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Bulletin No. 34  
OF THE  
Ontario Bureau of Mines

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MATACHEWAN GOLD AREA

By  
A. G. BURROWS

Accompanied by a geologically coloured Map

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## LETTER OF TRANSMISSION

TO THE HONOURABLE G. H. FERGUSON,  
*Minister of Lands, Forests and Mines.*

SIR,—I have the honour to submit to you herewith a report on the Matachewan Gold Area, by Mr. A. G. Burrows, Assistant Provincial Geologist. It will form part of the Twenty-seventh annual volume of the Bureau of Mines, but it has been deemed advisable to publish an advance edition as Bulletin No. 34, so that the information in the Report and geological map accompanying it may be made available to prospectors and others interested in the field at as early a date as possible.

The Matachewan Gold Area is so-called from its proximity to the Hudson's Bay Company post of that name on the Montreal river. Gold was found in the township of Powell in the autumn of 1916, and has also been discovered in the adjoining township of Cairo. It is yet too soon to speak definitely regarding the possibilities of this new camp, but its location and the number and widespread distribution of gold occurrences in the pre-Cambrian rocks of northern Ontario emphasize the value, actual and potential, of these great metal-bearing formations.

I have the honour to be, Sir,

Your obedient servant,

THOS. W. GIBSON,  
*Deputy Minister of Mines.*

BUREAU OF MINES,  
DEPARTMENT OF LANDS, FORESTS AND MINES,  
TORONTO, 15TH MAY, 1918.

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# THE MATACHEWAN GOLD AREA

By A. G. BURROWS

## Introduction

In the fall of 1916 a discovery of gold was made on the Davidson claims in Powell township, which is on the Montreal river, in the District of Timiskaming. Powell township is near Fort Matachewan, a Hudson's Bay Company post, consequently the area has become known as the "Matachewan Gold Area." Prospecting had been carried on from time to time since the discovery, in 1906, of silver in James township, at Elk Lake. Gold was found at several places in the southeast part of Alma township and in the north central part of Cairo township, in an area of syenite, a few years previous to the discovery in Powell.

At the Davidson claims in Powell township the original discovery was native gold in an irregular mass of quartz and rusty weathered schist. In 1917 gold was found in a reddish porphyry by Sam Otisse on his own claims to the northeast of



Fig. 1.—Scene on the Montreal river, north of the mouth of the East Branch (looking north).

the Davidson. This prospector also discovered gold in a band of grey pyritous schist which lies to the south of the porphyry. Further work on the Davidson claims resulted in gold being found in the red porphyry which outcrops on these claims.

Since there was no detailed geological map of this area, the writer was instructed by Dr. W. G. Miller, Provincial Geologist, to make an examination of the country in the vicinity of the "finds." It was found that while a number of claims had been staked the previous winter, work was being done on only a few of these, consequently only a very small part of the new staking has been well prospected.

A geological knowledge of the area was obtained by travelling the township boundaries, traversing most of the water routes, and making sections away from the water routes. Only a few of the claim lines in the vicinity of the Davidson find were travelled since most of the claims were very irregularly staked in the

winter and difficult to follow in the thick bush in summer. However, a general examination was made of Powell, Cairo, Baden and Alma and the Matachewan Indian Reserve, while portions of the north parts of Yarrow and Kimberley also received attention.

During the season of 1917, Dr. H. C. Cooke, of the Dominion Geological Survey, examined an extensive area to the west of the Matachewan area, and his map of this country, showing the geology and canoe routes, will be of great assistance to the prospectors working westerly from the Montreal river.

### Ingress to the Area

The nearest railway station is Elk Lake, the terminus of a branch line of the Timiskaming and Northern Ontario railway that leaves the main line at Earlton station.



Fig. 2.—Davidson camp. The discoverer of gold on the Davidson, Jake Davidson, is the second figure from the left.

From Elk Lake there is a canoe route up the Montreal river a distance of about 30 miles to the Davidson landing. In high water in spring a gasoline boat has been utilized as far as the foot of the Long portage, with a short portage around Indian Chute. The trip by canoe alone is very arduous owing to the swift current in the Montreal river above Indian Chute. In this trip three portages are necessary. In low water during the summer all the stiff rapids above Indian Chute are usually poled or tracked.

A route from Elk lake, by way of Long Point lake, was used by various parties in 1917. This requires transportation of supplies and canoes over the Gowganda



wagon road to Long Point lake, from which there is a water route down stream by way of the East Branch of the Montreal river to the Matachewan area. Supplies for operations in 1918 were taken in (from Elk Lake railway station) over a winter road that roughly follows the Montreal river.

### Early References to the Area

In 1875 Robt. Bell, of the Canadian Geological Survey, made an exploration survey of a route from Lake Huron to James Bay.\* In his report he describes the east and west branches of the Montreal river, which flow through the Matachewan area. The geology is of necessity very briefly described, but reference is made to the conglomerate and other rocks along the route. The igneous rocks are for the most part called diorite, a general term for the basalt, diabases and other rocks in the complex of basic igneous rocks. Bell describes a quartz vein containing specular iron ore, along the east branch, about ten miles south of the junction with the main Montreal river.

In the Report of Survey and Exploration of Northern Ontario, 1900, J. L. R. Parsons,† geologist with Exploration Survey Party No. 3, gives a brief description of the geology along the Montreal river where it traverses the Matachewan area. He obtained low values in gold from two samples of quartz and pyrite in veins near the first rapid below Fort Matachewan.

In 1903 G. F. Kay made an examination of an area to the southwest of Lake Abitibi. His report has a description of a canoe route from the Black river to Fort Matachewan. Part of this route is shown in the northeast portion of the accompanying geological map of the Matachewan gold area. Microscopical descriptions of rocks occurring on Turtle, Separation and other lakes in the Indian Reserve or in Alma township, are given in Mr. Kay's report.‡

In 1911, the Bureau of Mines, Ontario, published a sketch map, by W. M. Goodwin, showing part of the geology of the area between Porcupine and Gowganda. On this map the geology of part of the west portions of Powell and Baden townships is given.

In 1914, P. E. Hopkins, of the staff of the Bureau of Mines, examined claims in Yarrow township, on which iron ore was reported, and also some fluorite and barite veins in Cairo township. His notes on these occurrences are referred to later in the report.

### Topography

The country described in the report is near the height of land separating the waters flowing to James Bay from those flowing to the St. Lawrence river. A portage at the north end of Matachewan lake crosses the divide between these waters. The area is of the rocky lake type, but much of the rock is concealed by a thin covering of soil. Where not recently burned over, there is a very heavy growth of medium sized timber. The topography is quite rugged in parts, some hills reaching 200 feet above the plain. Changes of elevation of 50 to 100 feet

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\* Geological Survey of Canada. Report of an exploration in 1875 between James Bay and Lakes Superior and Huron. P. 301.

† Report of Survey and Exploration of Northern Ontario, p. 111.

