

PART E.  
EASTERN MINERAL SURVEY DISTRICT (No. 5).

BY  
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INTRODUCTION.

The year 1935 witnessed a material increase over 1934 in tonnage of ore mined in the Eastern Mineral Survey District. An increase in the Fort Steele Mining Division and a substantial increase in the Slocan camp more than made up for the reduced production of silver-lead-zinc ores in the Golden area. The tonnage of lode-gold ore mined showed a marked increase over the 1934 output, large increases in the Nelson Mining Division and in the Lardeau Mining Division more than making up for some reduction in the Rossland camp. Crude ore shipped to custom smelters decreased to about one-fourth the quantity shipped in 1934, while gold concentrates shipped increased about four to one. There was also a material increase in direct recovery of bullion from milling of gold ores.

The Slocan camp, embracing the active areas of three mining divisions, experienced a great revival, much of which was due to a larger number of properties being worked by lessees. Increased output was due also to three mining companies and the operation of their mills. The improvement in the prices of silver, lead, and zinc, which obtained until autumn, renewed optimism. Unfortunately the year closed with silver in a precarious position, and although the prices for lead and zinc were better than a year earlier the outlook for 1936 was quite uncertain.

A feature of the year was the appearance of buyers seeking ore and concentrates for export to foreign smelters. During the autumn, when prices for lead and zinc were at their peaks for the year, buyers were active particularly in the Slocan district. As a result, considerable shipments of concentrates and crude oil were made to European smelters. The output of the *Monarch* mine was exported to Europe as in the previous year. Shipments were also made to the smelter at Tacoma.

Placer-mining, although it did not contribute greatly to the output of the district, is a matter of widespread interest. The production of 1,101 oz. is largely the recovery made by individual miners or partnerships and in most cases represents hard-earned wages. The notes on placer-mining are, in all cases, based on information kindly supplied by Gold Commissioners and Mining Recorders.

The Geological Survey of Canada published Memoir 173, "Slocan Mining Camp, B.C.," in 1934, and Memoir 184, "Description of Properties, Slocan Mining Camp, B.C.," in 1935, both written by C. E. Cairnes. In addition to geological maps of the area, the publications contain invaluable information on the geology and mining history of the area and of the mines and prospects there.

Geological information concerning various areas in the No. 5 Mineral Survey District and, in many cases, descriptions and historical data concerning mining properties in the area are available in publications of the Geological Survey of Canada. The Annual Reports of the Minister of Mines for past years contain information on nearly every property in the district.

The writer gratefully acknowledges his indebtedness to prospectors, mine officials, and Government officials throughout for uniform courtesy and assistance both in connection with field-work and in supplying information used in this report.

LODE-GOLD DEPOSITS.

HALL CREEK, NELSON MINING DIVISION.

Four claims, *Allan*, *Allan No. 1*, *Allan No. 2*, and *Contact No. 1*, were staked in 1934 by H. Erickson and C. Peterson, of Hall. The three *Allan* claims, extending across the valley of Hall creek, while the *Contact* adjoins them south of the creek and up-stream from the rest, are situated about 5½ miles by trail from Hall Siding. The ground is moderately steep and south of Hall creek is still fairly well

timbered. There is a good road as far as the *Fern* mine, then 2½ miles of pack-trail obstructed by fallen timber. A substantial cabin has been built on the north side of the creek.

The rock formations consist of more or less schistose greenstone intruded by andesitic and some porphyritic dykes. Widely spaced workings have exposed shearing with variable amounts of quartz and pyrite mineralization paralleling or close to narrow andesitic dykes, strike about north 10 degrees east, extending from a point approximately 1,500 feet north of Hall creek and 300 feet above it to half a mile south of the creek and 800 feet above it. At a point 1,400 feet north of the creek and 230 feet above it an adit has been driven for 28 feet, the first 24 feet of which is timbered. The face shows 3 feet of rusty, sheared greenstone; the shearing strikes north 70 degrees west and dips 70 degrees to the east. Included in this on the hanging-wall side is 6 inches of vuggy quartz, which assayed: Gold, 0.02 oz. per ton; silver, trace. The remaining 2½ feet of rusty, sheared greenstone assayed a trace in gold and silver. There are several trenches to the north of the adit; one, 125 feet distant, exposes 15 inches of shearing with 6 inches of quartz. In this vicinity there is a good deal of porphyritic granite float. On the north bank of Hall creek there are two cuts about 70 feet apart. The one up-stream, under an andesitic sill, exposes some narrow fissures in greenstone, filled with bluish quartz frozen to the walls. A sample across 15 inches of greenstone and quartz containing some pyrite assayed: Gold, trace; silver, trace. The down-stream cut exposes a 15-inch andesitic dyke dipping steeply to the east; both dyke and walls are somewhat limy. Half a mile south of the creek and 800 feet above it a 12-foot-wide cut exposes a 3-foot andesitic dyke, strike south 10 degrees east, dip 70 degrees east, cutting a fine-grained greenstone. To the east of the dyke the greenstone is silicified and rusty, and for 6 feet to the west the greenstone is sheared and a good deal of quartz has been deposited. The quartz appears to be completely barren, but the 15 inches of sheared greenstone next to the dyke contains a little quartz and is mineralized with some pyrite and a little fine-grained galena. A sample of this material assayed: Gold, *nil*; silver, *nil*.

#### ERIE CREEK, NELSON MINING DIVISION.

##### **Mjolner Gold Mines.**

This property, owned by Andrew Sostad, of Vancouver, consists of the Crown-granted claims *Houlton* and *Princess* and six claims held by location. It is situated on Keystone mountain, 1 mile easterly from the Northern Cedar camp at the end of the Rest Creek road. The country immediately surrounding the property is rather flat, with low hills and ridges. A good cabin has been built some 1,400 feet westerly from the workings, which are located on a ridge trending northerly. There are two open-cuts on the ridge about 200 feet apart, the more southerly cut exposing aplite traceable on the surface for about 120 feet. This dyke or sill appears to follow the bedding of the enclosing impure tuffs, strike about north 15 degrees east, dip 45 degrees easterly. There is a width of about 10 feet of aplite which is fractured and healed with quartz, some pyrite and galena being developed in the aplite near quartz veinlets. On the hanging-wall is 1 foot of sheared tuff and east of that a mica dyke is exposed.

The northern cut, about 200 feet at north 10 degrees west from the other, opens about 24 feet of blocky argillaceous tuff, cut by aplite dykes, which in turn are cut by irregular quartz veinlets. The eastern end of the cut exposes brecciated aplite cemented with quartz. Three feet of this material on the south side was sampled, as was also 1½ feet on the northern side of the cut. These samples yielded no values in gold or silver. The portal of the adit at 70 feet lower elevation is 120 feet at north 60 degrees west from the cut. It is a crosscut being driven south 85 degrees east to intersect the material exposed in the cut and was in 125 feet in August. There would probably be 70 feet to drive in order to get through the aplite.

This group, consisting of six claims staked in October, 1934, held in the name of O. A. Haglund, of Erie, is located about 11 miles from Erie, east of the Erie Creek road on a moderately sloping hillside recently burned over. Late in 1934 a discovery was made at a point about three-quarters of a mile from the road at an elevation of 4,650 feet above sea-level. Some stripping was done partly exposing irregular quartz mineralization over a length of 35 feet, striking along the contour about north 15 degrees west and dip 35 degrees to the east. The prevailing rock is greenstone intruded by aplite dykes. There appears to be up to 3 feet of vuggy quartz containing some greenstone inclusions, a little pyrite and arsenopyrite, and some dark manganese-stain. A sample of selected pieces of

quartz better mineralized than the average assayed: Gold, *nil*; silver, *nil*; copper, *nil*. A sample across a 10-inch quartz offshoot assayed: Gold, *nil*. A crosscut adit driven 40 feet into the hill 35 feet below the outcrop would have to be advanced 40 to 50 feet to cut the downward extension of the quartz if it maintains the dip observed at the surface. A little free gold was noted on a manganese-stained fragment from an aplite dyke which outcrops 100 feet south-east from the cut. A cabin has been built about 600 feet north-westerly from the adit at an elevation of about 4,300 feet.

Approximately half a mile southerly from the adit on the southerly side of a small creek, at 3,825 feet elevation, a cut exposes an aplite dyke 2 to 2½ feet wide which has been fractured and filled with quartz, some pyrite, galena, and arsenopyrite. The dyke strikes south 35 degrees west and dips 35 degrees to the south-east. The hanging-wall is argillite or argillaceous tuff. Twenty feet to the west is a dyke of aplitic granite about 12 feet wide. In the cut a sample across 3 inches at the hanging-wall, consisting of quartz, argillite, and a little sulphide, assayed: Gold, *nil*; silver, *nil*. A 15-inch width on the foot-wall, consisting of aplite containing quartz stringers with some sulphides, assayed: Gold, *nil*; silver, *nil*.

About 450 feet south-easterly of this cut on the north side of a small creek an outcrop of granite lies in contact with greenstone. A shear cutting the granite is seen on the southerly side of the creek. At elevation 3,700 feet an old adit has been driven for 225 feet in a general northerly direction. For the first 90 feet from the portal this adit follows the shear to its contact with the granite on the east and greenstone on the west, and then along the contact for 65 feet and narrow joints in the greenstone for 70 feet to the face. At the portal there is a little quartz, but farther in there is practically no quartz nor other vein-mineralization. Some mineralized greenstone and quartz was seen on the dump, though none could be found underground.

#### SLOCAN AREA.

The *Little Daisy* group consists of four Crown-granted claims—namely, **Little Daisy**.\* *Little Daisy*, *Golden*, *Golden Fraction*, and *Idler*—owned by Mrs. McNaught, of Silverton, but under lease to R. A. Grimes, of Nelson, and under sub-lease to A. Erickson, of Silverton. The workings and cabin are on the north-east side of Aylwin creek at elevations between 3,900 and 4,000 feet. The property may be reached from Silverton via automobile-road for 5½ miles and then via 1 mile of pack-horse trail up the north-east side of Aylwin creek. It is situated on a steep side-hill rising from the valley of the creek and the workings are between 300 and 420 feet above the creek. In the narrow valley-bottom there is considerable red cedar that is suitable for shakes, but farther up the hillside in the vicinity of the adits and above, where the slopes are steep and rock bluffs numerous, the timber is chiefly small fir and spruce.

The rock in the immediate vicinity of the workings is fine-grained granite. It occurs in the form of a "Y"-shaped mass 2 miles long and about a quarter of a mile wide (*see* Geological Survey of Canada Slocan Sheet). This granite is much finer in grain than the typical granite of the Nelson batholith and Cairnes believes it is younger. In places the granite is finely porphyritic and in other places where fractured and slightly oxidized it has a brownish colour.

The main feature of the property is a tight fissure-vein of quartz in the granite. By means of three adits this vein has been explored for an aggregate length of 230 feet along its strike. The width of the vein varies from 2 to 6 inches, but it frequently splits into two or three branches, which individually vary in width from 1 to 2 inches. The vein-filling is quartz containing minor amounts of pyrite, with occasional grains of chalcopyrite and pyrrhotite.

There are several small faults. These are chiefly cross-faults, most of which displace the vein only slightly; the maximum measured displacement is 18 inches. However, a major fault in No. 2 adit displaces the vein an unknown amount greater than this. The evidence indicates that the movement has been at least 12 feet in the plane of the fault. Gouge and crushed rock are present in varying amounts adjacent to the fault-planes.

The mine-workings comprise three adits on the *Little Daisy* claim. The upper (or No. 1) adit is 100 feet long and has been driven at north 60 degrees east on the vein for the full length. The vein is tight and varies in width from 2 to 6 inches, the average being 3 inches. A sample taken across 6 inches of quartz in the face assayed: Gold, 0.02 oz. per ton; silver, trace.

\* Report by J. S. Stevenson.

The middle (or No. 2) adit is 70 feet below No. 1 and is distant 100 feet horizontally in a direction of south 50 degrees west. The adit follows the vein for 75 feet from the portal to a point where cross-faulting has developed considerable gouge and crushed rock, so that the back of the adit is badly caved and examination impossible. Thirty-five feet from the portal a winze has been sunk at 72 degrees from the horizontal on the vein for 31 feet. There is some 20 feet of lateral stoping on the vein from the winze for 15 feet from the floor of the adit. A sample taken along the vein from 37 feet to the caved part, a distance of 46 feet, assayed: Gold, 0.50 oz. per ton; silver, 0.1 oz. per ton; the width of the vein varying from 3 to 6 inches. Three samples were taken at the bottom of the winze (as of July 8th, 1935). Here the vein is 4 inches wide and contains a small amount of pyrite; the wall-rock, however, carries considerable pyrite, disseminated and in small seams. A 4-inch sample across the quartz vein assayed: Gold, trace; silver, trace. A 3-inch sample of the foot-wall rock, immediately adjacent to the veins, assayed: Gold, 0.54 oz. per ton; silver, 0.1 oz. per ton; this material containing much disseminated pyrite. A sample along a ½-inch pyrite-streak contained in a 1-inch quartz veinlet assayed: Gold, 1.20 oz. per ton; silver, 0.10 oz. per ton. Fifteen feet down the winze in the bottom of a small, underhand stope a sample across the quartz vein, which was here 2 inches wide and contained a small amount of pyrite, assayed: Gold, 0.04 oz. per ton; silver, trace.

No. 3 adit is 50 feet below No. 2 adit and 90 feet horizontally in a direction of south 60 degrees west from it. It has been driven east for 55 feet and then at north 60 degrees east for 60 feet, after which a short crosscut was driven at south 45 degrees east for 20 feet to the face. The face is about 20 feet in the direction of the strike of the vein beyond the portal of No. 2 adit. The drift is along the vein from 55 to 115 feet from the portal. In this section it consists of one and sometimes three tight stringers of quartz which vary from 1 to 3 inches in width.

The wall-rocks in all the adits are variations of the fine-grained granite as described previously.

At the time of examination A. Erickson and his son were hand-mining in the lower adits.

#### ROSSLAND CAMP.\*

##### *O.K. Mountain Area.*

The properties on O.K. mountain are about 2½ miles south-west from Rossland on the easterly slope of the mountain, and they extend up the hillside from the valley of Little Sheep creek at an altitude of 3,040 feet to the highest adit at an altitude of 3,610 feet. A good motor-road branches south-westward from the Cascade highway about 1 mile west of the city of Rossland and leads directly to the properties. In the vicinity of the various adits the slopes are covered by a heavy growth of underbrush and a scattering of evergreens, the densest growth being in the valley-bottom.

The writer examined only those properties on which most work has been done and which were being operated by lessees at the time. These included the *I.X.L.*, *O.K.*, and *Midnight* properties. Lessees had just commenced work on the *Golden Drip* at the time and were busy dewatering the workings; only a brief examination of this property was made.

From the time the claims were located in the early nineties most of the work on these properties has been done by lessees, who have followed the faulted sections of the veins and stoped the high-grade lenses of gold-quartz ore.

Milling on the properties has been attempted twice. In 1894 a 5-stamp mill was erected on the *O.K.*, but it did not operate for long; recently, in 1932, a mill to treat 8 tons in twenty-four hours was installed on the *Midnight* property; however, tests were not satisfactory and the mill is at present temporarily in disuse.

Work on these properties has been fairly active since 1920, and recent descriptions of the operations may be found in most of the Annual Reports since then, the more recent description being in the Annual Report for 1932. Memoir No. 77, "Geology and Ore Deposits of Rossland," 1915, by C. W. Drysdale, of the Geological Survey of Canada, includes a short description of the *I.X.L.* and *O.K.* properties.

\* Report on this area by J. S. Stevenson.

In the workings of the properties examined the rocks are all of igneous origin. They include highly altered andesite that is perhaps more safely termed greenstone, serpentine, monzonite, and basic dykes, the greater number of which are mica lamprophyres.

The andesite is a very fine-grained to dense, massive rock of dark-green to brownish hue. The original texture and composition have been largely destroyed, both by the development in varying amounts of chlorite and of fibrous amphibole and by local silicification and serpentinization. The andesite varies from a uniformly dark-green phase that is highly altered, but contains only small amounts of serpentine and magnetite, to a similar dense, dark-green phase that is mottled by small brown 1-inch areas containing abundant serpentine and magnetite, and finally to a dense, uniform brownish phase that, in addition to other alteration products, carries a uniform abundance of serpentine and magnetite.

The present investigation did not disclose any systematic distribution of these variations in the altered andesite. It is thought that the development of varying amounts of serpentine and magnetite is related to the main area of black serpentine that occurs south of the andesite in the lower *O.K.* adits and extends both across and down the valley of Little Sheep creek.

The typical massive serpentine is a very dense black rock. Cross-fibre asbestos has filled in many of the joints as  $\frac{1}{16}$ - to  $\frac{1}{4}$ -inch veinlets and light-green talc has developed in the immediate vicinity of faults. A contact-zone intervenes between the black serpentine and the andesite; it is best seen in the second and third crosscuts to the north from the main fault-drift in the lower *O.K.* adit. The zone strikes roughly east and varies from 20 to 30 feet in width. Over this width irregular areas of hard, chocolate-coloured andesite are interspersed with irregular areas of serpentine. It is reported that the quartz veins on the *O.K.* occur only in the andesite to the north; the Baker lead, where examined by the writer, is in andesite. It is suggested that, although there are faults in the serpentine, those faults which tapped quartz and precious-metal-bearing solutions did not continue from the andesite into the serpentine.

