$3,164; and \$77,063 recovered mainly from scrapped machinery, of which J. M. McLaren is credited with

\$326 on ore shipped to Noranda.
\$337; McLaren-Porcupine, \$205; Munro Croesus, \$6,184; Northern Turnbull, \$103; miscellaneous, \$992.
¹³Amalgamated Goldfields, \$33,488; McLaren \$2,261; Munro Croesus, \$13,292; Naybob, \$13,938; and miscellaneous, \$2,154.

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1000 9 Vein Systems. The Hollinger and McIntyre mines are adjacent properties operating on the same series of veins. The veins occur in a strongly sheared zone striking northeast. The width of the sheared zone at the boundary between the two properties is approximately 1,800 feet. The shapes of the veins are extremely irregular. The quartz structures vary from tabular and lenticular masses, several hundred feet long, to mere veinlets only a fraction of an inch wide and a few feet long. Some veins occupy curving fractures and have local branches. Other veins follow and replace sedimentary beds even where they are drag-folded into numerous kinks and meander-like curves. Some large masses of quartz contain irregular blocks and strips of schist, and in places the strips are so numerous as to give the vein a roughly banded appearance. Some of the lodes consist of stringers or quartz lenses arranged *en échelon*, the lenses lying parallel to the schistosity.

Most of the commercial ore-bodies consist of a central, quartz-rich vein with marginal bands of pyritized country rock, or of numerous quartz veinlets together with the intervening pyritized rock.

Most of the veins are in the greenstone, but some enter and run for long distances through schistose porphyry. However, on entering the porphyry the gold values fall almost immediately to much lower grade. Possibly the chloritic greenstones acted as a precipitant of the gold, whereas the sericitic schistose porphyry did not.

The quartz masses at the Dome mine are large, irregular lenses from 15 to 150 feet wide, and up to 600 feet long. Individual lenses are as long as 800 feet down the dip. Two large elliptical masses of quartz that were mined in an open-cut measured 125 feet by 100 feet in surface outline. The country rock is schistose conglomerate and greywacke of the Timiskaming series. The slate of the series does not contain ore.

The ores consisted, as at Hollinger, of quartz, and mineralized schist, but the proportion of schist was much larger, amounting to nearly 85 per cent. Some of the ore was simply a dark grey schist spotted with pyrite and cut by vague veinlets of quartz. Much of the gold occurred in combination with pyrite, which formed about 5 per cent of the ore. The proportion of quartz in the different ore-bodies varied greatly. Though occurring in large masses in some deposits it is estimated at from 10 to 15 per cent of the total ore mined.

The veins have now been mined out in the greywacke and conglomerate, but new large ore-bodies have been located in the Keewatin greenstones to the north and west. Some ore has also been mined in the porphyry adjacent to slate contact where damming of solutions induced ore deposition. Minor synclinal axes on a small fold within the major sedimentary syncline were found to have numerous ore-bodies, whereas on the anticlinal wrinkle ore was practically absent.

Mineralogy of the Ores. Most of the gold is intimately associated with pyrite, and is present in a very fine state, but with the microscope it may be seen along the crystal faces or in fractures in the pyrite or as rounded and irregular blebs within the pyrite grains. The crystals of pyrite are usually small and are present in amounts varying from 5 to 15 per cent of the ore. It is better crystallized in the schist than in the quartz. A small amount of free gold occurs in the white gangue of the veins independently of the pyrite. This type of gold is commonly associated with ankerite, in which it forms veinlets along grain boundaries, cleavage planes, twinning lamellæ, and intra-grain fractures. Most of it occurs along contacts between ankerite and quartz, but a little is entirely enclosed by quartz. The precious tellurides, petzite and sylvanite, are occasionally present and bear a similar relationship to ankerite and quartz. Some of the quartz carries crystals of tourmaline and the tellurides in places occur in the fractures and along the crystal faces of the tourmaline.

Some parts of the veins contain a considerable amount of albite feldspar. The deposition of ankerite was mainly later than albite, and quartz was the last gangue mineral. Pyrite deposition was continuous throughout the period of mineralization.

Pyrrhotite in irregular, massive forms is frequently found intergrown with pyrite. Chalcopyrite, galena, and zinc blende occur in small quantities, and where they are found the values are usually high. Arsenopyrite is occasionally present.

Reddish brown scheelite occurs at several mines. Pyrrhotite, tourmaline, and scheelite are recognized as high-temperature minerals and give evidence of the high-temperature origin of the veins.

Wall-rock alteration is most extreme where the shearing was most pronounced. Zones of extreme alteration are usually present along the margins of the most productive veins. The alteration consists of a development of carbonate, sericite, and pyrite. Chlorite is abundant where the rock is a basic lava. The change from vein material to wall-rock is commonly very abrupt, so that the margins of veins and stringers are generally sharply defined.

Faulting. The shear zones were presumably pre-mineral faults that sheared and sliced the rocks over considerable lateral widths. Many small breaks have developed since mineralization, but the veins are seldom offset more than a few feet.

MINES AND PROSPECTS

The area has been actively prospected since 1908 and has been a steady large producer of gold since 1910. The Hollinger mine has produced more gold than any other mine in Canada. The nature of the development work on the more active properties is given below.

Apex Mines, Limited. The property consists of 80 acres in Tisdale township about 1 mile west of the Dome mine. Two shafts were sunk in 1912 to depths of 65 and 120 feet, respectively, and 300 feet of lateral work completed. Considerable diamond drilling was done.

Arcadia Gold Mines, Limited. The company owns fourteen claims in Shaw township. There are two old shafts on the property, each reported to be 100 feet deep and with 400 feet of lateral work. Considerable surface trenching has been done.

Beaumont Claims. The property is in the northeast part of Tisdale township. In 1927-28 the shaft was deepened below the 700-foot level and some crosscutting done. The levels are at the 150-, 300-, 450-, 600-, and 700-foot horizons. Big Dyke Gold Mines, Limited. The property is about half a mile north of the "Hayden mine" in Ogden township. An adit 115 feet long was driven.

Buffalo Ankerite Gold Mines, Limited. The mining property consists of three claims, totalling 115 acres, in Deloro township about 2 miles southwest of Dome mines. The mine has been producing since 1926, but was closed during 1930 and 1931. Development has been carried to the 1,000-foot level. The mill is operating at about 350 tons a day. Total production to date is about \$2,000,000.

Canusa Gold Mines, Limited. The property was formerly the Scottish Ontario. It consists of 440 acres in Whitney township about a mile north of Porcupine lake. In 1928 the shaft was deepened to 320 feet. On the 305-foot level 560 feet of crosscutting and 135 feet of drifting were done. On the 90-foot level a crosscut was driven 135 feet south. A 50-ton pilot mill was completed in 1931. In 1933 the mine produced \$80,446 in gold.

Central Porcupine Mines, Limited. The property consists of thirteen claims in four groups adjacent to Coniaurum mines. Plans have been made to explore the ground by using the Coniaurum Goldale shaft. A crosscut will be driven into Central Porcupine property from the 1,000-foot level. Some diamond drilling was done.

Chappie-Mammoth Gold Mines, Limited. The company has acquired eleven claims, formerly belonging to "Mammoth Porcupine" at South Porcupine. Four thousand feet of diamond drilling has been done. Plans are made for an extensive drilling program.

Concordia Gold Mining Company, Limited. The company was formed to acquire and operate the Jones-Porter properties, consisting of fourteen claims in Deloro township. In 1928 a shaft was sunk 138 feet and a station cut at 125 feet.

Clifton Consolidated Mines, Limited. The property consists of 50 acres along the north boundary of Deloro township about a mile south of the Dome mine. Two shafts were sunk here, to 100 and 235 feet, respectively. Three thousand feet of lateral work was done and a 50-ton mill produced some bullion between 1922 and 1924.

Coniaurum Mines, Limited. The company owns $681\frac{1}{2}$ acres in Tisdale township adjoining the McIntyre Porcupine property. On the former Newray section of the property the mine has been developed to 3,150 feet by a new 3-compartment shaft. The Goldale shaft is down 1,000 feet. The mill is operating at a capacity of 400 tons a day. The mine has been producing since 1928, the value of bullion to date being in excess of \$4,000,000.

De Santis Gold Mining Company, Limited. The property consists of nine patented claims about 4 miles southwest of Timmins in Ogden township. A shaft was sunk 215 feet with levels at 90 and at 200 feet. Three hundred feet of lateral work and 1,500 feet of diamond drilling were done. In 1933 some ore was mined and gold valued at \$18,386 recovered. The Hayden mill, 2 miles distant, was used. Development work continued in 1934.

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Delnite Mines, Limited. The company is developing 130 acres in Deloro township, formerly the LaRoche and Rendix claims. The shaft is down 145 feet and about 600 feet of lateral work has been done on the 125-foot level. Diamond drilling is proceeding.

Dome Mines, Limited. The property consists of 558 acres and includes the claims formerly owned by Dome Extension Mines. The early workings consisted of glory-holes over a length of 900 feet, and up to 300 feet wide, carried below the 100-foot level. The mine is equipped with a 1,500ton cyanide mill and is producing over 4,000,000 yearly. The main development shaft has four compartments, is 2,079 feet deep, and has twenty-seven levels established at 125- to 150-foot intervals. During 1933, 546,500 tons of ore was milled, the yield a ton milled being 8.1485at \$20.67 an ounce.

Empire Gold Mines, Limited. The company owns 360 acres on the north shore of Gillies lake about $\frac{1}{2}$ mile north of Timmins. Surface trenching has been done and two 100-foot shafts were sunk.

Excello Mines, Limited. The company owns 200 acres $2\frac{1}{2}$ miles south of South Porcupine, formerly the property of Furness Gold Mines. A shaft was sunk 155 feet and about 900 feet of drifting and crosscutting performed on the 125-foot level. A 10-ton mill was under construction in 1934.

Foley O'Brien Corporation, Limited. The property consists of 520 acres adjoining and northeast of Dome mines, now partly owned by Newmont Mining Corporation. Three shafts were sunk to 70, 230, and 250 feet, respectively, and considerable lateral work accomplished prior to 1914.

Gillies Lake-Porcupine Gold Mines, Limited. The claims comprise 240 acres on Gillies lake adjacent to Timmins. The property was worked by Canadel Mines from 1923 to 1926. In 1928 Porcupine United Mines built a small mill and by 1931 had recovered over 100,000 in gold. The shaft is 947 feet deep with levels at 100, 300, 500, and 900 feet. About $1\frac{1}{2}$ miles of underground work has been accomplished, and a 100-ton mill is being built.

Hollinger Consolidated Gold Mines, Limited. The company owns the largest gold mine in Canada. The property consists of about 560 acres covering the main vein zone south of the McIntyre Porcupine property. Four of the numerous development shafts are used in production and development work. Twenty-five levels have been established to a depth of 4,100 feet. A central 6-compartment shaft is used to hoist all ore; men and materials are handled in two 3-compartment shafts. The mine is equipped with an 8,000-ton daily capacity cyanide mill. During 1933, 1,727,102 tons of ore was milled having an average value of \$8.26 a ton. An average of 2,527 men were employed during that year.

Hughes Porcupine Mines. The property is in lot 10, con. IV, Whitney tp. In 1912 the shaft was put down to 200 feet and 350 feet of lateral work done on three levels. Iroquois Porcupine Mining Company. The claims are in lot 9, con. II, Whitney tp. In 1911 two shafts were sunk to 40 and 25 feet.

Keora Mines, Limited. The property comprises 120 acres in Whitney township, upon which a shaft was sunk 250 feet and 1,000 feet of lateral work performed.

Langmuir Claims. These comprise ten claims lying west of Mountjoy creek in Ogden township. A shaft was sunk 115 feet on the west vein; for 60 feet on the east vein. Inactive since 1922.

Marbuan Gold Mines, Limited. The property consists of five claims in Deloro township, owned prior to 1933 by March Gold, Limited. The claims are immediately south of the Buffalo Ankerite. The mine has been developed to the 1,050-foot level and the mill is handling about 150 tons daily. Since 1926 over \$1,000,000 in gold has been recovered.

McIntyre-Porcupine Mines, Limited. The mining property comprises 680 acres, covering $1\frac{3}{5}$ miles along the strike of the main vein zone. There are eleven shafts on the property, three being used in operations. The main 5-compartment shaft reaches a depth of 4,150 feet. A winze from the 3,875-foot level has been completed to 5,500 feet and crosscuts driven at 4,175-, 4,475-, 4,925-, and 5,375-foot horizons. Recovery equipment includes a 2,400-ton flotation and cyanide mill. For the fiscal year ending March 31, 1934, 776,845 tons of ore was treated. The recovery was \$6.72 a ton with gold at \$20.67 an ounce.

McLaren Porcupine Gold Mines, Limited. The company owns seven claims, approximately 280 acres in Deloro township, about 3 miles from South Porcupine. A small mill was installed early in 1934 and has been producing on a small scale since that time. Three shallow shafts have been sunk and test pitting and trenching done.

Moneta Porcupine Mines, Limited. The property comprises three claims adjoining Hollinger's southwest boundary. A shaft has been sunk for 120 feet and some diamond drilling done. Inactive since 1917.

Mulholland Gold Mines. Work was done in lot 10, con. V, Whitney tp., in 1911. A shaft was sunk 100 feet and 285 feet of drifting and 140 feet of crosscutting done.

Naybob Gold Mines, Limited. This property belonged to Hayden Gold Mines prior to 1933. The claims comprise 625 acres $3\frac{1}{2}$ miles south of Timmins. A 2-compartment shaft has been sunk 719 feet, and lateral work done on levels at 100, 200, 300, 400, 550, and 700 feet. Equipment includes a 40-ton mill which produced \$1,497 in 1932.

New York Porcupine Mines, Limited. The claim is in the south half of lot 4, con. 1, Tisdale tp. A vertical shaft has a depth of 272 feet with levels at 125 and 250 feet, with 1,621 feet of drifting and crosscutting. In 1928 an inclined shaft was put down 375 feet.

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North Dome Mining Company. The property lies adjacent to, and north of, Dome mines. Shafts were put down to 60 and to 250 feet and connexion made on the 50-foot level, a distance of 325 feet. One hundred and fifty feet of drifting was done on the 250-foot level.

Pamour Porcupine Mines, Limited. A consolidation of Lapalme Porcupine, Three Nations Porcupine, and Porcupine Grande, totalling 800 acres, northeast of Porcupine in Whitney township. There are two shafts of 100- and 200-foot depths, respectively, and 3,000 feet of lateral work has been done. Six thousand feet of diamond drilling was completed. The old mill is of 50 tons capacity. Important ore-bodies were discovered in 1935.

Paymaster Consolidated Mines, Limited. The property consists of sixty-one claims, a consolidation of two former producers, adjacent to Dome mines. On the former West Dome Lake property there is a 150-ton mill and on United Mineral Lands Corporation a 1,000-ton concentrator and cyanide mill. Present development is through the West Dome and Dome Lake shafts, sunk to 425 and 1,050 feet, respectively. Production recommenced in November 1934.

Polaris Gold Mines of Canada, Limited. The company owns four claims at Timmins. An old shaft on the property was sunk 250 feet and trenching and test pitting performed. Inactive since 1931.

Porcupine Davidson Claims. The property is situated in the northeast part of Tisdale township and consists of 420 acres. Early development was through a 300-foot shaft with a winze to 600 feet. A 10-stamp mill produced \$53,914 in gold. A new inclined shaft reached a depth of 800 feet. Work ceased in October 1924.

Porcupine Gold Reef Mining Company, Limited. The company owns 240 acres north of Porcupine. The old shaft is 100 feet deep. Some diamond drilling was done. The mine produced \$2,135 in gold in 1915 and 1917. Now inactive.

Porcupine Imperial Mining Company, Limited. The claims are situated along the north edge of Deloro township. The old shaft is 100 feet deep with a total of 500 feet of lateral work. Inactive since 1915.

Porcupine Lake Gold Mines. The prospect is on the northeast shore of Porcupine lake. An inclined shaft was sunk to 275 feet and lateral work done. Some diamond drilling was done from the lake. Inactive since 1914.

Porcupine Pet. Property consists of one claim in Deloro township, south of Dome mines. Some ore was raised from the 50-foot level and treated in a small mill, in 1914 and 1915.

Preston East Dome Mines, Limited. The property includes 169 acres, the East Dome in Tisdale township and the Preston in Deloro township. Surface trenching was done in 1910-11. Diamond drilling was under way in 1934. Ridgedome Mines, Limited. The company owns sixteen claims in Ogden and Deloro townships, 3½ miles from Timmins. A shaft was sunk to 125 feet and a crosscut driven. On an additional seventeen claims in Fripp township, a tunnel was driven 116 feet and diamond drilling done.

Rypan Porcupine Mines, Limited. The property comprises 190 acres in Deloro township. Four thousand feet of diamond drilling was done in 1929.

South Dome Lake Mines, Limited. The property consists of 185 acres adjacent to Dome's southwest boundary. Surface trenching has been done.

South Keora Mines, Limited. The prospect is in Whitney township and consists of 80 acres. A shaft was sunk 250 feet with 1,000 feet of crosscutting. Some surface trenching and 5,000 feet of diamond drilling were done.

South Shore Gold Syndicate. The property is near South Porcupine. Some surface trenching and test pitting have been completed.

Sun Ray Gold Mines, Limited. The company was formed to acquire the old McEnaney property of 600 acres, in Deloro township. Prior to 1922 a shaft had been sunk to 300 feet and three levels opened up. In 1923 a winze was sunk to the 600-foot level and 610 feet of drifting and crosscutting, and 3,400 feet of diamond drilling, were done.

Two-in-One Gold Mines, Limited. The property consists of 1,000 acres in a block about $1\frac{1}{2}$ miles south of Porcupine. Considerable surface trenching and exploration have been done and seven shafts and thirty pits have been put down.

Vipond Consolidated Mines, Limited. The property adjoins Hollinger Mines. It consists of eight claims, 320 acres in extent. The mine is controlled by Anglo-Huronian, Limited. It has produced about \$8,000,000 in gold and silver since 1911. The mill handles about 300 tons a day. The main 3-compartment shaft has carried development work to 1,200 feet.

(22) Southeastern Ontario Area

Selected References: Miller, Willet G.: The Eastern Ontario Gold Belt; Ont. Bureau of Mines, 1902, pp. 186-207 (with outline map).