‡ The Abitibi Region. 13th Report. Ont. Bureau of Mines, p. 112.

are frequent. Conspicuous hills can be observed near the north end of Matachewan lake. These are of greyish andesitic rock intruded by fresh-looking diabase. On the west side of Mistinigon lake there are high ridges of quartzite and conglomerate of the Cobalt series. Matachewan lake from its north end to Fort Matachewan is simply a long narrow sheet of water with precipitous shores on either side. The portion of the Montreal river above the Long Rapids in Kimberley township consists of a series of lake expansions with high shores and connected by short flat rapids.

An interesting feature relating to the physiographic history of the area has been the diversion of the west branch of the Montreal river from its former to its present course. At one time the river flowed easterly from a point  $1\frac{1}{2}$  miles north

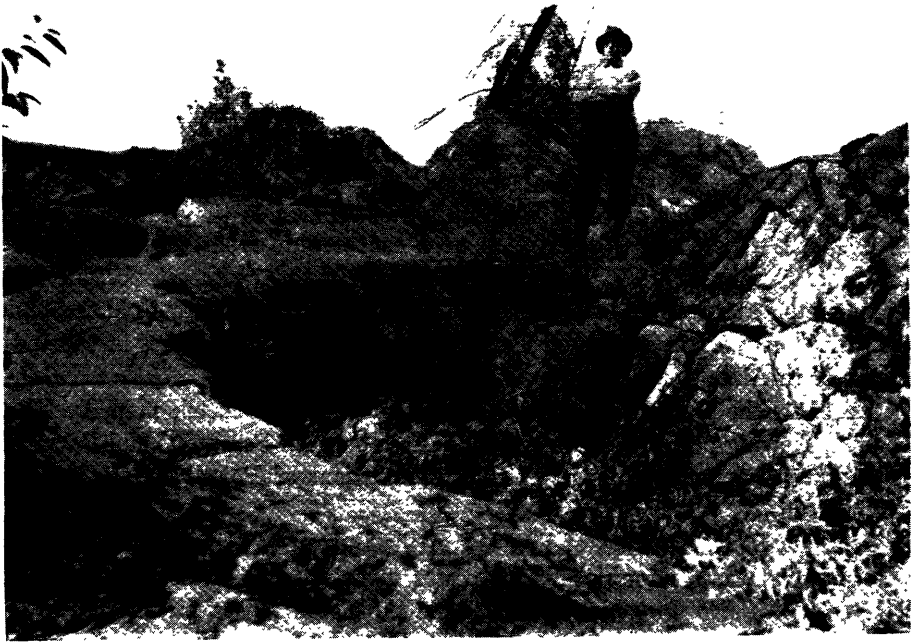


Fig. 3.—One of several large pot-holes at the mouth of Davidson creek.

of the south boundary of Powell, through what are now the Davidson claims, and emptied into the Montreal river a mile north of the junction with the East Branch. The ancient channel followed for three-quarters of the distance the course of Davidson creek shown on the map. From a small pond at the end of the small stream flowing to Davidson creek there is a depression for three-quarters of a mile to the present West Branch. The divide between this pond and the West Branch is seventeen feet above the latter, in low water, as determined by Sutcliffe and Neelands in their hydro-electric survey of Matachewan or Big Bend falls. At the west end of the pond there is a large dry pot-hole in the greywacké slate formation, and also a large cavern-like basin in the pond itself which had been formed by the cutting away by a strong eddy in the old river. For a half mile

along Davidson creek, near Davidson camp, there is an accumulation of huge boulders along the bed of the old stream, while near Davidson's landing, at the mouth of the creek, there are numerous large pot-holes in the Keewatin rocks. Some of these pot-holes are shown in the accompanying illustrations. The West Branch empties into Lake Matachewan at Matachewan falls, where there is a drop of 41 feet in 600 feet. The diversion of the river from its former course has been quite recent, geologically speaking, since the falls have been carried back only a short distance from the lake, with practically no gorge. There are two small rapids above the falls and below Mistinigon lake, and it is probable that formerly this

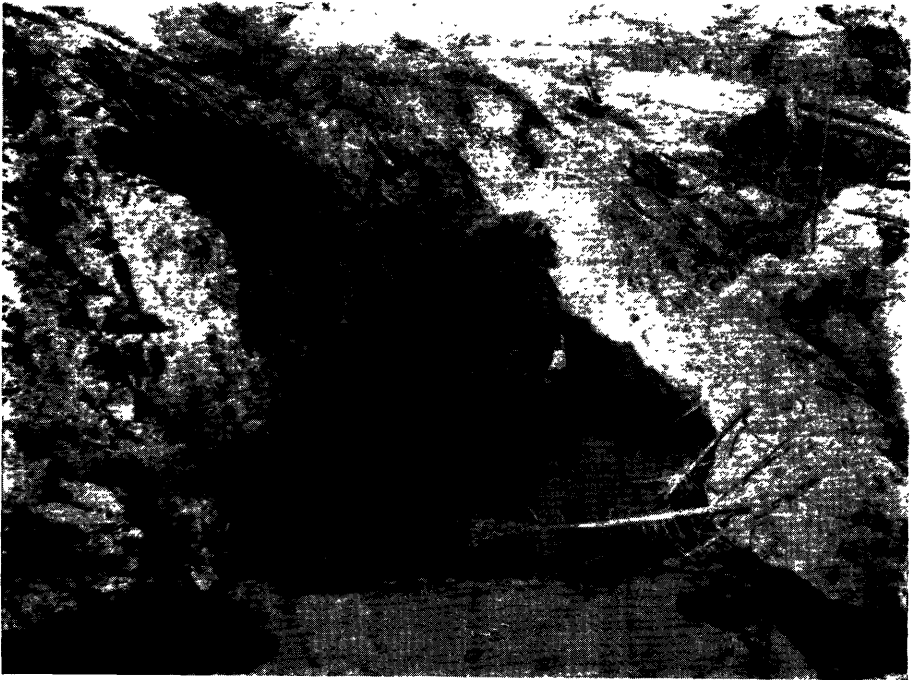


Fig. 4.—Cavern-like basin at the head of the north branch of Davidson creek. At one time this was probably part of the old course of the west branch of the Montreal river.

lake was a long narrow body of water closed at its north end, and discharging easterly from opposite the big island.

The old course of the West Branch followed a depression between the older Keewatin series and the later sedimentary rocks of the Cobalt series as shown on the accompanying geological map.

### Timber

This area has been burned over several times in the history of the Hudson's Bay Company at Fort Matachewan. Charred stubs of large pine trees are frequently observed throughout the green forest. The present timber is suitable for pulpwood, railway ties and local building purposes. It consists of the common trees of northern Ontario, spruce, jackpine, balsam, birch, poplar and cedar.

Along the east shore of the Montreal river, from the East Branch to the north end of Matachewan lake, there are small groves of red and white pine, which represent the northerly limit in northern Ontario for these trees.

The greater part of Cairo township has been burned over recently, exposing rolling sand plains and areas of rocky ridges burned off clean. A stretch across the southerly part of Powell township was burned over in 1916.

