BRITISH COLUMBIA DEPARTMENT OF MINES
HON. E. C. CARSON, *Minister* JOHN F. WALKER, *Deputy Minister*

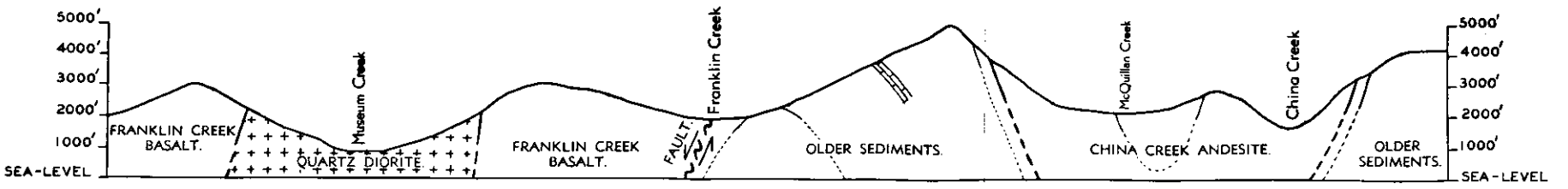
Geology and Ore Deposits of the China Creek Area

Vancouver Island, British Columbia

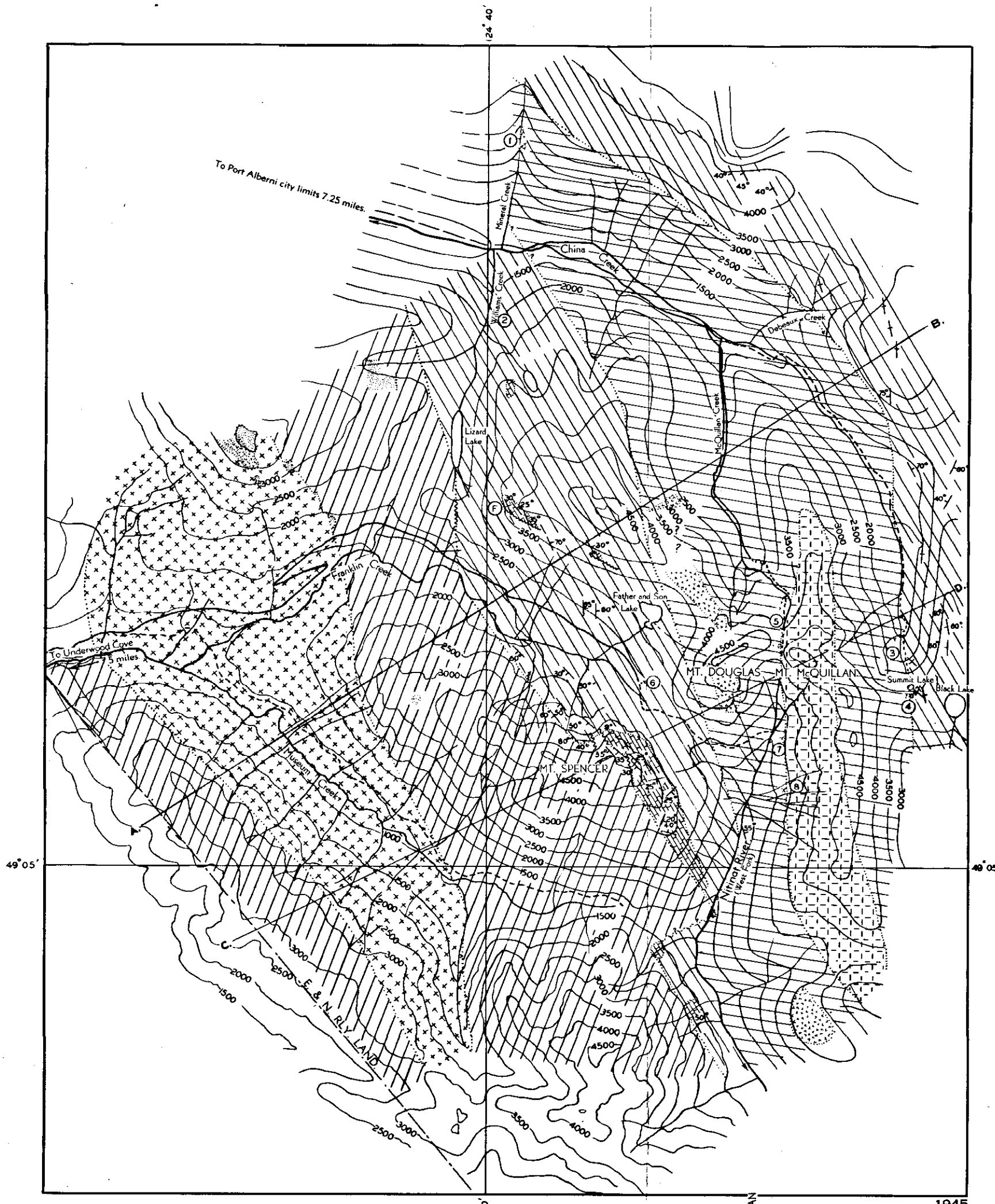
by
JOHN S. STEVENSON

1945

From Annual Report, 1944, Minister of Mines, British Columbia



Diagrammatic structure-section along line A–B.



LEGEND

YOUNGER SEDIMENTS AND INTRUSIVES

- Feldspar-hornblende porphyry.
- Cretaceous conglomerate, sandstone, and shale.

OLDER INTRUSIVES

- Feldspar porphyry.
- Quartz diorite.
- Diorite.

VOLCANICS

- Franklin Creek Basalt.
- China Creek Andesite.

OLDER SEDIMENTS

- Limestone, jasper, chert, tuff, and volcanic breccia.

Geologic boundary

Fault

Strike and dip of sediments

Fossil locality (F)

Adit

Prospect

Road

Trail

Contour interval 500 feet.

Magnetic declination 25° East.

Topography in part from information supplied by the Department of Lands, British Columbia, and in part by the writer.

Geology by John S. Stevenson, 1941. British Columbia Department of Mines.

Scale ½ 0 ½ 1 Miles

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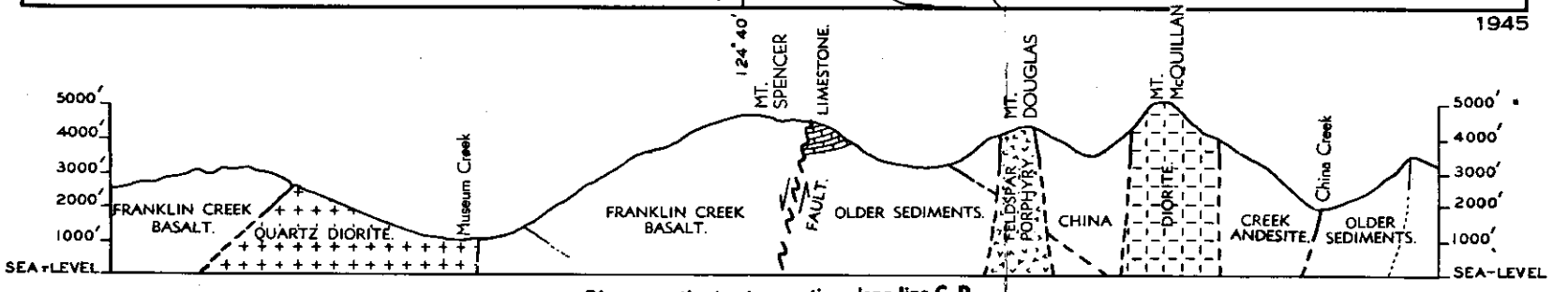

Diagrammatic structure-section along line C–D.

Geologic map of China Creek area. Scale 1 inch to 1 mile.

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GEOLOGY AND ORE DEPOSITS OF THE CHINA CREEK AREA, VANCOUVER ISLAND, BRITISH COLUMBIA.

(Latitude 49°, longitude 124° S.W.)

By John S. Stevenson.

INTRODUCTION.

The China Creek area includes 52 square miles of territory east of Alberni Canal. The city of Port Alberni, a deep-sea port at the head of the canal, is the nearest railroad-station. Access to the area is by truck-road from Port Alberni up China Creek or by boat down the canal to Underwood Cove and up Franklin Creek by truck.

PHYSICAL FEATURES.

The area comprises the rugged, mountainous country around the headwaters of China, Franklin (Hiwatches), and Museum Creeks, and the West Fork of the Nitinat River (Plate I., A and B), with Mount McQuillan (Plate II., A), elevation 5,200 feet, and Mount Spencer, elevation 4,900 feet, the two highest peaks. The sides of the valleys are steep and the bottoms narrow. Long ridges are absent, the general erosion surface being characterized by disconnected major and minor peaks. Timber-line lies between 4,000 and 4,500 feet, and small areas of alpine country and continuous rock-outcrop occur above timber-line. The stands of timber are heavy and consist of a typical West Coast growth of hemlock, balsam, and Douglas fir. Much merchantable timber has been logged from the more open valley-bottoms. Although the hillsides are densely wooded, the steepness of the slopes results in numerous rock bluffs and outcrops.

Drainage of the area is westerly to Alberni Canal by China, Franklin, and Museum Creeks, and southerly by Nitinat River through Nitinat Lake into the ocean.

Lakes are few and small. They include an upland-valley lake, Lizard Lake, and three glacial cirque lakes; namely, Father and Son, Summit, and Black Lakes.

PREVIOUS GEOLOGIC WORK.

The earliest report on the China Creek area was by Herbert Carmichael and may be found on page 1080 of the Annual Report, Minister of Mines, British Columbia, for 1893. This report is confined to short descriptions of the veins known at the time and to an account of the current mining activity. In 1895 Wm. J. Sutton mapped about 165 square miles of territory east of Alberni Canal, which included the entire area covered by the present report. The map and an accompanying report on the salient geologic features of the area appeared in the Annual Report of the Minister of Mines for 1895, pages 648–654. The map is on a scale of 60 chains to 1 inch with topography shown by hachures and the geology by printed rock-type names. In 1896, Wm. A. Carlyle, Provincial Mineralogist, in Bulletin No. 1 of the Department of Mines, British Columbia, described the properties close to Alberni Canal, including those on China and Franklin Creeks. The Geological Survey of Canada, Memoir 13, 1912, by C. H. Clapp, describes the geology of Southern Vancouver Island south-easterly from Alberni Canal and includes a geologic map on a scale of 6 miles to 1 inch. This map shows the general geology on China and Franklin Creeks.

Short property reports and brief references to prospecting have been published in the Annual Reports, Minister of Mines, British Columbia, and mention is made of these in the list of references following each property description in this report.

FIELD-WORK AND ACKNOWLEDGMENTS.

