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REPORT ON THE PROPERTY

OF THE

ALASKA NICKEL MINES

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MIRROR HARBOR

BY

HORACE V. WINCHELL

His Copy
Per R.J.S.

NOTE:

REPORT ON THE PROPERTY

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The location, claims and general situation have all been described in reports by Mrssrs. Fleming, Rogers Healy and Jackson. It is unnecessary to repeat the facts stated in their reports. The following report is limited therefore to certain observations regarding the geology of the deposit and considerations as to its commercial value.

GEOLOGY

The outcrop of the deposit is partially covered by high tide and a little of it by the dump from the sh shaft. It appears, however, exposed in outcrop and in a little trench which was extended at the time of my examination to have approximate dimensions of 50 feet in length by 40 feet in width The developements on the 75 foot level are not sufficient to disclose its full area, but it seems probable that the ore deposit is in the form of a pipe or shoot, extending downward at a high dip. There are no indications of great longitudinal extension in any direction

The country rock consists of gabbro, whose

general strike is northwesterly and southeasterly. This rock, which is quite typical of nickel deposits, has either been squeezed into a schist easterly and northeasterly from the shaft, or has been intruded into a schist of similar material. It is difficult, without the aid of thin sections, to determine where gabbro ends and the schist formation begins. It is true however, that the rock immediately to the northeast of the deposit is much more schistose than that to the southwest, and it may be that the ore has been deposited near the eastern contact between and intruded gabbro and an older schist formation.

In the vicinity of the deposit the gabbro has a peculiar banded structure. The bands are parallel in strike and dip and are brought out by weathering so as to show a thickness of from a fraction of an inch to six inches or more in width. They seem to be caused by some difference in the composition of the rock and the size of its crystals. When the rock is broken these bands are not visible, and the rock seems to be the same both in the bands and between them, but on weathering the structure becomes so evident as to be noticeable at a distance of 300 feet or more. This banding is not due to the presence of sulphide minerals, although one or more small bands of such minerals were observed concordant in strike and dip with the banding. The structure can hardly be due to flowage, for the rock is massive and possesses none of the characteristics of surface flows or beds. It can hardly be due to squeezing, for the rock has little cleavage, although at the mine there is also

on the northeasterly side of the ore, a schist containing fresh biotite and some quartz. I am at loss to explain this structure but it is present and may possess some significance in connection with future work of exploration.

Southwest of the shaft this structure strikes north 45 degrees west, and dips southwesterly about 50 degrees. As one travels westerly along the water's edge of Fleming Island, opposite Alexander Island, the structure becomes steeper and is seen to be nearly vertical at a point about 600 feet from the shaft. It then swings on strike a little more nearly north and south and dips steeply to the northeast, until at a point about 1400 feet southwest from the shaft, the dip is about 50 degrees to the northeast and the strike is north 10 degrees to 20 degrees west. There is here some mineralization of the same kind as that at the shaft, but of no commercial importance. Indeed, at many places where gabbro is a little coarser grained, than normal, or where pyroxene is whitened or asbestiform, there may be seen fine lines or disseminated specks of pyrrhotite and chalcopyrite. As shown in section the dip changes are illustrated in the following sketch:-

It is not meant to imply that the gabbro, or its structure, reach their limits in either direction. The rock extends indefinitely westward, while a more schistose rock is found in a northeasterly direction. Nor is the structure every

where apparent. On the contrary, the rock to the west is mostly quite massive.

The gabbro contains small dikes of aplite, a few inches in thickness, and stricking northwesterly. In places these dikes are borken into fragments entirely surrounded by gabbro. There are spots where the gabbro consists chiefly of course pyroxene in crystals from and inch to and inch and a half in length. There are other places where white feldspar and quartz is abundant. There are also, near the western end of the section illustrated above, two white quartz veins twelve inches in thickness, and apparently barren. In many places there is an irony discoloration. At such places the rock always shows specks of pyrrhotite and chalcopyrite at the depth of an inch or less.