A small intrusion of biotite monzonite is intersected by the lower *O.K.* adit and by Nos. 350 and 4 *I.X.L.* adits. This rock varies considerably, but the most characteristic features are its hard, fresh appearance and medium-grained granitic texture. Biotite is so abundant in the marginal facies of the monzonite that the rock is very dark and lamprophyric in appearance. However, in areas at a short distance from the contact, the feldspars are more abundant and the rock becomes dioritic in appearance. The relative amounts of orthoclase and plagioclase feldspar vary; in some phases of the rock they are equal, and in others orthoclase is by far the most abundant. Other than the fact that in the lower *O.K.* adit the monzonite is traversed by fault-seams, no data relating to the age relationships between the monzonite and the lamprophyre dykes or the veins were obtained. It is, however, definitely later than the andesite.

Lamprophyre dykes are numerous and widely distributed; they occur in most of the workings. These dykes contain abundant biotite, are medium to coarse-grained, and usually decompose to crumbly masses very shortly after being exposed to the air. In addition to the mica lamprophyres, there are a few narrow, very fine-grained dark dykes in which the former presence of either biotite, amphibole, or pyroxene is indicated by a ground-mass of chlorite; orthoclase and plagioclase feldspar occur as phenocrysts and as part of the ground-mass. The lamprophyre dykes occupy faults which cut, and in some places have slightly displaced, the quartz veins.

The veins in the properties on *O.K.* mountain are quartz-filled fissures in the highly altered but brittle volcanics. In sections undisturbed by faulting, the average strike of the veins is north 80 degrees east, but the dips vary from 35 to 75 degrees south. However, one vein on the *Midnight* strikes north and dips westward.

Although occasional concentrations do occur, sulphides are not common in the quartz veins. These sulphides include pyrite, chalcopyrite, and galena. Pyrite is also quite widely disseminated in small amounts throughout the wall-rock. The only other gangue-mineral in addition to quartz is ankeritic carbonate, which occurs in irregular areas in the vein and occasionally as veinlets in the surrounding rocks. The veins contain free gold, often in particles visible to the naked eye. Minalable amounts of gold occur in pockets that are very erratically distributed in the veins. These pockets, however, contain very high-grade gold quartz, so that work along barren sections of the vein is amply rewarded by the discovery of a high-grade lens of ore. A conception of the occasional very high concentration of gold may

be formed from the statement made by Drysdale in Memoir No. 77 of the Geological Survey of Canada, page 151: "Mr. W. F. Ferrier found 2½ oz. of gold in 6 square inches of ore."

The many faults on O.K. mountain are very diverse both as to time of formation and as to attitude of fault-planes. An early period of faulting has produced fissures, some of which were filled by the gold-quartz veins, others remaining barren. An intermediate period produced fissures, some of which were filled by lamprophyre dykes. A later period has produced fissures that at present contain only gouge and crushed country-rock. The intersection of fissures of the first period of faulting are of economic importance.

A high-grade shoot of ore was stoped between No. 1A and No. 2 adits of the *I.X.L.* from the intersection of the "A" vein-fissure and a cross-fissure. It is evident that the increased deposition of gold at this intersection indicates that the cross-fissure antedated the mineralizing solutions. Post-mineral faults that have displaced the veins are common; in most cases, however, it has been possible to find the faulted portion of the vein beyond the fault. Although discontinuous fissures do exist in the serpentine, present knowledge indicates that the vein-bearing fissures do not continue from the andesite into the black serpentine. The fissures in the serpentine probably represent those of the later period as indicated by the presence of crushed lamprophyre dykes in the immediate vicinity of faults in the serpentine.

The *I.X.L.* claim was located in 1891 and Crown-granted in 1895. There are seven adits on the property—namely, Nos. 1, 1A, 2, 3, 3A, 350, and 4. These adits have, with the exception of No. 3A, encountered quartz veins, three in number, which are locally known as the "A," "B," and "C" veins. The rock enclosing the veins is dense, highly altered andesite which has been cut by biotite monzonite and lamprophyre dykes. Black serpentine such as in the *O.K.* does not occur in the *I.X.L.* adits.

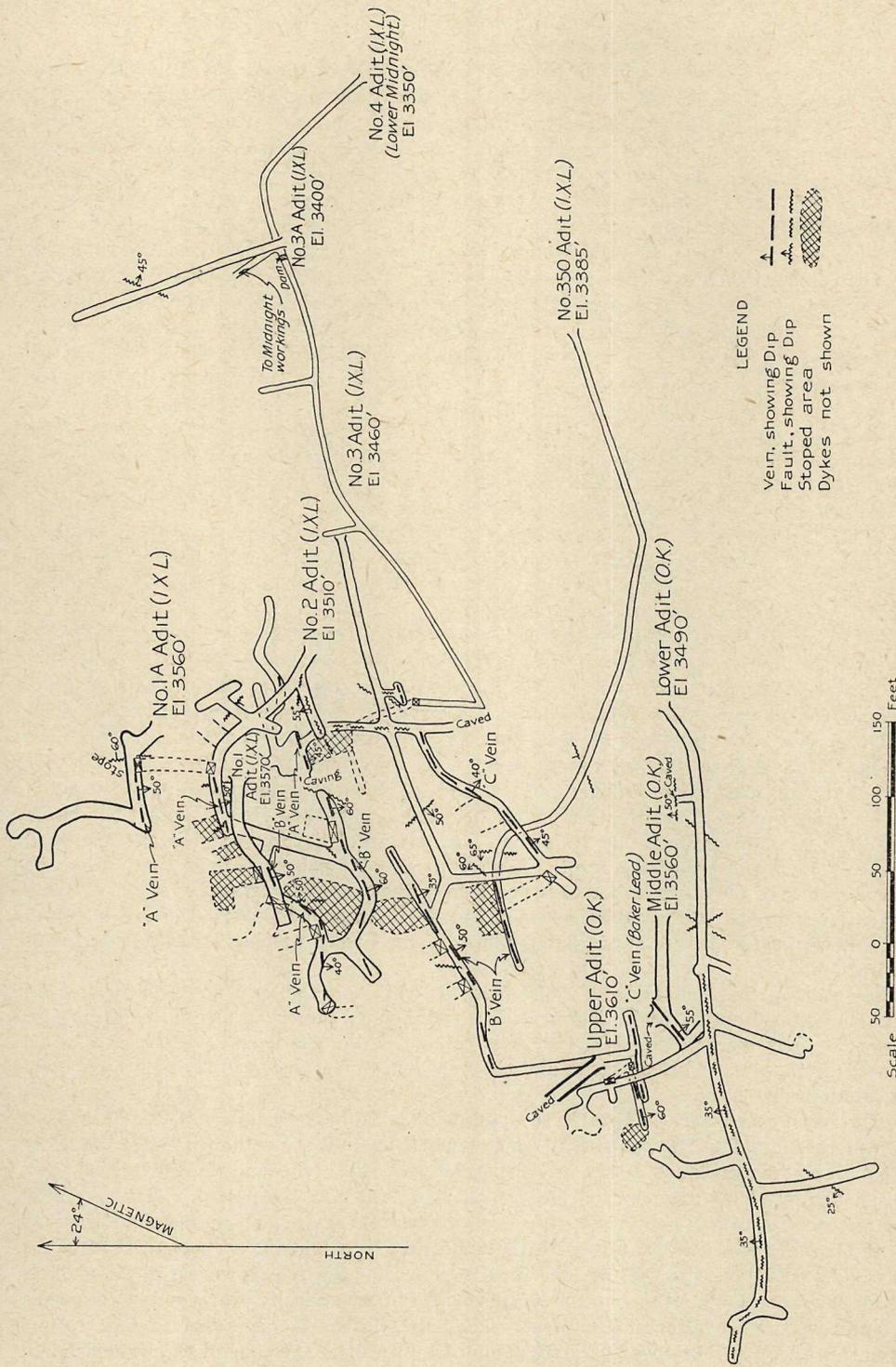
No. 1 adit is at an elevation of 3,570 feet. The vein-section in the adit is only 20 feet long; it pinches out both along the strike and up the dip, but maintains such widths and values down that an underhand stope was driven on the vein. Closely spaced cross-faulting has fractured the dense andesite badly at the west end. At 55 feet from the portal a dyke, locally known as No. 1 dyke, strikes east across the adit and dips 50 degrees north. It is a dense and massive lamprophyre that consists of orthoclase and plagioclase phenocrysts set in a ground-mass of felted feldspar laths and abundant vermicular chlorite.

No. 1A adit is at an elevation of 3,560 feet. It has been driven on a lenticular section of the "A" vein 40 feet long which varies in width from 6 to 4 inches and, where widest, contains closely fractured quartz. There is very little gouge along the walls. At its eastern end, 25 feet from the portal, the vein has been cut by a major fault. This fault contains 2 to 6 inches of gouge between smooth walls. A very high-grade shoot of ore is reported to have been mined along the intersection of the fault and the vein from this level towards the second level. This very obvious localization of an ore-shoot by the intersection of the vein with a fault suggests that other ore-shoots or pockets are related to intersections of the veins with faults of a similar age. The adit is in fine-grained andesite.

No. 2 adit is at an elevation of 3,510 feet. The workings of this adit have explored the various ramifications of both "A" and "B" veins. The "A" vein is quite lenticular, has been badly faulted, and varies considerably in strike. The first section of the vein is 110 feet from the portal; this section averages 8 inches in width and contains quartz between firm walls. Towards the west the vein is cut by many small normal faults. It dies out towards the west. A crosscut driven to the south-west and a drift to the west picked up faulted segments of the "A" vein. This drift follows differently striking sections of the vein southward and westward. In these sections the vein varies considerably in width from mere seams in the faulted andesite to quartz-filled fissures 4 inches thick that are usually bordered by a thin selvage of gouge. Towards the westerly end of the drift the vein is cut by a narrow, dense, basic dyke.

The southernmost drifting in No. 2 adit has explored the "B" vein over a length of 130 feet. The "B" vein varies considerably in width. In the east face it is only a small seam in the andesite; whereas 25 feet west from this place it is 18 inches wide, elsewhere along the drift the vein is approximately 4 inches thick. The strike of the vein varies from a few degrees south to a few degrees north of east; the dip averages 60 degrees south.

No. 2 adit intersects four different basic dykes. These dykes vary in width from 8 inches to 6 feet. In composition they vary from lamprophyres containing abundant biotite, and are



B.C. Department of Mines, 1935.

I.X.L. and O.K. Plan of Workings (modified from Leasing Syndicates' Plan).

usually decomposed, to those that contain feldspar accompanied by a little biotite and shreddy amphibole, and are usually dense and quite firm. These dykes are locally designated by numbers from 1 to 4. No. 1 dyke has been encountered in No. 1 adit. The adit is driven in massive, dense andesite; most of it is a uniform dark green, but some is mottled with small 1-inch patches of chocolate-coloured areas of serpentinous material.

No. 3 adit is at an elevation of 3,460 feet. This adit explores the downward continuation from No. 2 of both "A" and "B" veins and also a third vein that has been designated the "C" vein. This is thought to be the eastward extension of the Baker vein from the *O.K.* to the *I.X.L.* At a place 130 feet from the portal a crosscut has been driven north that intersects the "A" vein. This vein has been stoped both up and down for a considerable distance to the west and drifted on to the east for approximately 40 feet. On the walls of the stoped area the vein is fairly uniform in width, both along the strike and the dip, but in the drift to the east it is discontinuous and consists of disconnected lenses of quartz. At a place 240 feet from the portal a short crosscut 30 feet long intersects the "B" vein. This vein has been followed by a drift for some 170 feet. The vein has been developed upwards by stopes and raises.

Opposite the short diagonal crosscut and for several feet on either side, the main vein has split into three veins a few inches wide. The hanging-wall vein is constant in width, whereas the others pinch and swell. These three veins all have a smaller dip than ordinarily; they average 30 to 35 degrees south. In the east face the vein narrows to 3 inches of quartz which has frozen walls. At a place 50 feet from the west face the "B" vein goes into the wall as a 6-inch stringer of quartz. The westward continuation of this drift is offset about 10 feet to the north. This portion of the drift contains small discontinuous lenses of quartz that are thought to constitute a new vein, rather than to be a continuation of the "B" vein. At a place 130 feet from the portal a crosscut to the south intersects the third vein (or "C" vein) at 25 feet. This has been followed by a drift to the south-west for about 120 feet. This vein strikes from south-west to west. A short crosscut and drift 110 feet from the portal shows some lenticular quartz that is probably an eastward continuation of this vein.

The "C" vein is from  $\frac{1}{2}$  to 6 inches wide. In some places it forms the foot-wall of a crushed zone and in others it has frozen walls. Towards the west end of the "C" vein-drift, the vein dies out on entering the diorite. The diorite is medium-grained and consists of light-green chloritic hornblende and white feldspars. However, "C" vein is present again in a drift at the extreme south-west end of No. 3 adit as a strong quartz-filled fissure. This part is continuous with the Baker lead in a stope beneath the lowermost *O.K.* adit.

Of the four numbered dykes occurring in No. 2 adit, only No. 2 dyke is present in this adit; it occurs in the floor of the stope driven from the first crosscut to the north. Here it is a badly decomposed mica lamprophyre 2 feet wide that occupies a normal fault which has displaced the vein 4 feet down the dip of the fault. A narrow mica-lamprophyre dyke that cannot be correlated with any of the others is found in the face of the extreme west end of the drift from the last-mentioned stope. With the exception of the diorite mentioned above, the adit is driven in typical fine-grained andesite that in a few places shows brown patches indicating incipient serpentinization.

The 350 adit is at an elevation of 3,385 feet. In this adit the vein has been drifted on for 50 feet and stoped extensively. The vein is a well-defined quartz fissure-filling from 4 to 12 inches wide; however, in the west face this changes to quartz-lenses with frozen walls. These contain numerous rock fragments and show evidence of replacement having been more important than fissure-filling.

A badly decomposed mica-lamprophyre dyke extends from the north wall of the adit at 50 feet from the portal to the south wall at 120 feet. A 10-foot section of green andesite mottled by brown serpentinous areas intervenes between the dyke and the next rock-type, a biotite monzonite. This extends to a place about 210 feet from the portal. The monzonite is characterized by a coarse granitic texture and by two mineralogical phases, a biotite-rich phase at the borders where in contact with the andesite and a feldspar-rich phase within the main mass. From 210 feet to the face the rock is typical andesite. However, in the vicinity of a fault at 300 feet, abundant serpentine has developed in the andesite over a zone 4 feet wide.

No. 4 adit is at an elevation of 3,350 feet. The first 145 feet of this is on *Midnight* ground and that part on *I.X.L.* ground was filled by dammed-up water at the time of the writer's visit. The timbering in this adit extends to within 10 feet of the crosscut to the *Midnight* stopes,

and the dam is only 10 feet beyond this. The rock exposed in this section is a hard, dark, micaceous phase of the monzonite such as occurs in the 350 adit.

An adit at an elevation of 3,400 feet near the *Midnight* workings has been called No. 3A for reference. It has been driven at north 20 degrees west for 153 feet, but throughout this distance it did not encounter any vein. The predominant rock is a fine-grained andesite, but there are two areas of a dense, highly siliceous phase—one, a zone 4 feet wide that is 40 feet from the portal, and the other an indefinite zone in the face.

At present the property is leased to a syndicate, with Ole Osing in charge of the mining operations, which were confined during the summer to stoping on the vein from the 350 adit. Compressed air supplied by a small compressor is used.

**O.K.** The *O.K.* property includes but one claim, the *O.K.*, located in 1892 and Crown-granted in 1895. The workings are immediately west from those of the *I.X.L.* Three adits on the property give access to rather extensive workings, but at the time of the writer's visit the upper two were badly caved and only the lower could be fully examined.

The uppermost *O.K.* adit is at an elevation of 3,610 feet. Old plans and reports indicate that the workings on this level are quite extensive and that at least one vein was discovered and worked.

The middle *O.K.* adit is at an elevation of 3,560 feet. Most of this adit was badly caved at the time of the writer's visit and only a short section of the vein that had been intersected by a crosscut 70 feet from the portal could be examined. The vein is the usual quartz-filled-fissure type, strike south 65 degrees west, dip 50 degrees south-east, cutting serpentized andesite. Old maps and reports indicate that no other vein was encountered on this level.

The lower *O.K.* adit is at an elevation of 3,490 feet. From this level a vein, called the Baker lead, has been developed. Near the end of a crosscut that has been driven 90 feet south from a place 240 feet from the portal an underhand stope follows this vein to the floor of the No. 3 *I.X.L.* adit. An intermediate level 30 feet below the bottom *O.K.* adit and leading from this stope has been driven westward along the vein for 40 feet. A normal strike-fault along the vein on this level has faulted it so that the portion above the sub-level has been displaced to the north-east. Between this level and the No. 3 *I.X.L.* the vein dips quite steeply and varies in width from a few inches to 2 feet. It is quite tabular and definitely represents a quartz-filled fissure. The main portion of the lower *O.K.* adit follows a well-defined fault. This is first encountered at 170 feet from the portal and continues for about 260 feet to the face with only moderate changes in strike. The amount of gouge and crushed country-rock in the fault varies along the strike. The predominant rock in the lower working is serpentine, which occurs in the main drift, but the two crosscuts to the north encounter andesite and serpentized andesite approximately 40 feet north of the main drift and the serpentine. The contact is not sharp, but grades from serpentine that is almost soapstone into serpentized andesite and then into andesite. Biotite monzonite occurs between 45 and 55 feet from the portal. The boundaries are, however, very irregular and much complicated by the presence of lamprophyre dykes. A 4-foot lamprophyre dyke also crosses the main drift where the first crosscut to the south has been driven.

In June John Hendrickson and associates, lessees, were stoping ore from the Baker lead beneath the lower adit. Air from a small compressor was being used.