The writer spent ten weeks in the field in 1941 in topographic and geologic mapping. The topography of the area south-westerly from Franklin Creek had been previously mapped by photo-topography by the Topographic Division of the Survey Branch of the Department of Lands, British Columbia, on a scale of ½ inch to 1 mile with 100-foot contours. The topography of the area north-easterly from Franklin Creek was mapped in 1941 by the writer by plane-table methods on a scale of ½ mile to 1 inch with 500-foot contours. At that time the geology was mapped by traverses spaced mainly ½ mile apart but many were spaced closer than this. Because the country is mountainous with many creeks cut down to bed-rock, outcrops are abundant and give ample opportunity for geologic study commensurate with the scale of mapping.

The writer wishes to thank the officials of the Alberni Pacific Lumber Company, Limited, for supplying topographic maps of part of the area. Acknowledgments are given to the prospectors and mining operators of the district for their friendly co-operation and, especially, to the officials of the mining companies for their hospitality and for general information useful in the examination of their properties. The writer also gladly acknowledges the help of his field assistants, Alan Smith, Roy Deane, and Isaac Haale.

GENERAL GEOLOGY.

Intrusive and extrusive igneous rocks and sedimentary rocks occur in the area. On the basis of lithologic comparison with other rocks on Vancouver Island, the ages of which have been determined, the rocks in the map area are mainly Mesozoic in age. Fossils found in limestone (*see* below) indicate, however, that the older sediments are Upper Carboniferous or Permian. The younger sediments are lithologically similar to Cretaceous sediments found elsewhere on the island and are themselves also probably Cretaceous. The volcanic rocks may be referred to the Triassic Vancouver group. Scattered erosion remnants of some clastic sediments are referred to the Cretaceous Nanaimo series. Most of the intrusive igneous rocks are Jura-Cretaceous Coast Range intrusives, although some intrude Cretaceous sediments, and are therefore post-Cretaceous.

OLDER SEDIMENTS.

Two belts of older sedimentary rocks, mainly pyroclastics, are found in the area. One belt, from ¾ mile to 1½ miles wide, extends north-westerly from the eastern slopes of Mount Spencer past Lizard Lake. The other belt, about ¾ mile wide, extends northerly from Summit and Black Lakes to the north boundary of the area. The rocks in these two belts include limestone, jasper, chert, tuff, and volcanic and flow breccias. These rocks do not occur as a regularly stratified succession of beds but as lenses that pass north-westerly along the strike at about the same horizons, from one rock-type to another. The limestone occurs in a north-westerly-trending zone of discontinuous lenses, the largest of which (Plate II., B) is on Mount Spencer, with small lenses both north-westerly and south-easterly from that peak. The limestone is grey to buff in colour, and some of it is silicified and characterized by bands of cherty silica, 1 to 4 inches wide, alternating with buff-coloured limestone. The writer collected fossiliferous material from the limestone bluff, elevation 3,700 feet, north-east of Franklin Creek (*see* fossiliferous locality on geologic map, frontispiece). This material included crinoid disks and stems and a brachiopod. Dr. A. E. Wilson, of the Geological Survey of Canada, kindly examined this material and transmitted the following communication: "Crinoid disks and stems are not diagnostic, they occur at a number of horizons all through the Carboniferous and Permian, the *Spiriferella* is new. Its range is not known, but its development suggests Upper Carboniferous or Permian. More evidence is needed to be specific." Considerable red jasper is found along the strike of the limestone lenses and may represent silicified limestone. The chert is blue-green in colour, some of it is finely laminated and in part fragmental, and is

probably partly tuffaceous in origin. Some of the blue-green chert contains material that may be radiolaria but its extremely fragmental nature prevents accurate determination.* The tuffs weather greenish-grey and, where fine-grained, are usually well-banded. They are hornblende-andesite tuffs and, in the coarser phases, broken feldspar and hornblende crystals stand out prominently on slightly weathered surfaces. Some of the tuffs are schistose and are very similar to some of the Sicker schists found 40 miles south-easterly on Mount Sicker, near Duncan. The flow-breccia is a greenish-grey weathering rock similar to the tuff but of easily discernible coarser texture. The flow-breccia consists of angular fragments of volcanic material, 1 inch to 1 foot in diameter, in a matrix of lava; differential weathering has caused the fragments to be well outlined on weathered surfaces.

Volcanics.

Two north-westerly-trending belts of volcanic rocks are found in the area. A belt of older volcanic rocks extends north-westerly from the headwaters of the Nitinat River, down McQuillan and China Creeks and north-westerly to beyond Mineral Creek. These rocks comprise the China Creek andesite. A belt of younger volcanic rocks lies to the south-west of the older rocks and extends north-westerly from the Nitinat River, past the western slopes of Mount Spencer and north-westerly across Franklin Creek. These rocks comprise the Franklin Creek basalt.

China Creek Andesite.—The China Creek andesite is principally fine-grained, amygdaloidal andesite, most of which is dark green in colour but some is purple. Although not all the green andesite is amygdaloidal, all the purple andesite is amygdaloidal. Mineralogically the China Creek volcanics are mainly andesites, with either augite or hornblende or, in a few places, with both minerals. Some lenses of porcelain-white weathering, dark-grey chert, and red jasper are found intercalated with the andesite. The China Creek andesite overlies the older sediments and is folded with the sediments in a synclinal belt between the two belts of older sediments (*see* structure-sections accompanying geologic map, frontispiece).

Franklin Creek Basalt.—The Franklin Creek basalt is dark green to almost black in colour and, where well weathered, is strongly rust-coloured. Most of the basalt consists of pillow-lava with widespread quartz and a little actinolite and epidote occurring as interstitial material in the angles between the pillows. Amygdaloidal lava is scarce, and areas of chert and purple lava such as are found in the China Creek andesite have not been seen in the Franklin Creek basalt. Mineralogically the rock is an augite basalt with remarkably fresh, unaltered labradorite-feldspar.

Older Intrusives.

The intrusive igneous rocks include both acid and basic rocks occurring as dykes, sills, and stocks.

Diorite.—Numerous fine-grained diorite sills, ranging from 1 foot to 50 feet in thickness, and larger, irregular bodies up to 500 by 1,000 feet across, intrude the sediments near the *Thistle.*

An elongated area of diorite, 5 miles long by ½ mile wide, extends northerly and southerly from Mount McQuillan. Diabase dykes up to a few feet thick cut this diorite. Much of the diorite is a fracture-breccia (Plate III., A and B) and consists of angular fragments of diorite, replaced and rimmed by more acidic material. The sequence of events in the area of diorite north and south of Mount McQuillan and in the area of diorite sills around the *Thistle* appears to have been first, the intrusion of a large central mass of coarse diorite along a north-south zone of weakness in the China Creek andesite and second, the intrusion of smaller peripheral bodies of fine diorite mainly as sills into the older sediments around the *Thistle.* Brecciation of the main

* V. J. Okulitch, personal communication.

diorite body followed, probably as a result of a volume decrease consequent on both the change from a fluid magma to a crystalline rock and on the contraction of the rock body while cooling. Infiltration of acidic material from the same deep-seated source, from which the diorite was differentiated, followed and sealed the breccia, rimming the diorite fragments and forming small acidic dykes.

Quartz Diorite.—Hornblende quartz diorite occurs in a tongue-shaped area that extends south-easterly from a longer mass outside the map-area, across Franklin Creek to the South Fork of Museum Creek. The rock in the main mass is uniform both in texture and in composition. The contact-zone is marked by inclusions of basalt in different stages of absorption by the quartz diorite. This zone is usually narrow, but in a few places reaches a width of 100 feet.

Feldspar Porphyry.—Three small stocks of massive feldspar porphyry are strikingly aligned along a course that trends north 15 degrees west. These stocks are accompanied by many sills and dykes of feldspar porphyry which intrude the volcanics adjacent to the stocks. The feldspar porphyry consists principally of feldspar with but little quartz, and no hornblende or other dark mineral.

Younger Sediments and Intrusives.

Scattered erosion remnants of gently-dipping conglomerate, sandstone, and shale are found towards the north-west boundary of the area. These rocks, which are younger than any of those previously discussed, probably belong to the Nanaimo series of Cretaceous age.

Sills of hornblende feldspar porphyry, from 1 foot to 40 feet thick, intrude Cretaceous sediments that cap the flat-topped peak north of Franklin Creek and west of Lizard Lake.

Structural Geology.

Because of the lenticular habit of the sediments and massive nature of the lavas, the writer could not identify any continuous, easily recognizable marker-horizons to serve in unravelling the details of the complex structure of the rocks in the map-area.

Folds.—The rock units trend from northerly to north-westerly, and, where attitudes were determinable, also range in strike from northerly to north-westerly. Since the rocks are strongly folded, the dips vary considerably, and range from south-westward to north-eastward. Drag-folds are very common in the more incompetent members of the sedimentary group of rocks.

The major structures (*see* structure-sections accompanying geologic map, frontispiece) appear to be a north-westerly-trending anticline and accompanying syncline, which plunge 10 to 30 degrees south-easterly. The anticlinal axis is believed to extend from the eastern slopes of Mount Spencer north-westerly to Lizard Lake, and the synclinal axis to extend north-westerly along the McQuillan Creek valley.

Faults.—Faults and related shear-zones are common. Some are short but others are long and of major importance.

A shear-zone along which considerable movement has occurred extends along the west contact of the diorite that extends southerly from Mount McQuillan. This shear-zone has considerable economic importance, as mineralized quartz veins are found in and very close to it.

A major fault occurs along the contact between Franklin Creek basalt and limestone on Mount Spencer, and continues north-westerly, marking the contact between the basalt and the older group of sediments. The fault dips steeply south-westward and is normal, so that the movement along it has been such that the Franklin Creek basalt on the west has dropped at least 3,000 feet with respect to the adjacent limestone and sediments on the east. (*See* section B-C accompanying geologic map, frontispiece.)

A major fault south of Lizard Lake has offset the north-westerly extension of sedimentary rocks in that section about 4,000 feet southward. A smaller fault is

probably responsible for offsetting the south-easterly extension of limestone across the West Fork of the Nitinat River.

ORE DEPOSITS.

History.

Small-scale placer-mining was carried on as early as 1862, principally by the Chinese, on China Creek and the creek is reported to have been staked for hydraulic leases for 12 miles in the 1890's. The total placer production is known to exceed $40,000. The gold-quartz veins in the area were found subsequent to the early placer operations.

Prospecting was active between 1892 and 1900, and by 1895 gold-quartz veins had been found and staked on Mineral Creek, in King Solomon basin at the head of McQuillan Creek, and in the Golden Eagle basin at the head of China Creek. In 1898 an 8-stamp mill was built on Mineral Creek to treat ore from the veins on the Consolidated Alberni (Vancouver Island Gold Mines, Limited), property, but only two clean-ups were made.