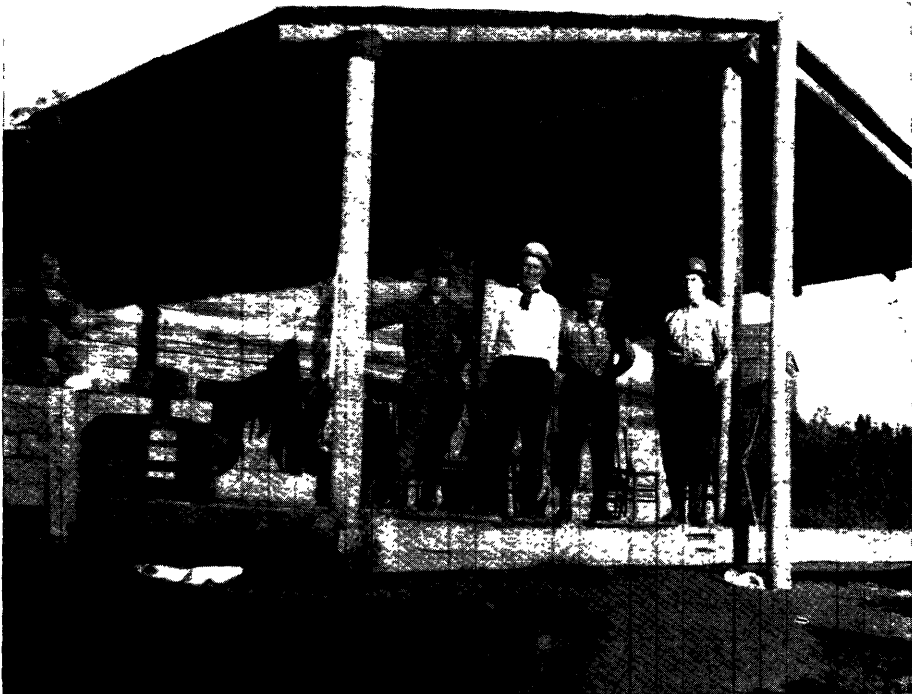


Fig 5.—Fort Matachewan. Steve Lafraicain, for many years in charge of the Hudson's Bay Co. post at Fort Matachewan, is the second figure from the left.

### Agriculture

The area is not suitable for agricultural purposes, except in small patches. Most of the soil is gravelly and sandy, and there are wide stretches of clean sand with small jackpine. Small areas have been cleared by the Indians in the Indian Reserve, and there is a vegetable garden at Fort Matachewan. Fine potatoes, turnips and cabbages are grown at these places.

### GEOLOGY

The compact rocks are all referred to the pre-Cambrian. The following legend shows a classification of the rocks in the probable order of geological succession, from the Pleistocene to the Keewatin.

## PLEISTOCENE—

GLACIAL AND RECENT ..... Sand and gravel.

## PRE-CAMBRIAN—

ANIMIKEAN (Cobalt series) ... Conglomerate, quartzite, slate-like greywacké.

*(Unconformity)*

ALGOMAN? ..... Granite, syenite, porphyry, diorite, diabase.

*(Intrusive contact)*

LAURENTIAN? ..... Granite, gneiss.

*(Intrusive contact)*KEEWATIN ..... Greenstone (pillow lava), meta-basalt, andesite, old  
diabases, serpentine, felsite, volcanic frag-  
mental, iron formation, conglomerate.

INTRUSIVE ROCKS ..... Diabase.

The oldest rocks of the area are of Keewatin age and consist mostly of basic to intermediate volcanics, accompanied by chert (iron formation) and schistose sedimentary rocks like quartzite and conglomerate. These have been intruded by numerous diabase and porphyritic dikes, whose age, beyond that they are younger than the Keewatin schists, is difficult to determine.

The older rocks have also been intruded by acid rocks like granite, syenite, gneiss and porphyry, which are probably of Laurentian or Algoman age. These acid rocks have also been intruded by numerous dikes of diabase, some quite fresh-looking.

A series of flat-lying sediments of the Cobalt series has been deposited on the eroded surface of the older greenstones, granites, syenite, porphyry, and some of the diabase dikes.

At only one place was a diabase dike observed intruding the Cobalt series, but a few others have been reported. This is in marked contrast to the older rocks, which are everywhere intruded by numerous dikes of diabase, consequently most of these dikes would appear to be older than the Cobalt series. In addition, at several points unconformities between the Cobalt series of sediments and diabase dikes have been noted. It would therefore seem that the conglomerate in the area would not be worth prospecting for silver, owing to the scarcity of sills and dikes of diabase of Keweenawan age.

### Keewatin

The Keewatin is represented by altered lavas, meta-basalt, andesite, porphyry, diabase, serpentine, carbonate rocks, iron formation, quartzite, conglomerate, etc. These rocks are for the greater part much altered, and many are now schists. Where schistose the general strike is approximately northeast and southwest.

Both amygdaloidal and ellipsoidal lavas occur in parts of the area, but most of the greenstone type of rock is fine-grained, dark-coloured meta-basalt. Fine-grained blackish rock can be well observed in the Keewatin area east of Whiskey Jack creek, in Cairo township. Here the ferromagnesian mineral has been altered to chlorite, but laths of plagioclase are well preserved, with extension angles near oligoclase-andesine. Secondary feldspar, mica and quartz are present, also numerous grains of magnetite, altering to leucoxene.

Excellent exposures of pillow lava occur to the south of St. Paul lake and on mining claim HF 13, west of Fox rapids. In the latter place there are also numerous amygdules in the altered lava. The pillow lava, east of the road from Fox rapids, is associated with bands of volcanic fragmental, of fine-grained and agglomeratic character, and some cherty iron formation.

Light coloured felsite occurs with the pillow lava and iron formation on claims HF 13 and 12502, west of Fox rapids. In hand specimens the rock is quite fine-grained, but under the microscope occasional small phenocrysts of feldspar are seen. The rock is crushed and contains numerous minute veinlets of secondary quartz. The siliceous iron formation is in bands, and several pits have been sunk on it where there is an oxidized surface from the weathering of iron pyrites. These different rocks are intruded by dikes of diabase, and thin remnants of basal conglomerate of the Cobalt series overlies unconformably this complex.

*Rocks north of Davidson Creek.*—The Keewatin rocks in Powell township that are exposed to the north of Davidson creek are greatly altered to schists. Some of the green and grey schists are probably derived from igneous rocks of basic to intermediate composition. Other schists are highly oxidized at the surface and show no indication of their origin. While rusty-weathering, below this oxidation they are light grey in colour, and contain quartz, carbonate, sericite and iron pyrites. On the Otisse claims, 5379 and 5380, this grey rock has been found to be gold-bearing, and it may prove of economic value as a gold deposit.

On mining claims 5387 and 5390, and adjacent claims, extremely altered volcanic rocks, some of which are fragmental, are recognized. They are cut by numerous whitish-weathering feldspar-porphyry dikes and diabase. The older rocks and the porphyry dikes contain quartz veinlets in places, and low values in gold are sometimes obtained. One of the porphyry dikes occurs on the trail 30 chains west of the Montreal river; another on the creek south of a small lake on claim 5402. A greyish porphyry dike with quartz veinlets is seen 12 chains northwest of number two post of claim 5385. These dikes belong to an older series than the orthoclase porphyry on the Davidson and Otisse claims, and are probably associated with the Keewatin rocks. Similar dikes occur in other parts of the area, but they do not appear to be of economic importance.