**Midnight.** The *Midnight* consists of one claim, the *Midnight*, Crown-granted in 1897. It adjoins the *I.X.L.* claim on the east and most of the workings are adjacent on the north-east to the *I.X.L.* workings. The general geology is very similar to that of the *I.X.L.*, but, owing to more abundant faulting and a definite lenticular habit, the veins are perhaps more difficult to follow and have not been developed to such a great extent.

The writer was able to discover four adits on the property, referred to as the upper, middle, and lower *Midnight* adits. Three of these are immediately north-east from the *I.X.L.* workings and a fourth is some 800 feet north-east from the *I.X.L.* No. 4 adit.

The upper *Midnight* adit is at an altitude of 3,420 feet and is distant 240 feet horizontally in a direction of north 30 degrees west from the *I.X.L.* No. 4 adit. The adit has been driven in a direction north 40 degrees west for 80 feet, thence north 20 degrees east for 80 feet to a point of reference "A." From here two workings lead westward; the first, a short drift which follows a narrow pinching quartz-seam, in a direction of south 85 degrees west for 25 feet to

a normal fault that drops the vein 4 feet into the foot-wall, and the second an exploratory crosscut in a direction of north 30 degrees west for 90 feet, thence north 75 degrees east for 40 feet; this working encountered three well-defined faults but no vein material. From "A" the adit is a drift on the vein in a direction of north 55 degrees east for 85 feet. In the immediate vicinity of "A" a stope ranging from 10 to 25 feet wide goes down on the vein and connects with the lowermost adit. Twenty-five feet eastward from "A," a winze was sunk on the vein which, as now seen, consists of 4 inches of crushed quartz in a fissure that strikes north 75 degrees east and dips 45 degrees southerly.

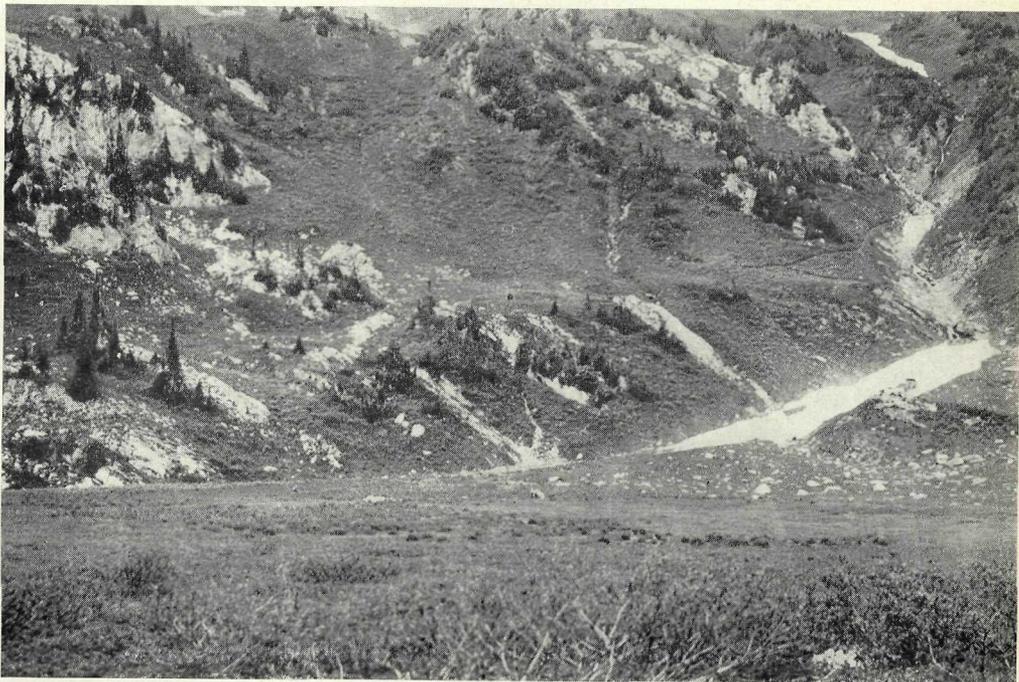
Two small stopes go up on the vein, one opposite the winze and another on a section of the vein 60 to 80 feet east from "A." A short working leads northward between these stopes. The vein as seen in the floor opposite the easterly stope is lenticular, ranging from a thin seam to 3 inches of quartz; it is cut by two mica-lamprophyre dykes and at the east end it has been lost where cut by a steeply dipping north-south fault. At 100 feet from the portal a winze was sunk on a small pocket of quartz about 10 feet long that occurred in a narrow seam in the rock. This adit is driven in fine-grained andesite that has been cut by black mica-lamprophyre dykes.

The middle adit, a short distance below the upper, is distant 175 feet horizontally in a direction of north 40 degrees east. The adit begins in a direction of north 30 degrees west for 40 feet, but here bad caving prevented further examination. In the floor of this first part there is a strong quartz vein, from 6 inches to 3 feet wide, strike north 30 degrees west, dip 70 degrees south-west, in andesite. This vein is reported to be stoped to the lower adit.

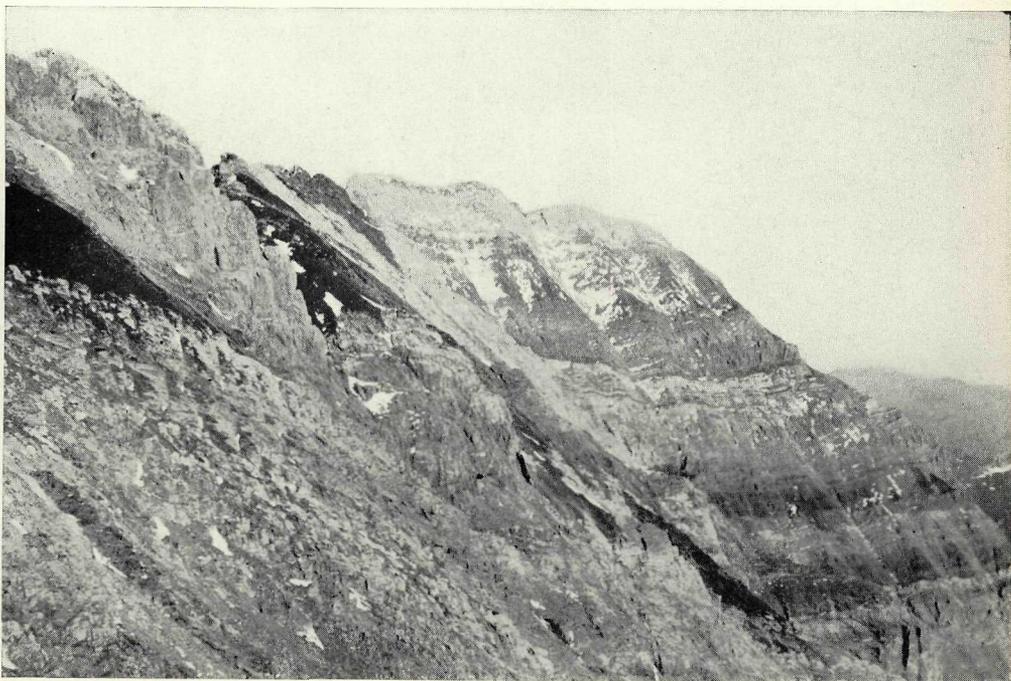
The lower *Midnight* adit, altitude 3,350 feet, corresponds to No. 4 of the *I.X.L.*, the first 140 feet of which is in *Midnight* ground. Just beyond this the adit branches, the *I.X.L.* part westward and the *Midnight* part northward. From here the *Midnight* adit goes north 30 degrees west for 45 feet, then north 5 degrees east along a slightly curving course for 150 feet to a reference point "A." Here a short section of a quartz vein was encountered and stoped by an irregularly shaped stope between this and the reference point "A" in the upper level. Where examined in the west side of the stope near the *I.X.L.*-*Midnight* boundary, and about 20 feet from the floor of the lower adit, the vein was quite sinuous, tight, and varied from 6 to 8 inches in width; the vein-filling was predominantly quartz. The strike is east and the dip 45 degrees south. From "A" the adit leads north 60 degrees east for 65 feet to a reference point "B." The last 30 feet of this section is through a badly decomposed mica-lamprophyre dyke that strikes north 30 degrees east and is approximately vertical. From "B" a crosscut goes eastward for 30 feet to a drift that goes north for 30 feet and south for 60 feet on a strong quartz vein that strikes north and dips 45 degrees west. The vein ranges from 2 inches to 6 feet in width between tight walls and pinches out at either end of the drift. For approximately 45 feet from the north end of the drift the vein has been stoped to the surface. The south end of the drift is in very dense and highly silicified rock; at the north end a 2-foot mica-lamprophyre dyke, strike north 30 degrees east, with a steep dip, cuts the vein; elsewhere the drift is in dense andesite. From "B" the adit goes north for 30 feet, mostly through a lamprophyre dyke, then north 45 degrees west for 30 feet to reference point "C." From "C" a crosscut goes north 75 degrees east for 25 feet to a drift which has been driven south for 25 feet on a section of a vein that averages 12 inches in width, strike north, dip 60 degrees west. Near the middle of this drift a steep fault, strike north 20 degrees east, has moved the south portion of the vein from the east wall of the drift to the west. The vein in this drift is reported to have been stoped to the middle adit. From "C" the adit goes north 75 degrees east for 70 feet, thence north 10 degrees east for 30 feet to a wide drift that turns south-eastward for 25 feet. This drift is on a curving section of the vein which strikes 70 degrees west and is as wide as 2 feet, but towards the north-west end narrows to 2 inches and towards the south-east end it is represented only by two slips in the andesite. The vein-filling is quartz.

In the lower adit the predominant rock is typical fine-grained andesite which is cut by mica-lamprophyre dykes. However, a zone about 6 feet wide of light-green silicified rock strikes north along the east wall of the adit between 120 and 180 feet from where the adit branches from the *I.X.L.* No. 4 level. The walls of this zone are ill-defined and are bounded by numerous and curving slips with varying attitudes.

An adit was driven on the *Midnight* claim from a place 100 feet north from the intersection of the upper road to the *I.X.L.* new ore-bins with the lower road to the portals of *I.X.L.* adits



Alco Silver Mines, Ltd., Western Side of Basin. No. 4 Adit is in Small Draw to the Right.



Looking East from Thunderbird Property, Windermere Area.



Folding in Sedimentary Rocks on Highway, East Side of Kootenay Lake, South of Gray Creek.



Pack-train returning from Teddy Glacier Property.

Nos. 4 and 350, etc. The portal of this adit is only a few feet lower than No. 4 of the *I.X.L.*, and is distant from it 480 feet west and 600 feet north. It has been driven south 15 degrees west for 110 feet, then south 60 degrees west for 120 feet and south 85 degrees west for 70 feet; at 100 feet a working goes off at 15 degrees for 14 feet.

The adit intersects several well-defined faults but no veins; faults occur at 100, 115, 175, and 290 feet from the portal. Most of these contain abundant gouge and sometimes narrow veinlets of calcite. The adit is driven in dense andesite.

At the time of the examination in June the property was leased by the Midnight Syndicate, of Rossland; Nick Leface and partner, of this syndicate, were hand-mining in the west side of the stope between the lower and upper adits.

### SILVER-LEAD-ZINC DEPOSITS.

#### DOCTOR FORK OF FINDLAY CREEK, WINDERMERE MINING DIVISION.

**Key.** This group consists of four claims staked in the summer of 1934 and two staked later, held in the names of the three Blake Bros., of Skookumchuck, and their associates. Leaving the highway 3 miles northerly from Canal Flats, an old logging-road is followed for 12 miles, thence 13 miles of pack-trail leads to the property, at elevations between 8,000 and 9,000 feet above sea-level, which is situated at the head of the East fork of Doctor creek, a tributary of Findlay creek.

Near the property two tributaries of the East fork of Doctor creek rise separately in a large basin. The west tributary rises in a small lake, flows through a short canyon, and is divided from the East branch, which rises in a meadow, by a flat-topped rock ridge. A cabin has been built on the meadow. To the east and south the rim of the basin is about 3,000 feet above the meadow and is formed of porphyritic granodiorite with large feldspar phenocrysts, while to the west the rim is quartzite, apparently overlain by greenstone for some distance.

The ridge between the creeks consists of greenstone on the east, and to the west it is a succession of quartzite-beds varying from thin argillaceous to thick cherty beds all more or less micaceous. The strata strike in general from north to north 30 degrees east and dip generally at about 60 degrees to the north-west.

The canyon previously mentioned apparently marks a fault and along it the beds vary greatly in dip and strike and at places are quite contorted. West of the canyon the quartzite is overlain by greenstone for some distance. Some of this greenstone may be a fine-grained diorite. Beyond this, quartzite outcrops again and is intruded by greenstone sills.

The claims are located to cover the western half of the ground between the tributaries and extend partly up the western rim of the basin. Much of the ground is covered with slide-rock. When the property was visited in mid-September a light snow had fallen.

On both sides of the short canyon mentioned, lenses and wedges of sulphide mineralization occurring along bedding-planes of the more or less metamorphosed, sericitized, and contorted quartzite consist of galena, pyrite, and minor amounts of sphalerite. A grab sample of this material taken by the Resident Mining Engineer in 1934 assayed: Gold, 0.02 oz. per ton; silver, 9.2 oz. per ton; lead, 17 per cent.; zinc, 1.5 per cent.

On the western side of the basin, well up the steep slope, at an elevation of about 9,000 feet, some 1,700 feet from the outlet of the lake, a vein is exposed for about 50 feet in fine-grained greenstone. The vein, strike about north 30 degrees east, dip 60 degrees north-west, is imperfectly exposed, but appears to be about 4 feet wide, containing quartz, siderite, and lenses of sulphides, including pyrite, galena, fine-grained sphalerite, and some arsenopyrite.

South-westerly about 150 feet along the strike a small cut exposes 6 feet of vein-matter mineralized principally with pyrite. The following samples were obtained from this vein:—

Gold.	Silver.	Lead.	Zinc.	Iron.	Remarks.
Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	
0.05	6.2	0.8	6.0	31.3	Heavy mixed sulphides of lead, zinc, and iron; 10 inches on hanging-wall of vein in greenstone.
0.10	0.8	Trace	14.0	-----	Selected pyrite from vein in greenstone.
0.01	80.4	36.0	8.0	-----	Selected cubic galena, first cut, vein in greenstone.

About 6 feet west of this cut a sample from a 2-inch fracture in the greenstone containing serpentine and a little fine-grained sulphide assayed: Gold, trace; silver, 4 oz. per ton.

Just west of this the greenstone is in contact with quartzite, the contact apparently following the bedding of the latter. In the quartzite, not far from the contact, is another cut about 100 feet south-west of the first, exposing a fairly solid band of sulphides irregular in width and 9 inches at the widest point. The mineralization follows the bedding, which strikes north 10 degrees east and dips 60 degrees to the west. The following samples were selected from this material:—

Gold.	Silver.	Lead.	Zinc.	Remarks.
Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	
0.06	4.4	3.6	28.0	Selected coarse crystalline zinc and some pyrite.
0.04	21.0	24.0	10.0	Selected fine mixed sulphide from top cut.
0.02	15.0	13.9	14.9	Selected fine sulphide with fine yellow mineral; reported gold-bearing.

About 50 feet north-west of this cut is a lens of quartz 2 feet wide heavily mineralized with pyrite. A sample across this width assayed: Gold, trace; silver, trace; lead, *nil*; zinc, *nil*.

#### TOBY CREEK, WINDERMERE MINING DIVISION.

##### **Thunderbird Mines, Ltd.**

This private company, of which J. P. Farnham, of New York, is president, owns seven claims and has an option on three claims, all located on the steep sides of the basin at the head of Mickleson creek, a tributary entering Delphine creek from the north. There is a packers' camp on Delphine creek 2 miles by road from the junction with Toby creek and 21 miles from the town of Invermere. From the packers' camp a rather steep "go-devil" trail 4 miles long leads to the mine camp at an elevation of 7,500 feet.

The workings, which consist of pits, trenches, and short adits, are at elevations ranging from 8,700 to 10,100 feet. In addition to this work, mineralization has been exposed near the power-house and on the trail between the power-house and No. 3 adit. The country is extremely rugged and above camp-level there is practically no vegetation. The steep slopes rise to the main ridge, a spur of Mount Nelson. Small peaks on the crest of the ridge are at elevations exceeding 10,000 feet.

The rocks exposed are mapped on the Windermere sheet, Geological Survey of Canada Memoir 148, as Mount Nelson Series. They consist of dolomitic limestones, some quartzites, and slates, which in part have been much contorted. The rocks strike north-westerly and dip to the north-east. They have been cut by several faults of considerable displacement which are marked by extensive widths of shattered rock, and at some points by greenstone intrusives. Greenstone dykes found at other points are generally much altered. Some are schistose and some have been altered to brown ankeritic carbonate. Much of the limestone is cut by innumerable closely spaced fractures which are filled with veinlets of quartz. Mineralization occurs in this limestone along fractures occasionally marked by polished surfaces which follow the bedding, also along some cross-fractures.

Intense oxidation of the outcrops is generally marked by gossan, dark with manganese. Occasionally specks and small pieces of sulphide occur in it, while at two or three of the higher points constant freezing and rapid erosion have evidently preserved the sulphides from oxidation by ground-waters. Three of the lowest exposures are in tight fractures with but little sign of oxidation and in them galena and light-coloured sphalerite are to be seen. At the higher points galena containing grains of pyrite varies from quite fine-grained steel galena to moderately coarse-grained cubic galena, stained with copper carbonate probably derived from grey copper. Copper carbonate is to be seen at points in the limestone adjacent to the fractures. Disseminated galena was also noted in the centre of a piece of limestone impregnated with siderite, the outer surface of which was dark with manganese and iron oxides.