Activity had died down by 1900 and little was done in the area until 1933 when Vancouver Island Gold Mines, Limited, began to explore the veins on the Consolidated Alberni ground on Mineral Creek. This company worked for three years and built a 35-ton pilot-mill in 1936, but difficulties of operation forced it to close down all work the same year. That same year, however, gold-quartz veins above King Solomon basin were opened up by the Havilah Gold Mines, Limited, and a small quantity of ore was produced between then and 1939.

Between 1938 and 1942 a small tonnage of high-grade ore was shipped from the *Thistle* on Franklin Creek.

During 1941 active prospecting was carried on by Pioneer Gold Mines of B.C., Limited, and by Bralorne Gold Mines, Limited, on the *Black Panther* and *Black Lion* respectively, at the headwaters of the West Fork of the Nitinat River. Since then there has been little activity other than prospecting in the area, although it is understood (February, 1945) that a company has recently been formed to develop the *Black Panther* further.

Production.

Records show that two properties, those of Vancouver Island Golds, Limited, and Havilah Gold Mines, Limited, have produced 1,565 tons of gold ore containing 562 oz. of gold and 1,386 oz. of silver, and that one property, the *Thistle*, has produced 6,867 tons of gold-copper ore containing 2,667 oz. of gold, 1,667 oz. of silver, and 626,556 lb. of copper.

General Features of the Deposits.

The deposits are mainly gold-quartz veins in the China Creek andesite. The vein-quartz contains variable amounts of the sulphides, pyrite, galena, and sphalerite, and small quantities of gold. The gold content of the veins is roughly proportional to the sulphide content, and samples of heavy sulphides have assayed several ounces of gold per ton.

Gold-copper ore is found in a high-temperature replacement deposit on the *Thistle*.

The deposits lie in a belt 1½ miles wide that follows the general trend of a line of feldspar-porphyry stocks and dykes. Those deposits towards the south end of the belt lie close to a north-south area of diorite. This diorite is badly fractured and the resulting breccia sealed by granitic material. It is probable that the same deep-seated source gave rise to the diorite, the feldspar porphyry, the granitic material that seals the diorite breccia, and, as late products of differentiation of the magma, the veins and replacement deposits.

Vancouver Island Gold Mines, Ltd. (Consolidated Alberni Gold Mining Co.).

Vancouver Island Gold Mines, Limited, care of W. C. Mainwaring, B.C. Electric Railway Company, Vancouver, owns and has most recently worked the property of the old Consolidated Alberni Gold Mining Company, with workings between 2,600 and 2,800 feet elevations on Mineral Creek, a tributary of China Creek. The property is reported to include the following Crown grants: *Victoria* (Lot 205G), *Alberni* (Lot 206G), *Chicago* (Lot 207G), *Warspite* (Lot 208G), *Missing Link* (Lot 214G), *Last Dollar* (Lot 216G), *Champion* (Lot 217G), and *Last Chance* (Lot 220G).

A motor-road leads from Port Alberni for 9½ miles up China Creek to Mineral Creek, elevation 1,100 feet. Thence a switchback caterpillar-road leads for 1½ miles to the mine camp, elevation 2,600 feet. The workings are on the hillside above and close to the camp.

The property was worked in the late 1890's by the Consolidated Alberni Gold Mining Company, when an 8-stamp mill was built, and again between 1933 and 1936 when it was operated by Vancouver Island Gold Mines, Limited. The latter company built a 35-ton pilot-mill in 1936, but because of operating difficulties milled only a few tons of ore. Work on the property was suspended in 1936. Total production has amounted to 403 tons of ore, containing 303 oz. of gold and 52 oz. of silver.

The rocks on the property include andesitic flows and tuffs, strike north, and dip 25 degrees westward. "Granitic" rocks are reported to have been found a short distance west of the property.

Three quartz veins, two of which strike north-westerly and dip from 40 to 55 degrees south-eastward, and the third which strikes north and dips 80 degrees eastward, have been developed and mined by five drift-adits. The veins in general range in width from a few inches to 12 inches, but occasional sections as much as 4 feet in width are found. The vein-matter is quartz with a small amount of pyrite and occasionally a little free gold.

The quartz veins were developed early in the history of the property, in the late 1890's, and between 1933 and 1936 a strongly carbonatized shear-zone, 40 feet wide, was prospected in Mineral Creek by stripping, open-cuts, and a few short adits. This zone contained many small stringers of quartz that carried a little gold but not enough to make mineable ore.

The geology and workings have been described more fully by the writer in the Annual Report of the Minister of Mines, British Columbia, 1936, pages F 25 to F 30. No work has been done on the property since then.

The property was examined by the writer in 1936 and 1941.

References: Annual Reports, Minister of Mines, B.C. (*see* Consolidated Alberni Gold Mining Co.)—1896, 1, 504; 1897, 566, 569; 1898, 1132, 1160; 1899, 151, 796; 1904, 250; (*see* Vancouver Island Gold Mines, Ltd.)—1934, A 28, 29, F 2; 1936, F 25.

Regina.

The *Regina* group comprises the following Crown grants: *Regina No. 1* (Lot 57G), *Regina No. 2* (Lot 55G), *Regina No. 3* (Lot 54G), *Regina No. 2 Extension* (Lot 94G) and the *Barney Barnato* (Lot 49G). The *Regina No. 2* and *Regina No. 2 Extension* are in good standing and owned by Emelio Marillia, of Port Alberni; the other claims have reverted to the Crown and have been leased to various people.

The workings, between elevations 1,850 and 2,550 feet, are in the heavy timber above the logging slash on the south side of China Creek and from 1,000 feet to 2,000 feet east of Williams Creek, a small stream flowing northerly into China Creek almost opposite Mineral Creek. At present they are most easily reached by following an abandoned and overgrown logging-incline of the Alberni-Pacific Lumber Company, up the slope opposite Mineral Creek, to an elevation of 1,880 feet; thence through the bush easterly for 125 feet to the first working, a short adit at an elevation of 1,860 feet; from a point 40 feet above this working a trail winds easterly for 800 feet to an

old cabin at an elevation of 2,050 feet. This cabin was formerly connected with China Creek by a pack-horse trail, but this is now overgrown and in the logged-off area is obscured by slash.

Near the workings the hillside is of uniform steepness, approximately 25 degrees, and heavily wooded with trees, which, although not merchantable as sawlogs, would be suitable as mine-timber.

Various claims in the *Regina* group were first Crown granted in 1898 and 1899 to the Alberni Gold Development Syndicate. All the workings and cabin are very old, probably dating from the late 1890's, the only recent work being the cleaning-out of the inclines-shaft and possibly some digging in the adjacent open-cut.

Tight quartz-sulphide lenses in green andesite have been explored by the various workings but nothing of value is as yet indicated. Some of the andesite is strongly silicified and pyritized.

The previously mentioned adit at an elevation of 1,860 feet has been driven north 55 degrees east for 15 feet in highly silicified and leached andesite which has so much disseminated pyrite and ankeritic carbonate that the weathered rock contains an abundance of limonite. The rusty outcrop exposed at an elevation of 2,100 feet on the logging-incline, and locally referred to as the " Big Showing," consists of similarly altered and pyritized andesite. A large bulk sample of highly oxidized material assayed: Gold, 0.64 oz. per ton; silver, trace.

A shaft, 100 feet south-westerly from the camp, at an elevation of 2,100 feet, was full of water at the time of the examination. The shaft is at least 30 feet deep and was sunk on a tight shear, partly filled with quartz, that strikes north 50 degrees east and dips 20 degrees south-eastward. In the north-east wall of the open-cut leading to the incline-shaft, a small lens and accompanying veinlets of quartz are exposed. In the south-west wall, close to the floor of the incline, there is a zone of andesite that has been highly silicified over a width of 25 inches and contains a 4-inch quartz lens and numerous related stringers; pyrite and chalcopyrite accompany the quartz; this zone is not continuous for more than 5 feet along the strike. Samples taken across the 4-inch quartz lens assayed only a trace in gold and 1.0 oz. per ton in silver; and a 25-inch sample, including quartz veinlets and sulphides, assayed: Gold, 0.02 oz. per ton; silver, 0.8 oz. per ton. A grab sample of quartz containing considerable pyrite, chalcopyrite, and galena from the dump assayed: Gold, 0.66 oz. per ton; silver, 14.0 oz. per ton.

An adit, at 2,300 feet elevation and 850 feet south of the incline, has been driven south 20 degrees east for 15 feet. The adit is now largely caved, but the exposed part of the face showed a 2-foot length of a 2-inch quartz-chalcopyrite-galena veinlet; and in the east wall at the portal a silicified zone 2 feet wide contains concentrations of pyrite. The zone strikes approximately north 70 degrees east and dips 25 degrees southward.

At 2,370 feet elevation, 100 feet south 25 degrees east from the last working, an adit has been driven southerly for 94 feet along a shear striking north 11 degrees west and dipping 70 degrees eastward. The shear contains approximately 1 foot of gouge and crushed andesite and, over a width of 1 foot in the hanging-wall, replacement veinlets of quartz and pyrite. A sample of this material contained, however, only traces of gold and silver. Twenty-five feet from the portal the shear cuts a sheeted zone 1 foot wide, strike north 80 degrees east, and dip 25 degrees southward. This zone, which contains several 2-inch quartz veinlets and a little pyrite, is seen only in the east wall of the adit. The main shear ends in the face against another shear which is barren and strikes east-west and dips 60 degrees southward. The rock in the working is dark green andesite, mostly massive, but sheared in the crushed zones.

At 2,450 feet elevation, 225 feet south 25 degrees west from the last adit, an adit has been driven south 45 degrees east for 20 feet from a pit at the portal 5 feet deep. The only mineralization seen was disseminated pyrite in highly silicified greenstone

and a small quartz veinlet at the face; a sample of the pyritized rock and quartz veinlet contained only traces of gold and silver.

One hundred and twenty-five feet south 25 degrees west from the adit there is a caved cut, and 75 feet westerly from this a second cut, showing similarly mineralized rock.

At 2,500 feet elevation, 75 feet north 30 degrees west from the last cut, the longest adit on the property has been driven south 17 degrees east for 33 feet, south 20 degrees east for 64 feet, and south 47 degrees east for 47 feet to the face. For 95 feet from the portal this working has been driven along a narrow shear which strikes north 30 degrees west and dips 65 degrees north-eastward. The walls consist of silicified andesite containing disseminated pyrite and occasional quartz stringers, and at 90 feet from the portal a small lens of barren quartz. At 97 feet from the portal a 4-inch lens of barren quartz and chlorite strikes north 50 degrees east across the adit and dips 30 degrees south-eastward. Unmineralized andesite extends from here to the face.

