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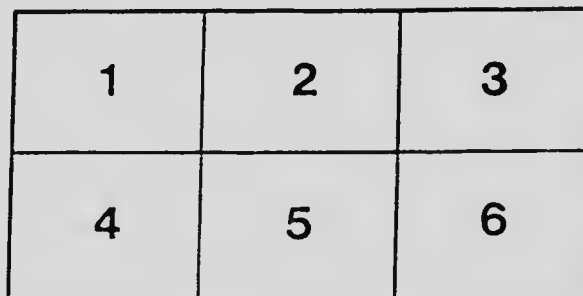
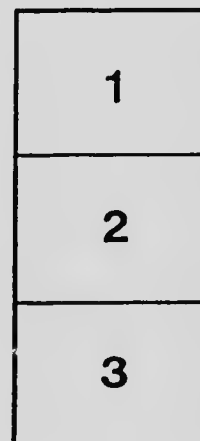
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BRITISH COLUMBIA BUREAU OF MINES.

BULLETIN No. 1, 1906.

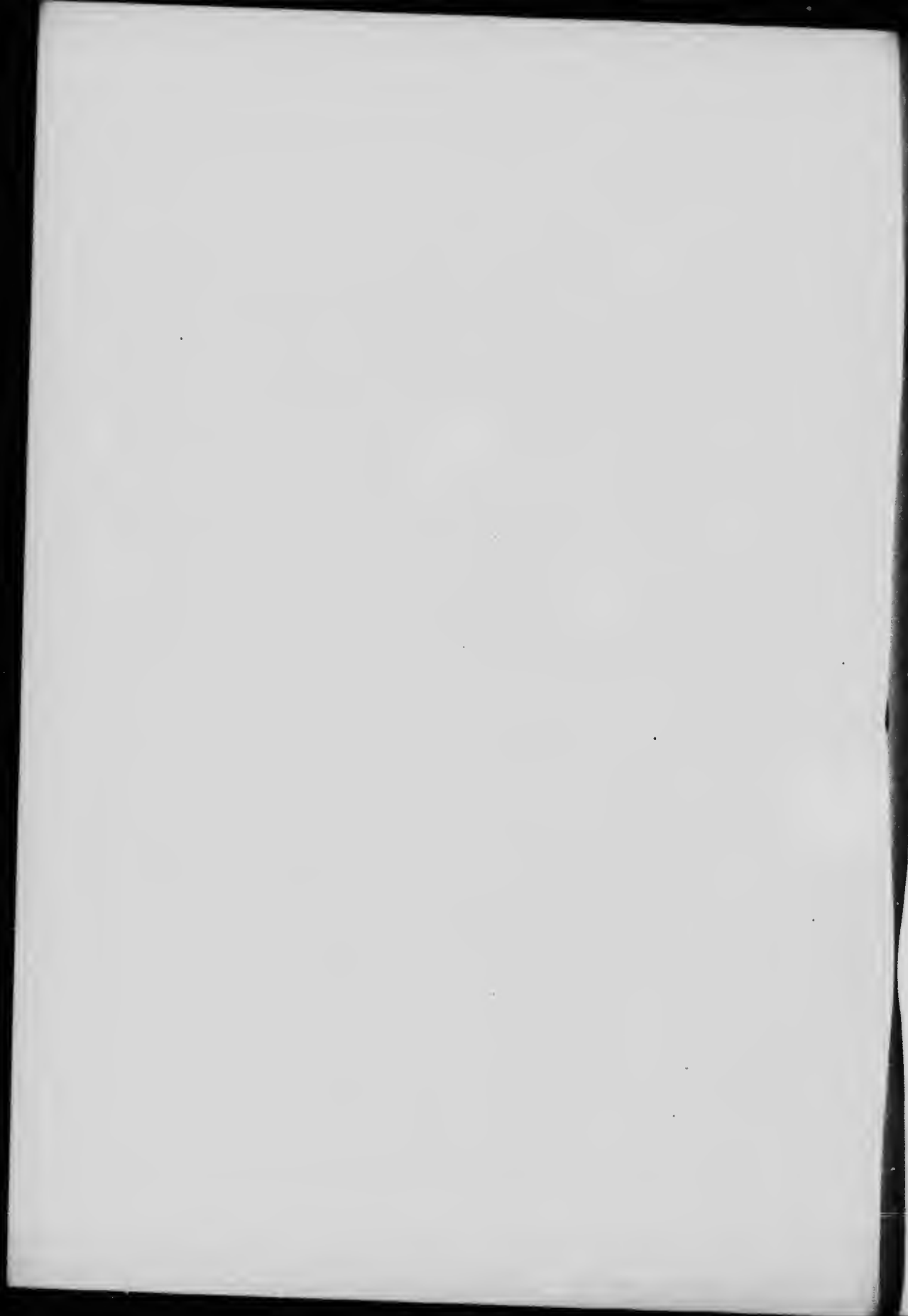
MINERAL CLAIMS ON THE WEST COAST

AND IN THE VICINITY OF

GREAT CENTRAL LAKE, VANCOUVER ISLAND.

—BY—

HERBERT CARMICHAEL,
PROVINCIAL ASSAYER.



WEST COAST OF VANCOUVER ISLAND.

—:O:—

REPORT OF H. CARMICHAEL, PROVINCIAL ASSAYER.

This section was visited by the Provincial Assayer in 1899, who then gave a general description of the district. It is now attempted in this report to give some account of the more important developments that have taken place since that time. The greater number of the claims have been re-visited, but some have not, in which latter case the information given has been obtained from various sources, and so carefully checked that it is believed to be reliable.

QUATSINO SOUND.

The Provincial Assayer visited and reported on the properties in the vicinity of Quatsino in 1903, since which time the only property upon which any important development work has been done is the *June Group*, situated a few miles back from the north

June Group. shore of the south-east arm of Quatsino sound. As was then noted, there was on this property a marked mineralised zone, occurring as a ridge, shown up for a length of 300 feet. This showing had then been prospected by a series of open cuts and gave promise of the probable finding of an ore-body. Last year the owners determined to do some development work on the property, to demonstrate at a depth the promise given by the surface showing, and started a long cross-cut tunnel. This work has been done under the charge of Mr. Harold Grant, of Victoria, from whom the following account of work done has been obtained:--

"Development work has been actively carried on for the last twelve months. This has consisted principally in running a tunnel under the large open cut where ore shows on the surface. This tunnel has been driven through very hard ground for 410 feet. The formation cut by the tunnel is well mineralised along a contact between limestone and granite, much cut up by felsitic intrusives. In a 20-foot cross-cut, to the north, ore carrying 2 per cent. copper was struck, and a considerable quantity can be hand-sorted to a shipping grade."

Yreka. The *Yreka* mine, which was being worked in 1903, and was then fully reported on, has since that date lain idle and no further development has taken place, so that nothing further can be added to the report then made.

Hematite Iron Ore. The hematite iron ore deposit, noted in 1903 Report as situated on the west arm of Quatsino sound, has been further prospected by small open cuts and test pits, with results that appear satisfactory to the owners. It is understood that the property has been under bond to a syndicate which contemplates the making of iron at Irondale, Washington, but, as far as can be learned, no ore has been mined or shipped from the property.