Recent work includes driving No. 3 adit a distance of 130 feet (as at September 15th) at an elevation of 8,700 feet, which exposed evidence of shearing along the bedding of limestone stained with iron oxide, but no commercial mineralization has yet been discovered. There is

also a 20-foot crosscut and a 40-foot drift following a narrow seam of gouge, along which some quartz and a little pyrite have been developed.

About 250 feet south-west of No. 3 adit a cross-fracture, strike north 25 degrees east, dip 45 degrees north-west, has been traced 60 feet on the surface and 40 feet by rock-cut and adit. Sulphides occur in lenses along this fracture, the largest lens having a length of 15 feet and maximum width of 14 inches, which appeared to pinch out in a pit about 3 feet below drift-level.

Mineralization, usually consisting of very dark gossan, has been traced in cuts to No. 1 adit about 2,000 feet north-west of No. 3 adit and in the same segment. Occasionally there is evidence of movement along the bedding represented by polished planes. At some points there is a little sulphide to be seen. No. 1 adit is caved, but about 40 feet above it in cut "D" at elevation 9,550 feet the writer obtained the following section across a total width of 38 inches:—

Width.	Gold.	Silver.	Lead.	Zinc.	Copper.	Remarks.
Inches.	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	
2	2.94	75.0	22.7	1.9	1.0	Hanging-wall streak, selected lumps of sulphide.
7	0.02	27.0	13.5	----	0.4	Manganiferous gossan showing some galena.
15	-----	-----	-----	----	----	Limestone "horse."
14	Nil	Nil	Trace	----	----	Black gossan.

About 2,000 feet west of this point under the peak are two cuts in a third segment at an elevation of about 10,000 feet which were filled by snow. Some steel galena containing fine grains of pyrite and showing stains of copper carbonate had been dug from these cuts. Lower down are some exposures of gossan.

No. 2 adit, 12 feet long, at an elevation of 8,875 feet and about 2,000 feet westerly from No. 3, was being driven by hand. The face showed 2 inches of manganese-stained, silicified limestone along a fracture following the bedding. A little galena was developed in narrow fractures branching from the larger fracture into the limestone.

Permanent buildings include a mess-house, one camp building, the power-house, blacksmith-shop, and powder-magazine. A 235-cubic-foot Gardner Denver compressor and a 16-k.v.a. generator driven by a gasoline-engine are installed in the power-house.

#### FIELD, GOLDEN MINING DIVISION.

**Monarch.\*** In view of the many inquiries and complaints made to this Department, in the light of recent developments at the *Monarch* mine, regarding statements issued from time to time by Base Metals Mining Corporation, the writer has prepared a review of these statements and also of operations at the *Monarch* mine from information on file in his office. From the time of incorporation to September 4th, 1935, Goldfield Consolidated Mines, Limited, of Nevada, had directorial control, and Frank Eichelberger, general manager, was in charge of operations. Mining Corporation of Canada did not obtain directorial control of Base Metals Mining Corporation until September 4th, 1935. Since that time an effort has been made and is continuing to discover other ore-bodies. The property was last examined by H. Sargent, Resident Engineer for No. 5 District, in September, 1935.

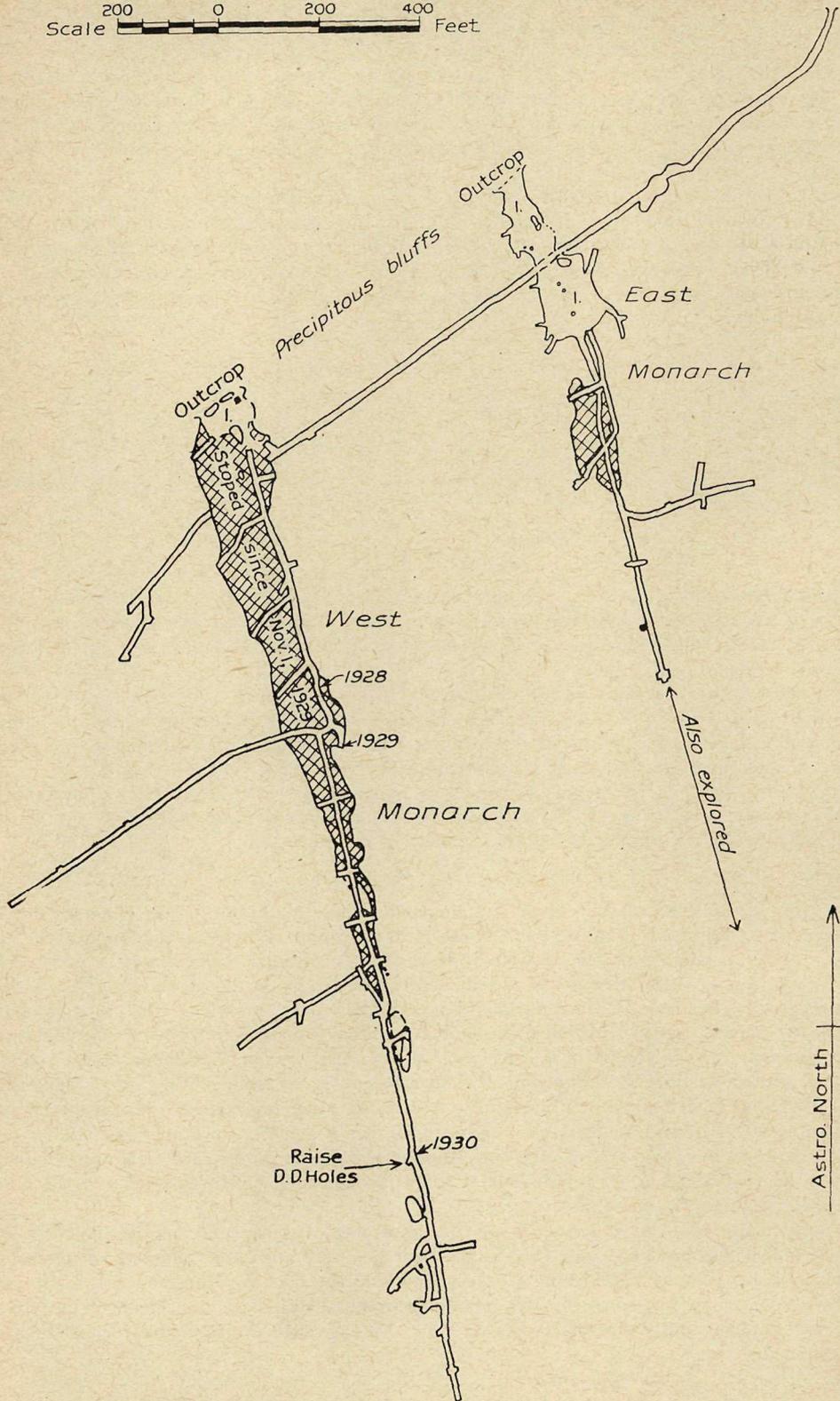
The workings of the *Monarch* mine are situated in the precipitous face of Mount Stephen, about 3 miles east of Field. They are about 1,000 feet above the railway-tracks of the main line of the Canadian Pacific Railway.

Mineralization consists of a replacement in limestone by galena and sphalerite.

Three ore-bodies have been developed—the East Monarch and West Monarch on the south or Mount Stephen side of the Kicking Horse valley, and the Kicking Horse on the north side.

The property now known as the *Monarch* mine was staked in 1884 and has been developed and worked intermittently since that time. From 1884 to 1910 approximately 2,420 tons of ore was mined.

\* By the Provincial Mineralogist.



Monarch Mine. Plan of Workings.

A 70-ton concentrating-mill was erected in 1912 and production from 1912 to 1924, inclusive, amounted to 40,015 tons. Most of the ore mined during this period came from the East Monarch ore-body. The areas mined during this period are shown without pattern on the plan and are numbered 1.

In 1925 the property was acquired by the A. B. Trites interests (Pacific Mines Development and Petroleum Company). The West Monarch was explored to a point 500 feet from the outcrop.

On December 6th, 1927, an option on the property was taken by Frank Eichelberger for \$236,000 and 25 per cent. of net profits; the latter could be converted for \$125,000 within two years.

On March 15th, 1928, an agreement was made between Eichelberger and Goldfield Consolidated Mines, Limited, of Nevada. Eichelberger had paid \$20,000 on his option.

By the end of 1928 the West Monarch ore-body had been explored to a point 600 feet from the outcrop. This point is shown on the plan by the date 1928. At this stage, development (estimated from the plans and figures given this Department by the company, Annual Report, 1929) should have partially developed 160,000 tons of ore. The Minister of Mines' Annual Report for 1928 gives 50,000 tons in the Kicking Horse and 150,000 tons for East and West Monarch combined. Therefore, the estimated figures is perhaps too high. However, it will be used.

On February 25th, 1929, Base Metals Mining Corporation was formed to take over the property. By this deal Goldfield Consolidated received 1,300,000 fully paid shares in the new company. Mining Corporation of Canada, agreement of February 25th, 1929, took 355,000 shares in the new company for \$345,000 and a further 345,000 shares in consideration of the covenant of Mining Corporation to assume the balance of the purchase price to A. B. Trites, but not to exceed the sum of \$341,000. The first \$345,000 provided for mill-construction and development.

In 1929 the present 300-ton mill was erected and put into operation. Production to the end of the year was 1,730 tons.

By the end of 1929 the West Monarch ore-body had been explored a further 110 feet from the outcrop. This point is shown by the date 1929 on the plan. The additional ore partially developed would be about 30,000 tons based on figures for drifting, crosscutting, and raising given by the management.

It is stated in the Annual Report of the Minister of Mines for 1929 that "The principal development has been done in the West Monarch, which has been explored by drifting, cross-cutting, and raising for a length of about 850 feet, with continuous ore throughout. The width of the deposit is about 130 feet, with a tendency to *taper slightly* as exploration proceeds to the south. . . .

"The whole ore-body will, *it is understood*, average around 26 per cent., combined metals in the proportion of, roughly, 14 per cent. lead and 12 per cent. zinc."

It is to be noted that as early as the end of 1929 the ore-body was showing a tendency to taper slightly to the south.

By the end of 1930 exploration had reached a point 1,525 feet from the outcrop. This point is shown by the date 1930 on the plan. It is apparent from an examination of the plan that the main drift passed out of ore about 1,260 feet from the outcrop. It is also apparent from the crosscuts shown on the plan that the width had narrowed to half or less than half of the width of the area developed to the end of 1929. This work would indicate about 35,000 tons of additional ore.

Let us now review the statements issued by Base Metals Mining Corporation up to and including the period ended 1930.

The first report bears the date March 20th, 1930, and is signed by Frank Eichelberger by order of the Board of Directors. The following quotations are from this report:—

(1.) "Development-work has been previously carried on and, at the time of the formation of the company, 300,000 tons of ore were developed in the three ore-bodies."

(1A.) "The mill has been brought up to its rated capacity. The ore mined and milled to date has come from the West Monarch, in a portion of the mine which is below the average grade. The mill extraction has averaged 97 per cent. of the lead, 90 per cent. of the zinc, and 85 per cent. of the silver. The economic recovery of the metals has averaged 96 per cent. of

the lead, 75 per cent. of the zinc, and 75 per cent. of the silver from an average head assay of 14 per cent. lead, 8 per cent. zinc, and 1.6 oz. silver. The average grade of the lead concentrate has been 6 oz. silver, 75 per cent. lead, and 5.4 per cent. zinc, while the zinc concentrate has averaged 58 per cent. zinc, 2 per cent. lead, and 2 oz. silver."

(2.) "During the construction period only a limited amount of development was accomplished, chiefly in the West Monarch ore-body. This advance exposed 75,000 tons additional, averaging 3 oz. silver, 22 per cent. lead, and 19 per cent. zinc, bringing the total for this ore-body to approximately 300,000 tons averaging 2.1 oz. silver, 16 per cent. lead, and 14 per cent. zinc. The ore in the face is of excellent grade."

(3.) "Similarly, the East Monarch ore-body has now developed approximately 50,000 tons of ore averaging 2 oz. silver, 18 per cent. lead, and 12 per cent. zinc, with the same character and grade of ore continuing in the face."

(4.) "The Kicking Horse ore-body remains at approximately 50,000 tons developed, of an average grade of 3 oz. silver, 5 per cent. lead, and 15 per cent. zinc. No work was done on this ore-body during the construction period."

(5.) "The fact that the West Monarch ore-body has been proven for a distance of over 900 feet, with the grade of ore improving, and the face of the south drift in the best ore so far encountered in the mine, gives great encouragement for future development. The total developed tonnage of ore as of March 1st, 1930, is approximately 400,000 tons."

*Remarks.*—(1.) Annual Report, Minister of Mines, for 1929:—East Monarch: "Only a few hundred feet of exploratory work has been done on the East Monarch deposit beyond the old stope, 350 feet long, from which past production was made. In the new workings a substantial body of ore has been partially explored by drifting, crosscutting, and raising, but this work is not sufficiently far advanced to indicate the possible dimensions of this deposit, which, however, occurs under conditions similar to the West Monarch."

Fifty thousand tons is estimated for the Kicking Horse deposit.

West Monarch: According to the Department's estimate for the end of 1928, 160,000 tons of ore was indicated in this part of the mine, or approximately 210,000 tons for the whole property.

(2.) The limited amount of development done during the construction period in 1929 is stated to have developed 75,000 tons of ore in the West Monarch, bringing the total for this ore-body to 300,000 tons. The Department's estimate is that 190,000 tons was indicated at the end of 1929.

(3.) In the Annual Report of the Minister of Mines for 1929 it is stated that no estimate could be made of ore in the East Monarch.

(5.) The Department's estimate of indicated ore at the end of 1929 would be 240,000 tons exclusive of an uncertain tonnage in the East Monarch.

No report appears for the year 1930, but a statement was made to this Department from the management containing:—

"The ore developed by the year's work is slightly thicker and narrower than that in the older northern part of the ore-body. A somewhat greater tonnage of ore has been developed during the year than has been mined, and it is of a somewhat higher grade, averaging about 40 per cent. combined metals.

"In the East Monarch mine, drifting and stoping has been carried southward 290 feet during the year.

"Approximately 1,300 feet of diamond-drilling has been done on and near the two ore-bodies.

"The mill was shut down on October 15th, but development continued until the end of the year."

The Department's estimate is that approximately 35,000 tons of additional ore was indicated in the West Monarch and an unknown amount in the East Monarch.

Production amounted to 75,000 tons for 1930. According to the Department's estimate, 225,000 tons of ore had been partially developed in the West Monarch to this date, and subtracting 75,000 tons mined it would leave 150,000 tons in this body. It is possible that sufficient ore had been partially developed in the East and West Monarch ore-bodies to warrant a statement that *indicated* ore resulting from the year's development-work equalled that mined.

The point to bear in mind is that by the end of 1930 it should have been evident to the management that the West Monarch ore-body had pinched out, that it had decreased rapidly in width during the year's development, and that indicated ore reserves in this body had been reduced.

The mine was closed during 1931, 1932, and the first six months of 1933.

On June 4th, 1933, Frank Eichelberger and associates, of Toronto and New York, and Mining Corporation acquired Goldfields Consolidated's remaining 51 per cent. interest in Base Metals Mining Corporation.

In 1933, Mining Corporation and Goldfields Consolidated, who had advanced moneys during the shut-down, received 289,975 shares for these advances at apparently \$1 per share.

A report to shareholders dated October 15th, 1933, states: "Developed tonnage represents a four-year supply of ore at the present rate of milling." The rate of milling was approximately 300 tons per day; therefore, four years' supply of ore would be approximately 400,000 tons. The Department's estimate would be 200,000 tons plus an unknown amount, not over 47,000 tons, in the East Monarch.

The annual report of Base Metals Mining Corporation, dated April 21st, 1934, contains a report by Frank Eichelberger, general manager, dated April 17th, 1934, containing the following statements:—

"Development: A complete geological survey of the Monarch Mines was made and 286 feet of crosscuts, 70 feet of drifting, and 72 feet of raising was done.

"The result of this work was to extend the lateral limits of the ore-bodies and to prove the continuation of ore in the south end of the West Monarch. The total development footage was 428 feet.

"The total cost of development-work, including work preliminary to starting operations, was \$10,334.60.

"Ore reserves: When the mine was reopened in August, 1933, ore reserves were:—

	Ore.	Silver.	Lead.	Zinc.
	Tons.	Oz. per Ton.	Per Cent.	Per Cent.
West Monarch .....	318,100	2.4	18.0	18.0
East Monarch .....	41,500	1.1	6.2	15.2
Kicking Horse .....	75,000	3.0	5.0	15.0
Totals .....	434,600	2.4	14.6	17.2

"Since operations were resumed development-work has put more ore in sight than has been extracted."

The development-work mentioned would reasonably prove 22,000 tons of ore if all carried out in the ore-body.

In 1933, 35,612 tons of ore was mined; therefore, reserves as at the end of 1930 would be reduced 13,000 tons according to the Department's estimates. Allowing 150,000 tons in the West Monarch, 50,000 in the Kicking Horse, and 47,000 in the East Monarch at the end of 1930, the total would at the end of 1933 be 234,000 tons.

A company quarterly report dated July 15th, 1934, states: "Stoping during this period has proven the West Monarch ore-body to have greater widths and thicknesses and to date no definite western limit has been reached in any of the present working stopes."