No production has been reported from the property.

This property was examined by the writer in July, 1936.

References: Annual Report, Minister of Mines, B.C.—1898, 1197; 1930, 291.

Golden Eagle.

The *Golden Eagle* property is reported to comprise the following contiguous Crown grants held in care of the Canada Trust Company, Victoria, B.C.: *Apex* (Lot 99G), *Skyline* (Lot 100G), *War Lion* (Lot 152G), *Conqueror* (Lot 153G), *Majestic* (Lot 154G), *Empress of India* (Lot 155G), *I.X.L.* (Lot 156G), *Golden Eagle* (Lot 198G), and *Ockolona* (Lot 199G). The *Lakeview* (Lot 151G) is a separate Crown grant, also held in care of Canada Trust Company, that is a considerable distance from the above group of contiguous claims and was not tied to them by the original Crown-grant survey.

The writer did not determine the exact area covered by these claims. The long time that has elapsed since the claims were surveyed for Crown grant and the open nature of the country make it impossible to determine the exact boundaries of the claims without an instrument survey. It is possible that some of the showings described under the *B. and K.* group are on *Golden Eagle* ground, which see.

The *Golden Eagle* workings are between elevations of 2,270 and 2,990 feet at the head of China Creek, about 15 miles from Port Alberni. They are near timber-line, at the base of steep, rocky bluffs that extend up to the eastern peak of Mount McQuillan, about 2,000 feet above.

The property may be reached from Port Alberni by motor-road up China Creek for 12½ miles to the mouth of McQuillan Creek; thence, by a pack-horse trail that follows an abandoned logging-railroad and the remains of the old mine wagon-road for 3 miles to the mine cabin. The former camp buildings have long since collapsed and present cabin is in disrepair. The mine-workings are about ½ mile southerly up-stream beyond the cabin.

The *Golden Eagle* vein was found and staked in the fall of 1892 by prospectors who pushed up-stream beyond the Chinese placer-workings lower on the creek in search of the source of the placer gold. By 1895 the four drift-adits on the vein had been driven and in 1896 the long, low-level adit was driven from a point beyond the reach of destructive snowslides. This latter adit, although driven for 2,100 feet, never intersected the vein.

No production has been reported from the property.

Prospecting has been done on a quartz vein, strike north 30 degrees east and dip 65 degrees south-eastward, that cuts a small intrusive mass of feldspar porphyry. The outcrop area of the porphyry measures 200 feet in an east-west direction and more than 500 feet in a north-south direction. The vein ranges from a few inches to 5 feet in width and has been traced by outcrops for a strike length of about 400 feet and a vertical distance of 325 feet. The vein-matter consists mainly of ribbon-quartz and pyrite, with small amounts of other sulphides scattered through the quartz.

The writer did not take any samples of the vein-matter, but assays up to $103 per ton in gold from well mineralized material have been reported (Annual Report, Minister of Mines, British Columbia, 1894, page 773).

The workings consist of one long exploratory crosscut, and four short drifts on the vein.

The crosscut, elevation 2,270 feet, was driven south-westerly for 2,100 feet and is in fine-grained andesite throughout its length. At 130 feet from the portal a cross-working was driven 60 feet south-easterly, and at 1,000 feet from the portal a cross-working was driven north-westerly for 85 feet. These workings intersect a few small stringers of unmineralized quartz but do not cut any material that resembles the main vein of the upper adits, in attitude or vein-matter.

Four short drifts have been driven on the main vein.

No. 1 drift, elevation 2,675 feet, 1,200 feet up-stream southerly from the cross-cut adit, has been driven south 30 degrees west for 45 feet on the vein which is 5 feet wide at the portal and 3 feet wide at the face.

No. 2 drift, elevation 2,790 feet and 70 feet south-westerly from No. 1, has been driven south-westerly for 65 feet on the vein. The vein-matter consists of 2 feet of ribbon-quartz that contains a small amount of sulphides.

No. 3 adit, elevation 2,870 feet and 60 feet south-westerly from No. 2, has been driven 46 feet south-westerly on the vein. The vein is 3 feet wide at the portal, narrows to 2½ feet half-way in and, 10 feet back from the face, it splits, one branch, 3 inches wide, going south-westerly to the face, and the other branch, 1 foot wide, going westerly into the wall.

No. 4 adit, elevation 2,990 feet and 200 feet south-westerly from No. 3, has been driven 22 feet at south 42 degrees west and 15 feet at north 60 degrees west to the face. At 15 feet from the face a working has been driven 12 feet south-westerly. At the portal the vein consists of a 2-foot shear-zone with a few stringers of quartz, but both the shear and vein-matter narrow to a single unmineralized shear 12 feet from the portal.

The rock in these four drift-adits is feldspar porphyry.

This property was examined by the writer in September, 1941.

References: Annual Report, Minister of Mines, B.C.—1893, 1080; 1894, 773; 1895, 651; 1896, 556, 557; 1897, 566; 1898, 1132; 1899, 607, 779, 785; 1901, 1190; 1902, 230, 257.

B. and K.

This group consists of the *B. and K. Nos. 1* to *6*, staked in 1938, the *Panorama No. 1* staked in 1939, and the *I am Alone* staked in 1940, belonging to the estate of Angus Beaton (deceased).

The *K.C. Nos. 1* to *4*, and *B.C. Nos. 1* and *2* mineral claims, staked in 1940 and owned by Ed. Keisig, of Alberni, are adjacent on the south to the *B. and K.* group and have been prospected in conjunction with that group.

These claims have not been surveyed and their exact position relative to the adjacent *Golden Eagle* group is not known. Some of the showings described in this report may therefore be on *Golden Eagle* ground, which see.

These claims are on the divide between China Creek and the East Fork of the Nitinat River, and extend from Summit Lake, the source of China Creek, southerly for several thousand feet along the eastern slopes of the ridge between the West and East Forks of the Nitinat River.

With the exception of a small amount of relatively flat ground around Summit Lake, the slopes are steep and consist mainly of rock bluffs and intervening grassy areas with clumps of small evergreens.

No production has been reported from the property.

The camp cabin and showings at Summit Lake are reached from the *Golden Eagle* cabin by a climb of 1,500 feet along a steep and narrow foot-trail 1¼ miles long. The workings on the hillside above the lake are reached by poorly-defined foot-trails.

The showings consist of many widely scattered, narrow quartz veins in tuffs and basalt. The veins range from a knife-edge to 8 inches in width and consist mainly of quartz with small amounts of pyrite. The richest vein found consists of quartz with abundant banded sulphides.

At the north end of Summit Lake three small veins have been prospected by trenches and strippings. The widest of these is exposed in a cross-trench 130 feet north-easterly from the cabin and in a small pit 40 feet northerly from the trench. This vein consists of a shear-zone with a maximum width of 8 feet, which contains three quartz stringers ranging from 1 inch to 8 inches in width. The quartz does not carry any easily recognizable amount of sulphides. The shear-zone strikes northerly along the contact of purple, amygdaloidal lava on the west and light green tuffs and black chert on the west.

A group of three open-cuts, beginning at a point 175 feet northerly from the cabin and extending 70 feet farther north, expose a leached quartz vein from 2 to 8 inches thick, strike north-westerly and dip 20 degrees south-westward.

At the south end of the lake, between 400 and 500 feet southerly from the cabin, a group of veins has been exposed by trenching.

One vein, strike north 10 to 20 degrees west and vertical, has been exposed by four trenches over a length of 100 feet. This vein is 8 inches wide and consists mainly of quartz with very little pyrite.

Another vein, 20 feet easterly from the first, has been exposed by two open-cuts in a length of 60 feet. This vein, strike north 30 degrees east and vertical, is only 2 inches wide and consists mainly of quartz.

A quartz vein, strike north 25 degrees east and vertical, and 2 to 8 inches wide, is exposed in the bed of a northerly flowing creek where the creek flows past the north end of the workings. Two samples from this vein assayed: Gold, 2.56 oz. and 2.26 oz. per ton respectively. Fifteen feet farther up-stream a 6-foot zone of quartz stringers is exposed. These stringers strike north-easterly and range from 1 to 5 inches in width.

Two small stringers of quartz have been found 400 and 520 feet farther up-stream.

The rocks in the workings at the south end of the lake are light greenish tuff with small areas of dense, black chert, all of which strike north-westerly and are vertical. Close to the veins the tuffs are strongly carbonatized by ankeritic carbonate and weather a buff colour.

A quartz-sulphide vein, known as the "high-grade vein," is exposed ¾ mile south-westerly from Summit Lake, at an elevation of 4,500 feet and within 200 feet of the top of the ridge. There is some doubt as to whether this vein is on the *B. and K.-K.C.* ground or *Golden Eagle* ground. The vein, strike north 4 degrees west and dip 65 degrees westward, has been exposed by five open-cuts for a length of 130 feet. The vein, 5 to 8 inches wide, consists of both ribbon- and comb-quartz and abundant sulphides. A sample across 5 inches of this vein-matter near the north end of the vein assayed: Gold, 3.84 oz. per ton; silver, 3.2 oz. per ton; copper 0.06 per cent. Towards the south the vein pinches to a shear and towards the north it goes under heavy overburden and has not been prospected. The wall-rock is dark green andesite.

A striking feature of the rocks on the hillside is a northerly trending zone of strongly carbonatized andesite that ranges from 6 to 25 feet in width. Because of the iron in the carbonate, the rock in the zone of alteration weathers a strong buff colour.

Near the south end of this zone, about ¾ mile south of the "high-grade vein," two open-cuts at elevations 3,340 and 2,270 feet in the bed of a creek have been driven on a small amount of pyrite, galena, and sphalerite contained in narrow veinlets in the carbonatized rock.

Between the "high-grade vein" and Summit Lake, at an elevation of 3,820 feet, an open-cut has been driven 15 feet north along two parallel shears 18 inches wide, on either side of a 6-foot feldspar-porphyry dyke. A few nodules of quartz, mineralized

with galena and pyrite, were found in the shears; a sample across the east shear of such material assayed: Gold, 0.82 oz. per ton; silver, 0.7 oz. per ton.

There are no previous published descriptions of the *B. and K.* group and adjacent claims.

The property was examined by the writer in September, 1941.

Havilah Gold Mines, Ltd.

This company, in the name of Herbert F. Hewitt, liquidator, holds the *Storm Nos. 1* to *4* mineral claims under the "Free Miners' Exemption Act." These claims are at the head of McQuillan Creek and are reported to include the ground mined by the company during the period of its operations between 1936 and 1940.