Miller, W. G., and Knight, C. W.: The Pre-Cambrian Geology of Southeastern Ontario; Ont. Bureau of Mines, vol. 22, pt. 2, 1914 (with accompanying maps).
Hurst, M. E.: Arsenic-bearing Deposits in Canada; Geol. Surv., Canada, Ec. Geol. Ser. No. 4, pp. 100-112 (1927).

SITUATION AND EXTENT

The southeastern Ontario gold area constitutes a narrow strip of country extending from Belmont township, Peterborough county, eastward across the counties of Hastings, Lennox and Addington, and Frontenac into the western part of Lanark. This belt is about 70 miles long and 25 miles wide. It includes the following townships: Methuen, Belmont, Marmora, Lake, Tudor, Madoc, Elzevir, Grimsthorpe, Anglesea, Kaladar, Kennebec, Barrie, Clarendon, and Palmerston. Geologically the area lies along the southern border of the Precambrian shield.

GEOLOGICAL OUTLINE

The oldest formations in the district belong to a group of rocks known as the Grenville series, consisting of crystalline limestone, dolomite, argillite, quartzite, and garnet gneiss with interstratified greenstone and green schist. The greenstone and green schist weather cavernously, in places contain amygdules and in other places pillow structure, features typically characteristic of lava flows. Resting unconformably on the Grenville series but without evident discordance in dip is the Hastings series which consists of conglomerate, argillite, dolomite, and "blue limestone." Both the Grenville and the Hastings series have been highly folded and intruded: (1) by masses of gabbro and diorite; and (2) by dykes, stocks, and batholiths of granite and granite-gneiss.

Gold-bearing veins of quartz and ankerite are common both in the gabbro and diorite and in the volcanic and sedimentary rocks. The veins are of two classes: (1) those carrying large amounts of mispickel or other sulphides with which the gold is associated; and (2) those in which sulphides are almost or entirely absent. Some of the most important goldbearing quartz-mispickel veins occur in bodies of diorite or gabbro that have been intruded by granite.

Flat-lying limestones of Palæozoic age overlie the Precambrian to the south and west of the area, and in places encroach upon the gold belt.

HISTORY OF MINING ACTIVITY

In August 1866, a Dutch miner named Powell discovered a pocket of rich gold ore while prospecting for copper in lot 18, con. V, Madoc tp. This became known as the Richardson mine. The find was followed by others and great mining excitement prevailed during the next few years. There was scarcely a lot or homestead in the immediately surrounding country on which pits or shafts were not sunk. Several mills were built, but, in the case of the mispickel ores, when the shaft had been sunk to the water line the ore ceased to be free milling and no process then known made its economic treatment possible. Various methods were tried, but the conviction gradually became settled that there was no money to be made in the Hastings mispickel ores. Finally the bromo-cyanide process, developed in Australia, was tried at the Deloro plant and proved successful in combination with amalgamation and concentration.

As a direct result of improved methods of ore treatment, there was a strong revival of mining activity throughout the area. The period of greatest activity lasted from 1895 until 1908. During these years almost thirty different mines were under development, and twelve of these produced gold. The Cordova mine was the most productive, with a total of 16,790 ounces of gold valued at \$289,302, during the period from 1897 to 1903. The mine lay idle from 1903 until 1911 but was reopened and worked until 1917, producing an additional amount of bullion valued at \$45,180 in gold and \$299 in silver. The Gilmour mine was second in value of bullion produced, with a yield valued at \$24,348.54, recovered during the period 1909-14. The Deloro mine, during the five-year period 1899-1903, produced gold valued at \$181,907 and arsenic worth \$128,975, with an aggregate yield of \$8.66 a ton. At the Golden Fleece mine, which was worked from 1907 until 1923, bullion valued at about \$10,000 was recovered.

The present keen interest in gold mining has again directed attention towards the possibilities of this area. Early in 1935 work was being pushed at a number of properties. The Cordova property was purchased by the Consolidated Mining and Smelting Company of Canada, Limited, and after a diamond drilling campaign, the intention to deepen the 500foot shaft to 1,000 feet was announced. In March 1935 this company took over the development of the Golden Fleece mine, which is owned by Rich Rock Gold Mines. A preliminary diamond drilling program was contemplated. Bey Mines, Limited, were reported to have done considerable work early in the year in preparation for mining the former Ore Chimney property. The company has developed a plant at Loon lake to supply electric power at the mine. The old Gilmour mine has been reopened by the Gilmour Gold Syndicate, and Craig Gold Mines, Limited, have taken over the old Craig mine.

GOLD DEPOSITS

The following description of some of the principal gold occurrences is abridged from an unpublished manuscript report by M. E. Wilson.

"The southeast part of Marmora township and adjoining southwest part of Madoc township are underlain by a body of granite which, with its surrounding offshoots, occupies an area 6 to 8 miles in diameter. The granite intrudes volcanic rocks of the Grenville series, crystalline limestone and greywacke of the Hastings series, and a body of gabbro intruding the Hastings strata. The gabbro occupies an area 2 miles long by $\frac{1}{2}$ mile wide in the locality where the most important known gold-bearing mispickel-quartz veins of the district are found. Dykes and small masses of granite occur in the strata surrounding the granite body. Along the north and south margins these offshoots of the main body are mainly confined to a narrow zone, but along the west margin they occur throughout a belt from $\frac{1}{2}$ to 2 miles wide. The gabbro mass is almost everywhere cut by a network of granite dykes.

"Throughout the zone characterized by the presence of dykes and small bodies of granite are numerous veins of quartz carrying 10 per cent or less of mispickel. The longest known vein measures 1,100 feet; the average width of the broadest vein is 7 feet. The veins parallel the margin of the granite body and dip westerly from the granite at angles varying from almost horizontal to 55 degrees. Besides quartz and mispickel, the veins carry ankerite, biotite, tourmaline, feldspar, fluorspar, chalcopyrite, pyrite, and magnetite. They occur in the limestone, greywacke, gabbro, and granite. Since they are confined to the contact zone of the granite batholith, it is concluded that they are derived from this intrusive. The gold is entirely, or almost entirely, associated with mispickel." The origin of these deposits has been briefly dealt with by W. G. Miller, who states in part:

"Most of the gold deposits occur near the contact of the diorite and granite, although some important ones are found at a considerable distance from the granite. It would appear that the cavities occupied by the deposits owe their origin to the shrinkage of the granite on cooling, which has caused fractures to be formed in the rocks near the contact. The cooling mass of granite was apparently tougher than the rocks near the contact. Hence fractures were produced in the latter when the granite began to contract. The openings now occupied by the gold ores evidently did not originally possess the width that they at present show. They may at first have been represented by narrow cracks which in the course of time became enlarged by circulating waters dissolving away portions of the surrounding rock."

The Deloro mine, one of the best known of the old gold producers in southwestern Ontario, and the adjoining properties, Atlas-Arsenic (Gatling Five Acres), Cook, Sovereign, Gawley, Crescent, and Richardson, all occur near the edge of a granite boss. The deposits, except for the Sovereign, consist of irregular quartz veins containing gold and mispickel.

The ore-bodies at the Cordova mine are of a different type. W. G. Miller and C. W. Knight describe the deposit briefly as follows:

"The ore-bodies occur in a coarse-grained gabbro-diabase which invades the Grenville and Hastings series. The veins are of quartz, with which are associated iron pyrites, feldspar, and calcite. The wall-rock has been altered to a chlorite-schist, or chlorite-mica schist, sometimes 50 feet wide, there being a gradual transition between the fresh gabbrodiabase and the schist. The latter is impregnated with quartz veinlets, parallel to the schistosity. Consequently, there is not a definite boundary line between the ore and the schistose wall-rock. The ore-body is low grade, the hand-culled material which is treated in the mill averaging between \$5 and \$6 a ton."

The Sophia or Diamond mine has visible gold and mispickel in a quartz-calcite gangue, occurring in a Keewatin hornblende schist near a felsite dyke. The Golden Fleece is on the contact of green Keewatin schist and Hastings conglomerate, the deposit consisting of schist, quartz, pyrite, and gold. The Ore Chimney prospect (Bey Mines) occurs on a similar contact about 5 miles to the northeast.

The vein at the Star of the East mine consists of quartz lenses highly impregnated with pyrites, occurring in crystalline limestone near diorite. The Big Dipper Mining Company worked quartz veins carrying pyrite, magnetite, and some gold in limestone near granite.

The rich gold specimens obtained at the Richardson or Eldorado mine in the early days came from crevices along a granite dolomite contact. The gold was in the form of nuggets and in small flakes and scales, and was reported to occur with reddish brown ferruginous earth and black carbonaceous matter, evidently gossan. The open crevices were found at depths of 4 and 15 feet. According to M. E. Wilson (unpublished manuscript) the deposit was formed as a result of downward surface enrichment in Precambrian time. Later it was covered by flat-lying Palæozoic limestones which protected the Precambrian surface from erosion during the glacial period. Nearby outliers of Ordovician limestone attest to how little of the enriched surface was removed by the ice.

MINES AND PROSPECTS

Gold was discovered in the area in 1866. Many mines produced ore, but production ceased in 1923. The high price of gold has resulted in renewed activity. The extent of the work done on the more active properties is given below.

Bannockburn Mine. This property is in lot 28, con. V, Madoc tp. A 10-stamp mill was erected and considerable development work done prior to 1894. Work was resumed in 1895, the vein was exposed for 700 feet and four shallow shafts were sunk. The main shaft was sunk 75 feet and some drifting was done on the 32-foot level. A small amount of bullion was recovered.

Barry Mine. Native gold was reported in 1869 to occur on lot 5, con. II, Elzevir tp. A shallow shaft was sunk.

Bey Mines, Limited. In 1928 Bey Mines purchased the property of the Ore Chimney Mining Company, comprising lots 34 to 36, con. I, Barrie tp. The mine was developed between 1911 and 1926 by a shaft sunk to 400 feet with a winze to 500 feet. About 2,700 feet of drifting and crosscutting were done on the 108-, 150-, 250-, 300-, 332-, 400-, and 500-foot levels. Development was resumed in 1935.

Big Dipper Mine. In 1905 the Big Dipper Mining and Milling Company prospected lots 4 and 12, con. X, Barrie tp. A 30- and a 75-foot shaft were sunk on lot 12. Some work was done on lot 4 in 1907. Some bullion was recovered with a 10-stamp mill.

Boerth Mine. The mine is situated between Plevna and Ardoch in concession VII, Clarendon township. In 1899 the Boerth Mining Company produced some bullion from a quartz mispickel vein. The shaft was 120 feet deep with a level at 75 feet. A 10-stamp mill was used. The Clarendon Mining Company did a little further work in 1901 and again in 1903 and 1908.

Campbell-Blomfield Claims. On the east half of lot 6, con. VIII, Marmora tp., two shafts were sunk, one to 60 feet and the other to 12 feet, on a well-defined quartz vein discovered in 1901.

Canada Company. Deposits of arsenical gold ores on lots 4 and 5, con. VIII, and on lot 5, con. IX, Marmora tp., were owned by the Canada Company in 1900. The amount of work done was not reported.

Clapp Property. The Clapp property is adjacent to the James at Actinolite village in Elzevir township. In 1901 only a small amount of surface work had been done on the quartz mispickel ore.

Cook Mine. The Cook Land Company of Toronto worked their mine east of the Deloro between 1900 and 1905 and produced considerable gold. The property comprised lots 7, 8, and 9, con. IX, and lots 10, 11, and 12, con. X, Marmora tp. The main shaft was sunk to 180 feet with levels at 70 and at 140 feet. A second shaft, 1,500 feet northeast of No. 1, is 120 feet deep with a level at 90 feet. The old Dean Williams mine, lot 7, was first worked and produced gold in 1870.

Cook Prospect. In 1901 a 40-foot shaft was sunk and surface stripping done on the Cook claims, about 2 miles south of the Boerth mine in Clarendon township.

Cordova Mine (Belmont). Gold was discovered on lots 20 and 21, con. I, Belmont tp., in 1890. Several English companies worked the property between 1891 and 1903 and some bullion was produced. From 1911 until 1917 Cordova Mines, Limited, carried on mining operations. Ore was treated in a 30-stamp mill and the total value of gold produced is said to have been \$334,781. The workings consisted of nine shafts, two of which reached depths of 400 feet, with lateral work on four levels. Some of the stopes were 20 feet wide, and the ore averaged between \$5 and \$6 a ton. The mine was purchased by the Consolidated Mining and Smelting Company of Canada in 1935.

Craig Mine. The Craig mine is situated on the south halves of lots 4 and 5, con. III, Tudor tp., about 8 miles northeast of Bannockburn station. In 1896 a Toronto company sank a shaft to 100 feet. In 1903 the mine was reopened by the Craig Gold Mining and Reduction Company and was operated until the summer of 1907. A 6-stamp mill was used and gold recovery amounted to about \$4 a ton. Shafts were sunk on the vein 370 feet apart, to 200 and 100 feet, respectively, and were connected on the 60-foot level. Some mining was done on the 150-foot level from the deeper shaft. In October 1934 Craig Gold Mines, Limited, announced their intention of reopening the mine.

Crescent Mine (Powell). The Crescent mine is on lots 16 and 17, con. XI, Marmora tp. It was first worked about 1870. The Crescent Gold Mining Company reopened the mine in 1890 and worked the deposit on a small scale. Two shafts were sunk to depths of about 80 feet. A total of 1,200 tons of ore was treated in a small mill and yielded about \$4 a ton in gold.

Deloro Mine. The Deloro property comprises the former Gatling and Tuttle claims on lots 9 and 10, con. VIII, Marmora tp. The mine was worked as early as 1870 and changed ownership a number of times during its history. Canadian Goldfields, Limited, purchased the mine in 1896 and worked it until March 1903. The workings comprise about nine shallow shafts. The Gatling shaft which supplied most of the ore was worked from levels at 70, 133, 233, and 333 feet. A 20-stamp mill and cyanide plant was used.

Diamond or Sophia Mine. Gold was discovered on lots 14 and 15, con. X, Madoc tp., in 1896. Three shafts were sunk, two to 60 feet and

one to 105 feet with levels at the 60- and 100-foot horizons. Operations were suspended in 1901. The Madoc Mines Company did a little further work in 1908. Old Diamond Gold Syndicate is now developing the property.

Empire Mine. This old mine is at Madoc village in lot 1, con. VI, Madoc tp. Ore specimens were reported to have been found here in 1868, which assayed over \$400 to the ton in gold and silver.

Emily Mine. This mine in Rawdon township was worked about 1870.

Fox Property. This old property adjoined the Richardson mine on the south. In 1866 à shaft was sunk on the vein and gold was found, but not in paying quantities.

Gatling Five Acres Mine (Atlas). This old mine is in lot 10, con. IX, Marmora tp. It was operated from 1899 until 1903 by the Atlas Gold and Arsenic Mining Company. The main shaft was sunk below 200 feet and stoping was carried out from the 80- and 200-foot levels. A 10-stamp mill was operated and a good gold recovery was reported.

Gawley Mine. The Gawley mine is in the east part of lot 18, con. IX, Marmora tp. When operated by the Atlas Arsenic Company in 1900, the shaft was down 100 feet and the ore was reported to carry \$7 in gold a ton.

Gawley Prospect. On lot 9, con. X, Marmora tp., some work was done in 1901.

Gillen Mine. The old Gillen mine is in the northeast corner of lot 6, con. VIII, Marmora tp. A 5-stamp mill was operated in 1870 and 1871, the ore coming from open pits. A run of 100 tons averaged \$6 a ton in gold. The vein is about 3 feet wide and cuts granite.

Gilmour Mine. The Gilmour, in lot 30, con. XIX, Grimsthorpe tp., was first operated between 1902 and 1907. The Gilmour Mining Company carried on mining operations from 1909 until 1914 and a production of \$24,348.54 was obtained with a 5-stamp mill. Two shafts were sunk and lateral work was done on three levels. The Gilmour Gold Syndicate of Toronto acquired the property in 1934 and reopened the mine early in 1935. A 100-ton mill was constructed and underground development begun.

Golden Fleece Mine. Gold was discovered on the site of this mine in 1881, on lot 25, con. VI, Kaladar tp. In 1907 the Golden Fleece Mining Company sank an 85-foot shaft, with lateral work on the 65-foot level. A 10-stamp mill was built and ran for a few weeks. In 1912 the Adelaide Mining Company ran the mill for some time, the ore coming from a deep open-cut. The Cobalt Frontenac Mining Company operated the mine intermittently from 1915 until 1923. A new shaft was sunk with about 750 feet of lateral work on the 100-foot level. A production of about \$10,000 was obtained from the 10-stamp mill. In 1928 the mine was sold to Rich Rock Gold Mines, Limited. The Consolidated Mining and Smelting Company optioned the property early in 1935. Hawkeye Mine. This prospect comprises E. $\frac{1}{4}$ lot 10, con. VIII, Marmora tp. Two shallow shafts were sunk here in 1870 and some ore was raised.

Helena Mines. The property is in Barrie township and the workings consist of three shafts. The "Hill" shaft on lot 20, concession VI, is inclined and 125 feet deep. The "Valley" shaft some 600 feet to the northeast is of the same depth, and the "Bill" shaft 300 feet farther northeast is 185 feet deep. The mine was closed in the spring of 1901.

International Mine. Lots 6, 7, 8, and 9, con. IX, Barrie tp., were held in 1902 by the International Gold and Copper Company. Two shafts of moderate depth were sunk and seven test pits dug.

James Mine. The property consists of 308 acres in concession IV, Elzevir township, at the village of Actinolite. In 1901 it was reported that five shallow shafts had been sunk on mispickel ore.

Jeffrey Prospect. In concession IX, Faraday township, about 7 miles west of L'Amable station, a pit 10 feet deep was sunk on a vein said to be 4 feet wide and to consist of quartz and arsenopyrite.

Kennefic Property. This is located on lot 7, con. V, Anglesea tp. Some exploration work was done in 1901.

Ledyard Mine. This old mine was on the east half of lot 19, con. I, Belmont tp. Operations were carried on during the period 1893-97. A shaft was sunk 100 feet and lateral work done on two levels. A small mill was built, but did not work satisfactorily.