A company quarterly statement dated October 15th, 1934, states: "In the West Monarch, considerable additions have been made to known widths and thicknesses of the ore-body, with the result that ore reserves have been more than maintained."

In the company's annual report dated April 12th, 1935, the report of Frank Eichelberger, general manager, dated March 15th, does not give any definite figures on ore reserves or tonnage developed during the year. The following statements are from this report:—

"Mining: During the year, 96,830.7 wet tons were trammed to the mill, 5,043 tons coming from the East Monarch and the balance from the West Monarch ore-body. Broken ore

reserves at the end of the year were estimated at 5,000 tons. All mining and aerial tramming costs, including office, overhead, insurance, and contingencies, amounted to \$100,288.80, equivalent to \$1.035 per ton of ore trammed. Stopping showed the stope limits, as adduced by the early development-work, were conservative, and also that ore proved to be continuous in the south section of the West Monarch ore-body where previously there had seemed to be a break in its continuity.

“Development: During the year 933 feet of drifting, 1,286 feet of crosscutting, and 1,020 feet of raising was done, a total of 3,239 feet of work. There was also 5,164 feet of diamond-drilling. Of this work, 229 feet of raising and 132 feet of drifting was for ore production and waste-disposal purposes, the remainder being development looking to extending the present ore-bodies and searching for others.

“High-grade zinc mineralization was encountered in the south end of the West Monarch and the ore-body developed for 120 feet. Drill-holes from 207 show this is probably the continuation of the main ore-body. The East Monarch ore-body stope limits were extended 45 feet and drilling showed mineralization for a width of 85 feet at the end of the production drift. This mineralization is parallel to the strike of the known ore-body, and the production drift will have to be extended and, after raising to the ore, crosscutting and drifting will be done to prove its extent. This ore was drilled just at the close of the year.”

It is worthy of note that 3,239 feet of development-work was done during 1934. During 1930 and 1933 only 1,523 feet of development was done. Definite statements regarding maintenance of ore reserves were made on the basis of the 1930 and 1933 work, but not on the greater amount of work done in 1934, except the quarterly statement on October 15th, 1934, previously quoted.

In 1934, 94,880 tons of ore was mined, of which 5,043 tons came from the East Monarch. An examination of the enclosed plan indicates that no appreciable tonnage of ore was developed in 1934. Therefore, the West Monarch ore-body at the end of 1934 definitely appears to have been reduced to approximately 60,000 tons.

The mill was closed February 16th, 1935, and if run at full capacity, approximately 13,000 tons was mined in the first six weeks of the year. According to the estimates given, it would leave 47,000 tons of ore in the West Monarch.

The mill was started on June 25th, 1935, and continued in operation until approximately December 5th, 1935.

On September 4th, 1935, the direction of Base Metals Mining Corporation was taken over by Mining Corporation of Canada.

In September, 1935, when Mr. Sargent examined the property, the rate of milling was approximately 210 tons per day. On the basis of 200 tons per day production to October 23rd, when a statement was issued by the Board of Base Metals Mining Corporation that milling would be suspended because of lack of ore, production would be approximately 24,000 tons. On the basis of the Department's estimates, 23,000 tons of ore would still be left in the mine. It is apparent that the Department's estimates have been too high.

Mr. Sargent found in September, 1935, that production was coming from “sniping” in the old stopes, including the removal of pillars, and from stoping the southerly extension of the West Monarch ore-body. He estimated that a section remained which might yield 30,000 tons.

*Grade of Ore.*—Production from 1910 to 1924, inclusive, amounted to 40,015 tons. The recovery made was 48,319 oz. silver, 6,899,967 lb. lead, and 228,000 lb. zinc; the latter was recovered only during two years' operation. On an average basis of recovery of 80 per cent. for the lead and 70 per cent. for the silver, the grade would be 10 per cent. lead and 1.77 oz. silver.

Production from 1929 to 1934, inclusive, amounted to 207,272 tons, and the recovery was 286,721 oz. silver, 40,486,193 lb. lead, and 43,268,283 lb. zinc.

In the Base Metals Mining Corporation report of March 20th, 1930, Frank Eichelberger stated that economic recovery averaged 96 per cent. lead, 75 per cent. zinc, and 75 per cent. of the silver. On this basis, the grade of ore for this period would be 10 per cent. lead, 13.9 per cent. zinc, and 1.84 oz. silver.

Actual mill-feed, according to:—

	Lead.	Zinc.	Silver.
	Per Cent.	Per Cent.	Oz. per Ton.
Minister of Mines' Report, 1930 .....	9.1	10.9	1.30
Base Metals quarterly report, October 15th, 1933 .....	15.0	11.0	1.80
Base Metals quarterly report, July 15th, 1934 .....	11.8	16.5	2.66
Base Metals quarterly report, October 15th, 1934 .....	12.5	13.3	1.85
Base Metals annual report, March 15th, 1935 .....	10.9	14.7	2.08

Only in one instance, for six weeks' operations, did the lead content of the ore milled approximate the content stated in reserves. The average is considerably below and the computed average is far below the figures given in ore reserves.

WOOLSEY CREEK, NORTH OF MAIN LINE OF C.P.R., REVELSTOKE MINING DIVISION.

**Alco Silver  
Mines, Ltd.  
(N.P.L.).**

This company, with head office at 708 Yorkshire Building, Vancouver, owns twenty-six mineral claims situated at the head of the Middle fork of Silver creek, about 12 miles by trail northerly from Silver Creek Siding on the main line of the Canadian Pacific Railway, 2 miles west of Albert Canyon Station. Known as Nos. 1 to 26 respectively, the claims are held by annual recording of assessment-work. Claims 14, 15, 21, 22, 23, 24, 25, and 26 were formerly known as the *Iron Cap* group, staked in 1930 and described in the 1931 Annual Report under "*Limestone Dyke and Iron Cap.*" The other claims staked were recorded in 1934.

The country is rugged, being deeply cut by the large stream-valleys. The claims, covering an easterly-facing basin, the floor of which is at an elevation of about 5,900 feet, extend for about 2 miles westerly, crossing the divide, which has an elevation of about 7,800 feet, and cover some ground on the slope which is drained by Carnes creek.

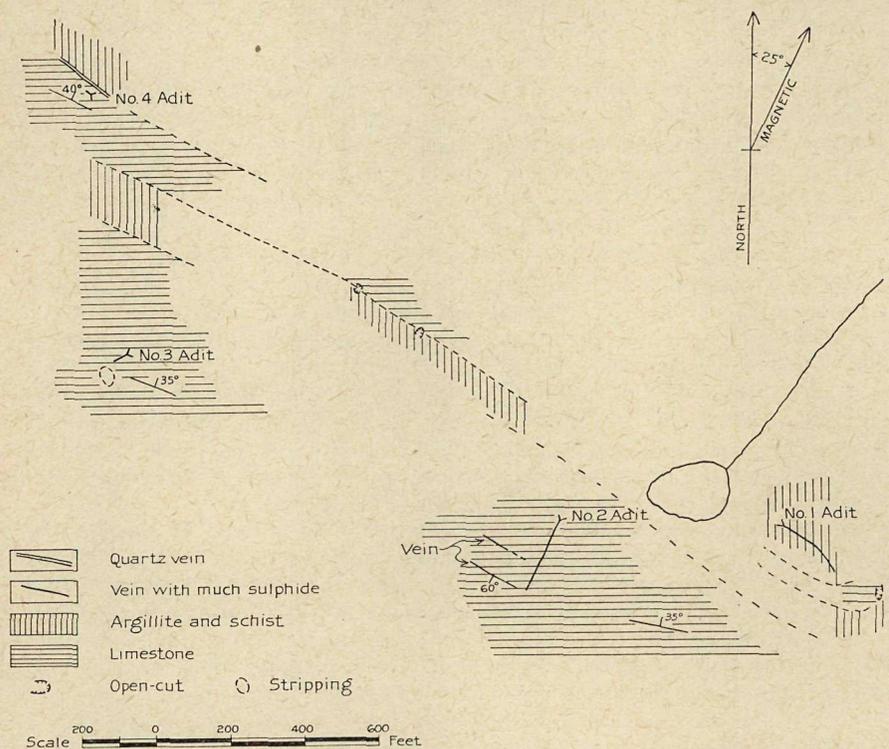
From Silver Creek Siding the route to the property follows the road to the *Snowflake* mine on the east side of Silver creek for about 4 miles. From this point a new road of good grade and width has been built to a point about 8 miles from Silver Creek Siding. Thence to the mine a pack-trail was being widened and at some points relocated to facilitate hauling with a caterpillar tractor. Towards the mine the grade is fairly steep.

The property was visited late in August and only the ground in the vicinity of the principal workings was examined in any detail. The workings consist of open-cuts and short adits around the southern and western sides and within an elevation of about 250 feet above the floor of the basin. There are also some cuts in a small knoll rising from the floor of the basin on the north side. The rocks exposed consist of slates, schists, and limestone, which strike from north-west to west and dip from 30 to 60 degrees to the north-east or north. North-east of the basin the rocks appear to be chiefly schists for some distance, while the south and west rims of the basin appear to be limestone. A band of limestone crossing the basin from the north-western corner is exposed for a width of 150 feet near No. 4 adit. Somewhat south of No. 3 adit the width appears to be less than 100 feet. The contact with the slates and schists to the north is faulted. South-west of this limestone there is a band of slate 150 feet wide at the western side of the basin and of undetermined width at the south-eastern corner. South-east of this, limestone is again exposed and, although its width was not determined, it appears to extend for a considerable distance.

In the larger mass of limestone south-west of No. 2 adit two parallel fractures have been exposed about 100 feet from the portal. The more southerly one, exposed for a length of 150 feet, is a narrow fracture from 2 to 4 inches wide, containing oxidized material with quite a lot of galena. A sample of the selected galena assayed: Gold, 0.04 oz. per ton; silver, 94.4 oz. per ton; lead, 63 per cent. The other fracture, about 75 feet north from the first, is exposed by a trench along the outcrop for 60 feet, and by pits for a further 60 feet easterly from the east end of the trench. For a length of 15 feet there is a width apparently related to a cross-fracture, of 2 to 5 feet of rusty gossan containing massive pyrite. Selected pyrite assayed: Gold, trace; silver, 1.8 oz. per ton; lead, *nil*. The strike of the fracture is north 60 degrees west or about the same as the limestone, but the dip is steeply to the south, while the limestone-beds dip at about 35 degrees to the north.

Farther west above No. 3 adit (*see map*), about 80 feet south-west of the portal, two lenses, each about 3 feet thick, containing sulphides appear to be partial replacements of certain beds of limestone and are separated by about 8 feet of rusty thin-bedded limestone. The upper lens contains some unaltered pyrite and the lower one pyrite and fairly massive sphalerite. The top half of the lower lens consists of a seam about 6 inches thick of fairly solid pyrite, and the bottom half of fairly massive sphalerite with some pyrite. Selected sphalerite assayed: Gold, trace; silver, 1 oz. per ton; lead, *nil*; zinc, 42 per cent. Selected pyrite assayed: Gold, trace; silver, 1.8 oz. per ton.

A third type of occurrence appears to be related to the contact between the limestone and the schist. Although the contact was not traced with accuracy and it is not well exposed at the south-east corner of the basin south of No. 1 adit, yet it is probable that the narrow band of limestone 150 feet wide near No. 4 adit extends across the basin on a general strike of north 60 degrees west. The contact is a faulted one and near No. 1 adit it appears to follow a less



B. C. Department of Mine, 1935.

Alco Silver Mines, Ltd. Sketch-plan showing Workings.

regular course. Two open-cuts above No. 1 adit expose sulphide mineralization, principally solid galena, developed in the limestone close to the contact. The exposures suggest that the solid sulphide mineralization is narrow and insufficient work has been done to indicate its continuity. From the lake in the basin to a cut on the southerly side of a knoll rising from the basin's floor are irregular outcroppings of a narrow, barren-looking quartz vein, which is assumed to mark the southern contact. The cut mentioned and another 200 feet westerly on the western end of the knoll expose the contact of limestone and schist. There is about 3 feet of more or less sheared rock with some quartz stringers and a little sulphide. The strike varies somewhat and the dip is steep to the north. Six inches of sheared matter with some quartz and a little galena, exposed in the western cut, was sampled and assayed: Gold, 0.06 oz. per ton; silver, 3.6 oz. per ton.

About 900 feet north-west from this cut and immediately north of No. 4 adit the contact is exposed in the bed of a small stream. A quartz vein varying from 8 to 24 inches wide,

apparently unmineralized, has been followed for 200 feet up the creek in the sheared rock at the contact. Near No. 4 adit a vein of galena, conforming to the strike of the limestone-beds and of irregular width up to 1 foot, branches off from the sheared contact. It appears to pinch at the top, while its horizontal extent is not shown.

There are other mineral occurrences on the property, but so far little work has been done on them and for the present they would seem to be of minor importance.

No. 1 adit, which was apparently headed for the cuts on the hillside above it, was driven 197 feet in graphitic thin-bedded sediments on a general bearing of south 45 degrees east, although it is not straight. Due to the local warping of the contact this adit was being driven parallel to rather than directly towards it.

No. 2 adit was driven by hand for 220 feet on a course of south 25 degrees west, about at right angles to the strike of the bedding. At that distance it should have cut the downward extension of the more northerly fracture and possibly also of the southerly fracture exposed on the surface. Two fractures were crossed, but they were tight and not well mineralized where the adit intersected them.

No. 3 adit, driven for 45 feet at south 70 degrees west in thick-bedded limestone, exposed slight mineralization on some joint-planes. No work was being done at this point at the time of examination, but results to be obtained are quite doubtful, as the mineralization exposed on the hillside above appears to follow the bedding, which dips about parallel to the slope of the hill. This adit was slowly crossing the beds and getting farther from the mineralization on the surface.

No. 4 adit, in 20 feet at north 50 degrees west, was designed to intersect the mineralization exposed in the creek, but had not reached its objective.

#### LARDEAU CAMP.

This property, consisting of seventeen claims and fractions situated at the **Teddy Glacier**, head of the Middle fork of Sable creek, is owned by Teddy Glacier Mines (1933), Limited; registered office, 555 Howe Street, Vancouver. The property was originally staked by Geo. Ritchie and Geo. Edge, who discovered ore in float issuing from the front of the glacier. In 1924 the ice retreated and the ore was found in place. During the summer of 1927 Detroit capital purchased a 50-per-cent. interest in the property. In 1929 the Bush & McCulloch interests employed thirteen men, and considerable improvements were made to the trail and a crosscut adit continued towards the Dunbar vein after the installation of a 60-horse-power Diesel engine and a Gardner compressor. Recently an English syndicate optioned the property and has done a good deal of development-work.

The property was reported upon in the 1924 Annual Report as the *Ritchie* group and as *Teddy Glacier* in the Reports for 1925 to 1930. It is also described in Geological Survey Memoir 161, "Lardeau Map-area."

The camp and principal workings are at an elevation of approximately 7,800 feet. There is a wide stretch of moderately sloping country covered by the glacier and by glacial debris, except where ridges project through the cover. The camp is about 13½ miles from Camborne and at about 5,800 feet higher elevation and access is rather difficult. A wagon-road extends some 4½ miles from Camborne. Beyond this point a narrow-gauge cart-road has been built for about 4 miles to the "Forks," at which point there is a packers' camp. Beyond this a steep pack-trail 5 miles long leads to the mine. The English syndicate, represented by J. Ellis, manager at the mine, began work late in 1934, but lack of supplies made it necessary to suspend operations. Fuel and some mine supplies were flown to the property and dropped from the air. Operations were resumed late in February. When the writer visited the property late in August a twenty-horse pack-train was being used to transport supplies from the "Forks" to the mine.

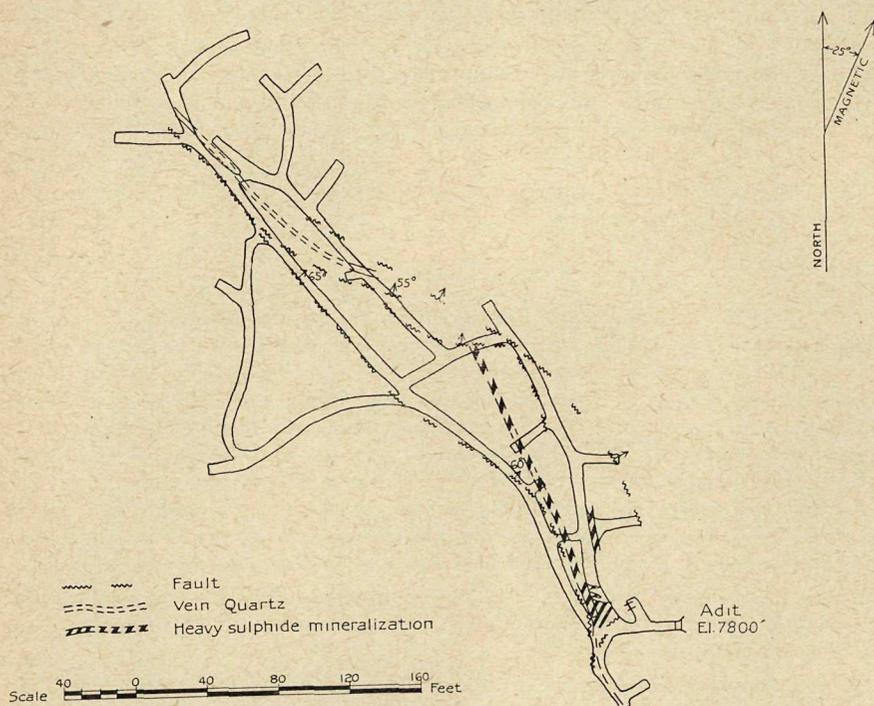
The English syndicate worked principally on the upper level, on which a total of about 1,600 feet of crosscutting and drifting has been done.