The workings are reached by motor-road from Port Alberni up China Creek for 12½ miles to the mouth of McQuillan Creek; thence for 2½ miles to a base camp, elevation 2,400 feet, at the head of the creek. From the base camp a pack-horse trail, ¾ mile long, leads to the mine camp, elevation 3,400 feet. During the period of active mining the company operated a high-line tram for ore and supplies between the base camp and the mine camp.

The main workings are on the Gillespie vein between elevations of 3,400 and 3,611 feet on the west side, and near the mouth, of a northerly-trending cirque. The upper workings, not so extensive as the lower, are on the Alberni and McQuillan veins between elevations of 4,200 and 4,370 feet and are 1,700 feet southerly by trail up the cirque from the lowest adit on the Gillespie vein. The workings on the Alberni and McQuillan veins and on a vein on the easterly side of the cirque have been described by the writer in the Annual Report, Minister of Mines, B.C., 1936, pages F 32–33. As very little work has been done since that time on the Alberni and McQuillan veins the reader is referred to the 1936 report.

Although the McQuillan vein was prospected by an open-cut and short adit as early as 1895, most of the work on the vein was done between 1936 and 1940 by Havilah Gold Mines, Limited. The work on the upper showings was done in 1936 and most of that on the lower showings—namely, the driving of the three drift-adits—was done in 1938 and 1939.

Production from the property has been as follows: In 1936, 7 tons containing 7 oz. of gold and 6 oz. of silver; in 1939, 1,039 tons containing 244 oz. of gold and 1,328 oz. of silver.

The hillside in the vicinity of all the workings is very steep. The lower slopes are covered with scrub fir and snow-brush and the upper slopes with heather and large talus boulders.

The Gillespie vein strikes north 8 degrees east and dips from 65 to 80 degrees eastward, but between Nos. 1 and 3 adits it dips, on the average, 75 degrees eastward.

The vein-matter consists of ribbon-quartz (Plate IV., A) and a moderate amount of sulphides. The quartz ribbons are separated by thin laminæ of sheared rock which is commonly replaced by the sulphides. The ribboning of the quartz is made more striking by the marked tendency of the vein to slab-off along the partings of sheared rock. Angular fragments of wall-rock, now largely carbonatized and replaced by mariposite and sulphides, may be recognized in the vein in places. Veinlets of late comb-quartz cut the ribbon-quartz in a few places. The sulphides are mainly pyrite, with small amounts of arsenopyrite, sphalerite, and galena.

Although the vein was not systematically sampled, thirteen samples were taken from different places along the vein in the three adits. Assays ranged from 0.02 to 0.4 oz. gold per ton over widths ranging from 6 to 33 inches.

The wall-rock consists of lava, of andesitic composition. It is massive, fine-grained, amygdaloidal in places, and mainly dark green in colour; however, purple amygdaloidal lava is found on the west wall of the lower adit for a distance of 500 feet back from the face.

The workings on the Gillespie vein consist of three drift-adits, the 800 adit at 3,600 feet elevation, the 900 adit at 3,500 feet elevation and 270 feet north 15 degrees east from the 800 adit, and the 1,000 adit at 3,400 feet elevation and 250 feet north 14 degrees east of the 900 adit.

The 800 adit has been driven south 2 degrees west for 275 feet. From the portal to a point 180 feet in the vein ranges from 4 to 16 inches wide. An arithmetical average of fourteen equally-spaced measurements gave an average vein-width in this section of 11 inches. At 180 feet the vein is cut by a diagonal fault of unknown displacement beyond which, to 220 feet, no vein has been found. From 220 feet to the face, a 2-inch quartz-pyrite vein, which the writer does not think is the main vein, is found in the back of the drift. This vein contrasts with the main vein in being much narrower, in lacking the characteristic ribboning, and in being vertical rather than dipping perceptibly eastward.

The 900 adit has been driven south 8 degrees west for 540 feet, and 160 feet from the portal a raise has been driven to the surface. From the portal to a point 125 feet from the face the vein ranges in width from 4 to 38 inches, with an arithmetical average based on twenty-three approximately equally-spaced measurements of 15 inches. At 125 feet from the face the vein is faulted and displaced an unknown distance. As in the 800 adit, only a 1-inch quartz-pyrite stringer is found in the back from the fault to the face and, for the same reasons given in describing the vein in the 800 adit, the writer does not think this stringer represents the faulted continuation of the main vein. In the 900 adit the vein splits at a point 90 feet from the portal and a branch 4 to 14 inches wide leads southerly from the main vein and goes into the east wall at 130 feet. At 160 feet from the portal a parallel vein comes into the east wall and follows along this to 300 feet, where it turns into the east wall again. This vein ranges from 2 to 4 inches in width, and is mainly ribbon-quartz with a small amount of sulphides.

The 1,000 adit has been driven south 8 degrees west for 860 feet. At a point 90 feet from the portal a crosscut has been driven westerly for 30 feet and at 550 feet a raise has been driven to the two upper adits.

In the 1,000 adit the vein ranges in width from 2 to 24 inches with an arithmetical average, based on thirty approximately equally-spaced measurements, of 9 inches. At a point 190 feet from the face the vein-shear is seen. It may be noted that this narrowing is coincident with the appearance of purple amygdaloidal lava on the west side of the drift, the usual dense green lava still being on the east side.

The writer last examined the Havilah property in September, 1941.

References: Annual Report, Minister of Mines, B.C.—Under *King Solomon*, 1893, 1080; 1894, 773; 1895, 652; and under *Havilah*, 1936, F 30; 1939, A 40, 88.

Thistle.

This property consists of five Crown grants, the *Thistle* (Lot 91G), the *Pansy* (Lot 92G), the *Primrose* (Lot 93G), the *Rose* (Lot 95G), and the *Jumbo* (Lot 97G), staked between 1896 and 1899. The claims are owned by United Prospectors, Limited, 604 Bank of Toronto Building, Victoria, B.C.

The property is at the head of Franklin (Hiwatches) Creek, with the mine camp at an elevation of 2,150 feet and the workings between elevations of 2,460 and 2,750 feet. The mine camp may be reached from Underwood Cove, 8 miles down the Alberni Canal from Port Alberni, by 12 miles of motor-road. The ore-bunkers are ½ mile beyond the camp by a good road.

The workings are on a very steep (50 to 65 degrees as determined by clinometer) but heavily wooded hillside that slopes south-westerly into the headwaters of Franklin Creek. The hillside is covered with a good stand of fir and hemlock, much of it of sawlog size; there is little underbrush.

The *Thistle* was staked in 1896 and by 1899 the 300 adit had been driven 90 feet and the 500 adit 65 feet. Access to the property was still by trail in 1901 when a San

Francisco syndicate took over the property, did considerable development-work and undertook to build a wagon-road from Alberni Canal to the mine.

Although the syndicate had 200 men working for about two months, bad weather prevented their building the road for more than 6 of the 12 miles from the beach. Very little mining was done from then until 1938, when the property was acquired by the United Prospectors, Limited, of Victoria. This company completed the road to the mine, following, in part, abandoned logging-railroads, and drove the adits to their present faces.

United Prospectors, Limited, or its lessees and later, an affiliated company, the Vancouver Island Diamond Drilling and Exploration Company, Limited, also of Victoria, shipped 6,867 tons of ore containing 2,667 oz. of gold; 1,667 oz. of silver; and 626,556 lb. of copper between 1938 and 1942. The latter company ceased operations at the *Thistle* in July, 1942, and since then the property has been idle.

The *Thistle* deposit consists of two chalcopyrite replacement ore-bodies found along two shear-zones about 130 feet apart. These shear-zones are in a band of altered limestone, 200 feet wide, which strikes north 20 degrees west and dips 60 to 75 degrees south-westward. The limestone is enclosed on three sides, north-east, south-east, and south-west, and in part underlain, by fine-grained diorite. The limestone has been largely replaced by fine-grained diopside, resulting in a dense, light-green rock that may be referred to as diopside-rock. Although some small remnants of crystalline limestone, from a few inches to a few feet in maximum diameter, escaped replacement by the diopside, many of them were later replaced by the ore-minerals.

Strong faults are found along the ore-bodies and extend downward beyond the limits of the known ore.

The ore consists mainly of chalcopyrite and some pyrite in a gangue of dirty grey calcite and a little quartz. Very fine magnetite is dispersed through much of the calcite; some of the magnetite has been oxidized to hematite, giving a dull reddish colour to the calcite which encloses it.

The workings, extending north-easterly up the steep hillside from the ore-bunkers at the end of the road, include four adits: the 500 adit, elevation 2,525 feet; the 300 and 300A adits, elevation 2,650 feet; an upper short adit, elevation 2,750 feet; and two large glory-holes, one between the 500 and 300 adits, and another one between the 300 and the uppermost adits. In addition, several open-cuts have been dug above the 300 levels.

The 500 adit, 65 feet above the road, has been driven north 69 degrees east for 45 feet as a crosscut from the face of which a drift has been driven north 16 degrees west for 57 feet and another south 10 degrees east for 52 feet. These drifts follow a well-defined fault that is 2 feet wide at the northern face but narrows to 1 inch at the southern face. This fault is unmineralized and contains only crushed wall-rock and gouge. Seventeen feet back from the south face, a short branch drift has been driven south 45 degrees east for 30 feet along a faulted block of sulphide-calcite ore that is bounded on the south by a fault, strike south 55 degrees east, dip 80 degrees north-eastward, and on the north by a fault, strike south 40 degrees east, dip 80 degrees south-westward. This block of ore, cut off to the north-west by the fault along the main drift and to the south-east by the junction of the two branch-drift faults, is only about 25 feet long and has a maximum thickness of 4 feet. It has not been stoped, and its vertical extent is unknown. The country-rock in this adit is fine-grained diorite that underlies, in part, the diopside-rock found in the workings above.

The lower glory-hole has been excavated between points 35 feet, elevation 2,570 feet, and 85 feet, elevation 2,580 feet, north-easterly up the hillside from the 500-adit portal, elevation 2,525 feet. The glory-hole measures 55 feet wide in a north-easterly direction and 70 feet long in a north-westerly direction, and its deepest point is 20 feet below the down-hill rim of the excavation. A short open-cut has been driven 6 feet into the north-east face of the glory-hole half-way up the face. The ore mined

in the glory-hole apparently came from a north-westerly striking and south-westward dipping lens that, itself, did not extend to the main drift in the 500 adit, although the fault following the strike of the ore extended to this drift. A remnant of the ore, 15 feet long, 3 feet thick and 10 feet down the dip, may still be seen in the north-west face of the glory-hole. Diopside-rock forms both the hanging-wall and foot-wall of the ore. A small portion of a 2-inch bed of crystalline limestone was seen in the remnant of ore, and several small kidneys seen in the diopside-rock. The sulphides, pyrite and chalcoyprite, replace the limestone in preference to the diopside-rock.