O'Donnel's Prospect. The property is on lots 6 and 7, con. III, Anglesea tp. A 15-foot shaft was sunk on a wide quartz vein mineralized with sulphides.

Ore Extension Property. The Ore Extension Mining Company began work on NW. $\frac{1}{4}$ lot 27, con. VII, Kaladar tp., in June 1927. A shaft was sunk and lateral work done.

Ore Mountain Mine. On lot 32, con. I, Barrie tp., the Ore Mountain Mining Company, Limited, did considerable surface exploration in 1914-15.

Oso Township. In 1895 considerable surface work was done on a property located about 2 miles from Oso station.

Palmerston Township. On the west half of lot 2, con. IX, Palmerston tp., a little surface work was done on a quartz vein carrying a large proportion of chalcopyrite (1900).

Pay Ore Mines, Limited. This company sank a 70-foot shaft on lot 35 or 36, con. I, Barrie tp., in 1914.

Pearce or Severn Mine. The mine is on lot 8, con. VIII, Marmora tp. It was first worked in 1893 by the Hastings Mining and Reduction Company. The Atlas Gold and Arsenic Mining Company took it over in 1900 and worked it for about three years. An inclined shaft was sunk to 185 feet and ore was mined on the 65- and 150-foot levels. In 1904 the Cleveland Mining Company operated the mine for several months. It was reopened for a short time in 1907 by H. E. Lawson.

Rebstock Mine. The Rebstock mine is in lots 2 and 3, con. V, Kaladar tp. Two shafts were put down to about 80 feet.

Richardson Mine (Eldorado). The first gold discovery in southeastern Ontario was made in 1866 on the east half of lot 18, con. V, Madoc tp. Exceedingly rich specimens of gold were taken from a cavity about 4 feet below the surface, and a second pocket occurred at a depth of 15 feet.

Rollins Property. The Rollins prospect is near the north end of lot 16, con. XIV, Wollaston tp. In 1901 a shaft 25 feet deep was sunk on a mispickel vein and two carloads of ore were shipped to Deloro.

Sheppard's Mine. A large quartz vein in the granite on lot 12, Tudor township, was trenched and sampled in 1883.

Sovereign Mine (Feigle). This mine, on lot 17, con. XI, Marmora tp., was worked in 1878 by D. E. K. Stewart who recovered about \$20,000 in gold. It had been worked for years previously. The vein was traced for 1,400 feet and was developed by two shafts, one 50 feet and the other 80 feet deep. The adjacent Gladstone vein was worked at the same time.

Star of the East. The Star of the East Gold Mining and Milling Company worked on lot 24, con. X, Barrie tp., from 1903 until 1907. A shaft 213 feet deep was sunk, with levels at 35, 74, 108, and 200 feet. About 500 feet of lateral work was done.

St. Joe Mine. In 1897 considerable ore was mined from open-cuts on lot 25, con. V, Madoc tp., about 1,000 feet from the Hastings road.

Victoria Gold Mine. In 1883 some work was done on a rusty quartz vein at the Victoria Gold Mine on lot 62, con. XIII, Monteagle tp., in north Hastings.

(23) Sudbury Basin Area

As Sudbury is essentially a nickel and copper mining centre, no attempt will be made to discuss the area in any detail in this volume. Gold is present in small amounts in the nickel-copper ores that lie along or close to the outer norite rim of the nickel basin, and it is recovered during the refining of these ores. A little gold also occurs in copper-lead-zinc ores that are found in the tuffs and slates near Vermilion lake within the basin. The latter deposits were worked in 1929 and 1930 and appreciable amounts of gold were recovered from the copper and lead concentrates. There are a few scattered quartz veins throughout the area but they contain little or no gold. During the year 1934 the gold produced during the refining of the nickel-copper ores was valued at over \$2,000,000. The recovery for the entire group of precious metals was as follows: platinum 116,177 ounces; palladium, rhodium, ruthenium, osmium, and iridium 83,932 ounces; gold 60,370 ounces; and silver 1,882,293 ounces. The total value of these metals was over \$9,100,000.

(24) Swayze Area

Selected References: Furse, G. D.: Geology of the Swayze Area; Ont. Dept. of Mines, vol. 41, pt. III, 1932.

Rickaby, H. C.: Some Geological Features of the Swayze Gold Area; Trans. Can. Inst. of Min. and Met., 1933, pp. 204-216.

Emmons, R. C., and Thomson, Ellis: Woman River and Ridout Map-Areas; Geol. Surv., Canada, Mem. 157 (1929).

Rickaby, H. C.: Geology of the Swayze Gold Area; Ont. Dept. of Mines, vol. 43, pt. III, 1934.

Map No. 41C: Swayze Area; Ont. Dept. of Mines. Issued in 1932 to accompany report by G. D. Furse.

Map No. 2189: Ridout Sheet; Geol. Surv., Canada. Issued 1929.

Map No. 1933a: Kamiskotia-Ridout Area; Ont. Dept. of Mines. Issued 1933.

Map No. 43b: Swayze Gold Area; Ont. Dept. of Mines, 1934.

SITUATION AND EXTENT

The township of Swayze, from which the Swayze gold area derives its name, is approximately 125 miles northwest of Sudbury. The area, which occupies the townships of Rollo, Raney, Halcrow, Denyes, Swayze, Dore, Coppell, Cunningham, Greenlaw, and Tooms, lies between the main lines of the Canadian National and Canadian Pacific railways, and may be reached by good canoe routes from either line. A fairly good wagon road runs north from Sultan on the Canadian Pacific railway to the Kenty property.

GEOLOGICAL OUTLINE

The oldest rocks of the area are volcanic flows of Keewatin age with which are associated sediments occurring probably at two horizons in the Keewatin greenstones, and known locally as the Ridout series and the Swayze series. These rocks are intruded by dykes and bosses of granites, porphyries, and basic igneous rocks, and by diabase dykes of two or more ages.

Generally the predominant Keewatin rocks consist of andesite lava flows interbedded in places with more acidic or more basic flows. Pillow lavas are widespread, and in places very coarsely crystalline diorites or gabbros are apparently parts of thick flows, but are difficult to distinguish from later basic intrusives. In many places the Keewatin has been altered to greenstone schists, and along the west boundary of the area, near the granite, the greenstones and related sediments have been altered to hornblende schists and gneisses. Typical iron formation occurs in the southeast corner of Halcrow township and in the southwest part of Swayze township. A prominent band of sedimentary rocks, known as the Ridout series, extends southeast across Halcrow township and into Tooms township. Similar rocks also occur in Swayze, Cunningham, and Dore townships. All these rocks are interrupted at intervals by strong faults. In Halcrow township the band is approximately one mile wide and consists of conglomerate, greywacke, quartzite, and related beds. The attitude of the beds indicates a monoclinal structure, the beds dipping to the northeast with flow rocks apparently overlying them on the northeast side. In places beds of the sediments alternate with flow rocks similar to the main Keewatin flows.

The Swayze series forms a band of rocks with an average width of from $1\frac{1}{2}$ to 2 miles, extending from the east side of Dore township, near its north boundary, westward across the northern parts of the townships of Swayze, Denyes, and Halcrow, where it is cut off by the granite and gneiss. The series is dominantly volcanic in origin, but includes numerous beds of conglomerate and greywacke, as well as waterlain tuffs and breccias. On the west side of Kenogami river, in Halcrow township, the conglomerate has a thickness of over 1,000 feet.

The greenstones and associated sediments have been folded along east-west axes. The main band of the Swayze series is an example of a synclinal fold, the north limb of which is slightly overturned. The beds of the Ridout series dip at rather steep angles to the north and the Keewatin flows are likewise steeply folded. There are numerous faults striking north.

The greenstones and sediments are cut by numerous dykes and bosses of granite, diorite, and porphyry. Two of the largest bosses of porphyry occur on Brett lake, one at the east end and another at the west end of the lake. On the fresh surface the porphyry is reddish and shows phenocrysts of plagioclase and hornblende. The granite around the western edge of the area is largely medium-grained, pink to grey biotite granite. Most of it is massive, but part of it is foliated and gneissic.

The gold-bearing veins all occur within greenstones or sediments in the vicinity of the intrusive porphyries or granitic dykes.

HISTORY OF MINING ACTIVITY

In August 1931 J. G. and J. L. Kenty discovered gold in Swayze township on the northeast side of Brett lake. News of the find brought a tremendous rush of prospectors into the area and hundreds of claims were staked. Many new finds were made the following summer and very soon a large number of mining companies and syndicates were actively engaged in development work. In most cases work was confined to surface trenching, test-pitting, sampling, and diamond drilling, but underground work was done by Greenlaw Gold Mines, Kenty Gold Mines, Lee Gold Mines, and Swayze-Huycke Gold Mines. Results at these properties were very discouraging, and as no important quantities of commercial ore were found all operations at these properties were discontinued by the end of 1934.

Halcrow Swayze Mines, Limited, and Greenlaw Swayze Gold Mines Syndicate were early in 1935 the only active survivors in this field. According to a progress report issued by Halcrow Swayze Mines in March 1935 a considerable tonnage of low-grade ore had been developed at the mine. It is reported that both properties ceased operations later in 1935.

GOLD DEPOSITS

All the gold-bearing veins are found within the greenstones and sedimentary rocks, in the immediate vicinity of intrusive porphyries and granitic dykes. There are three types of vein structures: lode deposits, fissure veins, and shear zones. Quartz, ankerite, and pyrite are the most prominent gangue minerals, and chalcopyrite, galena, sphalerite, specularite, calcite, and tourmaline occur in varying amounts. The gold is generally present in the free state and no tellurides have been identified.

Halcrow-Swayze Mines, Limited. According to H. C. Rickaby the principal showing consists of a shear zone in an impure quartzite or greywacke belonging to the Ridout series. The shear zone has a width up to 15 feet, strikes approximately north 60 degrees west, and has been trenched for a distance of 1,000 feet. Along the shear zone the rock has been silicified, carbonated, and heavily mineralized with pyrite. Considerable chalcopyrite is present, and fine native gold in thin leaves is to be seen along the planes of the schist. Approximately 250 feet north of the shear zone, and parallel to it, is a dyke of quartz diorite or quartz monzonite. The dyke is from 60 to 100 feet wide and is reported to be traceable for over a mile.

A recent press report states that three veins were located on the surface. The No. 1 vein, with a length of 100 feet and width of 16 inches, has an indicated grade of \$8.33. No. 2 vein has a 900-foot length with widths up to 7 feet, the grade being \$4.20 a ton. No. 4 vein is 30 feet long and 12 inches wide and has a grade of \$30 a ton (gold at \$35).

"Mr. Strong estimates a possible tonnage in the No. 2 vein of 82,500 tons of 0.11-ounce ore above the 200-foot level. Assuming duplication of conditions to the 354-foot level there would seem to be indicated a tonnage of sufficient ore to feed a 250-ton mill for seventeen months. By adopting a system of selective mining, it is stated, it is probable that 35,000 tons of \$6 grade can be extracted above the 354-foot level. All assay values are quoted with a gold price of \$35." (The Northern Miner.)

Kenty Gold Mines, Limited. The following description of the Kenty property is taken from Rickaby's report, written in 1933.

"The Kenty veins belong to the lode type of deposits, consisting of a series of parallel veins or vein systems, each showing a main quartz leader, with subsidiary parallel quartz veinlets and replaced country rock intervening. They occur in the lavas or volcanic sediments, or in the diorite, porphyry, or lamprophyre which intrude the older rocks. The average strike of the veins is approximately north 60 degrees east and the dip varies from 45 degrees to 70 degrees to the southeast. Surface work up to date indicates five parallel vein systems running out from the north side of the eastern nose of the main porphyry body.

"The veins occur in fractures in the country rock, with practically no schisting. The greatest width of vein material disclosed up to date is 10 feet with an average width for all the veins of from 4 to 5 feet. The typical vein shows one or more main quartz leaders, usually not over 1 foot wide, of white quartz containing a little pyrite. The wall-rocks show considerable replacement by carbonates, chiefly ankerite, and are heavily mineralized with pyrite. Tourmaline is prominent in the quartz, and other gangue minerals noted are calcite, galena, specularite, graphite, chalcopyrite, and a little feldspar. Coarse native gold is visible in fractures in the main quartz or in the narrow veinlets paralleling the main quartz. Almost every vein has visible gold and in places it is present in spectacular amount."

Derraugh Property. The discovery vein is on claim S 22459. The country rock consists of altered arkosic sediments and flow rocks cut by dykes of quartz porphyry. Rickaby states that the discovery vein consists of a series of quartz lenses along a fracture, striking approximately north and dipping steeply east. Over a length of 400 feet the fracture is reported to show widths of 8 to 22 feet of quartz and included country rock. The quartz is mineralized with pyrite, chalcopyrite, a little galena, and carbonates. Lenses of the quartz are heavily mineralized with fine pyrite, and this material assays high gold. No native gold was seen, but all of the vein quartz gives, on assay, appreciable gold.

Generally speaking, showings of free gold are quite common in the area, but experience has shown that the gold values are very erratically distributed. Diamond drilling and underground exploration have proved the existence of considerable tonnages of low-grade material, assaying \$2 to \$3 a ton.

MINES AND PROSPECTS

Gold was not discovered in the area until 1931 but hundreds of claims have been staked. Interest in the area has waned. Only those properties that were most actively explored are listed below.

Buffalo Canadian Gold Mines, Limited. The company owns eighteen claims in Swayze township near Brett lake. In 1933 surface stripping of veins was carried out. Early in 1934 some diamond drilling and bulk sampling were done.

Cambro Kirkland Mines, Limited. Some surface work has been done by this company on their claims in Halcrow township.

Canadian Mineral Development Corporation, Limited. Two groups of claims are held, nine claims in Denyes township and nine claims in Halcrow township. Surface work has been done.

Derraugh Property. The property is in Denyes township near the 4-mile post on the east boundary. In 1933 the property was under option to Kirkland Hudson Bay Gold Mines, Limited. Considerable surface trenching was done on the discovery vein and eleven shallow holes were drilled with an aggregate length of 2,000 feet.

Dyment Mining and Investments, Limited. This company owns the Beaumont property at Dyment lake, Denyes township. Surface exploration was carried out.

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Garnet Long Lac Mines, Limited. The name of this company was changed in 1934 from Swayze Contact Gold Mines. It was formed in 1933 to acquire five groups of claims in Halcrow, Swayze, Denyes, and Dore townships. Only surface trenching and test pitting were done.

Gold Chief Mines, Limited. This property was known as the Copper Chief Mines in 1933. It comprises 360 acres located in the southeast part of Greenlaw township. Surface operations were carried on for a time.

Gold Discovery Syndicate. This syndicate owns nine claims in the southwest part of Swayze township on the north side of Cree lake. A crew of six men were at work here during the summer of 1934.

Greenlaw Gold Mines, Limited. The company acquired a group of nineteen claims in the north-central part of Greenlaw township. A vein was trenched and test pitted for 300 feet early in 1934 and a shaft was sunk. In February the shaft was down 50 feet on an incline, following the vein.

Greenlaw Swayze Gold Mining Syndicate. The syndicate holds thirteen claims in a block, in Greenlaw township, west of Newbec and south of Lee Gold and Halcrow Swayze Gold Mines. A gold-bearing deposit has been trenched and test pitted. In March 1935 it was reported that shaft sinking had reached a depth of 31 feet.

Halcrow-Swayze Mines, Limited. The company is carrying on development work on a group of thirty-five claims in Halcrow township. Some 2,000 feet of diamond drilling from the surface and 2,300 feet from underground has been completed. The shaft has been sunk to 371 feet with levels at 125, 250, and 354 feet. Crosscutting totals 625 feet, drifting 1,528 feet, and raising 120 feet. The property is equipped with a small test mill.

Harlake Gold Mines, Limited. This company owns 240 acres in Swayze township, situated on the northeast shore of Cree lake. Surface trenching and exploration were done.

Kenty Gold Mines, Limited. The Kenty property is situated in the northeast corner of Swayze township. Mining operations were started here in the autumn of 1932 and two shafts were sunk to depths of 500 feet, about 1,800 feet apart. Operations were suspended in July 1934 after 8,000 feet of drifting, sinking, and crosscutting had been done, as well as 7,300 feet of diamond drilling.

Lafayette Long Lac Gold Mines, Limited. The company has two groups of claims, six in Greenlaw township and eleven in Swayze township. Surface exploration has been carried out.

Lee Gold Mines, Limited. The Greenlaw township prospect comprises seventeen claims. Test pitting and diamond drilling were done in 1933 and in 1934 a shaft was sunk to a depth of 275 feet with stations at 125-foot and 250-foot levels. About 1,500 feet of underground workings were completed on the two levels. The mine was closed at the end of January 1935. Manitoba and Eastern Mines, Limited. The company did assessment work on a group of eleven claims in Halcrow township in 1933.

Montgomery-Ackerman Gold Mines, Limited. Surface exploration and trenching were done on a group of seventeen claims adjoining the Kenty on the southeast.

Nugold Mining Corporation, Limited, hold the Swayze property, consisting of 240 acres on the north shore of Cree lake, Swayze township. Surface exploration was carried on during 1933 and early in 1934.

Sunorca Exploration Company, Limited. The company holds twentysix claims in southern Rollo and Raney township. About 2,500 feet of diamond drilling was done, in addition to surface trenching of the veins.

Swayze-Huycke Gold Mines, Limited. The company is developing a prospect comprising six claims in Cunningham township. Diamond drilling was done in 1933, followed by shaft sinking in 1934. The shaft had reached a depth of 150 feet with 400 feet of lateral work on the 125-foot level when operations were suspended in November.

Tyche Longlac Gold Mines, Limited. The company succeeds Central Swayze and holds twelve claims in Denyes township. Surface exploration and trenching were done.

(25) Three Duck Lake Area

Selected References: Laird, H. C.: Geology of the Three Duck Lakes Area; Ont. Dept. of Mines, vol. 41, pt. III, 1932.

Emmons, R. C., and Thomson, Ellis: Woman River and Ridout Map-areas; Geol. Surv., Canada, Mem. 157 (1929).

Map No. 41d: Three Duck Lakes Area; Ont. Dept. of Mines. Issued 1932.

Map No. 1933a: Kamiskotia-Ridout Area; Ont. Dept. of Mines. Issued 1933. Map No. 231A: Woman River Sheet; Geol. Surv., Canada, 1929.

