THIRTIETH ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

1921

PART II

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Ontario Gold Deposits

Their Character, Distribution and Productiveness

By

PERCY E. HOPKINS

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Sample of gold ore (natural size) from between the sixth (550-foot) and seventh (700-foot) levels of the Dome mine, Porcupine.

ONTARIO GOLD DEPOSITS [1]

THEIR CHARACTER, DISTRIBUTION AND PRODUCTIVENESS

By

Percy E. Hopkins

Gold mining at the present time is receiving renewed attention in Ontario. Abundance of labour, reduction in mining costs, and the premium on gold are chief causes of the stimulation. In 1920 the exchange premium received by Ontario's gold mining companies was $1,376,275 or 11.7 per cent. The success or failure of Ontario's gold mining industry, however, is not dependent on the premium, the rate of which is, at this time, declining rapidly.

It is the purpose of this paper to give an historical summary of gold mining in Ontario, and to describe, as succinctly as possible, the geological features of the several gold fields as related to the ore deposits. Notes on the character of the deposits themselves, their production and development will naturally be included. The mining claim numbers, and the important literature of each area have been given.

Accompanying the paper are index maps showing the location of the producing gold mines and of many gold prospects. Railway stations and wagon roads, together with hydro-electric power plants and transmission lines serving the gold mining industry, are also shown. The maps were drawn by H. C. Smith, cartographer of the Ontario Department of Mines. I wish to express my appprreciation to W. R. Rogers, statistician of the Ontario Department of Mines, for his kindness in furnishing statements of gold production. I am also specially indebted to Dr. W. G. Miller, Provincial Geologist, and T. W. Gibson, Deputy Minister of Mines, for numerous suggestions.

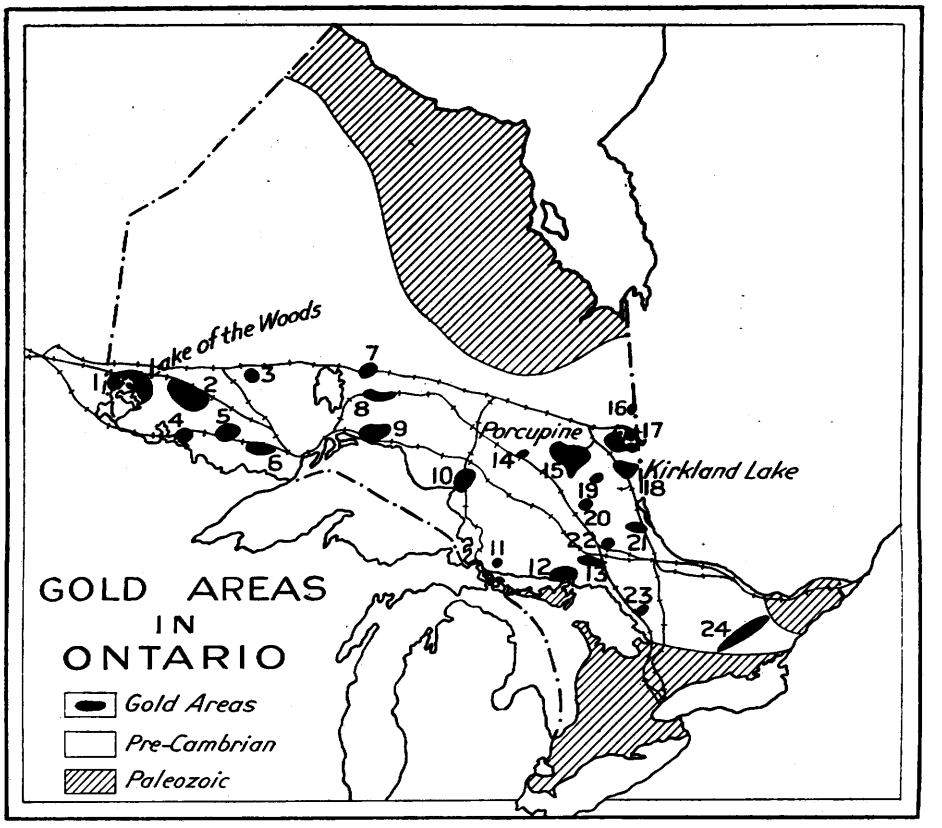
History

Gold was first discovered in Ontario in 1866, at the Richardson location, Hastings county, southeastern Ontario.

Curiously enough, the Richardson deposit was far from being typical of Ontario gold mines, either of the locality in which it was found or elsewhere. The original account of the discovery is given by H. G. Vennor in the report of the Geological Survey of Canada 1866-69, page 165 *et seq.* Mr. Vennor, who in May 1866 began the work of geological exploration in Hastings and adjoining counties which he carried on for several years, had instructions to take "particular note of all mineral deposits of economic value." He states:

> **In the early part of August, 1866, while exploring in the neighborhood of Bannockburn village, in the township of Madoc, I was informed that a metal, suspected to be gold, had just been taken from an opening in the eighteenth lot of the fifth range of the township, on the property of Mr. J. Richardson. A visit was at once made to the locality and the lot was found to be the same as that on which openings had previously been made for copper ore, described in Mr. Macfarlane's Report of 1866, (p. 106). Mr. Richardson informed me that a person named Powell, and an old Dutch miner, had lately found flakes of yellow metal resembling copper, which he could beat out into thin leaves. At my request he showed me the specimens which he had collected, and I at once informed him that the metal was gold.**

[1] Paper presented in abstract at the annual meeting of the Canadian Institute of Mining and Metallurgy, March, 1922.



MAP OF ONTARIO SHOWING THE LODE GOLD AREAS.

1. Lake of the Woods and West Shoal lake.
2. Eagle Lake, Wabigoon or Dryden, Manitou and Sakoose.
3. Sturgeon lake.
4. Mine Centre, East Shoal lake or Lower Seine area.
5. Atikokan or Upper Seine area.
6. Huronian and Shebandowan lake.
7. Kowkash and Tashota.
8. Jellicoe, Kinghorn and Little Long lake (only a few assays have been obtained from this area).
9. Schreiber, Duck lake and Jackfish.
10. Michipicoten and Goudreau.
11. Ophir or Havilah (Galbraith township).
12. Shakespeare, Howry creek and Whiskey lake.
13. Long lake and Sudbury.
14. Tionaga.
15. Porcupine, Cripple creek, Night Hawk lake and McArthur township.
16. Patten river (only assays obtained here).
17. Painkiller lake, Rickard, Abitibi lake and Lightning river.
18. Kirkland lake, Larder lake, Boston creek, Swastika and Bourkes.
19. Matachewan.
20. West Shiningtree.
21. Timagami.
22. Wanapitei.
23. Parry Sound.
24. Southeastern Ontario (Peterborough to Lanark county).

Mr. Vennor describes the opening from which the gold was taken as being on the east end of the lot, and containing an irregular layer of chlorite and epidotic gneiss, which was overlain by a band resembling an impure steatite, the whole dipping N. 5° E. at an angle of 45°. The seat of the gold appeared to be a crevice of longitudinal ovoid form, about 4 feet below the surface, filled with reddish-brown ferruginous earth, in which were scattered fragments of a black carbonaceous matter, the latter showing when broken, small flakes or scales of the metal. Fresh blasts were made during Mr. Vennor's stay, but no further development of the precious metal resulted. Later, in October, on returning to the mine, Mr. Vennor found that at a depth of 15 feet, another open crevice had been struck, which beyond doubt proved rich in the metal. From the ferruginous carbonaceous earth, Mr. Vennor himself obtained by washing and amalgamation 25 pennyweights of gold. He observed no gold in the solid rock, but shortly afterwards, some "very beautiful and rich" specimens were displayed to him, in which the gold was enclosed in the dolomite and calcspar.

Powell himself, the discoverer, confirms[1] the story of the crevices. He was following on a seam for copper, and at a depth of 15 feet struck ore carrying free gold. The seam was 6 inches wide at the top and was decomposed for 6 feet, then it was solid rock to 15 feet, "when it suddenly opened out into a cave 12 feet long, 6 feet wide and 6 feet high, so that I could stand upright in it." The gold was found in the rocks of the roof, walls and floor, in the form of leaves and nuggets, and in the roof it ran through a foot thickness like knife-blades. The largest nugget was about the size of a butternut. Powell and his associates disposed of their interest in the discovery for $36,000, but there is no record of the amount of gold taken from the deposit. This discovery attracted a large number or prospectors, who over-ran the neighborhood during the summer of 1867, and whose rough and ready ways necessitated the organization of a squad of mounted policemen, 25 in number, in March of that year; they were discharged in September. Gold was found in several of the surrounding townships, but the rich deposit on the Richardson farm was not duplicated.

In the Hastings area gold has been produced spasmodically up to the present from numerous properties, the principal being the Deloro and Cordova.

The first important discovery in northwestern Ontario was made by Peter McKellar in 1871, at what was afterwards known as the Huronian mine, Moss township. In 1872, gold was found on an island in Partridge lake. This was followed by many other discoveries in the Lake of the Woods district where the chief mines were the Sultana, Mikado, and Regina. In 1875 small nuggets of gold were found on Victoria cape, near Jackfish, Lake Superior. The discovery of gold on the United States side of Rainy Lake in 1892 resulted in prospecting soon being extended into Shoal Lake, Seine river, Manitou, Sturgeon lake, and other neighboring areas. The gold boom of northwestern Ontario reached its peak in 1897, resulting in many unwarranted stamp mills being erected. Inefficient management and stock-jobbing operators caused the loss of much capital; nevertheless certain mines—the Sultana, Mikado, and Regina—produced from about one-half to three-quarters of a million dollars each.

Gold associated with copper was found at the McGown property, two miles east of Parry Sound, in 1894, but little production resulted. In 1895 and 1896 the precious metal was discovered on the north shore of Lake Superior, at Jack-

[1] Rep. Ont. Bur. Mines, Vol. III, 1893, p. 54.

fish and Schreiber, respectively, and the area was enlarged in 1914 by the discovery of gold at Duck Lake, 18 miles north of the latter place. From 1892 to the present time, isolated properties, situated near Wanapitei and Sudbury, and westward along the north shore of Lake Huron, have had a small production; these include the Crystal, Ophir, Shakespeare, Long Lake and others. In addition, a small quantity of gold is recovered from the nickel-copper ores at Sudbury. Since 1902, three or four mines have produced in the vicinity of Wawa, Michipicoten, where gold was found in 1897, but they are now lying idle. Of these, the Grace mine is best known. East of Goudreau on the Algoma Central railway gold was found in 1918, and in 1921 the Murphy claims were staked out southwest of that station.

The discovery of silver at Cobalt in 1903 brought hundreds of prospectors into northeastern Ontario. From 1905 to 1918 important gold areas were found annually. They are as follows: Playfair, 1905; Abitibi and Larder Lake, 1906; Night Hawk Lake, 1907; Painkiller, 1908; Munro and Porcupine, 1909; Swastika, 1910; Howry Creek and West Shiningtree, 1911; Whiskey Lake and Kirkland Lake, 1912; Boston Creek, 1914; Kowkash-Tashota, 1915; Matachewan, 1916; Rickard and Lightning River, 1917; Bourkes, 1918. In addition to these areas, many small gold discoveries have been made in other localities.

Porcupine is by far the largest producer, the principal mine, the Hollinger Consolidated being one of the great gold mines of the world. Kirkland Lake area is next in importance. Ontario now leads the other provinces of Canada, and every state in the United States, excepting California, in production. Ontario produced 74 per cent. of Canada's gold production in 1920. There is every reason to believe that Ontario's gold production will continue to increase for some time. Gold is so wide-spread and the production is so substantial and increasing so rapidly, that it seems fitting to name Ontario the "Golden Province."

Production

The total gold production of Ontario up to the end of 1920 was $73,173,463, all of which came from pre-Cambrian deposits. From 1892 to 1911 the total production was small, the greatest output for any year being $424,568 in 1889. During these years the Sultana, Mikado, and Regina were the principal producers. Gold has been recovered as a by-product from the copper-nickel ores mined at Sudbury, where work began in the late eighties. A small recovery of gold has also been made from the Cobalt ores. The Lake of the Woods mines were not active between 1904 and 1911. In 1909, the Laurentian was the only producer.

Up to 1911 gold mining in Ontario was on the whole not profitable. Since then the industry has flourished, owing particularly to Porcupine, and, to a less extent, to Kirkland Lake. The 1913 production, $4,558,518, almost equals the entire output up to that year from the time gold was first found in the Province in 1866. In 1920 the gold production exceeded the silver output for the first time since Cobalt was discovered in 1903. The gold production of Ontario for 1921 will likely amount to about fourteen million dollars. For the first nine months of the year it was valued at $9,818,073. Ontario is the only important country whose gold production has not decreased in the last four years. The world's maximum production of 468.7 million dollars in 1915 has steadily de-

creased to 339.4 million dollars in 1920. The table which follows shows the yearly and total gold production of the Province up to the end of 1921, as published by the Ontario Department of Mines.

GOLD PRODUCTION OF ONTARIO.

Year	Ounces	Value$	Year	Ounces	Value$
1866-1891	9,200*	190,258	1907	3,810	66,399
1892	1,785	36,900	1908	3,465	60,337
1893	1,695	32,960	1909	2,042	32,445
1894	2,022	32,776	1910	3,619	68,498
1895	3,030	50,281	1911	2,062	42,637
1896	7,154	121,848	1912	102,278	2,114,086
1897	11,412	190,244	1913	220,837	4,558,518
1898	16,261	275,078	1914	268,942	5,529,767
1899	27,594	424,568	1915	411,588	8,501,391
1900	18,767	297,861	1916	497,833	10,339,259
1901	14,293	244,443	1917	420,893	8,698,735
1902	13,625	229,828	1918	411,878	8,502,480
1903	10,383	188,036	1919	505,964	10,451,709
1904	2,285	40,000	1920	565,283	11,686,043
1905	5,541	99,885	† 1921	707,509	14,624,085
1906	3,926	66,193	Total	4,276,876	$87,797,553

*Estimated

† Preliminary.

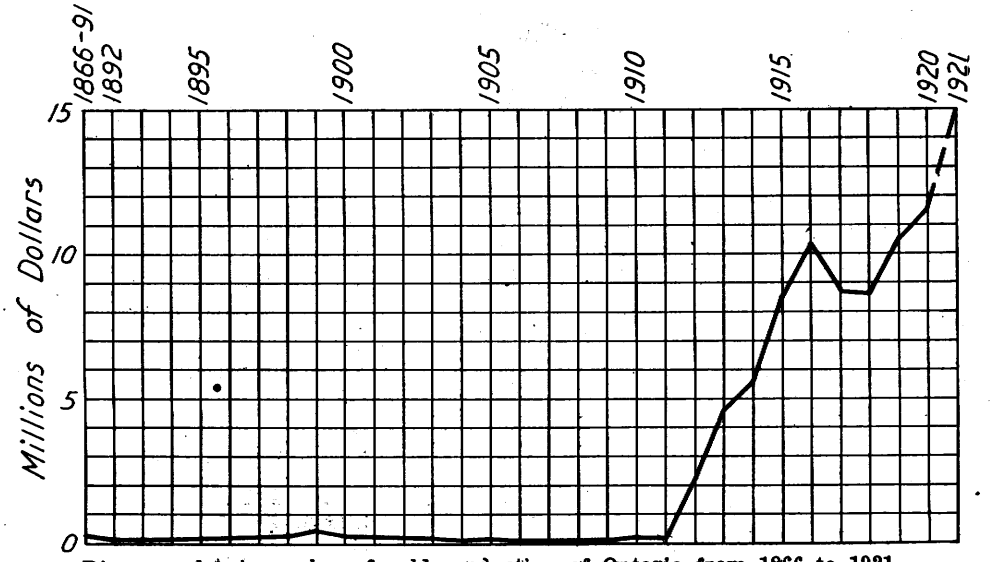


Diagram showing value of gold production of Ontario from 1866 to 1921.

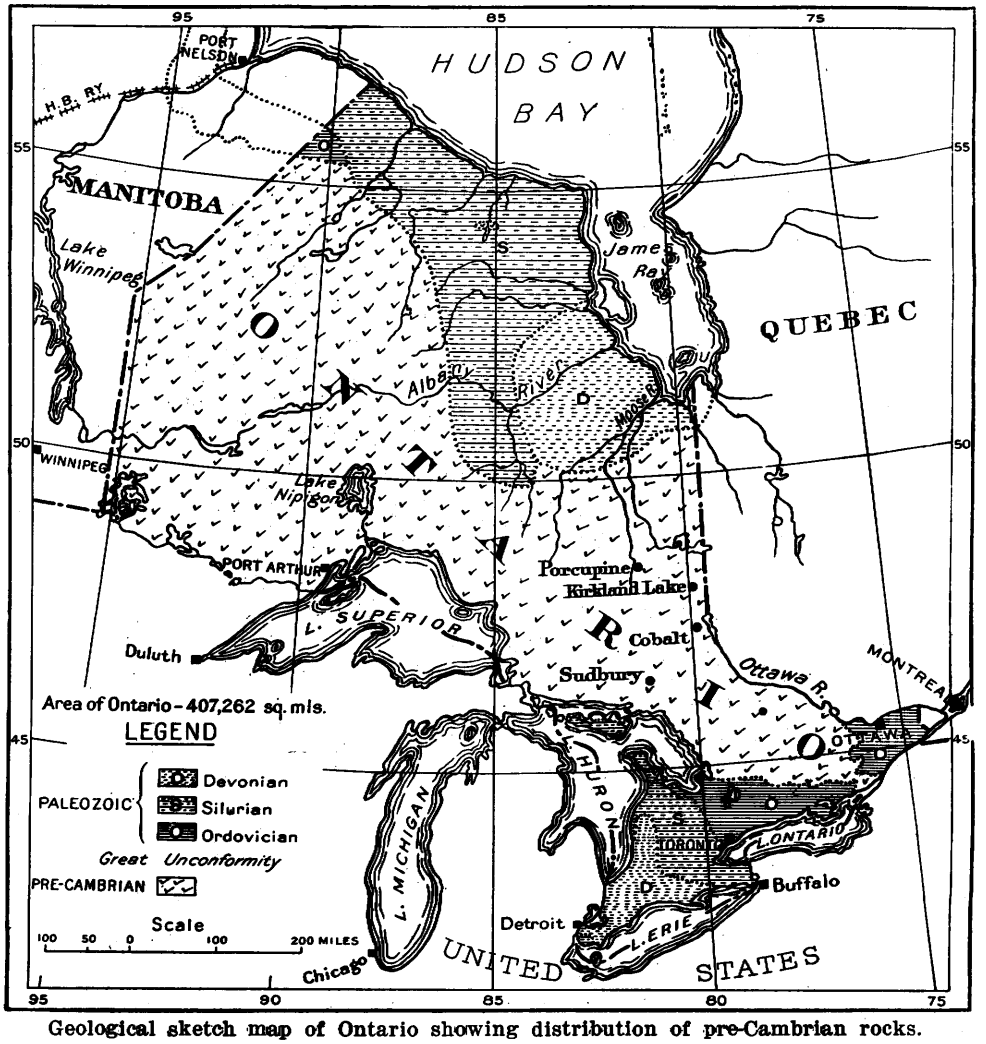
Since dividend payments commenced in 1913, a total up to the end of 1921 of $23,140,734 has been returned to shareholders by gold mining companies. Ore reserves at the end of 1921 at Porcupine and Kirkland Lake amounted to approximately $60,000,000.

Pre-Cambrian Geology of Ontario

The vast extent of the pre-Cambrian rocks of Ontario is shown on the accompanying geological sketch map. By far the greater part of the surface underlain by these rocks is unprospected, and much of it is worthy of attention from the searcher for gold deposits.

Gold occurs in many varieties of pre-Cambrian rocks, particularly in those belonging to the Keewatin and Timiskamian series that have been intruded by Algoman granite and porphyry as the Hollinger, Dome, McIntyre and Tough-Oakes. Most of the gold at Kirkland Lake comes from Algoman porphyry, although in places the wall rock is syenite. A small production has come from veins in granite.

Judging from the minerals present, the pre-Cambrian gold deposits of Ontario were formed at great depth and at high to intermediate temperatures. Secondary enrichment has played no important part.



Geological sketch map of Ontario showing distribution of pre-Cambrian rocks.

The most promising gold-bearing rocks of the Province are being gradually mapped, but pre-Cambrian geology is so complex that many years must elapse before detailed maps of the whole can be prepared. The age classification used in this report is that employed by the Ontario Department of Mines, and is as follows:

Pre-Cambrian Epochs of Ontario and their Metal Production[1]

(KEWEENAWAN)—	Epoch following basic intrusions of (a) silver, cobalt, nickel, and arsenic at Cobalt and elsewhere; (b) nickel and copper at Sudbury, and copper elsewhere. Certain gold deposits, not now being worked, appear to belong to this epoch.
ANIMIKEAN—	Epoch of deposition of "iron formation" as a chemical precipitate. Includes the Cobalt and other series of sediments.
(ALGOMAN)—	Epoch following granite intrusions, of gold at Porcupine and at many other localities, and of auriferous mispickel. Deposits of galena, zinc blende, fluorite, and other minerals appear also to have been derived from the granites, but some of them were not formed till post pre-Cambrian time.
(HAILEYBURIAN)—	Preceding the intrusion of the Algoman granites, basic intrusives, of post-Timiskaming age, gave rise to nickel and titaniferous and non-titaniferous magnetite deposits and chromite [and possibly gold].
TIMISKAMIAN—	Epoch of minor deposition of "iron formation" as a chemical precipitate, with conglomerate and other sediments.
(LAURENTIAN)—	Granite instrusions probably gave rise to ore deposits which have been removed by excessive erosion, as is known to be the case with deposits of later origin.
LOGANIAN { Grenville—	Epoch of deposition of extensive "iron formation" as a chemical precipitate, with limestone and other sediments.
LOGANIAN { (Keewatin)—	Composed largely of basic lava flows, many of which are now schistose. There are also acid lava flows such as rhyolite at Lightning river, which gave rise to some gold.

In the table names of epochs that are represented essentially by igneous rocks are enclosed in parentheses.

Gold Epochs

There were probably four epochs of gold deposition during pre-Cambrian times, namely, (*a*) Keweenawan, (*b*) Algoman, (*c*) Haileyburian, and (*d*) Laurentian and Keewatin.[2] Erosion has destroyed many deposits. Those now remaining are chiefly of Algoman age.

It is often difficult to determine the epoch in which an ore-body was formed. Hence, in the following pages the age given for certain deposits is to be considered only provisional.

Keweenawan.—The gold deposits of the Keweenawan are of comparatively little importance. A few small deposits, not now productive, are apparently genetically connected with Keweenawan intrusives, more especially with the later more acidic facies. They are as follows: the Crystal mine on Lake Wanapitei; the Havilah, formerly the Ophir mine, north of Thessalon; the Sudbury copper-

[1] Ont. Bur. Mines, Vol. XXIV, 1915, pp. 243-248.

[2] Haileyburian Intrusive Rocks, by W. G. Miller and C. W. Knight, Ont. Bur. Mines, Vol. XXIX, 1920, Pt. 1, pp. 235-236.

nickel deposits,[1] of which the Vermilion mine in lot 6 in the fourth concession of Denison township had the richest gold showing. The Bruce copper mines, which are in Keweenawan diabase and were first worked in 1849, carried in places small quantities of gold, as do also certain cobalt-silver ores which owe their origin to intrusives of this epoch. Portions of the prospects at Howry creek and Whiskey lake are in Animikie sediments and Keweenawan diabase. The Ogema (80 E. and 150 E., Dorion township) and other Keweenawan lead-zinc deposits in the vicinity of Black bay carry small quantities of gold and silver.

Algoman.—Other known gold deposits are presumably pre-Keweenawan in age, since diabase dikes of this age clearly intrude them as at Porcupine, Kirkland Lake, West Shiningtree, Boston Creek, Schreiber, etc. All the known important gold deposits of Ontario appear to have been formed during the Algoman epoch. They are found chiefly in Keewatin, Grenville and infolded Timiskamian sediments which have been intruded by Algoman granite and porphyry. The deposits at Porcupine, Kirkland Lake, Boston Creek, Matachewan, Deloro and elsewhere are believed to belong to this epoch.

Haileyburian.—Certain gold deposits appear to be genetically related to intrusives of this age. The Long Lake gold mine, near Sudbury, is believed to owe its origin to diorite of Haileyburian or Algoman age. The Cordova deposits are found in a gabbro-diabase mass which is post-Hastings in age and may therefore be Haileyburian. The Jamieson deposit in Robb township and the Shaft island deposit on Abitibi lake apparently owe their origin to a diabase-gabbro magma, probably of Haileyburian age.

Laurentian and Keewatin.—Following the intrusion of Laurentian granites and related rocks, doubtless gold deposits were formed that were genetically connected with the intrusives, but they have been removed, for the greater part at least, by erosion. It is difficult to prove that deposits referred by certain writers to this epoch are not of later age. The term Laurentian has been often loosely used; the same may be said of Keewatin. The Foley and other mines at Mine Centre are genetically connected with an altered granite or protogine described as Laurentian by A. C. Lawson, although A. L. Parsons refers to the rock as Algoman. The Ophir, Sultana and Saw Bill occur in a porphyritic gneiss which may be Laurentian. The Goodfish Lake deposits are related to schistose quartz porphyries which may be of Laurentian age. The fact that gold occurs in small quantities in the Keewatin rhyolites at Lightning river and other places would suggest that some of the gold may be of Keewatin age.

Placer Deposits

There are no known gold placer deposits that have been proved to be of commercial importance in Ontario. This may be due to the intense glaciation to which the country has been subjected. However, little systematic prospecting has been done as yet. Attempts have been made at placer mining on the Vermilion and Wanapitei rivers, Meteor lake, Lake Manitou (on claims H.P. 304 and H.P. 384) and Lake Savant, but the ventures were not successful. Low assays in gold can be obtained from glacial sands from various other parts of the Province, such as in Munro, McCool, Montrose, Timmins, and other townships. Where streams have cut through some glacial sands gold can be panned, as for example,

[1] Gold was also found by the Creighton Gold Mining Co., (lot 11, concessions V and VI, Creighton township) in 1889 and a mill operated for a short time in 1893.

in Grassy river. The productive gold deposits of Ontario with which this report deals are primary or lode deposits.

Types of Lode Gold Deposits

Specimens of gold ore may frequently be identified as regards locality by certain characteristics.