Toward the southeast along the "strike" of the gabbro for 2,000 feet or more, toward what is known as the 3,000 foot point, are fine gabbro outcrops along both sides of the channel. This gabbro also contains here and there small iron stained spots which, on breaking, disclose scattered specks of white and yellow sulphides. There is, however, nothing to suggest the existence of a large ore body, nor the prolongation or extension of the deposit near the shaft. Neither does the ore body at the shaft extend much further in a northwestern direction. The rocks are clearly exposed at a distance of not more than 150 feet across the water, and such mineralization as is found there exists only in small blebs and bunches, and but few of them. The gabbro to the southeast also contains

quartz veins and dikes of finer gabbro and of lighter colored rock, sometimes granitic and other times aplite. It presents typical glaciated, round weathered knobs, and often contains uralitic hornblende. The dikes dip northeasterly as one goes along the strike southeast from the shaft.

The ore has been altered but little by surface weathering since the ice retreated. Seaweed is found growing on solid sulphide ore. In the more protected or softer spots there may be seen a few inches of thoroughly oxidized gossan containing filaments of native copper, and in seams on the 75 footle level was found a little oxidation and a few covellite and bornite stains, as well as some niccolite, but on the whole there is no gossan.

In a northeasterly direction fromtthe ore deposit the rocks become schistose almost immediately. Besides this schistose structure there is a definite banding, due to difference of color and slight difference of texture. This banding is sometimes parallel with and sometimes <u>corssed</u> by the schistosity. Often the schist resembles a squeezed gabbro, but is micaceous and may contain quartz, and again it is so banded and full of peculiar long dark colored orthorhombic crystals (andalusite) that it looks like and entirely different rock. The schist contains dikes of granite which becomes more frequent as we travel northeastward. The general structure of the Coast Ranges is mapped as a series of granites, slates, graywackes and schists, all having a northwest-southeast trend. The mountains east of the coastal plane, a mile or more distant from the

mine, are said to consist of granite, and it is probable that the granite intrusions which are found cutting the schists east of the mine have been derived from this granite range. Some of these granite dikes dip in one direction and some in another. They vary greatly in the angle of dip, from nearly flat to vertical.

At the 3,000 foot point is very little of interest. Here are a few spots of sulphides in the gabbro; their horizontal extent is limited to a few feet, and they can almost definitely be seen to peter out in depth. They are exposed above the surface and have been eroded around their bases so that a portion of the barren underlying rock is exposed. There is nothing to suggest merchantable ore in workable bodies, nor any connection with any other deposit. Nor is there any incentive for exploration by drilling or shaft sinking here. So far as it goes, the mineralization is similar to that at the shaft, but it is manifestly of no commercial importance.

To the north and east of the mine there is a distinct change in the strike of the schists. They seem to swing around the gabbro and to assume a direction more nearly east and west. The situation is illustrated in the following sketch, which is not drawn to scale:

ORE DEPOSIT

Underground the rock looks like a typical gabbro. The bytownite crystals glisten and show characteristic twinning, and the texture, color and feel of the rock are all typical. On the 75 foot level the rock is fresh and tough and contains few slips and small quartz veinlets. This level, which is only about 60 feet below the outcrop of the waters edge, presents a really attractive showing of nickel ore. It is developed for a length of 30 feet and a width of 15 feet, with some horses of waste. The ore has been sampled by others and was not resampled. Its outline is irregular, and there are no walls or other boundaries of uniform dip or strike. The transition from ore to rock is not abrupt, but takes place within a couple of inches. The rock is perfectly fresh and the feldspar apparently unaltered within a few inches of solid sulphide ore, and none of the phenomem of rock replacement by ore or later minerals are to be observed. In other words, the situation is typical of syngenetic ore bodies, and apprentl similar in paragenesis to the Sudbury ores.