An adit designed to gain a depth of 180 feet below the upper level by driving about 600 feet north-westerly was in about 60 feet when the property was visited. As the results on the

upper level were not considered to be sufficiently encouraging, it was decided to abandon the project, and the property was shut down in September, 1935.

Late in August the "big showing" mentioned in former reports was still covered by the glacier, while the camp building had been built on another showing. Only the "carbonate lead," as it was called, which may be the "Dunbar lead" mentioned by A. G. Langley in the 1927 Annual Report, was exposed.

At the head of Eva branch, South fork of Sable creek, about 7,800 feet above sea-level, is the *Teddy Glacier* group. It was originally staked by George Ritchie and George Edge, who discovered ore in float issuing from the front of a glacier. In 1924 the ice retreated and the ore was found in place. The property is now owned by the Teddy Glacier Mines, Limited, financed in Vancouver, with F. R. Blochberger in charge of development-work. During the summer of 1927 Detroit capital, for which C. G. Bush is engineer, purchased a 50-per-cent. interest in the property and considerable development is planned. An aerial tram and a power-line from Menhenick creek to the property have been mentioned as possibilities, and in 1927 it was understood that an adit was being contemplated to tap the surface showings at



Teddy Glacier. Plan of Upper Adit.

B.C. Department of Mines, 1935

400 feet depth. A trail from Incomappleux River wagon-road connects the property with Camborne, about  $13\frac{1}{2}$  miles away. A small but serviceable cabin stands near the surface showings.

The rocks on the property are carbonaceous to graphitic schists, grey argillaceous schists with calcareous varieties grading to pure crystalline limestones, and fine-grained to gritty quartzites. They strike north 45 degrees west and dip 75 degrees north-east on the average. To the north-east of the workings chlorite-schists and numerous small beds of grey marble appear in the sediments, and finally, about half a mile north-east, a large dyke of greenstone of dioritic appearance. Microscopic examination of it shows albite, orthoclase, and a small amount of quartz in a mass of accessory and secondary mineral. It is consequently more acidic than a true diorite and is probably allied to quartz monzonite or granodiorite. About 100 yards south-west of the main surface showing, the sediments are cut by a dyke of green-

stone which has been more or less completely carbonated to the familiar rusty weathering carbonate rock of the district.

On the property, particularly between the ore-showings and the summit almost due west, much complex, practically isoclinal, folding has taken place. It is accompanied by shearing, faulting, and on the summit the sediments dip flatly to the south-west. The schistosity maintains its normal easterly dip. This belt of folding continues north-west over one divide to the head of Dog creek and essentially the same rocks persist.

The most important mineralization on the *Teddy Glacier* is found along two fracture-zones. The more easterly strikes roughly north 10 degrees west and has been traced on the surface for over 120 feet and is possibly exposed again 80 feet farther north. It is mineralized with galena, pyrite, sphalerite, and some chalcopryite in a gangue of white quartz and rock inclusions, the width varying from a few inches to 4 feet. The second vein, to the west of the first, strikes north 17 degrees west where exposed and has been traced for about 130 feet, varying in width after the manner of the first and being similar in all respects. In addition, there are numerous other quartz veins on the property which trend in various directions, but most frequently about at right angles to the strike of the formation. Many of them connect with the main veins and die out a short distance away from them. Mineralization in these veins is quite irregular, but some good showings have been uncovered, particularly near their junctions with the main veins. Where the first vein intersects the second one, and north of the latter, is the big showing; it is a large body of quartz some 30 feet long and carrying bodies, up to 5 feet wide, of coarse sulphides. It follows a somewhat more easterly course than the average strike of the eastern vein. Apparently the nature of the country-rock has had no important effect on the ore-deposition, although black carbonaceous schists mineralized with pyrite are most abundant near and west of the big showing. Whether the sulphides have replaced the limestones where these are intersected by the veins is a speculation that should be investigated, as such has been found to be the case in other properties in the Lardeau. The toe of the glacier lies 100 yards east of north from the big showing and in the float at its edge are some boulders of ore, indicating that further disclosures may be made as the ice recedes, which it is doing slowly but surely.

The sulphides, galena, pyrite, sphalerite, and chalcopryite, occur in bunches in the quartz veins or as continuous bands, pinching and swelling along the strike and varying in width from practically nothing to 4 or 5 feet. They are coarse-grained or very fine-grained and the chalcopryite is generally present in very minor amount. The finer-grained ore is an intimate mixture of the sulphides with grains of quartz and may require rather fine grinding for concentration. Examination under the microscope reveals many minute areas of tetrahedrite in the galena. Some movement has taken place along the veins since their formation, as the galena is in many cases sheared.

The following assays are quoted from the Annual Report, Minister of Mines, British Columbia, 1925:—

Description of Sample.	Au.	Ag.	Pb.	Zn.
	Oz.	Oz.	Per Cent.	Per Cent.
Coarse crystalline galena from a number of places; a substantial amount of this ore could be sorted out	0.08	39.5	74.6	1.2
Steel-grained galena containing pyrite and quartz, from various places; similar material occurs in quantity	0.04	23.3	53.1	10.3
Average sample across 5½ feet of ore and waste at the north-east extremity of the southern fissure, 78 feet from the big showing	0.29	17.6	31.3	7.2
Fairly clean pyrite selected from various places; this material occurs in abundance	0.28	16.7	1.6	-----

It is noted that the last assay is unexpectedly high in silver and that similar material assayed for the owners gave: Gold, 0.86 oz.; silver, 6.4 oz.; lead, 11.5 per cent.

The surface showings on the *Teddy Glacier* are very promising. The ore is of a good grade and should be easily concentrated. Underground development will be watched with interest.

The relation of the surface showings to the underground workings is not clear from previous descriptions. Apparently the upper level was designed to gain 35 feet of depth on the "big showing" and probably the distance to be driven was not great.

Galena, sphalerite, pyrite, chalcopyrite, and grey-copper mineralization have been described in earlier reports, which indicated that the pyrite carried fair values in gold and that silver values were somewhat less than  $\frac{1}{2}$  oz. per unit of lead. Well-crystallized mixed sulphides of lead, iron, and zinc, selected by the writer, assayed: Gold, 0.26 oz. per ton; silver, 8.6 oz. per ton; lead, 12.6 per cent.; zinc, 26.8 per cent.; while clean sphalerite assayed: Gold, 0.01 oz. per ton; silver, 1.4 oz. per ton; lead, *nil*; zinc, 62 per cent.

The accompanying plan of the upper level indicates the mineralization found underground as well as the general faulting. The workings are in a shear-zone, strike north-westerly. About 40 feet from the portal there is a width of about 15 feet of heavy mineralization exposed in a crosscut and in the pillar between the two drifts. To the east this mineralization appears to finger out into a great many narrow stringers largely filled with quartz. In the south wall of the above crosscut the mineralization is weak, and to the south and west and in the roof of the workings it dies out on approaching the fault-planes. The fault-plane on the east side of the westerly drift may be the western margin of mineralization (*see map*). Four crosscuts intersected similar mineralization varying from 15 inches to 6 feet in width, over an indicated length of about 160 feet, lying between the two drifts. The mineralization apparently dies out or is cut off at its northern extremity by a slip dipping north-east. A lens of similar mineralization is exposed on the east side of the easterly drift at the north of the first crosscut east from this drift. Its relation to the main mass of mineralization, 40 feet from the portal, is not apparent in the workings.

No definite evidence was seen underground regarding post- or pre-mineral faulting. There is a suggestion, however, that the sulphide mineralization is, to a considerable degree, a replacement-type along a north-westerly fracture, and is most intense where there is much cross-fracturing and dies out on approaching fault-planes along which there may have been some post-mineral faulting.

#### BURTON, ARROW LAKE MINING DIVISION.

**Silver Queen.** The *Grey Wolf*, *Grey Wolf Fraction*, *Red Fox*, *Black Fox Fraction*, and *Black Bear Fraction* claims are owned, and the *Red Fox Fraction* is leased, by H. E. Stones and his partner, J. Gayford, of Burton. The property is located near Silver Queen peak on the ridge between Canyon creek and Snow creek, some 13 miles easterly from Burton by road and trail. The present trail leads to the basin at the head of Goat Canyon creek, from which a footpath about  $2\frac{1}{2}$  miles long following the crest of the ridge has been made to the property. There is another route following Snow creek, but this trail has not been completed. The property was described in the Annual Report for 1930.

The ridge drops steeply on the southern side to Snow creek, some 3,000 feet below. The slope on the northern side of the ridge is precipitous until the basins at the heads of tributaries of Canyon creek are reached.

The West Kootenay Sheet, Map 792 of the Geological Survey of Canada, published in 1904, indicates that this area is underlain by rocks of the Slocan series. The rocks observed consist of tuffaceous sediments, crumbly sandstone, limy and more or less schistose argillite, greenstone, and some aplite and granodiorite dykes.

The ridge running westerly from Silver Queen peak consists of impure tuffs and sandy sediments striking east to north-east and dipping steeply to the south. They are intruded by numerous dykes of andesitic greenstones and aplite. The peak consists of a knob of granodiorite. On the ridge some 700 feet westerly from Silver Queen peak there is a band of rather coarsely crystallized white calcite about 3 feet wide lying to the west of some impure tuff and apparently following the bedding. About 150 feet down the southerly slope in a direction of south 45 degrees west and at an elevation of about 7,700 feet a 20-foot open-cut has been driven into the hill on a similar band of coarsely crystallized calcite lying between beds of crumbly sandstone, strike north 40 degrees east, dip 55 degrees north-west, and apparently pinching as it goes down.

A little pyrite and some streaks of fine black sulphide were noted in the calcite. Selected material containing pyrite and the black streaks assayed: Gold, 0.10 oz. per ton; silver, 28 oz. per ton. Kidneys of black material, probably manganese oxide containing nodules of calcite, were noted in the crumbly sandstone.

Some 300 feet south 55 degrees west down the slope is another cut at elevation 7,550 feet, exposing 1½ to 2½ feet of coarsely crystalline calcite, with up to 8 inches, towards the foot-wall side, of rusty material and also some galena. Three samples across the full width assayed: Gold, 0.06 oz. per ton; silver, 7.5 oz. per ton. This band also lies between beds of crumbly sandstone, strike north 45 degrees east, dip 55 degrees north-west. Near the bottom of the cut a 2½-foot aplite dyke is exposed cutting the band of calcite. Below the dyke, calcite, probably drag, is exposed following the lower contact to a point 10 feet east of the band above the dyke. At elevation 6,850 feet, some 1,200 feet south 50 degrees west down the side-hill, a shaft about 30 feet deep has been sunk which was inaccessible. On the dump some calcite showing a little sulphide was noted. Three hundred and fifty feet farther, south 60 degrees west, downhill is an adit. The portal is 10 feet to the north-west of an exposure of calcite in doubtful relationship with crumbly sandstone. The calcite is mineralized with galena and the overburden shows much iron and manganese oxides. An outcrop of aplitic granite about 50 feet wide occurs 60 feet west of the portal. There are about 350 feet of workings in the adit, including a branch to the left near the portal. The calcite-band exposed at the portal is not seen underground, having been cut off by a fault observed at the outcrop. The adit is principally in limy greenstone. About 25 feet from the portal it crosses a shear running a little west of north. A drift follows this for about 55 feet, then turns east for 40 feet. The first shear is intersected by another and near the junction some quartz and fine-grained sulphide are developed. The fine sulphide, consisting largely of pyrite, assayed: Gold, 0.04 oz. per ton; silver, 20 oz. per ton. The main adit-working is driven north-easterly for about 115 feet, then turns northerly for 115 feet and ends in aplitic granite. The contact has a low dip to the east. A sample taken near the portal of the adit, consisting of silicified rock with some red stain, possibly ruby silver, assayed: Gold, 0.10 oz. per ton; silver, 31 oz. per ton.

#### SILVER-LEAD-ZINC MINERALIZATION.

##### NORTH OF BLAEBERRY RIVER, GOLDEN MINING DIVISION.

**Seward.** These claims, as well as several others, were staked in 1934 on the southerly slope of Willow Bank mountain north of Blaeberry river, 10 miles north of Golden and about 3 miles east of the railway, in the vicinity of a small stream locally called "Pole Cabin creek." The original locations were made by Roy and J. A. Seward. A long ridge runs south-easterly from the mountain and forms the south-easterly side of Pole Cabin Creek valley. The rock formations exposed consist of blue limestone, more or less dolomitic, overlying thin-bedded shales. Practically no work has been done.

Numerous intersecting veinlets filled with calcite, quartz, and occasionally with small bunches of sulphides occur in the more massive blue limestone. Selected galena from this type of mineralization containing very little tetrahedrite (grey copper) assayed: Gold, trace; silver, 28.5 oz. per ton; lead, 80.9 per cent.; copper, *nil*. There are also some larger veins a few inches in width mineralized with a small amount of tetrahedrite, which does not, however, appear to be rich in silver. A sample of quartz showing much copper-stain and some tetrahedrite assayed: Gold, trace; silver, 10 oz. per ton; lead, 1.5 per cent.; copper, 1.5 per cent.

Work has been done by the Seward Bros. at three points: At the creek-level, about 1¼ miles by trail north-westerly from the farm buildings, where numerous intersecting veins ½ to 2 inches wide contain small nodules of galena. About 1¼ miles north-westerly from the first point, on the southerly side of the ridge south-west of Pole Cabin creek, for 6 feet along a fracture of northerly strike intersected by numerous cross-fractures, there is a 2-inch streak of fairly solid galena; however, blasting to a depth of 1 foot removed most of the galena. On the north-eastern side of the creek opposite this point and for half a mile down-stream, quartz veins 2 to 6 inches wide are seen in the limestone cliffs which form the wall of the canyon. Quartz in the talus shows a good deal of copper-stain and some tetrahedrite. There are also two quartz-lenses of some size. One of them is about 4 feet wide and shows some

small lenses of galena and a little tetrahedrite. Another lens of white quartz 6 to 8 feet wide, in which no mineralization was seen, occurs 100 feet down-stream.

### QUARTZ-LENSES IN SHALE.

#### NORTH OF BLAEBERRY RIVER, GOLDEN MINING DIVISION.

Four claims were staked in 1934 on the east side of Willow creek, about a mile northerly from Blaeberry river, in the names of J. Moyer, F. Bergenham, O. Bergenham, and H. C. Beresford. The valley of Blaeberry river is fairly wide; Willow creek enters it from the north-west, flowing from the moderately steeply-sloping north side of the main valley. The country is well wooded, principally with lodgepole pine. Outcrops are scarce.

From the main road along the Columbia river there is a fair road up Blaeberry river as far as the Deacon ranch, about 4 miles, thence a rather rough trail leads to the claims.

The rock formation exposed in the vicinity of the workings is a soft, brown, thin-bedded shale, strike from north 45 degrees west to north 75 degrees west, dip steep north-east. There are two open-cuts; the southerly one exposes 3 feet of vein-matter apparently following the bedding of the shale, strike north 70 degrees west, dip 85 degrees north. There is an outcrop of white quartz about 5 feet wide, 65 feet north 70 degrees west from the open-cut. The second cut is 70 feet north 35 degrees west from this outcrop. The north-easterly end of this cut exposes the foot-wall of a rib of white quartz 5 feet wide traceable 10 feet north-westerly and 30 feet south-easterly from the cut. In the cut, 3 feet from the foot-wall (south-west) of this quartz, are 4 inches of vein-matter, and from 8½ to 10 feet south-west of the quartz is another 2½ feet of vein-matter. This 5-foot quartz-band and the two narrower bands also appear to follow the bedding, strike north 45 degrees west and dip steeply to the north.

White quartz is the principal vein material and is practically unmineralized. There is also some calcite and some inclusions of chloritic wall-rock, which show a little iron-stain.

Three samples were taken: (1) Consisting of 10 lb. of material obtained by taking several chip cuts across the 5-foot quartz-band at the second cut; (2) a sample of the 2½-foot vein in the second cut consisting of quartz, calcite, and some included wall-rock; (3) selected material, principally rust-stained calcite and altered wall-rock, selected from the two cuts. All were assayed for gold and silver, the assay being *nil* in all cases.

The country was examined on both sides and to the south-east of the cuts, also for about half a mile north-west of the second cut. Fairly heavy float was found to 130 feet north-west of the second cut, but at 150 feet north-west on the strike there is an outcrop of shale striking north 70 degrees west and dipping steeply to the north-east. North-west of this point there are no vein-outcrops and very little float of vein material were found.

### PROGRESS NOTES.

#### SMELTER OPERATIONS.

*Consolidated Mining & Smelting Co. of Canada, Ltd., Trail, B.C.*—The improved prices for lead and zinc during the year have encouraged increased production at the smelter. Towards the end of the year a daily production of 470 tons of refined lead and 350 tons of refined zinc was reached, which are higher rates of production than have obtained at any time formerly. The silver production reached some 20,000 oz. daily. New production records for all three metals were established this year. In addition, there were substantial values in gold and cadmium.

The customs mill was in operation part of the year treating Rossland copper-bearing gold ore. The concentrates produced with some crude ore were smelted in a lead-furnace as outlined in the 1933 Annual Report. Copper contained in these ores is separated from the lead bullion by dressing and is sent to Tacoma for final treatment. The copper produced was materially less than in 1934.

Though somewhat less than the output for 1934, production of fertilizers was in good volume despite the fact that there was some curtailment due to the longshoremen's strike at Coast ports.

