

THIRTY-THIRD ANNUAL REPORT
OF THE
ONTARIO DEPARTMENT OF MINES
1924
PART III



PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. CHAS. MCCREA, *Minister of Mines*

THOS. W. GIBSON, *Deputy Minister*

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BEING
VOL. XXXIII, PART III, 1924

Larder Lake Area, by Percy E. Hopkins.....	1-26
Night Hawk Lake Gold Area, by Percy E. Hopkins.....	27-36
Notes on Gold in McNeil and Other Townships, by Percy E. Hopkins	37-40
Lightning River Gold Area, by Cyril W. Knight.....	41-49
Murphy, Hoyle and Matheson Townships.....	50-54

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TABLE OF CONTENTS

Vol. XXXIII, Part III

LARDER LAKE AREA	PAGE		PAGE
Introduction.....	1	NOTES ON GOLD IN McNEIL AND OTHER TOWNSHIPS	
Location.....	1	Introduction.....	37
History.....	2	Topography.....	37
Previous Work.....	2	Geology.....	37
General Geology.....	3	Gold Deposits.....	38
Keewatin.....	4	McNeil Township.....	38
Timiskamian Series.....	5	Cleaver Township.....	39
Haileyburian (?).....	7	Baden Township.....	40
Algoman.....	7		
Carbonate Rocks.....	8	LIGHTNING RIVER GOLD AREA	
Animikie (Cobalt Series).....	9	Introduction.....	41
Keweenaw or Matachewan (?).....	10	Acknowledgements.....	42
Pleistocene.....	10	History of the Area.....	42
Economic Geology.....	10	Rocks of the Lightning River Area.....	43
McVittie Township.....	11	Dome Mines Conglomerate.....	44
McGarry Township.....	22	Two Great Gold Belts in Northeastern Ontario.....	44
Hearst Township.....	24	Why Gold Follows Timiskaming Belts..	44
		The Seagers Claim.....	45
NIGHT HAWK LAKE GOLD AREA		The Meridian Claim.....	46
Introduction.....	27	Claims Near Seagers Claim.....	47
Location.....	27	Summary.....	49
General Geology.....	27		
Greenstone Schists, etc.....	28	MURPHY, HOYLE AND MATHESON TOWNSHIPS (Porcupine Gold Area)	
Serpentine-Chlorite-Carbonate Schist.....	28	Introduction.....	50
Rusty-weathering Carbonates.....	29	General Description.....	50
Chert and tuff.....	30	Geology.....	51
Timiskaming Series.....	30	Pleistocene Deposits.....	51
Algoman.....	30	Pre-Cambrian.....	52
Keweenaw (?).....	31	General Structure and Distribution of the Pre-Cambrian Rocks.....	54
Matachewan (?).....	31	Mineral Possibilities of the Area.....	54
Description of Properties.....	31		
Night Hawk Peninsular Mine.....	31		
Gold Island Claims.....	31		

ILLUSTRATIONS

	PAGE
View of Larder Lake looking east from the Harris-Maxwell hill near Larder townsite	1
Banded slate and greywacké of the Timiskamian series on the Shaver claim	5
Mount Chaminiis	9
Gold-bearing quartz stringers in serpentinized and silicified dolomite (?), Reddick group	11
Jack Costello, the discoverer of the Costello vein on the Associated Goldfields' property	12
Ore body twenty-two feet wide on the 360-foot level, Associated Goldfields	16
Associated Goldfields and Crown Reserve shafts on the Costello vein at Pancake lake	17
Crown Reserve mine, Larder lake	19
Larder Lake Proprietary—foundation of old mill removed to Harris-Maxwell property	22
Remains of Lucky Boy plant, now Shaver claim, McGarry township	24
Glaciated surface, Night Hawk lake	28
Ferruginous carbonate intersected by quartz stringer, Night Hawk lake	29
No. 1 shaft, Night Hawk Peninsular mine, with mill under construction	32
Granite dike cut by quartz veins on the O'Connor claim, Night Hawk lake	35
Narrow quartz vein carrying spectacular gold showings on the Rogers claim, McNeil township	38
Visible gold occurs in porphyry associated with large dome of quartz	39
Shaft house and plant, Thesaurus gold mine, Baden township	40

SKETCH MAPS AND DIAGRAMS

Key map showing position of the Larder Lake area	3
Geological plan of Canadian Associated Goldfields and Crown Reserve near Pancake lake	13
Vertical section A-B, running in a northwest-southeast direction through the Associated Goldfields shaft on claim L. 1794	15
Vertical section C-D, running in a northwest-southeast direction through the Crown Reserve shaft on claim No. L.S. 191	18
Property map of Larder Lake area showing roads, power lines, veins, and positions and depths of shafts	20
Plan of 425-foot level, Night Hawk Peninsular mine	34
Key map connecting Night Hawk with Cleaver, McNeil, and Matachewan gold areas	36
Sketch map of McNeil, Cleaver, and Fallon townships	38
Key map of part of Northern Ontario extending westerly from the Quebec boundary and showing general position of the northern and southern gold belts	44
Map No. 33d—Townships of Murphy, Hoyle and Matheson	50

GEOLOGICAL MAPS

Map No. 33b—Larder Lake Area, District of Timiskaming, Ontario. Scale: three-quarters of a mile to the inch	<i>in pocket</i>
Map No. 33c—Night Hawk Peninsular Area. Scale: one-half mile to the inch	<i>facing 26</i>

Larder Lake Gold Area

By Percy E. Hopkins

Introduction

During 1922, the eastern extension of the Kirkland Lake gold area, namely, Lebel, Gauthier, and a part of McVittie townships, was geologically mapped.¹ In the eastern portion of this area near Larder lake, certain properties, namely, Argonaut, Crown Reserve, and Associated Goldfields, were meeting with success; hence it was thought advisable to continue the mapping eastwardly to the interprovincial boundary between Ontario and Quebec. This mapping was done in 1923 and covered, partly in detail, McVittie, McGarry, Hearst, and McFadden, the four townships which corner on Larder lake and form what is known as the Larder Lake gold area. The geology is briefly referred to, and the various mineral deposits and working properties are described according to the township in which they are located.



View of Larder lake looking east from the Harris-Maxwell hill near Larder townsite.

C. F. Cockshutt and J. C. Adamson acted as efficient assistants. In addition, Mr. Cockshutt helped to compile the coloured geological map No. 33b, which accompanies the report.

The assays and analyses were made by W. K. McNeill and T. E. Rothwell.

The writer is indebted particularly to the management of the Argonaut, Crown Reserve, and Associated Goldfields, for their kind hospitality.

Location

The accompanying map, No. 33b, of the Larder Lake gold area includes McVittie, McGarry, Hearst, and McFadden townships, which border on Larder

¹ See report on Lebel and Gauthier Townships accompanying the Kirkland Lake report, Ont. Dept. Mines, Vol. XXXII, pt. 4.

lake. Larder lake is situated fifty miles due north of the Cobalt silver area near the Ontario-Quebec boundary. At the northwest corner of the lake is Larder village, a hamlet connected by a seventeen-mile wagon road with Dane station, which is at mileage 160 on the Temiskaming and Northern Ontario railway. The road is used much of the time by automobiles. A branch line of the T. & N.O. railway, now under construction, will connect Crown Reserve and Associated Goldfields, which lie one and a half miles north of Larder village, with Kirkland Lake and Swastika.

History

Larder lake was the scene of the first gold-mining rush into northeastern Ontario. The finding of gold at Larder lake in August, 1906, by Dr. Reddick caused a rush of prospectors to the area during the following winter of 1906-07, when a few claims were staked. In June, 1907, the Larder Lake Mining Division was formed, and J. A. Hough was appointed mining recorder at Larder village. Development and prospecting, following the "winter stakings," resulted in much disappointment, as is often the case; hence, most of the prospectors left the area, and the recording office was moved to Matheson in March, 1911. In 1919, the office was moved to Swastika, and H. George Ginn was appointed mining recorder.

Desultory mining has been carried on at a few properties around Larder lake since 1906. Most of the early work was done at the Reddick and Harris-Maxwell and numerous other properties along the same general strike on rusty-weathering carbonates which are intersected by quartz veins and in places carry some gold. The total gold production to the end of 1923, coming almost wholly from the Argonaut, formerly La Mine d'Or Huronia, on the Gauthier-McVittie boundary, was \$107,248 in gold, and \$475 in silver. Small contributions came from the Harris-Maxwell and Reddick, both of which now belong to the Associated Goldfields. The Argonaut deposits are quartz and calcite veins in Keewatin basalt which has been intruded by Algoman porphyry. In July, 1923, a 200-ton mill was completed, and for the first nine months of 1924, the output was \$136,873 in gold, and \$107 in silver.

The development of the Costello vein, a new type of deposit at Pancake lake, by Crown Reserve and Associated Goldfields, since 1920 and 1921, has resulted in a fairly large, low-grade ore body being developed. Both companies contemplate building mills in the near future.

Previous Work

In 1901, W. G. Miller,¹ Provincial Geologist of Ontario, passed through Larder Lake, then called Lake Present. In 1903, W. A. Parks,² of Toronto University, described the geology along the chief waterways of the area. In June, 1907, R. W. Brock,³ who afterwards became Director of the Geological Survey of Canada, examined and reported on an area in the vicinity of Larder lake for the Ontario Bureau of Mines, his report being accompanied by a geological sketch map. His assistant, N. L. Bowen,⁴ continued geological work during the remainder of the summer and published a more detailed map and a

¹ Miller, W. G., Lake Timiskaming to the Height of Land, Ont. Bur. Mines, Vol. XI, 1902, pp. 214-230.

² Parks, W. A., The Geology of a District from Lake Timiskaming Northward, Sum. Rept., Geol. Surv. Can., 1904, pp. 198-225.

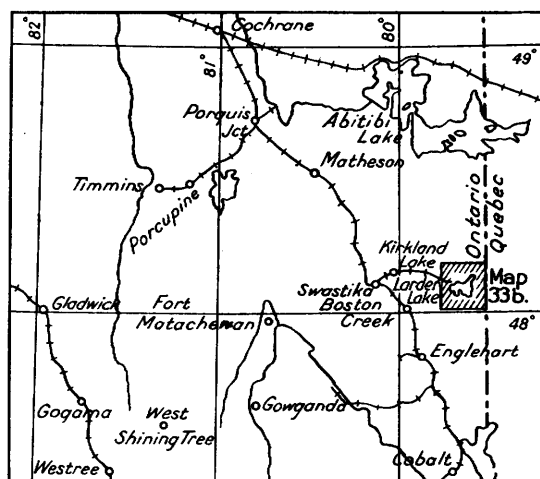
³ Brock, R. W., The Larder Lake District, Ont. Bur. Mines, Vol. XVI, pt. 1, 1907, pp. 202-220.

⁴ Bowen, N. L., Ont. Bur. Mines, Vol. XVII, 1908, pp. 10-11.

brief report. M. E. Wilson¹ spent 1908 and 1909 in the area and published excellent maps of the area. During 1912 and 1913, A. G. Burrows and P. E. Hopkins² examined from the Swastika and Kirkland Lake gold areas easterly to McVittie township. In September, 1916, A. G. Burrows³ examined the Argonaut mine, then La Mine d'Or Huronia and a part of Gauthier township. In October, 1918, P. E. Hopkins⁴ spent a week in examining the working properties at Larder Lake. In the summer of 1919, C. W. Knight⁵ spent ten days in making a detailed map and report on the Argonaut gold mine. The most detailed map of parts of McVittie and McGarry townships, Larder Lake, was made in 1920 by H. C. Cooke.⁶ Much of Mr. Cooke's geology is embodied on the accompanying map.

General Geology

Larder lake is on a narrow band of Timiskamian sediments which extend almost continuously for over 100 miles from Kenogami Station on the west nearly to Bell river on the east. These infolded and highly altered greywackes



Scale, 50 Miles = 1 Inch
Key map showing position of the Larder Lake area.

and conglomerates pass through the well-known areas, Swastika, Kirkland Lake, Larder Lake, Lake Fortune, Rouyn, and Harricanaw. At Larder lake and elsewhere, certain volcanic rocks occur with the Timiskamian. The underlying rock is typical Keewatin, consisting largely of basic volcanics, tuffs, and iron formation. Intruding the older rocks are numerous stocks and dikes of porphyry and other rocks of Algonian age. Covering a large part of the above-mentioned rocks in the southeast portion of the map-sheet and elsewhere are

¹ Wilson, M. E., Larder Lake and Eastward, Sum. Rept., Geol. Surv. Can., 1909, pp. 173-179; Geology and Economic Resources of Larder Lake, Geol. Surv. Can., 1912, Mem. No. 17, pp. 1-57.

² Burrows, A. G., and Hopkins, P. E., Kirkland Lake and Swastika Gold Areas, Ont. Bur. Mines, Vol. XXIII, pt. 2, 1914, pp. 1-39.

³ Burrows, A. G., Gold in Gauthier Township, Ont. Bur. Mines, Vol. XXVI, 1917, pp. 252-257.

⁴ Hopkins, P. E., Larder Lake Gold Area, Ont. Bur. Mines, Vol. XXVIII, pt. 2, 1919, pp. 71-77.

⁵ Knight, C. W., Argonaut Gold Mine, Ont. Dept. Mines, Vol. XXIX, pt. 4, 1920, pp. 65-76.

⁶ Cooke, H. C., Larder Lake District, Ontario, Geol. Surv. Can., 1922, Mem. No. 131, pp. 17-61.

great thicknesses of flat-lying Cobalt sediments. A few isolated dikes of diabase were noted, but it is not known whether they cut the Cobalt series or not.

The rocks are classified in the following table:—

LEGEND	
PLEISTOCENE	
GLACIAL and RECENT:	Drift-covered areas. .
PRE-CAMBRIAN	
KEWEENAWAN (?) OF MATACHEWAN:	Diabase.
	<i>Intrusive contact</i>
ANIMIKIE (Cobalt series):	Conglomerate, slate, etc.
	<i>Great unconformity</i>
ALGOMAN:	{Diorite, diorite porphyry, granite, syenite, feldspar porphyry, quartz porphyry, lamprophyre.
HAILEYBURIAN (?):	Serpentine.
	<i>Intrusive contact</i>
TIMISKAMIAN:	{Trachyte. Greywacké, slate, etc. Conglomerate with interbedded greywacké.
	<i>Great unconformity</i>
KEEWATIN:	{Iron formation and tuff. Altered basalt, etc.
	<hr style="width: 20%; margin-left: 0;"/>
	{Carbonate rock or dolomite. (The rocks belonging to the four main older divisions have been altered in places to rusty carbonates which are shown on the map with a black stipple.)

Since the geology is quite similar to that which has been given in the two preceding reports, only brief descriptions are given of the rocks of this area. For fuller descriptions one may refer to these reports and also to reports on the Larder Lake area by M. E. Wilson¹ and H. C. Cooke.²

Keewatin

The rocks of this system cover nearly one-half of the map-sheet. They consist largely of basalt, diorite, diabase, gabbro, etc., some of which are highly altered to carbonate, chlorite, and other schists. Many of the more basic varieties have been altered almost entirely to serpentine and carbonate as on the Imerson claims, H.F. 101 and C.E. 26, McVittie township, on the 550-foot level of the Crown Reserve mine, at the southeast corner of C.E. 37, McGarry township, and elsewhere. On the first-mentioned claim, pillow lava can be seen grading within a few feet into serpentine. The usual pillow and amygdaloidal structures are common. A large area of gabbro occurs in the vicinity of Crosby and Legend lakes in the northeast part of McVittie township. Under the microscope, plagioclase and hornblende are highly altered to saussurite chlorite, and other minerals. On the east shore of Crosby lake, the rock is very light-coloured, due to the abundance of feldspar and kaolin. This rock may be a basic phase of the syenite mass occurring in the southeast of Katrine township.

Associated with these rocks are banded tuff, agglomerate, and iron formation, some of which are differentiated on the map. The most prominent band

¹ Geol. Surv. Can., Mem. 17.

² Geol. Surv. Can., Mem. 131.

of these rocks extends through Diamond and Pancake lakes in McVittie township, and the ore bodies of the Crown Reserve and Associated Goldfields are largely enclosed in these black slaty tuffs. The island on Diamond lake contains much magnetite. To the south of Pancake lake, on C.E. 25, the formation contains magnetite, hematite, and red jasper. Some of the tuffs north of Enright Point, although mapped as Timiskamian, may be Keewatin tuffs. Other exposures occur in the northwest and southeast corners of Hearst township. The south shore of Larder lake on the Hearst-McFadden boundary and the large island to the north are largely coarse agglomerate.

A small area of mica schist, somewhat similar to the Pontiac schist at Opasatika lake, outcrops to the east of the mouth of Sharp creek in Hearst township.



Banded slate and greywacké of the Timiskamian series on the Shaver claim, L. 5414, McGarry township.

Timiskamian Series

Sediments.—Infolded with the Keewatin are large volumes of Timiskamian sediments extending continuously in an east-west direction from Kirkland lake along the north shore of Larder lake to a point near the east end of Larder lake, McGarry township. A second belt starts north of this, near C.E. 128 in the vicinity of Monocle lake, and passes through Beaver lake and easterly to the Quebec boundary. Considerable volumes of these rocks are found in the south central part of Hearst township, while smaller isolated areas were seen in various parts of Hearst and other townships. The beds, which consist largely of conglomerate with some interbedded greywacké, have been separated on the map from the finer-grained sediments, greywacké and slate, which form the bulk of the series. Good exposures of slate with the characteristic vertical dips were seen on the Shaver claim, L. 5414, McGarry township. The fine-grained sediments in parts of the map-sheet resemble Keewatin iron formation and tuff, as they do in Lebel and Gauthier townships to the west. On the east line of C.E. 20 and H.S. 153, north of the narrows on Larder lake, are narrow bands

of iron formation, comprising a few inches of magnetite and whitish limestone conformable with the slaty tuffs. The slaty tuffs at this locality are nearly a mile in thickness. They are classed as Timiskamian, but there is a possibility that Keewatin and Timiskamian tuffs are closely folded, making it difficult to separate them in mapping.

The two main synclines of sediments appear to be separated at the east end of Larder lake by an anticline of Keewatin which has been highly altered to rusty carbonates. There are also two belts of trachyte accompanying these two main belts of sediments which are also separated by the same Keewatin mass.

Trachyte.—According to H. C. Cooke,¹ soda trachyte occurs in the Timiskaming in this area:—

During the Timiskaming period, and particularly near its end, great flows of lava were poured out. The principal type, found throughout McVittie and McGarry, is a soda trachyte, a flow rock of about the same composition as an alkaline syenite. In certain of its phases it is highly porphyritic, and strongly resembles some of the intrusive porphyries of the district. . . .

It is composed of albite feldspar and common hornblende in proportions of about two to one and, being thus the effusive equivalent of a hornblende syenite rich in soda, the name soda trachyte is applicable. . . .

Different phases of the lava vary so widely in appearance that the casual observer would not suppose the possibility of any relationship between them. . . . The base of the thicker flows is usually a coarse-grained porphyritic rock of warm brown to brownish-grey tints. . . . The phenocrysts [hornblende and albite] are embedded in a groundmass . . . of oligoclase-albite feldspar with small needles of actinolite and some sericite. . . .

A flow breccia, found in a number of places, consists of trachyte, somewhat finer-grained than that described, filled with angular fragments of fine-grained reddish material. . . .

The coarse massive phase commonly grades upward, with or without the intermediate occurrence of the brecciated phase, into a rock made up of irregular masses of the glassy, reddish-brown lava, in a small amount of dark grey matrix. . . .

The upper parts of the flow, finally, are dark grey, fine grained, and massive, strongly resembling unbedded argillitic greywacké, and distinguished from it only by the presence of numerous small needle-like phenocrysts of hornblende. . . .

One of the best samples of breccia, coarse-grained, angular fragments in a fine-grained matrix, occurs on L. 9084 and adjoining claims to the southeast of Binney lake, McVittie township.

A sample of the trachyte resembling fine-grained red syenite, from claim No. L. 12143 between Binney and Marjorie lakes in McVittie township, was found by W. K. McNeill to have the following composition:—

	Per cent.
Silica	52.74
Alumina	17.96
Ferrous oxide	3.87
Ferric oxide	5.66
Lime	4.12
Magnesia	3.76
Soda	5.63
Potash	1.93
Water (combined)	2.72
Carbon dioxide	1.54
Total	99.93

Under thin section this rock resembles an altered diorite porphyry.

H. C. Cooke has recognized amygdaloidal structure on H.S. 129, McVittie township, and flow texture on L.M. 3, McGarry township.

The trachyte in many parts of the area contains numerous quartz veins, some of which are heavily mineralized with pyrite and other sulphides, but containing as a rule little or no gold. Visible gold was reported to have been found in a quartz vein in trachyte near the northwest corner of H.J.B. 23,

¹ Geol. Surv. Can., Memoir No. 131, pp. 23-25.

McGarry township. The "Shepherd" quartz vein on Binney lake has yielded low values in gold on analyses. Large masses of quartz were noted in the trachyte in northeast McGarry.

Rocks similar to the trachyte extend westerly across Gauthier and Lebel townships, as indicated on map No. 32e. Rocks, apparently similar, also occur on the Highland-Kirkland property, T. 16554 and T. 16555, in Teck township, where low values in gold were obtained over considerable widths by diamond-drilling. One of the richest veins in this formation occurs on the Pawnee, L.S. 466, Lebel township.

Haileyburian (?)

Apart from the serpentinous Keewatin rocks which occur in the Crown Reserve workings at Pancake lake and on the Imerson and other adjoining claims in that vicinity, there are some outcrops of almost pure serpentine in different parts of Hearst township, which have been classed provisionally as Haileyburian. These occur in the southwest part of the township, on B.G. 225 and near the narrows on Larder lake. A sample from a point about half a mile south of the narrows on Larder lake was found under the microscope to consist almost entirely of serpentine with a little carbonate, magnetite, pyrite, and iron oxide. A few serpentine masses have the outline of olivine, suggesting that the original rock may have been a peridotite.

Algoman

The Algoman rocks have a wide distribution in the area, particularly in McVittie and Hearst townships. The rocks are represented by numerous varieties, namely, lamprophyre, diorite, diorite porphyry, syenite porphyry, granite, granite porphyry, quartz porphyry, aplite, pegmatite, etc., in the form of stocks and dikes.

Lamprophyre.—Several narrow dikes of mica lamprophyre, similar to the lamprophyres at Kirkland lake, were noted cutting the Keewatin and Timiskamian rocks near Larder village and elsewhere.

Diorite Porphyry and Diorite.—A large mass of diorite and diorite porphyry about one mile in diameter occurs near the northwest corner of Larder lake. Offshoots were found cutting the Keewatin and Timiskamian rocks in the vicinity. In places the rock has been altered to carbonate and impregnated by gold-bearing quartz veins, as on the Harris-Maxwell claim H.F. 183, on the adjoining Richardson claim L.M. 31, and on the Thib claim on Enright point. H. C. Cooke has recognized and described three main phases: a porphyritic, a dioritic, and a basic phase, the variation in composition being due to differentiation in place.¹

Syenite Porphyry.—The largest area of Algoman rocks is a syenite or feldspar porphyry which extends from the Argonaut mine on Beaverhouse lake to Bear lake in McGarry township. The rock occurs largely in Keewatin, but it also cuts the Timiskamian at Monocle and Beaver lakes. The porphyry is silicified and heavily mineralized with pyrite, and contains some gold on analyses on the Costello and Yule claims at Monocle lake and on the Brant and Arthur claims to the east of Malone lake. The phenocrysts are largely albite. Occasionally sufficient quartz is present to classify the rock as granite porphyry.

Granite and Syenite.—A small mass of pink hornblende granite occurs in the southwest part of McFadden township. Gold occurs in a somewhat similar granite on the Wisconsin-Skead property, two miles to the southwest in Skead

¹ Geol. Surv. Can., Mem. No. 131, pp. 43-44.

township. Small masses of red hornblende syenite occur in various parts of the area, as indicated on the map particularly in the east half of Hearst township. Certain masses contain syenite grading into lamprophyre and diorite.