(1) According to the minerals present, the deposits may be divided into five classes, namely:

(*a*) *The pyrite-gold-quartz type,* in which pyrite is the predominant sulphide. The gold usually occurs with pyrite, calcite, chlorite, etc., along crushed seams in the quartz, and associated with pyrite in the mineralized schist. Certain of the following minerals may also be present in minor quantities; copper pyrites, native copper, galena, zinc blende, bismuth minerals, pyrrhotite, magnetite, mispickel, tellurides, molybdenite, scheelite, barite, tourmaline, feldspar, etc. This is the most common and most productive type, as represented by the Porcupine deposits.

(*b*) *The arsenopyrite-gold-quartz type,* in which arsenopyrite is prominent. The southeastern Ontario, Timagami, Long lake, Howry creek, and some of the Painkiller lake deposits are the only known ones belonging to this type in Ontario. Small quantities of mispickel are present in other types of deposits, such as the Sultana, Pine Portage, Keewatin, Winnipeg Consolidated, Croesus, and McAuley-Bridge in Bristol township. The Beaver Lake deposit in northern Manitoba is of this type.[1]

(*c*) *The gold-telluride veins* characterized by the presence of tellurides. Calaverite and petzite, gold tellurides, are found at the Miller Independence; both calaverite and kalgoorlite occur in No. 3 vein of the Tough-Oakes; calaverite occurs on the Boston-McRae, and petzite has been recognized at the Bourkes mine. Gold-bearing tellurides probably occur at various mines in Kirkland Lake and other places, but so finely disseminated that they are difficult to recognise. Several other tellurides have been found in various parts of the Province and, although they are non-gold tellurides, they frequently indicate rich gold ore, since native gold invariably occurs as veinlets in the tellurides. Altaite is quite common at all the mines of Kirkland Lake, while coloradoite, tetradymite and hessite (?) occur in small quantities. Other known telluride occurrences in the Province are as follows:[2] sylvanite and nagyagite at the Huronian mine (Moss township); hessite from Gold Creek, Pine Portage Bay, Lake of the Woods, and Powell claim (M.E. 20) in Deloro township; tetradymite from the Mikado mine, Raty claim (Rickard township) and from the Hattie, Treadwell, Mayot, Hill and Cartwright properties at Painkiller Lake. Tellurides not yet identified have been found on the Devanney claim (T.B. 2650) at Tashota, on claims K. 665 and H. W. 443 at Dryden, on the McKellar-Longworth claim (B. J. 122) Schreiber, on the Stitt claims in the centre of Grenfell township, on the Wisconsin-Skead, and on the Malouf, Labine-Smith and other claims on lots 9 and 10 in the second concession of Maisonville township.

(*d*) *Calcite-gold type.*—Calcite is the principal gangue mineral, there being small quantities of quartz with galena, zinc blende, pyrite, etc., as at the McQuaig and Sjolander-McKirdy claims at Big Duck lake. Some of the veins on the Argonaut (Huronia) are made up largely of calcite.

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[1] Pre-Cambrian Goldfields of Central Canada, by J. B. Tyrrell, Trans. Roy. Soc. Can., 1915, 3rd series, Vol. 9, pp. 89-118.

[2] Ont. Bur. Min. Rep., Vol. XXIV, 1915, Pt. 1, pp. 183-184; Vol. XXVI, 1917, pp. 186, 218; Vol. XXVIII, 1919, Pt. 2; Vol. XXIX, 1920, Pt. 4.

(*e*) *Copper-nickel-gold deposits.*—Some gold is recovered as a by-product from the nickel-copper ores at Sudbudy. The Whiskey lake, McGown and Skead-Gold deposits are of the copper-gold type.

(2). The shape of the deposit is a minor detail; however, according to form or structure,[1] the doposits may be classified into several groups following the descriptions of various authors who have examined them, namely:

(*a*) *"Simple" or "true fissure"* veins, in which the ore occupies a sheet-like space, with smooth walls, usually in a massive rock; examples, Mikado, Regina, Pine Portage, Foley at Mine Centre, No. 1 vein at Miller-Independence, Clifton-Porcupine, and a portion of the Rea vein at Porcupine.

Gold-bearing quartz stringers in dolomite representing the stockwork type of deposit.

(*b*) *Composite veins or lodes,* namely, a number of nearly parallel lenticular fissures irregularly connected and spaced over a considerable width with replaced country rock intervening. Most of the productive deposits are of this type. The Hollnger, McIntyre and Dome, the largest known gold ore bodies in Ontario, are of this type. Some of the Kirkland Lake deposits are lode deposits in which the quartz veins are quite narrow.

(*c*) *Sheeted zone,* e.g. minute fractures closely spaced and parallel. Examples are the Howey-Cochenour at Lightning river, and portions of the deposits in the Kirkland Lake area.

(*d*) *Stockwork.*—The stockwork type in granite, porphyry, and dolomite or ankerite is common in most gold areas. The Ferguson at Mine Centre, Gold island at Night Hawk lake, and deposits at Larder lake are examples of stockwork in these rocks.

(*e*) *Fahlbands or Shear-zones,* i.e. schist bands, impregnated with pyrite and other sulphides and containing very little quartz. Examples are Canadian

[1] The gold deposits of Northwestern Ontario were classified by A. P. Coleman in 1896, Ont. Bur. Mines, Vol. VI, 1896, pp. 115-120.

Homestake (Scramble) in northwestern Ontario, Dome Lake and Davidson at Porcupine, the Bosquet at Howry creek and the Currie prospect at Boston creek; the Elstone-Dunkin prospect in Gauthier township approaches this type.

(*f*) *Pyrite and iron formation,* comprising alternating layers of chert, sugary quartz, magnetite and pyrite, and frequently carrying a little gold. Pits and shafts have been sunk on this type of deposit in almost every gold area. The low gold contents may have been present in the rocks as they were deposited. Where secondary quartz veins intersect the iron formation, gold has in some cases been deposited, the sulphide acting as the precipitating agent for the metal. The Big Master vein, according to A. L. Parsons, shows a remarkable similarity to iron formation. The quartz of the Elizabeth at Atikokan is white and granular, like silica formed in iron formation. Typical examples are the Wright, James, Philadelphia, and Red Dog deposits at Porcupine, and the Cochrane and Gold Corona at West Shiningtree.

(*g*) *Single lens and pipe-like deposits.*—Portions of the Cordova deposits are pipe-like. The Regina and Mikado have a nearly vertical chimney or short shoot. The Long Lake gold deposit has the shape of a large vertical core, or pipe.

Gold-Bearing Veins in Granite and Syenite

As stated above, the bulk of the gold comes from Keewatin basalt schists and Timiskamian sediments which have been intruded by Algoman granite and porphyry. However, gold-bearing veins in granite and syenite are common in certain parts of the Province; some gold has been recovered from fissure veins occurring in these rocks. The main veins on the Regina, Mikado and St. Anthony pass from altered granite into Keewatin schists. The Ophir is in a porphyritic granite. The Foley, Elizabeth and Harold Lake mines have also yielded gold from veins in altered granite called protogine. The U.S. Gold Mining Co., at Sturgeon lake produced a little gold from small veins in granite. Certain prospects like the Hammond Reef and Ferguson, etc., are stockworks in altered granite. Examples of gold-bearing quartz veins in granite in northeastern Ontario are Thesaurus at Matachewan, and Authier, Charest and Wisconsin-Skead near Boston Creek. Some of the Teck-Hughes ore bodies are in syenite. Other prospects in syenite are the Brookbanks, Chief and Craig at Matachewan.

Gold-Bearing Veins in Porphyry, Felsite, etc.

The most important deposits in porphyry are the lodes and fissure veins of the Kirkland Lake area, which occur in fault zones in Algoman feldspar porphyry. The Bidgood and King-Kirkland are also of this type. Near Timmins at Porcupine, practically all the gold comes from the green schist adjoining the quartz porphyry, the values in the porphyry being low or erratic. A little gold has been recovered from fissure veins in quartz-porphyry at the Little Pet, Porcupine-Porphyry Hill and Clifton-Porcupine. Gold-bearing porphyry stockworks, namely a net-work of quartz stringers in porphyry and felsite, are common in certain areas, but no deposits of this character, as yet, have been worked with success. They occur at the Champion, near Kenora, Bully Boy on Camp bay, Manitou, Boston Creek, Gold Island (Night Hawk lake), West Shiningtree, Matachewan and other places. The Ophir (Lake of the Woods) deposits are in a porphyritic

granite with phenocrysts of orthoclase half an inch wide. The acid rock at the Matachewan Gold is orthoclase porphyry. At Kirkland Lake the fine-grained, red syenite is rich in orthoclase; these rocks from the two last mentioned areas contain about 9 per cent of potash.

Depth of Mine Workings

The depth of workings of certain gold mines and prospects are as follows, the figures representing the vertical depth in feet unless otherwise stated:

Southeastern Ontario.—Deloro, 500 (incline); Cordova (Belmont), 500; Star of the East, 213.

Boston Creek and Larder Lake.—Boston Creek, 400; R.A.P., 200; Patricia (Boston-Hollinger), 215; Miller-Independence, 500; Argonaut (Huronia), 370; Harris-Maxwell (Associated Goldfields), 500; Kerr-Addison (Associated Goldfields), 300; Wisconsin-Skead, 112.

Kirkland Lake.—Kirkland Lake, 900; Teck-Hughes, 600; Orr, 400; Lake Shore, 600; Wright-Hargreaves, 600; Tough-Oakes, 500 (55° incline); Ontario-Kirkland, 450; Elliott-Kirkland, 500; Black, 155; Hunton, 100; Kirkland Combined, 200; Canadian-Kirkland, 100; Comfort-Kirkland, 150; La Belle Kirkland, 340; Fidelity, 140; Swastika, 400; Marigold (Lucky Cross), 200; Baldwin, 200; Bidgood, 400; King-Kirkland, 100; Sylvanite, 300.

Bourkes and Munro.—Bourkes, 400; Murray-Mogridge, 226; Croesus, 400 (22° incline); Burton-Munro, 318 (55° incline); Detroit-New Ontario, 183, Hill or Premier, 200; Cartwright, 100.

Porcupine.—Hollinger, 1,530; McIntyre, 1,950; Dome, 1,300; West Dome (62° incline), 350; North Dome, 325; Porcupine Crown (North Crown), 700; Vipond-North Thompson, 600; Schumacher, 600; Dome Lake, 500; Rea, 400; Davidson, 500; Foley-O'Brien, 250; Hollinger Reserve (Grey or McEnaney), 440; Hayden, 375; Anchorite, 350; Keora, 120; Clifton-Porcupine, 228 (80° incline); Plenaurum, 1,000 (drift from McIntyre); Peninsular, 180; Union, 275.

Matachewan and West Shiningtree.—Matachewan Gold Mine, 170; Thesaurus, 100; Wasapika, 200; Herrick, 150; Westree, 100; Buckingham, 105; Steep, 100; White Rock, 165.

North Shore and Michipicoten.—Long Lake, 225; Grace, 300; Shakespeare, 300.

Northwestern Ontario.—St. Anthony, 525; Saw Bill, 275; Sunbeam (A. L. 282), 43° incline, 410; Elizabeth, 280; Golden Star, 537; Foley, 420; Olive, 251; Laurentian, 480; Big Master, 285; Twentieth Century, 340; Paymaster, 325; Sakoose or Golden Whale, 165 (incline 85°); Redeemer, 235; Golden Horn or Rush Bay, 255; Regina or Black Eagle, 545; Sultana, 600; Mikado, 540; Tash-Orn, 140.

Hydro-Electric Power

The following gold mines and gold-mining areas have been or are being supplied with hydro-electric power: Porcupine, Kirkland Lake, Boston Creek, Larder Lake, Long Lake, Wawa, Canadian Homestake or Scramble, Hammond

Reef, Cordova, Deloro and Golden Fleece. The locations of the various power plants and transmission lines are shown on the accompanying maps.

Description of Gold-Mining Areas

The gold deposits of the Province, including all the producers and a number of prospects are briefly described under the areas in which they occur. The locations are shown on the accompanying maps and most of the claim numbers are given in the text. Amongst the producers, particularly in northwestern Ontario, are included many properties which have recovered a small amount of bullion from mill tests only. Owing to many of the older departmental reports being out of print it was deemed advisable to republish a number of cuts showing cross-sections through old workings, and also refer to them at greater length than some of the large present producers.

Southeastern Ontario

The Eastern Ontario gold area constitutes a narrow strip of country extending from Belmont township, Peterborough county, eastward across the counties of Hastings, Addington, and Frontenac and into the western part of Lanark, a distance of about 70 miles. It was in this area that gold was first found in the Province, in 1866, at the Richardson location. Among the most important mines were the Cordova (Belmont), Deloro, Atlas-Arsenic, and Cook. The deepest mine workings reach about 500 feet. The ores are largely of the arsenical-gold type in which the gold was recovered by various methods, namely, amalgamation, chlorination, or cyaniding. The mispickel concentrates were treated in a refinery and white arsenic was produced. The smelter at Deloro continues to operate, but since 1904, all the ores treated have been from the Cobalt silver camp. There are also quartz-pyrite gold deposits free from mispickel, such as the Cordova, Sovereign, etc.

A list of some of the important articles relating to the area is given in the foot-note below. [1]

W. G. Miller, in his report on "The Eastern Ontario Gold Belt", in 1901. summarizes the geology of the area as follows:—

> A series of diorites, crystalline limestones and various schistose rocks has been cut through by granite. . . . Overlying all the rocks mentioned are areas, here and there, of undisturbed Silurian limestone. . . . The granite was found . . . to be younger in age than either the diorite or crystalline limestone. . . . The diorite is also seen to be younger than limestone . . . Most of the gold deposits occur near the contact of the diorite and granite, although some important ones are found at a considerable distance from the granite. . . . The cavities occupied by the deposits owe their origin to the shrinkage of the granite on cooling.[2]

Some years later W. G. Miller and C. W Knight,[3] made a detailed study of seven distinct key areas in the region and described more fully the relationship of the rocks in the vicinity of some of the gold mines.

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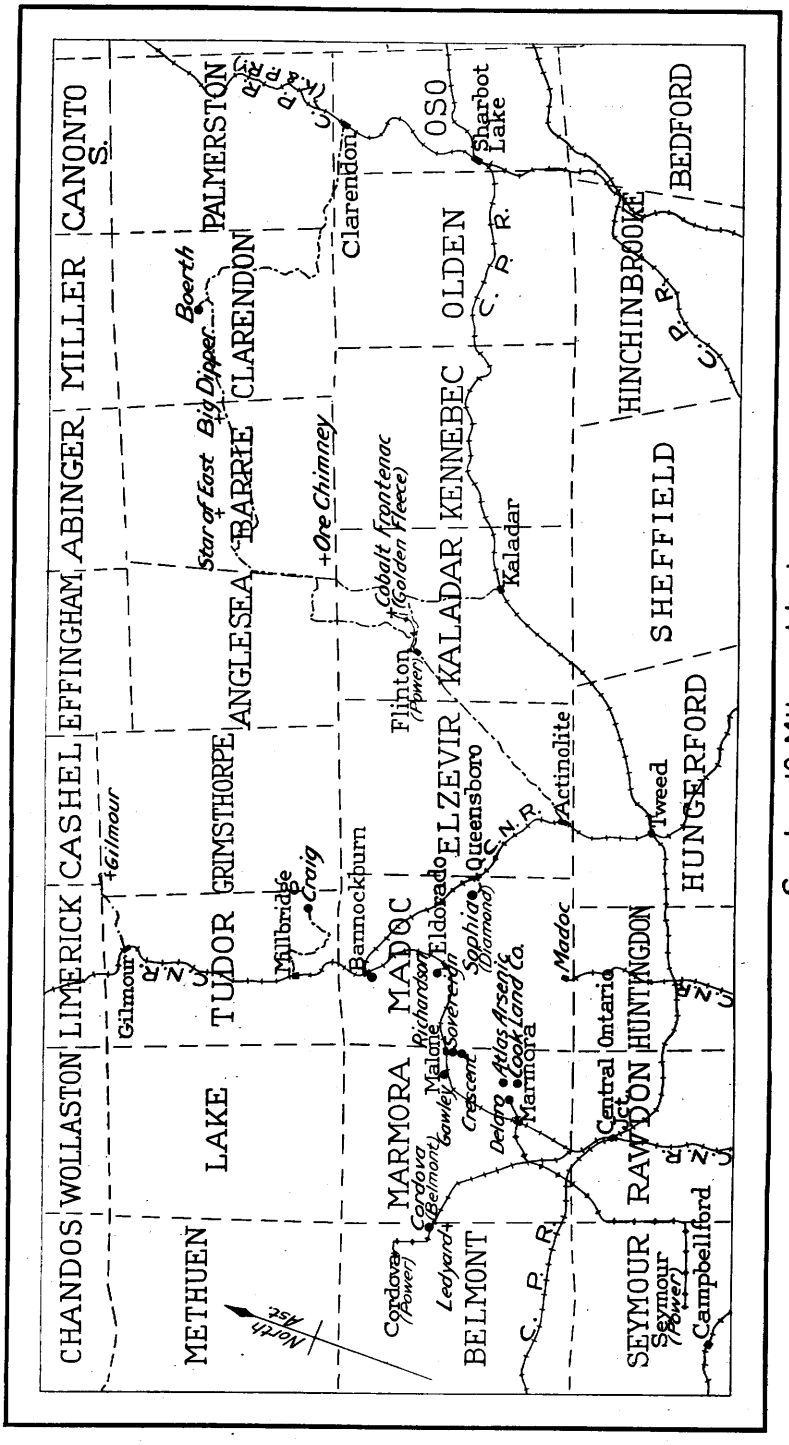
[1] Can. Geol. Surv., Report 1869, etc.; Trans. Can. Min. Inst. Vol. V. pp. 233-255 "Eastern Ontario, A Region of Varied Mining Industries" by W. G. Miller; Ont. Bur. Mines, Vol. XII, 1903, pp. 108-116, "Mines of Eastern Ontario" by W. E. H. Carter; Ibid Vol. XI, 1902, pp. 101-122, "Arsenic in Ontario" by J. W. Wells; Idem, pp. 186-207, "The Eastern Gold Belt" by W. G. Miller. Vol. XXII., 1913. pt. 2, "The Pre-Cambrian of South Eastern Ontario" by W. G. Miller and C. W. Knight; also other Annual Reports Ont. Bur. Mines.

[2] Ont. Bur. Mines, Vol XI, 1902, pp. 186-187. The term diorite in the report cited was used in a comprehensive sense, to cover dark-colored rocks of various character.

[3] Ibid, Vol. XXII, 1913, Pt. 2.



Key map showing location of gold mines and prospects in Southeastern Ontario

The *Cordova* (*Belmont*) mine occurs in and is genetically connected with a gabbro-diabase mass of post-Hastings age: The *Sophia* or *Diamond* mine (lots 14 and 15, concessions X, Madoc township) has visible gold, and mispickel in a quartz-calcite gangue, occurring in a Keewatin hornblende schist,[1] and near a felsite intrusion. The *Golden Fleece* or *Cobalt Frontenac* (west ½ lot 24 and lot 25, concession VI, Kaladar township) occurs at the contact of Keewatin green schist and Hastings conglomerate, the deposit consisting of schist, quartz, pyrite and gold. A production of approximately $10,000. was obtained from a 10-stamp mill. A hydro-electric power plant at Flinton now supplies the mine. The *Ore Chimney* (lots 34 to 36 in concession 1, Barrie township) is a prospect occurring on a similar contact about 5 miles northeast. The company is building a hydro-electric power plant on the Scootamatta river.

The *Deloro*, which is the best known gold mine in Eastern Ontario, and the following adjoining properties, *Atlas-Arsenic* (Lot 10, concession IX, Marmora township); *Cook* (lots 7, 8, and 9, con. IX, and lots 10, 11, and 12, con. X, Marmora township); *Sovereign* (lot 17, con. XI, Marmora township); *Gawley* (lot 18, con. IX, Marmora township), *Crescent* (lots 16 and 17, concession XI, Marmora township); and the *Richardson* mine (lot 18, con. V, Madoc township), all occur near the edge of a granite boss, Algoman in age, which intrudes Keewatin green schists and Grenville limestone. The deposits, except the *Sovereign*, consist of irregular quartz veins containing gold and mispickel, and are genetically connected with the Algoman granite.

A few other properties in the area may be mentioned; the *Gilmour*, which lies five miles east of the village of Gilmour in lot 30, con. XIX, Grimsthorpe township, was operated from 1909 to 1914, and yeilded $24,348.54 with a 5-stamp mill. *The Craig* gold mine, which is situated on the south halves of lots 4 and 5, in the third concession of the township of Tudor, has a shaft 150 feet deep on a quartz vein from 5 to 12 feet wide, and in 1905 yielded a small quantity of gold by a 6-stamp mill. The *Star of the East* (lot 24, con. X, Barrie township), also produced some gold by a 10-stamp mill in 1905. The vein consists of quartz lenses highly impregnated with pyrites occurring in crystalline limestone near diorite[1]. The workings are 213 feet deep. The *Big Dipper Mining Co.* are interested in lots 4 to 21 in the tenth concession of Barrie township. Considerable work has been done on quartz veins carrying pyrite, magnetite and some gold in limestone near granite.[2] The *Boerth* mine, (*Clarendon Mining Co.*), which is situated in lot 28 of the seventh concession of Clarendon township, produced some gold bullion in 1899. According to W. G. Miller:[3]

> **The deposits of auriferous mispickel and quartz occur near the contact of diorite and crystalline limestone. . . . Some of the quartz veins run across the strike of the rocks. Tourmaline occurs at times mixed with the mispickel, and the ore containing this mixture is said to be the richest in gold.**

Rich gold specimens came from the *Bannockburn* deposits (lot 28, con. V, Madoc township) which consists of quartz stringers and pyrite in diorite schist. Some bullion was recovered with a 10-stamp mill.

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[1] Ont. Bur. Mines, Vol. XXII, 1913, Pt. 2, p. 111.

[2] Ibid, Vol. XV, 1906, p. 89.

[3] Ibid, Vol. XI, p. 203.

The two chief properties, the Cordova and Deloro, are more fully described in the following paragraphs.

Cordova (*Belmont*).—(E. half lot 20, con. I, Belmont township). From its discovery in 1897 up to the end of 1903 the mine produced 16,790 ounces of gold bullion valued at $289,302.[1] The mine lay idle from 1903 until 1911, when it was re-opened by P. Kirkegaard and worked almost continuously until the plant was burned in 1917, producing an additional amount of bullion valued at $45,180 in gold and $299 in silver. The total production therefore was $334,781. Before the fire the mine was equipped with 30 stamps, Wilfley tables and a cyanide mill operated by electricity supplied from the company's own hydro-electric power at Deer lake, 2½ miles distant.

W. G. Miller and C. W. Knight, describe the deposit as follows[2]:—

The ore-bodies occur in a coarse-grained gabbro-diabase which invades the Grenville and Hastings series. The veins are of quartz, with which are associated iron pyrites, feldspar and calcite. The wall rock has been altered to a chlorite schist, or chlorite-mica schist, sometimes 50 feet wide, there being a gradual transition between the fresh gabbro-diabase and the schist. The latter is impregnated with quartz veinlets parallel to the schistosity. Consequently, there is not a definite boundary line between the ore and the schistose wall rock. The ore body is low-grade, the hand-culled material which is treated in the mill averaging between $5.00 and $6.00 per ton. The deposits may have been formed by hot solutions which followed the intrusion of the gabbro-diabase.

Speaking of the rocks in which the ore occurs they remark[3]:

The gabbro-diabase series is important from an economic point of view, as in it at Cordova are the auriferous veins of the Cordova mine.

The gabbro-diabase is classed as Keweenawan (?) but it may be Haileyburian or Algoman in age.

W. G. Miller also states[4]:

The large ore bodies are found at points of intersection of two fissures, and come to the surface in some cases in the form of what may be called chimneys. . . . Mispickel, which is characteristic of the Deloro and other properties farther east on the gold belt, does not occur here. Pyrrhotite, galena and copper pyrites are met with at times.

Ledyard.—Adjoining the Belmont or Cordova is the Ledyard gold mine (east half lot 19, concession 1, Belmont township), which in 1897 had a 20-ton mill and a shaft 100 feet deep.

Deloro.—The property includes lot 9, concession VIII, and adjoining lots in Marmora township, and was formerly known as the Gatling. It was operated by the *Canadian Goldfields Company, Limited*, a British concern, and has been described in the Reports of the Geological Survey and of the Bureau of Mines. Miller and Knight say[5]:

The ore bodies consist essentially of quartz lenses in the schist which contain visible gold and mispickel. The lenses conform to the strike of the schist, and cut across dikes of granite which intrude the latter. Near the surface the ore was com-

[1] Can. Min. Inst. Trans., Vol, VII, 1904, p. 120.
[2] Ont. Bur. Mines, Vol. XXII, 1913, Pt. 2, p. 110.
[3] Idem, p. 33.
[4] Ibid Vol, XI, 1902, pp. 190-191.
[5] Ibid, Vol. XXII, 1913, Pt. 2, p. 110.

paratively rich, but the value gradually decreased in depth. At a depth of 500 feet in the inclined shaft, the gold represented only two or three dollars a ton, but massive mispickel was present. Two factors contributed to the closing of the mine, viz., the encountering of a heavy flow of water in the lower levels, and the discovery of rich arsenical ores at Cobalt. Deloro was the pioneer white arsenic producer in North America, but the ores now treated there all come from Cobalt.

The Deloro, at times, ran 20 stamps and had a cyanide plant for treatment of its concentrates. During the five year period of operation from 1899 to 1903, 35,877 tons of ore were raised and milled from which the total value of gold recovered was $181,907.55, and of arsenic $128,975.50, making a grand total value of $310,883.05, or of $8.66 per ton.[1] The present Deloro smelter is operated by hydro-electric power furnished by the Hydro-Electric Power Commission of Ontario from its plant at Campbellford.

Parry Sound District

McGown.—In 1894 gold-copper ore was discovered at the McGown mine, on lots 146, con. A. and B., Foley township, two miles east of the town of Parry Sound. In 1898 a 10-stamp mill was erected. According to A. P. Coleman[2] the deposit consists of "an irregular bedded vein about 3 feet wide containing quartz mixed with dark schistose rock and carrying some free gold and copper ores, especially bornite and chalcocite. Much of the geology corresponds to the Grenville series or Upper Laurentian of Eastern Ontario and Quebec, or to the Keewatin rocks of Western Ontario."