Because of its irregular outline and th fact that its boundary has not been developed fully, it is impossible to state either its full areal extent on the 75 foot level, or itsdip or pitch. It might lie almost flat, so far as could be told by anything in the way of structure to be observed on thes level. There is, however, on possible clue to its dip, apart from the position of the outcrop, with relation

to the 75 foot level, and that clue lies in the evidences of a dip to the rock sturcture, which has been mentioned above; This same structure is seen in the gabbro in the shaft at various points down to the bottom and in the 180 foot level. The banding is not everywhere evident, but at some points is quite distinct. In the crosscut from the shaft on the 180 foot level the dip is about 45 degreesin a southerly direction. This structure has not been observed in the ore itself, although it may possibly be discovered there on further development and close examination. If this structure, which appears to be cotemporary with the cooling and crystallization of the gabbro, and not one which has been acquired recently, has any effect upon the deposition and location of the ore(which is genetically perhaps only the baser portion of the rock mass) then, in the vicinity of the present workings, it may well be that the ore has a southerly dip or pitch. If such be the case it becomes at once apparent that the developments on the 180 foot level have not yet reached the point where the downward extension of the ore body developed on the surface and on the 75 foot level would be expected.

There is an additional reason why, even with a vertical dip, the 75 foot level ore body may not have been found on the 180 foot level. This preason might be found in the existance of a fault, whose presence was noted by Messrs. Jackson and Healy, and which is shown in their plan of the 180 foot level, where it is labelled "Main Fault" and in section through C-D. This fault strikes easterly and westerly and dips to the north at an angle of about 70 degrees. It is seen on the 180

foot level and cutting across the shaft above that level, but is south of any workings on the 75 foot level. It is persistent. It has a thickness of from two inches to six inches. It carries good gouge, and contains secondary quartz and groundup gabbro. It cuts off the quartz stringers of the country rock and, although quite old, is in all probability younger than the ore body, and must therefore cut and probably displace it. The movement on this fault seems to have been diagonally downward on the hanging side. It is therefore a normal fault. Now, the ore on the 75 foot level is on the upper or hanging wall side of this fault, and even if the ore body were originally vertical, the ore beneath, or on the lower side of the fault, will be found in a southerly direction, the distance depending upon the horizontal component of the fault whose displacement is at present undetermined, and which took place partly directly downward upon a 70 degree north dipping plane, and partly in a direction diagonal to the true dip of said plane. The practical inference to be drawn is that workings on the 180 foot level should be driven further south before they may expect to encounter the ore body developed on the 75 foot level. The situation is illustrated by the following section:

In this connection, as a practical consideration, attention might be called to the fact that this fault comes to the surfacr beneath the water of the bay, and that mining operations, either above or below the fault, are likely to open it up so as to admit considerable water into the mine.

On the 180 foot level the rocks are more crushed and fissured than above. The gabbro contains many quartz veinlets, running in various directions. The workings have encountered some disseminated ore in the western and southern portions of the level, but no solid ore has been found. It is worthy of note that the mineralization lies around large masses of gabbro. The rock is not what could be called a crush breccia, like that at Sudbury, but in a large way there are masses of gabbro surrounded by and filled in with mineralization. It seems probable the solid ore may be encountered on the 180 foot level by a few feet of drifting in a southerly direction from the present faces. If such exploration work should disclose the existence of the main ore body, the level is in condition to accommodate diamond drills, which could be pointed downward and cut the ore at still greater depth. It is quite apparent that neither here nor on the 75 foot level has the extent of the ore been developed.

SIZE OF ORE BODY AND PROBABLE TONNAGE.

It appears from the foregoing that the ore body, so far as developed, is small. Taking into consideration the horses of rock which occur in the ore, it is probable that there may be 15,000 tons of ore for each 100 feet of depth.