The 300 adit, portal elevation 2,650 feet, and 150 feet north 55 degrees east from the 500 adit, has been driven north 63 degrees east for 30 feet, thence north 84 degrees east for 60 feet to the face. Thirty feet back from the face a short drift has been driven 30 feet southerly. No ore appears to have been found in this adit. It crosscuts slightly-banded diopside-rock and some limy bands, which strike north 20 degrees west and dip 60 degrees westward.

The 300A adit, portal elevation 2,650 feet, and 25 feet south 40 degrees east from the 300 adit, has been driven south 76 degrees east for 30 feet, as a diagonal crosscut, and then as a drift south 52 degrees east for 115 feet to the face. For a distance of 40 feet the drift follows the downward extension of ore which was mined in the glory-hole above, and then follows the north-eastern side of a fault, 2 to 20 inches wide, that cuts the ore-body at an angle of 10 degrees on a strike of south 60 degrees east and dip of 75 degrees south-westward. Eighteen inches of heavy sulphide ore found at the face (September 27th, 1941), in the foot-wall of the fault, narrows to 1 inch, 12 feet back from the face. Farther back, three lenses of unmineralized quartz, 1 to 3 inches thick, are found in the fault. From the beginning of the drift-section, but 6 feet above the floor of the drift, a branch working has been driven south-westerly for 15 feet, thence south-easterly for 13 feet along the same fault that is found farther to the south-east in the main drift. Two 1-inch stringers of quartz are found along the fault in this working. The 300A adit is in diopside-rock except for the branch-working in the hanging-wall of the fault, where fine diorite is found. This suggests displacement of the fine diorite against the otherwise south-westerly extension of the diopside-rock.

The upper glory-hole, above the 300 and 300A adits, is 80 feet long in a north-easterly direction. The downhill rim is at an elevation of 2,670 feet and the uphill rim at an elevation of 2,690 feet, with the floor, at its deepest point, 10 feet below the downhill rim. The north-western end, elevation 2,685 feet, is 50 feet north 30 degrees east from the portal of the 300 adit and the south-eastern end, elevation 2,685 feet, is 80 feet, south 70 degrees east from the same point. A flat piece of ore was followed south-easterly for 60 feet from the south-eastern end of the glory-hole in a stope, 18 feet high by 25 feet broad. Towards the entrance of the stope, ore which bent downward was followed to the drift-section of the 300A adit. A few small patches of ore remain in the face of the stope and in the north-western end of the glory-hole. Diopside-rock forms the walls and floor of the glory-hole; some small limestone kidneys are found in the ore.

From a point north-west of the glory-hole and 70 feet east of the 500-adit portal an open-cut, elevation 2,710 feet, has been driven north-easterly for 30 feet, exposing diopside-rock with a few small kidneys of limestone. A fault, strike north 10 degrees east, dip 35 degrees eastward, is found at the face, but no ore is found.

Forty feet northerly up the hillside a small open-cut, elevation 2,785 feet, has been driven for 6 feet across a poorly-defined, rusty shear-zone, strike north 20 degrees west, and 6 inches to 3 feet wide. A small amount of scattered chalcopyrite and pyrite is found in the diopside-rock of the cut.

The uppermost adit is a short one at an elevation of 2,750 feet and 110 feet in a direction south 64 degrees east from the 300 adit. This adit has been driven south for 50 feet along a lens of heavy sulphide ore, a few inches wide at the portal but plunging

down and widening to 8 feet near the face. However, at the face it is cut off by a cross-fault, strike south 70 degrees east and dip 75 degrees south-westward. Diopside-rock and small remnants of crystalline limestone are found in this working.

The *Thistle* mine was examined by the writer in August and September, 1941.

References: Annual Reports, Minister of Mines, B.C.—1899, 606, 778; 1901, 1097, 1101; 1902, 307; 1927, 340; 1928, 366; 1930, 291; 1938, A 38; 1939, A 40; 1940, A 27, 73; 1941, A 27, 71; 1942, A 66.

Black Panther.

The *Black Panther Nos. 1* to *4*, staked in 1936 and owned by Walter Harris and family, of Port Alberni, are at the head of the West Fork of the Nitinat River, and extend northerly to the divide between the Nitinat and McQuillan Creek.

The hillside around the workings is very steep and bluffy and is covered by a good stand of timber, mainly hemlock and some fir.

The property is reached from Port Alberni by way of the *Thistle*. From the ore-bunkers at the *Thistle*, elevation 2,460 feet, a steep pack-horse trail, 2 miles long, leads south-easterly over the divide, elevation 3,180 feet, between Franklin Creek and the West Fork of the Nitinat River, to the present mine camp on the *Black Panther*; elevation at the cook-house, 2,500 feet.

The upper adits were driven by the owner shortly after the claims were staked in 1936, but the 2,450- and 2,700-foot lower adits near the present mine camp were driven in 1941 by Pioneer Gold Mines, Limited, who at that time held an option on the ground. It is understood that the property is under development at present by a newly formed company, Nitinat Golds, Limited, of 221 Hall Building, Vancouver.

No production has been recorded.

Prospecting has been done on a strong shear-zone that, for at least 2 miles, follows the contact of andesite lava on the west with diorite-breccia on the east, northerly from the headwaters of the West Fork of the Nitinat River over the divide and into the McQuillan Creek basin.

Along the shear, ankeritic-carbonate alteration of the volcanics has been very pronounced over widths ranging from a few inches to 30 feet. In surface outcrops the carbonate zone is marked by a pronounced buff-weathering of the otherwise green volcanics.

Along the shear are found quartz lenses and faulted segments of lenses, some of which have been prospected. The most promising lenses found so far are explored by the main workings on the *Black Panther*. The mineralized material consists of quartz and sulphides, from 1 inch to 3 feet thick and up to 40 feet long; is in a well-defined section of the shear-zone; and, as seen in the main or 2,700-foot adit, occurs both along a main shear and a branch (Plate IV., B) of it. In this adit the main shear has been followed for 400 feet, north 2 degrees west, by a drift, from a point about midway along which a branch shear has been followed for 260 feet, south 20 degrees west, in a branch drift. The main shear consists of gouge and badly crushed rock, over widths of 1 to 5 feet. Along this shear about 35 per cent. of the drift length is vein-matter, and the remainder is barren crushed rock. The branch shear is narrower, and, although along it about 75 per cent. of the drift length is vein-matter, the vein-widths are less than in the main shear.

The vein-matter in the adits ranges from 6 inches to 3 feet in width and consists of ribbon-quartz with varying amounts of sulphides. In some places the sulphides are sparse, in other places they are abundant. Heavy sulphides give assays of several ounces in gold per ton. Two samples of heavy sulphides taken by the writer in the north drift of the 2,700 adit assayed: Gold, 2.68 oz. and 2.30 oz. per ton respectively; one from the ore-dump at the portal of this adit assayed: Gold, 2.88 oz. per ton; and a sample of heavy sulphides from the portal of the north adit at 2,790 feet elevation assayed: Gold, 2.54 oz. per ton. The sulphides are mainly pyrite, but small amounts of galena and sphalerite are also found.

In the *Black Panther* workings the shear-zone tends to follow the contact between green andesitic lava on the west and diorite on the east; but towards the southern end of the 2,700 adit the shear is in the diorite 70 feet east of the contact. This is because of a local, westerly bulge in the diorite rather than because of any bend in the general north-south trend of the contact or of the shear-zone. The wall-rock of the shears is altered to a pale, yellowish grey rock consisting mainly of ankeritic carbonate. The zone of carbonate alteration follows both the main and the branch fault and ranges from a few inches to 30 feet in width. The alteration preceded the period of vein-formation as may be seen in the quartz-sulphide stringers that cut the carbonate zones. In one place along the main drift in the 2,700 adit, these stringers in the carbonate rock are so numerous and of such diverse orientations that they form a stockwork about 10 feet in diameter.

The main or 2,700 adit, elevation 2,700 feet, is on the east side of the West Fork of the Nitinat River, across from and 200 feet above the mine camp. This working consists of a crosscut driven north 67 degrees east for 210 feet to the main drift which extends 285 feet, north 2 degrees east, and 120 feet, south 2 degrees west, from the face of the crosscut. This drift follows the main fault and contained vein-matter. A crosscut has been driven north-westerly for 70 feet from the south face of the main drift and another has been driven north-westerly for 30 feet from a point in the main drift 100 feet north of the entry crosscut. A second drift branches from the main drift at a point 50 feet north of the face of the main crosscut and follows a branch vein in a direction south 18 degrees west for 260 feet to the face. This drift crosses both the main crosscut and the crosscut from the southern end at the main drift.

A lower adit, elevation 2,450 feet, and 650 feet south 85 degrees west from the 2,700 adit, has been driven south 27 degrees east, and intersects a vein-shear 160 feet from the portal. The shear, containing quartz 8 inches wide, has been followed for 10 feet both north and south. The crosscut entry was not continued beyond this shear to the projected downward continuation of the veins in the upper, or 2,700, adit.

Two short adits, each at elevation 2,790 feet on opposite sides of a small stream, and two near-by open-cuts comprise the uppermost workings near the main adits. The northern short adit is 175 feet, north 67 degrees east, from the portal of the 2,700 adit, and extends northerly for 45 feet along the vein-shear. Quartz is found at the portal, but only barren fault material at the face. A raise connects the 2,700 adit with this adit. The southern adit is 50 feet south of the northern and extends for 20 feet in a southerly direction. The vein is 12 inches wide at the portal, but peters out towards the south and in the face there is only the vein-shear.

The quartz vein may be seen in two short open-cuts 15 feet and 25 feet respectively, south-westerly from the south adit.

The 2,450, 2,700, and 2,790 adits are easterly across the creek and up-stream from the camp.

Up-stream from the camp at an elevation of 2,680 feet on the east side of the creek and 280 feet north 35 degrees east from the portal of the 2,450 adit, an adit has been driven north 67 degrees east for 37 feet and then south 10 degrees east for 18 feet. At 2,700 feet elevation on the western side of the creek and 35 feet north-westerly from the 2,680 adit, an adit has been driven 35 feet in a north-westerly direction.

These adits are about 100 feet west of the main contact of the greenstone and diorite, close to but not on the main shear-zone. They prospect a quartz vein, strike north 20 degrees west and dip 70 degrees north-eastward, that is exposed in the creek-bed between them. It may be noted that the vein in these adits is on the projected strike of the vein cut by the 2,450 adit, but the vein in the two short adits has a markedly different strike and, if they are the same vein, a decided change in strike has taken place. The vein in these upper adits is from 1 inch to 12 inches wide in the creek but narrows in going north-westerly, and in the face of the north adit it has pinched out, and only the narrow vein-shear and a 4-foot zone of less strongly sheared

rock is seen. In the south adit the vein is 3 inches wide and has been followed for 18 feet. The vein-matter consists of ribbon-quartz with a small amount of sulphides, mainly pyrite and a little galena. The rock in these adits is amygdaloidal lava, with a few lenses of banded chert.