*Sedimentary Rocks.*—Schistose sedimentary rocks are seen on the east shore of Mistinigon lake about  $1\frac{1}{2}$  miles north of the south boundary of Powell and on the north side of the trail leading to the Davidson claims. The rocks are in vertical attitude and strike N.  $60^{\circ}$  E. They can be traced easterly in the township to beyond Otisse lake, and consist of coarse material resembling conglomerate, and finer material like greywacké. The inclusions in the conglomerate rock are mostly small fragments of rocks of obscure origin, whitish porphyry, felsite, etc. A sample of the greywacké material from 15 chains north of No. 1 post, claim 5375, examined in thin section, contains numerous fragments of feldspar and quartz and bits of rocks, in a fine groundmass. This rock is best preserved on the north shore of Otisse lake. Small porphyry dikes, altered dikes of basic igneous rock, and numerous diabase dikes, interrupt the continuity of these bands across country. No relationship was observed between these schistose sedimentary rocks and the

schistose altered igneous rocks observed to the south, consequently it is thought advisable to group them with the Keewatin, of which they appear to form a part.

However, the possibility of these sediments being a remnant of the Timiskaming series, folded with the Keewatin, must be considered. This area lies midway between Midlothian township, where J. G. McMillan \* recognized a wide area of Timiskaming, and the Kirkland Lake area, where this series occurs in large volume.

*Light-coloured Porphyritic Rocks.*—There are a number of light grey-coloured porphyritic rocks which are associated with the dark, very basic Keewatin greenstones, that are also probably altered volcanics, since these occur in larger volume than is generally seen in the porphyritic dikes. These rocks are prevalent in parts of the Indian Reserve, especially on Turtle lake, and around Matachewan lake above Matachewan falls. Feldspar phenocrysts can often be observed in hand specimens. A sample from the east expansion of Turtle lake shows altered plagioclase phenocrysts, in a groundmass of hornblende needles, biotite, zoisite, feldspar, and quartz. There are also rounded areas of fine-grained secondary quartz. Some of the rock is crushed and mashed to resemble a conglomerate, but is an autoclastic. Volcanic fragmental material occurs on the north line of Alma township to the west of the two-mile post, and on part of the shores of Alma lake. Along with the altered igneous rock in the northeast part of Alma there are bands of slate-like rock, greatly metamorphosed, and belonging to the Keewatin complex. Owing to the intermingling of the sedimentary with the igneous metamorphosed rocks, it would be difficult to separate them.

To the south of the narrows at the south end of the upper part of Lake Matachewan there is a greyish porphyritic rock, which under the microscope proves to be an andesite or porphyrite. Phenocrysts of plagioclase (oligoclase or andesine) and hornblende (actinolite) are abundant, while these are surrounded by small rods of feldspar in a dense groundmass in which hornblende can be recognized. Rocks of somewhat similar appearance occur on both sides of the lake inland, so that the volcanic rock is widespread and is probably an old lava flow rather than an intrusive.

An analysis of the grey porphyritic rock by W. K. McNeill, Provincial Assayer, shows the following percentage composition: Silica 59.06, alumina 14.39, ferrous oxide 5.80, ferric oxide, 2.14, lime 6.98, magnesia 5.11, soda 2.75, potash 1.20, water 2.31, carbon dioxide 0.44.

*Serpentine.*—There is an exposure of serpentine on a small island near the west shore of Mistinigon lake, one-half mile north of Bell island. The rock contains minute veinlets of asbestos. Serpentine also occurs at points on the east shore where there is a large proportion of carbonate, the surface of the rock being altered to a rusty brown colour. The rock also contains a number of white calcite veins.

One mile northeast of Fox rapids, there is a mass of serpentine on the west side of Whiskey Jack creek. Here a pit has been sunk, but no asbestos or chrome

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\* T. & N. O. Railway map of part of area between Gowganda and Porcupine, 1911.

ore was observed in the material on the dump. Just south of the pit there is a mixture of serpentine and carbonate rock in bands that are much contorted, with a rough honeycombed surface where the lime rock has been leached out.

*Diabase in Keewatin.*—In the areas of Keewatin, particularly in Powell and Baden townships, there is an abundance of diabase with the older rocks. This diabase has not been separated on the map from the older rocks. The occurrence is similar to that in other Keewatin areas, as in Maisonville and Munro townships, where diabase occurs in large volume with the greenstones and other rocks. The age of this diabase is unknown, but its freshness under the microscope suggests that it is much younger than the greatly altered Keewatin. Since the Timiskaming series in neighbouring areas, *e.g.*, Kirkland Lake area, is also schistose like the Keewatin, it is probable that the diabase is also younger than this series and consequently post-Timiskaming.

A specimen of quartz diabase from a ridge just south of the 2nd mile post on the north boundary of Powell township is quite fresh under the microscope. It contains laths of plagioclase and augite, some of the latter showing twinning. Quartz is present in numerous grains; a small quantity of magnetite occurs in the specimen.

#### **Granite and Gneiss (Laurentian ?)**

There are exposures of granite and gneiss along the Montreal river from a short distance below Fox rapids to the foot of the Long Portage. Similar rocks occur along the north boundary of Kimberley between the crossings of the Montreal river. The two rocks, reddish granite and dark grey to black glistening hornblende gneiss, are intermingled, and are similar to rocks that in areas farther south have been referred to the Laurentian.

#### **Granite and Diorite (Algomian ?)**

There are two small areas of reddish hornblende granite in the north part of Powell township. There is another small area in the northwest part of Baden township, and a larger area of granite and quartz diorite in the northeast part of Baden and the northwest part of the Indian reserve. The granite is pinkish in colour, and the diorite is a grey coarse-grained rock in which the feldspars are mostly plagioclase, the other constituents being orthoclase, quartz, hornblende and biotite.

Very small outcrops of granite occur in the northeast part of Alma township. The exact age of these isolated areas of granite is not known. They are all quite fresh and massive, and intrude the Keewatin. They are probably of Algomian age, like similar rocks in the Kirkland lake and Cobalt areas, that are younger than rocks of the Timiskaming series.

#### **Syenite (Algomian ?)**

There is a batholith of syenite which extends across parts of Cairo and Alma townships into Holmes and Flavelle townships to the east. It has a width across Cairo and Alma of five miles. Here and there it is intruded by fine-grained reddish acid dikes and also by dikes of diabase.



The rock is generally of a rich red colour in fresh material, and varies greatly in crystallization, often showing lathlike porphyritic crystals of feldspar one-half an inch in length. There is usually only a very small percentage of hornblende and quartz in the rock.

A specimen from the Brookbank claim, in the southeast part of Alma, is a quartz hornblende syenite, composed largely of red feldspar showing a somewhat perthitic intergrowth in the crystals. Magnetite and apatite are accessory minerals.

