THE GOLD FIELDS OF NEW ONTARIO

By Walter Baelz, Assessor of Mines.

I. In General.

The discovery of gold-bearing quartz veins in the neighborhood of Porcupine in 1909 is the most important made in Ontario since the discovery of the nickel deposits of Sudbury in 1886 and the silver veins at Cobalt in 1903.

As mining in the new gold belts is only beginning it will be necessary to wait for many years before being able to indicate the full extent of the gold region. At present, however, an examination of the work already done is sufficient to convince one that this gold occurrence deserves more than passing notice. On account of the promise of the Porcupine belt the Government of the Province of Ontario has recently built a railway line almost to the Mattagami River and it is proposed later to extend it toward the west.

In comparison with the Porcupine district the earlier discoveries at Swastika and Larder Lake are relatively less important. The following report is in general based upon observations in the Porcupine district.

The most important information regarding the Porcupine gold fields contained in a report by A. G. Burrows entitled "The Porcupine Gold Area" was published by the Ontario Bureau of Mines in 1911. Many other reports have appeared in the technical press, particularly in the Canadian Mining Journal, published in Toronto. In addition to these the Bureau of Mines has already issued a reconnaisance map of the Porcupine district on the scale of one mile to the inch. This map indicates the geology in the vicinity of the Hollinger and Dome and is accompanied by a brief geological statement of Prof. W. G. Miller. Naturally, this map is not complete and in the later editions the topography and geology will appear in greater detail. I wish to add that Dr. M. Maclaren very kindly indicated to me the geological relationships in the Township of Tisdale and further that I have had the benefit of the examination of numerous specimens by the Geological Survey at Berlin.

II. Extent of the Gold-Bearing Region.

It is not possible at present to definitely indicate the geographical boundaries of the region in which the gold-bearing quartz claims occur. Already about 10,000 claims representing an area of about 400,000 acres have been recorded. It must not be taken for granted that gold-bearing quartz veins occur on all of these claims—possibly some of the claims do not show quartz veins of any kind. On the other hand new discoveries continue to be made in districts in which valuable deposits were not previously known.

The most important deposits so far located lie to the east of the Mattagami River in the Townships of Tisdale and Whitney, but recently discoveries have been made to the west of the Mattagami in the Township of Bristol in the Cripple Creek district.

III. Topography.

The region is generally level or slightly undulating and possesses an The surface is usually covered with The surface is usually covered with glacial boulders, sand and clay. Upon the compact clay a substance resembling turf is formed. The older rocks project through the younger sediments and form ridges which seldom rise more than 20 metres above the plain. In these ridges the quartz veins appear.

The region contains numerous lakes which vary from three to six metres in depth. The Mattagami, which is the most important of the rivers, forms a wide sluggish stream when in the region of the recent sediments. Where, however, this stream cuts the altered rocks it forms rapids well suited for the development of electric power.

Until recently the whole district was difficult of access and covered with coniferous forests with thick moss. More recently forest fires have removed much of the vegetable covering and facilitated the work of prospecting in a remarkable degree.

IV. The Ore Bodies.

1. Geological Relationships.

The stratagraphical relationships of the country rock may be indicated gs follows:

Quaternary.
E.—Glacial.
Gravel, sand and clay.
Unconformity.
Precambrian (Algonkian).
D.—Post Huronian.
Younger diabase, usually containing olivine.
Slight unconformity.
C.—Huronian.
Lower Huronian slates, graywacke and conglomerate.
Archaean.
B.—Laurentian.
Coarsely crystalline granite and granite gneiss.
A.—Keewatin.
Acid porphyry, frequently schistose.
Older diabase with amphibolite and serpentine.
Iron formation.
Greenstone and Greenschists
(Amygdaloidal basalts).

The Keewatin is the oldest and at the same time the most widely distributed formation of the district. In it the most of the gold-bearing quartz veins occur. It has been built up by a series of volcanic outbreaks. These volcanic rocks as they appear today are more or less metamorphosed. Sediments played in this formation only a subordinate role.

The greenstone is very abundant. It is light to dark green in color and occurs schistose as chlorite schist, serpentine schist and sericite schist, which have been formed by the metamorphism of basic lava, tuff and ash. The Canadian geologists refer to the original rock as basalt or, in some cases on account of the cellular structure, as amygdaloidal basalt. The cells in this greenstone are usually filled with calcite.

The basalts are overlain locally by a deposit of iron bearing sediments. This iron formation, which is composed of alternate layers of magnetite and red jasper, occurs principally in the southern part of Whitney. It is regarded as equivalent to the Keewatin iron formation of Lake Superior.

After the depositation of the sediments occurred an eruption of diabase, as may be seen in Whitney Township. This older diabase is frequently altered to amphibolite.

The volcanic activity of the Keewatin came to its close with the extrusion of a mass of porphyry, usually acid. It occurs as felsitic quartz porphyry, but frequently, as in Deloro, it appears in the form of coarsely crystalline granite porphyry. In the neighborhood of Pearl Lake the quartz porphyry has been altered to sericite schist, which may be distinguished from the sericitic greenschist by its lighter color.

The coarse crystalline Laurentian granite occurs in Porcupine in only a few places. It is very frequent in Swastika, where it frequently forms veins.

Unconformally upon the Archaean rests the sediment of the lower Huronian composed of conglomerate, greywacke and more rarely grey slate. The conglomerate carries numerous boulders, usually of granite. The Huronian represents only a small development because it has been partly worn down by glacial action. In contrast to Cobalt, where the Huronian conglomerate appears in only slightly disturbed arrangement, it is in Porcupine strongly folded and altered frequently into conglomerate schists containing flattened boulders. Before the close of the Precambrian there occurred an extrusion of olivine diabase and of other basic eruptives (Post Huronian), which occurs mostly in veins and are regarded as the equivalent of the similar diabase of the Sudbury region.