The McGown and neighbouring deposits were found on developing to be pockets which were more valuable for copper than for gold. Several car-loads of ore were shipped to a smelter and yielded 15.8 per cent. of copper with a little less than an ounce of silver and $5.00 in gold to the ton.

North Shore of Lake Huron.

In this region isolated properties have yielded gold intermittently from 1892 to the present, the most important producer being the Long Lake mine. Many of the deposits belong to the Keweenawan epoch.

Crystal.—The Crystal gold mine (W.D. 44, Rathbun township), the only producer at Wanapitei lake, where gold was found in 1888, operated for a period of years following 1892. According to W. H. Collins[3] the deposit consists of narrow quartz veins carrying pyrite and gold at and near the contact of Keweenawan diabase and Cobalt sediments. Mispickel, chalcopyrite and pyrrhotite are also present. A small production was obtained from a 5-stamp mill. Other prospects in the vicinity are the *Gordon, Mondoux, Last Chance* and *Comstock.*

Havilah.—This mine, formerly the *Ophir,* in lot 12, in the third concession of Galbraith township, is also at the edge of a Keweenawan diabase intrusion, and is quite similar to the Crystal deposit. The vein was worked at intervals from 1892 to 1902 and was among the producers again in 1910 and 1911. During 1921 the Havilah and the Bass Lake property, 3 miles northwesterly, were taken over by *Kirk Gold Mines Company, Limited.* The Havilah mill is now being overhauled and a cyanide plant installed. According to T. L. Tanton, the Bass Lake vein is a dark quartz carrying visible gold and lying entirely in Keweenawan diabase.

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[1] Jour. Can. Min. Inst. Vol. VII, 1904, p. 121, by W. H. H. Carter.
[2] "Copper in Parry Sound" Ont. Bur. Mines, Vol. VIII, 1899, pp. 259-262.
[3] Onaping Map Area, by W. H. Collins, Memoir 95, Can. Geol. Surv. p. 12, 114.

Long Lake.—This mine[1] (W.D. 602), is situated near the southwest end of Long lake, in Timber Berth No. 69, and is reached by a 10-mile wagon road from Naughton station, 11 miles west of Sudbury. The property was purchased by the Canadian Exploration Company, Limited, who mined 150,000 tons of ore averaging about $6.00 per ton in gold which was successfully treated by a 10-stamp mill and a cyanide plant. The bullion production from 1910 to 1916 amounted to 142,265 ounces containing $829,281 in gold and $262 in silver. The mine was supplied by electricity from the Wanapitei power plant. According to M. B. Baker, Timiskamian feldspathic quartzite is cut by diorite and Algoman granite, the intrusives probably being from the same magma. The diorite, which is considered to be the source of the gold, has within it a large vertical core of quartzite mineralized with fine-grained arsenopyrite, pyrite and small quantities of pyrrhotite, galena and copper pyrites. This formed the ore body, which has been cut by post-Keweenawan faults. The diorite may be Haileyburian or Algoman in age. The known ore body was mined and milled, and the faulted portion could not be found on the 225-foot level.

The *Sudbury* copper-nickel ores, of which the *Vermilion* mine in lot 6, con. IV, Dennison township is the richest, yield some gold.[2]

The *Bruce* copper mines which were first worked in 1849 carry small quantities of gold in parts. The deposits occur in and are genetically connected with Keweenawan diabase.

Shakespeare.—Gold was found on lot 5, concession one, township of Shakespeare, in 1903, and work continued until the fall of 1907. During 1905, 1906 and 1907, $38,327 in gold was recovered by a 10-stamp mill. The mine is referred to in the Ontario Bureau of Mines Reports for these years. W. E. H. Carter states that "The ore is made up of interbanded lenses and stringers of quartz and chlorite schist . . . . . The contact with the granite lies to the north on the other side of the valley, probably half a mile away."[3] The lode is 40 feet wide, having an ore zone on either side. Iron pyrites is the principal sulphide. A shaft with several levels has been sunk to a depth of 300 feet or more.

Howry Creek.—Gold was found here in 1911 and reported on by A. P. Coleman[4] and W. H. Collins.[5] The veins are found in Animikie quartzite and conglomerate and in Keweenawan diabase. According to Dr. Collins "They [the ore deposits] are chiefly well-defined quartz veins . . . composed of white quartz and ankerite carrying arsenopyrite and free gold. . . . One of the deposits [mining locations 3180-81-82, the *Bosquet,* now operated by R. R. Tough, of Haileybury] is simply a broad sheared zone in conglomerate, which has been hydrothermally altered and filled with a plexus of quartz veinlets." The *Howry Creek* main vein (S. 2279, 2782, 2783 and S. 3673), consists of altered quartzite, quartz, ankerite, arsenopyrite, pyrite, and a little chalcopyrite in quartzite near diorite. The

[1] Pre-Cambrian Rocks North of Lake Huron, by A. P. Coleman, Ont. Bur. Mines, Vol. XXIII, 1914, Pt. 1, pp. 202-236; Long Lake Gold Mine, by M. B. Baker, Ibid, Vol. XXVI, 1917, pp. 157-162.

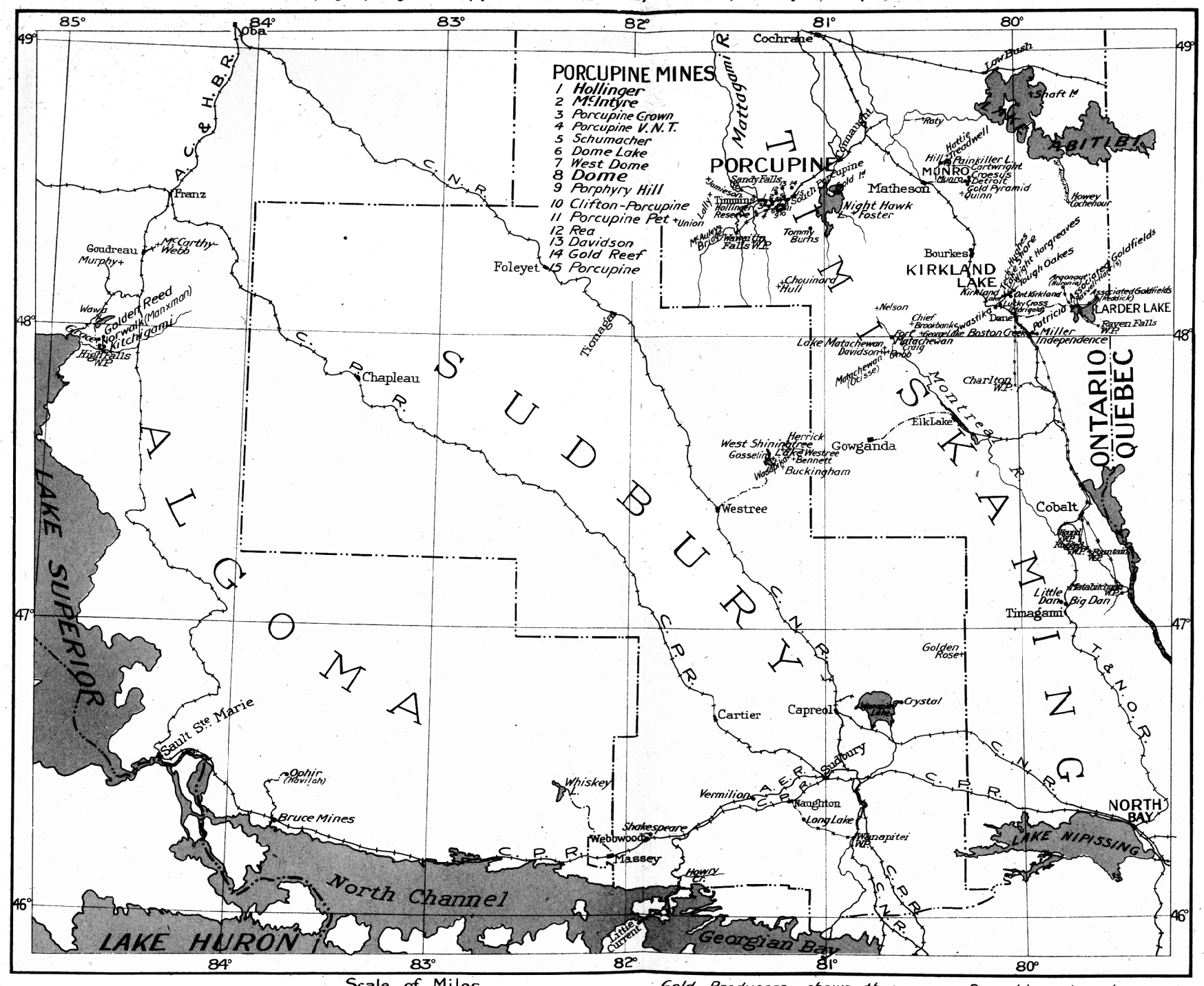
[2] R. L. Peek, in the Feb. 1922, issue of the Bulletin of the Canadian Institute of Mining and Metallurgy, calculates from analysis of the Sudbury matte that 60,400 ounces of gold were contained in matte produced to the end of 1920. According to the Royal Ontario Nickel Commission Report, page 43, the only gold produced of any account in the Sudbury copper-nickel area came from the Vermilion mine and from the refining of the nickel-copper ores.

[3] Ont. Bur. Min. Vol. XIII, 1904, pp. 70-71.

[4] Ont. Bur. Min., Vol. XXIII, 1914, Pt. 1, p. 224.

[5] Can. Geol. Surv. Summary Report 1917, pp. 10-13E.

To accompany Report by P. E. Hopkins in Vol. XXX Part 2, Ontario Department of Mines Report, 1921



Key Map of Part of Northern Ontario showing the Location of Mines that have produced Gold.

Note—Owing to the small scale of the map all prospects cannot be shown.

Majestic Gold Mines Limited are interested in claims S. 4706, S. 4730 and S. 4731. The vein being tested in 1921 is in quartzite or arkose, and consists of quartz, white, grey, and in places almost black. Not much mineralization is visible on the surface, but occasional bunches of pyrite are encountered in sinking.

Whiskey Lake.—In 1912 gold was found on the *Wilson* claim, Whiskey Lake, which lies 30 miles by lumber road to the northwest of Massey station. According to A. P. Coleman, the gold occurs in Lower Huronian quartzite and slate near greenstone, and in a green schist near the contact of sedimentary rocks including limestone. Granite outcrops a mile north of the principal showings. "The ore as disclosed is rusty quartz containing, where not too much weathered, pyrite, pyrrhotite and a little copper pyrites and galena. Free gold could be seen at a number of places."[1]

W. H. Collins,[2] states that the ore bodies are in Huronian (Bruce series) sediments close to intrusive bodies of diabase or in the diabase itself."

Michipicoten and Goudreau

Gold was found south of Wawa lake in 1897, and has been mined at intervals since then. Geologically coloured maps of the area by A. P. Coleman and A. B. Willmott,[3] J. M. Bell,[4] A. P. Coleman,[5] and W. H. Collins[6] have been published. The *Grace* (D. J. 7, or No. 1052), was the first producer in the area. Small productions also came from the *Manxman* or *Norwalk* (No. 1279) *Kitchegammi* (C B. 2, Y. 337) and *Golden Reed* (1239). According to J. B. Tyrrell the vein of the *Kitchegammi* is on the contact of a hornblende granite gneiss and an intrusive biotite granite. The mills were run by hydro-electric power supplied by the Algoma Power Company at High Falls, Michipicoten River. The deposits are lodes, containing sugary and glassy quartz carrying pyrite, pyrrhotite, chalcopyrite, arsenopyrite and visible gold with intermixed schist. They occur in Keewatin sericite schists and quartz porphyries not far from post-Keewatin granite and gneiss. The iron formation of the area carries small quantities of gold, e.g., at the *Emily*. "The location including the Helen mine itself was first staked as gold-bearing, but soon turned out to be of vastly greater importance as an iron mine."[7]

Grace, the most important mine of the area, produced during 1902. 1903, 1907, 1908 and 1910, gold bullion valued at $71,124.

On the first level at a depth of 100 feet the ore has been stoped out for 150 feet along the vein and to the level. In the north drift on this level, 90 feet from the shaft a winze has been put through to the second level stope. At the second level 200 feet in depth, the drifts north and south are 100 feet and 180 feet in length. The north stope has been carried through to the first level, while south of the shaft stoping is being done. On the third level at a depth of 300 feet drifts have run north and south 80 feet and 50 feet respectively. No stoping has been done on this level. [8]

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[1] "The Whiskey Lake Area" by A. P. Coleman, Ont. Bur. Mines, Vol. XXII, 1913, Pt. 1, p. 154.

[2] Can. Geol. Surv. Summary Report, 1917, pp. 8E-10E.

[3] "Michipicoten Iron Ranges," Scale 2 miles to the inch, Ont. Bur. Mines, Vol. XI, 1902.

[4] "Michipicoten Iron Ranges," Ibid, Vol. XIV, 1905.

[5] "Iron Ranges of Southeastern Michipicoten," Ibid, Vol. XV, 1906.

[6] "Ore Deposits of Goudreau and Magpie," Summary Report Can. Geo. Survey, 1918, Pt. E.

[7] Ont. Bur. Mines, Vol. XV, 1906, p. 175.

[8] Ibid, Vol. XVIII, 1909, p. 91.

McCarthy-Webb.—Gold was found on the claims (F.S.M. 2049-2052) near Goudreau in 1918. According to W. H. Collins[1] gold can be seen in quartz veinlets in narrow shear zones in an ash-grey feldspar porphyry resembling granite gneiss.

Murphy.—In April, 1921, a promising discovery of rich gold in quartz was made on the *Murphy* claims, 407 and 408, three and one half miles southwest from Goudreau. These claims are known as the *Goudreau Gold Mines.* An electrically driven 10-drill compressor is being installed. Other important discoveries have been made on the *Morrison* (2075), *Cline,* (2184, 2186 and 2189) and others.[2]

Gold-Mispickel Deposits near Timagami

Big Dan.—Gold-mispickel ore has been mined and shipped from the *Big Dan* and *Little Dan* properties which are situated about 2 miles north of Timagami station. The deposits have been described in various Reports of the Ontario Bureau of Mines: by A. P. Coleman[3] W. G. Miller[4] W. E. H. Carter[5] and E. T. Corkill[6]. In 1919 C. W. Knight[7] mapped an area in the vicinity of Cedar and Net Lakes which included these two deposits and described them in detail. According to Mr. Knight's report "The ore body (on the Big Dan, W.D. 271) occurs in a sheared and brecciated zone in basalt of Keewatin age . . . .The ore occurs in small veinlets and in grains through the rock . . . .It consists of mispickel, iron pyrites, copper pyrites and pyrrhotite . . . The shear zone . . . is gossan-stained on the surface, and has a width at the tunnel of about 50 feet and a length of about 1,000 feet . . . The origin . . . is uncertain[8]."

Little Dan.—This deposit on W.S. 13, W.S. 14, according to Mr. Knight, is similar in occurrence to the Big Dan. John E. Hardman, who was associated with the property some years ago when it was being worked, informed Mr. Knight that there were lenses of fine mispickel encountered from one to 18 inches wide. About 270 tons of mispickel were shipped and the gold and arsenic contents were paid for[9].

Golden Rose.—Some gold was obtained from this claim on the east shore of Emerald lake during parts of 1915 and 1916[10]. The ore contains much copper pyrites. The deposit was discovered about 1897.[11]

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[1] Can. Geol. Surv., 1918, Pt. E.

[2] Ont. Dept. Mines, Goudreau Gold Area, Press Bulletin (July, 1921) by A. G. Burrows. These notes were later incorporated with Vol. XXX, Part IV.

[3] Ont. Bur. Min., Vol. IX, 1900, p. 173.

[4] Ibid, Vol. V, 1901, p. 179.

[5] Ibid, Vol. XIV, 1905, Pt. 1, pp. 73-74.

[6] Ibid, Vol. XV, 1906, Pt. 1, pp. 87-88; Vol. XVIII, 1909, Pt. 1, pp. 132-3.

[7] Ibid, Vol. XXIX, 1920, Pt. 1, pp. 214-219.

[8] Idem, pp. 214, 216.

[9] Idem, pp. 218.

[10] Ibid, Vol. XXV, 1916, p. 103.

[11] Ibid, Vol. X, 1901, p. 175.

Boston Creek and Skead[1]

Boston Creek.—Gold has been produced at only two properties in the area, namely, the Patricia and the Miller-Independence. Both mills have been burned. The gold occurs in veins, stockworks and fahlbands in Keewatin rocks and in Algoman porphyries and granites.

The first discovery in 1914 was on the Kenzie vein, which extends from the *R.A.P. Company* (L. 5163) to the *Boston Creek* (L. 3665). The vein is 5 feet wide and consists of greenish quartz and some reddish calcite, with inclusions of silicified basalt and reddish porphyry carrying gold, pyrite, chalcopyrite, molybdenite and galena. The workings to the 400-foot level show that there are a few small shoots of high-grade ore, while most parts of the vein are barren. Gold, tetradymite and petzite (?) were discovered in a flat fissure quartz vein on the *Miller-Independence* (S. ½ lot 1, concession VI, Pacaud township), in July, 1915. This vein extends easterly on to the adjacent property, *Connell-McDonough*. In 1918 an ore shoot carrying calaverite, a precious telluride, was found on the Miller-Independence. The calaverite occurs as veinlets in copper pyrites and quartz stringers, the deposit being roughly 160 feet in length on the dip, about 50 feet in length along the strike and 3 feet in width between two faults, in Keewatin basaltic lava, altered to calcite, ankerite, or some other carbonate. Prospecting has been carried on at the 500-foot level. The mine is run by hydro electric power.

The *Patricia (Boston-Hollinger)*, the two north claims in lot 3 concession VI, Pacaud township, has three ore shoots of a good grade, 25, 80 and 130 feet in length and one to three feet wide. A fahlband carrying low contents of gold occurs on the *Currie prospect* (L. 5037, Boston township). At the north end of the *Boston-McRae* (N. ½ lot 2, concession VI, Pacaud township), there are a few small quartz lenses carrying native gold, calaverite, and pyrite in altered basalt. Gold occasionally associated with a telluride occurs in veinlets in the granite on the *Authier* (L. 5025, Boston township), *Charest* (L. 5505, McElroy township), *Gold Leaf* (L. 5757, Boston township), and in a porphyry stockwork on the *Catharine Gold* (N. ½ lot 10, concession IV, Catharine township). The *Peerless* claim, No. 5266, formerly the *Mondoux*, has a 250-foot shaft on a quartz vein, certain portions of which carry considerable native bismuth, galena, cosalite and some zinc blende, pyrrhotite, pyrite, chalcopyrite and native gold in Keewatin greenstone. The *Ivanhoe* (L. 5079, Boston township), also has considerable native bismuth carrying gold. A 130-foot shaft has been sunk on the *Kennedy-Boston* (S. ½, lot 11, concession VI, Catharine township), on a narrow fracture carrying pyrite and visible gold in places. The *Walsh-Taylor* deposit, in the N.E., ¼ of the S. ½, lot 5, concession III, Catharine township, consists of a stockwork in rusty carbonate. The *Roger-Barnett* (N. ½ lot 5 concession III, Catharine township), and the *Honslow* (S. ½, lot 4, concession 1, Catharine township), are also of the stockwork type in pillow lava altering to carbonate, and carry considerable visible gold.

Skead township.—Quartz veins carrying gold, but only prospected in part, have been found in various types of rock in Skead township, namely, in granite and porphyry on the *Wisconsin-Skead* (L. 4353) and *Sampson* claim (lot 10, con

[1] Boston Creek Gold Area, by A. G. Burrows and P. E. Hopkins, Ont. Bur. Min., Vol. XXV, 1916, Pt. 1, pp. 244-259; Boston-Skead Gold Area, Ont. Dept. Mines, Vol. XXX, 1921, Pt. 6.

cession VI); in granite-porphyry on the *Flanagan* claim, (lot 7, concession III); gold occurs with specular hematite, pyrite and chalcopyrite in andesite on the *Skead Gold Mines,* (N. ½, lot 2, concession II), Telluride Synidcate (S. ½, lot 2, concession II), and *Nigger* (M.R. 3); in porphyry on the *Manley-O'Reilly* (L.S. 128), *Lincoln-Nipissing* (C.E. 3, C.E. 4); *Zenith Gold* (Lot 1, concession VI) on the adjoining *Cook* claim (4041) in Hearst township; and in chert on the *Fidelity.* (L. 238).

Larder Lake and Vicinity [1]

Gold was discovered at Larder Lake in 1906, and since then development has been carried on at a few properties. The total production is approximately $50,000, mainly from the Argonaut, formerly La Mine D'Or Huronia, with a small contribution from the Harris-Maxwell and Reddick which now belong to the Associated Goldfields. The three properties are furnished with electric energy supplied from the Raven Falls power plant. Larder Lake is reached by a 17-mile wagon road from Dane station. The rocks comprise Keewatin volcanics and ferruginous carbonates and iron formation. The rusty-weathering carbonates are intersected by veinlets of quartz, which carry much of the gold of the area. Associated with the Keewatin are slate and conglomerate which are in part Timiskamian in age. Cutting the above mentioned rocks are dikes of Algoman (?) porphyry, felsite, and lamprophyre, which appear to be responsible for the gold. Lying on all these rocks are the erosion remnants of Cobalt sediments which are in turn cut by Keweenawan diabase.

Argonaut.—(L. 2587, Gauthier township), has been mapped and reported on in detail by C. W. Knight [2] who states:—

> There are said to be more than a score of veins, all of them containing gold, on the Argonaut property. Some of the 'veins' appear to consist mainly of felsite or feldspathic material in which occur magnetite, copper pyrites, pyrite and gold. Other veins are made up mostly of calcite, while still others consist mainly of quartz. It may be added that copper pyrites is a characteristic mineral in many of the ore bodies. Most of the veins strike northeastward and have more or less vertical dips. There has been about 1,400 feet of underground work done up to the spring of 1920.

The narrow quartz veins are in Keewatin basic schists. The total production up to the end of 1920 was approximately $33,000. The 15-ton mill continued to operate until it was burned in the summer of 1921.

The Associated Goldfields have been carrying on development work for several years at two or three of their properties; e.g. *Harris-Maxwell* (H.S. 114, 115, Hearst township), the *Reddick* (H.J.B. 29, 30, McGarry township), *Kerr-Addison,* etc. The mineral deposits are of the stockwork type, namely, ferruginous carbonate intersected by irregular quartz and calcite veins carrying pyrite, galena, tourmaline, gold, etc. One shaft has reached a depth of 500 feet, and much diamond drilling has been done.

Gold occurs in aplite on the *Gold King.*

Katrine Township.—About 1907, gold was discovered on claims H.S. 238 and 241, which are situated in southeast *Katrine township,* 6 miles north of Larder lake. In 1919 the claims were re-staked by Geo. Tucker and optioned to the Nipissing Mining Co., who did considerable testing during the year. According

[1] Ont. Bur. Mines, Vol. XVII, 1907, pp. 202-218, by R. W. Brock; Ibid, Vol XVII, 1908, pp.10-11,by N. L. Bowen; Geol Survey Can. Mem. No. 17-E, 1912, by M. E. Wilson; Ont. Bur. Mines, Vol. XXVIII, Pt. II, 1919, pp. 71-77, by P. E. Hopkins.

[2] Ibid, Vol. XXIX, 1920, Pt. III, pp. 65-76, by C. W. Knight.

to C. W. Knight, the gold-bearing quartz veins occur in a stock-like mass of Algoman mica syenite, porphyritic in places and cutting Keewatin basic volcanics. "These veins vary in width from a few inches to 4 or 5 feet or more . . . The veins consist mainly of quartz, and contain also iron pyrites, copper pyrites, specularite, galena and at times considerable ankerite. . . . There were no assays made which showed the absence of gold. . . . No free gold was seen in any of the veins, but gold could be obtained on panning."[1]

Elstone-Dunkin.—On this property (claims L. 3894 and L. 3893, Gauthier township), 6 miles northwest of Larder Lake, gold was found in 1916. It occurs in a mineralized zone or fahlband, in altered pillow lava, 20 feet in width, which is cut by Algoman feldspar porphyry.

A section exposed in one cross trench shows from the northeast hanging-wall of greenstone 6 feet of fine-grained greenish altered rock, 4 feet of reddish porphyry greatly fractured and containing a number of quartz veinlets, one foot of fine siliceous material resembling chert with parallel bands of fine grained iron pyrites and lenses of white quartz in the direction of the schist, and seven feet of similar rock to the greenstone section just described. [2]

In 1921 gold was found in a narrow quartz vein in porphyry on the *Tobico* (L.9532), ¾ of a mile northeast of the Elstone-Dunkin.

Crown Reserve.—A porphyry dike 30 feet wide and carrying encouraging gold values was diamond drilled in 1921. The claim lies about a mile northeast of the Harris-Maxwell.

Kirkland Lake, Lebel, Goodfish Lake and Swastika [3]

Kirkland Lake is the second most important gold-producing area in Ontario. Up to the end of December, 1920, the production of gold with some silver amounted to $4,021,473. The producing mines are situated along a fault zone 2½ miles in length. In this zone there are irregular low to high-grade ore-shoots of various sizes. These are lode or composite vein deposits of the gold-telluride type. The fractured zone contains several faults, some of which are later than the gold, and crosses the various rocks in its path, including Timiskamian conglomerate, Algoman syenite, porphyry and lamprophyre, all the intrusions being differentiation phases from the same magma, which is believed to be the source of the gold. The ore minerals are native gold with small quantities of calaverite, kalgoorlite and hessite. Coarse calaverite has been recognised only on the Tough-Oakes, but it probably occurs finely disseminated in the adjoining deposits. The lead telluride, altaite, is common, while coloradoite and tetradymite have rarely been encountered. Other minerals present are iron pyrites, copper pyrites, molybdenite, graphite, barite, galena and zinc blende in a gangue of the enclosing rock (syenite, porphyry or conglomerate), with quartz and a little calcite. All the ore is similar in appearance and is reddish in colour, due to the included porphyry. The ore-shoots vary in width from 3 to 40 feet, and in grade from $5.00 per ton to $30.00 or more. The six producers will probably have a production of $2,000,000 during 1922. The operating mines are briefly described, commencing at the west and taking them in order to the east along the main zone.