SITUATION AND EXTENT

Three Duck Lake area is situated adjacent to the Canadian National railway about 80 miles northwest of the city of Sudbury. The area is four townships wide, from east to west, and two townships deep. It includes Potier, Neville, St. Louis, Groves, Champagne, Benneweiss, Chester, and Yeo townships. The principal gold showings occur in Chester township and may be reached by a 9-mile wagon road which leads west from Makwa station.

GEOLOGICAL OUTLINE

A belt of Keewatin greenstones stretches across the northern part of the area along the southern border of Potier, Neville, and St. Louis townships; and a second belt occurs at intervals across Yeo, Chester, and Benneweiss townships. A rather narrow belt of sedimentary rocks has been traced almost without interruption from the west boundaries of Yeo and Potier townships to the Canadian National railway, crossing it 4 miles south of Gogama. These rocks are known under the local name of Ridout

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series and are composed of a variety of types, including conglomerate, greywacke, arkose, and quartzite. The sedimentary beds have been tightly folded along an east-west axis and H. C. Laird considers that they lie at the centre of a major synclinal structure.

Wide areas of pink and grey granite, both massive and gneissic, lie north and south of the greenstone belts and intrude them. Towards the central part of Benneweiss and Chester townships the older rocks are cut by what Laird describes as a "younger" granite. A diorite granite complex lies between the older granite-gneisses to the south and the younger granite batholith. On Schist lake dykes of coarse quartz-feldspar porphyry ranging from a few feet to 50 feet in width intrude the greenstone schists parallel to the schistosity. A few dykes of reddish quartz syenite, grey felsite, trap, and lamprophyre are found in the "younger" granite area. Diabase dykes occur abundantly in all parts of the area. The majority

Diabase dykes occur abundantly in all parts of the area. The majority have a northerly trend. A very large olivine diabase dyke 350 feet wide and striking northeast cuts across the western part of the area.

Gold is the most important mineral in the area, and in places is accompanied by appreciable quantities of copper. The principal gold occurrences are found within the "younger" granite area, close to the contact with the sedimentary series. The gold occurs in narrow quartz veins occupying strong fractures in the granite, or in quartz veins along the contact between the more acidic phases of the granite and basic dykes.

HISTORY OF MINING ACTIVITY

The first staking in the area is reported to have been done by J. A. Shannon and Charles Coté in 1908 on the iron formation on the south side of Schist lake. In 1910 J. A. Shannon discovered native gold at Yeo lake and staked a number of claims, and Percival Moore staked claims for gold south of the east end of Schist lake. At about the same time H. Phillips discovered the Lawrence copper showing on the east shore of Mesomikenda lake. For the following fifteen years there was little or no prospecting except by Russell Cryderman and John A. Shannon, the latter of whom in 1927 discovered native gold on the northeast shore of Clam lake. There was a mild influx of prospectors in 1928 but no further discoveries were made until 1930, when Alfred Gosselin found a spectacular showing of native gold on the east shore of Three Duck lake. It was this discovery that led to renewed interest and activity throughout the district, with the result that many more finds were made during the summer of 1931.

Since 1931 surface development work has been done on about two dozen different properties and a number of gold mining companies and syndicates have taken over the outstanding prospects.

The companies at present actively engaged include Garnet Long Lac Mines, Limited, Gomak Mines, Limited, Chester Gold Mines, Limited, Makwa Champagne Gold Mines, Limited, and Young Shannon Gold Mines, Limited. During 1934 the latter two companies did some underground work.

The small but rich veins so far explored by the various owners suggest that a number of small mines might be developed during the next few years.

GOLD DEPOSITS

Usually the gold occurs in narrow quartz veins occupying welldefined fractures in the "younger" granite, or in quartz veins along the contact between the acid intrusive and basic dykes, commonly lamprophyre. The majority of the fractures strike in a direction a few degrees south of east. Although the veins are narrow some high assays have been obtained.

Gold commonly accompanies pyrite and chalcopyrite, but occurs in the native state. The following minerals are also found in the veins: sphalerite, galena, bornite, covellite, malachite, azurite, molybdenite and its yellow oxide molybdite, and tetradymite (bismuth telluride). The ordinary gangue minerals are calcite, ankerite, and sericite. An important feature is that both gold and sulphides commonly penetrate the wall-rock for several feet.

Along the south shore of Schist lake gold occurs in the Ridout sediments. The ore consists of gold, arsenopyrite, and fine-grained iron sulphides in a highly silicified, carbonated, and sericitized schist. The deposits are lens-shaped bodies very much longer than they are wide. Rusty weathering quartz-ankerite veins also occur carrying small quantities of pyrite, but little or no gold.

In 1922 T. L. Tanton¹ described a gold occurrence in a granite diorite complex a short distance southeast of Makwa. He states that the gold is in limonite in narrow quartz veins occupying joint-planes in the rock, and he describes it as the lower part of what was perhaps a rich secondary deposit. The auriferous limonite yielded \$160 in gold a ton.

A description of the Chester Shannon (Young Shannon) showing illustrates the nature of the principal gold deposits. H. C. Laird writes as follows:

"The main showing occurs on the south side of a narrow peninsula near the outlet of Clam lake. Stripping has exposed for more than 200 feet a well-defined shear zone in the younger granite. It lies parallel to the lake shore, striking east 30 degrees south and dipping 45 degrees to 60 degrees north. Sulphides consisting chiefly of pyrite and chalcopyrite occur along this zone in quantities sufficient to produce a notable gossan. These minerals are not confined to the fractures alone, but are widely disseminated in the wall-rock as a replacement deposit. Toward the east end of the outcrop a less prominent shear zone striking east 58 degrees south converges with the main one. At this point there is a considerable concentration of sulphides occurring over a width of 24 feet. Within this width one 9-foot channelled section is reported to have yielded \$2.80 in gold a ton, and 5.32 per cent copper; a 46-inch channelled section yielded \$22.40 in gold a ton. In the main shear zone toward the western end of the outcrop there is a 14-inch quartz vein which is exposed for about 30 feet before it disappears into the lake. Near the lake it is cut and slightly offset by a 1-foot irregularly north-south trending diabase dyke. The vein matter scatters 25 feet east of this dyke and disappears. The quartz carries visible gold, telluride (tetradymite), pyrite, chalcopyrite, azurite,

¹ Geol. Surv., Canada, Sum. Rept. 1922, pt. D.

malachite, bornite, and covellite. Assays were made of two chip samples taken by the writer. The first sample gave: gold, \$36.60 a ton; copper, 12.85 per cent. The second sample assayed: gold, \$70.60 a ton; silver 1.97 ounces a ton; copper 4.88 per cent. The wall-rock contains gold values, some samples having yielded as high as \$20 in gold a ton."

The original discovery on the holdings of the Three Ducks Syndicate is on claim S 20095. The vein is a lenticular body following an east-west fracture zone in a type of granite approaching alaskite. The lens consists of mineralized quartz and highly altered country rock, in which sulphide replacement has been extensive. The quartz carries spectacular quantities of visible gold. A chip sample of the quartz gave the following values: gold, \$8.30 a ton; silver, none; copper, 0.25 per cent. A channel sample is reported to have assayed \$16.60 in gold a ton over a width of 10 feet. Laird's description of the No. 3 vein follows:

"No. 3 vein, which is located on the west shore of Coté lake on the line between claims S 19977 and S 19998, is a quartz vein and occurs along the contact between pink granite and a 2-foot lamprophyre dyke. On the south side of the dyke, that is, on the side opposite the granite, coarse hornblendite occurs. Quartz stringers extend into the granite but not into the dyke. The vein averages about 12 inches in width and has been traced for about 125 feet from the lake shore into low ground. Coarse gold occurs here in notable quantities, not only in the quartz but in the adjacent wall-rocks. Vugs in the veins are commonly lined with tremolite crystals on which specks of native gold were observed. Some telluride occurs. A chip sample assayed 27.40 in gold a ton and 0.53 ounce silver a ton."

MINES AND PROSPECTS

Although gold was discovered in the area in 1908 very little staking had been done before 1930. The most active prospects are listed below.

Beaver-Bethnal Syndicate. The syndicate owns a large group of claims near the north boundary of Chester township. In 1930 test pitting, trenching, and sampling were done. Inactive during 1934.

A. Brennan. There are seven claims in this group, on the west side of Mesomikenda lake, adjoining the Beaver-Bethnal group on the east. Just south of a small lake a sulphide zone 60 feet long and 4 feet wide was exposed by trenching.

H. J. Brennan. The group consists of twelve claims north of Three Duck lake. Surface exploration and trenching were done on a number of sulphide showings.

Chester Gold Mines, Limited. The gold prospect consists of fourteen claims adjoining the Young Shannon property. Trenching in 1933 revealed three veins and work was reported to have been continued throughout 1934. The company is controlled by Porcupine Crown Mines.

C. Coté. The holdings consist of six claims in Chester township, and six claims in Yeo township. Surface work has been done on a narrow quartz vein on the Chester township group.

J. R. Cryderman. This group of twelve claims is situated on either side of Three Duck lake toward the south end. In the northwest corner

of claim S 20575, on the north shore of a small lake east of Three Duck lake, a 2-foot quartz vein has been traced eastward for 325 feet from the water's edge.

Russell Cryderman. Surface work has been done on three groups of claims, namely, the Three Duck Lake group (nine claims), the Moore Lake group (thirteen claims), and the Schist Lake group (eight claims). The Moore Lake group, between Moore and Schist lakes, was originally staked in 1910 and in 1912 a 30-foot shaft was sunk in highly carbonated and pyritized sericite schist on claim S 5787.

Garnet Long Lac Mines, Limited. The company has an option on a group of ten claims, west of the Gomak and Young Shannon. Assessment work has been done and a diamond drilling program was outlined for 1935.

Gomak Mines, Limited. A group of twenty-four claims is being developed in Chester township. Early in 1935 a report stated that 1,200 feet of diamond drilling had been done, in addition to surface exploration and bulk sampling. Porcupine Crown Mines controls the company.

P. E. Hopkins. In 1932 Hopkins held three claims in Yeo township, 20 chains west of Clam lake. These were prospected by K. G. Miller.

A. Labbé. Surface exploration and trenching were done on a group of twelve claims between Three Duck lake and Mesomikenda lake during the summer of 1931. Work was chiefly confined to a shear zone showing in the granite on claim S 19991.

F. Lawrence. The Lawrence group comprises twenty-one claims on the east shore of Mesomikenda lake. A discovery was made here in 1910 and in 1916 Joseph Errington shipped 60 tons of copper ore from an open pit. The average value of the ore was 7 per cent copper and 3.50 in gold a ton.

Makwa Champagne Gold Mines, Limited. The company owns nine claims in Champagne township, adjoining the Canadian National railways. Development work consists of trenching and test pitting and in 1934 a shaft was sunk by hand steel to a depth of 60 feet.

Porcupine Hecla Mines Company. Claims S 2406 to 2410 are held, south of Schist lake in Yeo township. A number of wide quartz veins were trenched and sampled.

R. S. Sheppard. The group consists of seventeen claims adjoining the Three Ducks Syndicate group on the south in Chester township. Surface exploration was carried out.

Three Ducks Syndicate. The holdings comprise twenty-five claims in the north-central part of Chester township. In 1931 the Consolidated Mining and Smelting Company optioned the claims. Trenching, test pitting, and sampling were done on two veins, but the option was later dropped. More recent work has located a number of other veins in the granite.

Young-Shannon Gold Mines, Limited. The company is developing the Chester Shannon group of claims at Clam lake. During the summer of 1934 a 125-foot shaft was sunk and some lateral work was done.

(26) Timagami Lake Area

Selected References: Barlow, A. E.: Nipissing and Timiskaming Map-Sheets; Geol. Surv., Canada, 1907.

Knight, C. W.: Cedar and Net Lakes Area; Ont. Dept. of Mines, vol. 29, pt. 1, 1920, pp. 207-219.

Moore, E. S.: Timagami Lake Area; Ont. Dept. of Mines, 1935.

Map No. 155A: Lake Huron Sheet; Geol. Surv., Canada. Issued 1933.

SITUATION AND EXTENT

Lake Timagami is about half-way between lake Timiskaming and lake Wanapitei and lies within the Timagami forest reserve. Timagami station on the Temiskaming and Northern Ontario railway is on the northeast arm of the lake.

The area includes those townships that contain and surround Timagami lake. Delhi, Cassels, Askin, and Afton townships form the corners of the main block, but Canton and Ashton townships on the north and Macbeth, Clement, Vogt, and Torrington townships on the south are also included, making a total of twenty-four townships. The principal mineral occurrences so far discovered are confined to Strathy, Chambers, Briggs, Strathcona, and Afton townships.

GEOLOGICAL OUTLINE

The oldest rocks of the region are Keewatin and consist largely of hornblende, chlorite and sericite schists, and greenstones. The different schists grade into more massive rocks. Pillow structure is common at Arsenic lake and amygdaloidal textures are well developed on the north arm of Cedar lake. Rusty carbonate zones occur in several places. Large outcrops of iron formation associated with the greenstones occur bordering the northern side of the northeast arm of lake Timagami, in the neighbourhood of Austin bay, at the foot of the south arm of Timagami lake, and in the area between Eagle Rock lake and Emerald lake. This consists largely of siliceous magnetite interbanded with variously coloured jaspers and chert with, in some instances, a small proportion of hematite. A mineralized belt of Keewatin rocks containing much auriferous arsenopyrite extends from Net lake to Vermilion lake. In association with the banded iron formation or jaspilite there is in many places a parallel zone rich in pyrite. The pyritous zone carries small quantities of gold. Native gold has been found in quartz veins in the Keewatin rocks at Emerald lake, west of lake Timagami.

Serpentine, peridotite, and diabase, intrusive into the greenstone in oval and dyke-like outlines, are found infrequently. They are of economic interest as sulphide deposits carrying copper, nickel, platinum, gold, and silver values are associated with them.

Quartz porphyry and quartz porphyry schist occur in the form of bosses and dykes. One of these occurs on the Big Dan claim. They are probably of the same age as the great granite intrusions of the area. The greenstones and diabase or gabbro are cut both north and south of the northeast arm of the lake by bodies of coarse-grained pink granite. Sedimentary rocks of the Cobalt series, conglomerate, greywacke, and quartzite, occur over wide areas about the lake. They are younger than the granite intrusions, but are cut by sills and bosses of diabase. The youngest Precambrian rocks in the area are olivine diabase dykes.

HISTORY OF MINING ACTIVITY

Gold was discovered at Emerald lake in Afton township, and auriferous arsenopyrite was found in Strathy township, in 1897. Miller, reporting for the Bureau of Mines in 1900, describes discoveries of banded iron formation or jaspilite with which are associated parallel bands of greenstone highly impregnated with iron pyrites. Surface exploration of both iron deposits and pyrite bands was carried out. Analyses of the pyritic ores showed that all the sulphides examined carried gold in amounts sufficient to be of value as a by-product in case the ores were used as a source of sulphur.

The Big Dan mispickel deposit has been worked at intervals since its discovery in 1897 and considerable ore was shipped in 1906, but the plant was burned a few years later. The Little Dan mine was operated between 1904 and 1910 at Arsenic lake, but only about 270 tons of auriferous mispickel is said to have been shipped.

The Golden Rose mine at Emerald lake attracted a great deal of attention between 1915 and 1919. A small mill was erected and some gold produced before it closed in 1919. Afton Mines became owners of the property in 1927 and carried out further underground exploration. In 1934 Consolidated Mining and Smelting Company secured control of Afton Mines and provided funds for further development work.

Cuniptau Mines are actively developing a copper-nickel property in the northwest part of Strathy township. The ores carry low gold and platinum values. Manitoba and Eastern Mines took over the former Little Dan and adjacent claims and have been developing the property since 1933. The arsenopyrite ore is reported to carry good values in gold. A block of claims held by the Long Lac Adair Mines adjoins the Manitoba and Eastern claims to the southwest. The company was reported to be testing a band of sulphides associated with iron formation, in the autumn of 1934.

About ten other holding companies are engaged in, or intend to carry on, development work in the area during 1935.

GOLD DEPOSITS

Probably the most promising of the mineral occurrences in the area are the gold-bearing mispickel ore-bodies which have long been known as the Big Dan and Little Dan. The latter property has been under development by the Manitoba and Eastern Mines until recently.

The Little Dan deposit at the east end of Arsenic lake is described as occurring in a shear zone with a strike of north 15 degrees west and a fairly regular dip of 65 degrees west. The country rock is Keewatin basalt that shows well-developed pillow structures and that is bleached to a light grey colour near the ore-body. The vein minerals consist of arsenopyrite and pyrite with small quantities of chalcopyrite, sphalerite, and galena. In many places the vein is banded. Gold is present associated with arsenopyrite. According to press reports in February 1935 underground mining by Manitoba and Eastern Mines had proved the existence of a number of ore lenses, but they were small in size and the average gold content low.

"On the 300-foot level one shoot averaged 0.23 ounce a ton along 205 feet for an average width of 4.17 feet. The grade would be \$8.05 at present prices. On the 200-foot level two shoots were drifted on. One is 81 feet long, 2.9 feet wide, and 0.274 ounce a ton in grade. The other is 52 feet long, $3 \cdot 1$ feet wide, and $0 \cdot 33$ ounce a ton in grade."

The ore-body at the Big Dan mispickel deposit occurs in a sheared and brecciated zone in Keewatin basalt. Except along the shear zone the neighbouring basalt is massive. The ore is in small veinlets and in grains disseminated through the rock and there is also some massive sulphides containing angular fragments of brecciated country rock. The ore consists of auriferous arsenopyrite, pyrite, chalcopyrite, and pyrrhotite, with a little quartz and calcite. The shear zone in which the ore is found strikes about north and dips steeply west. It has a length, as indicated by gossan stains, of about 1,000 feet, and has widths up to 50 feet. There are at least three dykes on the property, namely, a quartz porphyry dyke, a diabase dyke, and a very basic dyke.

Coleman,¹ discussing this deposit in 1900, speaks of a band of nearly solid mispickel, 59 feet long, averaging a foot in thickness, and trenched to a depth of 10 feet. Assays showed this ore to run \$3.70 gold, \$2.52 silver, and 14.4 per cent arsenic a ton. Assays of ore samples collected from four different workings along the deposit showed the values to run from less than \$1 to \$31.20 in gold and silver, with an average of \$5.75 a ton.