The principal item of new construction is a plant to recover sulphur dioxide from zinc roaster gases. This plant is expected to be in operation in 1936.

## LODE-GOLD DEPOSITS.

*Cranbrook Area.*

*Kimberley Goldfields Consolidated, Ltd.*—This company, with forty-six claims on Sawmill creek, drove an adit 50 feet and then suspended operations early in the year.

*Little Sullivan.*—This property and adjoining claims, staked 3 miles south of Cranbrook by L. P. Sullivan and associates, were prospected by surface work. Two shallow shafts have been sunk.

*Midway.*—This property, at Aldridge, owned by J. Leask and associates, of Cranbrook, was under bond to B.C. Cariboo Goldfields, Limited, until late in the year. The drift has been extended to a length of about 1,350 feet. Work has been stopped since midsummer.

*Southern Kootenay Lake.*

*Bayonne Consolidated Mines, Ltd.*—This company was incorporated under the laws of British Columbia in April, 1935, with an authorized capital of 2,000,000 shares of no par value. The existing tractor-road from Tye Siding was improved and made passable for trucks. New camp and mine buildings were constructed at the mine. Underground work was limited to the removal of a car of ore from No. 1 level for bulk-sampling purposes, and to driving a short crosscut by hand on No. 3 level. Work stopped for the winter in October.

Late in the year Grull-Wihksne Gold Mines, Limited, acquired an interest and direction of the company and made preparations for resuming work.

*Wisconsin.*—Development at the *Wisconsin* and *Lucky Strike* Crown-granted claims located on Hughes creek, a tributary to Midge creek some 13 miles from the Canadian Pacific Railway siding at the mouth of Midge creek, was financed by A. C. Frost, of Seattle. The same interests have agreements covering near-by claims not yet Crown-granted. A description of this property appeared in the Annual Report for 1929 and in Bulletin No. 1, 1932, "Lode-gold Deposits of British Columbia."

E. W. McQuade was in charge at the property. Work began in June and ceased for the winter on October 22nd, a crew of sixteen men having been employed. The trail was reopened and a small compressor, oil-engine, and hoist were installed. The winze on No. 1 level was deepened from 64 to 151 feet and a station was cut at 150 feet. A heavy flow of water was encountered in the winze.

*Vicinity of Nelson.*

Many small properties were operated, usually by lessees, including Anderson Creek, Evening Mountain, and Toad Mountain areas, and ten properties made small shipments of ore or concentrates to Trail. Two of these exceeded 50 tons; G. T. Gormley, leasing the *Venus-Juno* group, shipped 93 tons and the *Granite-Poorman* shipped 233 tons of ore and 11 tons of concentrates. Between Nelson and Ymir the *Euphrates* shipped 24 tons, the *Fern* 2 tons, and the *Porto Rico* 32 tons. Lessees operating at the *Porto Rico* shipped two car-loads of ore in 1934 and one in 1935.

*Granite-Poorman.*—At this property, west of Nelson, the mill is now reconstructed at a site convenient to an adit designed to be connected with the *Hardscrabble-Poorman* workings at the 300 level. Work on the adit has been suspended for some time.

The *Hardscrabble* and *Poorman* workings have been unwatered and connected by completing a crosscut on the 300 level (300 feet on the slope below No. 4 level).

At the *Granite* mine recent work has had as its object the solution of fault problems. The mill was given a test run this autumn. During the year approximately 201 tons of ore and 11 tons of concentrates were shipped to Trail.

*Fern.*—This property consists of five claims located on the south side of Hall creek, about 3 miles by road from Hall, on the Nelson-Salmo road. The property is described in Geological Survey of Canada Memoir 94, also in the Annual Reports for 1896, 1915, and 1927, and in Bulletin No. 1, 1932, "Lode-gold Deposits of British Columbia."

Last year, according to the prospectus of the Gold Fern Mines, Limited, an assignment of option for lease and purchase of the property was secured.

In 1934 a crosscut was started some 800 feet below No. 4 level and driven about 160 feet when work was suspended. In 1935 work was resumed under the management of Neil

McKechnie, consisting of surface prospecting and cleaning out old workings, with the result that not far south-east from the portal of No. 1 level the "B" vein has been exposed for a length of 110 feet.

A new adit-crosscut, No. 5, started 150 feet in elevation below, was driven 50 feet of an estimated 150 feet required to reach the vein. Two tons of oxidized vein-matter was shipped to the smelter at Trail from a vein exposed near an old winze 120 feet east of No. 3 portal and from a narrow fissure above No. 1 level. All work was suspended in December.

#### *Vicinity of Ymir.*

*Gold Cup.*—The Gold Cup Mining Company, Limited (private), of which E. R. K. Waite is president, held twenty claims, including three which are Crown-granted, situated about 4 miles north of Ymir and 1 mile due east from the main road. The workings and camp are at an elevation of about 5,000 feet. An old shaft and an adit-level on the *Ohio No. 7* claim were reported on in Memoir 94, Geological Survey of Canada. The present operators opened and did some work in the old adit.

About 1,750 feet north-west from the old adit a crosscut was started and driven about 330 feet on a course of south 72 degrees east to test the downward extension of a quartz-lens outcropping 160 feet above. A tractor-road was built to the property and new camps and mine buildings have been erected. Work ceased in the middle of December.

*Clubine Comstock Gold Mines, Ltd.*—Development at the *Boulder City* group, 3½ miles north of Salmo, was continued during the early part of the year, but the property was shut down during the summer. About 29 tons of ore was shipped to Trail.

*Howard.*—This property, located on the east side of Active (South fork of Porcupine) creek, about 7 miles by road south-east of Ymir, has been described in various Annual Reports and in Memoir 172, Geological Survey of Canada. It has been bonded to Durango Gold Mines, Limited, of Vancouver, and development-work has been going on more or less continuously since November, 1934.

During the summer a good trail suitable for caterpillar tractors was built from the end of the road on Active creek to the mine. A Sullivan 400-cubic-foot compressor driven by a 72-horse-power Petters Diesel engine has been installed at the mine.

*Wesko Exploration and Development Co., Ltd.*—At the *Centre Star* mine the 300 level at 3,630 feet elevation and the 560 level at 3,367 feet elevation were started this year and 4,013 feet of drifting and crosscutting done on them, also 1,101 feet of diamond-drilling. A 1,400-cubic-foot Ingersoll-Rand compressor was installed and the upper terminal for an aerial tramway was built near the 560 level portal. Clearing and grading of the proposed mill-site and of the right-of-way for the proposed water-supply line were done in the autumn, though no definite plans for mill-construction have been made. The writer is indebted to the manager, Harold Lakes, for the above information.

*Ymir Consolidated Gold Mines, Ltd.*—This company, operating the *Ymir* and adjoining *Goodenough* mines near Ymir, shipped 4,260 tons of ore from the *Goodenough* in 1934. A new mill of 100 tons daily capacity began operation on July 18th, 1935, and was shut down on November 30th.

The mill made a flotation concentrate containing lead, zinc, and iron minerals which was not very high grade in gold and silver. Freight and treatment charges were accordingly heavy. It is apparent that the ore from the *Ymir* mine was below a profitable grade and ore from the *Goodenough*, although better grade, was more limited in quantity.

*Ymir Dundee Gold Mining Co., Ltd.*—On this property development-work was continued until summer and the ore obtained in part from development, amounting to 667 tons, was shipped to Trail.

*Wilcox.*—At this mine work was continued by the lessees, D. H. Norcross, J. J. Cullinane, and associates, between April 1st and November 4th. The following information was kindly supplied by D. H. Norcross: Tons milled, 1,595; recovered as bullion, 466.6 oz. fine gold and 471.7 oz. silver. Concentrates produced, 101.66 tons, containing 161.5 oz. fine gold, 584.2 oz. silver, and 11,526 lb. lead.

No. 1 ore-shoot produced 500 tons of oxidized ore. No. 2 ore-shoot, which averages about 16 inches in width, produced the balance. This ore-shoot in the western section of the mine lies in contact with the roof-pendant where it has spread in a "T" shape.

*Ymir Yankee Girl Gold Mines, Ltd.*—This company, at Ymir, after shipping fluxing-ore to the Trail smelter for a long period, was equipped with a mill which came into production on January 18th, 1935. The general flow-sheet was described in the Annual Report for 1934. Information concerning milling and production was kindly supplied by the manager, H. W. Seamon. The mill, with normal capacity of 100 tons daily, produced 1,068.9 tons of lead concentrates, containing 5,349.04 oz. gold, 23,141.9 oz. silver, and 529,116 lb. lead, which was shipped to Trail. Cyanidation of the zinc-iron flotation concentrate yielded 2,726.2 oz. gold and 5,153 oz. silver. The cyanide plant precipitate was at first shipped to Trail, but the gold and silver contained are now recovered as bullion at the property.

Mine-development during the year included drifting from a winze sunk below the 1,235 level.

*Erie Creek, Nelson Mining Division.*

*Relief-Arlington Mines, Ltd.*—This company during the year at the *Second Relief* mine sank a 2-compartment shaft and established a sixth level 150 feet below No. 5 level. Deepening the shaft was commenced late in November. Recovery to November 7th has been principally in the form of a flotation concentrate shipped to the smelter at Tacoma. Production for the year was 12,998 dry tons milled, containing 4,209 oz. gold.

A new mill was completed and operation began on December 20th, treating 75 tons per day by cyanidation. Waste discarded by sorting amounts to about 25 tons, making a total of 100 tons of mine ore handled per day.

*Arlington.*—The mine and dump were thoroughly sampled by engineers of the Premier Gold Mining Company; their report is not yet available. Lessees shipped some sorted ore from the mine to Trail amounting to 341 tons of ore, containing 617 oz. gold and 1,439 oz. silver.

*Keystone.*—F. Golightly, of Erie, with two men sorted ore from the dump on this property, some of which had been stoped earlier in the season; 171 tons was trucked to Trail.

*Sheep Creek Camp.*

*Golden Fawn.*—This group, lying on the ridge north of the *Nugget* mine, is referred to in the Annual Reports of the Minister of Mines and in the Geological Survey of Canada Memoir 172.

The Fawn Mining Company, of Vancouver, acquired an option covering the property in 1933. Work was commenced in May, 1935. The old adits were cleaned out and No. 3 was advanced 50 feet.

A road somewhat more than a mile in length was built connecting with the road to the *Reno* mine, also a new camp and a compressor-house and shop.

A Holman steel-sharpener and a Holman 500-cubic-foot air-compressor driven by a Ruston Diesel engine were installed. At present No. 5 level, about 290 feet below 3 level, is being driven from the west side of the ridge at elevation 6,420 feet.

*Gold Belt Mining Co., Ltd.*—Work on this property in 1935 consisted in extending the drifts on the 200 level, about 85 feet of drifting and crosscutting on the 600 level, and raising 130 feet on the *Bruce* vein at a point west of the main crosscut on the 600 level. Three drill-holes totalling approximately 2,400 feet were put down from the 600 level. The 1,850, a deep-level adit 1,250 feet below the 600 level, has been driven 700 feet. The old drift on the *Columbia* vein has been advanced about 80 feet. Preparations have been made to crosscut this vein at a depth of 125 feet below the drift.

A branch road about half a mile long was built to the 1,850 level portal from the main road west of the *Reno* mill. A shop, compressor-house, and change-house were built on sites convenient to the portal as well as a new camp accommodating forty men.

*Kootenay Belle Gold Mines, Ltd.*—J. P. McFadden, manager of this mine, kindly provided the following information: This year's No. 3 level adit-crosscut was driven 350 feet in elevation below No. 2 level. At 1,076 feet from the portal the crosscut intersected the "A" vein. A supply-tram has been built from the road to No. 3 level and an aerial tramway to transport ore from No. 3 level to the mill has been completed. The *Kootenay Belle* mill began operations in November, 1934. Recovery is in the form of corduroy-blanket concentrates and flotation concentrates shipped to Trail.

The Hadsel mill treats mine ore and delivers a product about 87 per cent. minus 200 mesh. About 45 tons of ore daily has been milled averaging about 0.43 oz. gold per ton. Total ore treated was 14,650 tons, from which 5,845 oz. gold and 2,207 oz. silver were recovered.

*Reno.*—This mine is under the management of W. S. Ellis, who kindly provided the following information: The 521 sub-level drift west was extended and encountered an ore-shoot 157 feet long and 2.4 feet wide. Development consisted chiefly of drifting on Nos. 7, 8, and 9 levels. On the seventh level west and the eighth level east ore was found beyond the recently known limits. Development on the eighth and ninth levels will be stopped pending shaft-sinking to the tenth and eleventh levels. In the meantime, recently developed ore on No. 5 level will be stoped.

Development was done at the *Nugget* mine, which, in conjunction with the *Motherlode*, is owned by Reno Gold Mines, Limited. At present the *Nugget* drift at the No. 5 level is being extended to explore the *Nugget* vein in the eastern Quartzite belt.

During the year 39,862 tons of ore was milled, containing 21,579 oz. gold, 10,092 oz. silver, and accompanied by lead and zinc.

*Sheep Creek Gold Mines, Ltd.*—This company commenced production at the old *Queen* mine on May 20th, 1935, in its new cyanide-mill and from 125 to 130 tons has been treated daily. The following notes were kindly supplied by the manager, H. E. Doelle: With the exception of a small tonnage from the west ore-shoot above No. 5 level, the ore was mined from the east shoot, mostly from above No. 7 level. Development for the year comprised 315 feet of sinking, 319 feet of raising, and 2,061 feet of drifting and crosscutting. Most of the drifting was done on No. 8 level and the east ore-shoot proved for 420 feet. The vein was found on the west side of the *Queen* fault on No. 8 level, but not developed. The west ore-shoot was developed by drifting on Nos. 3, 5, and 7 levels. To the end of the year production totalled 28,197 dry tons of ore, containing 9,081 oz. gold and 2,517 oz. silver.

*Ore Hill.*—This property, consisting of five Crown-granted claims and fractions situated near the head of Billings (Coon) creek, immediately north of the *Summit* group, is reached from the end of the road at the *Queen* mill by following about 2½ miles of rather steep trail. References appear in the Annual Report for 1917 and in Memoir 172, Geological Survey of Canada. Joe Gallo, of Nelson, has acquired a lease and bond on the property. In the summer, after improving the trail, a small crew prospected the property, also sorted some shipping-ore from two new showings and from an old adit dump.

In the autumn arrangements for financing were made and toward the end of the year an adit was started to intersect a new discovery at a depth of 100 feet, the estimated length of the drive required being 320 feet. No ore had been shipped at the end of the year.

#### *Pend d'Oreille River Area.*

*Bunker Hill (Waneta).*—This group consists of two Crown-granted mineral claims, the *Bunker Hill* and *Mormon Girl*, and fourteen adjoining claims held by location. They are on the east side of Limpid (16-Mile) creek, a tributary of the Pend d'Oreille river. The property has been fully described in the Minister of Mines' Annual Report for 1934. Early in the season a crew of men was engaged in making preparations for the construction of a road from the camp to the adits and surface workings and for the driving of a new low-level adit.

#### *Rossland Camp.*

Ores of this camp are valued chiefly for their gold content. Silver is also present, usually with low values in copper. In a few cases there are quite high values in silver with moderate values in lead.

*Company Leases.*—With a view to providing employment for residents of Trail and Rossland who were former employees of the company, then unemployed, the Consolidated Mining and Smelting Company of Canada in 1933 offered sections of its mining properties in the vicinity of Rossland for lease. Production from these leases and from independent mines in the vicinity reached very considerable proportions, exceeding the volume of such ore which could be handled economically at Trail, and resulted in the accumulation of Rossland ore in the yards at the smelter.

In order to reduce the rate of production to a volume which could be handled economically at the smelter, new leases were granted in 1935. These provide that those employed must be

former employees of the company resident in Rossland or Trail and the production per lease is limited to a maximum of 25 tons each month. The quantity of similar ore from independent shippers accepted per month is also limited.

The effect of this policy at Rossland will be to restrict the benefits of employment to otherwise unemployed residents of Rossland and Trail who are former employees of the company and will increase the time during which such employment will be possible.

Production by lessees at the Rossland mines of the Consolidated Mining and Smelting Company for the year 1935 was approximately 32,900 dry tons, containing \$680,000 gross value in gold and silver, for which the settlements amounted to \$480,000 after freight and treatment charges had been deducted. The value which the silver content contributes to the amount is small.

Approximately 120 individuals and partnerships, leasing sections of company mines, made shipments to the smelter. Part of this number is due to rearrangements of partnerships which were frequently composed of a number of miners. Before the new leases were granted lessees in some cases hired a number of employees.

In the last quarter lessees shipped a total of 2,650 dry tons, having a gross value of \$67,480 in gold and silver and a net value after deducting freight and treatment of \$50,560. This is about one-fourth of the average for the earlier periods. The number of shippers was sixty-one, while the quantity per shipper averaged much less than in the earlier periods. It is understood that approximately fifty men were working on company leases at the end of the year.

*Independent Shippers.*—In the vicinity of Rossland fourteen properties working in most cases on a leasing basis made shipments to Trail. The total from these independent shippers was 1,600 tons, as against 1,036 tons from eleven shippers in 1934. The 1935 shipments are listed below.

Mine.	Tons of Ore shipped.	Mine.	Tons of Ore shipped.
<i>Bluebird</i> .....	49	<i>Lily May</i> .....	24
<i>Cliff</i> .....	247	<i>Mayflower</i> .....	90
<i>Evening Star</i> .....	624	<i>Midnight</i> .....	95
<i>Georgia</i> .....	4	<i>O.K.</i> .....	55
<i>Hattie</i> .....	9	<i>Silverine</i> .....	22
<i>I.X.L.</i> .....	165	<i>Ural</i> .....	4
<i>Jumbo</i> .....	196	<i>Mighty Midas</i> .....	16

*Fire Valley, Arrow Lake Mining Division.*

From the *Paladora* group, consisting of three claims about 27 miles north-west from Edgewood by road, S. P. Pond shipped 60 tons of ore averaging 0.78 oz. gold and 3.9 oz. silver per ton.