A specimen from the Chief claim, also in the southeast part of Alma, is similar in its feldspar, but contains only a little chlorite as the ferromagnesian mineral.

A sample of syenite from the Biederman claim (16042) on Browning lake was analyzed by W. K. McNeill for its alkali content and contains 9.05 per cent. of potash and 2.95 per cent. of soda, showing that most of the feldspar is orthoclase. The high percentage of potash in the syenite is worthy of note, being about three-quarters as much as that contained in the orthoclase feldspar at the well-known Richardson feldspar mine in Frontenac county, on which experimental work has been done for the production of soluble alkalis, in aid of the fertilizer industry. It may be that at some future time this large deposit of syenite will be of value as a source of potash.

The syenite is an important formation, since several gold-bearing veins have been located in it, and while no economic deposits are yet proven, the area is worthy of careful prospecting. In the same rock veins of barite and fluorite have also been discovered.

The syenite is intrusive into the Keewatin, but underlies unconformably the conglomerate of the Cobalt series.

The erosion of the syenite batholith took place largely before the deposition of the rocks of the Cobalt series, since a considerable area of conglomerate lies unconformably on the syenite in Cairo township.

*Relationship Between Syenite and Granite-Gneiss.*—The relationship of the syenite to the granite and gneiss in the southeast part of Cairo is not known, but the syenite is believed to be the younger rock, since it shows no gneissic structures, and is probably of Algonian age. There are a number of syenites, granites and porphyries in northern Ontario with which gold-bearing quartz veins are associated, and these are considered to be post-Timiskaming intrusives, following the irruption of which there was gold mineralization.

#### **Orthoclase Porphyry (Algonian)**

Intruding the schist, on the Davidson, Otisse, and other claims to the north-east, there is a reddish porphyritic rock, that outcrops at various points. Owing to the great amount of drift and the intrusion of diabase dikes it was not determined whether the porphyry occurs as an irregular dike or as a series of stock-like bodies. On the Davidson claims, numbers 5372 and 5374, the porphyry is very irregular, as determined by trenching, and has a somewhat oval shape, with greatest width of about 300 feet. On the line between the northeast Davidson claim (5375) and the Otisse claim (5379), the porphyry has a width of at least 450 feet, and is probably greater since the rocks are drift-covered to the south.

In most of the rock phenocrysts of feldspar can be observed. Under the microscope these prove to be orthoclase. The groundmass is largely feldspar of similar composition. Chlorite is present in small amount. Crystals of iron pyrites are abundant in the rock, and in surface specimens are partly altered to limonite. In addition there are quartz and calcite veinlets and replacements of the same minerals.

On the surface the rock is partly oxidized and discoloured by iron oxide stain, In one trench on the Davidson an excavation over six feet in depth was made with pick and shovel in loose rock. The weathering has also broken down large dome-like masses of porphyry into loose fragments as seen in the illustration.

There are numerous quartz veinlets in the mass of porphyry. These are seldom over three inches in width, and most of them are fractions of an inch. These



Fig. 6.—A hummock of orthoclase porphyry, weathering to small fragments, on Davidson claim 5372.

irregular veinlets give the porphyry the character of a stockwork. Samples of porphyry with quartz are occasionally encountered on the surface, showing visible gold, and the decomposed earthy surface will usually show gold in panning.

At the west end of the outcrop on the Davidson, near the contact, the porphyry contains quite large crystals of orthoclase, nearly an inch in length, and a similar rock is seen in a dike of porphyry extending northwesterly on the Robb claim, 5399. Any extension of similar porphyritic rocks to the west is concealed by a thick covering of conglomerate of the Cobalt series.

An analysis of the orthoclase porphyry, by W. K. McNeill, Provincial Assayer, shows the following percentage composition: Silica 61.80, alumina 18.86, ferric oxide 2.95, ferrous oxide 0.32; lime 0.63; magnesia 0.34, potash 8.86, soda 3.19, water 0.54, carbon dioxide 0.84, pyrite 1.45, total 99.78.

The small stock-like masses of orthoclase porphyry on the Davidson and Otisse claims are probably of the same relative age as the syenite of Cairo township .

The high percentages of potash in the two rocks suggest a similar origin, while the different crystallization expressed may be due to the relative size of the intrusive bodies.

### Cobalt Series

In the southerly part of the area covered by the accompanying map there is a wide extent of rocks of the Cobalt series, consisting of conglomerate, quartzite and slate-like greywacké, similar to other numerous exposures over a wide extent of country from Cobalt northwesterly to Porcupine, and named by W. G. Miller from the occurrence of these rocks with the silver deposits at Cobalt.



Fig. 7.—Conglomerate hill (Cobalt series) west of Davidson discovery.

The series is generally in a nearly horizontal attitude of gently undulating rolls, seldom with greater dip than twenty degrees. Along the south boundary of Powell the sediments dip gently to the east at  $5^{\circ}$  to  $15^{\circ}$ . East of Davidson creek a section shows in ascending order quartzite, slate, conglomerate, quartzite, greywacké and conglomerate. Twenty chains east of the southwest corner of Powell township a cliff facing west exposes 18 feet of reddish weathering greywacké, overlain by 12 feet of conglomerate, with southeasterly dip of 5 to 10 degrees.

However, along the north shore of the main Montreal river, one and one-half miles west of Fox rapids, the rocks of the Cobalt series, quartzite and conglomerate, are more highly tilted, to nearly 45 degrees. This may be due to a fault along this part of the river, which shows such a marked dissimilarity between the rocks on the

different sides. A conglomerate just west of the mouth of the creek flowing from Knott lake has been rendered somewhat schistose, but contains the usual large fragments of Algoman (?) granite and syenite.

*Unconformity at Base of Cobalt Series.*—Basal conglomerate is exposed at numerous points extending from the west branch to near Fox rapids. One-quarter of a mile northwest of No. 1 post, claim 5374, there is a striking unconformity between the Cobalt series conglomerate and the Keewatin. Here the old surface consisted of a banded schistose sediment which had been intruded by a diabase dike about 30 feet wide. Recent erosion has exposed these old rocks to about the original surface on which the Cobalt conglomerate was deposited, as there are thin