On some of the other claims within the district tributary to the Sound some little work has been done, but it has been in each case limited to the amount of assessment necessary to hold the property.

Kyuquot sound and Esperanza inlet are to the south of Quatsino sound, on the west coast of the Island. These inlets were prospected to a certain extent some three or four years ago, but no ore showing warranting further prospecting was found.

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NOOTKA SOUND.

Nootka sound, which lies to the south of and adjacent to Esperanza inlet, was visited this year by the Provincial Assayer.

An attempt is being made on the shore of Deserted creek—an arm of Marble Quarry. Nootka sound—to develop a marble quarry, which is particularly interesting, as previous attempts on other parts of the Coast to develop deposits of marble have shown the deposits developed to be so fissured by the proximity of igneous rocks, developed locally, as to be of no value commercially.

Deserted creek is an arm some $2\frac{1}{2}$ miles long by about half a mile wide, running in a north-westerly direction, and has a depth of 40 fathoms of water at its mouth, gradually shoaling off to 14 fathoms at its head. From the water's edge the mountains rise abruptly to a height of over 1,000 feet, leaving little or no land anywhere along the shore.

At the mouth of the creek or inlet the country rock is syenitic granite, that about a mile up the inlet gives place to a highly crystalline limestone or marble, which has been traversed in places by diabase dykes, varying in width from a few inches to one that measured 45 feet across. These dykes seem to be more silicious on the western side of the inlet than on the eastern side.* On the east side of the inlet this limestone formation extends for $1\frac{1}{2}$ miles to the head of the inlet, rising to a height of several hundred feet and showing out strongly in great massive bluffs.

This entire mass of limestone has been rendered highly crystalline, probably by the great quantity of igneous rocks which surround and traverse it. While the entire mass has become crystalline, the crystallisation varies greatly in character, and it would appear, from close examination, that along the contacts of the limestones with the dykes the crystallisation is fine-grained, while farther away from the influence of the dykes the crystalline form is much coarser—in some places, very coarse. The original bedding of the limestone has been so completely obliterated by the metamorphism to which it has been subjected that no definite idea could be formed as to the strike of the beds, although this appeared to be N.E. and S.W., with an equally indefinite dip seemingly to the east.

The deposit on the east side of the inlet has been taken up by J. Hastie *et al.*, while that on the west side is held by J. Mortimer.

There is on either side of the inlet undoubtedly an extensive deposit of crystalline marble, of great purity and good quality, but as to whether this deposit will produce a commercial product—that is, solid, flawless slabs of commercial size—it is as yet impossible to say definitely, since no work has been done to open up quarries, and only a few shots have been blown out of the surface exposures to test them.

While, undoubtedly, in a number of places, the deposit has been considerably shaken and fissured, yet there are indications leading to the belief that there are several spots which have not been so affected, and where quarries may probably be opened up and blocks of even large size obtained, free from flaws or shakes.

The colour of the marble on the east side is somewhat variable, but it is generally a blue-gray, becoming darker towards the northern end of inlet.

* The following is the report of Dr. J. A. Dresser, of Montreal, on a microscopic examination of this dyke rock, taken from western side of the inlet:—

“No. 4,004.—*Dyke Rock, Deserted Cove.*—This is a yellowish green rock of fine, even texture. In the thin section is found to consist essentially of feldspar, augite, quartz and hornblende, with accessory amounts of some iron ore and shreds of leucosene. The feldspar is plagioclase, well crystallized; augite, which in amount is nearly equal to feldspar, is of the later crystallization than many parts of that mineral; at least several interstitial spaces are filled with quartz; hornblende occurs in rather small brown crystals, somewhat chloritized. The rock is a quartz diabase.”

On the west side of the inlet, while the extent of the deposit is not quite so great as on the east, the texture is finer and the colour is good, varying from a pure white to gray, while at several spots it presents a mottled face—white with gray streaks—from which it would seem from surface indications as if blocks of considerable size might be obtained.

If the properties prove upon subsequent development to be workable, as the present exposures indicate, they are admirably situated as regards transportation, being right on the shores of a deep navigable inlet, well sheltered from storms or rough water.

The *Stormont*, *Glengarry* and *Texas* form a group of claims owned by Messrs. Stockham, Grant & Dawley, of Victoria and Chysoquot, situated at the upper end of Head bay, an arm of Nootka sound, and distant half a mile from the water. At an altitude of 350 feet above the sea some surface stripping has uncovered a body of magnetic iron ore, that appears to be of considerable size. The best exposure is a bluff over 40 feet high and uncovered for a width of 100 feet, in which exposed face the magnetite seems to be solid and unmixed with rock matter. At this point the ore has been partly stripped for a further distance of 200 or 300 feet, while it is said to have been traced through the three claims. The mineralisation appears to occur along the contact of a felsitic, igneous rock with a limestone, but sufficient work has not been done to render any very definite ideas being formed of the dip or strike of the ore-body or of its general character. An analysis of an average sample gave the following result: Iron, 66.42 %; sulphur, 0.26 %. The property is most favourably situated for cheap mining, and a railway two miles long, with easy grade, would convey the ore to a sheltered bay with navigable water.

HESQUIAT HARBOUR.

Hesquiat harbour is the next inlet to the south of Nootka sound, and was visited by the Provincial Assayer in 1902, since which time no new developments have been made, further than assessment work performed on the *Brown Jug Group*, owned by Norris & Smith, of Alberni, and situated on the east side of Hesquiat lake. The ore is reported to be zinc blende, carrying 20 to 25 oz. of silver to the ton.

SIDNEY INLET.

Sidney inlet is about 10 miles south-east from Hesquiat harbour, and about 12 miles north of the Indian village of Ahousat. This camp was visited in 1899 by the writer, but since that time considerable development has taken place on both the *Indian Chief* and *Prince Groups* of claims, and some ore has been shipped.

Neither of these claims were being actually operated, and there was no one on the ground to serve as a guide, nor could one be obtained. However, an attempt was made to find the various workings by following up the old trails; but as trails in this part of the country become rapidly obscured by the rank underbrush and moss, the attempt was not very satisfactory, and only three of the numerous openings could be found. This is to be regretted, as from reliable authority it is known that a number of new exposures of ore have been uncovered, which the owners consider very promising.

This group, consisting of nine claims—*Firefly*, *Leschhi*, *Brutus*, *Indian Chief*, *Mephistopheles*, *Scotlet*, *Victor Fract.*, *Victor*, *Dendrop Fract.*, and *Tinnicanum*—is owned by Hon. Edgar Dewdney, of Victoria. The property extends from the shore of Sidney inlet back for some 6,000 feet, in which distance the hills rise to a height of over 2,000 feet. The mine camp has an elevation of 1,200 feet; the principal workings are farther up the mountain, and are reached by short trails from the main trail from the beach, which is one mile long, over which some 100 tons of ore have been

brought down to the beach by pack train and shipped to the Crofton smelter, yielding returns of 17 % Cu. The camp buildings consist of a cabin and stable on the beach and a good bunk-house up the hill.