Granite Porphyry.—As stated, the large masses of syenite porphyry contain sufficient quartz in places to be called granite porphyry, which is also the condition at Mud lake in Lebel township, in parts of Kirkland lake, and at the Argonaut mine. Narrow dikes of quartz-feldspar porphyry or granite porphyry are indicated in various places on the map. A dike crossing the Milton claim H.F. 137 and the Crown Reserve claim H.F. 138 is intersected by quartz veins carrying pyrite, mispickel, and gold.

Quartz Porphyry.—Dikes of quartz porphyry occur on claims L.S. 417 and L.S. 191 near Pancake lake, and directly east of L. 8055 on Diamond lake. The carbonitized rocks in proximity to these dikes may have been formed by some action caused by the porphyry. Another outcrop occurs on an island in Fitzpatrick bay, where the glassy quartz phenocrysts are nearly one inch in diameter. The phenocrysts are largely crystals and grains of quartz with an occasional crystal of orthoclase and oligoclase-andesine.

Carbonate Rocks

Large volumes of rocks, composed almost entirely of carbonates of lime, magnesium, and iron, and referred to as dolomites and ankerites, occur in different parts of the area but are more common in the vicinity of Larder lake. These rocks, which are frequently traversed by innumerable stringers of quartz and calcite which in places carry gold, have been described by R. W. Brock,¹ M. E. Wilson,² H. C. Cooke,³ and others. Most of the writers agree that the rocks are largely secondary, but it is often difficult to determine the original nature of the rock. Dr. Cooke's method of showing the carbonate rocks has been employed on the accompanying map. A black stipple representing the carbonate rock is inserted over a colour representing what is believed to have been the original rock, although the original nature of the carbonate rocks² cannot always be definitely determined. H. C. Cooke⁴ states that the dolomites at Larder lake are secondary products formed by the alteration of the Keewatin, Timiskaming, and intrusive rocks, the carbonate solutions representing the final exhalations from the porphyry magma and altering the minerals to carbonate in the following order: The ferromagnesian minerals were first replaced, the feldspars followed, and, finally, the quartz, which resisted the solvent action to a late stage, was removed. The writer agrees that the carbonate rocks are secondary, with the exception of some of the narrow carbonate bands in the iron formation and Timiskamian sediments. These later carbonates are probably primary, having been deposited in water at the time the associated sediments were formed. The intensely altered carbonate rocks, which occur in large volume around Larder lake, were probably formed by solutions emanating from the magma from which the syenite and porphyries extruded. Some carbonization, however, had taken place prior to the syenite and porphyry intrusions, as is shown by the presence of carbonate fragments in the basal conglomerate of the Timiskaming series on the Miller-Middleton claim No. L. 9394, Gauthier township. Most of the Keewatin volcanics, miles away from any known porphyry intrusions, are more or less replaced by carbonate, as pointed out by

¹ Ont. Bur. Mines, Vol. XVI, pt. 1, 1907, pp. 207, 215.

² Geol. Surv. Can., Sum. Rept., 1909, p. 175.

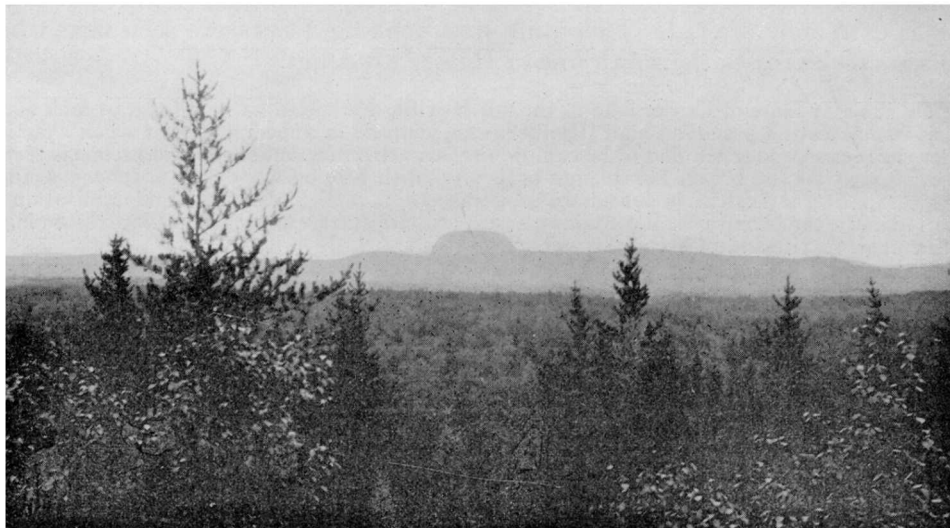
³ Geol. Surv. Can., 1922, Memoir No. 131, pp. 48-55.

⁴ Ibid, p. 52.

A. G. Burrows,¹ in the Keewatin rocks at Porcupine. This may represent a decomposition taking place during the Keewatin period. Certain peridotite dikes, some of which may be pre-Algoman, are likewise altered to serpentine and carbonate, which was also noted at Porcupine by A. G. Burrows,² and at Opatatika lake by Robert Harvie.³

Animikie (Cobalt Series)

Most of McFadden township is covered by sediments of the Cobalt series which rise from 100 to 350 feet above Larder and Raven lakes. These rocks also extend across the southeast corner of McGarry township and pass north-easterly into Quebec, where they overlie the Timiskamian sediments for a few square miles. Mt. Chaminis, one of the most prominent peaks in the region and situated in Quebec near mileage 39 on the interprovincial boundary, is composed of these rocks. Mt. Chaminis, which is an Indian word for "island,"



Mount Chaminis, about three and a half miles southeast from the southeast corner of Ossian township. This is one of the most striking mountains in central Canada.

has an elevation of approximately 1,720 feet, and its haystack or island-like appearance can be seen for miles above the general peneplain. A few erosion remnants of cobalt sediments occur in the southeast part of Hearst township, at the narrows on Larder lake, and also near the northwest shore of Larder lake in McVittie township.

The rocks are not described in detail since this has already been done by M. E. Wilson.⁴ It may be stated, however, that the rocks comprise conglomerate, greywacké, arkose, and slate, which represent the lower members of the Cobalt series. They appear to be at least 900 feet in thickness. The bedding planes are usually horizontal or 10 or 15 degrees off the horizontal, and rarely 45 or 60 degrees in the vicinity of certain faults.

The composition and texture of the conglomerate varies considerably from place to place. One exposure, seventeen chains east of the southeast corner of

¹ Ont. Bur. Mines, Vol. XXIV, pt. 3, p. 19.

² Ibid, p. 17.

³ Can. Min. Inst. Jour., Vol. XIV, p. 168.

⁴ Geol. Surv. Can., Mem. No. 17, pp. 34-46.

claim 6623, McGarry township, suggests that the sediments have a glacial origin. Lying in the fine-grained conglomerate in this locality is a large, rounded granite boulder some 12 feet long, 9 feet wide, and over 6 feet high.

Keweenaw or Matachewan (?)

A few narrow dikes of fairly fresh quartz diabase were observed in McVittie, McFadden, and Hearst townships. These dikes, which are from 50 to 100 feet in width, clearly intrude the Keewatin, Timiskamian, and Algoman, but their relationship to the Animikie is not known. Two dikes were seen in the large, flat-lying conglomerate areas in McFadden township, one on Raven lake and the other on Larder lake, but no diabase and conglomerate contacts were observed. In McVittie township, the diabase clearly intrudes the Algoman porphyry on an island in Beaverhouse lake. In central McVittie, a single diabase dike cuts rocks of Keewatin, Timiskaming, and Algoman age on claims C.E. 122, 125, and 126. Gold occurs in quartz veinlets in a highly altered diabase dike on claims H.S. 135 and C.E. 32 (L. 5499) in McGarry township. This particular dike is extremely altered. Two quite fresh-looking dikes were seen near where Benson creek crosses the south line of Hearst township.

On the east shore of Larder lake to the north of Big Pete island a small reef of rock occurs which resembles the post-Huronian [Keweenaw] diabase in appearance, but when examined under the microscope was found to be camptonite . . . this rock under the microscope is seen to consist largely of the brown hornblende barkeveite, with plagioclase, chlorite, sphene, epidote, ilmenite, apatite, and calcite in subsidiary proportions. . . . A slight amount of mineralization has occurred in the camptonite, for it contains masses of calcite, quartz, and epidote, with disseminated galena, chalcopyrite and pyrite in places.¹

Pleistocene

The pre-Cambrian rocks described are abundantly exposed in all of the four townships; however, here and there they are covered by small areas of sand, gravel, swamp, or clay, as shown on the accompanying map. The largest drift-covered area is sand and gravel, which occurs in ridges, some of which are 75 feet high, in the southwest part of McVittie township. Another large sand area is found in northeast McGarry. Diamond-drilling has indicated that portion of the drift in the vicinity of Pancake lake to be over 100 feet in thickness. Where the soil has been removed recently, the glacial grooves and striae are quite pronounced, indicating that the ice which laid the rocks bare moved in a southerly direction.

Economic Geology

Gold was found at Larder lake in 1906, but until recently only desultory mining has been carried on. The Canadian Associated Goldfields is the only company that carried on continuous operations for several years, and it is only since 1921 that gold-bearing veins of importance have been found; these occur at Pancake lake, one and one-half miles north of Larder village. Most of the early prospecting was done on quartz veins or in silicified dolomite which extend in an east-west direction across the north end of Larder lake and elsewhere. An example of this type is the Reddick which yielded a small amount of gold, but did not pay. According to H. C. Cooke, who made a study of this type of deposit, there is no connection whatever between the concentration of the pyrite, the only sulphide in the dolomite, and its gold content. There are, however, various other types of gold occurrences in the area. The Harris-

¹ Wilson, M. E., Larder Lake District, Geol. Surv. Can., Memoir No. 17, pp. 47-49.

Maxwell deposit on the north boundary of Hearst township is of the stockwork type in dolomitized diorite porphyry, which yielded a small amount of gold in 1908 and 1909. Other examples of this type are the Richardson, L.M. 31, and the Thib, L. 8012 or C.E. 16. On the Gold King, the gold occurs in quartz veins cutting aplite, an acid phase of the diorite porphyry. The principal gold deposit in the area, the Costello vein which is being worked by the Associated Goldfields and the Crown Reserve mining companies, is composed of reddish tuffs intruded by quartz syenite and impregnated by quartz, carbonate, iron pyrite, arsenopyrite, and gold. The arsenopyrite, which is so characteristic of the deposit, has been recognized in many veins in the area. Some pegmatitic material is also associated with the deposit. Gold is likewise found in quartz in feldspar porphyry on the Arthur-Costello claim C.E. 125, in basalt on the



Gold-bearing quartz stringers in serpentinized and silicified dolomite (?),
Reddick group.

Hall, 12054, in diabase on the Sheldon claim L. 5499, and in trachyte on the Shepherd. Many of these gold occurrences point to the possibility of the gold being genetically related to the deep-seated magma which formed the porphyries.

The various deposits are described according to townships in which they are located.

McVittie Township

Pancake Lake Area.—In 1914, Jack Costello found gold at Pancake lake, on claim L. 1794, in a rusty reddish schist and quartz which yielded \$5 in gold per ton across several feet. After the war, Costello returned to develop his gold deposit. In 1920 and 1921, the adjoining claim L.S. 191 and many other claims in the vicinity were staked by the Crown Reserve. By trenching through 20 feet of clay, the Crown Reserve located the Costello vein, having first determined the strike of the vein from the Costello workings. At depths from 100 to 300 feet, the Crown Reserve found three diamond-drill cores to average approximately \$6 in gold per ton across 20 feet. The Costello claim was sold to the

Associated Goldfields for \$6,000. Since the autumn of 1921, these two companies have been carrying on underground exploration with encouraging results. The shafts of the two mines, which were commenced on the Costello vein, are 360 feet apart. By drifting and drilling, the vein is now known to be over 2,000 feet in length. By the diamond-drill method, further extensions are looked for to the west on the Imerson claim and to the east on the Carr claim.

The geology in the vicinity of the ore deposits is shown on the accompanying plan (Fig. 1). Skirting the south edge of the Keewatin basalt, which has been intruded by quartz porphyry and altered in places to ferro-dolomite, is a narrow outcrop of tuffaceous greywacké and black slates. There is a possibility that some of these tuffs may be Timiskamian. They contain some iron formation and generally strike N. 65° E., and dip 65° S. 25° E.; they occupy a large part of the drift-covered area to the south, as was shown by diamond-drill cores. In thin section, they are seen to contain feldspar, biotite, quartz, calcite, chlorite,



Jack Costello, the discoverer of the Costello vein on the Associated Goldfields' property, Pancake lake.

sericite, leucoxene, pyrite, magnetite, and graphite, which are more or less banded. Within the carbonate tuffs and roughly conforming with their strike and dip is the Costello vein, which consists of red and grey tuffs, quartz, carbonate, and lenses of highly altered and fractured quartz-syenite, the whole being cut by veinlets of quartz and calcite, and impregnated with much pyrite and mispickel and, in places, copper pyrites. This ore is usually quite reddish and becomes redder on weathering, due to iron oxide and ferrous carbonate being finely disseminated through the material.

The walls, and particularly the hanging-wall, have been replaced by quartz, calcite, reddish feldspar, iron oxide, and other vein-forming minerals. The tuff, which forms a large part of the deposit, is porous and susceptible to the circulation of mineral solutions. The footwall of the Costello vein is usually quite sharp and consists for the most part of a pronounced graphitic fault-zone from six inches to three feet in width. There has been movement along the fault subsequent to ore deposition; there has also been faulting nearly normal

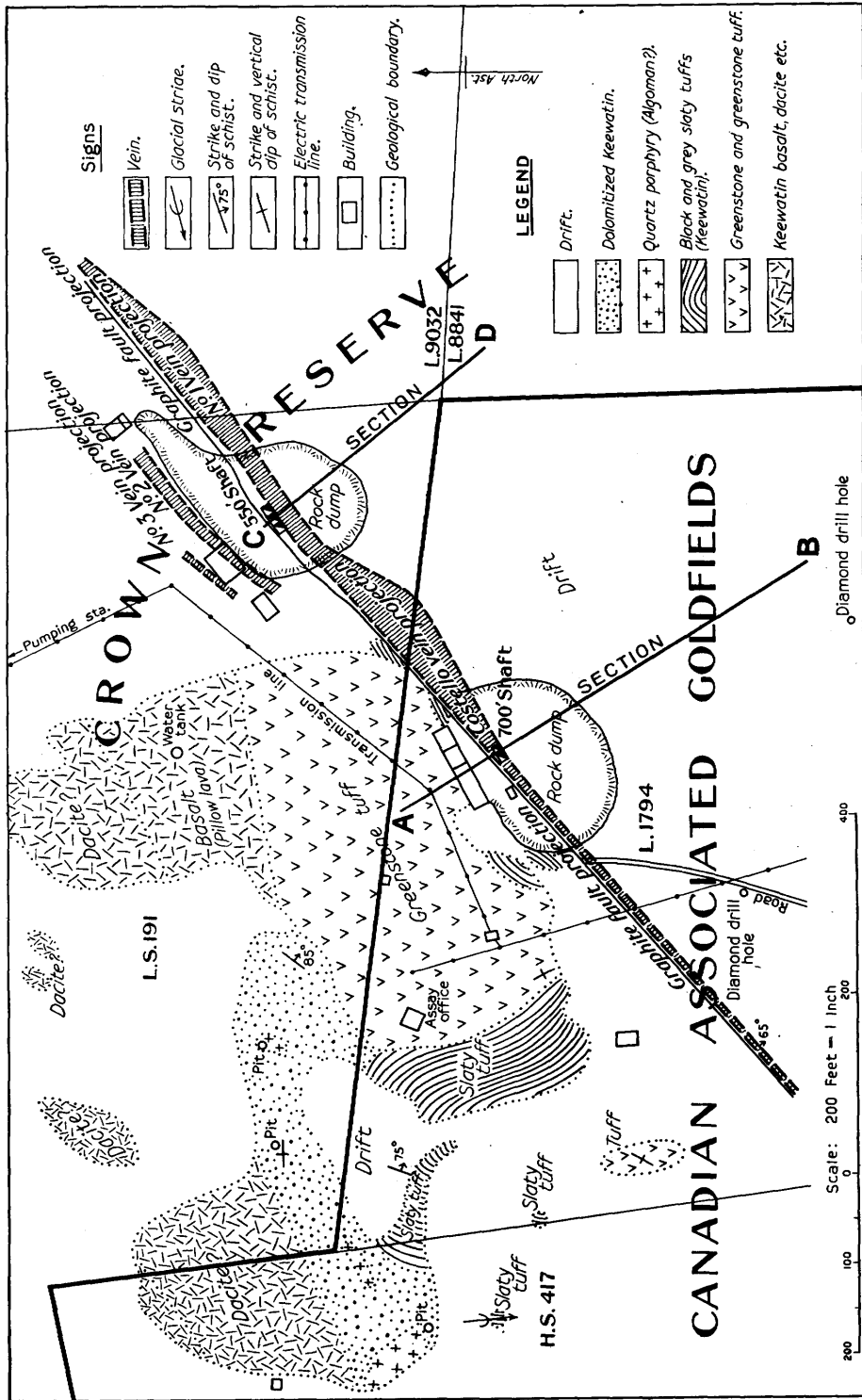


Fig. 1—Geological plan of Canadian Associated Goldfields and Crown Reserve near Pancake lake. The positions of cross-sections A-B (Fig. 2) and C-D (Fig. 3) are shown on the plan.

to the strike of the vein, which has slightly displaced the No. 2 vein on the Crown Reserve. A few small north-south faults are found in different parts of the working to the west of the Goldfields' shaft, showing small displacements in the vein.

Costello Graphite Fault.—As stated, a pronounced graphitic fault closely follows the Costello vein and is known as the Costello graphite fault. It extends for nearly three-quarters of a mile, having been drifted on for at least 1,200 feet on the Crown Reserve and Associated Goldfields, and located by diamond-drilling on the eastern part of the Crown Reserve and on the Imerson claim to the west. The graphitic material generally follows the footwall of the Costello vein, although occasionally it is 20 or 30 feet distant. It varies from a few inches to five feet in width, and the walls have an inch or sometimes a foot of gouge. Between the gouge walls are found rounded crushed rock and vein fragments coated with films of polished graphite. Veinlets of pegmatite, namely quartz and feldspar, are frequently seen with the crushed slate, quartz, etc., in the fault zone. In most places, the graphitic material will assay \$1 to \$4 in gold. On the fourth level, east drift, of the Associated Goldfields, there is much visible gold mixed with the quartz and graphite. Some faulting probably occurred prior to the ore deposition, since the vein closely followed the pronounced fault and deposited some gold in it, particularly around some of the graphite fragments. However, there has been much movement along the plane of the fault subsequent to ore deposition, since lenses of reddish drag ore were noted on the fourth level west in the Associated Goldfields. On the 235-foot level west, this same Costello graphite fault has been thrown two feet by a nearly north-south fault. The graphitic material somewhat resembles that of the Vipond and Hollinger-McIntyre.

Considerable graphitic schist was also noted on the Arthur claim, 9658 (unsurveyed), east of Malone lake, but this probably has no connection with the Costello graphite fault.

Associated Goldfields (Costello Property).—The Associated Goldfields' Costello property at Pancake lake contains approximately 65 acres. A vertical shaft has been sunk, commencing on the Costello vein, to a depth of 800 feet. Below 330 feet, the shaft has three compartments. The vein was followed 60 feet to where it left the shaft on the south side. From different levels, namely, 110, 235, 360, 500, and 750, crosscuts were made to the south to intersect the vein. Since the vein dips approximately 65 degrees south, the crosscuts at each succeeding level are longer. The shaft is being continued to 1,000 feet. The vein on the 110-foot level is about 20 feet south of a graphitic fault, while on all the lower levels this fault forms the footwall of the vein. Something like 100 feet of crosscutting and 30 feet of drifting comprise the workings on the 100-foot level. On the 235-foot level, the vein which lies 135 feet south of the shaft has been drifted on for over 500 feet. On this level to the west of the main crosscut, there is considerable white quartz which in one place in the floor of the drift carried several showings of visible gold. East of the main crosscut on this level, the red dike widens to 29 feet and carries approximately \$8 in gold per ton over this width. The hanging wall is a carbonate schist containing numerous quartz veins. The footwall is a tufaceous greywacké and black slate banded with a little hematite. A thin section of the red ore from the east drift on this level showed it to be an even-grained, altered quartz-syenite consisting of albite, microcline, partly altered to sericite and some quartz. The striking feature of the ore is the abundance of graphic intergrowth of quartz and feldspar, that is, one mineral containing particles of the other in such a way as to resemble ancient inscriptions.

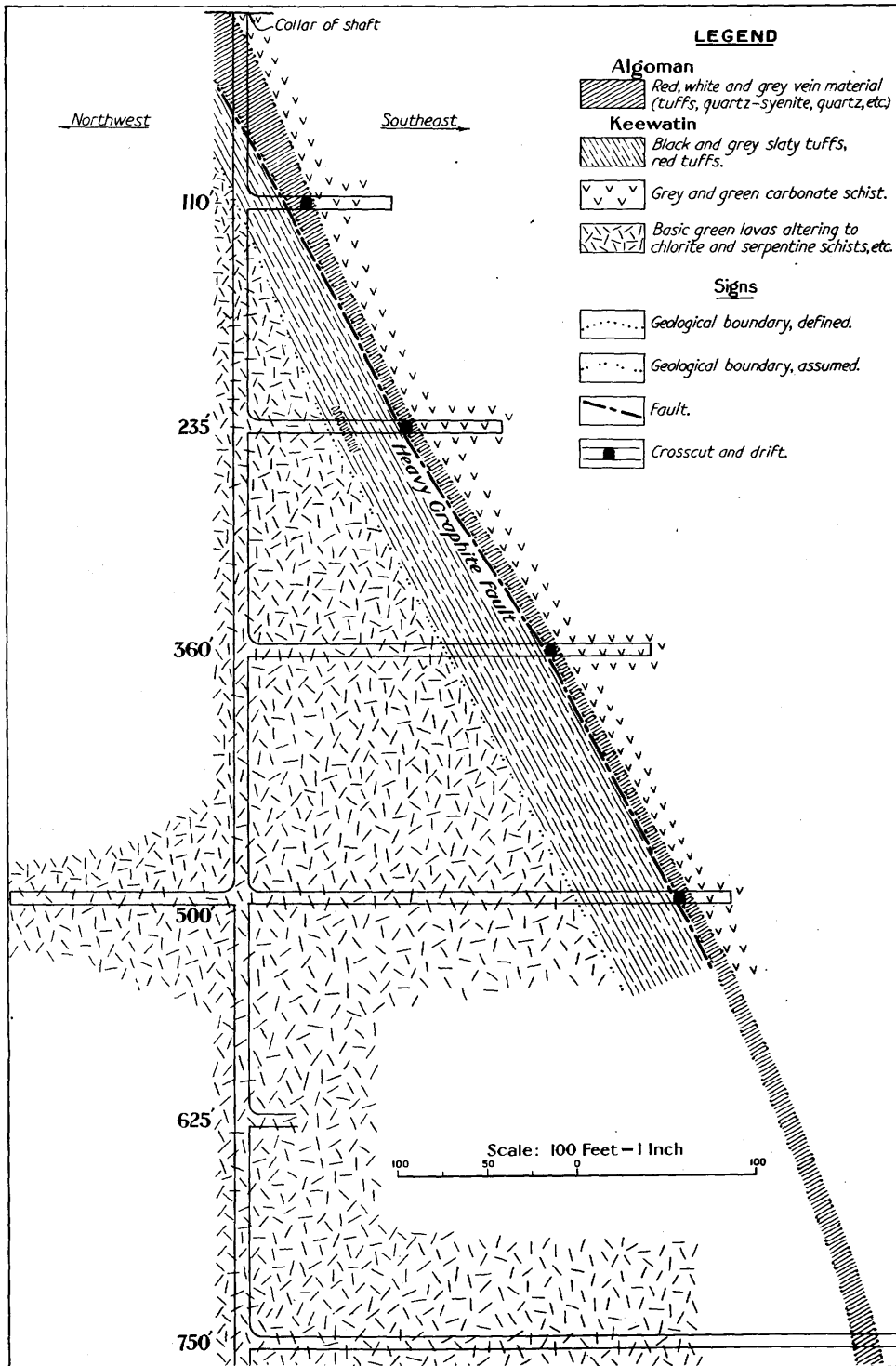


Fig. 2—Vertical section A-B, running in a northwest-southeast direction through the Associated Goldfields shaft on claim L. 1794.