A part of the older rocks was carried away by the glaciers in their southward movement. Glacial clay and sand were deposited over wide areas, thus hiding the Archaean and Precambrian formations and the quartz veins which occur within them.

2. Age.

The gold-bearing veins cut through the Keewatin and lower Huronian formations, but are themselves intersected by the younger post-Huronian diabase. They are, therefore, either upper or post-Huronian in age and belong to the older gold formation.

3. Form and Composition.

The ore deposits seldom form simple veins with sharp contacts on the country rock, but rather form compound veins, sending out numerous stringers into the country rock. The strike and dip of the veins is very variable. Sometimes the veins are only a few centimeters across; on the other hand, they occasionally expand and form enormous quartz masses which, like domes, rise above the surrounding country. These vein formations seldom occur singly, but rather form series of veins and stringers approximately parallel, constituting a broad zone of veins. These extend for long distances in the direction of the strike and as they possess considerable width one is forced to assume for them great depth.

The veins usually strike west, southwest to east, northeast. In rare instances veins have been observed which strike south, southeast, to north, northwest, as may be seen at the East Dome mine.

The dip is often almost vertical. Frequently, however, the veins appear to be strongly faulted by later earth movements. Such a fault has been discovered in shaft No. 2 of the McIntyre mine.

The gangue consists for the most part of milky quartz and more or less silicified country rock. This quartz contains gas and liquid inclusions, as well as feldspar crystals and fine needles of tourmaline. As a result of earth movements the quartz is much fissured and, consequently, easily broken. Along with the quartz, siderite and a brownish mineral with rhombohedral cleavage — ankerite (CaMgFe) CO—are fairly prominent. In a vein on the West Dome mine, ankerite is the chief mineral in which the quartz forms only slender stringers running across the vein. The vein body consisted therefore originally solely of carbonates and only after later movements in the old fissure did the introduction of the rising solutions carruing gold and silica become possible. A metasomatic replacement of the carbonate by quartz has been frequently observed. The ankerite sometimes carries a little gold, but this has been derived from the solutions which introduced the quartz. The appearance of ankerite in large proportions is not always a favorable sign for the occurrence of gold values evenly distributed through the vein.

The chief metallic minerals are pyrite, marcasite, magnetite, calcopyrite and occasionally a little galena and zinc blende. In the veins in Bristol Township arsenopyrite plans an important role.

More than half of the gold contained in the veins and stringers occurs as native gold. This appears as a rule in the form of fine plates within the quartz, especially along the lines of contact between the quartz and the country rock. The remainder of the gold is combined with the sulphides and arsenides which form large mineralization zones in the country rock.

It is interesting to note that in the northwestern part of Tisdale the native gold occurs in serpentine asbestos, which along with actinolite and calcite is found as veins in serpentine. According to Dr. McLaren, this type of gold occurrence had been previously observed in only one locality—Western Australia.

Gold telluride occurs in small amounts in a quartz ankerite vein to the east of Larder Lake. Up to the present tellurides of gold have not been observed in the Porcupine district.

No considerable development of gossan formation is present. The primary zone with milky quartz and undecomposed sulphide reaches almost to the surface. This is due to the fact that the glaciers have removed the oxidation and cementation zone—probably originally present—and that since the glacial period a sufficient time has not elapsed for the formation of extensive secondary zones. Only at the very surface may the decomposition of the sulphides and ankerite be observed. In this rusty mass the gold values are higher. This slight evidence of secondary enrichment is rarely marked at a depth greater than two to three metres.

From this point of view the exposures at the Jupiter mine are very instructive. Here the milky quartz containing scales of sericite and tourmaline needles is well banded with light and dark bands. It is well exposed from the surface to about fourteen metres below the ground water level, and is of a fairly uniform character. The gold, which is finly divided, may be seen without the aid of a lense, occurs in the native form and is scattered through the fresh quartz in such a manner that, notwithstanding the high values, one may not regard it as the product of secondary enrichment. Similar observations were made at the Hollinger mine which, at present, is the deepest in the district. Its shaft has attained a depth of about 60 metres, while its drilling operations have probably not exceeded 170 metres measured from the surface. It is just possible that this primary gold value may diminish with depth, as has been found to be the case in many mines in Western Australia. Inasmuch as the primary zone extends right to the surface the valuation of these ore bodies is considerably simplified.

It is very hazardous to value and purchase gold properties on the basis of surface observations, as is frequently done in the Porcupine district. It should not be forgotten that even in primary ore bodies bonanzas may occur representing portions of the vein primarily enriched. These bonanzas must be considered along with large amounts of poor ore to be encountered in following the vein either horizontally or vertically. In order to be able to determine whether we are dealing with isolated portions of rich ore accidentally occurring near the surface and of larger or small extent, as much of the vein as possible should be uncovered. Diamond drilling should be undertaken and test pits sunk to the depth of at least 20 to 30 metres.

These explorations should be along the vein as well as across it, and at short intervals.

Such explorations are strongly recommended also on account of the constant variation in the size of the vein.

The distribution of the ore seems to be most uniform when the ore body occurs in strongly disturbed and fissured country rock. This is particularly true in the case of the schistose quartz porphyry. Under such circumstances the rising ore-carrying solutions could penetrate everywhere freely and consequently found numerous points of contact with the country rock. A belt of quartz porphyry of this kind, now largely altered to sericite schist occurs in the vicinity of Pearl Lake.

(Concluded next week.)