The *Prince Group*, consisting of eight claims, the *Prince Nos. 1 to 8*, **Prince Group.** is situated to the north of and adjacent to the *Indian Chief Group*. The occurrence and the ore are very similar. This is a group of claims which was obtained and developed for a Scotch syndicate by Dr. T. R. Marshall, now of London, but since his departure from the Province, in 1904, the claims have remained idle.

The *Prince* and *Indian Chief Groups* use the same trail from the beach for a distance of 2,200 feet, when the trail forks, the right-hand branch going to the *Indian Chief* and the left-hand one to the *Prince Group*, this latter group being situated some 7,000 feet from the landing wharf.

AHOUSAT.

Ahousat is an Indian village situated on a sheltered bay, Matilda creek, making in on the east side of Flores island, and is a regular port of call for the coasting steamers. There is a store here owned by W. Dawley, of Clayoquot, where the more ordinary supplies can be obtained.

The *Ormond* is a claim owned by G. Beck and Gardhouse, of Ahousat, **Ormond.** and situated about a mile back from the west shore of Matilda creek or arm. At an altitude of some 950 feet a few blasts have been fired, breaking a few feet into an exposure of magnetite iron ore, showing here for a width of three or four feet, and occurring in epidote and diabase.

A little farther to the west and at about the same altitude there is to be seen, in a zone of movement in the diabase country rock, a mineralisation by copper pyrites and pyrrhotite, on which a short tunnel had been driven in for some eight feet. The mineralisation in this tunnel was very ill-defined and indistinct; consequently, a second tunnel was started some 30 feet lower down the hill, to prospect the showing at that greater depth. This tunnel is now in 54 feet, and has been driven on a well-defined slip wall in the diabase country rock. This slip forms the left side of the tunnel, and on that side no mineralisation was seen, but the right-hand wall is irregularly mineralised with iron pyrites and copper pyrites, which in certain spots ran as high as 6 or 7 % copper. Some 75 feet vertically and 150 horizontally back from the second tunnel several shots have been put in on a rock exposure showing mineralisation with pyrrhotite and copper pyrites.

A little to the south of and at 400 feet lower elevation than the *Ormond* there occurs in a basic eruptive rock a mineralised zone running in a north and south direction, and on this zone several claims have been located. Beginning at the northern end of this zone, the following claims were seen:—

The *Pete* and *Iron King*, adjoining claims, have been purchased by **Pete and Iron King.** Capt. John Irving and Wm. Wilson, of Victoria. At an altitude of 575 feet and half a mile west from the shore of Matilda creek or arm, several open cuts have been made, the longest being 27 feet. These cuts show the zone in the diabase to be strongly mineralised with pyrrhotite, with a little copper pyrites. A few feet to the south of this cut a few shots have exposed the rock, which here appears to contain a greater percentage of copper pyrites.

To the south of and adjoining the previously mentioned claims are the **Copper King Nos. 1, 2 and 3.** *Copper King Nos. 1, 2 and 3* mineral claims, owned by Messrs. A. Watson and Sullivan. Towards its southern end the mineralised zone already referred to occupies a ridge, and into this a tunnel has been driven, which for the whole 30 feet of its length is in solid pyrrhotite. To the east and on the other side of

the ridge the rock is soft and very much crushed, and in this very little mineralisation could be seen. One or two inclines have been run into the hillside, and these are said to carry ore, but as they were full of water, such statement could not be confirmed by personal observation.

The *Ormond No. 2* mineral claim has been located by Beck and Gard-Ormond No. 2. house on the east shore of Matilda creek, and has been prospected by several open cuts and a few shots on surface. In one of these exposures, on a contact between diorite and diabase, there was seen from 3 to 4 feet of solid magnetite, while from some of the other showings a small quantity of very fair copper ore has been taken out, but no extensive mineralisation has been proved by the work so far done.

CLAYOQUOT SOUND.

Clayoquot sound is the first important inlet to the south-west coast of Vancouver inlet, and it has many branches, affording a splendid landlocked waterway. This inlet was visited by the Provincial Assayer in 1899, when a number of claims were reported on in full. Since then many of the claims have lain dormant, and on a few only has even the requisite assessment work been done.

The *Good Hope* claim, owned by the Helga Mining Co., of Seattle, Washington, showed in 1899 a well-defined quartz vein from 4 to 7 feet wide; since then the owners started a tunnel 126 feet below the outcrop, to cross-cut the vein at depth. In and from this tunnel some 800 feet of drifting and cross-cutting has been done, without, it is regrettable to say, locating any body of pay ore. Still undiscouraged, the owners are preparing to do at least a small amount of further work, which, it is hoped, will meet with better reward, since such energetic development is rare on the west coast.

The *Killapa* claim is situated on the shore of Dissappointment inlet. Killapa. An attempt was made to find this claim, which was, however, not successful, as the trails were not traceable, being so grown over with underbrush. It was learned later that only the annual assessment work had been done on the property for some years. The following notes are from the report of an engineer who visited the property:

"The most important development work has been done at an altitude of some 600 feet, where a tunnel has been driven for 150 feet in ore. The vein-matter consists of quartz with iron pyrites and copper pyrites, carrying gold and silver, and is about 3 feet wide."

The *American Wonder* claim, situated on Tranquil creek and owned American Wonder. by General Aston, of Tacoma, was visited in 1899, when a good body of copper ore was exposed. Since then the claim has been Crown-granted and allowed to remain idle, no further work having been done, so that the conditions remain as they were when last visited.

The *Hetty Green* claim is situated on Deer creek and is owned by Hetty Green. Ward and Thompson, of Alberni. Considerable work has been done on the property, and in 1905 some 215 tons of very good copper ore were shipped out over a wagon road which was built with the assistance of the Provincial Government.

BARKLEY SOUND.

Barkley sound is the most important inlet on the west coast of Vancouver island, with many arms, extending for 35 miles in a north-east direction into the island, about two-thirds of the distance across, and at the head of the most important arm, Alberni canal, is the town of Alberni. There are a large number of claims situated in the district tributary to the various arms of this sound, and of which a number were visited this summer.

The *Red Rover* claim, owned by Messrs. Jay, Graham and Poole, is situated about $2\frac{1}{2}$ miles to the north from the shores of Toquat harbour, with which it is connected by trail, and at an elevation of 375 feet above tide water. A small creek flowing through the property has exposed a quartz vein from $2\frac{1}{2}$ to 3 feet wide, with a strike N. 30° W. and a dip of 65° to east at this point. Below this exposure, some 20 feet, an open cut 30 feet long was run, from which some quartz was taken out, carrying \$5 in gold per ton. From the exposure in the open cut it was seen that the vein was flatter than indicated by the outcrop, consequently, a tunnel was started at the end of the cut and under the vein as exposed. This tunnel gradually turns to the right, so as to cross-cut the course of the vein, but in the tunnel the vein does not appear to be clearly defined. The vein is in a diabase country rock, with fairly tight walls, although in the open cut the hanging wall is well defined. The vein-matter is somewhat brecciated in structure, containing enclosed fragments of the country rock. The owners claim to have obtained very good gold values from the vein and that the wall rock also carries values, but such values were not apparent in the samples taken by the writer for assay.