On the 360-foot level, some 500 feet of drifting has been done. The ore on the whole is narrow but widens in the east drift to 22 feet.

The fourth level, which is 500 feet below the collar of the shaft, is the best level opened up so far. In the east drift, the vein widens in one place to 50 feet, and for a considerable distance in the drift visible gold was seen along a narrow streak of quartz and graphite. The higher values are on the foot-wall side of the vein.

A station has been cut at the fifth level, 625 feet vertical, but no lateral work has yet been done.

The vein has been reached by a long crosscut on the sixth level, 750 feet below the surface, and is being drifted on.

A foundation has been completed for a mill, which will probably be built during 1924; a portion of the company's Harris-Maxwell mill may be utilized.

The mine is operated by electric power generated by the company's power plant at Raven falls, the outlet of Larder lake. Dr. George A. MacKay is president of the company and T. Graves, general superintendent.



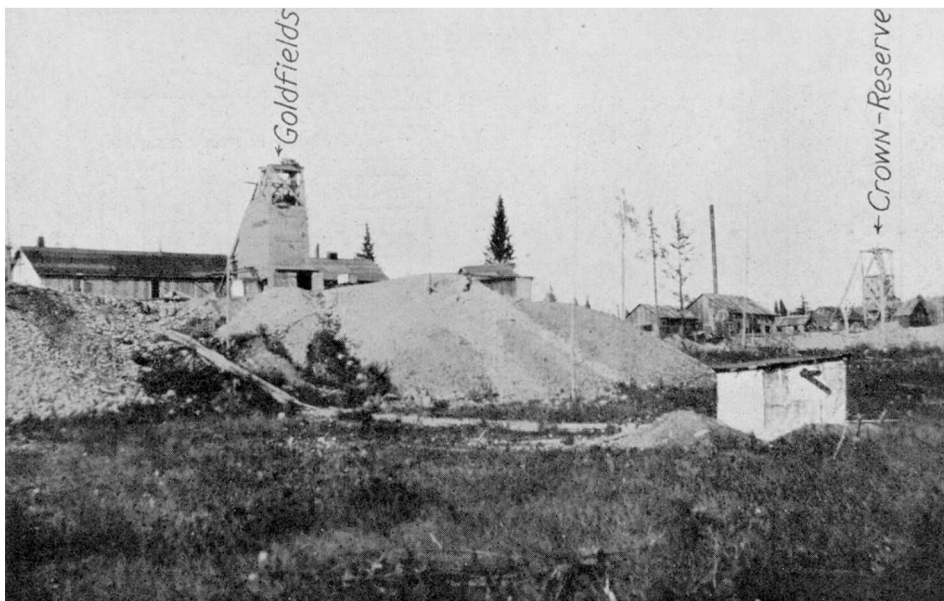
Ore body twenty-two feet wide on the 360-foot level, Associated Goldfields. The picture includes the ten feet next the footwall and shows white quartz cutting an altered, heavily mineralized, reddish tuff cut by quartz syenite.

The Harris-Maxwell, Kerr-Addison, and Reddick prospects, which belong to the company, are described elsewhere in the report.

*Crown Reserve.*¹—The Crown Reserve Mining Company is operating claims L.S. 191, L. 9032, L. 8841, and L. 8713, which adjoin the Associated Goldfields property at Pancake lake. The company also owns numerous other adjoining claims in the vicinity, upon which assessment work only has been done as yet. As stated, the claims, other than L. 8713, were staked by the company in 1920 and 1921, and the extension of the Costello vein was located through 20 feet of overburden, the strike of the vein from the Costello workings having just

¹ This is the Crown Reserve Mining Company which achieved spectacular success in mining silver on the bed of Kerr lake at Cobalt.

been determined. Towards the end of the year, the vein was found in three diamond-drill holes and over a length of 600 feet to average approximately \$6 per ton in gold over widths of 20 feet. A vertical, 3-compartment shaft¹ has been sunk to a depth of 570 feet, and crosscuts made at the 170-, 300-, 425-, and 550-foot levels. In sinking, there were encountered two parallel veins, Nos. 2 and 3, which lie 75 and 100 feet, respectively, to the north of the "Costello," or No. 1 vein, and likewise dip 65 degrees to the south. If one diamond-drill hole had been sunk an additional 100 feet, all three veins would have been cut. A cross-section through the mine workings (Fig. 3), shows the three veins, their approximate widths in the main crosscut, and the underground geology. The graphitic fault, which usually forms the footwall of the vein on the Goldfields property, is seen in this cross-section to be 25 feet north of the No. 1 vein, both in the shaft and on the 300-foot level; while on the 550-foot level, the



Associated Goldfields and Crown Reserve shafts on the Costello vein at Pancake lake, October, 1923.

graphitic fault forms the footwall of the No. 1 vein for 250 feet, the total length on which it has been drifted. Where the graphitic fault has been encountered away from the vein, it will assay from \$3 to \$4 gold per ton across two to four feet.

Vein No. 1 has been drifted on for a distance of about 400 feet on the 300- and 550-foot levels, and crosscuts have been driven about every 50 feet to determine the width and gold content of the vein. The vein varies from 5 to 50 feet in width, but this is not necessarily all ore. One crosscut showed 12 feet of \$8 ore, while the adjoining 12 or 15 feet assayed \$3 or \$4. Again, higher values may be obtained over narrower or wider widths. At any rate, ore of a milling grade can be obtained over stoping widths, and the poorer portions of the vein may be left for pillars. All drifts on No. 1 vein are being extended to the east. At a point about 1,000 feet easterly from the shaft, a diamond-drill core gave

¹ The collar of the Crown Reserve shaft is $3\frac{1}{4}$ feet lower than that of the Associated Goldfields.

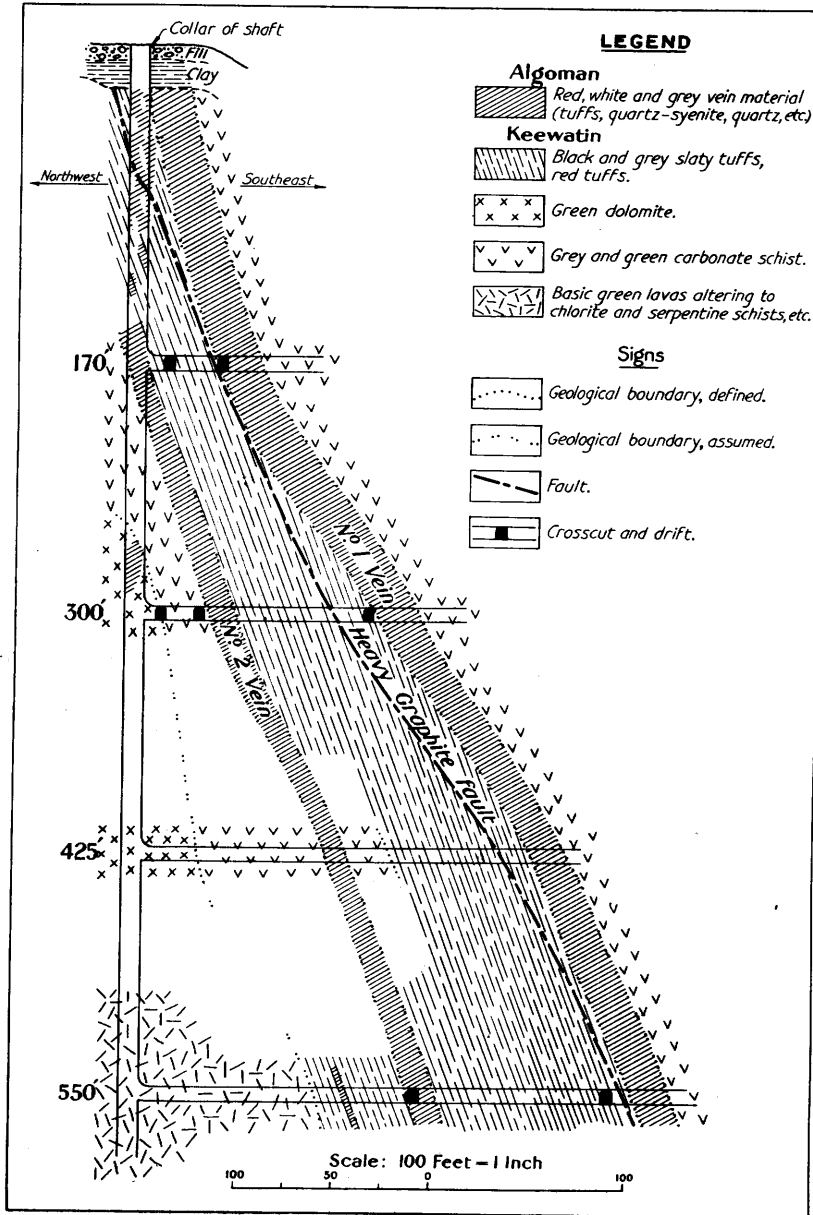


Fig. 3—Vertical section C-D running in a northwest-southeast direction through the Crown Reserve shaft on claim No. L.S. 191.

\$6.80 gold per ton across 11 feet. Gold is rarely visible in this vein; however, it was seen under the microscope occurring in cracks through the arsenopyrite. Much secondary feldspar, calcite rhombs, rutile, magnetite, and iron oxide were also noted under the microscope. The hanging-wall part of the vein is not well defined, but grades into pyritized talcose or dolomite schist and is defined only by sampling and assaying. The ore on the whole is quite hard compared with the soft wall rocks, and numerous slips occur throughout the vein. Certain sections also carry 25 per cent. or more of sulphides.

Vein No. 2 was drifted on to the east for 175 and 100 feet on the 300- and 550-foot levels, respectively. This vein is not as strong as No. 1, but it contains more grey carbonate and less red syenite and is usually softer and more banded than No. 1, owing to both walls being bedded tuff, greywacké, and slate, which are partly replaced by quartz, calcite, and ore-bearing precipitates. Portions



Photo by D. J. Hirst.

Crown Reserve mine, Larder lake, June, 1924.

of this deposit somewhat resemble the Elstone-Dunkin vein in Gauthier township. In drifting east on the 550-foot level, No. 2 vein was cut off by a number of slips, one of which strikes N. 70° W. and dips 70° S., 20° W. According to the company's annual report, No. 2 vein on the 300-foot level averaged \$5.31 gold per ton across 7 feet for a length of 125 feet.

Vein No. 3, where encountered in the shaft near the 300-foot level and in the crosscut on the 550-foot level, comprises pyritized schist, quartz, calcite, chlorite, and native gold in a green iron-magnesium-lime carbonate, locally known as green dolomite. This rock, which contains at least 80 per cent. carbonate and considerable quartz, frequently turns pale yellow on weathering. This vein is very irregular, but it contains spectacular gold showings.

According to the report of the consulting engineer of the company for the year ending December 31st, 1923:—

On the west side of the cross-cut [through vein No. 1 on 170-foot level], the values were \$8.09 per ton, and on the east side \$4.82 per ton, over a width of 18 feet.

Vein No. 1 [on the 300-foot level] has been drifted on for 350 feet and cross-cut at six (6) places, approximately, 50 feet apart.

The sampling of this ore exposure indicates a value of \$8.03 per ton over a sampling width of 10 feet. . . .

The length of this ore shoot at present is 257 feet.

This vein [No. 1 on 550-foot level] was drifted on for 250 feet and has been cross-cut in six (6) places, approximately, 50 feet apart.

From the sampling of these drifts and cross-cuts, we have an ore shoot 240 feet long; from 8 to 28 feet wide of an average value of \$6.56 per ton.

The power plant comprises a 4-drill compressor, a 150-horsepower Diesel oil engine capable of running six machines, a 100-horsepower steam boiler and a 1,000-foot hoist. The Associated Goldfields hydro-electric plant at Raven falls furnishes electric power for pumping and lighting. Harry Stewart was general superintendent during the first year's operations. M. W. Summerhayes is consulting engineer, A. S. Crow is mine captain, and C. Fox is mine engineer.

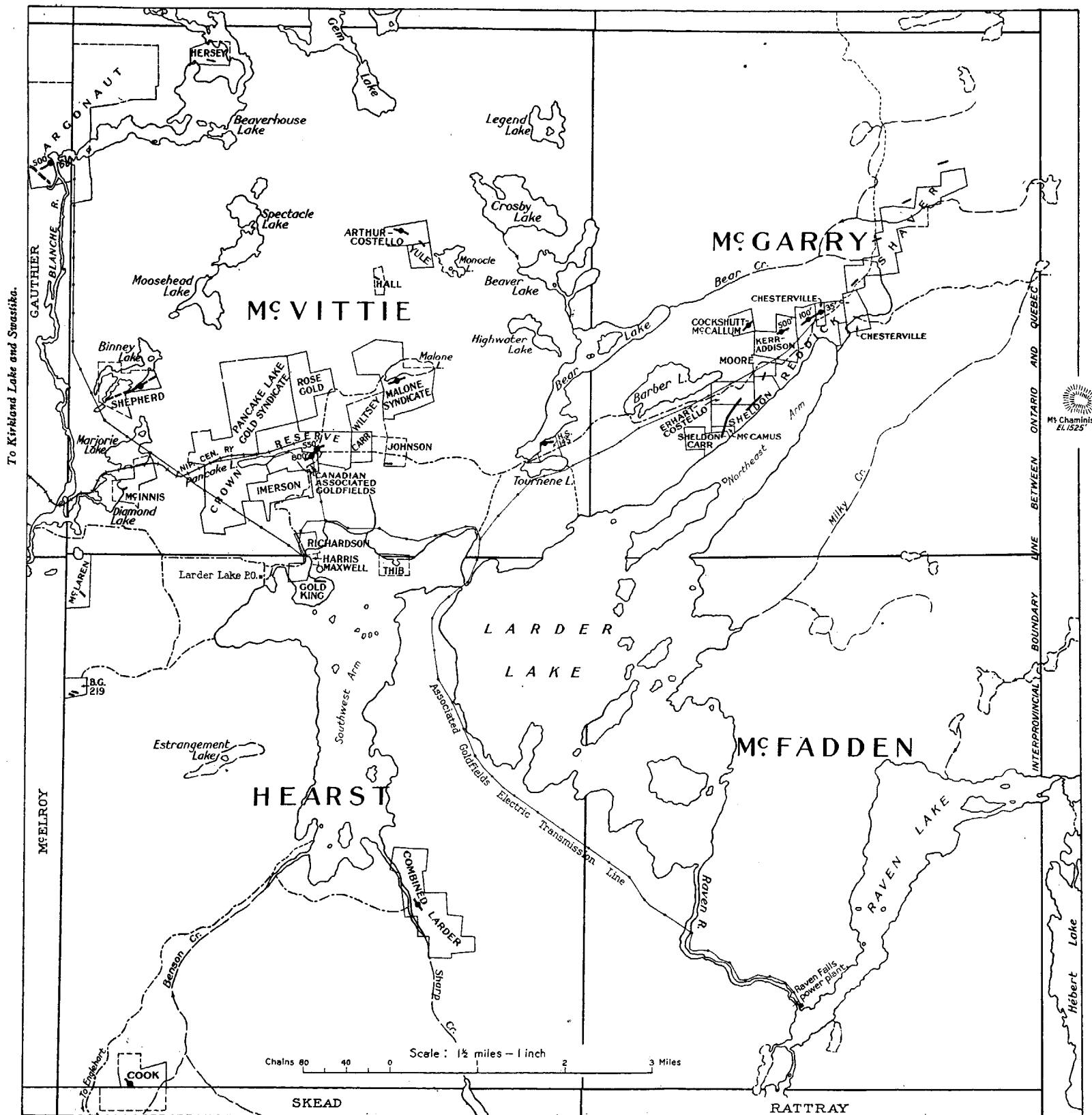
Considerable assessment work has been done on some of the company's outlying claims. On L. 8842 encouraging gold values were obtained in a pegmatite vein 13 feet in width, which occurs in Timiskaming sediments. Iron pyrites, galena, feldspar, and films of iron oxide and red feldspar were observed in the deposits. Cutting the Timiskaming conglomerates on H.F. 138 (L. 8825) is an altered feldspar-quartz porphyry about 100 feet in width, which contains numerous veins of quartz and calcite carrying iron pyrites, arsenopyrites, and some native gold. The dike was located at depth by diamond-drilling.

Pancake Lake Syndicate.—This last-mentioned dike extends westerly on to the Milton claim, H.F. 137 (L. 9513), where encouraging gold values were found in the mineralized Timiskaming sediments adjoining the porphyry.

Imerson Claims 8045 (H.F. 100), 8046 (H.F. 101), 8047, L.S. 294 (C.E. 26).—These claims which belong to the Kitchener-Kirkland Company lie southwest of the Goldfields on the strike of the Costello vein. Rich gold-bearing boulders or floats, some of which are similar to the Costello ore and assayed \$30 gold per ton, were found on the line between H.F. 100 and 101 and at a point 200 feet south of the northwest corner of H.F. 100. The Coniagas, which optioned the property in 1922, failed to locate the vein by diamond-drilling. One hole showed 110 feet of drift overburden. During 1923, the claims were re-optioned by the Anglo-Canadian Explorers, which did an additional 2,000 feet of diamond-drilling which extended almost across the two claims 8045 (H.F. 100) and 8046. A graphitic zone, one foot in width, was cut near the northeast corner of claim 8046 (H.F. 101). There is a possibility that the "float" may have come from the Crown Reserve showing on the southeast corner of claim 8825 (H.F. 138), since it was found only 30 chains distant in a S. 6° E. direction, the course in which the glacier travelled. The Anglo-Canadian Explorers also did considerable diamond-drilling on the Walsh-Tucker claims in southeast Katrine township during 1923.

Carr Claim (H.S. 156).—The Carr claim, which lies directly east of the Crown Reserve property, was partially drilled by the Coniagas in 1922. In one hole there was 180 feet of boulders and drift above the rock. In 1923, Messrs. Samuel and Julian Cohen optioned the property and put down one 800-foot diamond-drill hole near the northwest corner of the claim with the hope of picking up the easterly extension of the Costello vein. No vein was located and the option was dropped. In 1924, the claim was again optioned to M. J. O'Brien, Limited.

Johnson.—This unsurveyed claim, No. L.S. 1, lies directly east of the surveyed claim, H.F. 370, which is one mile east of the Crown Reserve shaft. Near the southwest corner of the claim is a carbonate-quartz vein, with pyrite five feet or more in width and carrying low values in gold. The enclosing rocks



Property map of Larder Lake area showing roads, power lines, veins, and positions and depths of shafts.

are tuffs and iron formation, partly altered to dolomite. The claim in 1922 was under option to the Coniagas and was diamond-drilled.

Wiltsey.—D. A. Wiltsey has a group of four unsurveyed claims, Nos. 9636, 9637, 9638, and 9639, cornering the Crown Reserve on the northeast. The rocks are largely Timiskamian sediments and trachyte, partly dolomitized. The claims were recently optioned to the O'Brien mine and will be prospected by diamond-drilling.

Malone Lake Gold Company.—These claims are situated in the vicinity of Malone lake. Much trenching and test-pitting have been done.

Rose Gold (R.S.C. 296, 297, 298, 299).—Some gold was obtained by assay from surface veins on R.S.C. 298; much diamond-drilling was done during 1922.

Arthur-Costello (C.E. 125 and 126).—J. Arthur and J. Costello have discovered a fine-grained red feldspar porphyry dike extending southeasterly across their claims near Monocle lake. The dike in places is much fractured and cut by veinlets of quartz and calcite which carry much pyrite and some specular hematite. Considerable pyrite is also disseminated through the porphyry, giving the surface a rusty appearance. In one pit, 7 by 15 feet, on C.E. 125, the rusty capping has been shot off and samples of the fresher material yielded small values in gold. Much mineralization also occurs in places along the contacts between the porphyry and the older rocks, which are Keewatin and Timiskamian. Similar occurrences are also found to the southeast on the adjoining *Yule* claim, C.E. 121.

Hall.—W. S. Hall has discovered visible gold associated with pyrite, quartz, and calcite in basalt on the unsurveyed claim 12054, which lies directly west of the surveyed claim H.F. 74. The basalt is 25 feet wide and has a narrow east-west porphyry dike on either side.

Shepherd (L. 9084 and 10900, etc.).—Extending northeast-southwest along the shore of Binney lake and dipping 65° N.W. is a quartz vein from 2 to 8 feet wide, occurring in a red hornblende syenite or trachyte. The rock near the vein is quite schistose and carries considerable iron pyrites; one sample contained \$2.40 gold per ton.

McInnis (8055).—On the east shore of Diamond lake, a pit has been sunk on five feet of porphyry and quartz carrying pyrite in a black slaty tuff.

Hersey (L. 3631, 5931).—On these claims, which are situated on Beaverhouse lake, is a large syenite porphyry mass cutting Keewatin basalt. Some trenching has been done along the contacts, exposing heavily mineralized sections which yield low gold values on assay.

Argonaut.—A large part of the Argonaut holdings are in McVittie township; however, the ore deposits and underground workings are on the western part of the property in Gauthier township, a few hundred feet from the township boundary. The mine is described in the preceding report on "Lebel and Gauthier Townships."

Bear Lake.—A band of Keewatin, altered to carbonate and cut by innumerable quartz stringers, extends across the south end of Bear lake. A 90-foot shaft and several pits have been made on the dolomite exposures in this vicinity and gold is reported to have been found.

Richardson (L.M. 31).—The deposit lies north of the Harris-Maxwell and is similar to it in appearance, namely, a stockwork in dolomitized diorite porphyry. Good showings of gold were obtained from the claim about the year 1908.

McGarry Township

McGarry township lies near the northeast part of Larder lake next the interprovincial boundary between Ontario and Quebec. A rough wagon road extends across the township not far from Larder lake and passes into Quebec. A part of the township may be reached more easily by gasoline boats on Larder lake.

The same assemblage of rocks which occurs in McVittie extends across McGarry. The most striking rock in the township, from the prospector's point of view, is the dolomite, which extends in one almost continuous band with branches from claim 8152 on the west boundary across Barber lake, the Kerr-Addison, Reddick, Chesterville, and Shaver, where it disappears under the drift. Most of the gold showings have come from veinlets in these rocks; hence most of the work has been done on them. Gold was also found in a 4-foot diabase dike cut by quartz veinlets on the Sheldon and Moore claims, Nos. 5499 and H.S. 135, respectively. This is a very unusual gold occurrence. Low values in gold may also be obtained from quartz veins in the Keewatin adjoining



Larder Lake Proprietary—foundation of old mill removed to Harris-Maxwell property.

the porphyry on the Richie, Jenner, Roy, McCallum, and Cockshutt claims to the east of Bear lake. Various claims are described in the following paragraphs.

H.F. 198 (13206), C.E. 34, C.E. 35.—Extending across these claims in a northeast-southwest direction is a band of dolomitized Keewatin with a network of quartz veinlets upon which several open-cuts have been made. Gold was reported by J. E. Sheldon, who is interested in the claims, to have been found where the dolomite crosses the line between C.E. 35 and H.F. 198, as well as in other pits along the band. Mr. Averall, of Larder Lake, has an interest in the group.

Urquhart-Costello (C.E. 37).—A dolomite band parallel to the one described in the preceding paragraph extends across the southeast corner of claim C.E. 37 and in places carries gold. The enclosing rocks are largely Keewatin basalt with some serpentine. It is reported that the Proprietary Mining Company produced 31 ounces of gold and silver from this vein in 1908. The mill was built on the shore of Larder lake on the adjoining claim, C.E. 33, but it was

afterwards removed to the Harris-Maxwell claim. A little cobalt bloom was found in a 6-inch calcite vein about 100 feet east of the southeast corner of the claim.

Sheldon (L. 5499).—Cutting the Keewatin on the north part of this claim is an altered diabase dike some four feet wide and striking in a northeast-southwest direction for about 100 yards. The dike contains numerous quartz veinlets carrying chlorite, sericite, iron pyrites, and some visible gold.