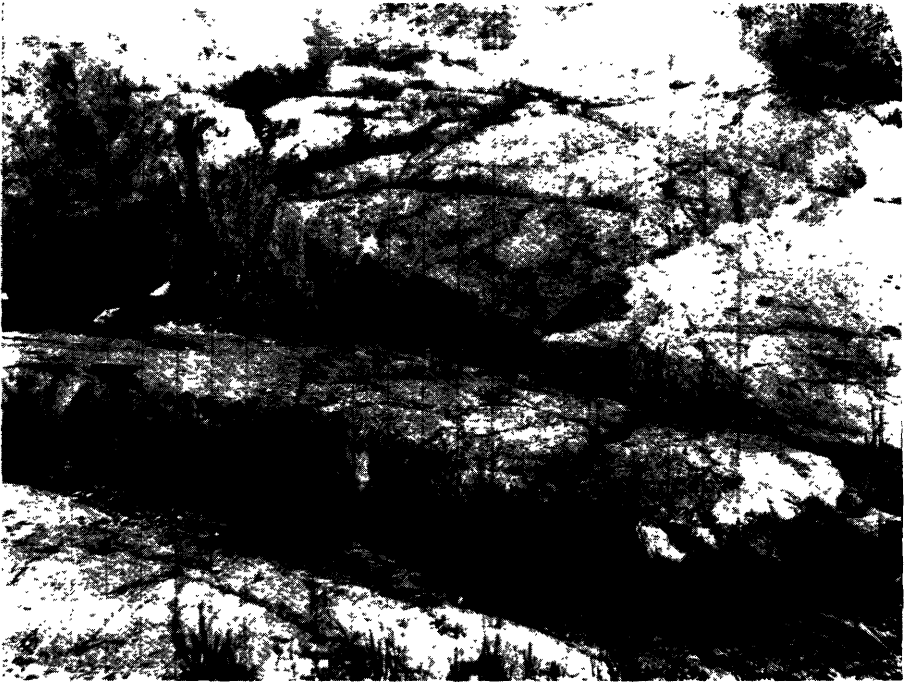


Fig. 8.—Flat-lying sediments of Cobalt series in the east part of Yarrow township.

skins of isolated patches of conglomerate at several places. This conglomerate contains large fragments of the old sediment and also of the diabase, and the line between the old schist and the later conglomerate is very distinct. The material here has been derived from local rock rather than by glacial transportation from a distance, but the old pre-Cobalt series surface, from the present evidence, would indicate a rather smooth rounded outline.

Other similar unconformities can be observed just west of No. 2 post, claim 5383, and on claim HF 13, west of Fox rapids.

On the northeast shore of Moyneur lake, in Cairo township, the conglomerate lies unconformably on the syenite. There is a similar relationship exposed in a cliff on the west side of the beaver meadow that extends southerly from Cameron lake. Here the conglomerate was deposited on a steep surface.

On the east shore of Mistinigon lake, opposite the north end of Bell island, there is a hill of conglomerate which overlies Keewatin. On the north side of the hill the Keewatin consists of chert or iron formation, that extends along the shore for a quarter of a mile. Fragments of the chert are included in the base of the conglomerate.

### Diabase

Diabase occurs abundantly in parts of the area. The Keewatin and the intrusives (granites, syenite and porphyry) are cut by numerous dikes of diabase; whereas in the rocks of the Cobalt series these dikes are quite rare. In the vicinity of the Davidson claims there are several dikes of diabase that lie uncon-



Fig. 9.—Unconformity, claim 5383, between conglomerate of Cobalt series (light-coloured patch), and underlying dark-coloured Keewatin, intruded by diabase.

formably below the basal conglomerate of the Cobalt series. These dikes intrude the orthoclase porphyry in the vicinity that have been classed with the Algonian intrusives. It is probable that most of the dikes are post-Algonian and pre-Cobalt series in age.

The dikes ordinarily are of the normal type, medium-grained, showing chiefly plagioclase feldspar and augite with some interstitial quartz.

Occasionally porphyritic varieties that contain large phenocrysts of greenish feldspar up to 2 and 3 inches in diameter are observed. One of these occurs on the north line of Alma, 20<sup>th</sup> chains west of the 2nd mile post. It contains greenish porphyritic feldspar in a coarse matrix of labradorite and augite with magnetite.

There are several narrow dikes of porphyritic diabase intruding Keewatin rocks along the trail north of Davidson creek.

On the east shore of the southwest bay of Squaw lake in the Indian Reserve there is a hornblende diabase. Small rods of plagioclase are set in crystals of hornblende and hypersthene. Interstitial quartz is abundant and magnetite occurs in small grains.

### Pleistocene

Deposits of unconsolidated material cover a great part of the area. These consist largely of sand and gravel accumulations of glacial origin. A wide stretch



Fig. 10.—Dike of porphyritic diabase on trail to Davidson camp from Montreal river.

of sand and gravel in the form of a rolling plain occurs in the southeast part of Cairo and the northeast part of Kimberley. This plain is crossed by the Long Portage. There is an esker-like ridge on the south boundary of Cairo, just west of Whiskey Jack creek. The Height of Land portage at the north end of Matachewan lake is over a sand plain, probably an outwash plain from a glacier.

Morainic ridges of boulders are seen two miles up the East Branch of the Montreal river, and the trail from the Montreal river to the Davidson claims follows along a similar ridge.

## ECONOMIC GEOLOGY

The chief interest in the area is in its possibilities as a gold producer. For some years gold has been known to occur in Cairo and Alma townships, but it was not until the discovery on the Davidson claim in Powell in 1916 that the area attracted much attention.

Since only a small part of the area has been closely examined by the prospectors, it is possible that other promising finds will be made in the Keewatin areas in Powell and adjoining townships. The Keewatin rocks near the contact with the intrusive syenite in Cairo and Alma townships should be worthy of close examination, and it is possible that other small masses of orthoclase porphyry, similar to the occurrences on the Davidson and Otisse, will be found. Prospecting is, however, rendered difficult by deposits of sand and gravel over much of the area.

### Gold in Cairo and Alma Townships

Gold was found by Jake Davidson, a prospector, in the sand-gravel stretches to the north of the Montreal river, near Fox rapids; the writer is informed by him that he frequently obtained colours in the pan, but found no place where there was any placer workable under present conditions.

Gold occurs in quartz veins in some parts of Cairo and Alma townships.

*Craig Claims.*—The Craig claims are situated about three miles north of Fox rapids. Here a wide quartz vein was discovered with a north and south strike. At one place trenching has shown a width of 150 feet of quartz, and silicified and brecciated syenite which is the wall rock of the vein. Part of the vein material is somewhat felsitic in appearance, suggesting some fine-grained igneous rock related to the syenite.

At one point a shaft has been sunk about 60 feet, with short drifts on the vein, and fine visible gold has been reported in the shaft and drifts, and in samples on the dump. No gold, however, was seen by the writer, but samples of material from the dump showed low values in gold. A little iron pyrites was observed in pieces of quartz and syenite, but generally the sulphide is in very minor quantity. The property is equipped with a small steam hoisting plant and has a good set of mine buildings.

*Chief Claim.*—The Chief claim (17310) is situated about 20 chains west of the two-mile post on the east boundary of Alma. A discovery of gold in a small hummock of syenite, which outcrops in a beaver meadow, was made some years ago. The vein strikes E. and W. and is quite narrow, varying in width from a mere crack to about 6 inches where exposed for 30 feet. A few shallow pits were sunk on the vein, and some samples rich in gold are reported to have been taken from the westerly pit, which was filled with water at the time of the visit. A sample of vein material from the dump, consisting of quartz, chalcopyrite, and a little galena, gave an assay of \$4.40 in gold. Attempts were made by trenching to pick up the vein on the hill to the east, but only mere stringers were found, a sample of which showed no gold.