This claim is situated on Prideaux island, on Sechart channel, Barkley sound, and is owned by J. Crawford Anderson. On the south-east side of the island a quartz outcrop on the beach has been uncovered by an open cut and some surface work; a shaft has also been sunk on the lead to a depth of 40 feet. This latter was, however, full of water when visited. The lead is 22 feet wide on the surface between well defined slicken-sided walls; strike, N. 75° E. The vein-matter is brecciated and shows considerable movement. The mineralisation on the surface and of the dump consists of a little copper and iron sulphides, with slight indications of cinnabar. The owner of the property claims to have obtained high values in gold and an appreciable percentage of mercury from the vein, but the samples taken and assayed by the writer only gave a trace of gold and no mercury. The ore on the dump did not show high values, but as it is much decomposed it is possible the values may have been lost. The vein appears to occur on a lime diabase contact and is seen on Nettle island, farther to the S. E., and it is reported to have been traced on to other islands for one and a half miles.

On the east side of Effingham inlet, about 5 miles up, there is a high bluff of reddish brown rock, having a close, fine-grained texture and showing no cleavage or bedding plans.* Associated with this rock mass are intrusions of a greenish eruptive, having a more or less amygdaloidal structure. The deposit has been taken up as a quarry by Mr. J. C. Anderson, of Sechart, and it is possible the rock may have some value as a building stone.

This group consists of the *Black Bear*, *Eureka*, *United*, *Southern Cross*, *Sarita Group*, *Midday*, *British Pacific*, and also a leased strip of the Indian Reserve fronting on the Sarita River. The property is owned by Wm. Wilson and Capt. J. Irving, of Victoria. The claims are reached by following up the Sarita river from Barkley Sound about one mile from deep water, where an outcrop of ore is seen in the river. Some 10 feet above the river a tunnel has been driven under an outcrop of ore showing on the bluff above. This tunnel has been run in a nearly straight line S. 17° E. for 180 feet. At 117 feet in two drifts have been run at nearly right angles, the one to the right for 54 feet, and that to the left for 40 feet. Some years ago a winze was sunk at 47 feet in on the tunnel

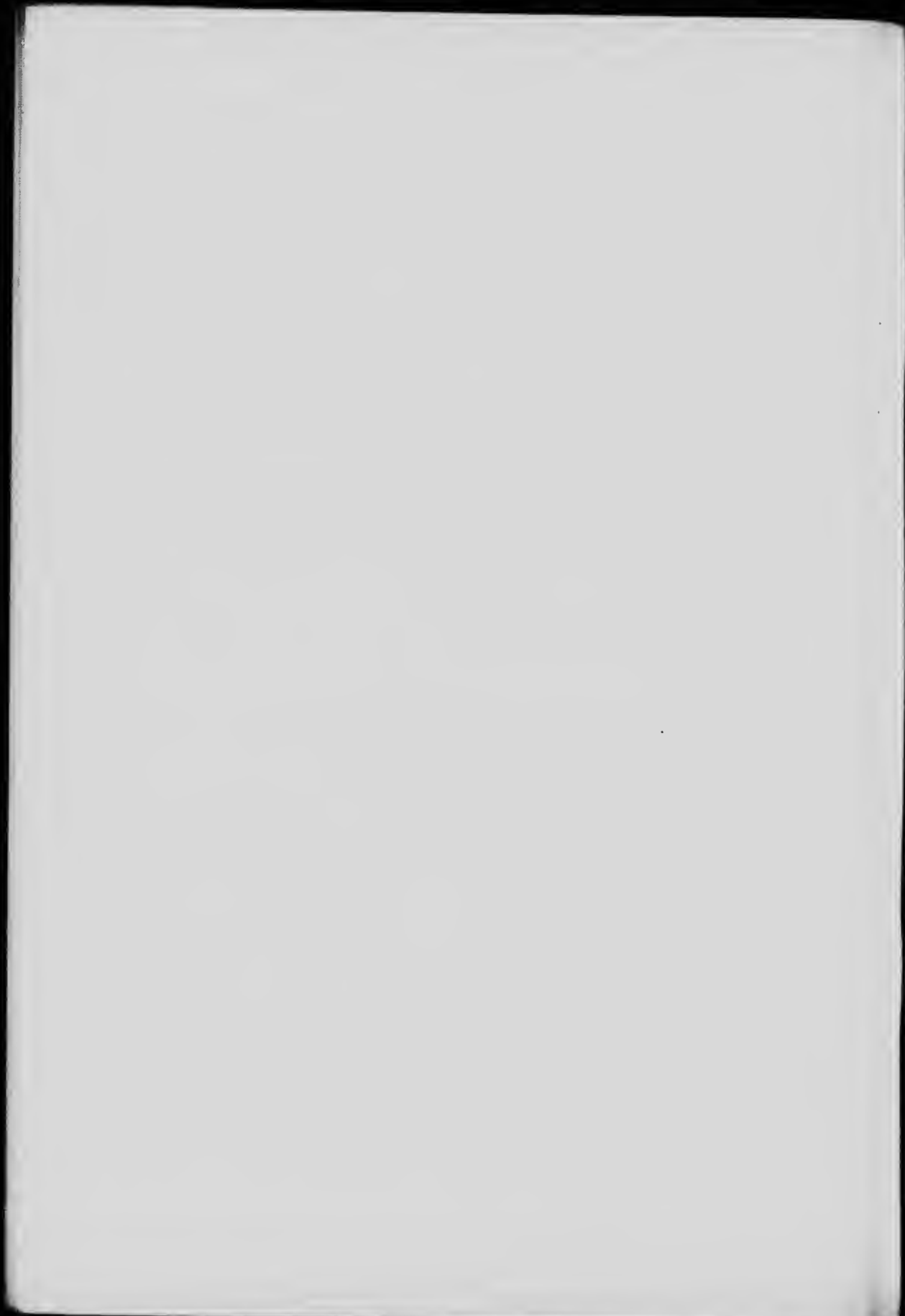
* The following is the report of Dr. J. A. Dresser, of Montreal, on a microscopic examination of this rock:—

"No. 4,002.—*Anderson's Red Rock, Effingham Inlet, B. C.*—This rock consists of angular grains of quartz, which are cemented together by fine aggregate of granular material, which is almost wholly hematite. The rock is a jaspilite or impure jasper.



B.C. Bureau of Mines

BASIN AT BIG INTERIOR MINE.



to a depth of 50 feet, and a drift run back towards the river of 50 feet. This winze and drift are now full of water. There has been a considerable amount of surface stripping done on different parts of the claim.

The entire surface is heavily timbered and covered with underbrush, but, from a general examination of the property, there would seem to be contact of a felsitic rock with limestone, and along this contact later diabase dykes* have intruded, carrying with them a little mineralization, consisting principally of pyrrhotite with a little chalcopyrite and arsenical iron. The mineralisation is not evenly distributed through the dyke matter, some parts carrying copper and others none. At present no body has been developed large enough to pay the cost of extraction.

The tunnel cross cuts a diabase dyke 40 feet wide, while the drift to the left, where the work is now being done, starts on the dyke, but at 40 feet turns, cutting through the dyke and at the face is about 2 feet in the felsitic country rock, the strike of the dyke at this point being N. 6° E. with a dip of 66° to the north. A systematic tracing of these dykes on the surface would much facilitate the working of the claims and would save a considerable amount of work underground.