Moore (H.S. 135).—The Sheldon vein on L. 5499 changes its course and extends in a N. 15° E. direction on to the Moore claim, H.S. 135, and disappears under drift. Gold was also seen in the vein on this claim.

Kerr-Addison (H.S. 164, 165, 166).—Extending across the south part of H.S. 166 is a carbonate band over 400 feet in width on which considerable work has been performed. A vertical 3-compartment shaft, commenced on October 4th, 1920, has been sunk to a depth of 500 feet. Considerable drifting, cross-cutting, and diamond-drilling have been done, particularly during 1921. No work was in progress in 1923. It is reported that specimens containing much gold were encountered in the workings. The dump consists largely of greenish carbonate cut by quartz veinlets and an occasional sample of white feldspar-porphry.

Reddick (H. F. 33 and H.J.B. 28 to 33, inclusive).—The Dr. Reddick, one of the pioneer properties in the area, consists of seven claims on the northeast arm of Larder lake. The gold deposits are largely on claim H.J.B. 29, and there is a 20-stamp mill, not in use, 1,000 feet distant near the lake shore on H.J.B. 30. The rocks consist of alternating bands of dolomite and green schists striking approximately east and west and dipping 70 degrees to the north. The dolomite contains a network of quartz veins, some of which have coarse gold showings. These extend easterly on to the Chesterville and westerly on to the Kerr-Addison.

Development work consists of a 90-foot shaft with approximately 1,000 feet of lateral work on the 83-foot level; much diamond-drilling has been done, and numerous test pits have been sunk. From one open pit, 100 tons of material were taken and put through the amalgamation mill in 1908 and a small production recorded. According to Mr. Ogilvy, then in charge, this ore carried \$10 to \$12 of gold to the ton. However, it is stated that in 1909 H. P. De Pencier made a drive of 350 feet on the 83-foot level underneath the open cut and obtained little or no gold. In the summer of 1911, development work was renewed by crosscutting to the northwest at the 83-foot level, in the hope of ascertaining the extent of a second surface gold showing. At a distance of 62 feet from the shaft, a small ore body was encountered, some of which was milled by amalgamation between July and October, 1911. No work was done afterwards until the Associated Goldfields bought the property in August, 1917, for about \$10,000. In October, 1918, this small ore-body on the first level had been drifted on for 250 feet. Gold in a fine-flour state was seen in the top of the stope, with iron pyrites, copper pyrites, and native copper along dark seams of chlorite, calcite, fuchsite, and other minerals. All work ceased in 1921, and during 1923 the mill was being wrecked.

Chesterville.—The principal claim of this group, namely H.F. 404, is a fraction which lies near the centre of the Reddick group, while the other two claims, H.F. 405 and 406, lie to the east of the Reddick. Rich specimens of gold were found on the surface of the fraction claim, and, in 1907, two 30-foot shafts were sunk on the deposit which is an extension of the Reddick deposit. On H.F. 405 a pit has been sunk on a calcite vein containing iron pyrites, copper pyrites,

and cobalt bloom. The wall rock is black slate. An old pit some 25 feet deep was also observed in the northwest corner of the claim. A few men were engaged in prospecting the surface in 1923.

Shaver (L. 5413, 5414, 6625, 6623, 5415, 6624, and H.S. 267).—John Shaver has been carrying on development work near the northeast corner of Larder lake since 1906. Most work has been done on claim L. 5413, formerly H.S. 185, which adjoins the Reddick and Chesterville. The early work on this claim was done by the Lucky Boy Mining Company, which drove a tunnel 50 feet to connect with the bottom of a 50-foot shaft. An Ansell mill was installed and a few ounces of gold recovered; some of the ore came from the Chesterville fraction, H.F. 404. The Keewatin-Timiskamian contact crosses this claim and the Keewatin rocks are quite schisted, dolomitized, and impregnated with veins. Intrusive into the contact is a small lens of syenite or porphyry which



Remains of Lucky Boy plant, now Shaver claim, McGarry township.

is reported to show gold on analysis. Gold was seen in a vein some 200 feet east of this porphyry outcrop.

Cockshutt-McCallum.—This claim, L.S. 157 or H.F. 39, is situated east of Barber lake and at the east end of a large syenite porphyry mass which extends across McVittie and a part of McGarry township. In the altered Keewatin basalt schist are a series of large quartz lenses, heavily impregnated in places with pyrite and arsenopyrite. They strike N. 60° E. and dip 80° S. 30° E. A pit was sunk 12 feet on a crushed quartz containing much arsenopyrite and iron pyrites and numerous faults. Samples yielded low values in gold.

Gold has been panned from other claims to the northwest on the Jenner, Roy, and Richie claims.

Hearst Township

Harris-Maxwell (H.F. 182 and 183).—These claims, which belong to the Associated Goldfields, are situated at Larder village. More underground work has been done on H.F. 183 than on any other claim in the township. However,

only a very small amount of gold was recovered from the 40-stamp mill, a few stamps running at a time from September, 1912, to May, 1913. The mill was dismantled in 1923, and parts of it will be used on the Associated Goldfields' Costello property at Pancake lake. On H.F. 183, a vertical shaft has been sunk approximately 500 feet, and 3,000 feet of drifting and crosscutting has been done on the 320- and 420-foot levels, together with some diamond-drilling. The workings are largely in dolomitized diorite porphyry, intersected by irregular quartz and calcite veins carrying pyrite and, in isolated places, some galena, tourmaline, and gold.

Gold King.—These claims (H.F. 140 and 141) adjoin the Harris-Maxwell on the southeast. On the north part of claim H.F. 141 is an east-west dike of diorite porphyry, some 300 feet in width, with Keewatin on the north and Timiskamian conglomerate with numerous jasper pebbles on the south. A portion of the dike on the north contact is quite acid, porphyritic, and aplitic, and contains numerous flat, nearly parallel, quartz veins carrying iron pyrites, copper pyrites, specular hematite, and gold. A tunnel was driven through some 50 feet of Keewatin, and the porphyry and quartz were obtained at a depth of 50 feet below the surface showing.

Thib (L. 8012, formerly C.E. 16).—Eli Thib has made several test pits and open-cuts in an altered feldspar porphyry stockwork containing much iron pyrites, some copper pyrites, and a little coarse gold. The deposit, which occurs on the southern part of Enright point near the narrows on Larder lake, is 75 feet wide and 200 feet in length and is surrounded by water on three sides.

About one mile and a half south of Enright point, on the east shore of the west bay of Larder lake, is a conspicuous quartz vein, 6 feet in width, which runs along the shore in a northeasterly direction for 200 feet. The owner of this vein is unknown to the writer.

McLaren (L. 8072 and 8216).—Cutting the Keewatin on the Finley McLaren claims in northwest Hearst township are several irregular dikes of aplite, syenite, and porphyry, which in places are cut by quartz stringers and contain iron pyrites with some specular hematite and green carbonate. Gold colours may be panned from two of the dikes, and samples across considerable widths are reported on good authority to yield about \$1 gold per ton. Higher values over narrow widths were stated to have been obtained.

B.G. 219.—On B.G. 219, which is situated on the west boundary of Hearst township, are some narrow quartz and calcite veins carrying galena, zinc blende, iron pyrites, and numerous angular inclusions of the wall rock, Keewatin diabase. Some galena samples showed a few ounces of silver on assay. This may be the deposit referred to by M. E. Wilson as claim B.G. 229.¹

Larder Combined (H.S. 903, or No. 2717[?], etc).—This is one of the original mining companies of Larder lake, which owns several patented mining claims along Sharp creek in the southeast corner of the west arm of Larder lake. Most of the work has been done on claim H.S. 903, on an iron formation band in Keewatin pillow lava. At the main shaft, the dump consists of fine-grained massive pyrite with occasional quartz and dolomite stringers carrying a little pyrrhotite and magnetite. An 8-pound sample, which was roughly representative of the dump, yielded on analysis 43 per cent. of sulphur and 40 cents of gold to the ton. No work has been done on the property for the past ten years. Massive pyrite, several feet wide, was also seen at a 6-foot pit on claim H.S. 913, in the southeast part of the township.

¹ Geol. Surv. Can., Mem. 17, 1912, p. 56.

Cook.—The Cook claims, Nos. 3943, 4041, 6743, and 6741, are situated along the boundary between the townships of Hearst and Skead. The rocks consist of bands of rusty weathered carbonate, green schist, and sediments, intruded by porphyry of which the general strike is N. 35° W. Most work has been done in Hearst township near the boundary line on claim 3943. Here the white-weathering porphyry and the rusty carbonate are traversed by numerous stringers of quartz striking N. 38° E. and varying from an inch to a foot in width. The cross stringers are in places connected by other stringers, affording a stock-work structure. The quartz carries in places iron and copper pyrites and the carbonate carries some pyrite near the quartz veinlets. A trench 100 feet in length has been blasted across the various formations to a depth of about six feet. Selected samples from various parts of the workings show gold on analysis.



LEGEND

PLEISTOCENE

Glacial and Recent
 Drift-covered areas.

PRE-CAMBRIAN

Keweenaw (?) or Matachewan (?)

Diabase.

Algonian

Aplite, syenite and porphyry.

Timiskaming

Greywackés, etc.

Keewatin

Banded chert (on claim 12581).

Rusty weathering grey and green carbonate schist with minor amounts of serpentine differentiated from the serpentine schist.

Serpentine-carbonate schist in places out by numerous quartz veinlets.

Green schist, andesite, basalt and diabase, in places showing pillow structure and altered, in part to chlorite-carbonate and serpentine schist.

Symbols

Road.

Building.

Strike and dip of strata or schist.

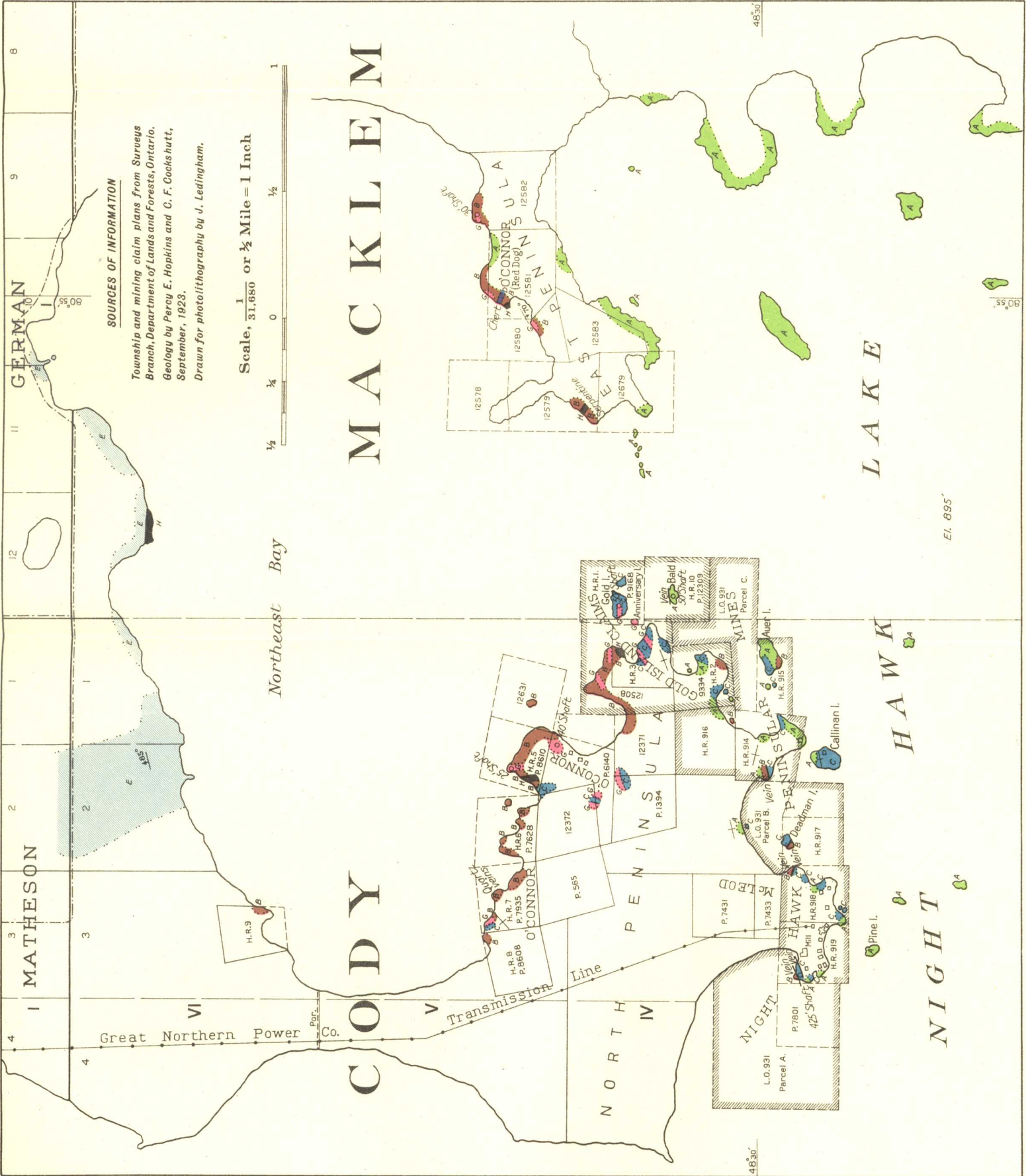
Strike and vertical dip of schist.

Geological boundary, defined.

Geological boundary, assumed.

Shaft or prospect pit.

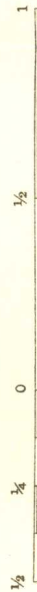
Vein.



SOURCES OF INFORMATION

Township and mining claim plans from Surveys Branch, Department of Lands and Forests, Ontario. Geology by Percy E. Hopkins and G. F. Cocks hutt, September, 1923. Drawn for photolithography by J. Ledingham.

Scale, 1/31,680 or 1/2 Mile = 1 Inch



NIGHT HAWK PENINSULAR AREA

To accompany report by P. E. Hopkins in Ontario Department of Mines Report, Vol. XXXIII, Part 3, 1924.

Night Hawk Lake Gold Area

By Percy E. Hopkins

Introduction

Visible gold was discovered in narrow quartz veins cutting pink aplite and rusty carbonate¹ on Gold island, Night Hawk lake, in the summer of 1907. This resulted in prospectors extending some ten miles to the west during the following two years and discovering the Porcupine gold camp, which has produced \$113,000,000 in gold up to the end of the year 1923. Prospecting has also been carried on, in and around Night Hawk lake, since 1907, but, owing to much water and overburden, progress has been slow. During 1923, one mine, the Night Hawk Peninsular, adjoining Gold island, began producing gold bullion and should be a producer of gold for years.

The earliest reference to gold on Night Hawk lake was made by A. A. Cole in 1907.² The writer was with A. G. Burrows in 1910 and 1911 when he spent two weeks on the lake, the results of which are given in the reports on the Porcupine gold area.³ The writer also spent a week during September, 1923, in examining the workings of the Night Hawk Peninsular mine and the geology in that vicinity. A map of the area, No. 33c, on a scale of half a mile to the inch, accompanies the report.

The writer is indebted to A. R. Globe, manager of the Night Hawk Peninsular mine, and to his staff and others, for their many courtesies extended to him and to his assistant, C. F. Cockshutt. The accompanying maps were compiled by Mr. Cockshutt.

Location

Night Hawk lake is situated in the northeast part of Ontario about ten miles east of Porcupine. The several properties on the shores of Night Hawk lake can be reached by gasoline boat from Connaught station on the T. and N.O. railway. The Night Hawk Peninsular, the only producer in the area, is supplied with hydro-electric power and has long-distance telephone service.

General Geology

Night Hawk lake is a large body of shallow water, fourteen miles in length, which probably represents a remnant of Lake Ojibway formed during the retreat of the Labrador ice-sheet. The shores are covered with twenty-five feet or more of stratified clay and sand which were formed in this large glacial lake. About the only rock outcrops in the area are on the islands and along parts of the shore where the drift has been washed away. The surface of these rocks is smooth, polished, and striated as the glaciers left them. On the whole the surrounding country is very flat.

The rocks, which are pre-Cambrian in age and consist largely of Keewatin, may be classed as follows, the youngest occurring at the top:—

KEWEENAWAN (?):	Diabase.
MATACHEWAN (?):	Diabase.
ALGOMAN:	Aplite, syenite, and porphyry dikes.
TIMISKAMIAN:	Greywacké, conglomerate, etc.
KEEWATIN:	Banded chert (on claim 12581).
	Rusty-weathering grey and green carbonate schist with subordinate amounts of serpentine differentiated from the serpentine schist.
	Serpentine-chlorite-carbonate schist.
	Greenstone schist (andesite, basalt, diabase, and tuff, altered in part to chlorite, carbonate, and serpentine schist).

¹ Rusty carbonate or grey carbonate throughout the report refers to a rock consisting largely of dolomite, ankerite, or some similar carbonate.

² Ont. Bur. Mines, Vol. XVI, 1907, p. 220.

³ Ont. Bur. Mines, Vols. XX, XXI, and XXIV.

Greenstone Schists, etc.—Basic lavas showing the usual pillow and amygdaloidal structure are common. On the whole these greenish rocks contain large percentages of chlorite, carbonate, and serpentine, and are frequently quite schistose. The more altered phases are described below. One of the freshest samples of Keewatin seen is a diabase occurring on the shore of the lake 150 yards southeast of the cook-house at the Night Hawk Peninsular mine. Under the microscope can be seen feldspar laths surrounded by hornblende, chlorite, magnetite, etc. In the carbonate-schist zone on the 425-foot level of the Night Hawk Peninsular mine, 100 feet south of the shaft, is a narrow band of altered greenish-grey lava containing much carbonate, chlorite, feldspar, quartz, and other secondary minerals. This is typical of a large part of the Keewatin greenish lavas, while in other places chlorite schist prevails. In places there is some agglomerate resembling conglomerate and tuffs resembling slate.

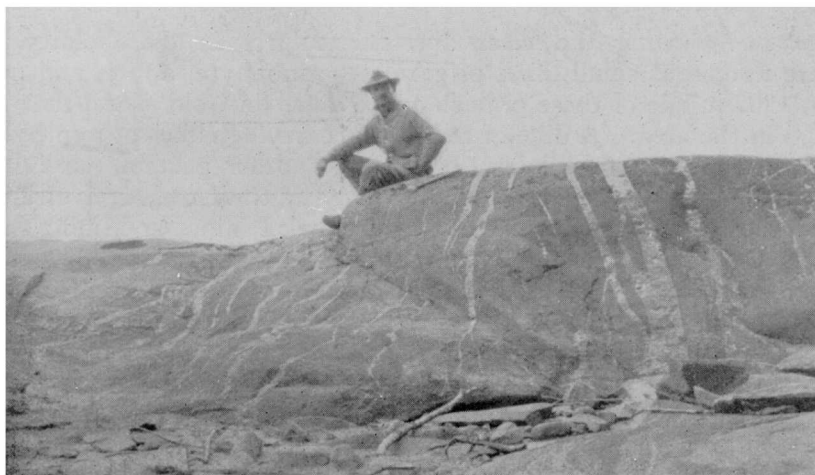


Glaciated surface, Night Hawk lake.

Serpentine-Chlorite-Carbonate Schist.—This type of rock, which usually contains over fifty per cent. of serpentine and chlorite and about fifty per cent. of carbonate, forms the north wall of No. 1 vein on the Night Hawk Peninsular mine on claim H.R. 919. The rock also occurs almost continuously along the shore line for one and a half miles to the northwest of Gold island, and also along the water's edge on the north side of "East Peninsula" and elsewhere. The carbonate may occur as layers, or as disseminated rhombs and patches, throughout the schist; the serpentine and chlorite as streaks in the carbonate. The serpentine, in places, as on the southwest end of Auer island, is clearly chloritized and serpentinized greenstone. The rocks containing the highest percentages of serpentine are found on claims 12579 and 12581 on East peninsula.

These serpentines may be altered peridotites which have intruded the adjoining Keewatin pillow lava. The serpentine, or the rocks from which it originally came, may have been responsible for the gold. At any rate, the changing of peridotite to serpentine would result in faulting and schisting and the circulating of serpentine solutions. Somewhat similar serpentine-carbonate schist occurs with the ore bodies on the Paymaster and Ankerite properties at Porcupine, the Crown Reserve at Larder lake, and the Otisse at Matachewan. The percentage of carbonate increases at times, so that it is difficult to tell in the field whether the rock should be mapped as chlorite-serpentine-carbonate schist or as carbonate schist. Numerous grains of quartz and pyrite are also present.

Rusty-Weathering Carbonates.—These rusty-weathering brown, grey, blue, and green carbonate schists have a wide distribution on the north peninsula of Night Hawk lake and are important, since ore bodies occur in them. The rocks contain about ninety per cent. of dolomite or other carbonate, with small amounts of serpentine, chlorite, feldspar, sericite, and quartz. They are usually cut by irregular quartz veins, some of which are auriferous. The carbonate rocks are



Ferruginous carbonate intersected by quartz stringer, Night Hawk lake.

in places quite green, owing to the presence of ferrous iron and chromium; these rocks are called "green carbonates." Similar rocks are common at Larder lake, Porcupine, West Shiningtree, and many other places. One may find green carbonate with streaks or layers of brown carbonate, as on the island directly east of Gold island and on the point to the northeast of Deadman island.

The origin of the rock is doubtful. Certain carbonate bands may have been chemically deposited or interbedded with the lava flows similarly to the cherts. A grey carbonate band containing ninety-five per cent. of carbonate lying next an unaltered green Keewatin diabase showing pillow structure may be seen at the Night Hawk Peninsular mine. At other points, e.g., a quarter of a mile southwest of Bald island and on a reef north of Deadman island, the carbonate schist contains ellipsoidal markings, showing that the original rocks were altered basic lavas. The veins may have been responsible for some of the carbonate solutions. However, the presence of veins on the Night Hawk Peninsular mine in the contact between dolomite and basic schist containing small quantities of carbonate, and the presence of carbonate rocks with no

veins in them, would lead one to infer that the veins were not in all cases responsible for the carbonate. The writer believes that some of the carbonate solutions came from the peridotite or serpentine.

Chert and Tuff.—A twenty-foot band of chert with serpentine walls occurs on claim 12581. The chert, which is more or less in narrow layers standing vertically, has been fractured and the fractures filled with chlorite, quartz, and occasionally some gold. Narrow bands of tuff were also observed in various places.

Timiskaming Series.—These rocks, which extend across the Porcupine gold area, skirt along the north shore of Night Hawk lake for two miles. They are described by A. G. Burrows as follows:¹—

Greywacké, with strike east and west and dip 85° N., occurs on the N.E. shore of Night Hawk lake. In the greywacké are thin beds of conglomerate containing pebbles of dark green Keewatin rock, numerous quartz pebbles, and some felsite. Some of the pebbles are six inches in diameter, which is larger than the average of the pebbles in the conglomerate. A sample of the greywacké examined under the microscope consists of angular fragments of quartz and feldspar with finer particles of the same materials and chlorite, sericite and limonite.

These sediments are cut by a dike of grey olivine diabase, as shown on the map.

Algoman.—Cutting the Keewatin, particularly in the vicinity of Gold island, are numerous small dikes of granite, granophyre, aplite, and porphyry. It was in 1907 in one of these pinkish aplite dikes on Gold island that gold was first found in the area. A dike of red aplite, carrying cubes of iron pyrites and cut by auriferous quartz veinlets, occurs on another part of the Gold island claim H.R. 3, namely, on the mainland directly southwest of Anniversary island. This dike was diamond-drilled by the Night Hawk Peninsular Mining Company, and values of \$5.00 gold per ton were reported across 27 feet. This rock, which is felsitic in texture, is composed almost wholly of albite with scattered rhombs of calcite and numerous cubes of iron pyrites. A red dike from the Pettipher claim near the three-mile post on the west boundary of Thomas township is, according to A. G. Burrows, essentially quartz and albite and a micrographic intergrowth of these minerals. Mr. Burrows found the chemical composition of this granophyre dike to be as follows:²—

	Per cent.
Silica	59.42
Alumina	17.86
Ferric oxide	3.46
Ferrous oxide	1.59
Lime	2.61
Magnesia	1.15
Potash	0.60
Soda	9.60
Carbon dioxide	2.61
Water	0.43
Sulphur	1.66
Total	100.39

Gold was also found in other dikes in the northeast bay of Night Hawk lake and on the Smith and O'Connor claim in the south bay of the same lake, as well as in McNeill, Cleaver, and other townships to the south. The dike on claim H.R. 7 is a coarse grey granite containing much secondary calcite and a little chlorite and iron oxide. A 25-foot shaft has been sunk on a similar dike with less quartz on H.R. 5. In the Night Hawk Peninsular workings the acid dikes

¹ Ont. Bur. Mines, Vol. XXIV, pt. 3, p. 21.