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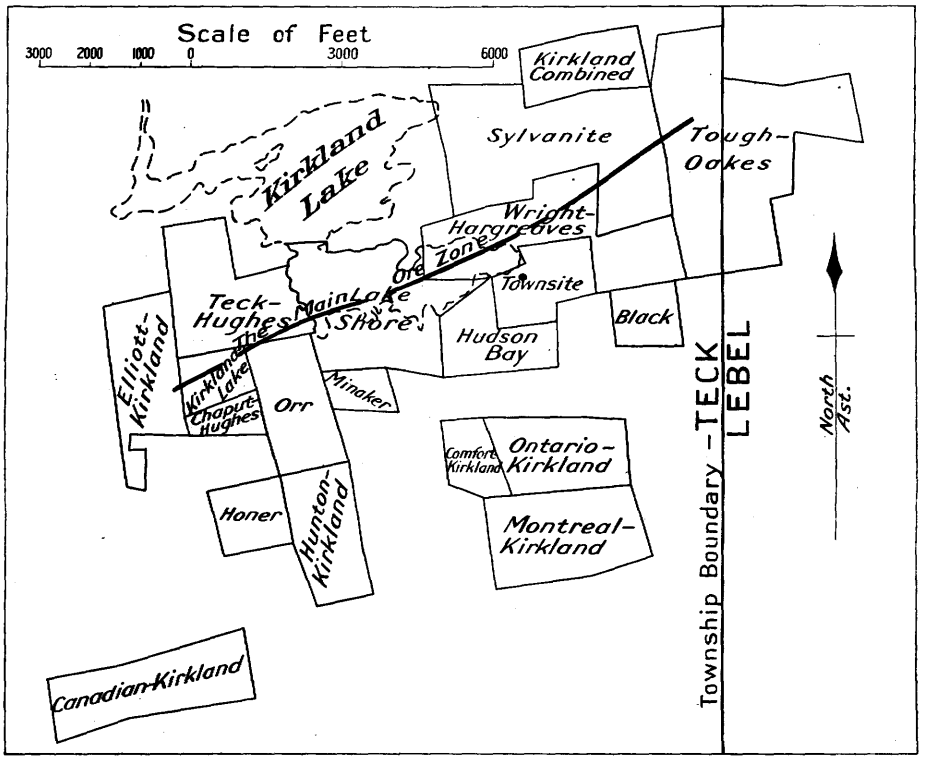
[1] Ont. Bur Mines, Vol. XXIX, 1920, Pt. 3, pp. 24-25.

[2] Ibid, Vol. XXVI, 1917, p. 257, by A. G. Burrows.

[3] Ibid, Vol. XXIII, 1914, Pt. II, pp. 1-39; Ibid, Vol. XXIX, 1920, Pt. IV, pp. 1-48, by A. G. Burrows and P. E. Hopkins.

Kirkland Lake Mine (L. 1236) has a 140-ton mill and is milling ore from a large shoot which extends from the 250-foot to the 900-foot level, the greatest depth reached in the area. Other rich shoots have been encountered further west on the lower levels.

Teck-Hughes (L. 1238, etc.) has stoped ore up to 40 feet in width from the 600-foot level nearly to the surface. The ore is put through a 150-ton mill, the extraction being over $9.00 per ton.

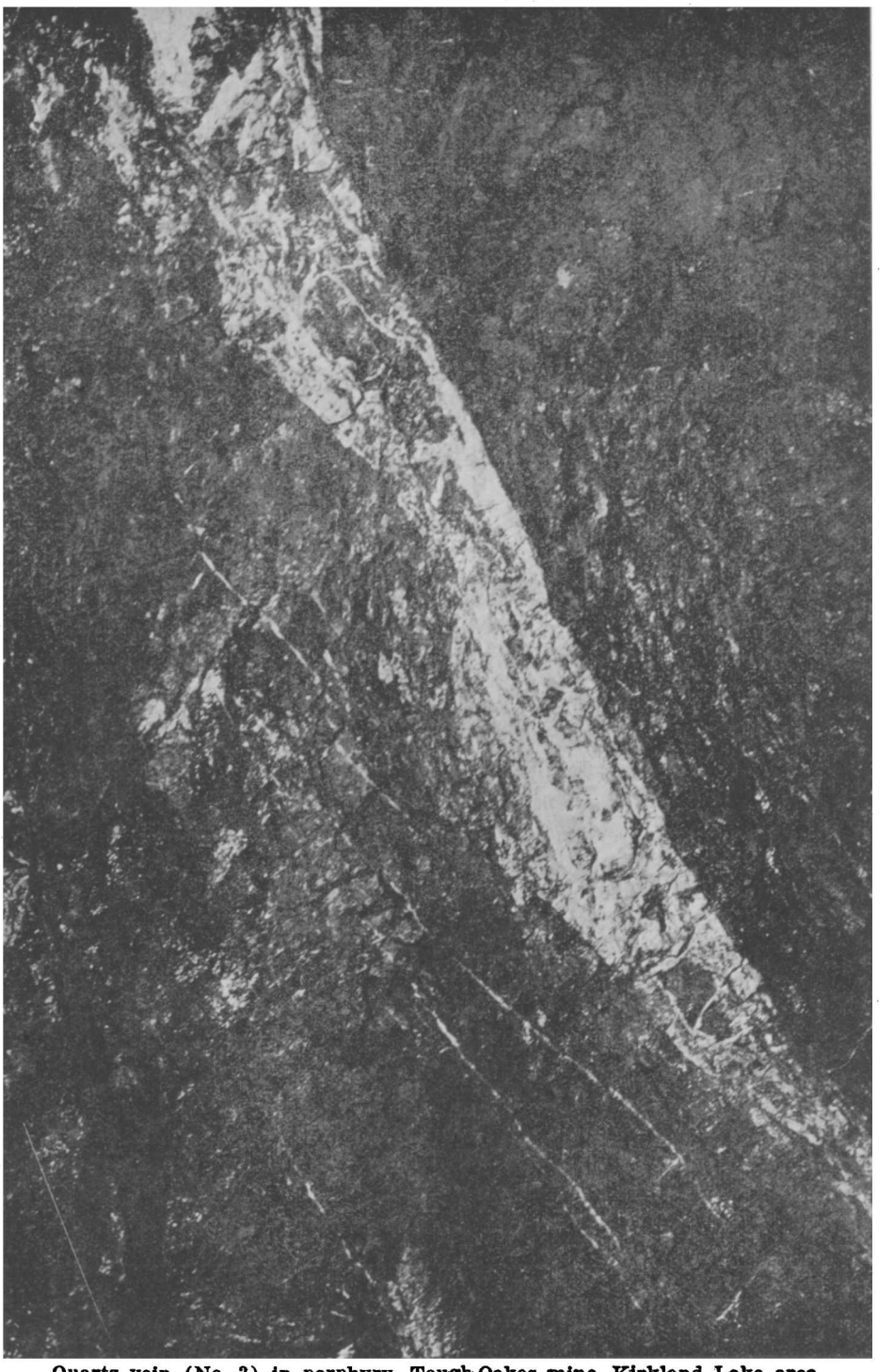


Plan showing location of several properties at Kirkland lake, in the vicinity of the main ore zone.

Lake Shore (L. 2645, L. 2605, L. 2606, L. 1557 and No. 16635) has two veins 400 feet apart with mine workings 600 feet in depth. The stopes average about 11 feet in width. During 1920 the 60-ton mill treated 19,779 tons of ore from which was recovered $502,113 in gold and $1,622 in silver, or at the rate of $25.47 per ton milled.

Wright-Hargreaves (L. 2103, L. 1829, L. 1830, etc.) has deposits similar to the Lake shore opened up to a depth of 600 feet. The mill which commenced operating in May 1921 treats daily about 175 tons of ore running approximately $12 to the ton. The vein is almost ¾ of a mile in length on the surface.

Tough-Oakes (L. 2372-L. 2376, L. 1823), with which is amalgamated the *Burnside*, was the first producer in the area. The mine yielded $1,933,955 from



Quartz vein (No. 3) in porphyry, Tough-Oakes mine, Kirkland Lake area.
(Ont. Bur. Mines, Vol. XXIX, Pt. 4, p. 39).

three narrow parallel veins which passed from porphyry into conglomerate. The ore averaged $20 to $75 per ton across 5 feet. Coarse calaverite came from No. 3 vein. The mine was re-opened in 1921 and is expected to be producing again in 1922. The capacity of the mill is 125-daily.

Other prospective producers on the main zone and having apparently similar deposits are the *Orr* (T. 16626), which has developed ore on the 400-foot level, and the *Sylvanite* (L. 2100, L. 2226, etc.), which is being systematically developed at the present time to a depth of 300-feet. The *Elliott-Kirkland* on the west has a shaft sunk 500-feet on the main fracture.

About three-quarters of a mile south of the main ore zone are a number of prospects mentioned in order from west to east; *Canadian Kirkland* (L. 6729), *Honer* (L. 5433), *Hunton-Kirkland* (T. 16621), *Ontario-Kirkland* (L. 2678, L.2679), and the *Black* (L. 2728). Of these the Ontario-Kirkland is at present the most promising. Ore of a good grade has been developed in a greywacké schist to a depth of 450-feet; a 100-ton mill has been constructed and began production in January, 1922. The *Comfort-Kirkland* is cross-cutting on L. 1329, with the hope of getting the extensions of the Ontario-Kirkland veins. On the Kirkland *Combined* (L. 6526, L. 6572,) a 200-foot shaft has been sunk on a fractured zone.

Lebel Township.[1]—Deposits are being explored in Lebel township, 5 miles east of Kirkland Lake. These deposits include the *Bidgood* (L. 6796, etc.), where an ore shoot has been encountered in porphyry on the 300-feet level; the *King-Kirkland* (L. 4118, L. 8002, etc), which has drifted on a short ore shoot on the 100-foot level; and the *Lebel Oro,* which has a shaft on a narrow rich vein.

Goodfish Lake.[2]—At Goodfish lake, three miles north of Kirkland lake several prospects, comprising narrow lenticular quartz veins and replacement deposits, have been located along the contact of Keewatin basic volcanic rocks and schistose quartz feldspar-porphyry. The porphyry has had some influnce on the gold deposition, and appears to be Keewatin or Laurentian in age. The main exploration is on *La Belle Kirkland,* claim L. 1751, where shaft A. is 340 feet deep with levels at 100, 270, and 340 feet. On the second level there are 1,100 feet of drifting and cross-cutting. Much diamond-drilling has also been done. High-grade lenses of silicified basalt up to one foot in width have been found in a zone of low grade material 7 to 10 feet in width. The *Fidelity* (L. 2845) has a 140 foot shaft on a deposit from 2 to 7 feet in width. Much work has been done on several other gold deposits, namely, *Costello* (L. 2194, L. 2202), Martin (L. 2233), and *Brennan* (L. 2603).

Swastika[3].—Although claims were first staked for gold at Swastika as early as 1906, there was little activity until 1910, when a rich showing of gold was found on the Lucky Cross and Swastika properties. The gold occurs in shoots with pyrite

[1] Ont. Bur. Mines, Vol. XXIX, 1920, Pt. 4, 1920, pp. 46-48, by A. G. Burrows and P. E. Hopkins.

[2] Ont. Bur. Mines, Vol. XXIII, 1914, Pt. 2, p. 31; Ibid, Vol. XXV, 1916, Pt. 1 pp. 260-263; Ibid, Vol. XXIX, 1920, Pt. 4, pp. 20, 46, by A. G. Burrows and P. E. Hopkins.

[3] Ont. Bur. Mines. Vol. XXI, 1912, Pt. 2, pp. 256-265, by E. L. Bruce; Ibid, Vol. XXIII, Pt. 2, 1914, p. 20, by A. G. Burrows and P. E. Hopkins.

in lenticular quartz veins and lode deposits, 7 to 10 feet wide, in Keewatin greenstone, near the contact with Algoman red feldspar-porphyry dikes. The *Swastika* mine (R.S.C. 204, and part of lot 9, concession VI, Otto township) has a 3-compartment shaft 400 feet deep with considerable work on the 35, 100, 200, 300, and 400-foot levels. Some gold was extracted in a 10-stamp mill, the ore coming largely from two small shoots. The deposits on the *Lucky Cross* or *Marigold* (T.C. 57, 58), are of the lode type. Gold ore from the 200-foot level has been milled in the 5-stamp mill. The *Baldwin* (lot 2, concession VI, Eby township,) has a 200-foot shaft on a vein in Timiskamian conglomerate, and porphyry.

Bourkes and Sesekinika [1]

Bourkes.—Gold was found on the *Bourkes* claim, formerly the Anderson farm, (S. ½ lot 9, concession II, Benoit township), in 1916, and is described by A. G. Burrows[2] as follows:

> **The deposit has the character of a shear zone in which there are lenses of quartz along its strike; at one point this rusty zone is about three feet wide. Some of the quartz lenses are about a foot in width. The rocks accompanying the quartz** are greatly impregnated with iron pyrites, which on the surface is very much oxidized; calcite is also abundant in the rocks. **Some specimens of oxidized material showing coarse gold also contain a dark grey mineral with metallic lustre, which proved on testing to be a telluride of gold and silver with 26.88 per cent. of gold, the mineral being probably petzite.**

A shaft has been sunk 400 feet and considerable work done on four levels; approximately $20,000 of ore has been blocked out.

Gold has also been found farther east in a quartz and porphyry mass having a pegmatitic appearance, on the *Wickstead claim,* (N.W. ¼ of the N. ½ of lot 4, concession I, Benoit township) and on the *Malouf* claim (N.W. ¼ of the N. ½ of lot 10, concession II, Maisonville township). Gold occurs in a number of flat-lying quartz veins in Keewatin basic lava on the *Skognshi*[3] (N.W. ¼ of the N. ½ of lot 2, concession I, Benoit township). The *Murray-Mogridge,* formerly the Dane Copper Mining Company, has sunk a shaft 226 feet deep on a quartz and pyrite gold-bearing vein in Keewatin amygdaloidal basalt schist on lot 5, concession V, Maisonville township. On the same lot gold occurs in quartz veinlets in Algoman feldspar-porphyry. Narrow quartz veins carrying native gold and telluride of gold and silver were found in 1914, on the *Labine-Smith* claims on lot 9, concession II, Maisonville township. Quartz veins containing gold and tellurides also occur on the *Stitt* claims in central Grenfell township. The *Golden Summit* or *Sesekinika* property (lot 6, concession I, Maisonville township), was discovered in September, 1916. A 20-foot pit has been sunk on a 6-inch quartz vein carrying pyrite and some native gold in Keewatin basalt.

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[1] Maisonville, Grenfell and Eby, Ont. Bur. Mines, Vol. XXIII. 1914, Pt. 2, pp. 33-35, by A. G. Burrows and P. E. Hopkins; Gold-bearing Veins in Benoit Township, Ibid, Vol. XXVI, 1917, pp, 248-251, by A. G. Burrows.

[2] Ibid. p. 250.

[3] Ont. Bur. Min., Vol. XXVI, 1917, p. 281.

Munro Township and Vicinity [1]

Prospecting has been going on in and around the southwest corner of Munro township since 1908, when gold was first found in the area. A 9-mile wagon road connects the area with Matheson station. The early mining was on narrow quartz veins, carrying gold, pyrite, galena and molybdenite in Timiskamian sediments occasionally cut by Algoman porphyry. Small production came from the *Detroit-New Ontario* (southwest quarter, south half, lot 10, Concesson I, Munro township), *Gold Pyramid,* (part of lot 11, concession VI, Guibord township), and the *Munro* or *Guelph* in the south-east corner of lot 11, concession I, Munro township. In 1918, gold accompanied by pyrite, copper pyrites, pyrrhotite and galena was found on the *Quinn* veteran lot (north half of lot 1, concession IV, Hislop township), in a narrow quartz vein cutting porphyry or rhyolite and basalt. The most important deposit was the *Croesus* (north half, lot 10, concession I, Munro township), which was discovered in 1914, and up to the time operations ceased in February, 1918, had produced 12,470 ounces or $259,953 in gold in a 50-ton Hardinge ball mill with amalgamation plates. The ore was probably the richest ever mined in Ontario; large pieces of milky white quartz contained over 20 per cent gold by weight. A shaft was sunk 400 feet in depth, with levels at each 100 feet, on a lenticular quartz vein dipping 22° east in Keewatin greenstone. The vein cuts across alternating flows of Keewatin basalt and diabase. Other properties in the area are the *American Eagle* and *Burton-Munro.* During 1921, Messrs. Barlow and Falkenham of Matheson, discovered a spectacular gold showing on the claim directly north of the Croesus.

Painkiller Lake [2]

In 1907, gold was found at Painkiller lake, which lies 10 miles by wagon road from Matheson. The majority of the deposits are small fissure veins of the gold-telluride-quartz type carrying gold, bismuth, telluride, pyrite, chalcopyrite, pyrrhotite, galena, zinc blende, quartz, chlorite, sericite and calcite. Another type of vein containing much mispickel, pyrite and quartz and carrying low contents of gold, silver, and copper, can be seen on the *Mayot* (lot 9, concession VI, Beatty township), and *Dunlop* (in lot 8, concession V, Beatty township). These deposits resemble the gold mispickel bodies at Timagami. The rocks are Keewatin pillow lavas intruded by Algoman porphyries, which bear some relation to the origin of the deposits. The *Hill* in lot 11, concession V, Beatty township, put a trial sample through its 50-ton Hardinge ball mill which yielded gold valued at $635. The property is now operated by the *Premier Gold Mining and Exploration Company.* The *Hattie* (lots 6 and 7, concession I, Coulson township), encountered some rich showings during shaft-sinking in 1921. *Cartwright* and *La Santa Lucia* have been united under one company called *Blue Quartz Gold Mines Limited;* some diamond drilling was done in 1921. Other properties in Beatty township are the *McMaster* (in lot 9, concession V), and *Painkiller* (lot 7, concession VI).

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[1] Geological Map No. 21c Munro and Guibord by A. G. Burrows, Ont. Bur. Mines, Vol. XXI, 1912; Beatty-Munro Gold Area, by P. E. Hopkins, Ibid, Vol. XXIV, 1915, pp. 171-184; Abitibi-Night Hawk Gold Area, by C. W. Knight, A. G. Burrows, P. E. Hopkins and A. L. Parsons, Vol. XXVIII, Pt. 2, 1919, pp. 53-56.

[2] Beatty-Munro Gold Area, by P. E. Hopkins, Ont. Bur. Mines, Vol. XXIV, 1915, pp. 171-184; Abitibi-Night Hawk Gold Area, by C. W. Knight, A. G. Burrows, P. E. Hopkins and A. L. Parsons, Ibid, Vol. XXVIII, 1919, Pt. 2, pp. 56-61.

Rickard Township [1]

In July, 1917, gold was found on the *Raty* claim in the southwest quarter of the south half of lot 7, concession IV, Rickard township. During the following year considerable work, namely, 2,000 feet of diamond drilling and 700 feet of drifting on the 100-foot level, was done, which showed only one small shoot of ore, 39 feet in depth. Pyrite, chalcopyrite, galena, and molybdenite occur in all parts of the quartz vein while coarse gold, bismuth and tellurides occurred in the small ore shoot. The rock consists of Keewatin basalt with subordinate amounts of banded chert, which are intruded by Algoman feldspar porphyry. The wall rocks adjacent to the vein are replaced by calcite.

Lightning River [2]

In August, 1917, gold was found on the *Howey-Cochenour* claim L. 7315, in Holloway township. According to A. G. Burrows, and C. W. Knight, the rocks comprise alternating flows of Keewatin basalt and rhyolite lying in a nearly vertical position. The rhyolite in many parts of the area shows the presence of gold in small quantities. The original discovery is a sheeted zone from 2 to 3 feet wide, in which is a persistent quartz vein up to 10 or 12 inches wide containing calcite, chlorite, feldspar, pyrite, zinc blende, galena and visible gold. A 70-foot incline shaft was put down on the vein, but values lowered considerably when the vein passed from the more basic rock into rhyolite. Other important discoveries were made in the area during 1921.

Abitibi Lake

In 1906, there was a rush to this area, and a large number of claims were staked along the shore of the lake and on the islands. Several gold-bearing veins were found in the Keewatin schist and dolomite, Haileyburian (?) diabase and Algoman (?) granite and porphyries. These have been described by W. G. Miller[3], M. B. Baker[4] and others [5]. None of the deposits appear to be of economic value. The principal showing, that on *Shaft* or *Gold Island*, is a narrow quartz vein carrying iron and copper pyrites and zinc blende in a diabase which is regarded by A. G. Burrows, and C. W. Knight, as pre-Algoman (Haileyburian?) in age.

Patten River [6]

North of Lake Abitibi narrow auriferous veins occur in an altered quartz gabbro (Haileyburian?) near the mouth of the Patten (Woman) river and two miles west of mileage CXXV, interprovincial boundary between Ontario and Quebec.

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[1] Ont. Bur. Mines, Vol. XXVII, 1918, pp. 212-214; Ibid, Vol. XXVIII, Pt. 2, 1919, pp. 61-62; Can. Min. Journal, February 15th, 1918, p. 57.

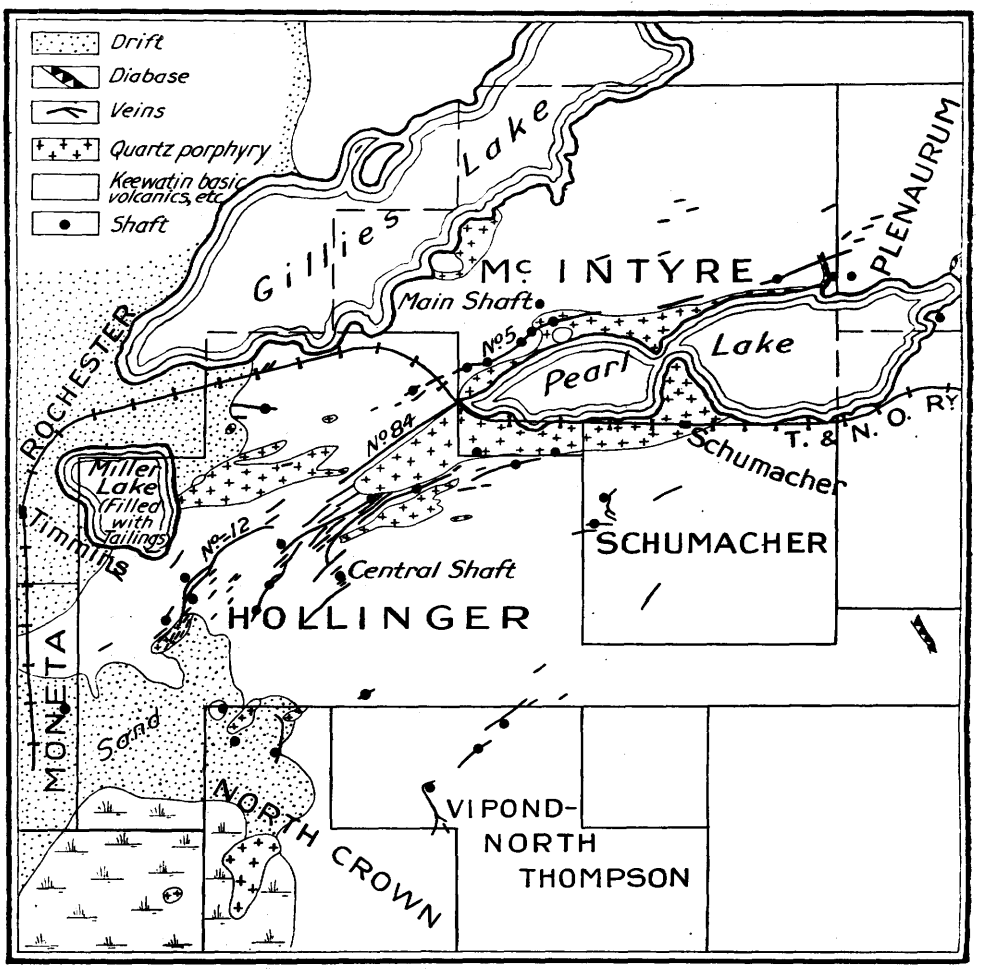
[2] Abitibi-Night Hawk Gold Area, Ont. Bur. Mines, Vol. XXVIII, 1919, Pt. 2.

[3] Ont. Bur. Mines, Vol. XVI, 1907, Pt. 1, 219-220.

[4] Ibid, Vol. XVIII, 1909, pp. 263-283.

[5] Ibid, Vol. XXVII, p. 209; Vol. XXVIII, Pt. 2, p. 52.

[6] Ont. Bur. Mines, Vol. XXVII, Pt. 1, 1918, pp. 209-210, by P. E. Hopkins.



HOLLINGER-Mc INTYRE GOLD AREA

Scale of Feet

2000 1000 0 2000 4000

Porcupine and Vicinity [1]

This is by far the most important gold area in Ontario. The first reported gold discovery was made in 1908, in quartz and schist on the *Hunter* claim on the east side of Porcupine lake. The discovery that caused a rush to the area was made by J. S. Wilson, in 1909, on the claim that came to be known as the *Dome* mine. During the following two years several mills were erected and production began. Up to the end of 1920, the total production from Porcupine was valued at $64,737,349. During 1920, the output was $10,597,572; in 1921, it was $13,095,630 in gold and $73,671 in silver. The three principal mines are the Hollinger Consolidated and McIntyre-Porcupine near the town of Timmins, and the Dome, three miles to the south-east. The ore deposits occur in Keewatin basic volcanic schists in the Hollinger area, and in the Keewatin volcanics and Timiskamian greywackè-conglomerate at the Dome; in both cases they are near the contact of schistose quartz porphyry which is classified as pre-Algoman in age. According to A. G. Burrows, the Ontario Department of Mines' geologist who studied the ore deposits, the intrusions of quartz porphyry in different parts of Tisdale township, have in some way influenced the deposition or location of the gold, but it is not likely that the porphyry has been the source of the gold-bearing solutions. [2] W. G. Miller, regards the quartz veins as genetically related to the Algoman granites and associated rocks of the region [3].

The ore deposits are of large size, low to medium in grade, and of the lode type in structure, containing much mineralized schist, metasomatically replaced. Iron pyrites is the most abundant sulphide, copper pyrites, galena and zinc blende usually occurring in the richer parts. Pyrrhotite is quite common at the Dome. Other minerals associated with the schist and quartz gangue are calcite, dolomite, scheelite, tourmaline, graphite, feldspar, chlorite, sericite, etc. The value of the ore has not decreased in depth. Number 5 vein on the McIntyre has an ore shoot 1,500 feet in length; the same ore shoot continues for at least 100 feet on Hollinger ground. No. 1 vein on the Hollinger averages 10 feet wide in ore for a length of 1,000 feet. The No. 84 ore zone on the Hollinger is 900 feet long with a lean place in the centre. Many shoots are 500 feet in length. Much thrust faulting has been encountered, e.g., in the upper levels of the McIntyre No. 5 vein, and on the Porcupine Crown vein.