The assay values from samples taken were as follows:—

	GOLD.	SILVER.	COPPER.
Straight pyrrhotite	0.16 oz. per ton.	1.12 oz. per ton.	None.
Ore from outcrop.....	Trace.	0.2 "	6.2%

The Cascade mine is situated on the north shore of Uchucklesat harbour.

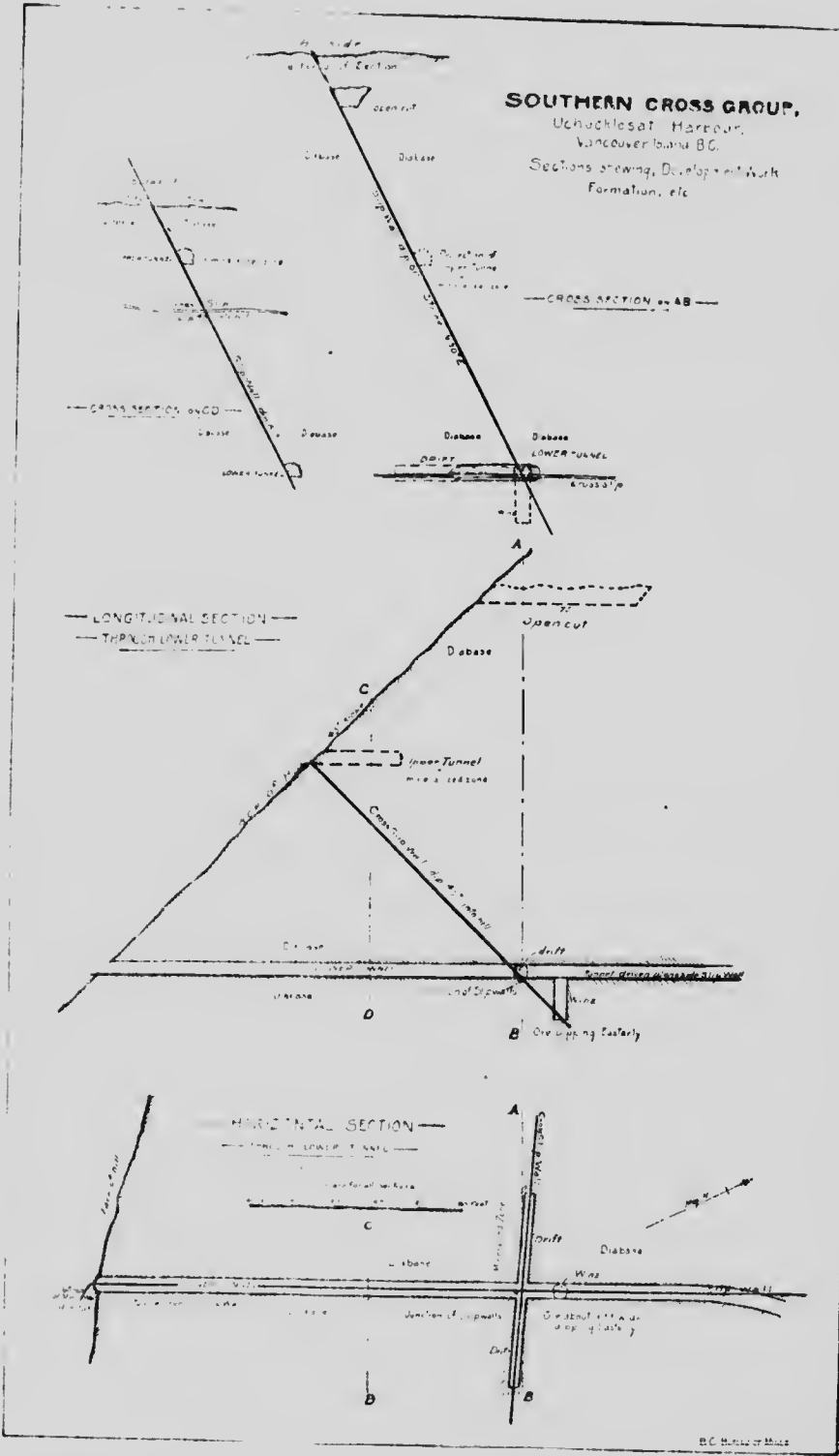
Cascade Mine. Near the head of the harbour the mountains on this side rise abruptly to a height of 3,000 feet. The general country rock is limestone traversed by diabase dykes. At an elevation of 275 feet above sea level some surface work has been done and an incline sunk on a diabase dyke, which is impregnated with bunches of iron and copper pyrites. Some 25 feet lower down, a tunnel has been run into the mountain side, on the dyke, for 54 feet in a general N. 30° E. direction, but turning a little more to the north towards its inner end. At 20 feet in, the tunnel ran through a chute of ore, a few feet wide, which is cut off by a slip-wall in the dyke. The mineralisation is iron and copper pyrites. Selected samples gave the following assay:—Gold, 0.06 oz. per ton; silver, 0.12 oz. per ton; copper, 5.5%. That there has been much movement is proved by the "slicken-sided" slip-walls which are seen. The evidence would point to the mineralisation having taken place during a second period of movement. The end of the tunnel is in the diabase dyke matter, but a little mineral is seen on a slip-wall near the floor. A considerable amount of ore has been shipped from this mine, taken principally from the open cut above and from the drift to the left of the tunnel. A gravity tramway has been erected to convey the ore to sea level, where it was shipped.

This group is situated on the north side of Uchucklesat harbour, near the mouth, and consists of five claims, the *Southern Cross*, *Ballarat*, *Little Group*, *Dipper Fraction*, *Constance Fraction* and *North Star*. The work has all been done on the *Southern Cross*. The mountain rises at an angle of about 45° and at an elevation of about 150 feet, on a contact of limestone with an intrusive

* The following is the report by Dr. J. A. Dresser, of Montreal, on a microscopic examination of this mineralised dyke matter:—

"No. 4,007.—This is a dark green or greyish green rock; consists of lath-shaped crystals of plagioclase feldspar arranged about crystals and the irregular masses of pyroxene. Smaller interstices amongst these minerals are filled with quartz. Grains of magnetite are enclosed in the various other minerals. The structure of the rock is that known as ophitic, and the rock is therefore a quartz diabase."