² Ont. Bur. Mines, Vol. XXIV, pt. 3, 1915, p. 28.

are rare; there were noted, however, dikelets of grey aplite or granophyre two inches in width cutting the green and grey carbonate schist in several parts of the workings. A sample from the east face of No. 2 drift on the 425-foot level was seen under the microscope to contain quartz, plagioclase, feldspar, orthoclase, carbonate, and pyrite. This dikelet also had hair-like veins of white quartz cutting through it. An altered grey porphyry appears to be associated with No. 7 ore body. Typical red aplite dikes are associated with the ore near Deadman island, as indicated by diamond-drilling.

As was pointed out by Mr. Burrows, there is apparently a genetic relationship between these acid dikes and the auriferous quartz veins which represent the final solidification of the porphyry magma. It must not be overlooked, however, that the serpentine may have had some bearing on the genesis of the ore deposits. The No. 1 deposit of the Night Hawk Peninsular mine occurs along the contact of serpentine and carbonate schists. The quartz is greenish in colour, due to inclusions of chlorite and serpentine. Gold also occurs in a twenty-foot band of chert in serpentine on the O'Connor claim, No. 12581. Visible gold has been found in quartz veinlets in serpentine schist on the McEachern claim, P. 8610. Gold may also be obtained on assay from mineralized serpentine on the O'Connor claim, No. 7935. If the basic rock were originally a peridotite, there would be an increase in volume when it changed into serpentine, causing movement in the serpentine and the formation of schists in the adjoining rocks. The serpentine and carbonate solutions would also extend into the adjoining rocks for hundreds of feet, which has been the case. Therefore, the serpentine may have been responsible for some of the gold in the area.

Keweenawan (?).—Four narrow dikes of diabase were noted in the area cutting the serpentine schist and the Timiskamian sediments. The dike cutting the Timiskamian sediments on the north shore of Night Hawk lake is a grey olivine diabase probably of Keweenawan age.

Matachewan (?).—A dike of diabase, four feet wide and containing large altered greenish phenocrysts, cuts the black serpentine on claim No. 12579, about one mile east of Gold island. A similar porphyritic diabase dike cuts the serpentine-carbonate schist on the mainland directly west of Gold island. These dikes resemble the diabase of Matachewan age at Gowganda and Matachewan.

Description of Properties

Night Hawk Peninsular Mine

The Night Hawk Peninsular Mining Company owns claims H.R. 914, 915, 916, 917, 918, 919, and P. 7801, comprising 266 acres on a large peninsula at the north end of Night Hawk lake, Cody township. In addition, the company has a license of occupation for the 248 adjoining acres under the bed of the lake, shown by three parcels, A, B, and C, or L.O. 931. Extending across these claims and over a mile in length, is a pronounced schist zone with branches in which important gold discoveries have been made and some ore bodies developed. The mill plant, buildings, and shaft are all located on claims H.R. 919 and 918 which are on a prominent peninsula on Night Hawk lake, eleven miles from Connaught station.

Most of these claims were staked in 1907 by Chas. Auer, following a gold discovery on Gold island to the northeast. Two years later, Rev. Mr. Paradis tried to facilitate prospecting on his claim, some three miles to the north, by lowering the water on Night Hawk lake. This was accomplished by making a small cutting in the clay bank next High falls (50 feet drop), in lot 8, concession I,

Mann township.¹ As a result High falls wore back far enough to drain the south half of Frederick House lake and to lower Night Hawk lake at least three feet. The cutting down of the stream would have extended back much farther towards Night Hawk lake had not an artificial dam been built across the Frederick House river at Connaught station to prevent further wearing back, and for the purpose of maintaining the upper Frederick House river and Night Hawk lake in a navigable condition. During the interval, when the water on Night Hawk lake was somewhat lower, gold was found in a quartz vein where the shaft is now located on the No. 1 vein. During 1916-17, an option was acquired on this property by W. Hatch, a shaft put down about eighty feet, and some drifting done, after which the option was dropped.

A. R. Globe and J. Callinan obtained an option on these and adjoining claims, and development work has been in progress ever since. The Night Hawk Peninsular is now a producing mine with a 200-ton mill, substantial veins, and workings 625 feet in depth.



No. 1 shaft, Night Hawk Peninsular mine, with mill under construction, September, 1923.

Striking roughly east and west across claim H.R. 919 is a belt some 300 feet in width, of green and grey carbonate schist in which are found certain ore bodies. No. 1 vein occurs at the northern edge of the schist zone next a blackish serpentine-chlorite-carbonate schist which in all probability extends for hundreds of feet to the north under an area largely covered with drift. The southern part of the schist zone is composed of Keewatin, namely, metabasalts, chlorite schist, etc. Minor amounts of greenish chlorite and other schists occur in the carbonate-schist zone. Seven veins have been located in this zone, and at present No. 7 is the most important.

No. 1 deposit is a quartz vein, some 20 feet wide, and upwards of 180 to 200 feet in length, which has been developed from the surface to the 425-foot level by a vertical two-compartment shaft and by four levels, viz., 80, 180, 300, and 425 feet. The levels are also connected by raises. No. 1 vein occurs largely along a contact between black serpentine-chlorite-carbonate schist and greenish carbonate schist, and the best values occur where there is a marked curve or bay in the contact. The shoot dips vertically and rakes about 45° to the east. The quartz is highly brecciated and contains numerous veinlets of almost transparent quartz, in some of which gold was seen. The quartz is

¹ Ont. Bur. Mines, Vol. XXVIII, pt. 2, pp. 42-43.

greenish in colour, due to inclusions of chlorite, talc, and serpentine. Pyrite is the chief sulphide; much of the gold is visible. Barite was also recognized, and much chlorite is present.

Farther south, in the carbonate-schist zone and on the lower levels, veins Nos. 2, 3, 4, 5, 6, and 7 have been developed, some of them for a considerable length. These veins are of a different type, consisting largely of mineralized schist with irregular quartz masses similar in character to the ores of the Porcupine camp. No. 4 vein is largely white quartz carrying considerable gold. No. 7 ore shoot is the most important one to date.

The various levels may be briefly described as follows: On the first level, depth 80 feet, vein No. 1 has been drifted on for 150 feet in a N. 70° E. direction; on the second level, 180 feet, the vein contains encouraging quantities of gold for a length of 100 feet. The vein splits up into several stringers where it enters the serpentine on the east. It is possible that the serpentinous rock is like the lamprophyre at Kirkland Lake in that it is a soft rock which did not lend itself to fractures. At the west end, the ore apparently lies against a pre-mineral fault which strikes about north and south and dips 40° to the east. However, the vein fracture has been traced southwesterly for some distance beyond this north-south fault.

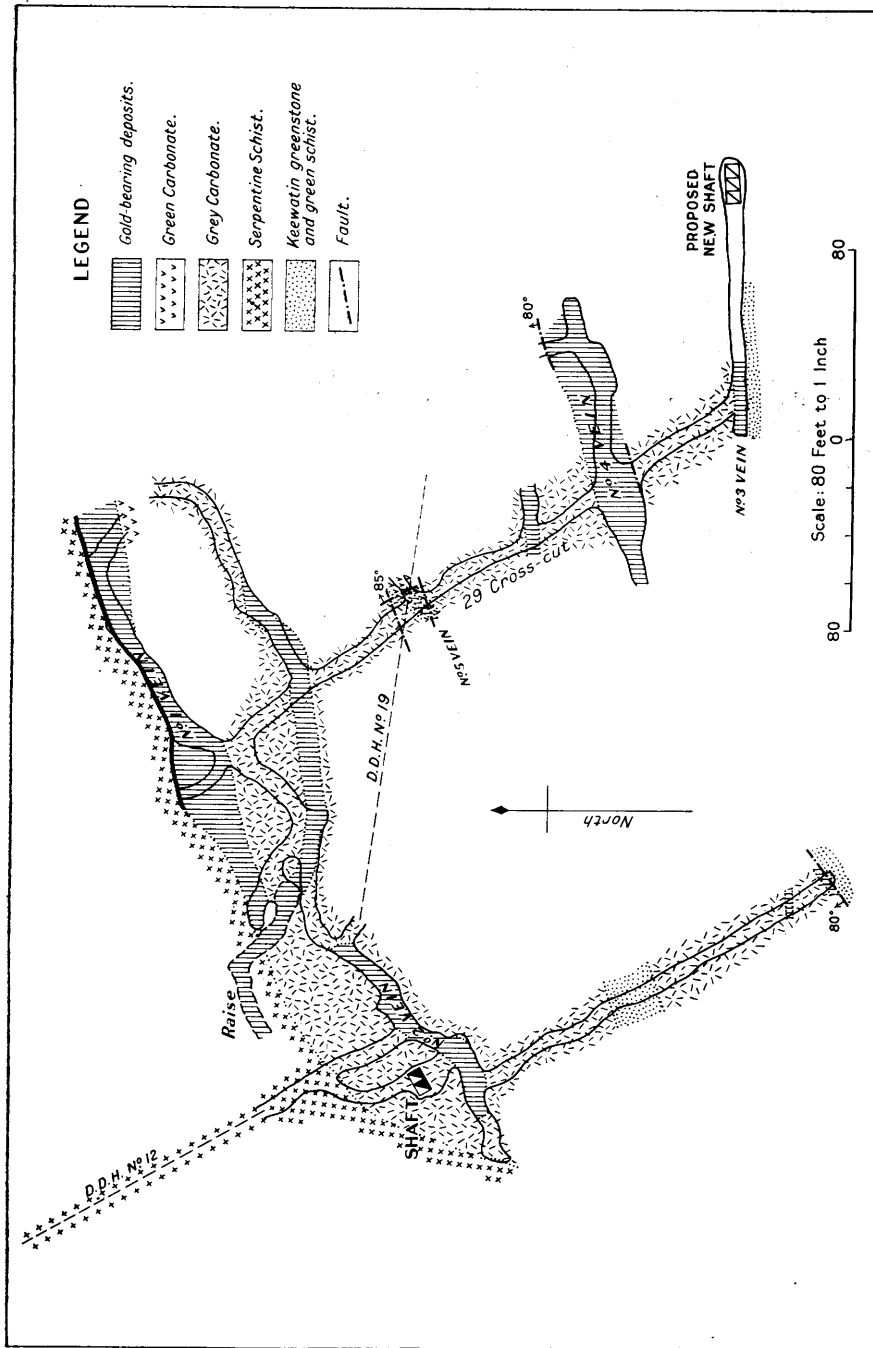
On the third level, depth 300 feet, No. 1 vein likewise occurs largely east of the north-south fault which dips 40° E.; however, some values extend for 50 feet to the west of the fault. Some 300 feet still farther to the west, some gold-bearing quartz was encountered along the No. 1 vein fracture. Veins Nos. 2, 4, and 5 have been drifted on for considerable distances on this level, vein No. 4 being the most important at present. The latter vein has an average width of 6 feet for a considerable length. Vein No. 6, and probably No. 7, has also been located.

All seven veins have been crosscut on the 425-foot level, which at present is the best level in the mine. No. 4 vein is 18 feet in width in one place and is reported to carry ore of a fair grade. A raise has been put through to the 300-foot level showing that the vein dips 60° S. In the schist are small lenses of quartz and numerous veinlets of very fine-grained pyrite. A winze has been put down on this vein to the 525-foot level, and another winze is down to the 625-foot level. No. 7 ore deposit is siliceous carbonate impregnated with pyrite and quartz.

The mine is operated by hydro-electric power supplied from Indian chutes. Excellent buildings have been erected and long distance phone service is installed. A. R. Globe has been succeeded by W. E. Segsworth as general manager.

Gold Island Claims

Belonging to this group are five claims, Nos. H.R. 1, 2, 3, 10, and P. 12508, situated in the vicinity of Gold island in the northeast part of Night Hawk lake; and also claims Nos. 12578, 12579, 12580, 12583, and 12679, three-quarters of a mile to the east. In the summer of 1907, visible gold was discovered in narrow quartz veinlets, cutting aplite and rusty carbonate on Gold island, mining claim H.R. 1. On Gold island, a 50-foot shaft has been sunk on the aplite, and some work has also been done on veins in the adjoining rusty carbonate. The assay office, plant, and other buildings were burned. About 1917, these claims were optioned to Messrs. Campbell, Fairburn, and Carmichael, who sank a 50-foot shaft on H.R. 10, on a small Keewatin island known as Bald island. From this depth there was driven 50 feet to the north a crosscut which



encountered a narrow schist quartz vein. This narrow vein, which outcropped at the surface at the water level, contained some gold. Later, the claims were optioned to the Night Hawk Peninsular company which also dropped the option after doing some diamond-drilling. Several diamond-drill holes were sunk on an auriferous aplite dike occurring on H.R. 3 situated on the mainland a few hundred yards southwest of Gold island. It was reported that \$5.00 gold per ton was obtained across 27 feet. This dike is heavily mineralized with cubes of iron pyrites and intruded by quartz veins in which gold can be seen. Samples of it resemble portions of the Costello vein on the Crown Reserve at Larder lake and parts of the Kirkland Lake deposits; the Gold island red aplite is not so altered. A similar aplite with visible gold occurs on Anniversary island, a small island 100 yards to the northeast. The claims are now under option to J. Callinan.



Granite dike cut by quartz veins on the O'Connor claim, Night Hawk lake.

McLeod (P. 7431 and 7433).—These claims, which are entirely drift-covered, adjoin the two main Night Hawk Peninsular claims on the north. In 1922, they were optioned to a syndicate which put down a diamond-drill hole. This hole showed 45 feet of stratified clay lying on top of the rock. The rock core was not seen by the writer.

McEachern (P. 8610).—Gold was seen in quartz veinlets cutting serpentine schist at the water's edge on claim P. 8610.

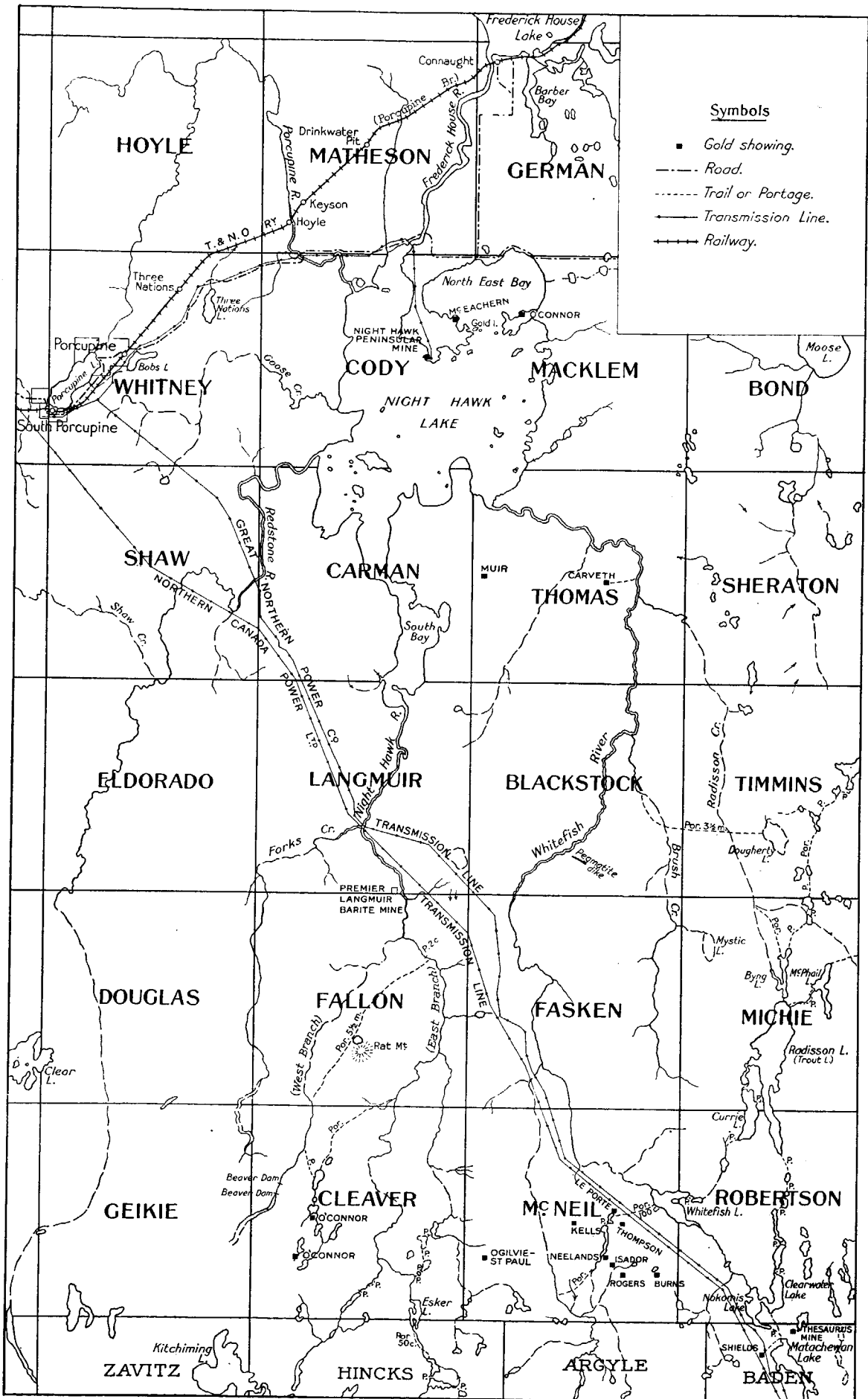
O'Connor (H.R. 6, 7, 8, and P. 6140).—These claims were optioned to the Sterling Development Company in 1923, and 1,000 feet of diamond-drilling was done in the vicinity of a 40-foot shaft on P. 6140. The serpentine-chlorite-carbonate schists, which are exposed as a fringe along the shore line, are heavily impregnated with iron pyrites and in places cut by a regular stockwork of quartz veins, some of which show gold on analyses. Bismuthinite was recognized from a quartz vein on a point near the central part of H.R. 7.

D. O'Connor also has gold in quartz veinlets cutting a 20-foot zone of chert on claim P. 12581, known as the *Red Dog*.

Gold occurs in quartz stringers cutting rusty carbonate on the north line of Thomas township, some two and a half miles east of Night Hawk lake.

Murr.—Gold is reported on the Murr claim No. 67634, which lies one and a quarter miles south of Night Hawk lake in Thomas township.

Carveth.—On the Carveth claim, No. P. 7583 in the central part of Thomas township, a 25-foot shaft has been sunk on a mineralized felsite dike and quartz which cuts various types of Keewatin rocks, namely, green banded dacite tuffs, containing bombs and resembling greywacké, and green carbonate-serpentine-chlorite schists. The schists have also been impregnated by quartz and pyrite. Much diamond-drilling has been done. A track was being laid from the river landing to the property (50 chains) for the purpose of handling freight.



Key map connecting Night Hawk with Cleaver, McNeil, and Matachewan gold areas.

Notes on Gold in McNeil and Other Townships

By Percy E. Hopkins

Introduction

In June, 1923, three Indians, named Isador, Micmack, and Tom Fox, discovered gold in McNeil township, which lies between Matachewan and Night Hawk lake, district of Timiskaming. This resulted in the staking of some 400 mining claims in McNeil township and the finding of several gold-bearing veins over a wide area. The writer spent ten days in September, 1923, in examining certain deposits in Baden, McNeil, and Cleaver townships and then proceeded north to Night Hawk lake to make an examination of the Night Hawk Peninsular mine. An insert map has been prepared to show the relative positions of the townships. Maps on a large scale have been made of the areas in the vicinity of McNeil township and around the Night Hawk Peninsular mine.

Topography

The topography of the eastern part of McNeil township is fairly flat, there being a few rocky knolls occasionally 50 feet in height, but the western part, like that of Cleaver, is more rugged. Only the boundaries of these townships have been surveyed; these outlines were run in 1910 by C. H. Fullerton, O.L.S. The transmission lines of the Great Northern and Northern Canada Power Companies were built across McNeil township to Porcupine in 1923 and 1924, respectively.

Geology

The oldest rocks are dominantly Keewatin basic lavas, having the ellipsoidal and amygdaloidal texture with subordinate amounts of rhyolite flows. Owing to the overburden of soil and green bush, the structure is difficult to solve. The flows, however, in some instances strike east and west and dip nearly vertically.

Intruding these rocks, generally in an east-west direction, are narrow dikes of felsite, granophyre, mica lamprophyre, quartz porphyry, and feldspar porphyry, probably of Algonian age. Most of these varieties may be seen in one trench 400 feet long at the west end of Tom Fox lake. An andesitic porphyry containing much disseminated iron pyrites and numerous quartz veinlets occurs on the Neelands claim, No. 9791. On the Ogilvie-St. Paul claim, No. 10065, the intrusive has the nature of a granophyre. A diorite porphyry occurs on the claim to the southeast. Of all these intrusives, the felsite is the most common type. It is a massive, even-grained rock which is grey, green, or pink in colour. In places, the surface is highly decomposed to a depth of one or two inches, owing to the large amount of iron pyrites and ferruginous carbonate present. Under the microscope, the rock is seen to consist of crystals and spherulites of feldspar and quartz in a very fine groundmass of quartz, feldspar, sericite, and probably dolomite or ankerite. Intersecting the felsite in places are numerous quartz veinlets which contain visible gold.

Large areas of granite and Cobalt sediments occur in adjoining townships. A few narrow dikes of diabase of Matachewan or Keweenawan age were noted.