A third adit, elevation 3,700 feet and 600 feet below the pass into McQuillan Creek, has been driven on the east side of the stream and close to the contact of the diorite and volcanics, from a point that is 800 feet northerly from the two adits just described. This adit has been driven north 18 degrees east for 16 feet along a shear dipping 60 degrees eastward and then north 10 degrees west for 22 feet along a shear, dipping 35 degrees eastward, which cuts off the steeper shear. In the adit these shears are unmineralized, but outside the portal for a distance of 30 feet the shear contains a lenticular quartz vein, 1 inch to 12 inches wide, mineralized with pyrite and a little galena. The wall-rock in the adit is carbonatized andesite, but the diorite lies only a few feet easterly.

The property was examined by the writer in August and September, 1941.

References: Annual Reports, Minister of Mines, B.C.—1939, A 88; 1941, A 71.

Black Lion.

This group includes the *Black Lion Nos. 5, 6, 8, 10,* and *12,* staked in 1941 by Len Belliveau and G. Moffett, and the *Pan Nos. 1* and *2,* staked in 1941 by R. L. Horie. All these claims are now owned by Bralorne Mines, Limited, of Vancouver.

The claims cover the southward continuation of the *Black Panther* vein-shear, adjoining the *Black Panther* group and lying southerly and easterly from it.

The property is on the steep, heavily timbered hillside that slopes westerly into the West Fork of the Nitinat River.

The workings are reached by a foot-trail, about 2,000 feet long, leading southerly past the *Black Panther* 2,450 adit.

The property was staked in 1941 and open-cut work was done that year by Bralorne Mines, Limited. The company prospected for a length of 1,500 feet the southerly continuation of the main vein-shear and accompanying carbonate-zone explored in the 2,700-foot adit on the *Black Panther.*

On the *Black Lion* group, in the length of the 1,500 feet prospected, the vein-shear strikes northerly and dips 75 degrees eastward. Usually, the break follows the contact between diorite on the east and fine-grained volcanics on the west; but because of a tendency of this contact to weave, the shear- and carbonate-zones may be either in diorite or in volcanics, but are never far from the actual contact.

At the time of the writer's visit (September 28th, 1941) four open-cuts had been made on the vein at an elevation of about 2,700 feet over a distance, north and south, of 175 feet. However, since then, the vein is reported to have been found about 1,300 feet southerly from these cuts. These cuts expose a strong carbonate-zone which ranges from 10 inches to 9 feet in width. In places strong shearing accompanies the zone. Quartz-sulphide stringers are found in zones 1 to 1½ feet wide in some of the trenches. The sulphides include pyrite and a little galena and evidently carry the main amounts of gold, as samples, taken by the writer, of quartz and heavy sulphides, assayed up to 1.2 oz. per ton in gold. Samples taken of the quartz-sulphide stringers and intervening carbonatized rock assayed from 0.27 to 0.43 oz. per ton in gold. The carbonatized rock itself, devoid of quartz stringers, assayed only traces to 0.03 oz. per ton in gold.

The property was examined by the writer on September 28th, 1941.

GEOLOGIC SETTING OF KNOWN MINERAL DEPOSITS AND DISCUSSION RELATING THEM TO PROSPECTING POSSIBILITIES.

Stocks and dykes of feldspar porphyry, in an alignment which trends northerly, and east of this line of feldspar-porphyry intrusives, an elongated mass of diorite trending northerly, are conspicuous features of the geology of the area mapped.

The line of feldspar-porphyry intrusives extends from the southern edge of the sheet, east of the West Fork of Nitinat River, northerly to a point west of McQuillan Creek. The fact that "granitic rock" has been reported from near the western boundary of the property of Vancouver Island Gold Mines, Limited, suggests that the line of feldspar-porphyry intrusives probably extends farther north, beyond the property. It is to be noted that the Vancouver Island Golds, *Regina, Thistle,* Havilah, *Black Panther,* and *Black Lion* properties are found within a belt 1½ miles wide along the general trend of these feldspar-porphyry intrusives. Feldspar-porphyry dykes are particularly numerous in the upper workings on the Havilah, and immediately west of these working on the ridge between the Havilah and *Black Panther.*

The diorite is 5 miles long and ½ mile wide and extends from a point 2 miles north of Mount McQuillan to a point 3 miles south of it. The diorite is intensively brecciated in most outcrops and the breccia is sealed by granitic material (Plate III., A and B). The total amount of granitic material, in the matrix of the breccia and in irregular dykelets, is large. Mineralized quartz veins have been found on both sides of this diorite, on the *Golden Eagle* and *B. and K.* on the east and on the Havilah, *Black Panther,* and *Black Lion* on the west. The west contact of the diorite with andesite is marked by a carbonatized shear-zone that follows south from the headwaters of McQuillan Creek over the divide and down the valley of the West Fork of the Nitinat River. At several places along its strike this carbonatized shear-zone contains narrow ribbons and lenses of quartz mineralized with pyrite and galena and some gold. As examples may be mentioned the upper workings on the Havilah and the showings on the *Black Panther* and *Black Lion.*

A deep-seated source, that was responsible not only for the infiltration of granitic material into the diorite breccia, but also for the introduction of the feldspar-porphyry intrusives, could reasonably be expected to supply the same general area with the mineralizing solutions necessary for vein formation.

The border areas of the feldspar-porphyry and of the diorite intrusives possess structural features favourable for ore-deposition. The contact-zone between the diorite and the andesite west of it appears to have been particularly favourable to the formation of a break suitable for the access of mineralizing solutions.

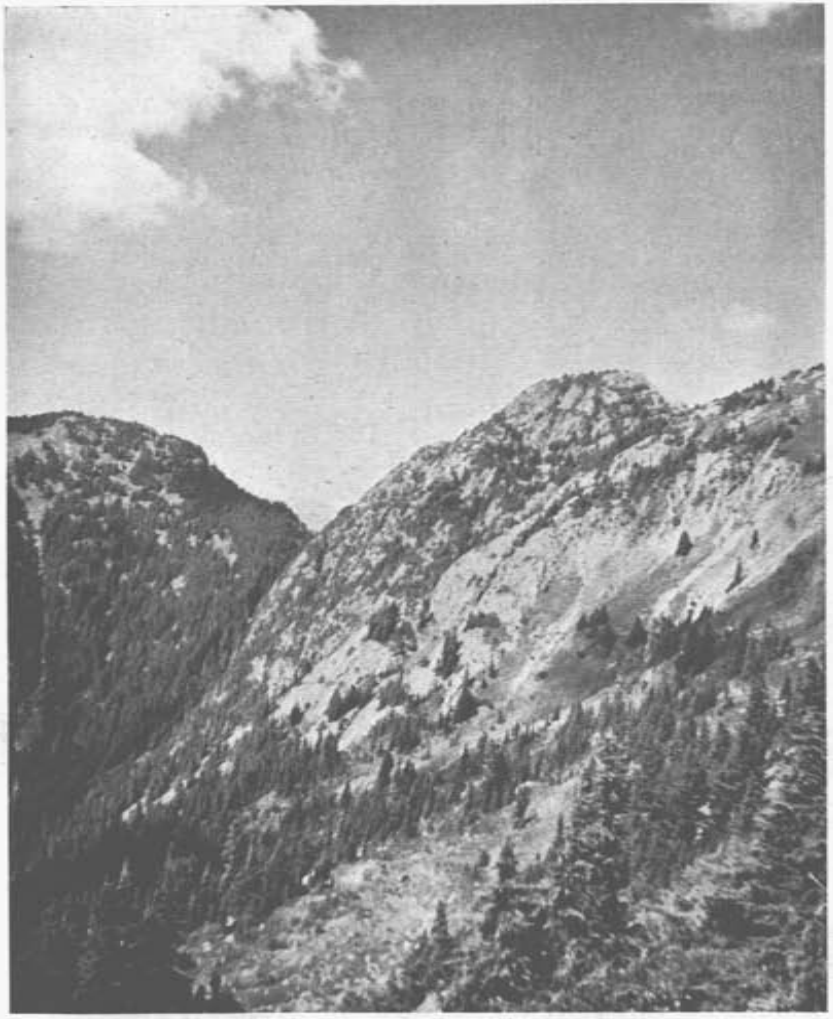
The line of feldspar-porphyry intrusives and the diorite mass are 1½ miles apart at the southern end. The small area towards the southern end of the diorite is therefore characterized by rock-types, feldspar porphyry, andesite and diorite, of varying competency or physical characteristics. This area would therefore be suitable for the formation of breaks, either fractures or shear-zones; moreover, the nearness of the feldspar porphyry suggests the probable presence of a deep-seated, potential source of mineralizing solutions. Because of this combination of features, the writer would suggest that prospectors pay careful attention to the area towards the southern end of the diorite.

As indicated by both the known occurrences of mineralization and by the local geology, the best general area for prospecting is a belt, about 2 miles wide, that includes the diorite and feldspar-porphyry intrusives, and extends from the West Fork of the Nitinat River, at the south boundary of the area, northerly to beyond Mineral Creek at the north boundary of the area.