SOUTHERN CROSS GROUP,
 Uchucklesat Harbour,
 Vancouver Island B.C.
 Sections showing Development of Work
 Formation, etc



rock, a well marked slip-wall is seen, having a strike N. 30° E. into the hill, with a dip of 60° towards the south-east.* This same intrusive rock also appears in the two after-mentioned claims, the *Happy John* and *Monitor*. Towards the south this slip-wall is cut off, nearly at right angles, by another slip having a strike of S. 55° E. and a dip of 45° into the hill. The north-easterly slip-wall, first mentioned, has been followed along by a tunnel 40 feet long, all in a body of low-grade ore, occurring in a mineralised zone in the diabase, following along the slip-wall.†

About 100 feet lower down the hill and slightly to the east, a tunnel has been driven to reach the point where the north-easterly slip and the cross slip, before referred to, intersect. This tunnel is now in 300 feet, and for 200 feet runs through diabase, at which distance it cuts the cross slip-wall, here found to have the same strike and dip as noted on the upper level. The north-easterly slip-wall was also struck, with an unchanged dip and strike, showing a well-developed ore body on the right hand side, some 6 feet in thickness. This is seen in a short cross-cut of 46 feet which runs into the limestone to the right. The tunnel has been continued along the slip-wall for 60 feet, with the ore on the right side, when the tunnel swings slightly to the right, and is being run for the limestone contact, which should soon be reached. Where the ore showed strongest promise was being sunk from the tunnel and was down 20 feet, good ore having been taken out as the winze was being sunk. The winze is now getting out of ore, as the body dips away from it on the main slip-wall. When a greater depth is reached cross-cuts will be run to the ore chute.

The cross slip-wall before noted has been followed from the main tunnel by a drift running to the left, which is now in a distance of 45 feet. This is fairly well mineralised and may develop a good body of ore. This cross slip is traceable on the surface and has been proved by an open cut to the left, in which direction the cross-cut is now being driven.

At 175 feet above the main shaft an open cut has been run for 75 feet along a mineralised zone in diabase on a limestone contact. In the open cut this zone shows for 17 feet, and is mineralised with iron pyrites and a little copper pyrites.

There has been no stoping done in this mine, and any ore taken out has been in the course of development. The management is pushing the development with three shifts and is making a strong endeavour to block out a good body of ore. The mine is equipped with two bunkers and ore chutes on the two working levels, and there is a good wharf on deep water for shipment. The bunkers were partially filled with a very good grade of ore, the values being principally in copper pyrites. A small shipment was made this year.

A sample taken of the best-looking ore in the bin gave, upon assay:—Gold, trace; silver, 0.56 oz. to ton; copper, 18%.

*The following is the report of Dr. J. A. Dresser, of Montreal, on a microscopic examination of this rock:—

"No. 4,013.—A fine-textured grey rock, showing a few grains of some brown sulphide. A few rusty patches also appear in the hand specimen. They are evidently due to the oxidation of an iron-bearing mineral. The rock consists essentially of feldspar, which is principally orthoclase and much chlorized hornblende, with a considerable development of epidote. The rock is essentially similar to the last (No. 4,007), but contains little, if any, quartz. It is a syenite porphyry."

†The following is the report by Dr. J. A. Dresser, of Montreal, on a microscopic examination of two samples taken from this mineralised zone:—

"No. 0.—*The Southern Cross Ore*.—The rock of this ore, which is an altered porphyrite, is penetrated by narrow seams of ore which maintain a generally parallel direction. In the microscopic section these lines are found to be small fractures in the rock, into which the ore has been infiltrated after the rock has been solidified and fractured. In one case a large feldspar has been broken across and ore has been subsequently deposited in the crevice thus formed. The ore has thus been the latest part of the rock to form, while if it were due to magnetic segregation, it would have been one of the earliest constituents to solidify.

"No. 4,018.—*Gangue Material from the Southern Cross Mine*.—This consists of radiating tufts of hornblende, chiefly actinolite and masses of some light-coloured zeolite, which is often partially decomposed. This specimen does not seem to throw any satisfactory light on the relations of the ore to the enclosing rock."

The *Happy John Group* is situated on the west side of the Alberni canal, near its mouth, and consists of the *Happy John*, *Happy John No. 1*, *No. 2* and *No. 3 Fraction*, which have been surveyed and contain 125 acres. The *Happy John* and *Happy John No. 1* have been Crown-granted, while

Happy John Group.

the others will be this year. The property is owned by the Frank Brothers and A. J. Engvik. There are minor showings all over the claims, but the principal work has been done at an altitude of about 300 feet, where an open cut has been run on a diabase dyke near a contact of limestone with a felsitic rock.* This cut is 40 feet long and for the first 12 feet follows a slip-wall in the diabase. On this slip-wall is a body of solid copper pyrites about 2 feet 6 inches wide at the widest part, but wedge-shaped, with the apex upwards, which assays about 12% copper, with 0.06 oz. gold and 1.7 oz. silver per ton.

To the east of this outcrop and some 40 feet lower down, a tunnel has been driven into a diabase dyke on a slip-wall. Ore shows in the bottom of the tunnel about 2 feet wide for 15 feet. This is not as strong a showing as that previously mentioned, although it is well mineralised, and it does not appear to be the same ore-body nor on the same dyke.

At a height of 50 feet above this lower tunnel, and farther to the east, another tunnel was run into the hillside, on a diabase dyke, and at 21 feet in cross-cuts diagonally a slip which showed ore, but this slip was not followed. This tunnel is being driven to the contact with the limestone and is now in 55 feet. At 40 feet in a detached horse of limestone was struck and a drift to the left was here started, which is now being run with the hope of reaching the contact of the solid limestone.

In the vicinity of this work there is considerable evidence of mineralisation, as shown by small surface strippings. The tunnels are situated in ground rising nearly vertically, for 80 feet or so, from the creek below. The means of ascent and descent is by ladders.

On the *No. 2* claim, higher up the mountain, a shaft was sunk 12 feet deep on a slip-wall in a diabase with 2 feet of ore. A tunnel, now in 40 feet, is being run at a level 300 feet lower to reach this ore.

Surface strippings show a number of parallel dykes more or less mineralised. Near the mouth of the creek a few shots disclose a mineralised dyke carrying arsenical iron, with traces of copper. Samples gave the following assay: Gold, 0.05 oz.; silver, 0.5 oz.; copper, 0.1% to the ton. These claims show a considerable copper mineralisation and there is reason to hope that a good body of ore may yet be blocked out.

A description of this property was given in the 1901 Report, since **Monitor.** when the company has ceased to ship ore, but has done some prospecting on its claims, which has been confined to surface stripping. At an altitude of 300 feet a number of small surface strippings show what is apparently a diabase dyke running through or on a contact with limestone, which dyke appears to be fairly-well mineralised, in one place solid copper pyrites being seen. This ore gave the following assay: Gold, trace; silver, trace; copper, 16.2%. While no defined body of ore has been disclosed, there is evidence which would warrant further prospecting by the company.

This mine is situated on the west side of the Alberni canal, 14 miles from Alberni. The Nahmint Mining Company, Limited, was organised in 1898, with a capital of \$100,000, and in 1899 had done 2,100 feet of underground development work, which disclosed a considerable amount of copper ore. In 1900 an aerial tramway was installed and ore shipped. The ore chute, however, gave out and a long tunnel has been driven to prospect for a new body, with, so far, negative results. The mine equipment is all in good order and in charge of a caretaker, but no work is being done on the property.

* See foot-note, page 11.

This claim is situated on the east side of the Alberni canal, near the mouth. The work on it has been done at an altitude of 400 feet and several hundred feet back from salt water, where a few shots have been put in on a horse of limestone appearing in the diabase dyke, mineralised with copper and iron pyrites, with a little arsenical iron. A shaft has been sunk on the dyke, 25 feet lower, from which a considerable amount of ore has been shipped. This shaft was full of water when visited, and the ore at present remaining on the dump is only second-class, the dump having been hand-picked and the first-class ore shipped. According to a miner who had worked in the mine, there was still good ore in the bottom of the shaft, but financial difficulties necessitated the temporary closing down of the property. The assay of some selected samples taken give the following results: Gold, 0.2 oz. per ton; silver, 2.32 oz.; copper, 16.43 %.