Gold Deposits

McNeil Township

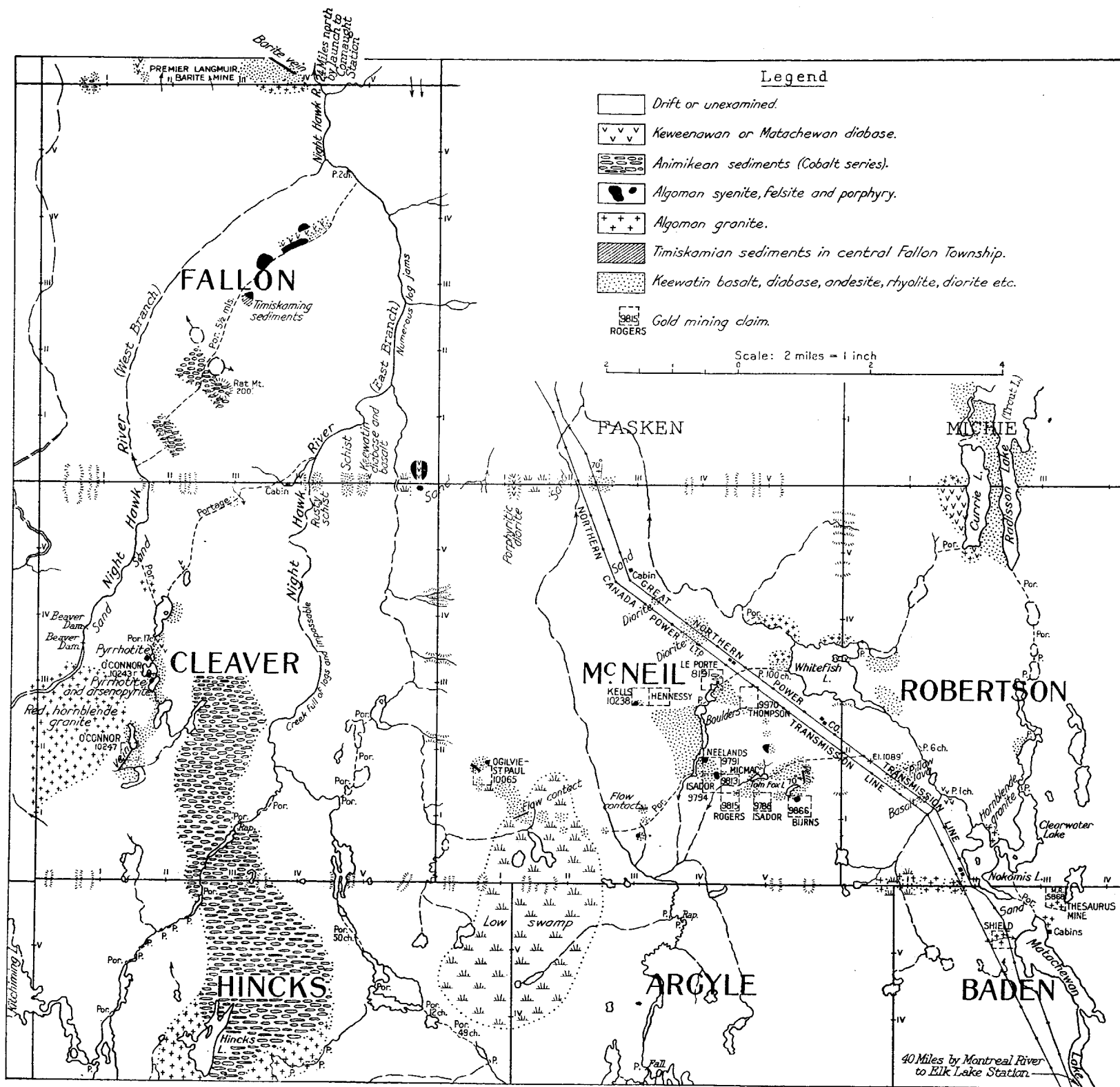
The gold is widespread, having been found on at least twenty claims in McNeil township and also in Cleaver township. Undoubtedly numerous other showings will be found. Most of the discoveries to date have been made in quartz veinlets having a nearly north-south trend across east-west dikes of felsite. Occasionally the gold-bearing quartz veinlets pass from the felsite into the adjoining Keewatin for several hundred feet as, for example, on the Rogers claim, 9815. Up to the present the richer showings have come from a 5-inch quartz vein in Keewatin diabase on the Rogers claim. The felsite dikes, as a rule, contain much iron pyrites; the visible gold occurs adjacent to the pyrite cubes in the quartz veinlets. In most cases the veins are too small



Narrow quartz vein carrying spectacular gold showings on the Rogers claim, No. 9815, now a part of the Jowsey-Segsworth group, McNeil township, September, 1923.

to work separately at a profit; however, in a pit on the Micmack claim, 9813, the veins are closely spaced and most of them carry visible gold. One might be rewarded by searching the north-south valleys for large shear zones. A large shear zone striking northwest-southeast in Cleaver township, with gold occurring in a 15-foot granophyric dike in the zone, has been found by Dan O'Connor.

The *McNeil Syndicate* which is controlled by W. E. Segsworth and R. Jowsey has taken over 12 claims in the vicinity of the original discoveries and has proceeded with considerable surface exploration. On the Isador claim, 9794, where the first discovery was made, the gold occurs in quartz veinlets



SKETCH MAP OF MCNEIL, CLEAVER, AND FALLON TOWNSHIPS.
 Geology of southern part from map No. 1793, Geological Survey of Canada, revised by P. E. Hopkins, 1923.

in felsite; most of the veinlets strike N. 30° W. The Isador dike has been located on the Micmack claim, 9813, and on the Neelands claim, 9790, to the east. On claim 9813, some 400 feet to the south of the Isador, gold has been found in a similar felsite dike, locally known as the "Scotch dike." An additional 400 feet to the south on claim 9813, a pit is being sunk on an "eight-foot" felsite dike carrying much pyrite, quartz, and gold. About 20 per cent. of the dike at the shaft is composed of quartz veinlets striking N. 20° W. and dipping 70° N. 70° E. Considerable gold was seen associated with large cubes of pyrite in the quartz. The richest showings were found by D. Oliver in the northeast corner of claim 9815. Some gold nuggets, the size of beans, came from a lenticular quartz vein from one to six inches wide in Keewatin diabase. Calcite,



Visible gold occurs in porphyry associated with the large dome of quartz shown in the background, O'Connor claim, 10247, Cleaver township, September, 1923. Mr. Dan O'Connor is the central figure in the illustration.

dolomite, chlorite, and pyrite are also present, and the wall rock is quite rusty due to the oxidization of the pyrite and carbonate. Gold has also been found on the Neelands claims, 9791.

A trapper named Le Porte, who has lived in McNeil township for ten years, has discovered gold in a felsite dike cutting Keewatin ellipsoidal basalt on claim 8198.

Similar showings have been found on several other claims in McNeil township, namely, the *St. Paul* (9861), *Burns* (9866), *Kells* (10238), *Hennessey* (10021), and *Ratford-Taylor* (9931).

Cleaver Township

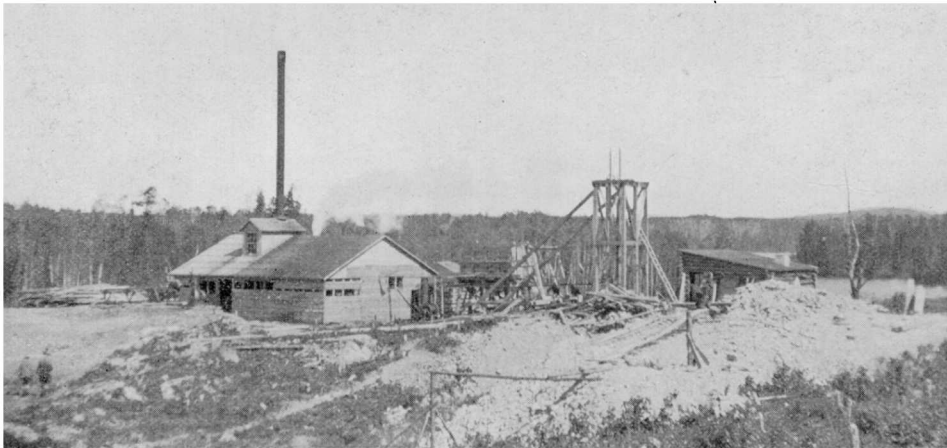
On *O'Connor claim, 10247*, running across the claim in a N. 30° W. direction, is a basalt schist zone containing large lenses of quartz and dikelets of syenite felsite, pegmatite, and porphyry, pointing to a genetic relationship between

the veins and the granite. Gold was observed in quartz veinlets cutting a narrow syenite dike in this shear zone. Much iron pyrites is disseminated throughout the whole deposit.

On *O'Connor claim, 10243*, a pit has been sunk on an altered iron formation band containing pyrite, limonite, mispickel, galena, zinc blende, copper pyrites, cobalt bloom, quartz, and calcite.

Baden Township

Thesaurus, M. R. 5868, etc.—In 1920, James Nelson discovered gold on M.R. 5868 on the northeast shore of Lake Matachewan. Eight or more claims have been grouped under the name of Thesaurus Gold Mining Company. When A. G. Burrows¹ described the property in his report on the Matachewan Gold Area, the shaft was down 12 feet; it is now 300 feet in depth, and 300 and 100 feet of lateral work have been accomplished on the 100- and 300-foot levels, respectively. The shaft follows the vein at an angle of 85° south for a depth of 41 feet, after which both the vein and shaft are vertical. At the shaft there



Shaft house and plant, Thesaurus gold mine, Baden township, looking northeast, September, 1923.

is a zone, 200 feet in width, of altered rusty mica granite resembling protogene. This zone contains considerable disseminated pyrite, numerous quartz veinlets, and phases resembling quartz porphyry and felsite. The main east-west fracture on which the shaft has been sunk contains primary white quartz and a secondary greyish and bluish quartz carrying much iron pyrites, some copper pyrites, zinc blende, native gold, chlorite, carbonate, and molybdenite. Many of these minerals frequently occur as thin seams in the quartz. The quartz lenses are from 10 to 30 inches in width, and the adjoining granite is highly altered, brecciated, and silicified. Visible gold, usually in a state of fine division, was found at frequent intervals throughout the workings. A few faults were encountered on the 100-foot drift to the west; to the east of the shaft, the vein has been intruded by a 30-foot dike of diabase of Matachewan age.

Shields Claim, 6078.—About in the line of strike of the Thesaurus vein and one mile to the west, W. J. Shields has located in a creek bed a vein comprising angular blocks of banded quartz carrying pyrite in a sheared green porphyritic rock.

¹Ont. Dept. Mines, Vol. XXIX, pt. 3, 1920.

Lightning River Gold Area¹

By Cyril W. Knight

Introduction

A discovery of native gold in quartz having been reported in the Lightning River area on what is known as the Seagers claim, at the northwest corner of Holloway township, the writer was instructed by Thos. W. Gibson, Deputy Minister of Mines of Ontario, to visit and examine the new occurrence. An examination was carried out during the latter part of August and early in September, 1922, at which time about sixty men were in the area.

The Seagers claim, No. 10080, is about four miles north of the Cochenour claim, No. 7135, on which gold was discovered by Messrs. Howey, Cochenour, and Willans in August, 1917.

The Lightning River gold area is in the district of Cochrane, south of upper Lake Abitibi, and includes the townships of Holloway and Harker, six miles south of the lake. The area is now easy of access. Most prospectors enter it by way of the village of La Reine, in the Province of Quebec, and on the Canadian National railway, 72 miles by rail east of Cochrane, Ont. There is hotel accommodation at La Reine. At the time of our visit the Canadian Mining Syndicate, now the Abitibi Mines, was running, four or five times a week, a 35-foot covered gasoline boat from La Reine down the Okikodosik river, across upper Lake Abitibi, and thence about six miles up the Lightning river to a dock. From this dock a rough "jumper" road, about two and a half miles long, has been constructed to the Seagers claim. Numerous trails have been cut recently by prospectors in the northwest part of Holloway and the northeast part of Harker townships.

In the winter season the quickest way to enter the area is by a winter road from Ramore, a station on the Temiskaming and Northern Ontario railway, ninety-two miles north of Cobalt. The Ramore road only goes as far as the southwest corner of Holloway township, to the Cochenour claim, No. 7135, of the Lightning River Gold Mines, Limited. A trail, however, connects the Cochenour claim with the Seagers claim at the northwest part of Holloway township.

During 1922, there has been considerable activity in the Lightning River gold area, and many claims have been staked. For instance, the blue-prints, issued by the Ontario Department of Mines from the North Bay office on September 11, 1922, show that much of the east half of Harker and the west half of Holloway townships had been staked and recorded. To be exact, there were staked and recorded on this date, according to the blue-prints referred to above, 168 claims in the township of Holloway, nineteen of which had been surveyed by an Ontario land surveyor. In the township of Harker, 155 claims had been staked and recorded, of which number seven had been surveyed by an Ontario land surveyor. In Frecheville township, north of Holloway, twenty-two claims have been staked and recorded; while in Garrison township, west of Harker, four claims have been staked and recorded.

In a hurriedly written preliminary report of this nature, time does not permit the publication of a new geological map of the area. It is, therefore, advisable, if the report is to be read intelligently, to have the most recent blue-prints of Holloway and Harker townships; these may be obtained from the office of the Mining Recorder, Swastika, Ont. The coloured geological map,

¹ This report was first issued in mimeograph form in September, 1922.

No. 28b, of the Abitibi-Night Hawk gold area, issued in 1919, should also be obtained from the Ontario Department of Mines, Toronto, Ont.

Acknowledgments

During the examination, the writer was accompanied by D. G. H. Wright, to whom he is greatly indebted for many suggestions and helpful discussions in connection with this brief report. To Russell Cryderman, also, the writer wishes to express his thanks for cheerfully guiding him to many claims on which work was done. It may be added that Mr. Cryderman prospected in this area in 1908 and staked some ground near what is now known as the Seagers claim.

The writer wishes to express his thanks to the Canadian Mining Syndicate, now the Abitibi Mines, for many courtesies shown, and particularly to I. W. C. Solloway, who has been associated with this syndicate. Thanks are also due to the Lightning River Gold Mines, Limited, with which company are associated Messrs. Howey, Cochenour, and Willans.

The assays and chemical determinations were made in the Ontario Provincial Assay Office, by W. K. McNeill, Provincial Assayer, and T. E. Rothwell.

History of the Area

Prospectors are said to have explored in the Lightning River area in the years 1907 and 1908, at which time some ground near the Seagers claim was staked. Included among the pioneers were Russell Cryderman, Wm. Cooper, and Wm. Woodney. In those days, however, it was difficult to get capital interested in that part of the country, remote and somewhat inaccessible as it was. Moreover, prospecting for silver was more fashionable then than it is now.

In the year 1917, Messrs. Howey, Cochenour, and Willans, working north-eastward from Kirkland lake, discovered in August of that year, a vein of gold-bearing quartz at the southwest corner of Holloway township on what subsequently became known as the Cochenour claim, No. 7135, of the Lightning River Gold Mines, Limited. As a result of that discovery, the Ontario Bureau of Mines the following year decided to make an examination of the area. Mr. A. G. Burrows and the writer were instructed to report on and geologically map in a general way the Lightning River area, particularly that section in the vicinity of the Cochenour claim.¹

An inclined shaft dipping at an angle of 23 degrees was sunk on the Cochenour vein to a depth of 70 feet; at a depth of 50 feet, the vein is reported to have passed from a basalt lava flow into a rhyolite flow. The quantity of gold in the vein is said to have decreased when the vein entered the rhyolite. This constitutes the main work which has been done on the Cochenour.

Recently a claim known as the Meridian claim, No. 7247, in Harker township, about a mile and a half west of the Cochenour, has been attracting attention, and a shaft has been sunk to a depth of 48 feet. The deposit on this claim is described elsewhere in this report.

Finally, the discovery this year on the Seagers claim of a vein of quartz containing rich gold specimens, about four miles north of the Cochenour, has aroused new interest in the area.

¹"Abitibi-Night Hawk Gold Area," by C. W. Knight, A. G. Burrows, P. E. Hopkins, and A. L. Parsons, Ont. Bur. Mines, Vol. 28, pt. II, 1919. Map No. 28b, "Gold Area Between Lakes Abitibi and Night Hawk," scale 2 miles to the inch, accompanied this report.

Rocks of the Lightning River Area

Most of the rocks of the Lightning River gold area belong to the Keewatin series and consist of lava flows. In the south part of Holloway and Harker townships, at the properties of the Lightning River Gold Mines, Limited, the lava flows have been studied and mapped in some detail by the geologists of the Ontario Department of Mines. Fourteen flows have been recognized, having a combined thickness of 4,400 feet. Most of the flows are dark green basalts or andesites, but a few are pink rhyolites. The flows have been tilted up into almost vertical positions, dipping steeply south and striking westward.

At the north end of Holloway and Harker townships, prospectors during this year have discovered half a dozen small outcrops of conglomerate, greywacké and slate. These rocks probably belong to the Timiskaming series and are younger than the Keewatin lava flows. Owing to the heavy overburden of clay, sand, and gravel, the extent of these sediments is not known. They strike westward and dip at steep angles. The conglomerate contains pebbles of feldspar porphyry, red jasper, and chert of various colours. Some fine-grained greenstone and green schist pebbles also occur.

The great intrusion of diabase or gabbro of Ghost mountain is about five miles long and a mile wide. It is in all probability younger than the Timiskaming sediments, and Haileyburian in age.

Finally intrusions of feldspar porphyry and quartz porphyry cut the Keewatin and Timiskaming series and presumably the diabase or gabbro of Ghost mountain. In the Lightning River area, these porphyry intrusions do not seem to be numerous, only a few small dikes having been found. However, the drift is so widespread that it is quite possible there are large intrusions of these "gold bringers." Great masses of syenite and granite occur in Garrison and Harker townships. The geology, as briefly outlined in preceding paragraphs, may be summarized in the following table, the older rocks being shown at the bottom of the column:—

ALGOMAN SERIES:	Feldspar porphyry, quartz porphyry, syenite, granite.
HAILEYBURIAN SERIES:	Diabase, gabbro and serpentine of Ghost mountain.
TIMISKAMING SERIES:	Conglomerate, greywacké, slate.
KEEWATIN SERIES:	Basalt, andesite, dacite, rhyolite.

Running in an east and west direction through the north end of Holloway and Harker townships, is a belt of schistose rocks. This belt of schist consists of Timiskaming sediments and Keewatin basalts greatly sheared. The belt extends along its strike for at least three or four miles, and disappears below the drift toward the west. It may be said to occupy, in a general way, the valley of the Teddy Bear river, most of the shearing having taken place on the north side of the valley.

While the lava flows in the south parts of Holloway and Harker townships have been tilted up into vertical positions, and therefore considerably disturbed, they are not, except in rare instances, altered to schist. Nor is the diabase and gabbro intrusion of Ghost mountain at the north end of these townships rendered schistose.

The Teddy Bear valley, bounded as it is on the north by the towering Ghost mountain and on the south by hills of little altered lava flows, forms the centre of prospecting activity at the present time.

Dome Mines Conglomerate

The discovery this year in the Lightning River area of Timiskaming sediments, consisting of conglomerate, greywacké, and slate, raises the question as to the relation of the gold deposits of northeastern Ontario to these belts of sediments.

Beginning at the Dome mine in Porcupine, there is a belt of these sediments striking eastward for 16 miles, the last known outcrop being in German township. To the east for 27 miles, the rocks are almost entirely drift-covered. Then there outcrops another belt of the sediments, about 9 miles long, in the Croesus gold mine area. East of the Croesus belt for a distance of 22 miles, the rocks are again almost entirely drift-covered, until, in the Lightning River area, conglomerate, greywacké, and slate once more make their appearance in a few places. These three occurrences of Timiskaming sediments, namely, the Dome Mine, the Croesus, and the Lightning River, may belong to the same great east and west belt of deeply infolded sediments. In the year 1915, P. E. Hopkins suggested that the Croesus belt of sediments might be continuous with the Porcupine belt.

Two Great Gold Belts in Northeastern Ontario¹

From 25 to 40 miles south of the great belt of sediments referred to in the preceding paragraph is another important belt of similar rocks, of which the Kirkland Lake band forms the most important part. This south belt begins in Midlothian township, outcrops again in the Matachewan gold area, and is developed to the east in large volume in Kirkland lake and Larder lake. Over much of this belt, gold occurs.

Thus there may be said to exist in northeastern Ontario two main gold belts which contain the most important gold mines in the province. The belts are roughly parallel to each other and 25 to 40 miles apart. Each is in the neighbourhood of 70 miles in length, and each follows a belt of Timiskaming sediments consisting of conglomerate, greywacké, and slate. Occurring in or near the northern belt of sediments are the Dome and other mines, the nearby Hollinger mine, the Croesus and the gold prospects of the Lightning River area. The south band includes the Matachewan, Kirkland Lake, and Larder Lake deposits.

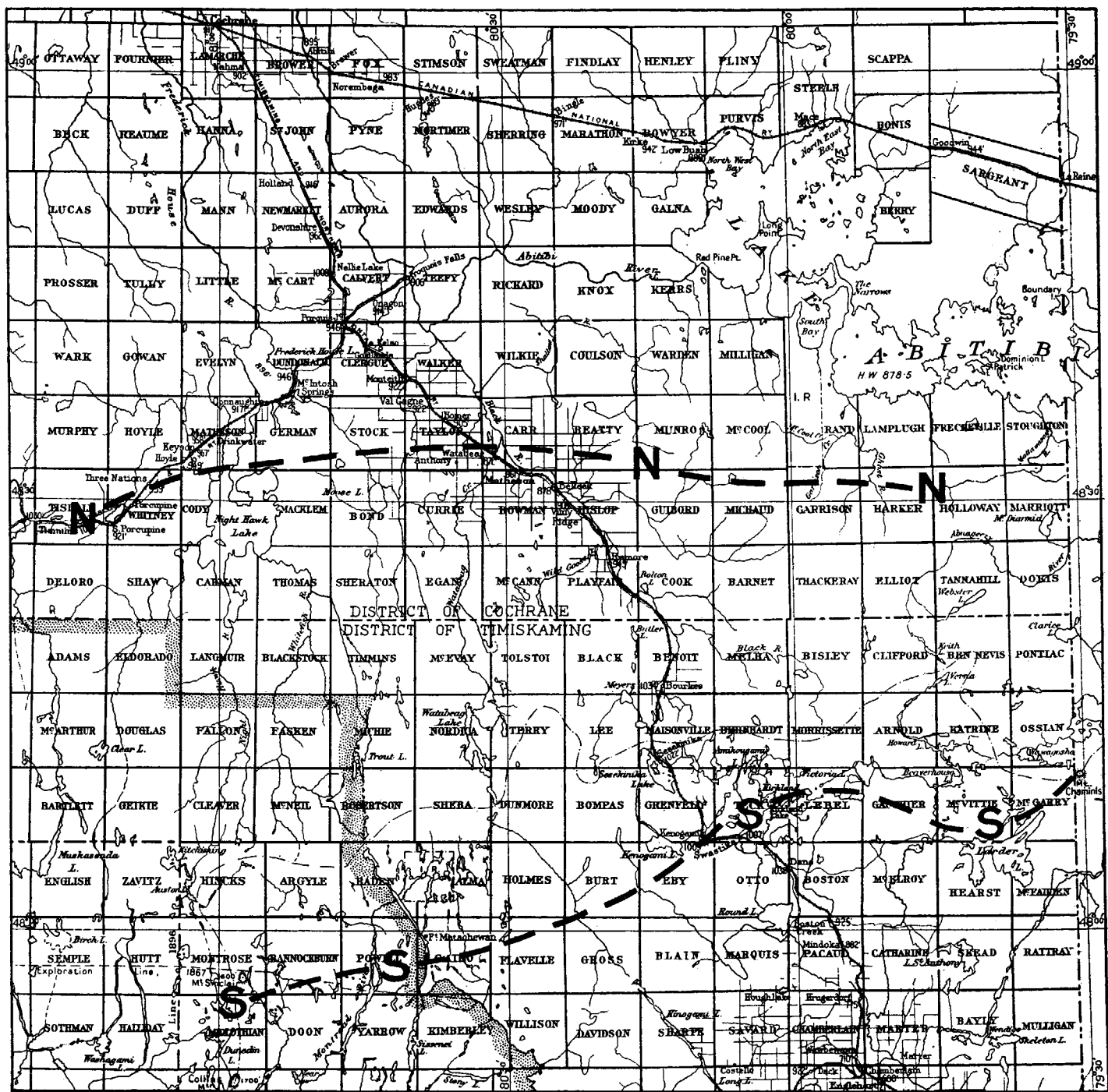
As is well known, the beds of sediments on these two belts have been mapped almost entirely by A. G. Burrows and P. E. Hopkins.

Why Gold Follows Timiskaming Belts

Some years ago, the Provincial Geologist of Ontario, Dr. Willet G. Miller, drew attention to the relation of the gold deposits of northeastern Ontario to belts of conglomerate, greywacké, and slate of the Timiskaming series.

In emphasizing the broad general relationship between belts of Timiskaming sediments and gold deposits, it is not meant to underrate the immense influence which intrusions of feldspar porphyry and quartz porphyry have played in the formation of the gold deposits. In the prospector's mind is indelibly fixed the importance of these porphyries. "No porphyry, no gold." But the occurrence of gold in or near the two great belts of Timiskaming sediments is a matter of fact, not of theory.

¹ See insert key map. North belt occurrences are marked "N" and south belt "S." See also general geological map No. 22h, "Sudbury-Cobalt-Porcupine."



Scale: 12 miles = 1 inch

12 8 4 0 12 24

Key map of part of Northern Ontario extending westerly from the Quebec boundary and showing general position of the northern and southern gold belts. The letter "N" appears for the Porcupine, Munro, and Lightning River areas, and "S" for Midlothian, Matachewan, Kirkland Lake, and Larder Lake.