The Golden Rose mine is owned by Afton Mines and controlled by Consolidated Mining and Smelting Company. Gold occurs in narrow quartz veins in a sheared zone in Keewatin greenstone. The shear zone, which is reported to have widths up to 85 feet, lies parallel to a band of jaspilite or iron formation. Two holes drilled in the jaspilite in 1928 are reported to have cut five narrow veins having values of \$2 to \$12.80 in gold. The main shear zone on the 150-foot level assayed from 20 cents to \$4.60 a ton in gold. The results of recent exploration are unknown.

The nickel-copper ores on claim T.R.T. 3187 of Cuniptau Mines are described by Savage² (1934) as occurring in a fractured zone of serpentinized diabase and peridotite. This fractured zone is in the northwestern part of the main serpentinized mass which intrudes the Keewatin greenstones and extends in an oval for approximately half a mile to the south. The main vein zone strikes in a northerly direction and dips at 30 degrees to 40 degrees to the east. The vein zone contains lenses of massive sulphides, chiefly pyrrhotite and chalcopyrite with some pentlandite, which range from a few inches to 4 feet in width. Analyses of the massive sulphides show the presence of copper, nickel, gold, silver, and platinum group metals. The combined values are reported in some cases to represent a fair grade of ore.

¹ Ont. Bureau of Mines, vol. 9, p. 173 (1900). ² Preliminary Rept. Ont. Dept. of Mines, 1934.

IRON FORMATION

There are three main bands of iron formation or jaspilite, the Vermilion Lake band, the Snake and Turtle Lakes band, and the Ko-Ko-Ko Lake band. A rusty band of rock highly impregnated with pyrite lies parallel to each band of jaspilite. At Vermilion lake the pyrite band runs along the south shore and lies between a breccia on the north and the jaspilite on the south. Nine samples of the sulphide collected from various locations by Miller,¹ in 1900, gave assays that averaged \$1.83 a ton in gold. Long Lac Adair Mines reported encouraging values in gold late in 1934, from chip sampling of sulphide zones associated with iron formation on claims T.R.T. 4444 and 4445 in Strathy township.

MINES AND PROSPECTS

A small, intermittent production of gold has been maintained since 1897. The properties that were most active are listed below.

Afton Mines, Limited. The property is situated at Emerald lake in Afton township, west of lake Timagami. It comprises 840 acres, and was previously held by Golden Rose Mines, Limited. This company worked the property between 1915 and 1919. An adit 100 feet long was driven into a hillside and a winze sunk for 150 feet. In 1927-28 Afton Mines carried out 300 feet of drifting and crosscutting on the 150-foot level, and three holes were drilled to depths of 730, 1,366, and 573 feet. In June 1934 Consolidated Mining and Smelting Company, Limited, optioned control of the company and commenced further active exploration.

Alfreda Lake Gold Syndicate. The syndicate holds eight claims in Strathy township, situated about 3½ miles west of Goward station. Stripping and trenching have been done on two veins.

Big Dan Mine. The mining property comprises claim W.D. 271, on the south shore of Net lake about 3 miles north of Timagami station. Surface operations on auriferous mispickel veins were started here in 1897. The Timagami Mining and Milling Company built a concentrating mill in 1906 and commenced mining operations. The arsenopyrite concentrates were bagged and shipped to the smelter. Two shafts were sunk about 1,000 feet apart and midway between them a tunnel was driven and an open-cut about 18 feet wide put down along the deposit. The mine was operated several years.

Claim T.R. 1877. The claim is near the northeast arm of Vermilion lake. Two shafts were sunk here, on rusty carbonate rocks, prior to 1919.

Cuniptau Mines, Limited. The property consists of a large block of claims in the northwest half of Strathy township. A shaft has been sunk to 245 feet with considerable crosscutting and drifting on the 100- and 225-foot levels. Over 8,000 feet of diamond drilling has been carried out. The sulphide ore-body carries values in copper, nickel, gold, and platinum. A small smelter was installed late in 1934.

¹ Ont. Bureau of Mines, vol. 10, pp. 170-180 (1901).

Delhi (Timagami) Gold Mines, Limited. The company owns 280 acres in Delhi township on the west side of Wakimika lake, 25 miles from Timagami station. A tunnel has been driven 240 feet and surface work includes the sinking of ten test pits and about 200 feet of trenching. The work was done in 1907.

Goward Gold Mines, Limited. The company succeeds Central Temagami Gold Syndicate. The property comprises twelve claims in Chambers and Strathy townships, about $1\frac{1}{2}$ miles south of Cuniptau mines. A number of veins have been traced by surface trenching.

Jackson McNab. On claim T.R.T. 4577 a pit was recently sunk on a fracture zone in diabase.

Little Dan Mine. This old mine was situated on claims W.S. 14 and W.S. 13 at the east end of Arsenic lake, about $1\frac{1}{4}$ miles west of the Temiskaming and Northern Ontario railway, in Strathy township. Considerable work was done here between 1904 and 1910. A 60-foot shaft was sunk and ore was mined from two open pits. About 270 tons of auriferous mispickel were shipped (See Manitoba and Eastern).

Long Lac Adair Mines, Limited. The company owns eleven claims, 440 acres, in Strathy township adjoining Manitoba and Eastern on the southwest. Surface work only has been done.

Manitoba and Eastern Mines, Limited. The property consists of sixteen claims situated about Arsenic lake and includes the former Little Dan claim. About 3,044 feet of drilling was done in 1933 and in 1934 a shaft was sunk to 322 feet, with 1,820 feet of drifting and crosscutting on the 200- and 300-foot levels. A total of \$114,000 was expended. Operations were suspended in February 1935 when Bobjo Mines withdrew their financial support.

Obongo Lake Gold Mining Syndicate. The syndicate owns 360 acres in Chambers township, in addition to other holdings. Surface exploration only has been done.

Stillar Temagami Gold Mines, Limited. The company owns eighteen claims in Vogt township, at the southeast end of lake Timagami. A vein is reported to have been traced for 1,400 feet by surface work.

Strathy Basin Mines, Limited. The claims are situated in the north half of Strathy township, and were staked in 1933. Surface exploration has exposed rusty, fractured zones containing quartz veinlets and sulphide mineralization.

Turcott Mine. On the east shore of Grassy lake, in Macbeth township, considerable work was done about 1898 on a 5-foot quartz vein situated at the top of a high greenstone hill.

(27) Tyrrell-Knight Area

Selected References: Graham, A. R.: Tyrrell-Knight Area; Ont. Dept. of Mines, vol. 41, pt. 2, 1932.

Map No. 41b: Tyrrell-Knight Area; Ont. Dept. of Mines, 1932.

SITUATION AND ACCESS

The townships of Tyrrell and Knight are situated along the western boundary of the district of Timiskaming, about 75 miles due north of Sudbury and 60 miles northwest of Cobalt. They are half-way between the West Shiningtree gold area and the Gowganda silver area. Entrance into the area is by way of Gowganda on the east or Shiningtree on the west, both towns being connected with railways by good motor roads. It is 27 miles from Gowganda to Elk Lake, the terminus of a branch railway line from Earlton Junction, and a motor bus service operates daily between Gowganda and Elk Lake. From Gowganda a 9-mile road leads around the northwest arm of Gowganda lake to Wapus creek in Tyrrell township. A winter road extends from the creek into the camp of the McIntyre-Porcupine Mines on the Knight-Tyrell boundary. A 20-mile automobile road connects Shiningtree with Westree on the main line of the Canadian National railways, and the road extends from Shiningtree 6 miles farther to the West Tree mine on the west branch of Montreal river. From the West Tree mine to Duncan lake is a 20-mile trip by river with fourteen short portages.

GEOLOGICAL OUTLINE

The basement rocks of the area are separated into three main divisions: the Keewatin volcanics, the Timiskaming volcanics and sediments, and the granitic intrusives. These formations underlie the Cobalt sediments, and are exposed in three separate localities, covering about half of the district.

The Keewatin rocks consist essentially of andesite and basaltic lavas, which are extremely massive in the main exposed areas west of Pigeon and Duncan lakes. A band of iron formation about 2 miles long is exposed in the southwest corner of Tyrrell township. The formation is from 20 to 60 feet in width, the central part consisting of alternating bands of brilliant red and black rock. Its strike ranges from north 20 degrees west and the dip is 80 degrees east, which is also the general direction of folding of the Keewatin volcanics in this area.

Rocks mapped by A. R. Graham as probably Timiskaming in age include rhyolite and trachyte flows, tuff, and volcanic breccias grading upwards into slate, arkose, and conglomerate. He states that the so-called Timiskaming is not metamorphosed or folded as greatly as the older Keewatin and is separated by a minor conformity. The series in the southern part of Tyrrell township between Spider and Slim lakes is folded along an axis striking north 20 degrees west and the beds dip at angles of 30 degrees to 80 degrees west. A central area extending from Duncan lake northwest into Natal township consists principally of the volcanic members. In the southeast corner of MacMurchy township this series consists mainly of pyroclastic sediments, the beds striking north 70 degrees
west with vertical dips. The Timiskaming rocks are thought to occupy minor synclines within the larger Keewatin synclinorium.

There are numerous masses of intrusive ultrabasic rocks, in most cases completely altered to serpentine, throughout the Keewatin and Timiskaming rocks. These peridotites are post-Timiskaming and pregranite in age. Most of the masses are small bosses with their longer axes conforming to the strike of the Keewatin greenstones.

Southwest of Pigeon lake the Keewatin is intruded by a small boss of granodiorite. Numerous lamprophyre and feldspar porphyry dykes occur within a radius of 6 miles of the granodiorite and appear to be facies of it. The dykes intrude both volcanics and sediments in Tyrrell township. Gold is found in mineralized shear zones and quartz veins near the boss and dyke rocks.

Most of the north and eastern parts of the area are covered by the younger Cobalt series. The lower Cobalt is composed of conglomerate, greywacke, slate, and arkose, whereas the upper formation is entirely quartzite. These rocks are little changed and only gently folded. Several sills of quartz diabase have been intruded along the bedding planes of the Cobalt or along the surface of the older basement rock. It is in association with diabase sills of this type that silver occurs at Cobalt.

Olivine and quartz diabase dykes intrude all other rock formations. They are long, narrow dykes striking from northeast to northwest.

HISTORY OF MINING ACTIVITY

Tyrrell and Knight townships have received the attention of prospectors at intervals since the Gowganda silver rush began in 1908. Prospectors found native silver in Leonard township and the staking extended into Tyrrell township in 1909. Gold occurrences were noted at this time, but did not attract attention even in 1912 and 1913 when the West Shiningtree area was active. Since that time no prospecting had been done until the recent activity at Matachewan spread to outlying points. In the autumn of 1930 Ed. Holland staked a block of twenty-seven claims for McIntyre Porcupine Mines, and this was followed by a mild rush early in 1931, at which time most of the favourable ground in the two townships was staked. During the summer of 1931 extensive surface work was done on certain prospects by several companies and many privately owned claims were systematically explored. Several low-grade deposits were indicated by surface work, but so far results have not induced operators to institute underground exploration aside from drilling.

GOLD DEPOSITS

An excellent description of the gold deposits, given by A. R. Graham, is as follows:

"There are two somewhat different types of deposits. In most cases the gold is found in mineralized shear zones filled with small quartz stringers. Frequently the rock in these zones is brecciated, and irregular masses of quartz fill the openings through the crushed rock. These mineralized shear zones have no definite boundaries separating them from the massive, unmineralized country rock. The introduction of secondary minerals into the shear zones caused the alteration of the rock, which is sometimes silicified, sometimes carbonated. Pyrite in the form of small cubes and grains is commonly distributed through the quartz and altered rock.

"The main system of shear zones strikes north 20 degrees to 30 degrees west parallel to the lines of weakness in the Keewatin rocks. The deposits are generally lenticular in form and attain widths of 60 feet. The mineralization continues along some shear zones for great lengths. Gold is found both native and combined with sulphides, especially pyrite. Although visible native gold has been discovered in many deposits, it is not concentrated spectacularly and is contained principally in sulphides. The metallic minerals are pyrite, pyrrhotite, chalcopyrite, and arsenopyrite. Graphite occurs in several shear zones. This type of mineralized shear zone forms large deposits of low-grade material.

"In the other type, gold is found in distinct quartz veins, only a few of which have been found in the area. They range in width up to 6 feet, but do not continue over great distances. The veins strike in two directions: one set strikes roughly north and the other set strikes east and west. Fine native gold occurs in small fractures in the quartz. Tellurides have been reported in samples of one vein. The metallic minerals are pyrite, chalcopyrite, and molybdenite."

Hedlund Deposit. Since 1930 this deposit has been popularly considered the most promising in the area. Surface assays indicated a large low-grade deposit with an average width of 30 feet and a length of 950 feet. Six drill holes put down to intersect the fracture zone at a vertical depth of approximately 70 feet showed that the values found on the surface were maintained across similar widths, but three drill holes across the fracture zone at a depth of 150 feet indicated pyritization across similar widths but with very small gold values.

The fracture zone in which the deposit occurs strikes north 20 degrees west, and dips at an angle of 70 degrees west. The wall-rock on the east is an altered andesite and the hanging-wall on the west, for at least 600 feet, is of peridotite altered to serpentine. Besides the contact alteration due to the peridotite intrusion, the silicification throughout the fracture zone was intensified by the gold-bearing solutions, so that the deposit is so siliceous as to be mistaken for an acid flow. The gold values are contained chiefly in pyrite, which impregnates the rock in the form of irregular particles and in cubic crystals. The width of the deposit depends upon the quantity of this mineral.

The McIntyre Porcupine Mines sampled a deposit in a fractured area. along a greenstone and granodiorite contact. The mineralized area is about 300 feet long and 60 feet wide, within which the fractured granodiorite and greenstone are partly replaced by quartz and pyrite. Quartz carbonate veinlets, containing small amounts of pyrite, chalcopyrite, and arsenopyrite, occupy many of the fractures, and visible gold was detected in veinlets cutting the granodiorite. Some of the best assay values came from the latter type of occurrence. Channel sampling indicated a lowgrade deposit.

In the northwest part of Tyrrell township a series of vertically dipping shear zones have been traced at intervals for over a mile. They occur along the contact of the ancient volcanics with the younger, supposedly Timiskaming, rocks. The younger rocks lie chiefly on the east side of Hydro creek and consist of acid volcanics with thin beds of conglomerate and quartzite. One of these shear zones is well exposed on claim G.G. 5962. It is more than 300 feet in length with widths up to 5 feet, and is occupied by numerous parallel and intersecting veinlets of quartz. The strike is north 20 degrees west and the dip vertical. The greenstone has been altered to a chlorite-graphite schist and was partly replaced by disseminated grains and cubes of pyrite. At several points along the shear zone, visible gold has been found in the quartz stringers. The principal groups of claims covering these gold occurrences are now held by Hilltop Mines, Limited, the Golden Regan Syndicate, and the Iona Matachewan Syndicate.

MINES AND PROSPECTS

Gold was discovered in the area in 1908 but few claims were staked before 1930. The most actively explored prospects are listed below.

Burroughs Claims. The claims comprise three groups in Tyrrell township. Cross trenching in 1931 on the west shore of Cripple lake disclosed a small quartz vein.

Coniagas Mines, Limited. The company did assessment work on a group of nine claims south of Indian lake, in 1931.

Cryderman Claims. Claims G.G. 6040-45, now of the John Agnew Estate, are situated north of Indian lake. Assessment work done in 1931 consisted of stripping of quartile outcrops.

Garvey Claims. This group of six claims is situated east of Breeze lake. Surface work in 1927 disclosed a narrow quartz ankerite stringer in sheared rhyolite.

Gordon Syndicate. The syndicate did considerable work in 1931 on a group of ten claims in Tyrrell township north of Breeze lake. A brecciated sulphide zone was explored by trenching and 1,000 feet of diamond drilling.

Hedlund Property (G.G. 5800-5805). The Hedlund group of six claims is on the boundary between Tyrrell and Knight townships. In 1931 the Waite Syndicate, assisted by Ventures, Limited, and the Nipissing Mines, did considerable surface trenching and completed 2,200 feet of diamond drilling. Further work was planned by M. J. O'Brien, Limited, who held an option on the property in 1932.

Hurst Property. The property consists of six claims on Pigeon lake in Knight township. Some surface trenching and sampling were done in 1931 under the directon of R. E. Hore.

Johnston-Gardner Claims. These claims are in three groups, one on the west side of Pigeon lake, a second across Hydro creek, and the third south of Pear lake. Trenching and blasting were reported on a few small showings during the summer of 1931. Martel (G.G. 5996-6004). On these claims, situated west of Cripple lake, assessment work was done in July 1931.

McIntyre Porcupine Mines. A block of twenty-seven claims (G.G. 5764-90) were staked for the company by Ed. Holland in 1930. Exploration of a mineralized fracture zone on G.G. 5764, in Knight township, was done in 1931. Besides 1,000 feet of trenching and rock cutting the company completed a systematic exploration of the twenty-seven claims. All rock outcrops were stripped along east-west survey lines cut at 500-foot intervals, from the township line south to Porphyry lake.

McNeely Matachewan Syndicate. There are four claims in the group at Hare lake, Tyrrell township. Trenching in 1931 exposed a large vein for 200 feet, in acid volcanics.

Mining Corporation of Canada, Limited. A group of nine claims were examined by this company south of Porphyry lake, in 1931. A narrow sulphide body was traced along the contact of an andesite and rhyolite flow.

Netherton Claims. The claims are in MacMurchy township, close to the eastern boundary. Surface prospecting in 1931 disclosed a 2-foot quartz vein.

Nipissing Mining Company, Limited. On claims G.G. 5806-11, south of Brush lake in Knight township, the company performed 2,500 feet of cross trenching along a ridge of pillow lavas. Examination was also made of the Ferguson claims (G.G. 5812-4) in Tyrrell township, and claims T.R.S. 6421-6 in MacMurchy township.

Pariseau (T.R.S. 5423). The claim is situated along the north boundary line, east of Montreal river in MacMurchy township. Stripping has revealed a quartz vein up to 10 feet wide near the river.

Shahen Claims. This group surrounds and includes Breeze lake. A number of mineralized zones have been opened up by surface trenching in rhyolite intruded by feldspar porphyry.