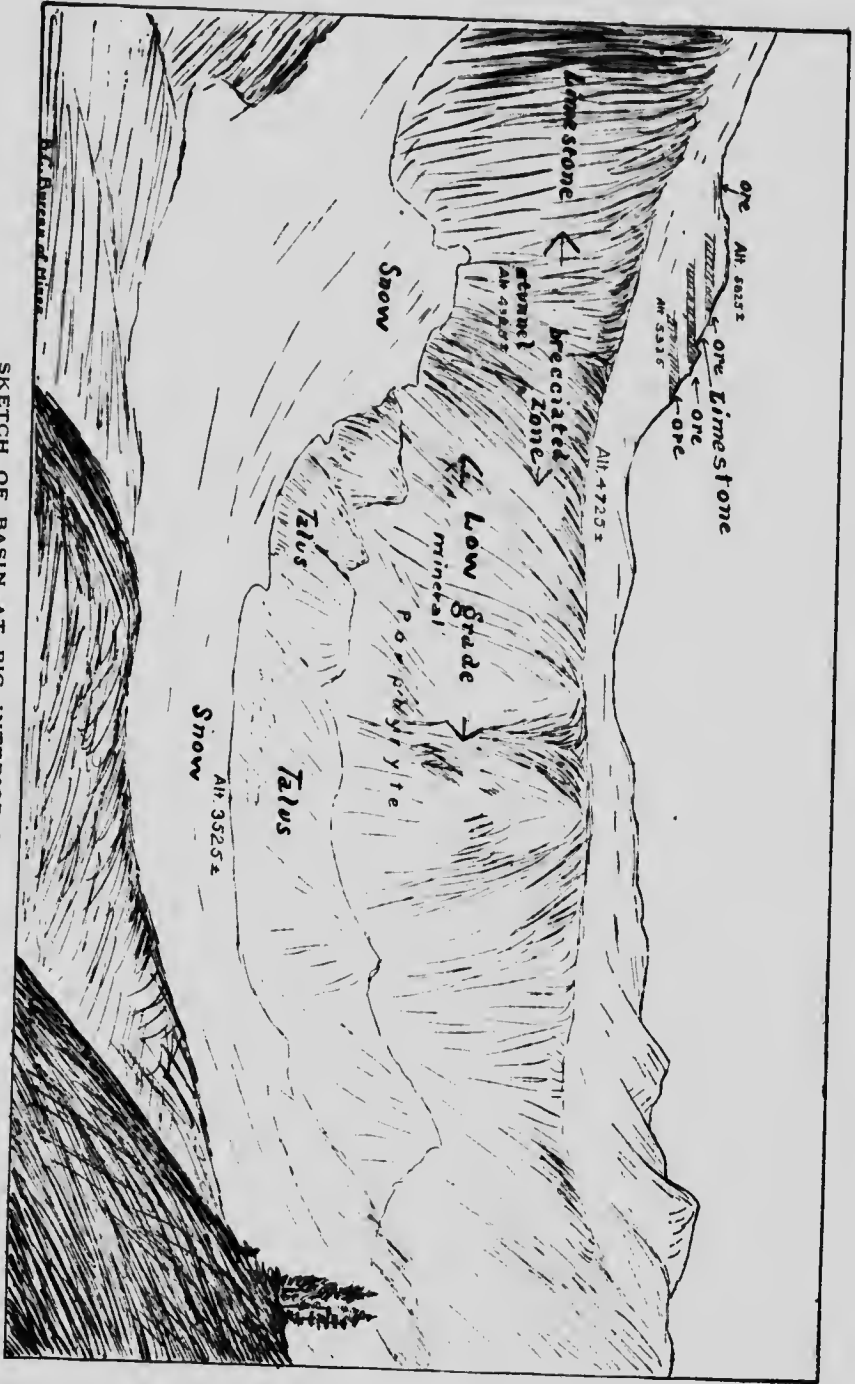
This group, consisting of the *Edith*, *Black Bear* and *Bruin*, owned by Edith Group. E. A. Waterhouse, of Alberni, is situated on the east side of the Alberni canal, a short distance from the mouth, and is reached by a trail from the beach about a mile long, although the distance to salt water would be less in a direct line. The workings are at an altitude of 475 feet, where a tunnel has been run in a S. 65° E. direction for 30 feet. This tunnel started to follow in a lime-diabase contact, but was diverted, continuing entirely in diabase, following a strong slip-wall along which no ore was visible, although some ore seen on the dump was presumably taken out of this tunnel. A few hundred yards to the east a number of open cuts have been made and shots blasted in diabase, which show more or less mineralisation with copper pyrites, iron pyrites and pyrrhotite, the latter, however, predominating, while in one of the open cuts solid pyrrhotite was noted.

Great Central Lake.

Considerable bodies of ore having been reported to exist at the head of Great Central lake, Alberni District, it was decided to make a preliminary examination of that region; which was done towards the end of August, 1906. Great Central lake can now be reached with ease from the town of Alberni, a distance of twelve miles, by waggon road, the elevation of the lake being 200 feet above the sea. This inland sheet of water presents the same physical features as do the inlets which indent the west coast of Vancouver Island, the mountains rising abruptly from the water, with here and there a valley extending back for a considerable distance, the most important valley being that extending to Ash lake on the north-east.

The general length of the lake is east and west, and it is about twenty-five miles long by a mile or so wide. At its western end two creeks flow in, heading from mountains still farther to the west. A trail from the lake follows the most northerly of these creeks on a gradual ascent for a distance of ten miles until it ends in a basin, shut in by high mountains, the basin having here an elevation of 1,500 feet above the Great Central lake, or 1,700 feet above the sea. To the south a precipitous bluff rises 2,075 feet high, from which pours a considerable stream of water that barely touches the rocks until it reaches the bottom, breaking into a mass of spray in its descent. The ascent of the bluff requires stout muscles and the aid of the small bushes which cling so tenaciously to the clefts in the rock. On the top there is a small rocky plateau or basin enclosing a lake about half a mile long by a quarter wide, the elevation of the lake being 3,350 feet above the sea. This mountain lake, situated in the heart of Vancouver Island, with snow-clad mountains rising 2,000 feet above it and the blue crevassed glacier of the "Nine Peaks" showing up to the south in the morning sun, forms a beautiful scene.