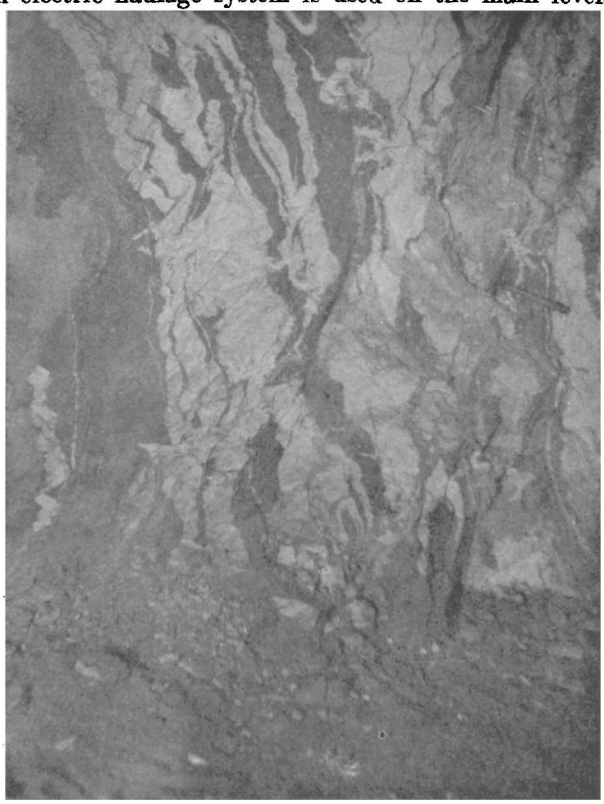
Following are brief descriptions of the ore deposits and of the various types of gold occurrences; these are partly summarized from Mr. Burrows' reports. Reference should be made to the maps accompanying these reports for the geology and locations of the several deposits. Many unimportant gold discoveries have been made in almost every township in the vicinity, but these are too numerous to enumerate; however, the several types will be mentioned. Production figures for the mines mentioned hereunder are complete up to the end of 1921.[4]

Hollinger.—The Hollinger Consolidated, the greatest gold mine in Canada, comprises 400 acres in the vicinity of the town of Timmins in Tisdale township. All the rocks are schistose, consisting of Keewatin ellipsoidal basalt and dacite intruded by wedge-shaped, chonolithic masses of quartz porphyry. The apex of the main, canoe-shaped mass of quartz porphyry around which the ore bodies

[1] Porcupine Gold Area, by A. G. Burrows, Ont. Bur. Mines, Vol. XX, Pt. 2, 1911. pp. 1-39; Ibid, Vol. XXI, 1912, Pt. 1, pp. 205-249; Ibid, Vol. XXIV, 1915, Pt. 3, 1-57.
[2] Ibid, Vol. XXIV, 1915, Pt. 3, p. 25.
[3] Ibid, Vol. XX, 1911, notes accompanying map.
[4] Values do not include the exchange premium.

occur recedes or dips about 50° to the northeast. In the grey schist surrounding the quartz porphyry mass, are numerous, large, closely-spaced parallel veins or lodes consisting of quartz and mineralized grey schist. Some of the veins extend into the porphyry, but the gold values in the veins in the porphyry are either low or erratic. The veins cut the schist at a low angle and appear as overlapping lenses, many of which are connected by branch veins forming, on the whole, large lode deposits. The southerly veins dip 87° to the southeast, while the big No. 84 vein on the north side of the porphyry dips 85° to the northwest.

Underground workings total 40 to 45 miles, the deepest level being 1,530 feet. In 1920, sinking, drifting, cross-cutting and raising amounted to 18,103 feet. An electric haulage system is used on the main levels underground



No. 4 vein on 425-foot level, Hollinger Mine, Porcupine, showing the lode structure. (Ont. Bur. Mines, Vol. XXIV, Pt. 3, p. 38).

During the latter part of 1921 the mill treated approximately 3,900 tons of $8.00 ore daily. The total production and dividends paid to the end of 1921, were $41,193,925 and $16,558,000 respectively. In the annual report of the Hollinger for the year ending December 31st, 1921, the developed ore is given as 3,402,609 tons, valued at $36,644,154. During 1922 the management hopes to attain a largely increased production from a lower grade of ore.

McIntyre.—The main quartz porphyry mass and veins Nos. 64, 84 and 91, of the Hollinger extend northeasterly on to the *McIntyre* (which has taken over the *Pearl Lake* and *Jupiter* mines); these vein extensions on the latter property are known as Nos. 1, 7, and 5 respectively. The No. 5 fissure vein, which dips highly to the northwest, has an extremely long ore shoot (1,500 feet), which rakes

steeply to the northeast. Much graphite is present in parts of the deposit. Vein No. 7, which lies a short distance south of No. 5, has been opened up for a considerable length on the lower levels. Vein No. 1, on the south side of the porphyry, was also an important deposit. Owing to the porphyry mass being somewhat wedge-shaped, more green schists and additional ore bodies are being encountered on the lower levels. In all about 63,000 feet of work has been done. The mill treats about 600 tons of $11.00 ore per day. It is the intention to enlarge the mill to a capacity of 800 tons daily. The total production to the end of 1921, was $11,857,232 in gold and $104,197 in silver. Dividends paid up to the end of 1921, amounted to $2,540,698. Developed ore reserves are valued at approximately 5½ million dollars.

Dome.—The Dome Mines, with which is incorporated the Dome Extension, comprise 400 acres in Tisdale township lying three miles southeast of the Hollinger and McIntyre. The ore bodies are less regular than the Hollinger,occurring in Keewatin basalt and the Timiskamian greywacké, and largely on the northerly edge of a schistose quartz porphyry mass. Some ore comprises well mineralized schist with numerous rich quartz veinlets. The veins strike a little north of east and dip nearly vertically, forming a large low grade, egg-shaped deposit, pitching about 45° towards the Dome Extension. Large low grade deposits have been worked by means of an open pit some 250 feet in width, and 930 feet in length. Recently, smaller individual higher-grade lodes are being worked; these are 10 to 40 feet or more in width, and yielding a higher grade of ore. Pyrite, pyrrhotite and galena are the chief sulphides. Recently some tellurides have been encountered. Ore of a good grade has been developed on the deepest levels, namely, 1,300 feet. Electric motors with storage batteries are in operation on the main levels. The mill has recently been treating about 1,000 tons of $7.00 ore daily. Sufficient ore is blocked out to keep the mill running at a maximum capacity for three or four years.[1] The total production, 1912 to 1921, inclusive, has been $13,821,613 in gold and $73,919 in silver. Dividends paid to the end of 1921 were $2,391,412.

Porcupine Crown.—This mine to the end of 1920, has produced $2,863,873 from a 4 to 7-foot quartz vein which strikes north and south and dips steeply to the east on or near a porphyry-basalt contact. The property together with the two *Thompson-Krist* claims is now owned by the *North Crown* company.

Vipond North Thompson.—The veins in this mine occur in altered greenstone and have been worked to a depth of 600 feet. The production of gold and silver amounted to $808,204. largely from the *Vipond* portion.

Schumacher.—This mine from 1915 to 1918, milled 112,124 tons of ore, yielding $561,885.02 in gold, and 4,194 ounces of silver from narrow contorted, low grade veins in highly altered Keewatin schists.

Rea, or Newray, also produced a small amount, namely, $147,076, from a rich ore shoot, approximately 200 feet long, 200 feet deep and 4 feet wide.

Plenaurum, Rochester and Moneta are promising prospects in this area. During 1921 the Nipissing Mining Co., did considerable diamond drilling on the Rochester.

Dome Lake.—Small isolated ore shoots, 2 and 3 feet in width, occur on this property in an east-west shear zone or fahleband, 1,000 feet in length. The ore consists of quartz, calcite, pyrite and metasomatically replaced rock, namely, amygda-

[1] Dome Mines Company annual report for the year ending Mar. 31st, 1920.

loidal and ellipsoidal green lava. The vein has been worked to a depth of 500 feet where the deposit dips north on to the West Dome. The property which is now closed, from 1915 to 1920 inclusive, produced gold worth $320,391 and silver valued at $1,435. These shear zones continue westerly on to the *Dobie,* or *Porcupine Tisdale,* where some favourable assays have been obtained from the surface.

West Dome and Apex to the west of the Dome have an ankerite vein some 20 feet in width cut by quartz veinlets which carry gold.

Porcupine Pet, (H.R. 907), *Preston,* or *Clifton-Porcupine* (H.R. 826), and *Porcupine-Porphyry Hill* (L.O. 325), in Deloro township, have each produced a small quantity of gold from narrow quartz veins in a rather massive quartz porphyry. A little visible gold occurs in quartz veinlets in Timiskamian conglomerate on the *North Dome.*

In the north part of the area there are large east-west shear zones in Keewatin greenstone. These are impregnated with secondary carbonate, quartz, and pyrite, and contain large lenses of quartz up to several feet in width. The *Davidson* is the only one in the area of this type which has made any production, the amount to the end of 1920 being $53,914. Other similar deposits in the zone are the *Beaumont,* formerly called *North Davidson, Crown-Chartered, Armstrong-McGibbon, Bannerman, Scottish-Ontario, Mulholland* and *Hughes.* Adjoining the Hughes is the *Gold Reef,* which produced a small amount of gold from narrow rich veinlets in basalt. Further east are the *Keora,* with gold in rusty carbonate, and the *Three Nations* and *La Palme* with narrow gold-bearing quartz veins in Timiskamian conglomerate.

Gold-bearing quartz veins also occur in Timiskamian sediments on the *McAuley-Bridge* claims in Bristol township. In the same township in 1921, gold was found in a narrow quartz vein in basalt schist on the *Hendrickson* claim. There are auriferous quartz veins in dolomite or ankerite on the *Anchorite* and *Maidens-McDonald* in Deloro township, and on the *Foster* claim in Thomas township. On the Anchorite a shaft has been sunk 350 feet and some ore of a good grade developed in two veins. Banded iron formation is cut by secondary gold-bearing quartz veins on the *Wright* (R.S.C. 175, R.S.C. 176), *James* and *Philadelphia* claims in Deloro township. Gold occurs in quartz veinlets in red aplite (large low-grade stockwork deposits), on *Gold Island,*[1] *Night Hawk Lake,* and in the adjoining Keewatin green schist. Rich ore was encountered in green schist in the 180-ft. shaft and on the 80-ft. level of the *Peninsular,* Night Hawk lake.

The *Tommy Burns* or *Triplex* in the southeast part of Shaw township has produced a few hundred dollars in gold. The small quartz vein on this property contains visible gold and occurs in pillow basalt, iron formation and an intrusive porphyry. Considerable development work has also been done on the *Triumph, Success, Hollinger Reserve, Whelpdale, Hayden, Big Dyke, Porcupine Paymaster (formerly Standard), March, Holtyrex* and others.

Gold has been found in several places west of Porcupine in Keewatin rocks. At Kamiskotia lake[2], in Robb township, are masses of Haileyburian (?) gabbro and diabase which have acid phases represented by felsite and aplite. The

[1] Ont. Bur. Mines, Vol. XXIV, 1915, Pt. 3, p. 27.

[2] Idem, pp. 58-60. Kamiskotia Lake Area, by A. G. Burrows and P. E. Hopkins.

principal deposit, the *Jamieson,* three-quarters of a mile south of the lake, consists of one of these felsite dikes intersected by gold-bearing quartz veinlets and carrying iron and copper pyrites, tourmaline and calcite. The *Lally* prospect is situated about three miles from the north boundary, on the east line of Turnbull township. Two shallow shafts have been sunk on a stockwork of porphyry and quartz.

At *Cripple Creek*,[1] in Carscallen and Denton townships, gold occurs with iron pyrites in lenticular quartz veins and parallel stringers in Keewatin schist and Algoman gray granites. At the *Union* mine, Whitesides township, a 275 foot shaft has been sunk on a quartz-schist zone, 40 feet in width. Gold occurs near the south boundary of McArthur township,[2] in a network of veinlets in a quartz feldspar dike on the *Chouinard* claim and in a narrow quartz vein in felsite on the *Hull* claim.

Matachewan [3]

At Matachewan gold is found in narrow quartz veins in a boss of red Algoman syenite on the *Brookbank* claim (17801, Alma township), and on the *Chief* claim (17310 Alma township). A stockwork deposit, 150 feet in width occurs in the same syenite mass on the *Craig* claims (16227 and 16228, Cairo township). A 100-foot shaft has been sunk on a small vein occurring in the hornblende and mica granite on the *Thesaursus* (M.R. 5868, Baden township). The principal deposits in the area are on the *Davidson* (5372 and 5373), and *Matachewan Gold Mines*. (5379, 5380, formerly the *Otisse*), in Powell township. On the Davidson, according to Mr. Burrows' second report,[4] "most work was done on irregular masses of quartz in a rusty weathering greenish schist. Considerable surface work was also done on a red syenite or orthoclase porphyry intrusive, which is intersected by quartz veinlets in a more or less stockwork arrangement, with many of the veinlets roughly parallel. Some very good assays were obtained in parts of the porphyry intrusive, but no underground work has been done as yet on these claims." On the Matachewan Gold Mines, "A number of separate ore shoots were indicated by this means [trenching]. In addition to trenching, further prospecting was done by means of diamond-drilling, after which two shafts were sunk. No. 1 shaft was sunk to a depth of 170 feet vertically, and drifts were run on the 160-foot level along a mineralized contact, between the basaltic rocks and the light green calcerous rocks.. . . . Several varieties of ore have been recognized in the workings. The most prominent is a light grey rock that has been altered from a dark basaltic rock. This carries abundant iron pyrites of small grain, much carbonate of iron, lime and magnesia; secondary feldspar, some sericite, and quartz in minute veinlets. Several narrow dikes or irregular masses of red

[1] Cripple Creek Gold Area, by W. R. Rogers and E. L. Bruce; Ont. Bur. Mines, Vol. XXI, 1912, Pt. 1, pp. 266-270.

[2] Notes on McArthur Township, by P. E. Hopkins, Idem, pp. 278-280.

[3] The Matachewan Gold Area, by A. G. Burrows, Ont. Bur. Mines, Vol. XXVII, 1918, Pt. 1, pp. 215-240; Ibid, Vol. XXIX, Pt. 3. 1920. pp. 53-64; Mem. No. 115 Geol. Surv. Canada, 1919, by H. C. Cook; Origin of the Gold Deposits of Matachewan, Econ. Geol. Vol. XIV, No. 4, 1919, by H. C. Cook. Geological maps accompany these heports.

[4] Ont. Bur. Min., Vol. XXIX, 1920, Pt. 3, pp. 57, 59, 60, 61.

or grey porphyry occur in trenches to the west of No. 1 shaft. They intrude the light-greenish carbonate schist, and these, particularly the grey varieties, frequently carry high gold values. They are so irregular that it is impossible to connect outcrops revealed in trenches only twenty feet apart. The schist along the porphyry intrusion usually carries gold values, where there are quartz stringers and an impregnation with iron pyrites." Iron pyrites, copper pyrites, and scheelite are present in the ore.

Gold has been found on the *Robb* claim (5402) and *Lake Matachewan Gold Mines* (5531 and 5514), in Powell township. During the fall of 1921, gold bearing quartz in porphyry was discovered in a small Keewatin area in the vicinity of George lake in Holmes and Flavelle townships. In 1921, B. Mickmac, an Indian, discovered a spectacular gold showing in conglomerate (?) schist in the north central part of Rankin township.

Gold-bearing quartz veinlets in syenite porphyry on the Davidson property, Matachewan area. (Ont. Bur. Mines, Vol. XXIX, Pt. 3, p. 56).

A hydro-electric development at Indian Chute on the Montreal river is projected to serve the power needs of this area.

West Shiningtree [1]

Since the first discovery of gold in 1911, when the railway was 60 miles distant, numerous other finds have been made in parts of four townships. The railway now passes within 20 miles, and is connected by a wagon road with most of the properties. No gold has yet been produced apart from what may have come from a few high-grade samples. The encouraging results obtained on a few properties, e.g., the *Wasapika, Herrick, Buckingham,* and *Gosselin*, may lead to min-

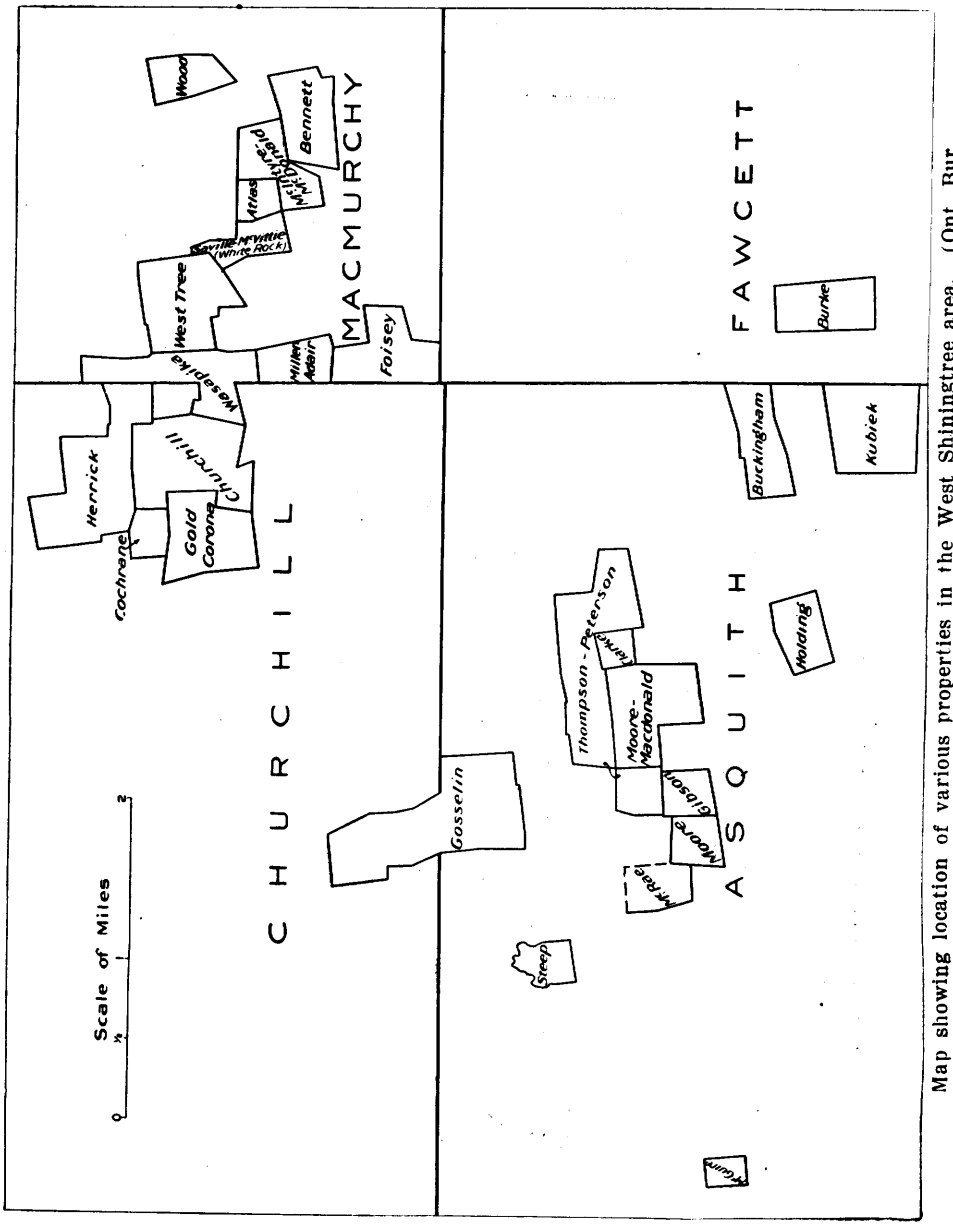
[1] West Shiningtree Gold District, by R. B. Stewart, Ont. Bur. Mines, Vol. XXI, 1912, Pt. 1, pp. 271-276; West Shiningtree Gold District, Ibid, Vol. XXII, 1913, pp. 233-237; West Shiningtree Gold Area, by P. E. Hopkins, Vol. XXIX, 1920, Pt. 3, pp. 28-52; Mem. No. 95, Onaping Map-Area between Shiningtree and Onaping Lakes, Geol. Sur. Can., by W. H. Collins.

ing being done on a larger scale. The "Ribble" vein which occurs in a chloritic schist extends southerly on the *Miller-Adair*. It is half a mile or more in length and averages at least four feet in width. A cross-cut on the 100-foot level of the *Wasapika* or *Ribble Mines* showed 23 feet of schist and quartz. At the 200-foot level the deposit is reported to be of a nearly similar width. Visible gold was seen by the writer on the 100-foot level and in some parts of the vein outcrop.

Gold-bearing quartz veins of the area have been found in Keewatin and Algoman rocks. They occur largely in the old basic volcanics, as in the case of the "Ribble" vein on the *Wasapika*. A vein carrying gold on the *Churchill* property passes from altered basalt into a rhyolite or porphyry. Gold occurs in quartz cutting iron formation on the *Cochrane* and *Gold Corona*. The *Herrick* vein passes from conglomerate and slate into mica lamprophyre, and has been exploited

Gold-quartz deposit outcropping on the Atlas property, West Shiningtree area.

on the 100-foot level. Coarse gold was seen on the *Clark* claim in quartz stringers, which cut rusty-weathering green magnesium-iron-calcium carbonate. On the *Gosselin*, the gold and quartz occur partly in the porphyry and felsite or rhyolite. Spectacular showings in a nearly transparent quartz on the *Holding* claim are entirely in amphibolite or horneblende schist. Most of the deposits in the vicinity of the *Steep* on West Shiningtree lake, and easterly to the *Buckingham*, occur in bluish grey quartz veins and lenses in shear zones in altered basalt, andesite and rhyolite. There is another type of deposit comprising banded tuff with pyrite or alternating layers of slate and pyrite, resembling iron formation, and carrying only small quantities, e.g., the *Moore*. The deposits on the *West Tree, Saville (White Rock), Atlas, McIntyre-McDonald* and *Bennett*, are of the lode type in Keewatin schist. The gold which occurs native and at times contains small quantities of silver, is found in dark seams in the fractured quartz with calcite, sericite talc, chlorite and pyrite. Such minerals as chalcopyrite, molybdenite,



Map showing location of various properties in the West Shiningtree area. (Ont. Bur Mines, Vol. XXIX, Pt. 3, p. 38).

pyrrhotite, barite, galena, tourmaline and specular hematite are present in certain deposits. Pyrite is usually abundant in the wall rock, but on the whole, is scantily distributed in the quartz. Most of the deposits are cut by Keweenawan diabase dikes, usually without being displaced.

Penhorwood and Reeve Townships

"Gold occurs in quartz veins cutting a ferruginous dolomite and chlorite schist—1½ miles north from the northeast corner of Penhorwood township [near Tionaga station]. No free gold is visible, but a sample taken across a vein by the writer yielded upon assay 0.02 ounces to the ton."[1] During 1921, F. Gosselin stated to the writer that he found visible gold in Penhorwood and Reeve townships, 8 miles north of Groundhog station. Considerable work was done on these deposits during 1921.

North of Lake Superior

Gold has been produced at the Empress Mine near Jackfish station, and trial shipments have been made from properties near Schreiber and Big Duck Lake.[2] These deposits occur in Keewatin schists near Algoman granite or porphyry. Veins carrying gold occur farther north along the Canadian Northern railway near Jellicoe and Kinghorn stations and Little Long Lake, and also on the Canadian National railway near Kowkash and Tashota.

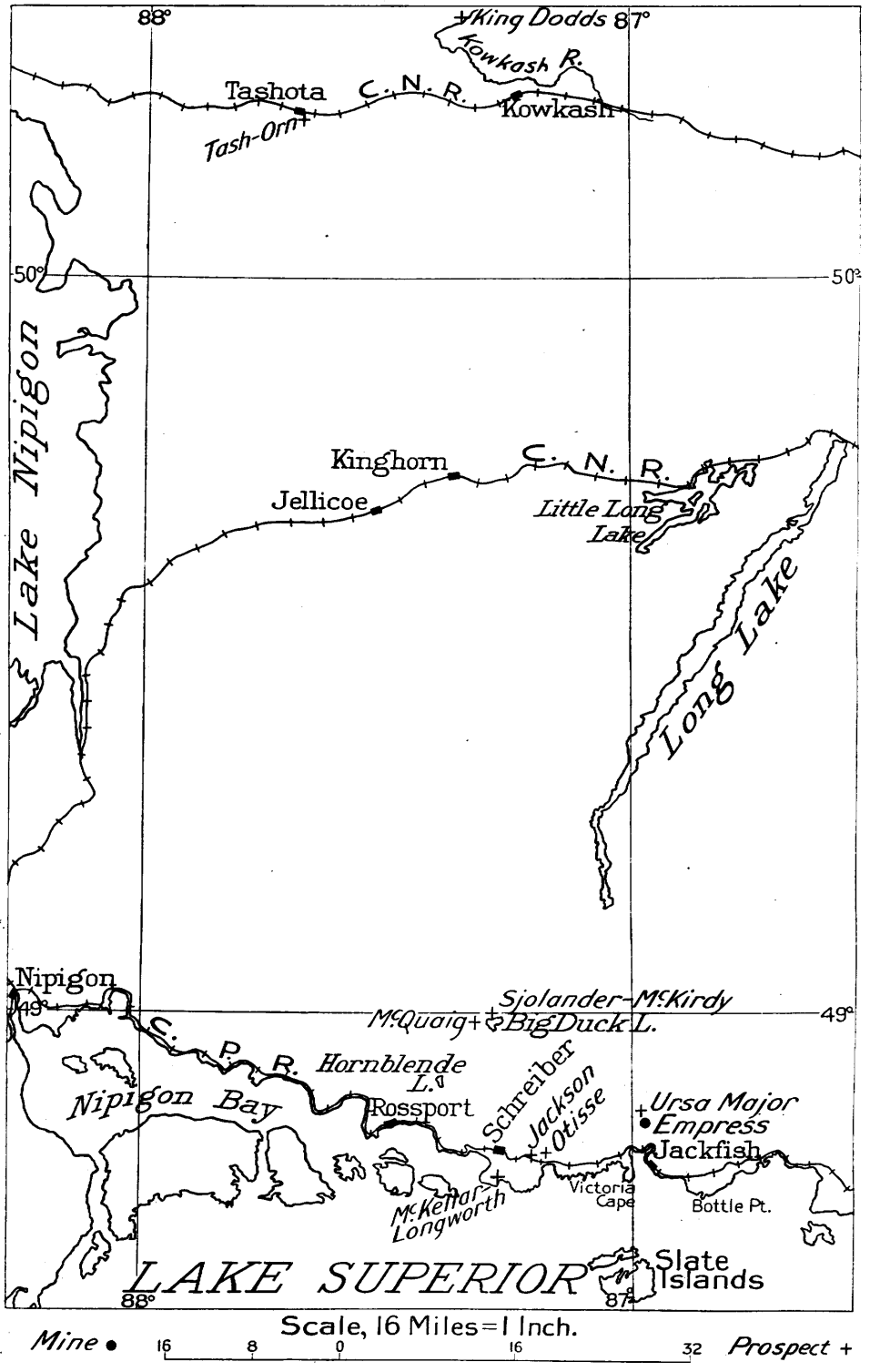
On the *Empress* claim, R. 569, is a large low-grade lode deposit in hornblende schist carrying much pyrite and some chalcopyrite, zinc blende and galena. A 10-stamp mill produced some bullion between 1896, and 1899, the ore coming largely from tunnel workings. Gold has been found in the vicinity on the *Ursa Major, Victoria Cape, Slate Islands*[3] and *Bottle Point.*

Some veins in the vicinity of Schreiber on the *McKellar-Longworth* (B. J. 122), *Jackson* (T. B. 3326, 3354), and *Otisse* (T. B. 3412), are narrow and contain rich showings of gold. During 1921, much exploratory work was done on the Jackson and McKellar. On the latter claim gold-telluride-quartz deposits have been found at intervals for half a mile in a pronounced east-west shear zone.