Roughly estimating the value of this ore at $20.00 per ton gives a gross value of $300,000,00 above each level of 100 feet. By analogy with other similar deposits ther is no reason to expect much larger dimensions to the ore in depth than on the surface. It si true that such deposits expand and contract, and it is also true that the full extent of this ore is known only at the surface. But, in the absence of further development work, there is nothing to justify the assumption of a larger deposit than is shown upon the surface. It seems altogether probable that this ore deposit is similar in its character and origin to the smaller deposits at Sudbury, and to similar deposits in Norway and other countries. Taking into consideration the expense necessarily involved in developing this property to the depth of say 1,000 feet, the cost of power, the difficulty of mining the ore near the surface, the cost of a plant to consume the product which altogether will probably amount to more than $1,000,000,00 it seems that such expense hardly is justified for the sake of a deposit which will only produce $3,000,000,00 gross to the depth of 1,000 feet.

It is well known that the Sudbury nickel mines contain large tonnages of ore, much larger in fact than are necessary to supply the present demand for nickel. It is also a fact that the average ore from the Sudbury mines is considerably better than the ore thus far developed at Chichagoff Island. Thus, the ore produced by the Canadian Copper Company between 1887 and 1902 amounted to 1,,581,506 tons,

averaging 2.92% nickel and 2.54% copper, while between 1903 and 1915 there were produced 6,034,932 tons of ore which averaged 3.93% nickel and 1.76% copper. The general average of all the ore produced by the Canadian Copper Company from 1887 to 1915 was 3.72% nickel and 1.92% copper. The Mond Nickel Company, between 1887 and 1915 produced 1,608,524 tons of ore, which averaged 2.55% nickel and 1.91 copper. The total tonnage of ore produced in Ontario down to 1916 was 10,866,392 tons. The Creighton ore body, which on the surface measured 380 feet by 240 feet, and whose actual width, normal to the dip was 180 feet, produces about 200,000 tons of ore per annum, averaging 4.68% nickel and 1.65% copper. To the end of 1910 this mine produced 2,088,531 tons of ore.

The ores from the New Caledonia now average about 5.4% nickel and in former years were much higher. It is stated that 6% ore from this district enabled a production at a cost of from 19 to 20 cents a pound before the war.

The Norwegian mines produce a lower grade of ore. The total production from Norway has been about 400,000 tons. The handpicked ore averaged between 1.4 and 1.7% nickel, but it is stated that the operation of these mines has not been attended with much profit.

At the present time there are no nickel refineries or smelters upon the Pacific Coast; nor are ther any known purchasers for nickel ore within reasonable distance of this property. It would therefore be necessary to install at some convenient point all the plant and equipment for producing

metallic nickel or nickel oxide from this mine. Market conditions are known to be variable and uncertain. The price for nickel varies greatly. At the present time the metal brings such a price as to make the operation of even a small mine profitable, but under normal conditions, with a price around 25 cents a pound, it could hardly be expected that a profit of more than five cents per pound could be realized under the most favorable circumstances, from the ore of this property. The production could hardly exceed 20,000 tons of ore, or from 800,000 to 1,200,000 pounds of nickel per annum. The profit on this amount of metal at five cents per pound would amount to from $40,000.00 to $60,000.00 per annum, and the operation would be too small to justify the expense of development and equipment.

CONCLUSION

The Alaska Nickel Mines have thus far found but one lens of ore worthy of further prospecting. This deposit whose dimensions are roughly 40 feet by 50 feet, may possibly expand on lower levels to a much larger deposit. The expense of prospecting and developing will not be great. A few feet of drifting on both the 75 and 150 foot levels would delineate the outline of the deposit on those levels, and if it proves to be larger on the present lower levels than above, a small amount of diamond drill work would explore it at still greater depth. Unless it is found to be considerably larger beneath the surface than at the outcrop it would be impossible to recommend its

purchase and development under present conditions. The other croppings and surface indications apparently have no connection with the deposit already developed, and do not seem to justify any expense in further exploration.

Respectfully submitted,

(signed) Horace V. Winchell

HVW-B

August 10, 1918