Sorbeil and Lafrance Claims. Both of these groups lie to the east of Indian lake. Some surface trenching has been done.

Tough-Regan-Summerville Claims. In 1931 these parties controlled about forty claims in the northwest part of Tyrrell township. Surface trenching and exploration revealed a mineralized shear zone exposed at intervals for over a mile. Several concerns purchased claims along this zone in the autumn of the year, including the Iona Matachewan, the Golden Regan, and the Hilltop Mines, Limited.

Spears \cdot Claims. These claims are favourably situated near the Hedlund. In 1931 surface trenching uncovered a sulphide zone in andesite lavas.

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(28) Wanapitei Lake Area

- Selected References: Quirke, T. T.: Wanapitei Lake Map-Area; Geol. Surv., Canada, Sum. Rept. 1921, pt. D.
 - Kindle, L. F.: Moose Mountain-Wanapitei Area; Ont. Dept. of Mines, vol. XLI, pt. IV, 1932.

Map No. 1948: Geol. Surv., Canada. Issued 1922.

Map No. 41e: Kitchener, Hutton, Parkin Townships; Ont. Dept. of Mines. Issued 1932.

SITUATION AND EXTENT

Lake Wanapitei is a round body of water, measuring almost 10 miles across its widest parts, situated about 15 miles northeast of Sudbury. The area includes the surrounding townships of Parkin, Aylmer, Mackelcan, McCarthy, Rathbun, Kelly, Scadding, Davis, Street, and Loughrin, and parts of Falconbridge, Maclennan, and Normian. About 3 miles west of the lake the area is bounded by the eastern end of the Sudbury nickel basin. The district is readily accessible by motor, by railway, and by boat. A small steamship operates on the lake.

GEOLOGICAL OUTLINE

In Wanapitei Lake area the Keewatin rocks are characteristically well banded, and evidently consist largely of fine-grained volcanic tuff, though some parts are composed of sedimentary material. On the west side of Massey bay a green greywacke or tuff with no perceptible bedding weathers with a pale chipped surface. Similar rocks occur along the railway for almost 2 miles east from Massey Bay station and extend south into Falconbridge township around the rim of the Sudbury nickel basin, and another band lies south of Crerar and Ess Creek. North of the old Indian reserve the rocks more closely resemble metamorphosed lavas.

The granite that intrudes the Keewatin rocks is commonly a fine to medium-grained, granular, pink rock. The large granite area west of Wanapitei lake includes large Keewatin masses. Here the granite is more variable and syenite and alaskite phases occur.

The base of the Huronian series is a dark conglomerate with many rounded pebbles and boulders of dark chert and smoky quartz. It is known as the Ramsey Lake conglomerate and forms the base of the Mississagi formation, which is mainly a white, coarse-grained, feldspathic quartzite. A massive conglomerate known as the Bruce overlies the Mississagi quartzite. The siliceous character of its matrix wth small fragments of quartz is quite distinctive. The Espanola formation, consisting of limestone and greywacke or indurated silt, lies above the Bruce conglomerate. The Espanola greywacke passes upwards into the Serpent quartzite. The lower part of the Serpent is a fine-grained, greenish white, impure quartzite which grades upwards into a medium to coarse-grained quartzite of nearly dead white colour with a fine lamination. The top of the formation has a pink coloration.

The Cobalt series, comprised of the Gowganda formation and Lorrain quartzite, occupies the northern and eastern parts of the area. The Gowganda consists of a roughly stratified basal conglomerate which grades into quartzite and greywacke. Well-bedded greywacke grades upwards into the Lorrain quartzite, a singularly pure, pale green quartzite characterized by the recurrence of streaks of small quartz and jasper pebbles throughout the whole formation. As it is the youngest Huronian formation it is found solely in the synclines, where it is commonly metamorphosed to a green mica schist.

A strong erosional unconformity exists between the Bruce and Cobalt series.

Numerous stock and dyke-like masses of quartz diabase intrude the Keewatin and Huronian formations. It is along the contacts of these diabase intrusives, or in the neighbourhood of faults near the contact of the diabase, that gold is found in quartz veins. Quartz carbonate veins also occur in shear zones and along faults intersecting the diabase and country rock.

Dykes of brown-weathering olivine diabase with a northwest strike intrude all of the older formations. They are customarily about 200 feet wide and up to 3 or 4 miles long.

There are many faults in the area, particularly in the neighbourhood of the contacts of the various formations. The strongest dislocations have been along north-south and northeast-southwest directions.

HISTORY OF MINING ACTIVITY

Gold was discovered in the summer of 1888 on the southern shore of lake Wanapitei, on the promontory between the two deep bays. It occurred in narrow veins of white quartz cutting feldspathic, reddish quartzite. The gold occurred as specks and small nuggets in the quartz. There was an attempt to extract the gold by means of a small arrastre, in 1890. The quartz was first calcined in a wood fire, after which it was easily ground under the flat surfaces of two large stones attached to a beam drawn round by a horse. In 1891-92 other promising leads were discovered near the lake and prospecting became very active. Between 1892 and 1900 underground exploration was undertaken at the Crystal, Comstock, and Scadding mines, and extensive surface work was done on a dozen other properties. The crystal mine put a 5-stamp mill into operation in 1897 and produced considerable gold at intervals until it closed in 1911.

Between 1923 and 1925 interest was centred on the activity at the Red Rock mine. A shaft was sunk to 160 feet and 1,140 feet of drifting and crosscutting were done. A little high-grade ore is reported to have been recovered, but no information is available as to the value of the main shear zone explored.

A number of privately owned claims have been actively developed at intervals since 1925 and in 1934 some of these were taken over by mining companies. The present operators include Mac-Auer Gold Mines, Wanapitei Gold Mines, Wanapitei Basin Mines, and the Blue Eagle Gold Syndicate. Crystal Comstock Gold Mines, owners of the former Crystal and Comstock properties, are at present inactive.

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GOLD DEPOSITS

The principal gold deposits occur in the Huronian sediments and are generally confined to the vicinity of bodies of quartz diabase. The proximity suggests that the gold-bearing veins are genetically related to the diabase, particularly as there is no other known geological agent to which the mineralization can be ascribed. The various types of occurrence are as follows:

- (1) In quartz carbonate veins occupying shear zones intersecting the diabase dykes.
- (2) In quartz carbonate veins occurring along shear zones in sediments or greenstones.
 - (3) In brecciated sedimentary rocks traversed by narrow quartz veins.
- (4) In quartz carbonate veins along major faults.

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The characteristic mineral associations are quartz, pyrite, carbonate (breunnerite), and gold. Breunnerite is a carbonate of magnesium and iron recognized by its deep bronze or tan-coloured weathering. Gold occurs in the free state and is free milling. Wire gold has been found in some places and was probably derived from sulphides during weathering processes.

A description of the Crystal mine has been given by W. H. Collins:¹

"The mine is located on the contact between banded greywacke and greenish arkose, belonging to the Cobalt series, and an intrusive mass, probably a sill, of diabase similar in outward appearance to the other post-Cobalt diabases of the region. The normal dip of the Huronian beds is 25 degrees or less, but near the diabase they are more steeply inclined and the contact itself is often marked by a crush-breccia of both intruded and intruding rocks. In the small hill that contains the mine workings both diabase and sediments are intersected by numerous quartz veins, usually less than a foot wide. These veins consist of quartz and a pink or pale brown carbonate of magnesium and iron (breunnerite), the breunnerite weathering when exposed on the ore dump to a characteristic deep bronze colour. The gangue of quartz and breunnerite carries pyrite and native gold. The pyrite is evidently copper bearing because it takes on brassy and purple weathering discolorations. The gold occurs in visible form, often in pieces of considerable size. The Huronian wall-rock for about 6 inches away from the veins is bleached and strongly impregnated with crystals of breunnerite and with pyrite."

The lode at the Red Rock mine is in a dark green, schistose and altered quartz diabase. The altered rock is cut by a stockwork of veins and veinlets of quartz and ferruginous carbonate. A number of attractive specimens of native gold were found in the veined zone. Pyrite is sparingly disseminated through some of the quartz and carbonate and a little mispickel is said to have been found.

The shaft at the Mount Edna mine near Crerar was sunk in the Cobalt conglomerate. The veins were largely of quartz with small amounts of barite, pyrite, and chalcopyrite. The vein at the Scadding mine was likewise in conglomerate. It is described as a metamorphic conglomerate

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¹ Geol. Surv., Canada, Mem. 95, pp. 114-116 (1917).

consisting of a chloritic base through which are set, sparingly, pebbles of pink or light-coloured granite. The vein averages about 6 feet in width, strikes 70 degrees west of north, and dips 80 degrees to the north. The ore is quartz which carries free gold and some chalcopyrite.

On the Mataris claims, in Parkin township, quartz veins occupy shear zones in the quartzite, and form narrow stockworks in the limestone. At the north end of claim S 5326, the diabase has been replaced by carbonate and sulphide minerals forming a quartz carbonate schist along the diabase contact. These zones are mineralized with pyrite and arsenopyrite and the veins carry low gold values. On the west boundary of Hutton township, at the Copenhagen

On the west boundary of Hutton township, at the Copenhagen property, a mineralized shear zone occurs along a greenstone and granite contact. The zone is mineralized with quartz and sulphides over a width of 8 feet. In the north part of Loughrin township there are a number of strong quartz veins in the gneissic complex.

The most favourable prospecting ground appears to be along the contacts of the quartz diabase with Huronian sediments. Major fault lines in the neighbourhood of diabase intrusions should also be carefully examined. Up to the present, however, gold deposits associated with sills of diabase have always been found to be erratic in gold content and to lack continuity.

MINES AND PROSPECTS

Gold was discovered in 1888 and two mines produced a little gold in the early years. The most actively developed properties are given below.

Alkins Prospect. The prospect comprises claims 5508P and 5441P in lot 8, con. II, Scadding tp. A quartz vein in diabase had been traced by trenching and stripping and a number of test pits were sunk upon it.

T. Boulanger, Claim S 5298. In the south half of lot 7, con. V, Street tp., surface trenching and test pitting have been done on a schistose vein zone in conglomerate.

Comstock Mine. This old mine is in Rathbun township on claim W.R. 40, near Bowland lake, adjoining the Crystal mine. In 1897 the Comstock Gold Mining and Development Company sank a shaft to 102 feet and carried out some lateral work on the 90-foot level.

Crystal Mine. A gold discovery was made in 1892 on claim W.D. 43, on the height of land between lakes Wanapitei and Matagamasi. The Crystal Gold Mining Company worked the property for a number of years. In 1897 the main shaft was down 100 feet, and three other shallow shafts had been sunk and an adit driven for 106 feet. A 5-stamp mill was in use and considerable gold was produced. The mine is reported to have been reopened in 1907 after being closed for some years and gold production was recorded until 1911. The mine has been held by Crystal Comstock Gold Mines since 1925.

Davis Township, Claim W.R. 36. The claim is on the south half of lot 14, concession IV. Trenching and test pitting have been done on narrow, gold-bearing quartz veins in conglomerate.

Davis Township, Claim S 16093. This claim is in lot 12, concession V, about a quarter mile from the southeast shore of Kuba lake. An inclined shaft has been sunk to a depth of 35 feet on a quartz carbonate vein in a sheared diabase dyke. About 400 feet to the southeast a second shaft has been sunk for 40 feet in altered diabase.

Davis Township, Claim S 3707. The claim is near Crerar, in lot 13, concession II. About fourteen years ago a 30-foot shaft was sunk on quartz veins in a buff-weathering quartzite, and considerable surface trenching was done. Two carloads of ore from the surface was shipped.

Gold Cliff Mine. In 1898 it was reported that a tunnel 182 feet long had been driven at the Gold Cliff mine on Kukagami lake.

Golden Mines Syndicate. The syndicate owns seven claims in Scadding township and fourteen claims in Street township. Surface work is reported to have been done during 1935.

Gordon Mine. The property is situated about one mile south of Bowland lake, in lot 6, con. III, Rathbun tp. A shaft was put down here for 40 feet and two diamond drill holes were bored in 1895.

Hub Mine. In 1898 it was stated that the Hub mine was situated about 2 miles east of the Crystal mine. A shaft had been sunk there on a vein 12 feet in width.

Hubbell Mine. On location W.H. 50, adjoining the Crystal mine, Mr. Hubbell carried out stripping and trenching operations late in the year 1897 and two shafts of 15 and 25 feet were sunk.

Johnston Claim. On a group of four claims 1 mile west of Spaidal station, in Maclennan township, a prospect shaft was sunk to 50 feet during the summer and autumn of 1923.

Last Chance Mine or O'Connor. This property was situated on lake Matagamasi, in lot 4. con. V, Rathbun tp. Between 1892 and 1897 two shallow shafts were sunk on quartz veins.

Mac-Auer Gold Mines, Limited. The company owns five claims in Davis township, about 3 miles north of Crerar. No. 1 shaft is reported to have been sunk to 100 feet and a second shaft was sunk 32 feet. Development work was recommenced early in 1934. The mine was formerly known as the MacKenzie. A small mill was installed in 1935.

Mammoth Mine. This prospect is on the north shore of Bonanza lake in lot 2, con. IV, Maclennan tp. Between 1895 and 1897 a shaft was sunk to 60 feet and about 50 feet of drifting done on the 35-foot level, by the Bonanza Nickel Mining Company. Several diamond drill holes were bored.

J. Mataris, Claims S 5324-26, 11560. The claims are on lots 2 and 3, con. II, Parkin tp. Surface exploration has exposed a number of quartz veins and mineralized zones in limestone, quartzite, and diabase.

Geo. E. McVittie. The claims are in the north half of lots 9 and 10, con. III, Street tp. Trenching on claim S 20285, on the west bank of the Wanapitei, has exposed narrow quartz veins in quartzite. In lot 11, con. I, Street tp., a shallow shaft has been sunk on a quartz sulphide vein in sheared diabase.

Mid-Continental Goldfields, Limited. In 1931 considerable trenching and test pitting were done in lots 5 and 6, con. VI, Scadding tp., adjacent to the Red Rock.

Mondoux. In 1895 quartz veins were exposed on this property by surface stripping and test pitting. The property is on lot 5, con. IV, Rathbun tp.

Moose Mine W.D. 32. This property on Kukagami lake was staked in 1892. Surface development work was done at that time and a small mill was used to treat high-grade specimens.

Mount Edna. The property is situated beside a small pond about $1\frac{1}{4}$ miles to the northeast of Crerar. A shaft at least 60 feet deep was sunk here some time prior to 1917, on mineralized quartz veins in Cobalt conglomerate.

Parkin Township, Claims S 5429 (P), 5468 (P). These claims are in the north part of lot 4, concession II. Veined shear zones in quartzite have been explored by test pitting and trenching.

Parkin Township, Claim S 13043. In the southeastern part of lot 6, concession III, test pitting has disclosed a brecciated limestone containing a number of quartz stringers.

A. Potvin, Claim S 17051. The claim adjoins the east side of the outlet dam of Wanapitei lake. Surface work has been done on a 7-foot quartz vein in diabase.

A. Potvin, Street Township. In lot 7, concession IV, stripping operations have been done on a number of quartz veins that occur in quartzite. On the east bank of Wanapitei river, in lot 9, concession VI, just south of the railway bridge, stripping operations have exposed the rusty mineralized contact zone of quartzite and conglomerate (S 19844).

Red Rock Mine. The mine is situated on claim S 5110, in the south half of lot 6, con. IV, Scadding tp. In 1923 the Gold Nugget Mining and Development Company carried out stripping operations and sank four test pits. In 1924-25 the McMillan Development Company sank a shaft to 160 feet and carried out 1,140 feet of drifting and crosscutting on the 100-foot level.

Scadding Township Gold Mine. The property is in the south half of the north half of lots 6 and 7, con. VI, Scadding tp. In 1902 the main shaft was reported to be at a depth of 186 feet, with drifting on both the 40- and 160-foot levels. A second shaft was 40 feet deep. Sheppard Mine. Records state that this mine, on the north side of the promontory between the two southern bays of Wanapitei lake, was worked for a short time about 1890. The workings consist of a short drift into the face of the hill near the shore and a small open-cut at the top of the hill. The ore was treated in an arrastre of Mexican design.

Skead Property. A few hundred feet east of the village of Skead several test pits were put down along a strong east-west fault and a number of drill holes were bored.

Tecumseh Gold Mines, Limited. The company holds twelve claims on Kukagami lake, Davis township, about 4 miles from the Canadian National railway at Ess Creek. Development consists of trenching, stripping, and deep test pitting.

Wanapitei Basin Mines, Limited. The company owns a prospect in Scadding township. Surface trenching and test pitting were done in 1934.

Wanapitei Gold Mines, Limited. Surface trenching, test pitting, and sampling have been done along with some drilling. In 1934 it was stated that a small mill had been taken to the property.

(29) Watabeag Lake Area

Selected References: Wright, D. G. H.: Geology of the Watabeag Area; Ont. Dept. of Mines, vol. 31, pt. VII, 1922.

Maps Nos. 1931a and 1934a: Porcupine-Shiningtree and Abitibi-Timiskaming Areas; Ont. Dept. of Mines. Issued 1931 and 1934.

SITUATION AND EXTENT

Watabeag lake is situated approximately 15 miles southeast of Nighthawk lake and lies at the junction of McEvoy, Tolstoi, Terry, and Nordica townships. In addition to these townships the area includes Michie, Timmins, and Egan townships. It lies between the Matachewan and Hislop-Beatty-Munro gold areas.

GEOLOGICAL OUTLINE

The oldest rocks of the area are of Keewatin age. These consistlargely of basic to intermediate volcanics, and their schistose derivatives. The relationships of the foliated schists indicate that they were all originally volcanic rocks that have been recrystallized and foliated through the contact action of the intrusive granite batholith. Almost everywhere the greenstones have been closely folded and tilted into almost vertical or slightly overturned attitudes. The axial strike of the folds is from north 83 degrees east to due east.

The Keewatin has been liberally intruded by acid dykes, and a large body of granite and syenite occupies parts of Michie, Nordica, and Terry townships. It is part of a huge batholith that extends southward into Matachewan and Kenogami Lake areas. A coarse-grained albite syenite porphyry outcrops in Egan and McCann townships. Both the Keewatin rocks and the granite and syenite are cut by dykes and small masses of fresh diabase. Many of the dykes consist of a coarse quartz diabase with phenocrysts of labradorite feldspar up to 2 inches in diameter. Dykes of olivine diabase characterized by spheroidal weathering are quite numerous.