At *Duck* lake, the two principal properties, the *McQuaig* or *Beaver* (T.B. 1686), and the *Sjolander-McKirdy* (T.B. 1861), are largely replacement deposits in which the gangue mineral is nearly all calcite, with considerable included schist and only a few quartz veinlets. Considerable gold in a fine flour state can be seen accompanied with pyrite, chalcopyrite, galena and zinc blende. A 45-foot shaft has been sunk on the McQuaig vein which passes from quartz porphyry into chlorite schist.

In the vicinity of *Jellicoe* and *Kinghorn* stations, and *Little Long* Lake, A. G. Burrows has obtained low gold values in gold from quartz veins in Keewatin pillow lavas intruded by an occasional felsite or albite porphyry dike. "A three-inch stringer containing quartz, specular iron ore, copper pyrites and iron pyrites, from a rock cut at mileage 145, near *Kinghorn,* gave on assay $1.20 in gold per ton. In a rock cut one mile to the west of Jellicoe there are several lenticular masses of quartz in the basalt. One of these, 15 inches in width, gave on assay $4.00 per ton. Gold values up to $2.00 per ton, were obtained from specimens of quartz, schist and iron pyrites from the shores of the west arm of Little Long Lake.[4] In the same area, "on the *Edie* claim near Main narrows, Little Long

[1] Sum. Rep. Geol. Sur. Can., 1916, p. 181, with map, by T. L. Tanton.
[2] Gold at Big Duck Lake, Ont. Bur. Mines, Vol. XXIV. 1915. Pt. 1. pp. 9-13, Schreiber-Duck Lake area, by P. E. Hopkins, Ont. Bur. Mines, Vol. XXX, 1921,
[3] Ont. Bur. Mines, Vol. XXVII, 1918, Pt. 1, pp. 155-167, by A. L. Parsons.
[4] Longuelac to Jellicoe and Orient Bay, by A. G. Burrows, Ont. Bur. Mines, Vol. XXVI 1917 p 244.



Map showing location of gold areas north of Lake Superior along the lines of the Canadian Pacific and Canadian National Railways.

lake, gold occurs in angular fragments of quartz, up to 3 inches in diameter in the drift along the shore."[1] T. Devanney has done considerable work on the Jellicoe deposits.

Kowkash-Tashota Area[2]

In 1915 gold was found on the *King-Dodds* claim (T.B. 2424) nine miles north of Kowkash station and in the following year on the *Tash-Orn* or *Wells* claim (T.B. 2892) near Tashota station. On the former claim there is a quartz vein up to 6 inches in width, which carries iron pyrites and rich showings of gold, and on which a 90-foot shaft was sunk. The wall rock is Keewatin pillow lava schist cut by Algoman quartz porphyry. The Tash-Orn lode deposit, which occurs in similar rocks, is 8 feet wide and contains visible gold, iron and copper pyrites, native copper and pyrrhotite. A shaft has been sunk 140 feet and some drifting done on the 90-foot level, the deposit containing approximately $5.00 in gold across 5 feet.

Gold has been discovered on the *Richardson* (T.B. 2599), *Devanney* (T.B. 2650), *Hull* (K.K. 92), *Hendrickson* (K.K. 15), and *Cline* (K.K. 61).

Sturgeon Lake Area[3]

Since gold was discovered in the area about 1894, the precious metal has been found to be widespread, occurring usually in and genetically connected with Algoman granite and other related types near the contact with Keewatin schists. Sturgeon lake, around which the deposits occur, lies four miles south of Bucke station on the Canadian National railway. According to E. S. Moore, the deposits are composed of lenses and stringers of quartz containing calcite, syenite, pyrite, chalcopyrite, galena, zinc blende, pyrrhotite and gold. Although on four properties stamp mills have been erected, only one, the St. Anthony, has produced an appreciable quantity of gold.

St. Anthony.—Claims B.G. 151, 152, formerly known as the Jack Lake and St. Anthony Reef, have been worked intermittently from 1903 to the present. The total production from the 10-stamp mill according to one owner, George Glendinning, is approximately $200,000 in gold. The deposit consists of three quartz lenses up to 25 feet in width, extending from the Keewatin into the altered granite, the vein being largely in the latter rock. The workings have reached a depth of 525 feet.

The U.S. Gold Mining Co. or Shore Properties (A.L. 367, 368; B.G. 136) have a 2-stamp mill which yielded a little gold about 1902, from small irregular quartz veins in granite near the greenstone.

Dawson.—The English River Mining Company, formerly the Sturgeon Lake Mining Company, operated the Dawson mine, B.G. 157, with a 10-stamp mill.

Belmore Bay.—A 3-stamp mill was erected on the Belmore Bay mine, S.V. 450.

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[1] Geol. Sur. Can. Summary Report, 1917, p. 4E, by T. L. Tanton.

[2] The Kowkash Gold Area, by P. E. Hopkins, Ont. Bur. Mines, Vol. XXVI, 1917, pp. 190-226.

[3] Sturgeon Lake Gold Area, by E. S. Moore; Ont. Bur. Mines, Vol. XX, 1911, Pt. 1, pp. 133-157. Geol. Sur. Can. reports by W. H. Collins, No. 992, pp. 19, 20; No. 1059, pp. 56-58.

Huronian Mine [1]

The first discovery of gold in western Ontario was made in 1871 at the Huronian mine, location H.1 in Moss township. According to A. P. Coleman's report [2] the deposit is a bedded vein from 6 to 8 feet wide, of which from 2 to 5 feet are white quartz, the rest being incorporated schists. The gold occurs free, and as sylvanite associated with galena, iron and copper pyrites, and zinc blende. The country rocks are talcose slate, chlorite schist, and altered porphyries [Keewatin]. "A small intrusive area of granite, well exposed on Jackfish Lake, sends an arm southwestward to within a short distance of the mine." [3] A 10-stamp mill was built in 1883, and was in operation for part of the following two years.

Atikokan or Upper Seine Area

In the vicinity of Atikokan station, a divisional point on the Canadian National railway, on the Upper Seine waters, are situated the Harold Lake, Elizabeth, Hammond Reef, Saw Bill and Sunbeam (A.L. 282) mines all of which have produced some gold. According to A. P. Coleman, [4] the country rock on the *Harold Lake* (219X), consists of various yellow and green schists pierced by small eruptive masses or bands of granite or protogine, the last mentioned rock being probably the source of the gold. The deposits are narrow fissure veins up to 2½ feet in width. Some of the veins occur in the granite itself, or at its contact with the schist, and others entirely in the schist. The quartz contains much pyrite, chalcopyrite, galena and in places a good deal of gold. A 5-stamp mill was operated during 1895 and 1896. The *Hammond Reef* (337X, 338X, etc.), is a large stockwork or zone of greatly shattered protogine or altered granite (Laurentian ?) in which quartz has been deposited, filling all the small fissures and cementing the rock together. The deposit is three-quarters of a mile or more in length, and 100 to 300 feet in width; it carries visible gold in some parts. In the quartz and granite are iron pyrites and occasionally a little galena, zinc blende, and magnetite. [5] A 10-stamp mill was installed in 1897, and an additional 30 stamps were added in 1899, but the mill results were disappointing. The gold-bearing material was quarried. Power was supplied by the hydro-electric plant, about two miles distant. All operations ceased on October 6th, 1900. [6] On the *Saw Bill* (313 and 314 X), is a quartz vein 4 to 6 feet wide carrying pyrite, chalcopyrite, galena and some free gold. The wall rock is foliated biotite-granite-gneiss or protogine (Laurentian ?). A 10-stamp mill was erected and commenced operation in October, 1897, but very little gold was recovered. The property has remained idle since the autumn of 1897. The workings are about 275 feet deep. The *Sunbeam,* or *A.L. 282,* has a number of short ore shoots confined to a fissure quartz vein, 4 to 5 feet wide, in altered biotite-granite-schist. An incline shaft at an angle of 43 degrees has been sunk 410 feet. Con-

[1] For the geology, see Map. No. 589, Lake Shebandowan Sheet, by W. McInnes, accompanying Annual Report of Geol. Sur. Can., Vol. X, New Series, 1897, or reprint accompanying Vol. VI, 1896, Ont. Bur. Mines.

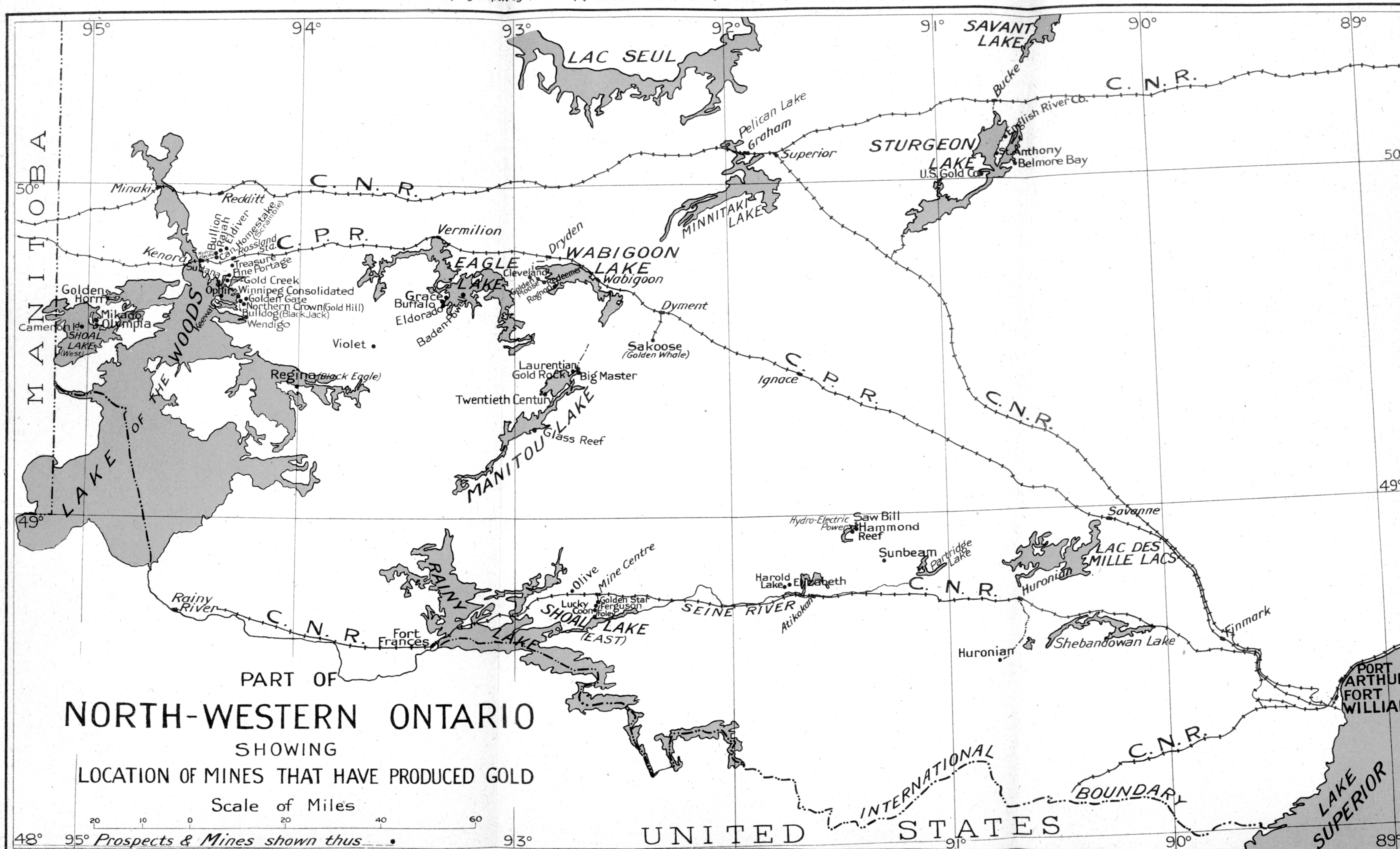
[2] Ont. Bur. Mines, Vol. V, 1895, pp. 76, et. seq.

[3] Geol. Sur. Can., 1897, p. 59 H, by W. McInnes.

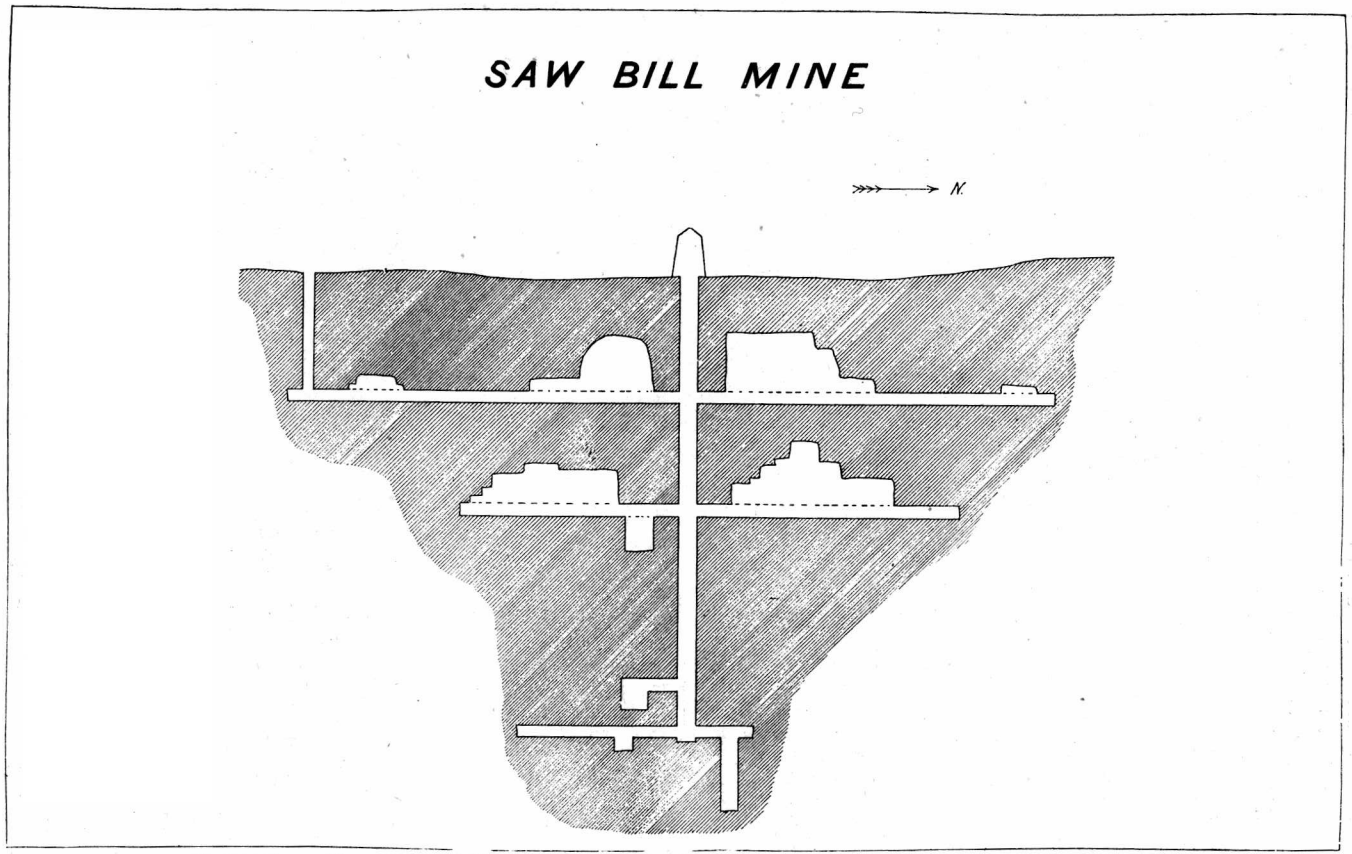
[4] Ont. Bur. Mines, Vol. V, 1895, pp. 69-70; Ibid, Vol. VII, Pt. 2, pp. 130-131 A. P. Coleman.

[5] Ibid, Vol. IX, 1900, pp. 77-78; Ibid, Vol. X, 1901, pp. 103-104.

[6] Ibid, Vol. VI, 1896, p. 76, A. P. Coleman.



PART OF
NORTH-WESTERN ONTARIO
SHOWING
LOCATION OF MINES THAT HAVE PRODUCED GOLD
Scale of Miles
20 10 0 20 40 60
Prospects & Mines shown thus
MANITOBA
UNITED STATES
INTERNATIONAL BOUNDARY
LAKE OF THE WOODS
LAC SEUL
SAVANT LAKE
STURGEON LAKE
MINNITAKI LAKE
WABIGOON LAKE
EAGLE LAKE
MANITOU LAKE
RAINY LAKE
SHOAL LAKE (EAST)
SHOAL LAKE (West)
LAC DES MILLE LACS
Shebandowan Lake
LAKE SUPERIOR
SEINE RIVER
C. N. R.
C. P. R.
PORT ARTHUR
FORT WILLIAM
Minaki
Reddit
Kenora
Vermilion
Dryden
Wabigoon
Dyment
Ignace
Pelican Lake
Graham
Superior
Bucke
English River Co.
St. Anthony
Belmore Bay
U.S. Gold Co.
Savanne
Finmark
Rainy River
Fort Frances
Atikokan
Huronian
Sakoose (Golden Whale)
Laurentian
Gold Rock
Big Master
Twentieth Century
Glass Reef
Violet
Regina (Black Eagle)
Grace
Buffalo
Eldorado
Baden-Powell
Cleveland
Olive
Mine Centre
Lucky Coon
Golden Star
Ferguson
Foley
Harold Lake
Elizabeth
Sunbeam
Partridge Lake
Hydro-Electric Power
Saw Bill
Hammond Reef
Golden Horn
Mikado
Olympia
Cameron I.
Bullion
Rajah
Eldiver
Can. Homestake
Treasure
Pine Portage
Gold Creek
Winnipeg Consolidated
Golden Gate
Northern Crown (Gold Hill)
Bulldog (Black Jack)
Wendigo
Ophir
Sultana
Keewatin
95° 94° 93° 92° 91° 90° 89°
50° 49° 48°



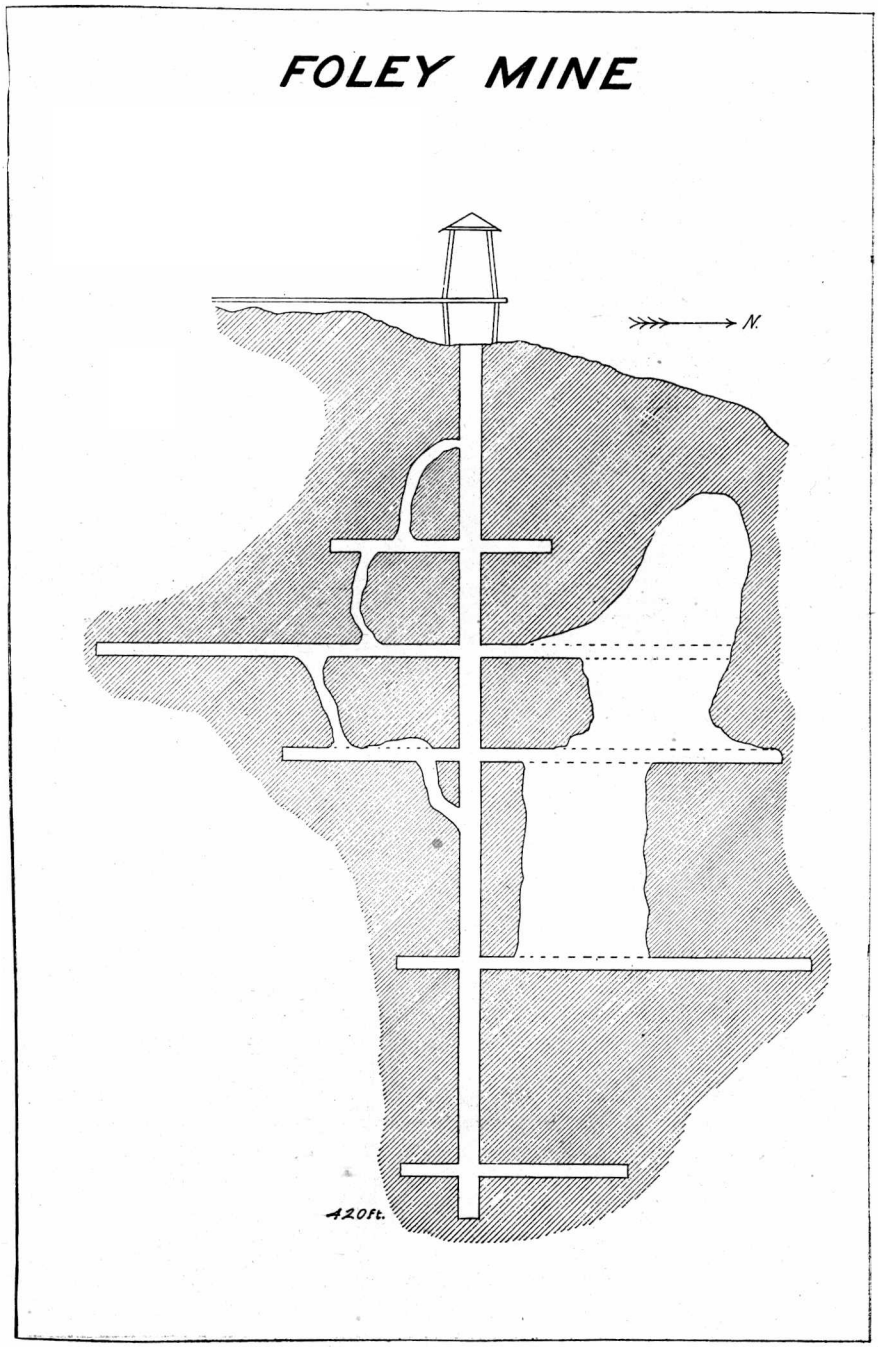
Vertical section, scale 100 feet to the inch, of underground workings at Saw Bill mine, north of Atikokan. (Ont. Bur. Mines, Vol. IX, p. 77)

siderable gold bullion was produced from a 10-stamp mill erected in 1904, on 614Z., three-quarters of a mile distant from the ore body.[1] The mine has remained closed since the early part of 1905. The *Elizabeth* (F.M. 171, F.M. 172) was discovered in July, 1900, and before it closed, in 1903, a 10-stamp mill had been erected and some bullion produced. The deposit consists of a series of quartz lenses crossing from chloritic schists into altered granite. The quartz is white and granular, like the silica in iron formation.[2] "The lode is developed by shafts, winzes, and levels to a depth of 280 feet and the gross amount of ore exposed to date (February, 1903), was about 20,000 tons. The width of the stopes varies from 4 to 12 feet, and while there are some rich lenses and shoots of quartz in which the values rise to $40 and $50 a ton, the average value may be taken at from $8 to $10."[3] According to W. E. H. Carter, the pay shoot is 250 feet in length along the course of the vein.[4] The mine was re-opened and produced bullion during parts of 1912, 1913, and 1914.[5]