*Brookbank Claim.*—This claim (17801) lies in the southeast corner of Alma township where the rock is a red syenite. Some work has been done about four chains west of the east boundary of the township and just northeast of the cabin which is on the boundary. Here there is a N.-S. vein on which two pits had been sunk. The vein is about 2 inches in width between the pits, showing for 30 feet. The vein filling is chiefly quartz, but contains also some galena, copper pyrites, pyrite, and some barite and fluorite. No gold was observed, but one assay of 2 inches of vein contained \$5.20 in gold and 8 oz. in silver, while another of 5 inches in width from the north pit gave \$7.60 in gold and 8 oz. in silver.

*Cooper Claim.*—Gold is also reported on the Cooper claim (MR 5645), which lies nearly a mile northwest of the Brookbank.

The above properties were not being worked during the summer of 1917, and there were only a few prospectors in Cairo and none in Alma.



Fig. 11.—Large boulders of auriferous quartz and schist, Davidson claim 5372.

### Gold in Powell Township

*Davidson Claims.*—These claims are situated in Powell township about two miles west of the Montreal river. Gold was found by Jake Davidson in 1916, on the south part of claim 5372, in a mass of quartz and schist. This deposit strikes nearly east and west, and has been traced by trenching for 225 feet. It dips 60° S., is 40 feet wide at the west end and narrows toward the east. The quartz is very irregularly distributed in the schist, and for the most part the veinlets or quartz masses are transverse to the strike. The deposit very probably is lenticular in form. To the southeast there are a number of huge boulders of material from this deposit. The surface of the schist is weathered to a brown



rust, largely due to the oxidation of the iron in the ankerite which forms a part of the altered rock. There is also a proportion of bright green serpentinous mineral. Gold in a state of very fine division was noted at a few places in this deposit. The only sulphide observed is a little iron pyrites, but for the most part the deposit is deficient in mineralization. A few chains southeast there is a quartz vein on which a pit had been sunk some years previously by Steve Lafricain, of Fort Matachewan. This quartz vein contains small quantities of cobalt bloom, iron and copper pyrites, which first attracted attention, but promising values in gold or silver were not obtained on assay.

The Keewatin rocks accompanying these veins are quite schistose, igneous and sedimentary. To the north of the first mentioned deposit there is a whitish altered porphyry which shows phenocrysts of orthoclase and plagioclase in a groundmass



Fig. 12.—Auriferous quartz and schist deposit, Davidson claim 5372.

of feldspar and quartz, with much sericite and calcite. Near this altered porphyry there is ashy weathering chert, or iron formation. Part of the south wall of the deposit is schistose quartz-porphyry with conspicuous phenocrysts of quartz.

Intruding the schist in the north parts of these claims there is a red orthoclase porphyry that has been referred to previously as gold-bearing. Iron pyrites occurs abundantly in portions of this rock, and there has been considerable oxidation, resulting in the breaking down to a red earthy material or loose fragments on the surface, that has involved a certain amount of surface concentration. This condition varies greatly in different parts of the property; on some of the knolls there are only a few inches or less of oxidized rock, but one trench shows over six feet of loose oxidized material. Consequently, for a proper examination of the deposit, it would be necessary to prospect below this shallow rusty surface by means of open cuts through the weathered rock, by drilling, or by shafts.

The porphyry is cut by numerous veinlets of quartz which in places carry visible gold, that frequently occurs near the contact with the porphyry and also in the wall rock, near the veinlets. In one deep trench there are several flat-lying quartz veins from a fraction of an inch to two inches in width. In other places the quartz veins may be irregular in their distribution, the whole mass occurring like a stockwork. It is quite likely the quartz veins are genetically connected with the porphyry, being the filling of tension cracks that have developed on the cooling of the rock, while the gold has accompanied the quartz in the formation of these veins. Sometimes gold can be observed deposited on grains of iron pyrites in the quartz or along the wall rock. A few samples were taken from the Davidson by the writer. One of these, from the surface of the porphyry in a trench on claim 5372, gave on assay \$10.00 per ton over a length of 15 feet. The porphyry here was not so altered as is frequently seen, but visible gold was observed in minute quartz veinlets near the place from which the sample was taken.

Another surface sample from a long trench at the northeast corner of the claim gave on assay a value of \$15.20 over a length of ten feet in the trench. Several specimen samples of quartz and porphyry carrying iron pyrites gave values of 80 cents to \$2.00 per ton. None of these assays are quoted as representative of the actual value of the whole mass of the porphyry, but indicate its gold-bearing character. It may be found on extended examination that there are isolated parts of the porphyry which are sufficiently enriched with gold to be of economic value.

The following is a description of a microscopic examination of gold-bearing porphyry and quartz from Davidson claim 5372:

Orthoclase crystals are set in a groundmass of smaller feldspar crystals with a little chlorite in flakes and scattered crystals of apatite. Calcite is abundant as a secondary mineral. Quartz occurs in small secondary masses and in veinlets. Cubes and irregular grains of pyrite with an oxidized surface of limonite are frequent in the porphyry and also in the quartz veinlets. The quartz veinlets contain clear secondary feldspar, plagioclase and microcline moulded on the older feldspars of the porphyry. Vein calcite also accompanies the quartz in the veinlets, while native gold occurs near the wall rock in the quartz. A small amount of copper pyrites is occasionally seen. None of the rarer minerals, like the tellurides, have been recognized in any of the samples examined.

*Otisse Claims (5379-5380).*—These claims lie directly east of the Davidson group, and, owing to a somewhat deeper covering of drift and a smaller amount of trenching, the distribution of the rocks is not as well known.

In the northwest part of claim 5379 the orthoclase porphyry is well exposed. There is also a surface oxidation similar to the Davidson, with an amount of loose brown earthy material in which trenches were made. Gold has been found in a number of pits in the same association as in the porphyry on the Davidson.

To the east of this outcrop other occurrences of porphyry have been located by Sam Otisse in heavily timbered country; it is probable that a band of porphyry extends through the northerly part of the claims.

Near the centre line of the claims, a few chains north of the south line, there are outcrops of rusty weathered schist in which native gold has also been discovered.

This band of rock lies to the south of the porphyry band. Below the oxidized surface the rock is light grey in colour and spotted with pyrite. Examined under the microscope it contains much secondary silica, calcite, sericite, and iron pyrites, indicating that the rock has been entirely altered by replacement from its original composition. Mr. Otisse discovered gold at several other places on his claims in rocks which are of different character from those described above.

An examination of these properties in January last resulted in options being taken on these and adjoining claims, and it is expected that during the summer of 1918 a thorough examination will be made to prove their possibilities as gold producers.

*Otisse Claim (5376).*—This claim lies north of the Davidson claim, 5372. The rocks are largely schistose sedimentary rocks intruded by narrow porphyritic dikes. Six chains north of the Davidson claim there is a quartz vein striking nearly east and west and three to four feet wide in places. It contains, in parts, copper pyrites, iron pyrites, and galena. Fragments of grey porphyry in the quartz suggest that the vein was formed along an old porphyry dike. Gold values are reported from this vein. A selected sample of quartz, galena, and copper pyrites contained \$1.20 in gold per ton.