This group consists of seven claims, viz.: *Big Interior Nos. 1 to 7*, and *Big Interior Group* was located by Drinkwater and Nicholls, of Alberni. The claims are reached from the head of the small lake referred to by following up a small second basin, slightly to the north of the main basin, about a quarter of a mile. The head of this second basin is hemmed in on three sides by precipitous cliffs a



SKETCH OF BASIN AT BIG INTERIOR MINE.

thousand feet high, on which rests a snow cap, terminating in peaks which are 2,000 feet above the lake below. Practically, this entire face, some 4,000 feet wide by 1,000 feet high, shows the strong red colour due to iron stain, while at the base there are thousands of tons of the same rock which have been mined by the action of the elements. A closer examination shows this cliff to be a granitoid rock,* mineralised with copper pyrites, pyrrhotite and pyrite in varying proportions, some zones showing strong mineralisation, while in others it is more sparse. To the west the rock assumes a brecciated structure and has been cemented together by a filling of calcite, with a considerable impregnation of copper carbonates and into this zone a tunnel has been driven a distance of 31 feet. The ascent of the bluff is somewhat dangerous, owing to the rather precarious foothold and the absence of vegetation, the top being reached at an elevation of 1,375 feet above the small lake. From the top of the bluff a snowslide was followed until a further elevation of 500 feet was reached, at which point the ore is uncovered and shows the strongly mineralised granitic mass which is seen to penetrate a nearly horizontal strata of limestone, alternate bands of which continue to the top of the mountain 500 feet still higher. This sharp ridge, with an altitude of 5,700 feet, may be considered as the backbone of Vancouver island, shedding the water to the south down the Alberni canal, to the north-east down Buttle lake and the Campbell river, and to the west by Bear river into Clayoquot sound.

SUMMARY.—The mineralised zone, showing in the face of the cliff to the north of the basin and forming the great mass of low grade mineral on the property, is so large, so inaccessible, and the mineralisation so scattered, that it would be impossible to obtain anything approximating an average general sample of the exposure without the expenditure of an amount of time and money not justifiable under the circumstances. However, at the foot of the cliff, and as illustrated in the accompanying sketch, there is a talus extending the whole length or width of the mineralised zone, made up of material broken away from the whole face of the zone in question. While this talus may to a certain extent have been affected by weathering, it still may be considered a very approximate sample of the inaccessible cliff. Samples were taken from this talus, from which it is judged that approximately the central portion of the mineralised zone will assay from $\frac{1}{2}$ to 1 % copper, with from $1\frac{1}{2}$ to 2 oz. silver per ton, and a trace of gold. These values extend over a width of about 1,500 feet, while to the right the mineralisation gradually fades off into the country rock.

To the left of the mineralised zone is what has been called, for purposes of designation, the "brecciated zone," and which is merely a continuation, to the left, of the mineralised zone which has here been subjected to a crushing due to movement, and in which the interstices between the fragments of the rock have been filled with secondary minerals, chiefly calcite, with some carbonate of copper, forming a secondary enrichment. This secondary enrichment has taken place, as would be expected, along defined channels, producing streaks of higher grade mineralisation often forming commercial ore. Here, again, no general sampling was possible; although a tunnel has been driven for some 31 feet into the bluff, it was found impossible to examine the face of the cliff for 10 feet on either side of the tunnel mouth.

* The following is a report of Dr. J. A. Dresser, of Montreal, of a microscopic examination made on two samples, the light and the dark-coloured varieties, of this rock:—

"No. 4,069.—*Light variety.*—This is a holocrystalline, a fine-textured rock having a light grey colour, and is flecked with small needles of green hornblende. In the slide it is found to consist of feldspar, hornblende and quartz. The feldspar is principally orthoclase, although small amount of plagioclase is also present. The hornblende is much altered, chiefly to chlorite. Quartz is present, both in large crystals and also filling smaller interstitial spaces. This rock is a granite porphyry.

"No. 4,070.—*Dark variety.*—This is a porphyritic rock. The larger crystals or phenocrysts consist of hornblende and feldspar; the former is green and occasionally somewhat chloritized. Feldspar crystals are well formed and belong to the lime soda series. One crystal showed symmetrical extinction parallel to its line of twinning, which was according to the albite law, at an angle of thirty degrees on either side, thus indicating that its composition is that of an acid labradorite. The groundmass is a finely crystalline aggregate of feldspar and biotite. Angular grains of magnetite are scattered somewhat sparingly through the rock. It is a porphyrite."

The mineralisation just described, and which forms the great bulk of visible mineralisation on the property, is admittedly very much diffused through the rock, and is consequently so low grade as to be of value only if found to be amenable to some form of concentration, and of which there seems to be a fair probability.

On the top of the mountain, in the knob shown to the left of the centre in the sketch herewith, is an area in which the mineralisation seems to be more concentrated, producing, in places, ore of a grade to stand transportation and treatment charges. This higher grade ore appears to occur along the lines of contact of alternating bands of granitic rock and limestone. The extent of the latter deposit it was found impossible to determine, as the ore was found to be covered in most places by a heavy capping of gossan, and in many places seemingly permanent snow and ice covered up the formation. While the future of the property is far from being proven, the very great extent of the mineralisation, with occasional concentrations, certainly renders the proposition worthy of most careful investigation and prospecting.

These claims are situated on the small lake in the Big Interior Basin, **Della and Glacier**, and are owned by Drinkwater and Engvik. On the claims is a small quartz vein from 2 to 3 feet wide, mineralised chiefly with arsenical iron. Assays of the straight ore gave the following result:—Gold, 5.12 oz. per ton; silver, 5.2 oz. per ton; copper, 1.0%. The vein has not yet been worked to any extent, but an attempt is being made to extract the values by roasting the ore and grinding in an arastra, which has been erected and is being run by a small water-wheel constructed on the ground. The arastra had just been completed at the time of my visit.

Formation of Ore Bodies on West Coast.

An examination of the different properties on the west coast of Vancouver Island, especially those on which extensive development work has been done, would point to the following theory as to the mode of ore deposition:—

The properties, with the exception of those in Quatsino sound and Great Central lake, present nearly identical conditions. The mineralisation occurs in or close to diabase dykes. Sometimes there is sufficient quartz in the fissure to make a quartz vein, but more often there is an entire absence of quartz, the vein-matter being the crushed material of the dyke. There appear to have been two periods of movement, the first in which the dykes were formed, when no mineralisation took place; the second period in which these dykes were shattered and twisted, when probably secondary dykes of a similar composition to the first series were injected into the fissures found by the movement. A careful examination of these deposits would lead one to the conclusion that mineralisation took place at this time, not as a secondary enrichment, but as a direct deposit by ore-bearing solutions from below. The solid mineral is seen to penetrate what were originally cavities, and to follow along old slip-walls, inside of which, as a rule, no mineral whatever is seen, as would be the case if segregation had occurred. The deposits are often of brecciated structure, the ore enclosing fragments of the original dyke-rock and only occasionally is it seen forming a part of the dyke, and then it would be accounted for as forming part of the second upheaval when the later dykes were formed. Mineralisation is found along fractured zones in these diabase dykes, and where these fractures contained cavities for the entrance of mineral-bearing solutions we now have ore-bodies, but where the ground is tight or shows only slight movement, little or no ore is found.

Chalcopyrite forms the principal mineral of value, while pyrrhotite is a common mineral, occurring both massive and mixed with pyrite and chalcopyrite, but carrying little or no value in itself. Arsenopyrite occurs in many of the properties and, as a rule, carries gold values.

While no geological map or extensive examination of this region has been made, the general country rock outside of the mineralised zones appears to be syenite, occurring often as mountains of great size and connected with a series of felspathic dykes which penetrate the older rocks.

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