*Slocan Area.*

*L.H.*—This property comprises the following Crown-granted mineral claims: *L.H.*, *Harlem*, *Baby Ruth*, *Camden*, *C.B.*, *St. Joe*, *Bain Fraction*, and *Summit*. The property is at the head of Vevey (*L.H.*) creek and is between elevations of 5,200 and 5,600 feet. The geology and mine-workings have been adequately described by C. E. Cairnes in Memoir No. 184, published in 1935 by the Bureau of Economic Geology, Department of Mines, Ottawa. Work has been temporarily suspended on the property.

*Lardeau Area.*

*Meridian Mining Co., Ltd.*—This company has continued mining and milling operations on its consolidated groups of claims at Camborne. However, most of the work during 1935 was confined to mining and milling ore from the *Criterion* vein as exposed in the *Criterion Nos. 1* and *2* in the Rossland adits.

Breaking of ore in the stopes in the above-mentioned levels ceased in November and a programme of development-work was initiated. It is understood that the programme is to crosscut north-eastward from the *Criterion No. 2* adit to the *Eva* shear; to drift on this and raise to the upper workings of the *Eva*. Since November ore for the mill has been obtained by drawing from the stopes.

## SILVER-GOLD DEPOSITS.

*Slocan Valley.*

Shipments of crude ore valued for its gold and silver content were made to Trail during the year from the following properties in the vicinity of Slocan City:—

	Tons of Ore shipped.
Lemon Creek-Springer Creek area—	
<i>Chapleau</i> .....	50
<i>Meteor</i> .....	17
<i>Port Hope</i> .....	1
North of Slocan City—	
<i>Gold Viking</i> .....	7
<i>Republic</i> .....	65
<i>White Hope</i> .....	16

## DRY SILVER-ORE DEPOSITS.

*Slocan Camp.*

Dry silver ores—that is, siliceous ores with values in silver but comparatively little lead—were produced principally from the vicinity of Slocan City. They are also produced at other points in the Slocan camp. Usually the dry ores come from veins in or near the Nelson batholith.

*Ottawa.*—This property, consisting of twenty-one claims on Springer creek owned by the Consolidated Mining and Smelting Company of Canada, is under lease and bond to a Spokane group represented by W. R. Green. The latter, with three or four men, built a new camp and has been engaged in reopening and retimbering No. 5 level. The property is described in Geological Survey of Canada Memoir 184 and various Annual Reports; that of 1921, by A. G. Langley, being of especial interest. The following paragraphs are quoted from Langley's report:—

“The ore deposits occur in a sheared fissure in granite. The character of the ore-bodies would indicate that they owe their origin to replacement by the circulation of mineral-bearing solutions or vapours through small channels and filling interstices in the sheared material between the walls of the fissure, and that continuity might be expected with depth.

“The ore occurs in lenses of considerable dimensions, the stoping-width being as great as 8 feet. The ore is essentially a ‘dry’ silver ore consisting of argentite with which is occasionally associated small leaves of native silver, the latter, no doubt, being of secondary origin. The gangue is quartz and country-rock. In places barytes is the predominant gangue and is invariably associated with high values. It is both a difficult ore to sort and to recognize underground, as often lean-looking material will run well in silver.

“In the past only the highest-grade ore was shipped owing to the difficulties presented by the concentration of the silver minerals. Hence the dumps contain some high-grade and a considerable tonnage of second-grade ore, while there is a possibility of winning a fairly large tonnage of mill-feed from the old stope fillings.

“The fissure dissects the hillside in a northerly and southerly direction and dips at 37 degrees to the east. The mine has been opened by five adit-tunnels at vertical distances of 100 feet. The uppermost, or the No. 1, is the old original prospect-tunnel and is no longer of any consequence. The Nos. 2, 4, and 5 are in good condition and the No. 3 is caved. Below the No. 5 there is still another level, the No. 6. This does not come out to the surface and is now full of water. It is interesting to note that the ore-shoots showed a marked increase in size as depth was gained. The ore has been stoped out above the No. 5, although there are places from which small tonnages can be mined, while further prospecting on the hanging-wall side may reveal the presence of parallel shoots. By a rough estimation the dumps contain about 25,000 tons in which the values are bound to be spotty. In order to arrive at an estimate of the tonnage suitable for mill-feed, extensive and costly sampling would have to be undertaken. Shipments made so far have been encouraging; for instance, 700 tons shipped in 1919 averaged 19.8 oz. in silver, while another 700 tons recently treated by the mill averaged 12 oz. in silver.”

As certain rather optimistic reports concerning the ore reserves at this mine have been circulated, it is considered advisable to mention that the official production figures from 1903 to 1934 were 6,448 tons, containing 764,650 oz. silver and 750,540 lb. lead; there was no production between 1926 and 1934. The total tonnage given includes ore removed from the dump.

In Geological Survey of Canada Memoir 184, Cairnes says: "In 1921, 1,440 tons of mill-feed averaging less than 5 oz. in silver were extracted. Production of all other years has been of higher-grade material and has, exclusive of 1921, amounted to 4,758 tons of ore with an average content of 159 oz. of silver a ton." From this it would appear that the total of crude shipping-ore taken from the stopes amounted to 4,758 tons. It is quite improbable that in mining this quantity of shipping-ore any very large tonnage of second-grade ore could have been left in the stopes.

*Crude Ore.*—Shipments of crude ore, usually from leasing operations, were made to Trail from the following properties. Of these properties the *Molly Hughes* at New Denver produces ore carrying important values in gold.

Section and Mine.	Tons of Ore shipped.
Springer creek—	
<i>Alma</i> .....	2
<i>Cub</i> .....	9
<i>L.T.</i> (also known as <i>Olympic</i> ) .....	6
<i>Morning Star</i> .....	4
<i>Riverside</i> .....	3
Enterprise creek— <i>Buster</i> .....	2
Silverton— <i>Metallic</i> .....	23
New Denver— <i>Molly Hughes</i> .....	61
Kane creek (Three Forks)— <i>Black Grouse</i> .....	11

#### SILVER-LEAD-ZINC DEPOSITS.

##### *Cranbrook Area.*

*Sullivan.*—The Consolidated Mining and Smelting Company of Canada, Limited, continues to be the most important factor in the economic life of the East Kootenay district and during the autumn brought this property to peak production. Total production for the year amounted to 1,861,245 tons, comprising 1,859,171 tons of lead-zinc ore shipped to the concentrator at Kimberley and 2,074 tons of crude lead ore to the smelter at Tadanac, an increase of 112,844 tons over the production of 1934. During the year the mine worked 278 days, the coarse-crushing plant 281.5 days, and the concentrator 312 days. The concentrator treated 1,859,221 tons, an average of 5,959 tons per day, and produced 226,837 tons of lead concentrates and 209,078 tons of zinc concentrates.

An interesting feature in this year's operations is the filling of "K stope" with boulder-clay from the surface. This is an initial and, to some extent, an experimental step in the programme designed to make possible recovery of the large tonnage of ore in mine pillars.

*Dibble Mines, Ltd.*—This company, promoted in Calgary by G. M. Wittichen, employed two or three men during the season, driving a crosscut 180 feet into the hill at 6,500 feet elevation. The *Dibble* group lies in a basin  $4\frac{1}{2}$  miles by steep pack-trail from the end of a branch road  $10\frac{1}{2}$  miles south-easterly from Fort Steele. Years ago there was some production of silver ore from small scattered quartz-lenses in schist exposed on the surface.

*Sirdar.*—This claim, leased by a Calgary syndicate represented by W. W. Douglas, is reached by a branch from the road to Bull River power plant, some 21 miles south-east from Fort Steele by road. A shaft sunk this year to a depth of 24 feet was full of water when the property was visited. This shaft prospects a showing which at the surface is 12 feet wide consisting of quartz containing fragments of limy wall-rock and bunches of sulphide mineralization, principally pyrite with some galena.

##### *Pend d'Oreille River Area.*

*Michaely Silver Lead Co.*—This company, operating the property formerly known as the *Red Rock* group, on the north side of Salmo river, shipped 35 tons of silver-lead ore to Trail.

*Slocan-Ainsworth Camp.*

*Western Exploration Co., Ltd.*—This company owns the *Mammoth* mine and the *Standard*, adjoining it on the west. The *Mammoth* has been developed on seven levels, a flotation-mill built at Silverton, and a tramway from the mine to the mill when operations were suspended in 1930. Geological Survey of Canada Memoir 184 and the Annual Reports for 1926, 1928, and 1929 describe the mines and the new mill. During the past few years lessees shipped some ore from both mines and are still working in the *Standard*.

In the past summer the property was reopened under the management of A. M. Ham. Milling was commenced in July. After tuning up the mill and doing initial work at the mine a daily production of about 100 tons was reached. Lead concentrates were at first shipped to Trail and later to Europe.

*Fisher Maiden.*—This property, consisting of the *Fisher Maiden* and *Troy Crown*-granted claims on Silverton creek, about 8 miles by road and trail from Silverton, is owned by the *Fisher Maiden Troy Mining Company*. References are Geological Survey of Canada Memoir 184 and Annual Reports for 1896, 1904, and 1926.

The property had been idle for several years until the summer of 1935, when, financed by subscriptions from the larger shareholders of the company, some work was undertaken by J. L. Prickett and a small crew. The old route up Silverton creek was reopened and in part relocated. A good log cabin was built at the mine. No. 5 level on the *Fisher Maiden* vein was cleaned out and retimbered from the surface to caved ground encountered farther in. A shipment of 9 tons of ore was made to Trail.

*Monitor.*—The *Slocan-Monitor Silver Mines, Limited*, to which reference is made in the Annual Report for 1934, began work at the property with a small crew in June, 1934. Recently it was decided to install a portable compressor and a machine-drill. Three short raises have been put up from No. 5 level and the drift has been advanced 200 feet. Recently No. 4 fault has been crossed and it is hoped that the vein will shortly be picked up beyond. In the upper levels a good ore-body was worked beyond this fault.

*Noble Five Mines, Ltd.*—This company, of which Paul Lincoln is president and manager, resumed operation of its property at Cody in the spring. In June the mill began operations after a five-year shut-down. Operating on day shifts the plant milled about 30 tons daily. Ore was mined on the 1,800 and 800 levels. Work was stopped again in the late autumn when a cold snap caused difficulty with the water-power supply.

*Ross Mining Syndicate (N.P.L.).*—The *Ross Mining Syndicate, Limited (N.P.L.)*, leased the *Wellington* mine, part of the *Whitewater* mine at Retallack, and the *Rambler-Cariboo* mine in McGuigan basin. The tramway from the old *Rambler* mill in the basin to a newer mill on Seaton creek was reconditioned. Tailings from the old mill were trucked and trammed to the *Whitewater* mill, which treated 80 tons daily until early in December. Concentrates averaging about 50 per cent. lead and 80 oz. silver per ton and zinc concentrates averaging about 50 per cent. zinc and 27 oz. silver per ton were shipped both to Trail and to Europe.

Development was done by hand on the *Wellington* group. At the *Whitewater* mine a 100-foot raise was put up from No. 10 level and 150 feet of drifting was done on a cross-fracture on No. 14 level. Some ore from the *Whitewater Deep* workings was milled during the year.

*Lucky Boy.*—This group of three claims held by annual recording of assessment-work and owned by Charles Lind, of Kaslo, is situated on the south side of Kaslo creek, 14 miles from Kaslo on the railway, and lies immediately east of the *Contact* group, owned by A. J. Curle. The claims cover benches along Kaslo creek.

Exploration consists of surface-trenching and an adit 75 feet long, from which a branch drift commencing at a point 35 feet from the portal has been driven to the contact of limestone and thin-bedded argillaceous sediments. Some massive galena and sphalerite is developed in the limestone.

*Burton, Arrow Lake Mining Division.*

*Black Bear.*—This property, adjoining the *Millie Mac* and the *Great Western* properties and owned by H. E. Forster, of Wilmer, is reached by 4½ miles of steep pack-trail from the end of the wagon-road near the Blue Grouse creek on the north side of Caribou creek.

C. Marshall and C. A. Marshall, of Burton, have done surface work in the past two seasons, consisting of cuts exposing a shear-zone which appears to be the same as that upon which the *Millie Mac* and *Black Bear* underground workings and the open-cuts at the *Great Western* are located.

*Eureka*.—This group consists of two claims, *Eureka No. 1* and *Eureka No. 2 Fraction*, held in the names of Annie Prough and R. H. Brett, of Burton, which extend southerly from Caribou creek at a point some 15 miles by road and trail north-easterly from Burton. The camp is on a low bench on the north side of Caribou creek. South of the creek the closely timbered side of the valley rises steeply from a low bench a few feet above creek-level. John Prough and Walter Isaacs have been driving No. 2 level by hand. Three adits have been driven south-westerly on a graphitic shear-zone in limestone from the western side of a small stream: No. 1, elevation 4,100 feet and 1,500 feet from Caribou creek; No. 2, elevation 4,280 feet; and No. 3, elevation 4,350 feet.

*Crude Silver-lead Ore*, usually produced by lessees, was shipped from numerous properties to the smelter at Trail. G. H. Grimwood, of Nelson, representing Ayerton & Cohen, of London, England, supplied information that ore from the *Banker*, *Jackson*, and *Whitewater* mines had been exported to Europe. The following list gives the names of properties and amount of crude ore shipped during the year; 163 tons from the *Banker*, 10 tons from the *Jackson*, and 30 tons from the *Whitewater* were shipped to Europe. The other shipments went to Trail. Ore from the *Western* at Three Forks carried important values in gold. Ore from the *Bosun* mine is frequently high in zinc. The shipments from the *Bosun* include ore won by jiggling material from the dump.

Section and Property.	Tons of Ore shipped.
Springer creek— <i>Dayton</i> .....	4
Silverton-New Denver—	
<i>Bosun</i> .....	343
<i>Cliff</i> .....	16
<i>Comstock</i> .....	3
<i>Fisher Maiden</i> .....	9
<i>Hewitt</i> .....	7
<i>Lucky Thought</i> .....	190
<i>Mammoth*</i> .....	62
<i>Mountain Chief</i> .....	64
<i>Shannon</i> .....	5
<i>Standard</i> .....	179
Three Forks-Sandon-Cody—	
<i>Black Colt</i> .....	180
<i>Canadian group</i> .....	22
<i>Ivanhoe</i> .....	29
<i>Palmita</i> .....	213
<i>Payne</i> .....	2
<i>Reco</i> .....	5
<i>Rio</i> .....	14
<i>Ruth-Hope</i> .....	233
<i>Victor</i> .....	64
<i>Western</i> .....	17
<i>Wonderful</i> .....	1
Ainsworth-Kaslo-Retallack—	
<i>Banker</i> .....	163
<i>Daybreak</i> .....	33
<i>Jackson</i> .....	10
<i>Utica</i> .....	5
<i>Whitewater*</i> .....	49

\* Also shipped concentrates.

## PLACER-GOLD DEPOSITS.

*Golden M.D.*—Six dredging leases near Wood river, 90 miles north-westerly from Golden, were located in the fall by a Toronto syndicate and some prospecting and testing done on the ground with bore-holes. Prospecting on placer-ground was reported on Canyon creek and also on Quartz creek at Beaver mouth.

*Windermere M.D.*—Placer-mining or prospecting was done on seven leases located on Findlay, Toby, and Dutch creeks.

*Fort Steele M.D.*—Placer operations were under way during the season on Perry, Sawmill, Palmer Bar, and Wild Horse creeks and Skookumchuck and Moyie rivers, and a number of small operators have been active. The total production from this area was 640 oz. placer gold. On Perry creek a Calgary syndicate undertook to drive to bed-rock, but work was stopped by the breakdown of their water-wheel. Driving of rock drifts was undertaken on Boulder creek by W. A. Drayton and on Moyie river near the falls by James Ewen and Dave Oscarson.

*Nelson M.D.*—On 49 creek there was some activity from which a recovery of 5½ oz. gold was reported. During the low-water period "snipers" were active along the Pend d'Oreille river below the mouth of the Salmo river. Late in the year a considerable amount of interest was taken in the ground along the lower Salmo river, where in a short time two men recovered 27 oz. gold from two 250-foot leases. Recovery of 1 oz. was reported from Erie creek.

*Arrow Lake M.D.*—West of Whatshan lake, on Holding creek and on Eureka creek below the mouth of Holding creek, four men working on three leases recovered 6 oz. gold. Holding creek is a tributary of Barnes creek.

*Slocan City M.D.*—Recovery of 4 oz. gold was reported from placer operations on Lemon creek.

*Ainsworth M.D.*—On the Duncan river four placer-miners recovered 30.8 oz. gold. On Fry creek 8 dwt. 7 gr. placer gold was recovered.

*Revelstoke M.D.*—There was, as usual, some "sniping" along the Columbia river and on other streams. Coughlin Gold Mines, Limited, operated the *Theda Bara* group of five leases on Camp creek, about 3½ miles easterly from the road and 60 miles north from Revelstoke. A drag-line scraper operated by a steam donkey-engine was used in excavating for sluices and in moving top gravel. Preliminary work was still in progress when the property was visited at the end of August. It is understood that L. N. Remillard is doing some drifting during the winter on leases recently relocated on French creek.