Gold occurs in quartz veins cutting both Keewatin schists and syenite porphyry. On the Biederman claim, in Terry township, gold was found in a wide quartz pegmatite vein. This suggests a genetic relationship between the gold mineralization and the acid intrusives.

Unfortunately, unconsolidated materials cover by far the greatest part of the area. They consist largely of sand, gravel, and stratified clay, or sand and clay. The townships of McEvoy, Tolstoi, and Terry are, in the main, one vast, undulating sand area.

HISTORY OF MINING ACTIVITY

Gold was discovered in 1908 along the south boundary of Terry township near Fall Duck lake, and the following year there was a mild rush known as the "Caribou rush" to that part of the area. Other discoveries were made and some development work was done during the next few years, but nothing of exceptional merit was found. There has been no report of further work during recent years.

GOLD DEPOSITS

Gold occurs in quartz veins cutting the greenstone schists and the granite, syenite, and feldspar porphyry dykes and bosses. In one instance it occurs in a pegmatite vein of quartz and feldspar. As all of the deposits are within or in close proximity to the granite, syenite, or feldspar porphyry, it is believed that the gold is genetically related to these acid intrusions.

On the Biederman property, gold occurs in a quartz pegmatite vein, about 25 feet wide, cutting a pink granite containing biotite and hornblende as accessory minerals. The vein strikes south 25 degrees east magnetic, and dips about 85 degrees east. The central part of the vein is barren, white, vitreous quartz, with little gossan. Near the margin the gangue is irregularly mineralized by iron pyrites, chalcopyrite, and molybdenite, and a good deal of feldspar occurs with the quartz. A picked sample, heavily mineralized with all of the minerals mentioned, did not yield an encouraging assay in gold or in silver. Values ranging from 90 cents to \$14 in gold, with 2 to 3 ounces of silver a ton, were obtained from one of four drill holes. The economic importance of the deposit is problematical, as no further information is available.

The property of Lightning River Gold Mines lies close to the Keewatin schist-granite contact. The main outcrop consists of Keewatin hornblende and chlorite schists which have been intimately intruded by narrow granitic and porphyritic dykes. The dykes have no uniform strike, but are in a general way parallel to the schistosity of the Keewatin. The main discovery is a sheeted zone slightly over 100 feet wide and exposed along the strike for several hundred feet. The schists in this zone strike north 37 degrees west, dip 65 degrees northeast, and are cut by a narrow quartz vein which strikes south 53 degrees east. The quartz veins and the intervening rock are slightly mineralized with cubes of pyrite. The schists are locally altered to a ferruginous carbonate. There is a series of joint fissures at right angles to the main fracture. Grab samples as nearly representative as possible, taken from sixteen different points across the sheeted zone, gave low gold values.

In Timmins township considerable surface work was done on claims 17010 and 16088. A shallow shaft was sunk on several parallel veins striking north 6 degrees east (magnetic), near the syenite and chlorite schist contact. The vein is composed largely of quartz with minor quantities of calcite, pyrite, ankerite, and another carbonate, probably breunnerite, judging by its tan-coloured weathering. The quartz veins cut both the Keewatin schists and the syenite porphyry, but the best parts of the veins are confined to the schists. A representative grab sample of the vein material gave on assay \$10.40 in gold a ton.

Near the southeast corner of claim 17010, a white vitreous quartz vein strikes south 80 degrees west (magnetic), and dips 60 degrees north. A belt, varying from a few to 18 inches in width, along the foot-wall side of the vein contains considerable molybdenite and ankerite. The hangingwall has been altered to a ferruginous carbonate and, judging from material on the dump, the vein is associated with a deep pink to redcoloured felsite dyke which does not outcrop at the surface. The footwall rock, carrying considerable molybdenite, assayed only a trace of gold.

Generally speaking the area is disappointing from an economic viewpoint, as no deposits of ore grade have yet been found. The Keewatin rocks near the margin of the granite batholith are favourable for prospecting, but most of the area is heavily overlain by swamps and sand-plains and the amount of outcrop is very small.

MINES AND PROSPECTS

The area was prospected in 1908 and the next few years but did not produce any gold. It has been inactive for some years. The most actively explored prospects are listed below.

Biederman Claims. A gold discovery was made in 1908 on claims D.G. 67 and 15740 along the south boundary of Terry township near the 2-mile post. At that time a 20-foot shaft was sunk on the vein and in 1914 four drill holes were bored, the longest being 320 feet deep.

Lightning River Gold Mines, Limited. The company owns four claims in Egan township comprising the south half of lot 9, concession III. Stripping and trenching of a sheeted mineralized zone were done in 1916.

Timmins Township Claims. Claims 17010 and 16088 are situated along the north boundary of Timmins township at the southwest corner of Egan township. In 1922 a shaft had been sunk to a depth of 30 feet and considerable surface work done. On claim 17010, near the southeast corner, a test pit 13 feet deep was sunk on a quartz vein.

(30) West Shiningtree Area

Selected References: Hopkins, P. E.: West Shiningtree Gold Area; Ont. Dept. of Mines, vol. 29, pt. 3, 1920.

Finley, F. L.: Wasapika Section, West Shiningtree Gold Area; Ont. Dept. of Mines, vol. 35, pt. 6, 1926.

Langford, G. B.: Shiningtree Silver Area and Wasapika Section, West Shiningtree Gold Area; Ont. Dept. of Mines, 1927, pp. 87-104.

Collins, W. H.: "West Shiningtree Area"; Geol. Surv., Canada, Sum. Rept. 1911, pp. 244-252.

Map No. 29A: West Shiningtree Gold Area; Ont. Dept. of Mines, 1920.

Map No. 153A: Asquith and Churchill Townships; Geol. Surv., Canada, 1916.

SITUATION AND EXTENT

The West Shiningtree gold area lies about 60 miles due north of Sudbury and about 20 miles west of Gowganda. It includes a block of four townships, Churchill and MacMurchy on the north and Asquith and Fawcett on the south. A 20-mile motor road connects Westree station on the Canadian National railway with West Shiningtree village. A motor road is being built between the area and Gowganda.

GEOLOGICAL OUTLINE

The oldest rocks belong to the Keewatin, and consist dominantly of andesite, basalt, and rhyolite, with subordinate amounts of rusty carbonates, green schists, iron formation, and a variety of sediments of pyroclastic origin. Pillow structures are widespread over considerable areas and denote that these rocks are surface flows. Rhyolite flows are most abundant in the northern part of Churchill township. They pass gradually into fine-grained ash rocks and finally into water-sorted slates and greywacke, or iron formation or conglomerate.

In general the lava flows and associated sediments have been closely folded and the axes strike about north 60 degrees west. The dips are vertical or almost so. No detailed work has yet been done to determine the regional structures. Finley was of the opinion that Michiwakenda lake marked the axis of a synclinal structure, but this has not been proved.

An exposure of serpentine occurs on the east shore of Gosselin lake and another on the south side of Green lake. They are probably altered peridotites older than the granitic rocks.

Other igneous rocks intrusive into the Keewatin include quartz porphyry and felsite, batholiths and stocks of granite and gneiss, dykes and stocks of lamprophyre and granite porphyry, and dykes and sills of diabase.

The granite in the southern parts of Asquith and Fawcett townships marks the northern edge of a large hornblende-biotite granite batholith. The quartz porphyries and granite porphyry and other acid rocks in Churchill and MacMurchy townships are probably apophyses or small offshoots from the parent mass on the south and west. In the southeast corner of Churchill a small stock-like mass of granite varies from finely grained to porphyritic, and in the extreme southeast corner consists of white quartz porphyry. The felsites are fine-grained, white-weathering rocks of which some exposures appear to be altered rhyolites. On the Gosselin property the felsites contain gold-bearing veins and are closely connected with the porphyry. A reddish grey lamprophyre with mica phenocrysts and large chloritic inclusions occurs as sills or dykes cutting the rhyolite on the Herrick property and forms the wall-rock of a large part of the Herrick vein.

The principal gold-bearing veins occupy strong shear zones or faults in the basic volcanic rocks. Many of the veins are found in close proximity to quartz porphyry intrusives and many occur within the porphyry. Where the veins extend into iron formation or rocks rich in sulphides, they are usually richer in gold.

HISTORY OF MINING ACTIVITY

The first gold discovery was made on the Gosselin property in August 1911, and a few days later gold was found on what became known as the Atlas claim, 5 miles to the east. Other discoveries followed rapidly, such as that on the West Tree property where an uprooted tree exposed native gold, and within a few weeks most of the central part of the area was solidly staked. Due to the difficulty and expense of bringing in supplies from the railway, then 60 miles distant, and due also to conditions during the war period, mining development was greatly retarded and little underground work done.

At the time of Hopkins' visit in the autumn of 1919 underground work was being done only on the Wasapika and West Tree properties, with diamond drilling at the Herrick and surface prospecting on the Atlas. Shallow pits had been put down on many other properties in the preceding years, but aside from taking out small, sensationally rich ore pockets no attempt had been made to evaluate the veins. The last work done on the Herrick between 1920 and 1923 was the sinking of a shaft to 300 feet, with 1,000 feet of lateral work, by the Tonopah Mining Company of Nevada. Surface and underground work done between 1916 and 1923 on the Ribble vein of the Wasapika property was the most extensive development at that time. The shaft was carried to 300 feet and about 2,000 feet of drifting was done. Although some good ore was found development was discontinued until electric power could be supplied. For a time the White Rock mine operated a steam stamp battery and amalgamation mill with good results. Spectacular high-grade ore was also found in the Atlas and West Tree mines. The latter was developed for a time by the Canadian Champion Reef Mines, who carried the shaft to a depth of 500 feet.

Interest was revived during 1934 when a number of new mining companies were formed to reopen and operate the most promising properties. Lake Caswell Mines took over the former West Tree property and resumed underground work. The Churchill Mining and Milling Company deepened their shaft during the summer from 40 to 110 feet and operated a 10-ton Straub mill at intervals, but the plant was closed in the autumn due to shortage of funds. Neville Canadian Gold Mines are working the Ribble vein on the old Wasapika property and a considerable tonnage of ore has been indicated. Early in 1935 arrangements were made with the Ontario Hydro Electric Commission to build a 9-mile transmission line to the mine from the main Canyon power line. Bilmac Gold Mines began underground work early in 1935. The holdings are an amalgamation of four groups of claims, the White Rock, the Atlas, one of the McVittie claims, and two claims formerly owned by Harvey Kirkland Mines. Considerable underground work has been done, but the two veins have been only partly tested. Some high-grade ore was previously taken from the workings.

In addition, surface exploration has been carried out on a number of other properties such as the E. B. James group near the Caswell, where high-grade gold specimens were found in a narrow quartz vein 500 feet long.

GOLD DEPOSITS

The gold-bearing quartz veins have been found in all the rocks of the area with the exception of the granite, serpentine, and diabase. Most of them occur in the basic volcanic rocks, as in the case of the Ribble vein. On the Churchill property a quartz vein carrying gold passes from altered basalt into rhyolite and porphyry. Gold occurs in quartz veins cutting iron formation on the Cochrane and Gold Corona claims. The Herrick vein traverses conglomerate, slate, and mica lamprophyre. Coarse gold was reported on the Clark claim in quartz stringers cutting a green, rusty weathering, magnesium iron-calcium carbonate. On the Gosselin the gold occurs in large quartz lenses cutting porphyry and felsite or rhyolite. Some spectacular showings in a nearly transparent quartz on the Holding claim are entirely in amphibolite or hornblende schist.

VEIN SYSTEMS

The mineral deposits usually consist of lenses of quartz several feet in width, with stringers of quartz running into the wall-rocks, or of numerous quartz stringers in a wide, mineralized, rusty schist zone. Most of the quartz veins strike east, but some of the most persistent and important run north and south.

The "Kingsley" vein on the Herrick property occurs in a vertical fault and has been traced north for 1,000 feet. In some places the vein consists of several feet of solid quartz, but in others, particularly where it crosses lamprophyre and rhyolite, it splits into a number of stringers across a width of 8 or 10 feet. The Ribble vein on the Wasapika (Neville Canadian) property has been traced for half a mile in a northerly direction. It occurs along a shear zone that dips west at about 60 degrees. What may be an extension of the same vein or one formed in the same shear zone is found three-quarters mile to the south on the Miller-Adair and Foisey claims. A vein on the Burke property, about $2\frac{1}{2}$ miles south of the Foisey, occurs in a northerly striking fracture. This vein has an average width of about 4 feet, although a width of 23 feet of quartz and schist was reported on the 100foot level, at the Wasapika mine.

At the West Tree the gold-bearing quartz veins occur in schistose bands, up to 20 feet in width, which strike a little north of east and dip vertically. The individual quartz veins are numerous but short and narrow, varying from an inch to a foot in width. The vein on the White Rock is about 6 feet wide, strikes north 60 degrees west, has a vertical dip, and occupies a fairly well-defined shear zone. On both the West Tree and White Rock there are short veins at right angles to the main veins, and slightly later in age. In the open-cut on the West Tree the main vein has been faulted for 20 feet along a cross-vein, but as both veins are goldbearing they are probably not far separated in time of formation.

Langford observed in 1926 that most of the veins in the Wasapika Lake section occur close to dykes of quartz porphyry. On the West Tree, White Rock, and Atlas properties the main veins are parallel to the strike of the Keewatin and porphyry bodies in the vicinity are elongated in the same direction. On the McIntyre-MacDonald, Bennett, and Kingston claims the veins are short and branched and occur near a long dyke of porphyry.

Following the formation of the mineralized quartz veins regional compression acted from the north and south shattering and folding the north-south veins, like the Ribble, Herrick, and Gold Corona. The eastwest veins are little folded, and the veins with an intervening strike such as the Saville, which runs northwest, are folded and broken to an intermediate degree.

The gold-bearing quartz veins are cut by many dykes of quartz and olivine diabase which strike in a general northwest direction. Their intrusion was followed by minor faulting and the forming of another set of quartz veins. The quartz in these later fractures is reported to be barren. Quartz veins that are found cutting the diabase dykes are easily recognized as of the non-gold-bearing type.

Some exceptionally large bodies of quartz occur on the Gosselin claims. A large vertical quartz vein from 1 to 20 feet wide can be traced for 650 feet in a north 15 degrees west direction to a small lake on claim 2196. North of the lake quartz lenses outcrop for a farther 450 feet. One of these quartz masses is 160 feet long and 65 feet wide at its broadest part, and contains gold. Directly west of this vein, on claim 2135, there are parallel lenses in schist with some free gold, and in the northeast corner of claim 2196 large lenses of quartz in felsite contain gold. Sampling has shown the gold to be unevenly distributed, but parts of the veins are well mineralized.

MINERALOGY OF THE ORES

The gold occurs native and at times contains small quantities of silver. It is frequently found in dark seams in the fractured quartz, with calcite, sericite, talc, chlorite, and pyrite. Minerals such as chalcopyrite, molybdenite, pyrrhotite, barite, galena, tourmaline, and specular hematite are present in certain deposits. The quartz is frequently white or a light bluish grey. A little albite feldspar occurs in veins on the West Tree, Bennett, and Kingston properties and appears to show mutual crystallization relations with the quartz.

Pyrite is on the whole scantily distributed in the quartz, but is usually abundant in the adjoining schist. As a rule the gold is not commonly found in contact with the sulphides, but in specimens from the Gold Corona, McIntyre-MacDonald, and West Tree it forms veins and replaces the pyrite, and in specimens from the Kingston mine gold occurs in unfractured grains of pyrite.

In examining the West Tree ores, R. E. Hore¹ noted that the gold occurred as isolated grains, visible to the naked eye, in clear white quartz, and that fracture faces coated with sericite in many cases showed minute grains of gold. Most of the easily detected gold was seen along well-defined seams running roughly in the same direction as the vein. Quartz from the Wasapika ore deposit shows evidence of great strain; fractures are numerous and many of the grains are broken into a large number of smaller grains. Many of the small fractures are filled by carbonate, but the gold grains occur in the quartz. The grains of gold were seen both in the granulated quartz and in the large quartz grains that showed distinct strain shadows, and were probably there when deformation by pressure took place.

On the Gold Corona claims, formerly the Queen of Sheba, quartz veins intersect banded iron formation. Most of the quartz veinlets extending on either side of the main vein into iron formation contain visible gold. It is believed that the sulphides in the iron band were probably the precipitating agent for the gold. At the Gosselin the quartz in the various deposits has a white or rose colour. It is brecciated in many places and contains numerous tiny veinlets of transparent quartz which may have some relation to gold deposition. Gold was seen in many parts of the various veins, but the richest values appear to be on the edges of the quartz masses. Spectacular gold samples were found on both the West Tree and the Atlas, where the veins are enriched at their intersections with slate bands.

According to Geo. R. Rogers,² surface sampling of the Ribble vein gave \$10.40 a ton in gold over a width of 50 inches, for a length of 150 feet. Another part of the vein, 120 feet distant, gave \$8 in gold across 49 inches for a length of 280 feet. A third section of the vein gave \$9 ore for an additional 300 feet over a width of 48 inches. Assay returns across 23 feet of quartz and schist on the 100-foot level yielded \$7.20 in gold a ton.

The distribution of visible gold is somewhat erratic and parts of the veins are poorly mineralized. However, ore-bodies of this type are being profitably mined in other parts of the province and there is every reason to expect operations in this camp to be equally successful, providing the gold values found at the surface persist to lower depths.

MINES AND PROSPECTS

The area has produced very little gold, but is being actively prospected. The following list includes the more active properties.

Atlas (2504). The claim is on the west shore of lake Wasapika, Mac-Murchy township. An 87-foot shaft was sunk many years ago on the Evelyn vein. At the base of a 60-foot bluff a tunnel was driven along a quartz vein.

¹ Can. Min. Jour., vol. 39, p. 280 (1918).

² Can. Min. Jour., vol. 40, p. 750 (1919).

Bennett (2507, 2544). The property is situated in the south part of MacMurchy township, on the east side of Montreal river. A shaft was sunk for 50 feet on a shear zone in greenstone in 1912.