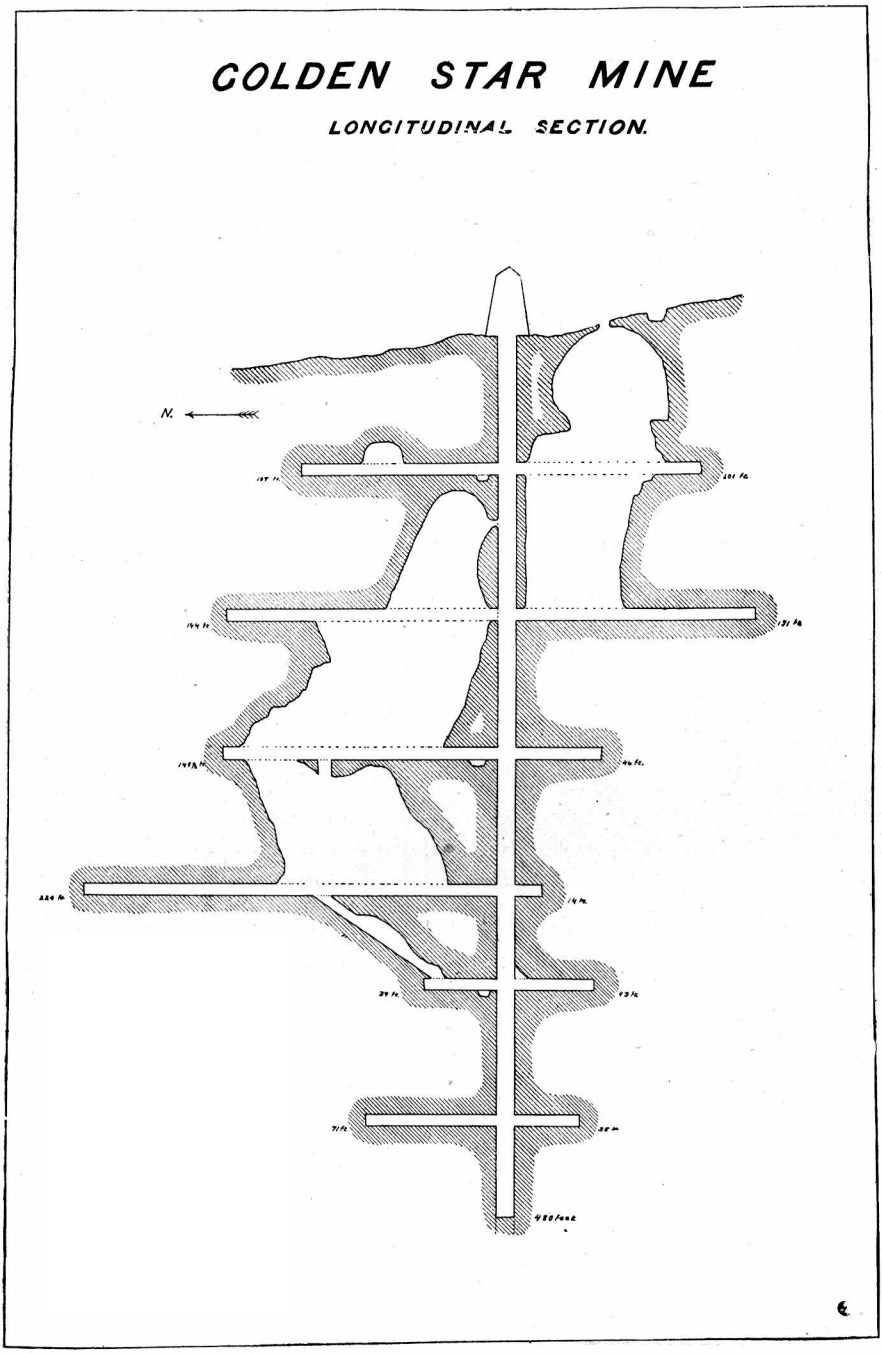
Mine Centre, East Shoal Lake or Lower Seine Area

The best geological map of the area is that accompanying A. C. Lawson's report of the Archean Geology of Rainy Lake.[6] A small portion of the sheet near Vermilion lake has been revised by A. L. Parsons.[7] Gold was first discovered in the area in 1893 on claim A.D. 2; during the following seven years approximately $250,000 in bullion was produced from the Golden Star, Foley and Olive, with small amounts from the Ferguson, Lucky Coon and Stone. The veins occur in Keewatin green schists, and in an intrusive boss of Laurentian granite. The granite, which is probably responsible for the gold, is classed as Algoman by A. L. Parsons. The *Foley* (A.L. 74,75,76), *Lucky Coon* (P. 655) and *Ferguson* (A.L. 110-112, K. 223) deposits are narrow fissure quartz veins up to a few feet in width in coarse mica-granite or protogine. In places the veins are joined by cross fractures, presenting a stockwork effect, while in other places the veins are small and difficult to trace for any appreciable length. Minerals usually present are pyrite, galena, zinc blende, copper pyrites, and visible gold. The Foley produced in the neighborhood of $75,000 prior to 1900, from above the 120-foot level. The mine was optioned by the Swedish Mining Syndicate in 1920, and the workings partially de-watered and sampled. The *Golden Star* (A.L. 114, 116, J.O. 4), the principal mine, produced $161,000 from a lenticular quartz vein in Keewatin basic schist, the shoots averaging $10.60 across 3½ feet. Underground workings were carried to a depth of 537 feet with 3,500 feet of lateral work. Operations ceased in 1900, and the plant, including a 10-stamp mill, was burned in 1910. A gold-bearing vein occurs in a similar green schist

[1] Ont. Bur. Mines, Vol. XIV, 1905, Pt. 1, p. 56.
[2] Ibid, Vol, XI, 1902, p. 150, A. P. Coleman.
[3] Ibid, Vol. XII, 1903, p. 15.
[4] Ibid, Vol. XI, 1902, p. 241.
[5] Ibid, Vol. XXII, 1913, p. 99; Ibid, Vol. XXIV, 1915, p. 95.
[6] Memoir No.. 40, Geol. Sur. Can. 1914.
[7] Map facing page 172, Ont Bur. Mines, Vol. XXVII, 1918, Pt. 1.



Vertical section, scale 90 feet to the inch, of underground workings at the Foley mine, Mine Centre. (Ont. Bur. Mines, Vol. IX, p. 65).



Vertical section, scale 105 feet=1 inch, of the workings at Golden Star mine, Mine Centre. (Ont. Bur. Mines, Vol. IX, p. 69).

on the adjoining *Stone* property A.L. 113. The *Olive* or *Preston* (G. 61), according to A. P. Coleman,[1] is on a bedded quartz vein running from 6 inches or less, to about two feet in width in a greenish-grey sericite schist or phyllite, and carrying considerable gold, pyrite, pyrrhotite, chalcopyrite, and dolomite. A. P. Coleman also refers to gold and quartz in felsite schist on *K. 190,* and *K. 191,* north of Potato lake.

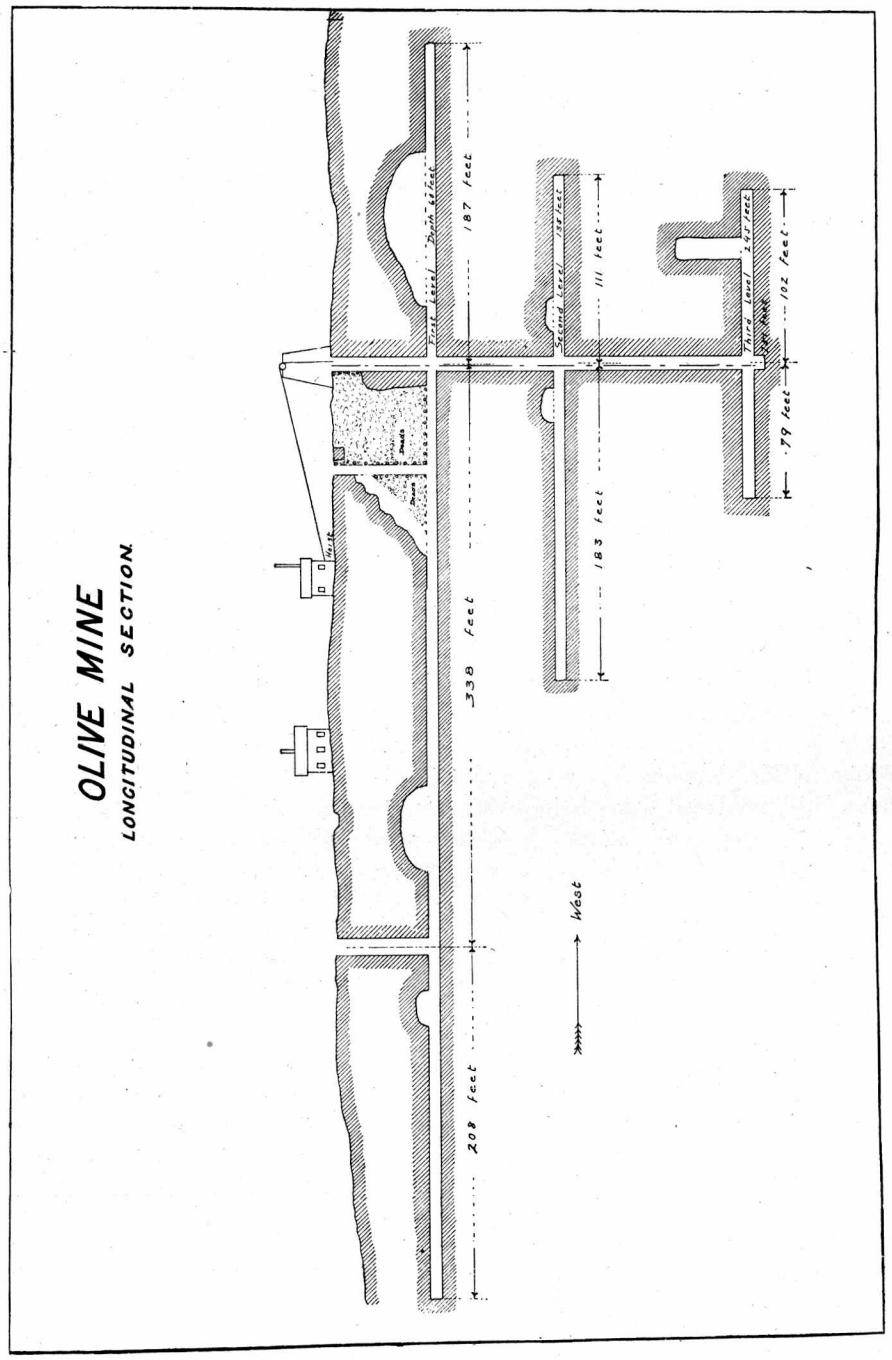
Lake Manitou Area

Gold was found in this area about 1895, and the occurrences have been described by A. P. Coleman,[2] A. L. Parsons.[3] and others. The rocks are Keewatin altered diabase, diorite, andesite, agglomerate, and quartz-porphyry. According to A. P. Coleman,[4] "The deposits are of great variety, fissure veins, bedded quartz veins, schists impregnated with sulphides and dikes of porphyry, all carrying gold to a greater or less extent." A. L. Parsons, describes the deposits as light-coloured schists containing quartz, a considerable percentage of pyrite and some calcite. The following descriptions of the mines are largely from A. L. Parsons' reports:

The *Laurentian* (H.P. 371), began operations in 1903 and produced from a 20-stamp mill the greatest amount of gold from any one property in the area. The main ore body consists of diabase schist and numerous bands of quartz, from a mere trace up to several inches in width, having in all an average width of 20 feet. "The sinking has followed a small vein of dark quartz, which in places produced some showy free gold specimens."[5] The deposit has been worked to a depth of 480 feet, and ore has been stoped from small shoots on various levels and only in proximity to the shaft.[6] *The Big Master* (H.P. 366, etc.) vein, according to Mr. Parsons, shows a remarkable similarity to iron formation. A 10-stamp mill produced some bullion between 1902 and 1905. According to the mine plans, the ore shoot in the west vein has been found to widen and lengthen respectively from 2½ feet by 30 feet on the surface, to 8 feet by 156 feet on the second or 185-foot level, and 9 feet width in the winze below this point, (285-foot level), and to have shown an average value of $17 per ton. The east vein or shoot, so far only opened out along the first or 85-foot level, has a length there of 140 feet, and a width of 12 feet, with an average assay value of $8.35 per ton."[7]

The *Twentieth Century Mining Company* sank a shaft 340 feet deep on H.P. 398, and installed a 20-stamp mill which produced a small quantity of gold. The stamp mill was later removed to the Laurentian. The Company also operated the *Volcanic Reef* (S.40), which has a small quartz vein with pyrite and gold.

[1] Ont. Bur. Mines, Vol. VII, 187, Pt. 2, p. 128.
[2] Ont. Bur. Mines, Vol. VI, 1896, pp. 83-87; Ibid, Vol. VII, 1897, Pt. 2, pp. 121-123.
[3] Ibid, Vol. XX, 1911, Pt. 1, pp. 178-188; Ibid, Vol. XXI, 1912, Pt. 1, pp. 194-198.
[4] Ibid, Vol. VI, 1896, p. 86.
[5] Ibid, Vol. XIV, 1905, Pt. 1, p. 52, E. T. Corkill.
[6] Ibid, Vol. XVIII, 1909, p. 79, E. T. Corkill.
[7] Ibid, Vol. XIV, 1905, Pt. 54, W. E. H. Carter.



Vertical section of workings, Olive mine, Mine Centre, scale 110 ft.=1 inch. (Ont. Bur. Mines, Vol. IX, p. 73).

The *Paymaster* (H.W. 20) has a schist quartz vein in diabase which has been opened to the 325-foot level. A 10-stamp mill is on the property. Other prospects are the *Victory* (McA. 28), *Jubilee* (H.P. 301) with a 4 or 5-foot fissure vein, *Little Master* (H.P. 375), *Detola* (R.P. 411), and *Last Chance* (S. 28). In the early part of 1916, the Laurentian, Big Master, and Jubilee were de-watered and sampled by the Dominion Reduction Company of Cobalt, but no further work was done by the Company. The *Glass Reef* (H.W. 391, H.W. 594) produced a little gold from a 10-stamp mill.

The Sakoose or *Golden Whale*[1] (H.W. 416, etc.) near Dyment station in the New Klondike region, mined and shipped ore to the Keewatin Reduction Works at Keewatin, Ontario, during 1899 to 1902. "The ore consists of a dark quartz containing variable quantities of zinc blende, chalcopyrite, pyrites and galena, lying in a fissure tight against the walls of brownish grey disturbed quartzose schist [felsite] . . A dike of quartz porphyry runs in and out through this broken up area of country rock and for long stretches lies against the quartz veins."[2]

Dryden

The geology of this area is included in Wm. McInnes'[3] Manitou Lake sheet. Further detailed work around Wabigoon lake was done by A. L. Parsons[4] and Ellis Thomson.[5] According to Mr. Thomson, the veins occur chiefly in the Keewatin, particularly near the Laurentian formation. The veins vary in width from a few inches to 20 feet or more, and consist chiefly of white quartz; ankerite, pyrite and black tourmaline are also quite plentiful, while chlorite, malachite, azurite, hematite, and native gold are rarer constituents. Only a small quantity of gold has been produced from three or four properties.

The Redeemer,—(S.W. ¼, S. ½, lot 7, con. 1, Van Horne), produced a small quantity of gold in 1905, from a 10-stamp mill. The deposit is apparently a lode of quartz and green schist with much pyrite, which has been worked to a depth of 235 feet with levels at 100 and 200 feet. The upper workings were de-watered in 1910, and later in 1919, by the *Contact Bay Mining Company*.. This company also operates the *Rognon*,[6] K. 635, (formerly the surveyed claim A.S. 14), where the vein "varies in width from two feet two inches, pinching and swelling alternately throughout the length. The vein material is reddish quartz highly impregnated with hematite and occasionally carrying a little pyrite"[7] and visible gold. The country rock is biotite schist. A shaft has been sunk 106 feet with 65 and 192 feet of drifting at the 50 and 100-foot levels respectively. A little gold has been recovered from a one-stamp testing mill[8]. At the

[1] Ont. Bur. Mines, Vol. X, 1901. pp. 89, 90, 101, 102,; Ibid, Vol. XI, 1902, pp. 11, 53, 57, 251, 255; Ibid, Vol. XII, 1903, p. 15.

[2] Ibid, Vol. X., 1901, p. 101, W. E. H. Carter

[3] Map No. 720, Manitou Lake Sheet, Rainy River District, Geol. Sur. Can. 1902.

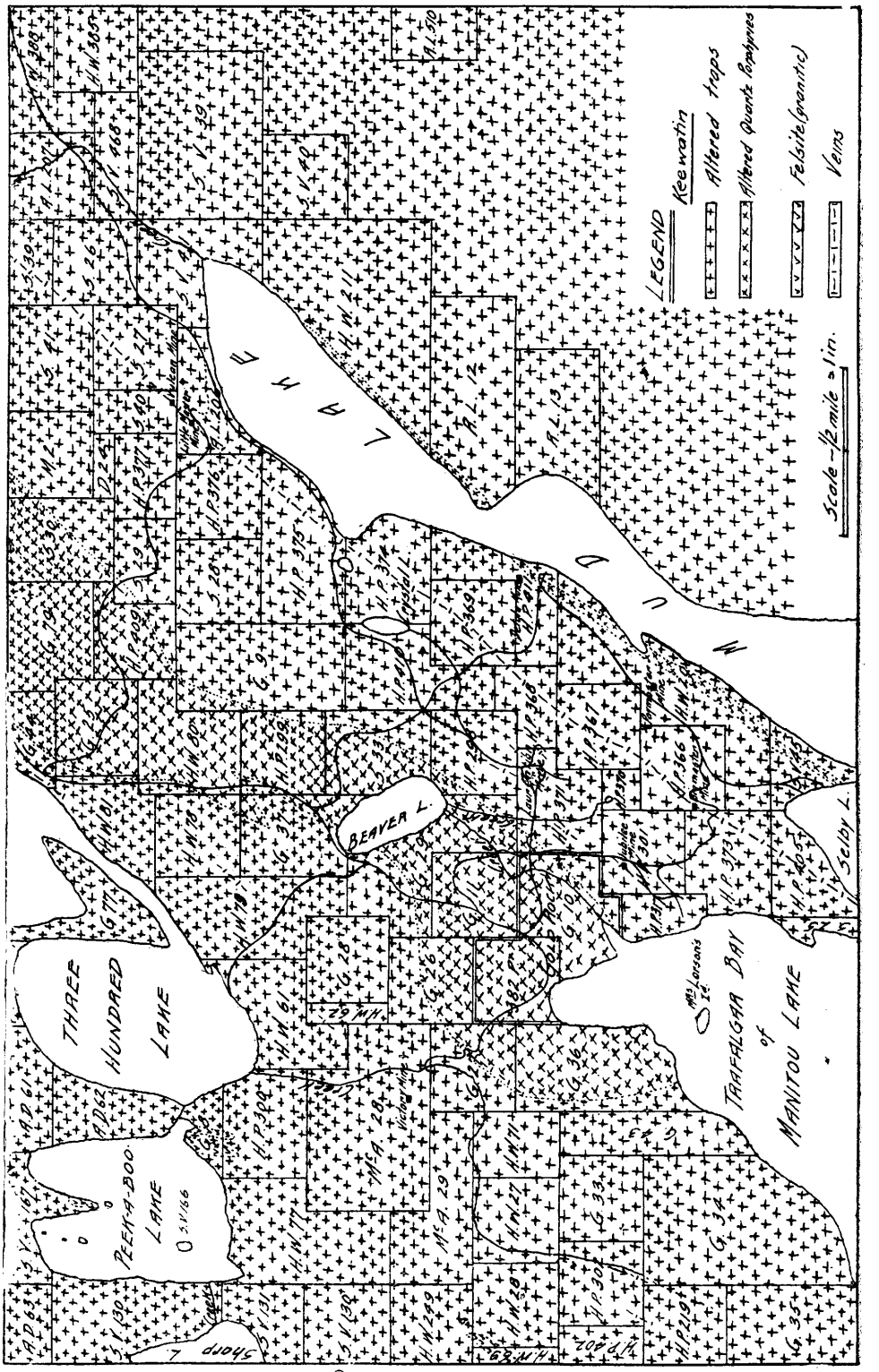
[4] Map on page 120. Ont Bur. Mines, Vol. XX, 1911, "Gold Fields of Lake of the Woods, Manitou and Dryden".

[5] Dryden Gold Area, by Ellis Thomson, accompanied by a geological coloured map, scale 8 miles to 1 in., Ont. Bur. Mines, Vol. XXVI, 1917, pp. 163-189.

[6] Can. Min. Jour., Dec. 10, 1915, by Jas. Bartlett.

[7] Ont. Bur. Mines, Vol. XXIV, 1917, p. 184, E. Thomson.

[8] Ibid, Vol. XXIX. 1920, p. 66.



Geological map of the Manitou area by A. L. Parsons. The altered traps include diabase, diorite and andesite. (Ont. Bur. Mines, Vol. XX, Pt. 1, p. 79).

Gold Moose (lot 8, con. 1, Van Horne), the shaft has been sunk to a depth of 114 feet. The vein, which is in trap, is 18 inches wide at the surface and 4 feet wide at the bottom. "In February of this year [1901] a mill test of 67 tons of ore made at the Keewatin Reduction works, is said by Hutchison Bros, to have given satisfactory returns."[1]

The League mine (N. ½, lots 5 and 6, con. 1, Van Horne) shows a vein consisting of quartz, ankerite, tourmaline, and pyrite with green mica and chalcopyrite. The country rock is dense felsite or quartz-porphyry. The shaft is 80 feet in depth. A one-stamp mill is on the property.[2] The *Cleveland* (lot 11, con. 1, Van Horne), has an 80-foot shaft on a small quartz vein in altered diabase.

Gold has also been found to the northeast of Dryden, on the Cross and other claims on *Minnitaki lake*.[3]

Eagle Lake

The geology has been worked out by Wm. McInnes in the Manitou Lake sheet of the Geological Survey of Canada, and is further discussed by W. G. Miller, W. E. H. Carter, E. T. Corkill, A. L. Parsons and others who also treat of the properties on which work has been done.[4] The important gold-bearing veins of the area are confined to the granite over a width of a mile or more from the contact with the green trap, which contact crosses Eagle lake with a tortuous but on the whole northeast-southwest strike.[5]

The *Grace* gold mine (M.H. 251), lies near the contact of Laurentian granite and altered quartz-porphyry of Keewatin age. Six veins have been located and a shaft sunk 135 feet on No. 1 vein where one level has been opened up. The vein consists principally of schist and bluish quartz. A tunnel has been driven into the hill 160 feet.[6] According to W. E. H. Carter, the veins are quite narrow, carrying galena, blende, pyrite and an unusual sprinkling of visible gold.[7] A 5-stamp mill was erected in 1907, and a little ore milled.[8] The *Golden Eagle* in 1903 had 29 tons of ore run through the Eldorado mill, producing $307.50 in gold.[9] The following four properties, some of which produced bullion in 1903, 1904, and 1905, have been worked by the *Northern Light Mining Company*. The *Baden-Powell* (S. W. end of South Twin island) has three quartz veins in granite, probably of Laurentian age. About 40 tons of ore were tested at the Eldorado mill.[10] Later, a 5-stamp mill was erected and a shaft put down 135 feet.[11] The *Eldorado* (M.H. 257), has a 31-foot shaft on a vein in Laurentian granite. A 2-stamp mill was erected. Considerable exploratory mining was also done on the *Buffalo* (M.H. 246), and on *Pioneer Island* (McA. 245). On the latter an 80-foot shaft has been sunk on a vein of pyrite and quartz on a contact of granite and trap.[12]

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[1] Ont. Bur. Mines, Vol. XI, 1902, p. 244, W. E. H. Carter.
[2] Ibid, Vol. XXVI, 1917, p. 181, Ellis Thomson.
[3] Ibid, Vol. VIII, 1898, pp. 69-72; Vol. IX, 1899, p. 64.
[4] Ibid, Vols, XII, 1903, to XVII, 1908, inclusive and Vol. XX, 1911.
[5] Ibid, Vol. XX, 1911, p. 196, A. L. Parsons.
[6] Ibid, Vol. XIII, 1904, p. 64, W. E. H. Carter.
[7] Ibid, Vol. XIII, 1904, p. 64, W. E. H. Carter.
[8] Ibid, Vol. XVII, 1908, p. 64, E. T. Corkill.
[9] Ibid, Vol, XIII, 1904, p. 64, W. E. H. Carter.
[10] Ibid, Vol. XII, 1903, p. 93, W. G. Miller.
[11] Ibid, Vol. XX, 1911, p. 197, A. L. Parsons.
[12] Ibid, Vol. XIV, 1905, p. 49, W. E. H. Carter.

Lake of the Woods and West Shoal Lake

The geology of Lake of the Woods has been worked out in detail by A. C. Lawson[1] and minor changes and additions have been made by A. P. Coleman, and A. L. Parsons. Prof. Coleman[2] wrote three detailed reports on the "Western Ontario Gold Regions," in 1894, 1895, and 1896. Later, in 1910, 1911, and 1912 Mr. Parsons[3] did detailed mapping in the vicinity of some of the mines and reported on the accessible properties. These have been described from year to year by the Mining Inspectors of Ontario, and a brief account is given in the International Geological Guide Book No. 8 published by the Geological Survey of Canada, in 1913.

Gold mining began around Lake of the Woods about 1883, the greatest activity being in the year 1897. The principal producers were: the *Sultana* which yielded between $700,000 and $1,000,000 the *Mikado*, and the *Regina* or *Black Eagle*; the production of the latter two was approximately $500,000 each. Small quantities of bullion have come from Ophir, Olympia, Golden Horn, Cornucopia, Cameron Island, Winnipeg Consolidated, Pine Portage, and the Keewatin Contact. The production from a number of the smaller properties was obtained from mill tests only. Mining has been carried on intermittently at most of the properties; none of the mines were in operation during 1920.

The rocks are of pre-Cambrian age, consisting of Keewatin horneblende, chlorite, sericite schist, etc., Laurentian granite and gneiss, a series of granites, porphyries and felsites younger than the Laurentian (probably Algoman), and a few Keweenawan diabase dikes. The Keewatin hornblende schists, altered traps, are the most important rocks, since the main ore deposits are located in them, as at the Sultana, Regina, and Mikado; the ore in the latter two mines also extends into the adjoining granite, which may be responsible for the gold.

The veins are chiefly of the fissure type, with quartz and some ferro-dolomite. They frequently cut across the contact between granite and Keewatin altered volcanics.