Viewed from this angle, the Lightning River gold field assumes a new importance as a prospective gold area. Therefore, to the prospector we would say: Explore for feldspar porphyry and quartz porphyry intrusions in or near these great belts of sediments. Incidentally it may be mentioned that there is a band of Timiskaming sediments 25 or 30 miles north of the Lightning River area, in Steele township on the shore of Lake Abitibi, which may be worth prospecting.

The Seagers Claim

The discovery which is attracting attention at the moment is near the northwest corner of Holloway township on claim No. 10080, about three-quarters of a mile south of Ghost mountain. This claim is known as the Seagers claim. Gold was first found on it in February, 1922, by Wm. S. Seagers, who obtained the precious metal by panning. Subsequently, the claim was optioned by the Canadian Mining Syndicate, now known as the Abitibi Mines; and after some stripping and blasting were done, a narrow vein of gold-bearing quartz was discovered in July. From this vein specimens of native gold have been obtained.

The discovery was made on a low, flat hill, the country rock of which is fine-grained basalt, with a light grey colour on fresh surfaces, but with a rusty brown colour on weathered surfaces. While the rock is much altered and impregnated with rusty-weathering iron carbonate, it is not, however, schistose. The hill has been trenched and stripped to a considerable extent, and some shallow pits have been blasted in the rock. In these pits it may be seen that iron pyrites in small crystals impregnates the country rock, but it cannot be said that the rock is heavily mineralized with pyrite. The rusty brown colour of the rock on weathered surfaces appears to be due more to the oxidation of iron carbonate than to the oxidation of iron pyrites.

This hill is intersected by numerous quartz veins varying in width from fractions of an inch to two or three feet. The vein from which the rich specimens of native gold have been obtained averages a few inches in width, bulging at one place to 15 or 20 inches. It is in the widest part of the vein that most of the native gold occurs. The vein strikes south about 20 to 25 degrees west, dipping, apparently, at an angle of about 45 degrees eastward. It was exposed for about 50 feet at the time of our visit, but a greater length was said to have been uncovered in a trench, which was full of water at the time of examination. The vein strikes southward into low, drift-covered ground.

Iron pyrites occurs sparingly in the vein, but is more abundant in the country rock. Traversing at angles of 45 to 90 degrees across this vein are stringers of white quartz, varying in width from fractions of an inch to an inch or two in width.

Native gold in a quartz vein was also said to have been obtained from a nearby pit on this hill. The pit was full of water at the time of the examination.

In various places on the hill, fine gold may be obtained by panning the rusty brown, oxidized material.

Some of the quartz veins contain feldspar and tourmaline. It may be noted, also, that the country rock contains in places a brilliant, emerald green micaceous mineral which was tested for chromium by W. K. McNeill, Provincial Assayer. Mr. McNeill found no trace of chromium, but believes, judging from tests which he made, that the green colour is due to ferrous iron.

An interesting feature of the Seagers occurrence is that an outcrop of conglomerate of the Timiskaming series occurs less than two hundred yards away, on claim No. 10082, about five chains south of the northwest corner near the west boundary line.

The Seagers claim is the only one in the north part of Holloway and Harker townships on which we saw native gold, although gold could be obtained by panning oxidized material elsewhere in this section. At the south part of these townships, however, native gold is known to occur over a wider area.

Four log cabins have been erected by the Canadian Mining Syndicate, now the Abitibi Mines.

The Meridian Claim

While the main object of our visit to the Lightning River gold area was for the purpose of examining the Seagers claim, a visit was also paid to the Meridian claim at the southwest part of the township of Holloway, about three and a half miles south of the Seagers claim. The Meridian claim, No. 7247, in Harker township, is so named because the gold deposit on it intersects the east boundary of that township; this boundary line was surveyed as a meridian line some years before Harker township was surveyed, and the meridian line was subsequently used as the east boundary of the township.

The gold deposit on the Meridian claim was described by A. G. Burrows in 1918.¹ At that time the claim was known as the "Cochenour, in Harker township." Very little work had been done on the claim. Recently a shaft has been sunk on the ore body to a depth of 48 feet. The shaft is located about 200 feet west of the east boundary of the claim. It may be seen that the ore body dips steeply to the south and strikes about westward.

The ore body consists of a shear zone in basalt which has been impregnated with fine-grained iron pyrites. The average width of this pyritic zone is about three or four feet; in places, its width is five or six feet or more. Very little quartz is to be seen. The rock on the dump from the shaft is not schistose, so it may be judged that the shearing was not intense. The rock appears to be slightly silicified, and impregnated with a little rusty-weathering iron carbonate. A little finely divided native gold has been found in the pyritic zone. A grab sample of the material on the dump from the shaft was taken by the writer and assayed by T. E. Rothwell of the Ontario Provincial Assay Office, and found to contain \$9.60 of gold per ton. The deposit is covered immediately to the west of the shaft by a swamp and drift, said to extend some distance to the westward. This is a promising claim.

The deposit passes on the east into the Taylor-Horne claim, No. 7261, in Holloway township. On this claim a quartz vein six to eight inches wide occurs in the shear zone, and some native gold has been found in the vein. Mr. A. G. Burrows has noted the presence of pyrite, copper pyrites, zinc blende, and galena in the vein, and some selected material obtained by him from the vein gave on assay \$4.40 in gold.

The deposit on the Taylor-Horne and Meridian claims has a length of more than three hundred and twenty-five feet. As stated above it passes at the west end under swamp and drift.

In March, 1922, the Temiskaming Testing Laboratories at Cobalt made some tests on a shipment of 1,820 pounds of ore from the Meridian claim. The ore was submitted by the Lightning River Gold Mines, Limited. The laboratory found that the shipment contained 0.7 ounces, or \$14, of gold, and 4.6 ounces of silver per ton.

¹ "Abitibi-Night Hawk Gold Area," by C. W. Knight, A. G. Burrows, P. E. Hopkins, and A. L. Parsons, *Ont. Bur. Mines*, Vol. 28, pt. II, 1919, pp. 49-50.

After carrying out certain amalgamation and cyanidation tests on this shipment, the Temiskaming Testing Laboratory reached the following general conclusions:—

1. Amalgamation will give a recovery of about 75 per cent. of the gold.
2. Cyanidation will give a recovery of about 95 per cent. of the gold.
3. Amalgamation and cyanidation combined will give about 95 per cent. recovery of the gold.
4. Whatever method is adopted, fine grinding will be necessary.

There do not appear to be any interfering elements, and even with fine grinding very little slime is formed, so that the ore is an ideal one to cyanide. Tests by water concentration on a Wilfley table indicate that the gold is probably associated with the pyrite.

Claims Near Seagers Claim

Prospectors have been attracted by a belt of schists and other less highly sheared rocks which strike westward across the north part of Holloway and Harker townships. The Seagers claim is on this belt. During our visit we examined several claims along the belt where either the rock or the ore deposits might prove of interest, and a few notes may be added regarding these claims, beginning with the most eastwardly one visited, namely, No. 11013, in Holloway township. We are indebted to Thomas O'Neill for his kindness in guiding us to this claim. At the northeast corner of the claim, considerable stripping has been accomplished and some blasting has also been done. The rock here is a rusty-weathering, iron carbonate schist, striking west 10 to 20 degrees south magnetic, and dipping steeply to the north. Narrow stringers of quartz and iron carbonate containing a little iron pyrites intersect the country rock. The country rock also contains a little iron pyrites. Fragmental material was noted in one place, but the rock is too much altered to determine its true character.

West of this claim about three-quarters of a mile is the "east" Remo claim, No. 8246, in Holloway township. At the northwest corner of this claim, a tunnel has been driven southward into the side of a hill, a distance of 35 feet. The tunnel intersects a rusty-weathering brown schist impregnated with iron carbonate, striking westward and dipping 80 degrees to the south. A few stringers of quartz about an inch in diameter occur parallel to the strike and dip of the schist. A curious occurrence of dull-looking graphite is found along a few shear zones in the schist.

West of here about a quarter of a mile, some work has been done on "west" Remo claim, No. 8247, in Holloway township, at the north part of the claim near the trail. A vein of quartz from a few inches up to two feet in width has been found, occurring in an altered basalt impregnated with rusty-weathering iron carbonate.

Two claims west of the "west" Remo, the Mining Corporation of Canada, Limited, has done some stripping in several places on claim No. 10476, in Holloway township. On the north part of the lot, a schistose pillow lava has been stripped for a length of 100 feet and a maximum width of 40 feet. The schist dips almost vertically. A few small stringers of quartz up to six inches in width occur. A minor fault follows the strike of the schist. Gold has been panned in the rusty oxidized material. On another part of the claim, where stripping has been done, the massive rock has a pale mauve colour and is impregnated heavily with iron pyrites. At the southeast corner of the claim a

trench 100 feet long and 10 feet wide has revealed finely-bedded slate of the Timiskaming series, striking N. 73° E. and dipping steeply to the north. In places these slates are highly contorted.

On the claim immediately to the north, No. 9864, in Holloway township, there is an outcrop of schistose, fragmental-looking rock, at the southwest corner of the claim at the roadside. This claim is owned by the Mining Corporation of Canada, Limited.

On the contiguous claim to the west, No. 9863, in Holloway township, near the southwest corner, on the south boundary line, there is an outcrop of a grey rock resembling a feldspar porphyry on weathered surfaces. Seven thin sections of this rock were examined under the microscope, and it was found that the rock is too much altered to identify positively. In the meantime, until further stripping is done, or new outcrops found, the rock may be tentatively classed as a feldspar porphyry. Crushed schistose porphyries and schistose greywackés are often difficult to distinguish.

On the claim contiguous to the west, No. 9862, in Harker township, there is, near the southeast corner, an outcrop of quartz porphyry which is locally known as the "Cooper dike." This rock was said to have been found some years ago by Wm. Cooper. The quartz porphyry is in contact with a grey, vaguely banded, siliceous rock resembling certain phases of "iron formation."

The claim immediately to the south, No. 10084, in Harker township, known as the Manwell, contains an outcrop of a rock resembling conglomerate. The outcrop is about 500 feet west of No. 1 post, and 25 feet south of the north boundary line. The pebbles and fragments are mainly of feldspar porphyry and green schist. The rock has been sheared, and the fragments are more or less flattened. It is of doubtful origin, and only a small outcrop is visible.

Cornering at the northwest on the claim referred to in the last paragraph, is claim No. 10531, in Harker township. Some heavy trenching and shallow blasting has been done by the Teddy Bear Syndicate on an outcrop of rusty-weathering, iron carbonate rock, which is intersected by a net-work of white quartz stringers varying in width from a few inches up to two or three feet. These white quartz veins with a background of the rusty-brown rock give the outcrop a striking appearance. A few grains of iron and copper pyrites were noted; and the occurrence of a dull-looking graphite may be put on record.

Six claims to the west, on claims Nos. 11347 and 11348, in Harker township, a white quartz vein, averaging about a foot in width, has been stripped from point to point across the two claims. It occurs in porphyrite which is not schistose.

Immediately south of these two claims, on claim No. 11267 known as the Compton-Pollard, in Harker township, some stripping has been done on a brown schist which is cut by many parallel quartz stringers. The schist contains much rusty-weathering iron carbonate. A shot had been put in revealing iron pyrites finely disseminated in the rock.

Four claims south of the Compton-Pollard, on the Roche claim, No. 11290, in Harker township, some work has been done. This property was examined by D. G. H. Wright, who reports that stripping, trenching, and a little blasting had been done. There is a disturbed zone 10 or 12 feet wide, striking east 5 degrees south magnetic, which is silicified and impregnated with iron carbonate.

About a mile south of the Seagers claim, a red feldspar porphyry dike has been discovered at the north end of claims Nos. 11009 and 11010. These claims are known as the O'Neill claims, and are in Holloway township. The dike is three to five feet in width, strikes about east and west, and appears to

have a nearly vertical dip. The occurrence is about 200 feet south of the north boundary line. The country rock is an altered basalt which is impregnated with iron pyrites at and near the dike. The dike has been stripped for about 300 feet and a few shots put in. The country rock appears to contain more iron pyrites than does the dike. Gold has been panned in the rusty oxidized material along the dike and in the country rock. A good trail has been cut from these claims northward to the Canadian Mining Syndicate claims.

Immediately east of the O'Neill claims, P. A. McDermott has done a little work on claims Nos. 11381 and 11382, in Holloway township.

South of the O'Neill claims, on claim No. 11313, in Holloway township, R. Reid has done some stripping. A narrow quartz vein occurs in basalt.

In Frecheville township, at the forks of the Lightning river, Wm. Dillabough has done a little stripping on the west bank of the river. The rock here is a light-coloured grey schist, with a greenish colour on fresh surfaces. The schist has a fragmental appearance due to the presence of light grey lenses of hard siliceous material set in a yellow matrix. Veins of quartz up to 20 inches wide occur parallel to the schist.

Summary

It has seldom been the custom of the Ontario Department of Mines to sample systematically the various deposits which the officers of the department examine from time to time. Consequently, in sizing up an area, it has been necessary to base an expression of opinion largely on geological structures, although the results of careful sampling by companies or individuals have frequently been available. In the case of the Lightning River area, the writer believes that, at the north parts of Harker and Holloway townships, the severe disturbance and alteration to which the rocks have been subjected are favourable to the deposition of gold ore and give promise of further discoveries being made. The finding by prospectors of a belt of schisted Timiskaming conglomerate may fairly be judged another point in favour of the occurrence of gold, since both in Porcupine and Kirkland Lake, the gold mines occur in or near these belts of Timiskaming conglomerates. The gold-bearing vein on the Seagers claim is but 500 feet distant from an outcrop of Timiskaming conglomerate.

At the south part of Holloway township, three and a half miles south of the Seagers claim, the Meridian claim is a promising prospect, if one may judge from the results of assays shown the writer.

Finally, while it should be noted that the occurrences of gold in the Lightning River area are in the prospect stage, the area is unquestionably worthy of further and more intensive prospecting.

Murphy, Hoyle and Matheson Townships

(Porcupine Gold Area)

By B. Rose

Introduction

Murphy, Hoyle, and Matheson townships are situated directly north of Tisdale, Whitney, and Cody townships, respectively. The producing mines of the Porcupine gold area are located in Tisdale township. Prospecting has not yielded any paying mines in Whitney, although gold values sufficient to justify considerable development have been found. The Night Hawk Peninsular mine is located in Cody township.

The field season occupied eight weeks, beginning July 23rd, 1923. During this time very efficient assistance was given by James L. Hall. Rainy weather throughout the season retarded the progress of the work. Before commencing work, six weeks were spent in the Porcupine gold area proper in assisting A. G. Burrows in his work there and in studying the general geology. The matter of this report is based largely on information gained by association with Mr. Burrows and from study of his reports.

The townships have been surveyed and subdivided into square mile blocks. The reconnaissance was carried out by following the cut lines and recording on township maps the locations of bed-rock outcrops. There may be many small outcrops away from the cut lines which were not seen and recorded, but in all cases where small elevations or the trend of observed outcrops indicated the possibility of others, examinations were made.

General Description

The area examined comprises three townships, each six miles square, Murphy, Hoyle, and Matheson, from west to east in the order of naming. It lies immediately north of the Porcupine gold area at $48^{\circ} 35'$ north latitude, and extends from approximately $80^{\circ} 56'$ to $81^{\circ} 20'$ west longitude, passing nearly through the centre of the three townships. It is situated on the Hudson Bay slope of northern Ontario, near the southern edge of the clay belt, and is drained largely by Porcupine river to Night Hawk lake, and thence by way of Frederick House river across the east part of Matheson township, the drainage being carried to Abitibi river. The western part of Murphy township drains directly to Mattagami river by small swamp creeks.

Porcupine river is navigable for canoes, and Frederick House river for canoes and motor boats. Both the railway and the highway from Porquis Junction to Timmins cut diagonally across Matheson township, crossing Porcupine river at Hoyle station and Frederick House river at Connaught station, a short distance east of the map area. A wagon road follows a ridge of sand and gravel hills northward, from Timmins to Big Water lake in the northwest part of Murphy township. A few branch roads lead to farms in Matheson township, but these are as yet very poor. There are a number of winter logging roads. By far the greater part of the area can only be reached on foot, but any part can be reached in one day or less from one of the routes.

The area has an average elevation of less than 1,000 feet above sea level, Porcupine lake, from which Porcupine river runs, being 910 feet, and Night Hawk lake, into which it drains, being 895 feet. In general, the country is flat with

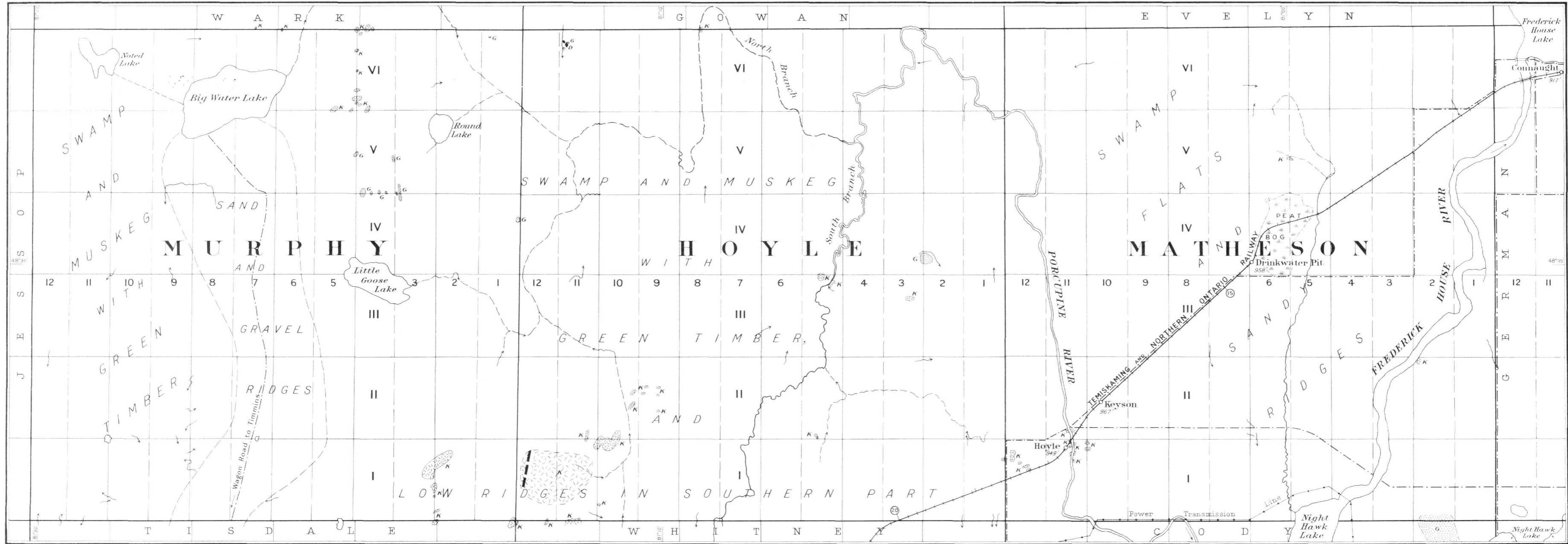


LEGEND

- PLEISTOCENE
Glacial and Recent
Boulder clay, stratified clay, sand, gravel and peat.
- PRE-CAMBRIAN
Keweenaw(?)
Diabase.
- Timiskaming
Greywacke and slate.
- Keewatin
Lava flows, agglomerates, tuffs and quartzites.

Symbols

- Road.
- Geological boundary, defined.
- Geological boundary, assumed.
- Railway with mileage from Porquis Junction.



TOWNSHIPS OF MURPHY, HOYLE AND MATHESON

To accompany report by B. ROSE in Ontario Department of Mines Report, Vol. XXXIII, Part 3, 1924.

Scale, $\frac{1}{63,360}$ or 1 Mile = 1 Inch.



some ridges rising 50 to 100 feet. The highest points are in Murphy township along the sand and gravel ridges which separate the headwaters of the swamp creeks of Porcupine river from those of Mattagami river. The altitudes here are probably less than 1,050 feet above sea level, but may in places be slightly more, as no accurate determinations of levels were taken.

Most of the area is covered with green timber of pulpwood size, but there is a great deal of alder swamp and muskeg. The timber includes white and black spruce, jack pine, birch, and poplar. The only portion which has suffered greatly from forest fires recently is the gravel and sand ridges in Murphy township, where a good growth of jack pine has been destroyed. Considerable pulpwood has been cut, particularly in the parts adjacent to Porcupine river, and the area will yield pulpwood for years to come, unless it is destroyed by fires.

Bed-rock outcrops, which to the south in Tisdale and Whitney townships make up a considerable portion of the surface, are here confined to a few scattered knolls just rising above the general level of the clay and other superficial deposits. As much of the superficial deposits are covered by timber and swamps, they can only be seen at a very few points, such as at the bends in Porcupine river or in pits along the railway.

The area as a whole is best suited for timbering and for farming. There are a few farms close to the railway in Matheson township, but as yet there is little cleared land. The timber is easy to clear and with proper drainage most of the area will make good farm land. The closeness to the railway and to the market of the Porcupine gold camp makes it a desirable area for homesteaders.

The area has, of course, been searched by prospectors, but there has been no mining development. A few pits and prospect trenches were noted in places, but there was nothing to warrant further expenditure on such outcrops as were observed by the writer.

Geology

The following legend refers to the rocks shown on the accompanying map and is made to conform with the terminology used by Mr. Burrows in his reports on the Porcupine gold area:—

PLEISTOCENE

GLACIAL AND RECENT..... { Superficial deposits of boulder
clay, stratified clay, sand,
gravel, and peat.

PRE-CAMBRIAN

KEEWEENAWAN..... Diabase dike.

Intrusive contact

TIMISKAMING..... { Interbanded slate and grey-
wacké, the whole largely
altered to schists.

Unconformity

KEEWATIN..... { A complex of basic to acidic
volcanic flows, agglomerates,
and ash rocks, with some
quartzitic sedimentary rocks,
the whole largely altered to
schists.

Pleistocene Deposits

Superficial deposits of boulder clay, stratified clay, sand, and gravel, left on the retreat of the continental glacier, mantle the surface, except for the few

small areas of bed-rock outcrops. It is difficult to delimit the deposits on account of the tree and swamp covering, but in general it may be said that the coarser deposits occupy the ridges and that the flats are underlain by stratified clay.

Two sandy ridges trending in a north-south direction occupy the main portion of Matheson township between Porcupine and Frederick House rivers, and on these and other small ridges there are many boulders. Coarse sand and fine gravel from one of these ridges at Drinkwater Pit station have been used for railway filling. The flats of this township are doubtless underlain by stratified clay.

Hoyle township is also probably largely underlain by stratified clay. There are a few small ridges towards the southern part, where gravel and boulder clay occur; but the township is in general flat and swampy, and where exposures can be seen along Porcupine river they are of the thinly bedded clay, typical of glacial lake deposits.

The major portion of Murphy township is like Hoyle township, but there is here a prominent belt of sandy ridges running in a north-south direction across the centre of the township on the divide between the creeks flowing towards Porcupine river and those flowing to Mattagami river. These ridges rise in places to 100 feet or more above the flats on each side and in general exhibit the knob and basin topography of ice-heaped material. Several of the basins are occupied by small lakes with no outflowing streams. The hills and basins are elongated in a north-south direction. Most of the material is coarse sand, grading to fine gravel, and in a few places it is stratified. There are on the ridges a few high glacial boulders. These ridges are neither typical drumlins nor kames, but are thought to be a combination of the two. They are, in part, outwash deposits from the front of a retreating glacier, and their shapes and location have been controlled either by a lobe in the front of the glacier in which they were deposited or by the bed-rock topography. They continue south-westward to the vicinity of Timmins, and the material of which they are composed is finer in this direction, suggesting that they are in part outwash deposits. To the east, they end rather abruptly in swampy flats, suggesting an ice front in this direction at the time of deposition. To the west they grade into swamps, and here there are sand flats, while to the north they gradually sink into swamp flats in the vicinity of Big Water lake. These sand ridges are of special importance, in that they are not likely to make good farm land but are well adapted for the growing of jack pine, a good stand of which has recently been destroyed by a forest fire.

Recent deposits consist of the filling of local hollows with surface wash from the ridges and of the accumulation of peat in the swamps and muskegs.