In the southwest part of the claim there is a narrow red porphyry dike that strikes northwesterly to the Robb claim. It contains quite large crystals of orthoclase, and is probably a narrow dike representative of the stock-like mass of red porphyry on the Davidson. Gold is reported to occur in this dike.

*O'Connell Claims (5389-5390).*—On claim 5389, adjoining the boundary line between Powell and Cairo, there is a reddish feldspar porphyry dike that intrudes a slate-like rock of Keewatin age. This porphyry is much harder than that on the Davidson and Otisse claims, and does not show so heavy a mineralization with iron pyrites. It is cut by quartz veinlets, and has been partly prospected by stripping and a shallow open cut. Low values in gold from this material are reported by the owners.

On claim 5390, one mile south, work was done on a band of blackish chert-like rock cut by quartz veinlets with pyrite, from which low gold values were also obtained.

### Fluorite

Fluorite (fluorspar) has been found in small quantity in a number of quartz veins in Cairo and Alma townships, but none of the deposits examined are of commercial value. Owing to the widespread occurrence of the mineral, it is possible that prospecting might result in the finding of economic deposits. The mineral is of a deep purple colour, occurring in small masses in the quartz or in the wall rock adjacent to the veins. It is also present in the Biederman barite vein. One occurrence where the fluorite is in the quartz is on the Harvey claim, No. 18285, west of the road from Fox rapids north to the Craig claims. This vein is about seven inches wide, strikes N. 75° E., and has been traced several hundred feet. Some pieces of fluorite, two inches across, were taken from the vein. All the showings of fluorite are in the syenite.



### Barite

Veins containing barite occur in several parts of the area. These are generally small, but two deposits have been found which would be of commercial value were they nearer railway transportation. These are the Biederman deposit in Cairo township, and a deposit near Yarrow lake in Yarrow township.

*Biederman Claim.*—This claim (15042) is situated on the west shore of Browning lake, in the north part of Cairo township. The country rock is a red syenite in which there is a barite vein with strike N. 65° W. and dip 80° N. The



Fig. 13.—Biederman barite vein, on claim 16042, in Cairo township.

deposit can be observed about 100 feet from the shore of the lake where a shallow shaft has been sunk at a point where the vein has been concealed by drift to the east. Here there is a width of 15 feet, and the barite can be traced westerly for 100 feet, decreasing to a width of 7 feet. Beyond this there is drift followed by an exposure of barite about 30 feet in length and 3 feet wide at the east end, and 2 feet wide at the west end. The barite is for the most part quite white in colour and of good quality. At the shaft there are minor quantities of zinc blende, galena and specularite, and a little fluorite as impurities. The deposit also contains at this point some large inclusions of syenite. A sample across eight feet, on analysis contains 90.50 per cent. barium sulphate.

*Yarrow Deposit.*—This deposit occurs along the creek which flows from Yarrow lake to Mistinigon lake. The rocks are slate and quartzite of the Cobalt series, but they are largely concealed by a deep covering of drift along the creek. The deposit was discovered in the bed of the creek, and attempts have been made to open it up by diverting the water by means of a small dam. Two shallow pits were sunk in the bed of the creek on the barite, which is in two veins five feet and six feet wide respectively, separated by a band of quartzite. As the deposit was noted only in the creek bottom its length has not been determined, but owing to its width it is probable that it also has considerable length. This deposit, like the Biederman, will probably be of commercial value at a future time.

### Iron Ore

The La Brosse claims, JS 65 and JS 66, situated in Yarrow township, a short distance west of the east branch of the Montreal river, were examined by P. E. Hopkins in August, 1914, and the following account is from his manuscript:

The iron ore, which consists of hematite, in reniform structure and also the highly crystallized specular variety, occurs in a quartz vein that strikes N. 72° E., and dips about vertically. This vein can be traced across two claims, and varies from five feet to thirty feet in width. The iron ore occurs in isolated masses and stringers in the quartz, and in places is brecciated. On the east part of JS 66 is located the largest body of clean iron ore. This ore on the surface is sixty feet long and six feet wide at its greatest width, being in the form of a lens. Another lens is twenty-five feet in length. More work may prove the bodies to be larger, as the vein is partly drift-covered. No kidney ore was observed in other parts of the vein where exposed, but small quantities of specular iron ore occur sparingly in the vein.

Iron ore was observed in small quartz veins in the vicinity in Yarrow township. The country rock that encloses the veins is conglomerate and quartzite of the Cobalt series that dip gently to the east at 10° to 15°.

### Waterpower†

Mining camps in northern Ontario have been greatly favoured by the proximity of waterfalls capable of development for the generation of hydro-electric energy. Powell township is well situated in this regard, Big Bend or Matachewan falls lying about 6½ miles north of the Davidson and Otisse claims. This water power is located in the township of Baden on the west branch of the Montreal river at a point known as the Great Northern Bend.

Application to develop this power was made in 1916 by a firm of engineers and surveyors, Sutcliffe and Neelands, of New Liskeard, with the object of supplying electric energy to the prospective gold camp in Powell township and possibly the Gowganda silver camp some twenty miles farther south. Regarding their exploratory surveys in 1900, De Morest and Silvester, with party No. 3, report \* as follows:

Matachewan falls and rapids, where the river empties into Matachewan lake, have a drop of about forty feet and constitute a very important waterpower, as the length is short and the site comparatively easy of development.

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† The notes on Waterpower have been supplied by W. R. Rogers, Topographer for the Ontario Bureau of Mines.

\* Report of Survey and Exploration of Nor. Ont. in 1900, p. 87.

The watershed of the West Branch is 790 square miles in area. Under natural head the drop at Matachewan falls and rapids is 41 feet, but a dam raising the water at the upper level to high water mark would give a head of 45 feet. Assuming a run-off coefficient of 0.3 cu. ft. per sec. per square mile of drainage area for minimum flow conditions, the possible development without storage would be about 1,000 horsepower.

Permission has been sought to raise the level of Mistinigon lake 25 feet in order to provide storage and also to increase the available head to 70 feet. Another project involves the diversion of the East Branch of the Montreal river by way of Kawakinika lake, Cleaver lake and Cleaver creek, to a point on the West Branch near the centre of the township of Rankin, a route that marks a former course of the river. Such a diversion would add 210 square miles to the drainage area, making a total of 1,000 square miles, and could be effected by erecting a dam at



Fig. 14.—Matachewan or Big Bend falls, Montreal river, where the West Branch enters Matachewan lake.

the first rapids below Obushkong lake near the boundary line between the townships of Haultain and Morel. Both of these projects were suggested late in the fall of 1917, and either or both may not be prejudicial to other interests, such as navigation and lumbering. A Departmental examination of the feasibility of the plans had to be postponed until navigation opened in the spring of 1918. Undoubtedly work on this power will proceed in the near future, the extent of the development depending on the success met with in mining operations in the vicinity.

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The assays mentioned in this report were made at the Provincial Assay Office, Toronto.

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