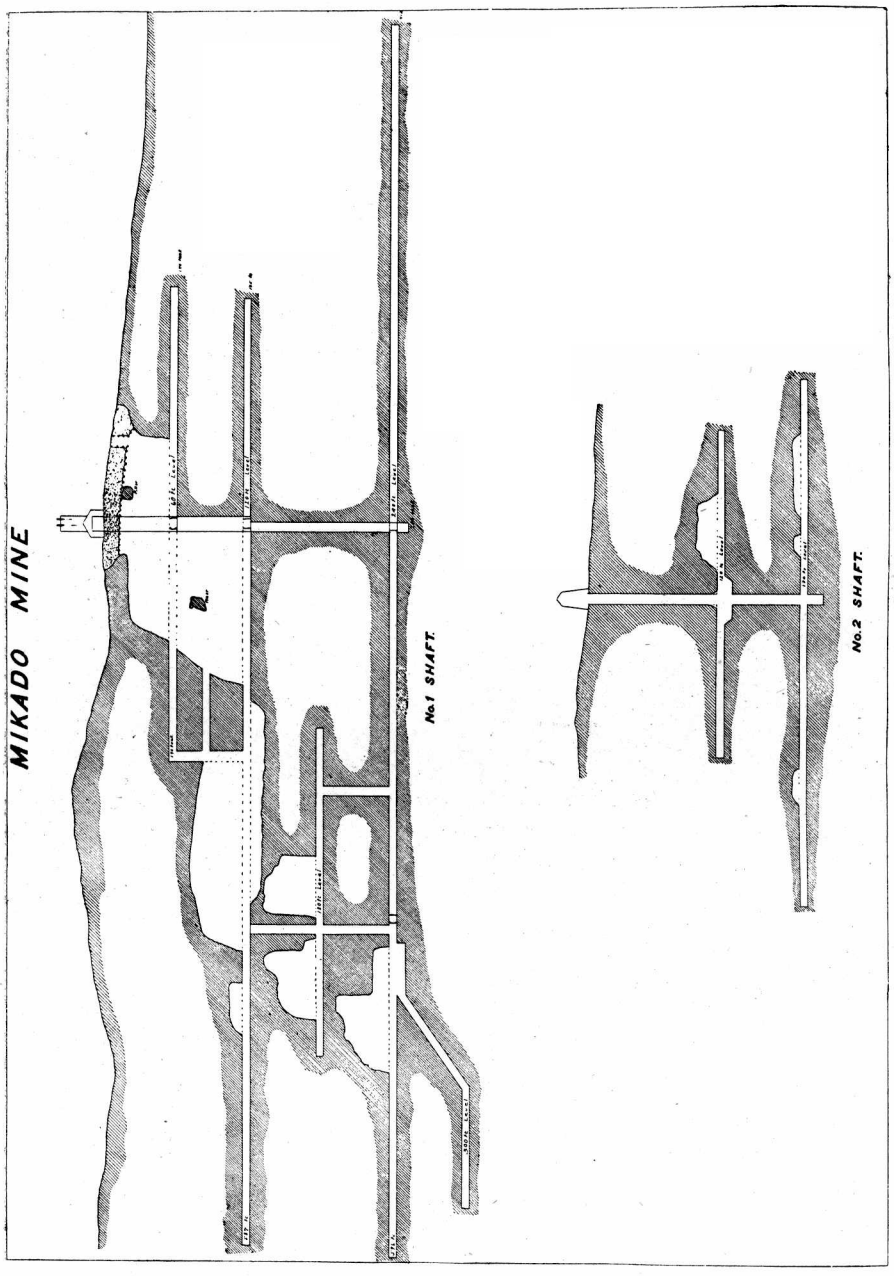
The *Mikado* (D. 148) was discovered in 1893, operated up to 1903, and again in 1910 and 1911. The mine produced approximately $500,000 in gold, the ore running $8 and up per ton. According to A. L. Parsons, the rocks are Keewatin traps, basalts altered to hornblende and chlorite schists and andesite and quartz porphyry, which have been intruded by felsite dikes and sills, and granite. The main vein is of the fissure type and consists of blue and white quartz averaging from 4 to 5 feet in width and carrying pyrite, chalcopyrite, bismuthinite, molybendite, malachite, native gold, chlorite, and tetradymite. An inclined shaft has been sunk to a depth of 540 feet, 1,300 feet on the incline, and nine levels have been opened up. The stoping has been done principally in the felsite and for a short distance in the adjoining traps. A less important

[1] Report on the Geology of Lake of the Woods Region, Ont., Geol. Sur. Can. Annual Rep., 1885, Pt. CC; See also reprint of Prof. Lawson's map in Ont. Bur. Mines, Vol. VI.

[2] Ont. Bur. Mines, Vols. IV, 1894, V, 1895, and VI, 1896.

[3] Ibid, Vols. XX, 1911, XXI, 1912, and XXII, 1913.

Geological map, scale 4 miles to the inch, of northern part of Lake of the Woods, by A. L. Parsons.



Vertical section of underground workings, Mikado mine, Lake of the Woods area, scale, 1 inch=160 feet. (Ont. Bur. Mines, Vol. IX, p. 53).

vein occurs in the adjoining granite[1]. The best values are always found where one or both walls are composed of granite[2]. The mine may be re-opened during 1922.

The *Cornucopia* (Cedar Island No. D. 212). The shaft was sunk on a vein carrying much pyrrhotite. The gold recovered was valued at $1,560.

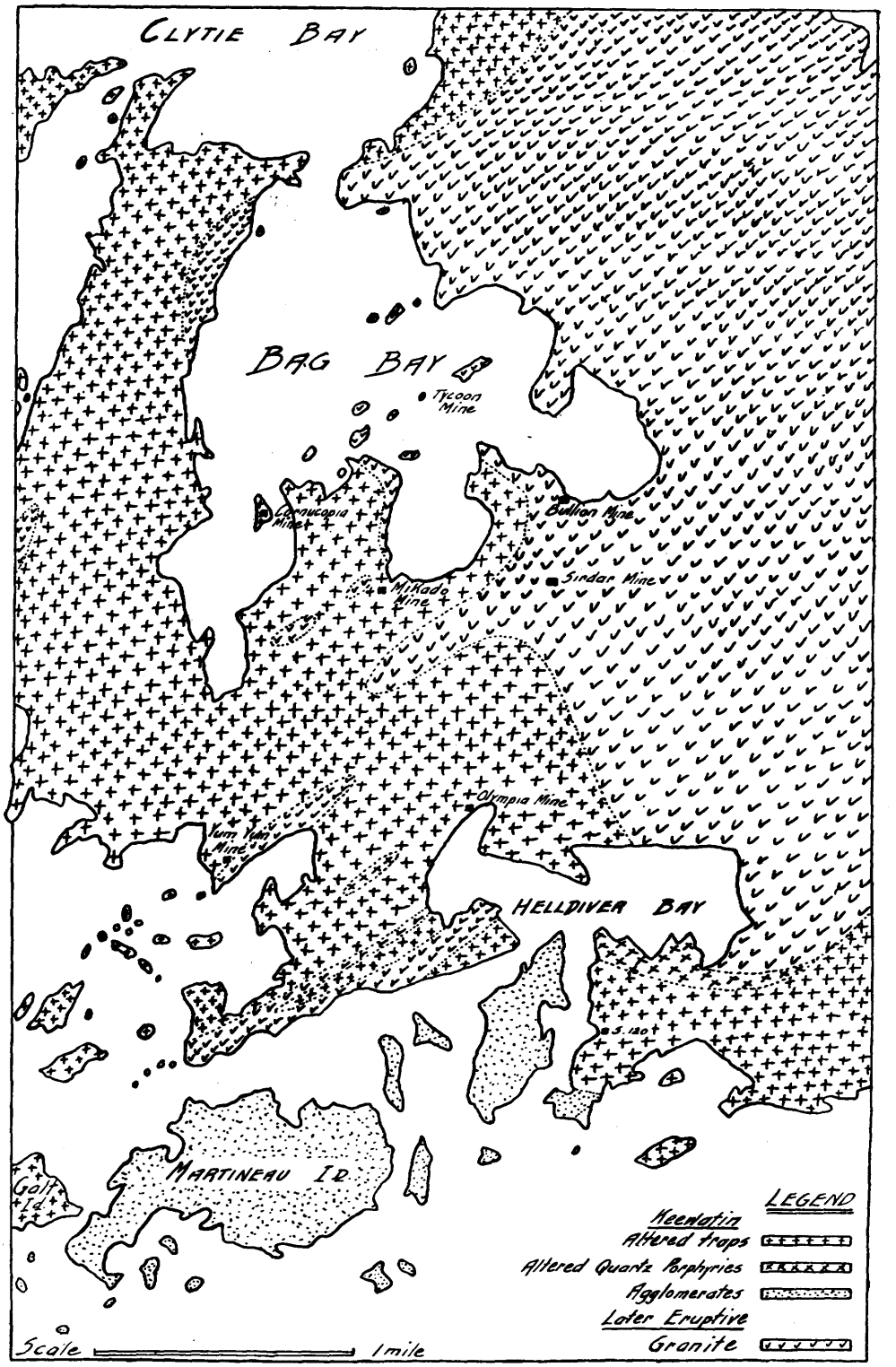
The *Olympia* (M. 11) has a quartz-calcite vein from 3½ to 6 feet in width in Keewatin diabase. Gold valued at $2,101, was produced in 1912 from a 10-stamp mill. Some ore was also milled in the summer of 1915. There are five shafts and three tunnels on the property[3].

Cameron Island.—(S. 170). The rocks are amphibolite, altered trap, intruded by felsite. The main quartz vein is four feet wide carrying much pyrrhotite, pyrite and chalcopyrite[4]. A mill run in a 5-stamp mill yielded $200 in gold the ore averaging about $10 per ton. According to T. F. Sutherland,[5] the shaft has been sunk 132 feet with 500 feet of lateral work on the 63 and 127-foot levels. The mill has been replaced by two Forsythe pulverizers, a rotary roasting kiln and two amalgamation plates.

Golden Horn or *Rush Bay* (D. 288) produced some gold in 1905 from a 2-stamp mill. According to W. E. H. Carter, "the vein is very irregular in width, waving in and out from a mere stringer to a solid quartz body 3½ feet wide. The one solid band occasionally breaks up into several, which then interband with the chloritic schist forming a well-defined deposit several feet wide."[6] The quartz varies from a white variety with a little iron pyrites to a smoky quartz carrying galena, blende, chalcopyrite and pyrite.[7] "No. 1 shaft has been sunk, to a depth of 225 feet, and 175 feet of drifting has been done in both directions on the vein on the first level. On the third level a cross-cut has been driven south 285 feet. No. 2, shaft is 113 feet deep on a vein 84 feet south of No. 1, vein."[8]

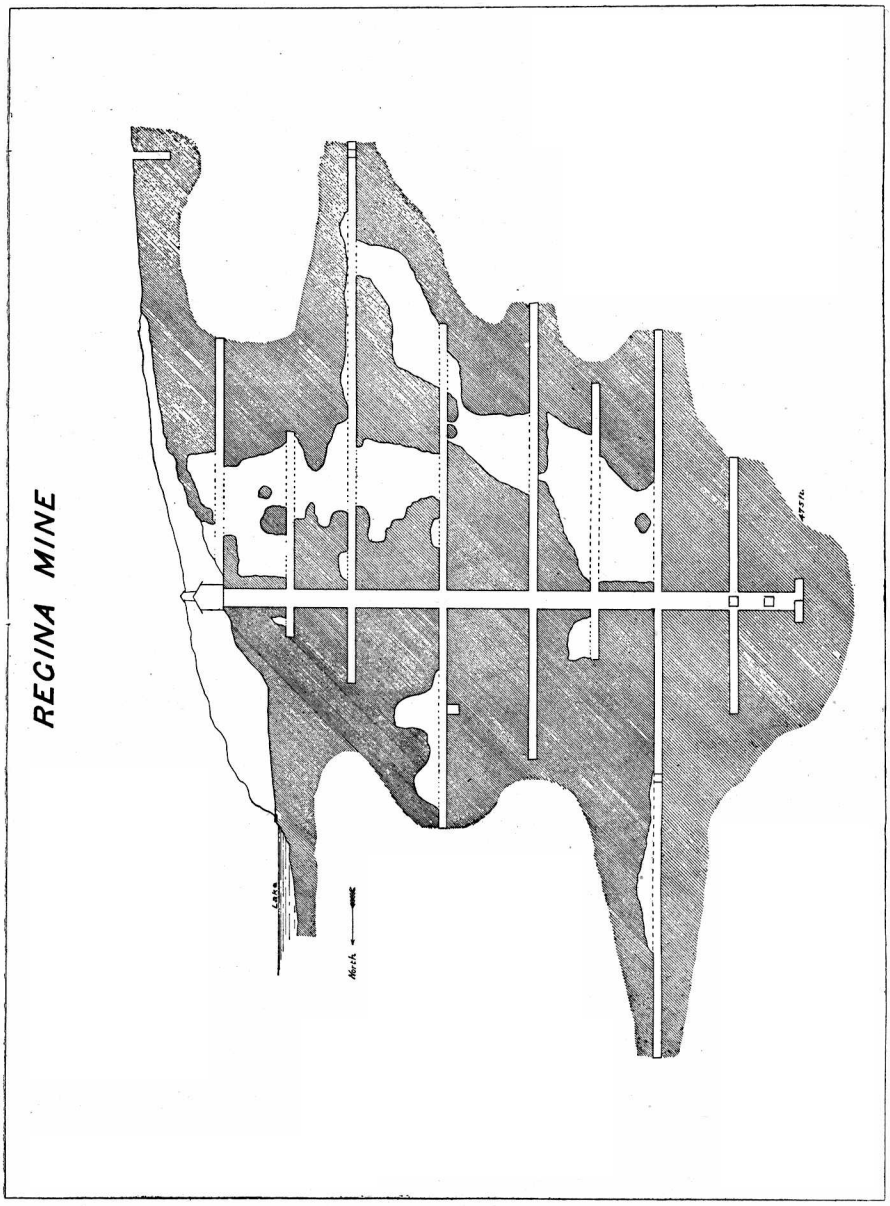
The *Regina* mine (556 P, 557 P.), later known as the *Black Eagle,* began mining and milling in 1895 and worked continuously until October, 1899. The property was in operation for a short time during 1902 and also in 1905, the total production being approximately $500,000. The ore occurs as a nearly vertical chimney or ore shoot in a "true fissure" vein. According to A. L. Parsons[9] "The vein upon which the shaft is sunk varies in width from about 2 feet to 6 feet with a general average [in the four upper levels] of about 4 feet, and at only one place was a width of less than two feet noted. The vein cuts the contact of granite and a more or less altered trap [the ore occurring in both formations] . . The shaft has been sunk to a depth of 545 feet and nine levels have been opened up at intervals of 60 feet . . .The vein is principally quartz, though in places a fair

[1] Ont. Bur. Mines, Vol. XX, 1911, pp. 164-5; Vol. XXI, 1912, pp. 192-3.
[2] Ibid, Vol. XII, 1903, p. 95, W. G. Miller.
[3] Ibid, Vol. XX, 1911, p. 162; Vol. XXV, 1916, Pt. 1, p. 68.
[4] Ibid, Vol. XX, 1911, p. 166, A. L. Parsons.
[5] Ibid, Vol. XXV, 1916, p. 66.
[6] Ibid, Vol. XIII, 1904, Pt. 1, p. 61.
[7] Ibid, Vol. XI, 1902, p. 252.
[8] Ibid, Vol. XV, 1906, p. 59, E. T .Corkill.
[9] Ibid, Vol. XX, Pt. 1, p. 173.



Map of West Shoal lake, Lake of the Woods area, by A. L. Parsons, (Ont. Bur. Mines, Vol. XX, Pt. 1, p. 79).

percentage of a rusty carbonate is found intermingled with the quartz." According to James A. Bow,[1] the stope, which has been carried through from the sixth level to the surface, averages about 6 feet in width and is approximately 60 feet in length on the levels; the vein in the lower workings is 7 to 12 feet



Vertical section of underground workings, Regina Mine, Lake of the Woods area, scale—160 ft.=1 inch. (Ont. Bur. Mines Rep., Vol. IX, p. 45).

in width, possesses good walls and averages about $7 per ton. Gold has also been found on the property in quartz veins in granite, and in quartz stringers cutting rusty carbonate. There is a 40-stamp mill and other buildings and equipment. Cyanide was used in recovering the gold.

[1] Ont. Bur. Mines, Vol. VIII, 1899, p. 57; Vol. IX, 1900, p. 46.

The *Canadian Homestake,* formerly known as the *Scramble* (lots 13, and 14, concession VI, Jaffray township), was located in 1894, and was partially explored. After lying idle for thirteen years the property was re-opened in 1911, and operated by electric power from Kenora. According to A. L. Parsons, the ore body is a fahlband about 30 feet wide, containing veins and stringers of quartz and ankerite and considerable pyrite, and resembles iron formation occurring in altered diabase which in places exhibits a pillow structure.[1] "The company continued development work until September 15th, 1914, when all work was stopped. At that date the underground development stood as follows:— The shaft was 225 feet deep and timbered to 200 feet. On the 55-foot level a cross-cut was driven a distance of 60 feet. On the 75-foot level a cross-cut was driven 27 feet and a sump cut. On the 200-foot level a drift was driven 100 feet and a sump cut."[2]

The *Sultana mine* (42X) began operation in 1891 and worked almost continously until it closed in 1906, the production during that time being between $700,000 and $1,000,000,which is the largest yield from any gold mine in northwestern Ontario. The ore averaged about $8.00 per ton and had a fineness of about 840. The workings are about 600 feet deep, which is the greatest depth reached in any gold mine in this area. According to A. P. Coleman[3] the deposits are bedded veins [lodes?] in Keewatin hornblende and chlorite schist [altered trap] near granite and granite-porphyry which may be of Laurentian or later age. Some veins are also in the granite. "In addition to native gold it is reported that considerable molybdenite was found in this mine, and the tailings along the shore show that there was a large quantity of pyrite and other sulphides in the vein".[4] "The latest developments appear to show that the ore body is a large irregular chimney extending through all the levels from the second down."[5] The main stope has a minimum cross-section of about 25 feet by 25 feet and a maximum of about 60 by 120 feet. The ore shoot was cut off by a fault on the seventh level.[6] There is a 30-stamp mill and other surface equipment.[7]

The *Ophir* (A. 20) vein is entirely in unaltered granite porphyry (Laurentian?) near Keewatin altered trap. A little gold was obtained in 1911. According to A. L. Parsons,[8] a shaft has been sunk 160 feet deep with levels at depths of 40 and 100 feet. The vein is apparently a lode consisting of a few lenses and bands of quartz separated by micaceous and chloritic material and granite-porphyry.

Winnipeg-Consolidated. (F 22, and X 85).—A. L. Parsons says, " The vein of the Winnipeg Consolidated mine was seen in the shaft, and at a depth of 6 feet it has a thickness of about three feet and is between walls of altered diabase.[9]" Ore was mined and milled in 1883. According to E. Coste, "the true vein of massive quartz . . ., was found to be narrow (6 inches to 2 feet); it is certainly

[1] Ont. Bur. Mines, Vol. XX, 1911, p. 175; Vol. XXII, 1913, p. 227.

[2] Ibid, Vol. XXIV, 1915, p. 96.

[3] Ibid, Vol. IV, 1894, p. 68.

[4] Ibid, Vol. XX, 1911. p. 169, A. L. Parsons.

[5] Ibid, Vol. VIII, 1899, p. 50, James A. Bow.

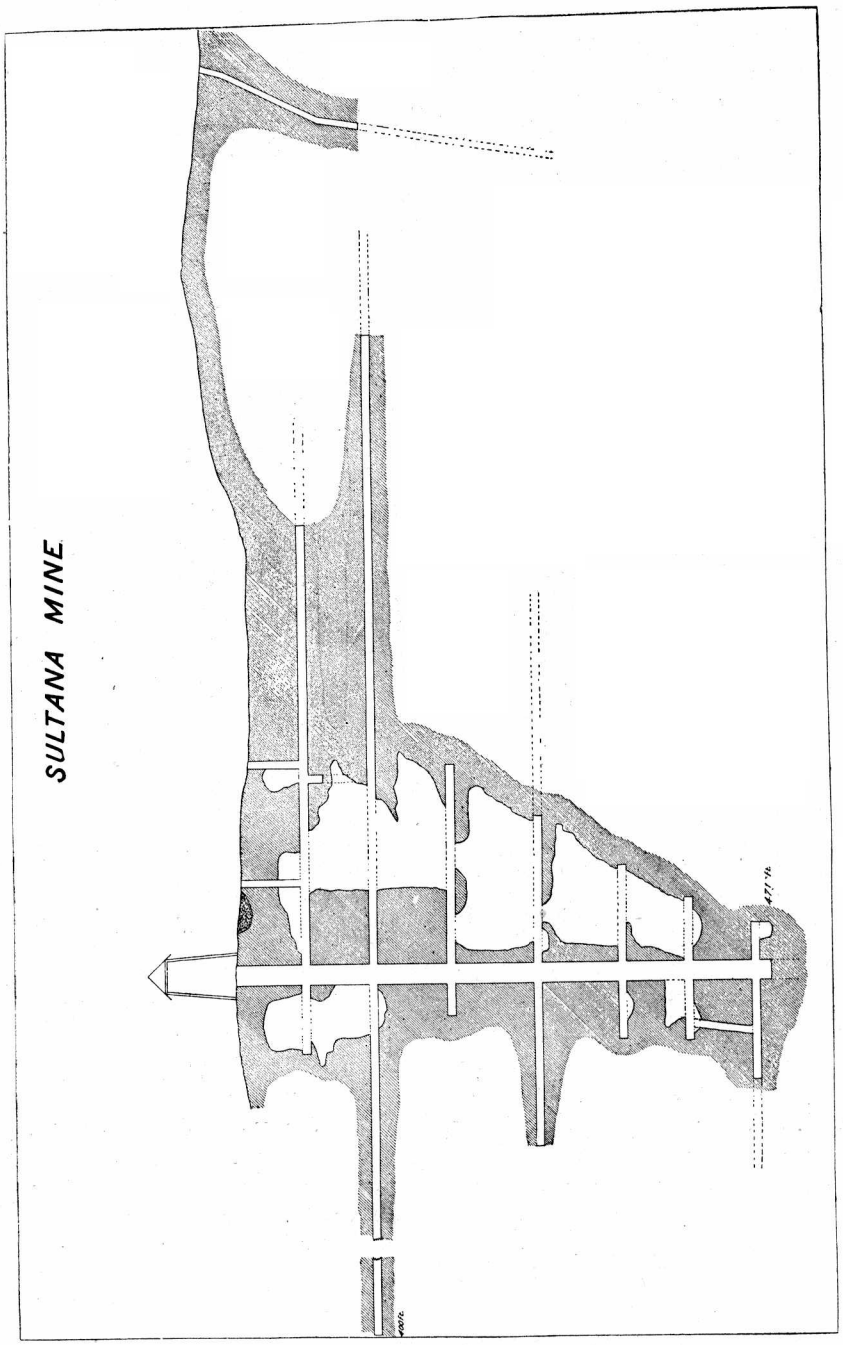
[6] Jour. Can. Min. Instit., Vol. VII, 1897, p. 132, W. E. H. Carter.

[7] Ont. Bur. Mines, Vol. XX, 1911, Pt. 1, p. 170.

[8] Ibid, Vol. XXII, 1913, Pt. 1, pp. 226-7.

[9] Ibid, Vol. XX, 1911, p. 172.

auriferous . . ., it contains besides iron and copper pyrites, mispickel, a little calcite and a very little galena and blende.[1]"



Underground workings of the Sultana, Lake of the Woods area, scale: 170 ft.=1 inch
The shaft is now 600 feet deep and a drift on the third level has reached the Crown
Reef vein, 750 feet from the main shaft, where some ore was stoped.
(Ont. Bur. Mines, Vol. IX, p. 39).

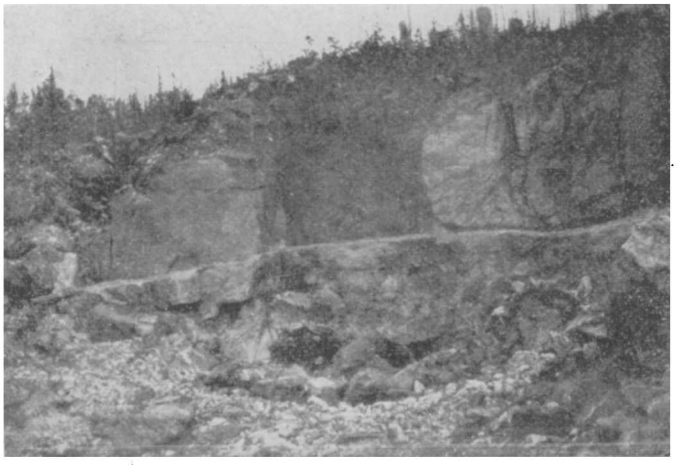
Pine Portage.—"Ore was milled as it was taken from a 100-foot shaft in 1884. The vein is a quartz fissure over 7 feet in width; it is certainly very auriferous and is impregnated with iron and copper pyrites, blende, galena, mispickel

[1] Geol. Sur. Can., 1882-4, p. 11k, 12k.

and a little covellite."[1] The lead is a fissure cutting a hard massive schistose hornblende rock at a distance of only 150 feet from a granite mass towards which it dips."[2].

Keewatin.—"In 1884, ore was shipped in barges to the stamp mill of the Argyle mine. The quartz, which is rich in iron and copper pyrites and in mispickel, runs in small veins between the laminæ of the schist, forming a total width of about six feet of impregnated matter."[3].

The Combined mine lies two miles east of the south end of Camp bay—"37 tons of ore were milled in July, [1903], producing gold, according to the superintendent, to the amount of $10.50 per ton."[4] "The vein is nearly horizontal . . . lies between overlying trap, exhibiting a pillow structure, and a dark underlying



Flat quartz vein overlain by trap, Combined gold mine, Lake of the Woods area. (Ont. Bur. Mines, Vol. XIII, Pt. 1, p. 48).

felsite or fine-grained quartz (?) porphyry. With the quartz, which in the principal vein varies from two to four feet in thickness, is a large body of rusty carbonate rock which seems to be derived from the alteration of quartz (?) porphyry or felsite and shows considerable sericite.[5].

Numerous other prospects in the area have made mill tests or shipped ore to the smelters, from which a few hundred dollars were recovered. A number of the following come under this class: *North Crown* (formerly called *Gold Hill,* 70 K); *Homestake,* P. 64; *Champion* or *Good,* P. 349; *Gold Creek,* P. 347; *Eldiver,* P. 351; *Treasure,* P. 400; P. 409; *Caribou,* P. 288; *Bulldog or Black Jack,* X. 90; *Rajah,* P. 317; *Standard,* McA. 251; *Bully Boy,* S. 79; *Triggs,* McA. 56; *Flint Lake,* McA. 285, 286; *Crown Point; Bullion; Triumph; Nonesuch; Boulder Island; Golden Gate; Master Jack; Dead Broke* or *Climax; Princess; Black Sturgeon; Sirdar; Tycoon; Yum-Yum; Nino;* J.E.S. 93; *Violet,* (produced gold in 1907.

[1] Geol. Sur. Can. 1882-1884, p. 15k, E. Coste.
[2] Ibid 1885, pp. 141, 142, CC., A. C. Lawson.
[3] Ibid, 1882,-1884, p. 10K.
[4] Ont. Bur. Mines, Vol. XIV, 1905, p. 48.
[5] Ibid, Vol. XXI, 1912, p. 190, A. L. Parsons.

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