Pre-Cambrian

Although the bed-rock outcrops are few and scattered, they are in general easily correlated with similar rocks in the Porcupine gold area.

The following outline of their general characters and distribution summarizes the broad features, and a discussion of the mineral possibilities will be found in the concluding section.

Keewatin.—The Keewatin rocks are composed largely of volcanic flows. There is not sufficient outcrop to delimitate the extent of individual flows as has been done by Mr. Burrows in Tisdale and Whitney townships. At only one place was the brecciated top of a flow noted. Some of the flows show ellipsoidal or pillow-lava structure. The flows are roughly bedded in a northeast and southwest direction, and the rock has been highly schisted, the direction of

schistosity being more nearly in an east and west direction. The dips of both the bedding and schistosity approach the vertical, and in this they conform with that of the highly folded Keewatin rocks of the general region.

In the field, the flow rocks are commonly grey-green, fine-grained, and schistose, and microscopic examination shows them to be highly altered. There is in all the rocks a great deal of chlorite, sericite, and carbonates. It is almost impossible in most of the specimens examined to make out the original mineralogical composition and texture. Certain rocks show remnants of altered augite and plagioclase, suggesting a basalt composition, while others show small quartz phenocrysts in a highly altered feldspar and hornblende groundmass, suggesting an andesite or dacite composition. These rocks are so like those described by Mr. Burrows in his report on the Porcupine gold area that further description is not necessary here.

Coarser agglomeratic bands and very fine-grained ash rock are interbedded with the flows in places. Also, along the north boundary of Murphy township, two small outcrops of darker, highly schistose rock, apparently interbedded with the flows, were found on microscopic examination to consist mainly of fine quartz grains and considerable biotite, suggesting that here, at least, there is a small amount of sedimentary rock included in the Keewatin. One small outcrop of grey-green carbonate rock occurs on the line between lots 5 and 6, concession V, Matheson township. No serpentine and no iron formation, which are typical of the Keewatin in other localities, were noted in these townships.

Timiskaming Series.—The rocks of the Timiskaming series consist of interbedded greywacké and slate of light and dark grey colours. They are easily recognized in the field by their similarity to the greywacké and slate of Tisdale and Whitney townships, but here the greywacké makes up the larger part of the series, and there are only a few narrow bands of slate, while no conglomerate was noted in the series. The rocks, like those of the Keewatin, are highly altered and schisted. The bedding, the schistosity, and the dips are approximately the same as those of the neighbouring Keewatin rocks, and it would appear that the Timiskaming series was deposited on the Keewatin flows before they were greatly disturbed and that the two have been subjected to the same deformation and metamorphism.

Under the microscope, the rocks are seen to be highly altered with the development of carbonates, chlorite, and sericite. The greywackés consist of angular fragments of quartz and altered feldspar, while the slate is so fine-grained as to make it difficult to recognize minerals other than those of the alteration.

Both the Keewatin rocks and the rocks of the Timiskaming series are cut in many places by small quartz veins, and considerable pyrite occurs with the quartz and also impregnated in the surrounding schists. Tourmaline and epidote were also noted in some of the veins.

Keeweenawan(?).—One dark grey-green dike rock cuts Timiskaming sediments in lot 11, concession VI, Hoyle township. The outcrop is about 200 feet along the strike of the dike in a southeast-northwest direction, and its width is less than 100 feet.

In the hand specimen, the rock is seen to be made up of a finely crystalline mass of light grey and dark green minerals. These, under the microscope, were found to consist of altered plagioclase and fairly fresh augite crystals, with a diabase texture. This basic dike is here correlated with what Mr. Burrows calls the later intrusives, on account of its general similarity to these rocks, and accordingly its age is placed as Keeweenawan. It is the only bed-rock

outcrop of post-Timiskaming age in the area, and lies in intrusive contact with the Timiskaming sediments. It is of no economic importance, other than as a possible source of road material.

General Structure and Distribution of the Pre-Cambrian Rocks

The few isolated outcrops of bed rock are distributed in a way which suggests that the major structure of the area is that of a large syncline whose axis trends in a general northeast-southwest direction and whose trough is occupied by rocks of the Timiskaming series, while the arms are flanked by Keewatin rocks.

A general survey of the accompanying map will show this three-band distribution of the rocks. The Keewatin rocks on the northwest flank of the syncline are located in the north part of Murphy township, while on the southeast flank they extend from the southeast part of Murphy township across the south half of Hoyle township to Matheson township, where only Keewatin rocks were noted. Between these two bands, the rocks of the Timiskaming series occupy the trough of the syncline, in the east central part of Murphy township and in the north half of Hoyle township. If this interpretation be correct, the major structure is similar to that in Tisdale and Whitney townships to the south, where a syncline of Timiskaming rocks flanked by Keewatin rocks lies in a nearly parallel position. No contact of the two rock series was noted, as the outcrops of each occur as isolated knolls. While it is assumed that there is an unconformity between the two series, this assumption depends on the nature of the contacts as observed in nearby areas. The general strike of the rocks of both series is the same, parallel to the axis of the assumed syncline. This supports the idea of a major fold to explain the distribution of the rocks.

Mineral Possibilities of the Area

On account of the proximity of the area to the producing mines of the Porcupine gold camp, the mineral possibilities are largely limited to the chance of finding gold in paying quantity.

The most significant thing about the rocks, from an economic standpoint, is that no outcrops of the intrusive porphyries of post-Timiskaming age with which the gold of the Porcupine camp is associated were noted. While there are quartz veins in both the Keewatin and Timiskaming rocks whose deposition may be associated with the deposition of the gold-bearing quartz veins of the producing area, these are too far removed from the main porphyry intrusions to be likely to carry gold values in quantity sufficient to justify mining.

Pyritized schist and pyrite in quartz veins were noted at many localities, but the quartz veins are in no place either large or persistent. Visible gold has been reported in the southwest part of Hoyle township. While prospectors report values in the greenstone schists where they are cut by quartz veins, these are in all cases scattered and of low value; or where an occasional high value is found by assay, it does not persist. Assay reports vary from nothing up to \$3 and \$4 per ton, and at one locality an assay of \$22 per ton was reported.

INDEX, PART III

A	PAGE		PAGE
Abitibi l., Timiskaming series	45	Brant g. claim	7
Abitibi Mines, Ltd.	45, 46	Breccia	
Adamson, J. C.	1	McVittie tp.	6
Algomian period.		Brock, R. W.	2, 8
Larder l. area	3, 7, 8	Burns g. claim	39
McNeil, Baden and Cleaver tps.	37	Burrows, A. G.	
Night Hawk l. area	27, 30	Acknowledgments to	50
Altitudes, Porcupine area	50	References to reports by	3, 9, 27, 40, 46
Analyses.		Timiskaming series described by	30
Diorite porphyry	6		
Granophyre dike	30	C	
Andesite.		Callinan, J.	32, 35
Night Hawk l. area. <i>See</i> Keewatin.		Campbell, Fairburn and Carmichael	33
Anglo-Canadian Explorers	20	Camptonite	10
Animikie formation.		Canadian Associated Goldfields, Ltd.	
Larder l. area	9, 10	<i>See</i> Associated Goldfields, Ltd.	
Ankerite g. m.	29	Canadian Mg. Synd.	45, 46
Anniversary isld.	30, 35	Carbonate, ferruginous.	
Aplite.		Night Hawk l., photo	29
Gold isld., auriferous	30	Carbonate rocks.	
<i>See also</i> Algomian (Night Hawk l. area).		Larder l. area	8, 9
Argonaut g. m.		Night Hawk l. area. <i>See</i> Keewatin formation.	
Location; production	2, 21	Carr g. claim	20
Rocks and veins	2, 7, 8	Carveth g. claim	36
Arthur g. claim, rocks	7, 14	C. E. 16 g. claim. <i>See</i> Thib g. claim.	
Arthur-Costello g. claim.		C. E. 20 g. claim, rocks	5
Notes and developments	21	C. E. 25 g. claim, rocks	5
Rocks	11, 14	C. E. 26 g. claim. <i>See</i> Imerson g. claims.	
Associated Goldfields	1, 2	C. E. 32 g. claim, rocks	10
<i>See also</i> Costello g. m.		C. E. 34 and 35 g. claims	22
Early work by	10	C. E. 37 g. claim. <i>See</i> Urquhart-Costello g. claim.	
Plan of claims	13	C. E. 128 g. claim	5
Auer, Chas.	31	Chaminis mt.	
Auer isld., Larder l.	28	Meaning of name; photos; rocks	1, 9
Averall, Mr.	22	Chert, banded	27, 30
B		Chesterville g. claim	23, 24
Baden tp., gold claims	40	Chlorite-carbonate schist.	
Map, sketch	<i>facing</i> 38	Night Hawk l. area	27-29
Bald isld., Night Hawk l.	29, 33	Clay, boulder and stratified. <i>See</i> Pleistocene.	
Barber l.	22	Cleaver tp.	
<i>See also</i> Cockshutt-McCallum g. claim.		<i>See also</i> Index map	<i>facing</i> 36
Barkerite	10	Gold	30, 38-40
Basalt.		Map	<i>facing</i> 38
<i>See also</i> Keewatin formation.		Rocks	38
Argonaut g. m., quartz and calcite veins in	2	Cobalt bloom.	
Bear l., McGarry tp.		Cleaver tp.	40
Algomian rocks	7	Larder l.	23
Bear lake g. claim	21	Cochenour g. claim	41
Beaver l., rocks	5	Cochrane dist.	
Beaverhouse l.		<i>See</i> Lightning r. g. area.	
<i>See also</i> Argonaut g. m.		Night Hawk l. g. area.	
Rocks	7, 10	Porcupine g. area.	
B. G. 219 gold claim	25	Map of S. E. portion	<i>facing</i> 44
Big Pete isld., rocks	10	Cockshutt, C. F.	27
Big Water l.	52	Cody tp. <i>See</i> Night Hawk lake g. area.	
Binney l.		Cohen, Samuel and Julian	20
Breccia near, analysis	6	Cole, A. A.	27
Bismuthinite.		Compton-Pollard g. claim	48
Night Hawk l.	35	Conglomerate.	
Boulder clay. <i>See</i> Pleistocene.		Dome g. m. to German tp., notes	44
Bowen, N. L.	2		

Conglomerate—Continued	PAGE	PAGE
Larder l. area. <i>See</i> Animikie formation; Timiskaming series.		
Timiskaming and Cochrane dists., distribution	3	
Coniagas Mg. Co.	20	
Cook g. claim, rocks	26	
Cooke, H. C.	3-10	
Cooper, Wm.	48	
Costello, Arthur. <i>See</i> Arthur-Costello g. claim.		
Costello, Jack.		
Discoverer, Costello g. m.	11	
Photo	12	
Costello g. m.		
Geology; description	11-14	
Ore body, photo	16	
Photo	17	
Porphyry, auriferous	7	
Sale price	12	
Section, vertical	15	
Costello graphite fault.		
Plan and description	13, 14	
Croesus g. m., conglomerate	44	
Crosby l., rocks	4	
Crow, A. S.	20	
Crown Reserve g. m. (Larder l.)		
Costello vein located by	11	
Development; photo; section	16-20	
Graphite fault	14	
Plan of claims	13	
Rocks	4-8, 29	
Crown Reserve Mg. Co.		
<i>See also</i> Crown Reserve g. m.		
Claims owned by	16	
Cryderman, Russell	42	
D		
Dacite tuffs, Thomas tp.	36	
Deadman isld., Night Hawk l.	29	
Diabase. <i>See</i> Keweenaw formation.		
Diamond l., rocks	8	
Dillabough, Wm.	49	
Diorite.		
Larder l. area. <i>See</i> Algoman period.		
Diorite porphyry.		
Larder l. area. <i>See</i> Algoman period.		
McVittie tp., analysis	6	
Dolomite.		
Larder l. area	8, 22	
Dome g. m., conglomerate	44	
E		
East peninsula, Larder l.	28	
Enright pt.	5	
<i>See also</i> Thib g. claim.		
Epidote.		
Porcupine g. area	53	
Erythrite. <i>See</i> Cobalt bloom.		
F		
Fallon tp., sketch map	38	<i>facing</i>
Farming, Porcupine area	51	
Feldspar porphyry.		
Larder l. area. <i>See</i> Algoman period.		
McNeil tp.	37	
Prospecting for, advisable	45	
Felsite dikes.		
Baden, Cleaver and McNeil tps.	37	
Formational tables. <i>See</i> tables of formations.		
Fox, C.	20	
Fox, Tom (Indian)	37	
Frecheville tp., claims staked	41	
Frederick House r.	32, 50	
Fullerton, C. H.	37	
G		
Gabbro, McVittie tp.	4	
Garrison tp., claims staked	41	
Gauthier tp.		
<i>See also</i> Argonaut g. m.		
Rocks	5-8	
Geology, economic.		
Larder l. area	10-26	
Lightning r. area	45-49	
McNeil and other tps.	38-40	
Murphy, Hoyle and Matheson tps.	54	
Night Hawk l. area	31-35	
Geology, general.		
Larder l. area	3-10	
Lightning r. area	43, 44	
McNeil and other tps.	37	
Night Hawk l. area	27	
Porcupine area	51-54	
German tp., conglomerate	44	
Ghost mt.	43	
Ginn, H. George.	2	
Glacial deposits. <i>See</i> Pleistocene.		
Glaciated surface.		
Night Hawk l., photo	28	
Globe, A. R.	27, 32, 33	
Gold.		
Baden and Cleaver tps.	40	
Belts in N.E. Ont.	44	
Larder l. area	1-26	
Lightning r. area	41, 45-49	
McNeil and other tps.	38	
Night Hawk l. area	30-36	
Porcupine area	50, 52	
Gold isld., Night Hawk l.		
Gold; rocks	27, 30, 33, 35	
Gold King g. claim	11, 25	
Granite.		
Larder l. area. <i>See</i> Algoman.		
Night Hawk l. cut by quartz veins, photo	35	
Granophyre dike.		
Baden, Cleaver and McNeil tps.	37	
Thomas tp., analysis	30	
Graphite in Remo g. claim	47	
Graphite fault. <i>See</i> Costello graphite fault.		
Gravel.		
Porcupine gold area	51, 52	
Graves, T.	16	
Great Northern Power Co.		
Map showing transmission lines	38	<i>facing</i>
Greenstone schist.		
Night Hawk l. area. <i>See</i> Keewatin formation.		
Greywacké.		
Cochrane and Timiskaming dists., distribution	3	
Larder l. and Night Hawk l. areas.		
<i>See</i> Timiskaming series.		
H		
Haileyburian series.		
Larder l. area	4, 7	
Hall gold claim.	11, 21	

	PAGE		PAGE
Harker tp. <i>See</i> Lightning river gold area.		Index maps— <i>Continued</i>	
Harris-Maxwell g. m.		Connecting Night Hawk l. area with Cleaver, McNeil and Matachewan g. areas..... <i>facing</i>	36
<i>See also</i> Associated Goldfields.		Larder l. area	3
Development.....	24, 25	Indian chutes, waterpower.....	33
Gold producing (1923).....	2	Iron formation.	
Mill removed to, photo.....	22	Cleaver tp.....	40
Rocks.....	7, 10, 11	Larder l. area. <i>See</i> Keewatin.	
Harvie, Robt.....	9	Isador (Indian).....	37
Hatch, W.....	32	Isador dike.....	39
Hearst tp.		Isador g. claim.....	38
<i>See also</i> Cook g. claims.			
Gold mines, described.....	24-26	J	
Maps..... <i>facing</i> 20, <i>in pocket</i>		Jasper, red.	
Rocks.....	5-10	Pancake l.....	5
Hematite, Pancake l.....	5	Jenner g. claim.....	24
Hennessey g. claim.....	39	Johnson g. claim.....	20, 21
H. P. 33 g. claim. <i>See</i> Reddick g. m.		Jowsey, R. <i>See</i> McNeil Synd.	
H. F. 39 g. claim. <i>See</i> Cockshutt-McCallum g. claim.		Jowsey-Segworth g. claim.....	38
H. F. 101, 102 g. claims. <i>See</i> Imerson g. claims.		K	
H. F. 137, 138 g. claims.....	20	Katrine tp.	
H. F. 182, 183 g. claims. <i>See</i> Harris-Maxwell g. m.		Diamond drilling.....	20
H. F. 198 g. claim.....	22	Syenite.....	4
H. F. 404-406 g. claims. <i>See</i> Chester-ville g. claims.		Keewatin formation.	
High falls.		Larder l. area.....	3-5
Cutting of, to lower Night Hawk l....	32	<i>See also</i> Basalt.	
Highland-Kirkland g. m., rocks.....	7	McNeil, Baden and Cleaver tps.....	37
Hints to prospectors.....	45	Night Hawk l. area	27
Historical notes.		Porcupine area.....	51-53
Larder l. area	2	Kells g. claim.....	39
H. J. B. 28-33 g. claims. <i>See</i> Reddick g. m.		Kenogami, rocks.....	3
Holloway tp. <i>See</i> Lightning r. g. area.		Kerr-Addison g. claim.....	23
Hopkins, Percy E.....	3	Keewenawan formation.	
Reports by, on:		Larder l. area	4, 10
Larder l. area	1-26	Night Hawk l. area	27
McNeil and other tps.....	37-40	Porcupine area.....	51-54
Night Hawk l. area	27-36	Key maps. <i>See</i> Index maps.	
Hornblende granite.		Kirkland l., rocks	5, 8
McFadden tp.....	7	Kitchener-Kirkland Co. <i>See</i> Imerson g. claims.	
Hornblende syenite.		Knight, C. W.	
Hearst tp.....	8	Report by, on Lightning River area ..	41-49
Hough, J. A.....	2	L	
Howey, Mr.....	41	L. 1794 g. claim. <i>See</i> Costello g. m.	
Hoyle tp. <i>See</i> Porcupine g. area.		L. 3631 g. claim. <i>See</i> Hersey g. claim.	
H. R. 1-3 and 10 g. claims. <i>See</i> Gold island gold claims.		L. 5414, 5415 and 5499 g. claims. <i>See</i> Shaver g. claims.	
H. R. 3 g. claim, rocks	30	L. 8012 g. claim. <i>See</i> Thib g. claim.	
H. R. 6-8 g. claims. <i>See</i> O'Connor g. claims.		L. 8055 g. claim. <i>See</i> McInnis g. claim.	
H. R. 914-919 g. claims. <i>See</i> Night Hawk Peninsular g. m.		L. 8072 and 8216 g. claims. <i>See</i> McLaren g. claims.	
H. S. 135 g. claim. <i>See</i> Moore g. claim		L. 8713 g. claim. <i>See</i> Crown Reserve g. m.	
H. S. 153 g. claim, rocks.....	5	L. 8825 g. claim	20
H. S. 156 g. claim. <i>See</i> Carr g. claim.		L. 8841 g. claim. <i>See</i> Crown Reserve g. m.	
H. S. 164-166 g. claim. <i>See</i> Kerr-Addison g. claims.		L. 8842 g. claim.	
H. S. 267 g. claim. <i>See</i> Shaver g. claim.		Gold in pegmatite.....	20
I		L. 9032 g. claim. <i>See</i> Crown Reserve g. m.	
Imerson gold claims.		L. 9084 g. claim. <i>See</i> Shepherd g. claim.	
Description.....	20	L. 9394. <i>See</i> Miller-Middleton g. claim.	
Graphite fault.....	14	L. 9513 g. claim.....	20
Rocks.....	4, 7	L. 12143 g. claim.	
Index maps.		Trachyte, analysis.....	6
Cochrane and Timiskaming dists., <i>facing</i>	44	L. 12581 g. claim.	
		Banded chert.....	27, 30
		La Mine d'Or Huronia. <i>See</i> Argonaut g. m.	

	PAGE
Olivine diabase.	
Night Hawk l.	30
O'Neill, Thomas.	47
O'Neill g. claim.	48
Ontario, northeastern.	
Two gold belts of, map and notes.	44
Opasatika l., Pontiac schists.	5
Otisse g. m., rocks.	29
P	
P. 7431 g. claim. <i>See</i> McLeod g. claim.	
P. 7583 g. claim. <i>See</i> Carveth g. claim.	
P. 8610 g. claim. <i>See</i> McEachern g. claim.	
P. 12508 g. claim. <i>See</i> Gold island g. claims.	
P. 12581 g. claim. <i>See</i> Red Dog g. claim.	
Pancake l.	
<i>See also</i> Costello g. m., Crown Reserve g. m.	
Algonman rocks near.	8
Gold mines in area, report on.	11-21
Pleistocene deposits.	10
Pancake Lake Syndicate.	20
Paradis, Rev.	31
Parks, W. A.	2
Parsons, A. L.	42, 46
Paymaster g. m.	29
Pettipher g. claim.	
Granophyre dike, analysis.	30
Pillow lava.	
Imerson g. claim.	4
Pleistocene deposits.	
Larder Lake area.	10
Porcupine gold area.	51, 52
Pontiac schist.	
Opasatika l.	5
Porcupine gold area.	
Gold production to 1923.	27
Report in part of, by B. Rose.	50-54
Porcupine l.	50
Porcupine r.	50-52
Porphyry.	
<i>See also</i> Feldspar porphyry; quartz porphyry; Algonman period.	
Connection with gold.	44
Pre-Cambrian.	
Larder l. area.	4-10
Lightning r. area.	43
McNeil and other tps.	37
Night Hawk l. area.	27-31
Porcupine gold area.	51-54
Proprietary Mining Co.	22
Prospectors, hints to.	45
Pulpwood.	51
Q	
Quartz porphyry.	
<i>See also</i> Algonman period.	
McNeil tp.	37
Prospecting for, advisable.	45
R	
Ratford-Taylor g. claim.	39
Raven l.	
Rocks; waterpower.	10, 16
Recent deposits. <i>See</i> Pleistocene.	
Reddick, Dr.	2
Reddick gold mine.	
Development.	23
Dolomite, auriferous veins in, photo. ..	11
Gold producing (1923).	2
Trachyte, auriferous.	6, 7

	PAGE
Red Dog g. claim.	35
Reid, R.	49
Remo g. claim.	47
Rhyolite, McNeil tp.	37
Richardson g. claim, rocks.	11, 21
Richie g. claim.	24
Robertson tp.	
Map, sketch.	facing 38
Roche g. claim.	48
Rogers g. claim.	
Quartz vein, photo.	38
Rose g. claim.	21
Rothwell, T. E.	1, 46
Roy g. claim.	24
R. S. C. 296-299 g. claims. <i>See</i> Rose g. claims.	

S

St. Paul g. claim.	39
Schist, greenstone. <i>See</i> Greenstone schist.	
Schist, serpentine-chlorite-carbonate.	
Night Hawk l. area.	27-29
"Scotch dike".	39
Seagers, W. S.	45
Seagers g. claim.	41, 45, 49
Segsworth, W. E.	33
<i>See also</i> McNeil Synd.	
Serpentine.	
Larder l. area. <i>See</i> Haileyburian.	
Night Hawk l. area. <i>See</i> Keewatin.	
Sharp ck., Hearst tp.	5
<i>See also</i> Larder Combined g. claim.	
Shaver, John.	24
Shaver g. claim.	
Notes and photo.	24
Timiskaming series, photo.	5
Sheldon, J. E.	22
Sheldon g. claim.	10, 11, 23
Shepherd g. claim.	
Rocks; ore values.	21
auriferous trachyte.	7, 11
Shields, W. J.	40
Skead tp.	
Gold. <i>See</i> Cook g. claim.	
Wisconsin-Skead g. claim.	
Slate.	
Larder l. area. <i>See</i> Timiskaming series.	
Smith g. claim.	30
Soda trachyte.	
McVittie and McGarry tps.	6
Sterling Development Co.	35
Stewart, Henry.	20
Summerhayes, M. W.	20
Syenite. <i>See</i> Algonman period.	

T

T. 16554 and 16555 g. claims. <i>See</i> Highland-Kirkland g. claims.	
Tables of formations.	
Larder l. area.	4
Lightning r. area.	43
Night Hawk l. area.	27
Porcupine gold area.	54
Taylor-Horne g. claim.	46
Teck tp., rocks; gold.	7
Teddy Bear r.	43
Teddy Bear Syndicate.	48