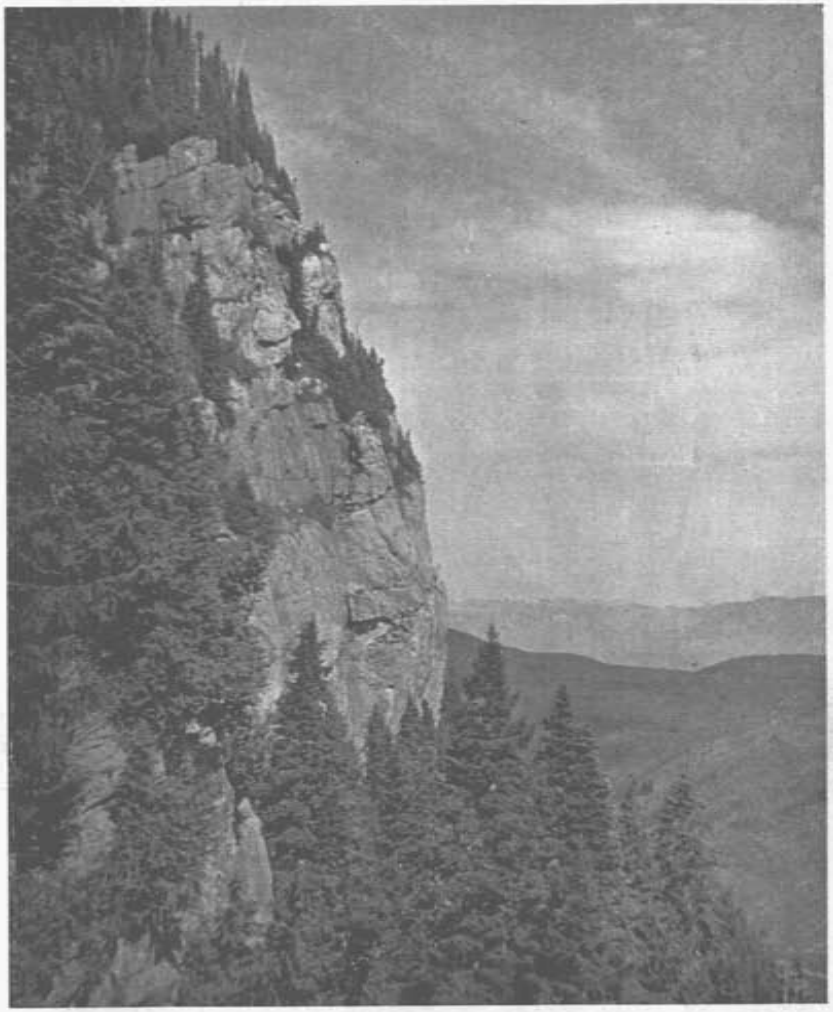
PLATE I.

A. Looking down McQuillan Creek from Havilah mine, towards Mount Arrowsmith in background. White patch in left centre is logged-off area. (Page 5.)

B. Headwaters of McQuillan Creek, with Mount McQuillan (left) and Mount Douglas (right) in background. (Page 5.)



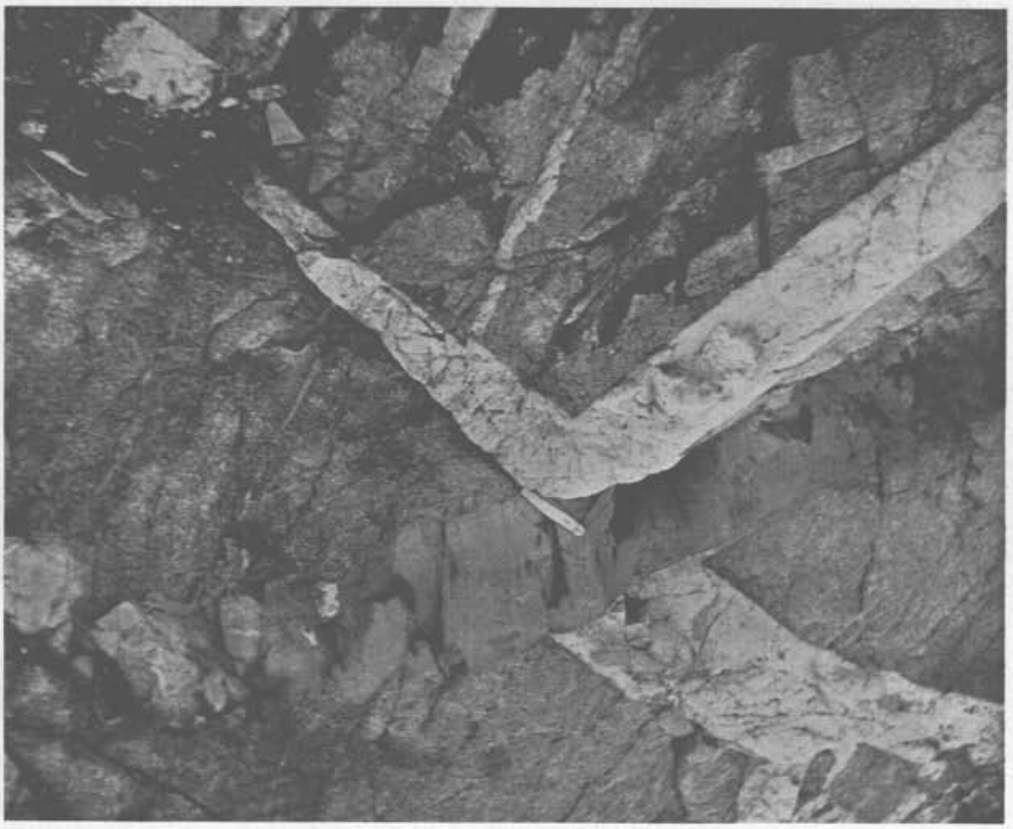
A. Mount McQuillan (left) and Mount Douglas (right), between headwaters of McQuillan Creek and the West Fork of the Nitinat River. (Page 5.)



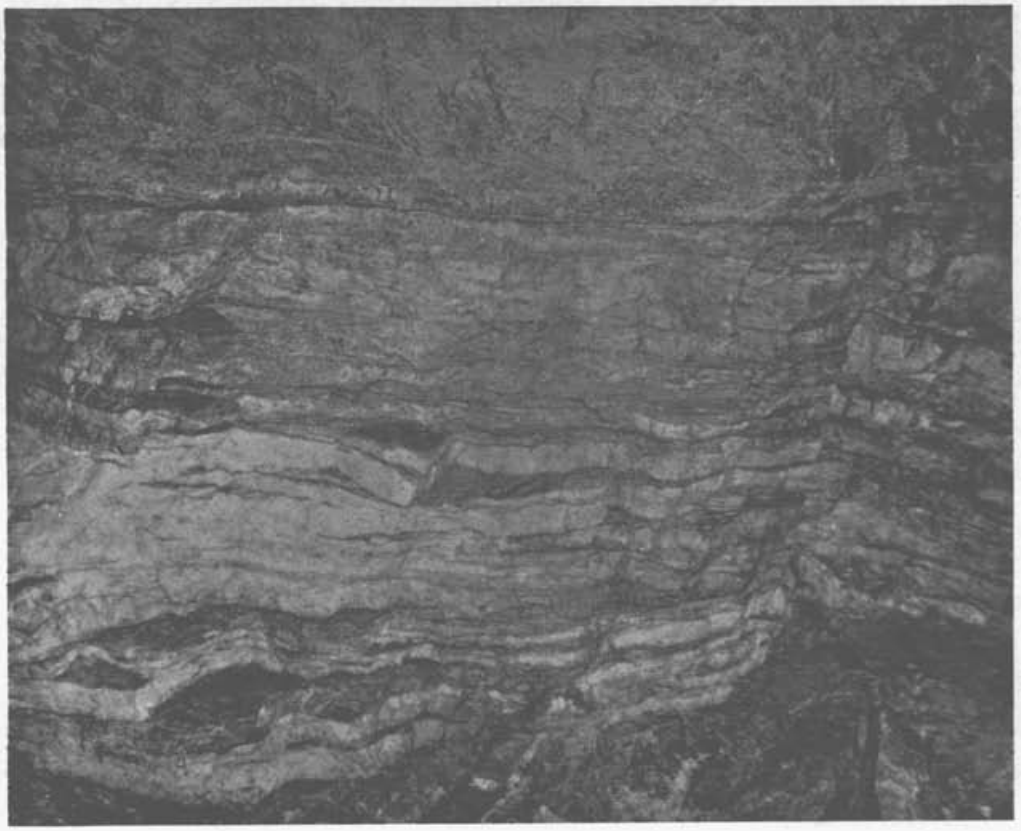
B. High, steep bluffs, typical of limestone on Mount Spencer. (Page 6.)

PLATE III.

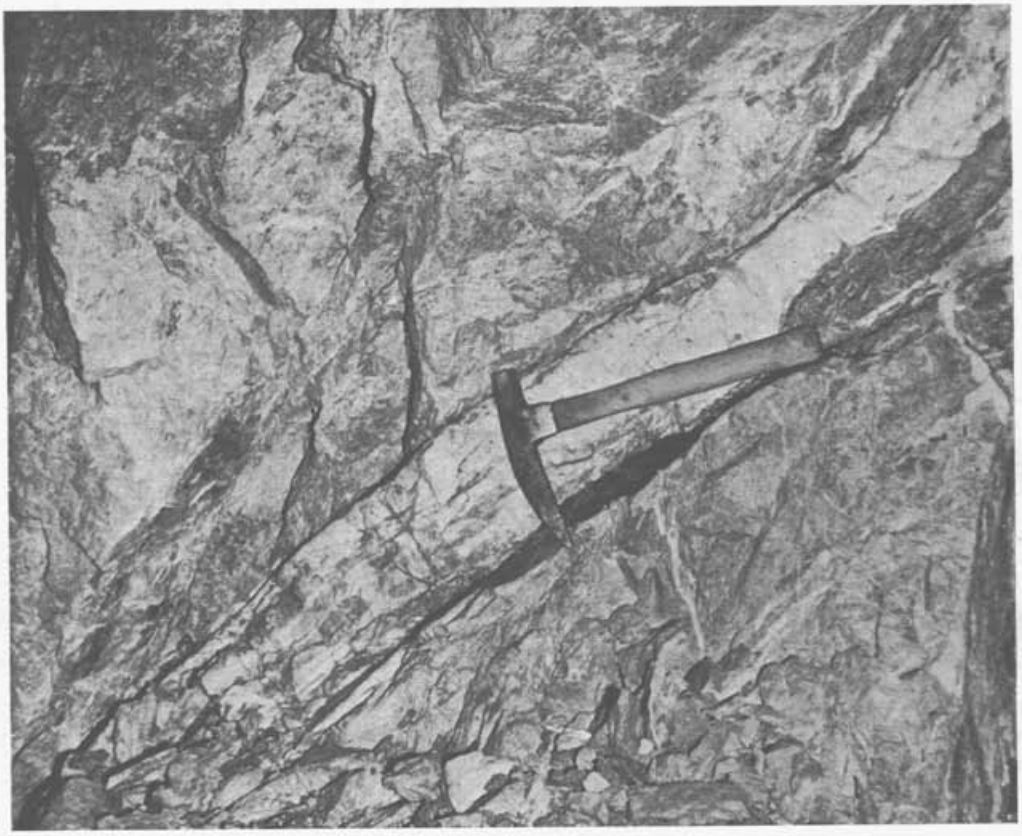
A. Typical diorite breccia, Mount McQuillan. (Page 7.)



B. Acidic dyke (white) cutting diorite, and in turn cut by diabase dyke (smooth, dark grey), Mount McQuillan. (Page 7.)



A. Ribbon-quartz, characteristic of Gillespie vein, in back of 800 adit, Havilah mine. (Page 15.)



B. Section of branch vein in 2,700 adit, *Black Panther* mine, width of vein shown by head of pick. (Page 19.)

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