Bilmac Gold Mines, Limited. The claims are a consolidation of the White rock, the Atlas, one claim of the Wm. McVittie Estate, and two claims formerly owned by the Harvey Kirkland. There are four shallow shafts, the main one being 175 feet deep, with lateral work done on the bottom level and at the 65-foot horizon. Active development work started early in 1935.

Buckingham (2407, 2461, 3664). These claims lie between Stewart and Seagers lakes in Asquith township. On claim 2461 an 85-foot shaft was sunk on a quartz vein cutting pillow lava. Inactive since 1920.

Burke (3767, 3786). A 20-foot shaft was sunk in 1918 on the bank of Papoose creek near Granite lake. From the bottom of the shaft a crosscut was driven 78 feet to intersect a vein of quartz and schist. Inactive since.

Churchill Mining and Milling Company, Limited. The company owns four claims southwest on Michiwakenda lake in Churchill township. Prior to 1920 a shaft was sunk 40 feet on a 3-foot quartz vein in pillow lava and 1,500 feet of trenching was done. In 1934 a 10-ton stamp mill was placed in operation and ran for a few months. The shaft was carried to 110 feet by January 1935.

Clark Claims. These claims are on the north shore of MacDonald lake. Stripping was done in 1912 on a strong band of carbonate rock, from which free gold could be panned.

Cochrane (3712). The claim is northwest of the Churchill property in Churchill township. Trenching was reported in 1920 to have traced two different gold-bearing quartz veins.

Consolidated Ontario Gold Mines, Limited. The claims are a consolidation of the Shiningtree Consolidated, the Algonquin Mines, and Gosselin Gold Mines. On the Gosselin claims large quartz lenses were explored by surface trenching, in 1912-13, and a shaft sunk for 50 feet. Active operations were planned in 1934.

Cryderman. On the southwest shore of West Shiningtree lake stripping, in 1912, revealed a schistose zone 70 feet wide from which gold was panned.

Foisey (3544, 3545, 3722, 4075). These claims lie in the southwest part of MacMurchy township. A vein similar to the Ribble vein was exposed by trenching for a quarter mile on 3544 and 3772 (1920).

Gold Corona. This group of four claims lies west of the south end of Michiwakenda lake. In 1920 trenching was reported to have exposed a vein 8 feet wide along the east boundary of claim 3645. Herrick (4105-7, 4096-98). The property lies on the west side of Michiwakenda lake, in Churchill township. In 1918 a shaft was sunk for 50 feet on the "Kingsley" vein and in 1919 three diamond drill holes put down. During the years 1920-23 the Tonopah Mining Company sank the shaft to 300 feet and did 1,000 feet of lateral work in addition to 3,000 feet of drilling.

Holbrook (4428). Gold was discovered on this claim in MacMurchy township in 1924. Several test pits through sand deposits located a 4-foot quartz vein cutting greenstone schist.

Holding (3508, 3118). The claims are south of MacDonald lake in Asquith township. It was reported in 1920 that an inclined shaft had been sunk to 50 feet on quartz stringers cutting hornblende schist.

James, E. B. This group of eleven claims is in the central part of Asquith township. On claim 6699 a quartz vein 3 to 12 inches wide has been exposed at intervals for 500 feet. Stripping and trenching were done during 1934.

Kingston (3715, 3508, 4955). The property lies to the southeast of Wasapika lake in MacMurchy township. Development work done between 1920 and 1926 consists of sinking two small shafts and tracing a quartz vein by trenching and diamond drilling for about 1,200 feet.

Kubiak (4091, 4295, 4296, 4327). The claims are in Asquith township. In 1920 trenching was reported to have revealed gold-bearing areas of schist with quartz lenses.

Lake Caswell Mines, Limited. The company owns the former West Tree claims in MacMurchy township. The Canadian Champion Reef Mines operated the property from 1926 until 1933. Development work consists of two shafts, 75 and 500 feet deep, an open-cut, about 5,000 feet of diamond drilling, and surface work. Further underground work is planned in 1935.

McGuire (3738). Several veins 8 to 10 inches wide were reported to have been uncovered in hornblende schist, in the southwest bay of West Shiningtree lake, in 1913.

McIntyre-MacDonald (2565-66). The property is on Wasapika lake, MacMurchy township. Two 50-foot shafts have been sunk about 350 feet apart on the main vein. Several hundred dollars in gold are reported to have been recovered by hand methods (1926).

McRae (3792, Etc.). Gold was found by trenching on McRae island, West Shiningtree lake, in 1919. The occurrence was in parallel quartz veinlets cutting green schist.

Moore-MacDonald (2275-76, 2279). These claims are situated in the vicinity of Moore lake, Asquith township. Trenching was reported in 1920 to have revealed a number of mineralized shear zones.

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Moore (3638). The claim lies on the southeast shore of West Shiningtree lake. Trenching was reported in 1920 to have explored veined and mineralized zones of hornblende schist.

Neville Canadian Gold Mines, Limited. The company owns the old Wasapika Ribble property, comprising some 240 acres in MacMurchy township. Between 1916 and 1923 a shaft was carried to 300 feet and extensive drifting was done along the vein on three horizons. Commercial values were reported. Active development was resumed in 1935.

Steep (2434). The claim is situated on a point near the centre of West Shiningtree lake. In 1914 an inclined shaft was sunk 100 feet on an east-west shear zone in pillow lava. Inactive.

Thompson-Peterson (2306-2312). Trenching in 1920 exposed rusty gold-bearing carbonate near granite porphyry. The claims are at the southeast end of West Shiningtree lake.

White Rock (2535, 2536). These claims were originally known as the Saville-McVittie. They are situated west of the Atlas, MacMurchy township. Development work consists of a main shaft 175 feet deep; another about 1,000 feet to the north, 40 feet deep; and over 1,000 feet of lateral work.

(31) Whiskey Lake Area

Selected References: Coleman, A. P.: The Whiskey Lake Area; Ont. Bureau of Mines, vol. 22, pt. 2, 1913, pp. 146-154.

Collins, W. H.: "Whiskey Lake Claims"; Geol. Surv., Canada, Sum. Rept. 1917, pt. E, pp. 8-10.

Douglas, G. V.: Whiskey Lake Area; Ont. Dept. of Mines, vol. 34, pt. 4, 1925, pp. 35-49.

Map No. 1970: Blind River Area; Geol. Surv., Canada. Issued 1925.

SITUATION AND EXTENT

Whiskey Lake area, consisting of townships Nos. 137 and 138, is situated north of lake Huron about 70 miles due west of Sudbury. Access into the area is by canoe by way of Serpent river, and by an old lumber road from Massey.

GEOLOGICAL OUTLINE

Greenstone and green schist of Keewatin age occur east and south of Whiskey lake. These rocks are intruded and surrounded by a large area of granite and syenite. The lake lies at the eastern extremity or nose of a synclinal fold of Huronian sediments, so that the Mississagi quartzite or basal member of the Huronian outcrops along the west shore of the lake. Farther to the west the successive overlying sediments of the Bruce and Cobalt series are exposed, with the Lorraine quartzite at the top. The sediments are intruded by numerous dykes and sills of quartz diabase and by a few of the younger olivine diabase dykes. The quartzites and slates have been greatly shattered and faulted in places, and the fissures were filled with quartz charged with sulphides and some free gold. Many of the veins carry up to 5 or 6 per cent copper and only very little gold. The mineral deposits are presumably related to the intrusive dykes and sills of quartz diabase.

HISTORY OF MINING ACTIVITY

The area was prospected for copper ores as early as 1895, but it was not until the discovery of gold on the Payton property in 1912 that much interest was aroused. A score or more of claims were staked and surface work and sampling done, but no further gold find was made. Sampling done by T. V. Douglas and J. S. Wilson at the Payton in 1924 showed that the values were very erratically distributed and apparently low in grade. There have been no recent reports regarding further activity.

GOLD DEPOSITS

Payton Prospect. The gold occurrence on this claim is considered to be the most promising in the area. The veins are composed of white quartz containing occasional patches of disseminated pyrite. Fine specimens of free gold have been obtained from them, but the average gold content is reported to be fairly low. From a small fissure where the vein was only 5 inches wide an assay value of \$121.20 was returned, but of six other samples, three gave nil and three returned 80 cents.

The veins occur both intersecting and lying parallel to argillite beds of the Mississagi formation. A short distance to the west there is a sill of quartz diabase. Douglas states that the veins occur at the crest of an anticlinal fold.

Whitefish Location. The copper deposits on claim Y352 are situated near the top of the southwest slope of a diabase ridge. They form a series of lenticular, mineralized fractures arranged *en échelon* in the diabase. The fractures are about 25 feet apart and strike about south 80 degrees east. They dip from 45 to 50 degrees south, being only 10 to 15 degrees steeper than the side of the diabase ridge. The largest lens shows ore for a maximum width of 8 feet and a length of 25 feet. They consist of angular fragments of diabase cemented together by a mixture of quartz, ankerite, chalcopyrite, and pyrite, deposited in the order named. This ore carries about 2 per cent copper and can be concentrated by hand sorting to about 10 per cent. A general representative sample yielded on assay 0.16 ounce gold a ton.

Reynolds Mine. On claim W.R. 92 a large mass of diabase abuts against the older conglomerate, argillite, and impure limestone of the Bruce series. Its contact is almost vertical and the argillite close to it is greatly contorted and somewhat schistose. Over a width of almost 100 feet, adjacent to the diabase, the deformed argillite is silicified and traversed by a plexus of veinlets and irregular patches of quartz, and is impregnated irregularly with pyrite, chalcopyrite, and a few specks of galena. This mineralized contact zone, extending north 30 degrees west, is exposed at two places 500 feet apart, between which lies a soil-filled ravine. The richer parts might be mined for copper, but carry unimportant amounts of gold.

MINES AND PROSPECTS

The area was prospected for copper in 1895. A small flurry of gold prospecting followed a discovery in 1912. Very little has been done since 1920. The properties that were most actively explored are given below.

Long (Claims W.R. 91, 113, 114). These claims are situated on the north side of McCool lake towards the west end. In 1912 a long quartz vein had been exposed by stripping.

Payton or Wilson's Mine. This property is situated on the west shore of the southern half of Whiskey lake. A small shaft was sunk close to the shore in 1898, and in 1907 a pit was sunk twenty paces inland on a shear zone. In 1912 stripping and trenching and extensive test pitting were done. A 30-foot shaft was sunk.

Reynolds Mine. This old mining property is situated at the northwest end of Whiskey lake, on a hilly ridge between it and Bear lake. A shaft was sunk here for 50 feet, in 1910, along a mineralized zone at the contact of diabase and sedimentary rocks.

Whitefish Property. On mining location Y352, on the northwest shore of Whitefish lake, three mineralized lenses in diabase were uncovered about 35 feet apart.

(32) Woman River-Opeepeesway Lake Area

Selected References: Bannerman, H. M.: Mineral Deposits of the Eastern Part of Rush River Map-area; Geol. Surv., Canada, Sum. Rept. 1928, pt. C. See also 1929, pt. C.

Laird, H. C.: Opeepeesway Lake Area, Sudbury District; Ont. Dept. of Mines, 1934.

Map No. 231A: Woman River Sheet; Geol. Surv., Canada. Issued 1929.

Map No. 290A: Rush Lake Sheet; Geol. Surv., Canada. Issued 1933.

Map No. 1933A: Kamiskotia-Ridout Area; Ont. Dept. of Mines. Issued 1933.

SITUATION AND EXTENT

The Woman River-Opeepeesway Lake area is situated 100 miles north of lake Huron and lies between the Swayze area on the west and the Three Duck Lake area on the east. The area includes four tiers of townships, from north to south, as follows: Newton, Dale, and McOwen; Heenan, Marion, and Genoa; Benton, Mallard, and Eric; and Esther, Osway, and Huffman. Canoe travel throughout the area by way of Woman river and its tributary streams is comparatively easy.

GEOLOGICAL OUTLINE

The southern part of the area is occupied by a broad belt of Keewatin volcanic rocks overlain by narrow belts of sedimentary rocks known as the Ridout series, and flanked on both sides by widespread areas of intrusive granite. The Keewatin rocks consist of rhyolite, rhyolite tuff and agglomerate, and esite, and basalt. These rocks extend north and west and are contiguous with the greenstones of Swayze area. Northwest of Rush lake the Keewatin contains a much greater percentage of acidic and pyroclastic material, and relatively large and persistent bands of iron formation. The iron formation consists of interbanded silica and iron oxides, carbonates, and, in some cases, pyrite, with which are associated rather large replacement deposits of iron carbonate and sulphides. The iron range extends in a general southwesterly direction from the north end of Rush lake across the townships of Genoa and Marion into Heenan. Andesitic tuffs and flows lie on the north side of the iron formation.

The Ridout sedimentary belt crosses Opeepeesway lake where it attains its maximum width of about $2\frac{3}{4}$ miles; it becomes narrower farther to the northwest and continues into Swayze area. On the southwest these sediments enter the Three Duck Lake area. The main belt of sediments has been deeply infolded into the Keewatin volcanics and a number of subsidiary outlying belts represent smaller infolds on the flanks of the major structure.

The intrusive rocks consist chiefly of the granite, with dykes and small bosses of quartz and feldspar porphyries, dykes of lamprophyre, and dykes and sills of quartz diorite. The granites are largely pink to greyish pink and of medium texture, with occasional gneissose structure. The quartz porphyry dykes in places seem to radiate from the granite and may be derived from the same magma. A large number of olivine diabase dykes occur in the area. They are the youngest rocks.

In Mallard township gold occurs in a mineralized shear zone in carbonated schistose rhyolite. In various other localities veins containing lead, zinc, and copper minerals occur with varying amounts of quartz, calcite, and pyrite. Several of these sulphide bodies are known to carry values in gold and silver.

HISTORY OF MINING ACTIVITY

In 1902, and following years, numerous mining claims were taken up along the iron range in Heenan, Marion, and Genoa townships. A considerable amount of work was done on many of these claims, but no iron deposit of commercial size and of grade suitable for development under present market conditions was discovered. In recent years the discovery of lead-zinc and copper mineralization, at many localities, and of gold showings in more restricted areas again enlivened prospecting operations. The discovery of gold on the Mogridge and Hermiston groups, in the central part of Mallard township, in the summer of 1933, led to the staking of more than one hundred claims adjacent to Opeepeesway river. The Mogridge showing was drilled during the autumn of the same year, but results were disappointing. Woman River Gold Mines, Limited, were active during the summer of 1934 and results from surface explorations are said to have been encouraging.

GOLD DEPOSITS

There are no operating properties in this area at present and the only one on which surface exploration work was done during 1934 was that of the Woman River Gold Mines. The main showing occurs in the southeast corner of a highly schistose and carbonated body of rhyolite cut by narrow quartz stringers and porphyry dykes. The deposit consists largely of pyrite with minor quantities of chalcopyrite. No visible gold occurs, but grab samples are stated to have yielded as high as 0.29 ounce a ton. Two irregularly shaped quartz lenses are exposed about 50 feet south of the main shear zone, near the falls. One of these attains a width of 3 feet. The quartz is of the amethystine variety and carries moderate quantities of pyrite and some chalcopyrite. The gold values are low.

Early in the summer of 1928 impregnations of sphalerite were discovered in an iron formation bluff on the south shore of the northeast bay of Rush lake. Stripping revealed a zone 36 inches wide, veined and impregnated by sulphides of lead, zinc, and copper, along with pyrite and magnetite. The sulphide veinlets follow the bedding planes of the iron formation, except where the latter are crumpled where the veins cut across and penetrate them at various angles. Sphalerite is the most abundant of the sulphides present, but the combined amount of sulphide does not exceed 10 per cent of the rock. They are usually accompanied by a gangue of quartz. Assays made from samples of the deposit are said to have yielded values in silver and gold, along with their copper-lead-zinc content. The iron formation in which the ore minerals occur is comparatively small, and is intermixed hornblende and chlorite schist. Dykes of quartz diorite and granite cut and greatly disturb the iron formation and its associated rocks on this claim.

MINES AND PROSPECTS

The area was prospected for iron ore in 1902 and later years. Prospecting for gold has been carried on since 1933. The type of exploration work is given for the more active properties.

Burton Claims. On claim S 5991, in the northwest part of Genoa township, A. Burton sank a 40-foot shaft on a shear zone.

M. D. Fisher. In 1928 five claims were staked, by M. D. Fisher, just south of the Heenan-Newton township boundary between mile posts 4 and 5. Stripping has exposed a small stockwork of sulphide-bearing veins in a crushed part of intrusive gabbro.

Hermiston Claims. These claims are near the centre of Mallard township. Surface operations were carried out here in 1933.

Jessop Claims. The claims were staked along the north shore of Rush lake in the spring of 1928. A sulphide band 36 inches wide was discovered in an iron formation bluff and traced for 150 feet.

Mogridge Claims. The Mogridge claims are situated adjacent to the Hermiston, in the central part of Mallard township. In the autumn of 1933 the N. A. Timmins Corporation drilled four short holes over a length of 520 feet.

Woman River Gold Mines, Limited. The company holds a group of fourteen claims situated in the northwestern part of Mallard township. Trenching and test pitting operations were carried out during the summer of 1934. Further work is planned in 1935.

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Figure 1. Index map showing relative positions of thirty-two gold-bearing areas of Ontario east of Lake Superior.

GOLD-BEARING AREAS

I. Abitibi Lake area.

2. Ben Nevis area.

3. Black River and Goodfish Lake areas.

4. Boston Creek area.

5. Bruce Mines area.

6. Cripple Creek area.

7. Grassy-Redstone River area.

8. Hislop-Beatty-Munro area.

9. Horwood Lake area.

10. Kamiskotia area.

11. Kenogami Lake area.

12. Kirkland Lake area.

13. Larder Lake area.

14. Lightning River area.

15. Matachewan area.

16. Michipicoten and Goudreau areas.

17. Night Hawk Lake area.

18. Oba area.

19. Panache Lake area.

20. Parry Sound area.

21. Porcupine area.

22. Southeastern Ontario area.

23. Sudbury Basin area.

24. Swayze area.

25. Three Duck Lakes area.

26. Timagami Lake area.

27. Tyrrell-Knight area.

28. Wanapitei Lake area.

29. Watabeag area.

30. West Shiningtree area.

31. Whiskey Lake area.

32. Woman River-Opeepeesway Lake area.

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