REPORT ON SLOCAN ORES

by

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SLOCAN ORES

Introduction

Slocan mining area occupies a rectangular strip of territory about 280 square miles in extent between Slocan and Kootenay lakes, West Kootenay district, British Columbia. It includes parts of Slocan and Ainsworth mining divisions and falls within the Selkirk Mountain system of Cordillera. The area is traversed from east to west by an important valley occupied by Kaslo creek flowing east into Kootenay lake and by Seaton and Carpenter creeks draining west into Slocan Lake. New Denver at the mouth of Carpenter creek and Kaslo at the mouth of Kaslo creek are the two largest towns in the area and are connected by boat and rail with Canadian Pacific railway and steamship lines. Important mining centres in the area are grouped about the towns of Sandon and Silverton and the Whitewater property at Retallack. The Kaslo-Carpenter Creeks Valley separates the southern Lardeau mountains on the north from Slocan mountains on the south. The relief ranges from 1,730 feet, the elevation of Slocan lake, to over 8,600 feet at the summit of mount Carlyle, the highest peak in the area. Small mountain glaciers occur near the summit of mount Carlyle and Reco mountain. The area, owing partly to forest fires and early lumbering operations, is sparingly forested and has been rendered easily accessible at all points by a network of roads and trails.

Geology

The area is underlain by sediments ranging in age from Pre Cambrian to Triassie and by Post Triassie batholethic intrusives. All the formations except the intrusive rocks have a general north to northwesterly trend and dys at high angles to the southwest and northeast.

Lardeau Series (Late Pre Cambrian)

The Lardeau series occupies an area some two miles wide along Kootenay Lake. It comprises a group of highly metamorphosed schists, quartzite and crystalline limestone. Although, economically it is very important in the Lardeau and Ainsworth, within the maps area it contains no productive deposits.

MILFORD GROUP (Carboniferous to Triassie)

The Lardeau series is overlain to the west by a group of less highly metamorphosed sediments, composed largely of slate, limestone and schist. Within the map area this group holds no deposits of economic importance.

Kaslo Schists (Triassie)

The Kaslo schists occupy a belt lying to the west of the Milford and Lardeau series and east of Kaslo creek. They comprise flow and fragmental volcanic rocks with some intercalated sediments. A few relatively unimportant properties are located within their limits.

Slocan Series (Triassie)

The Slocan series, as represented in this area, might be divided into four roughly parallel zones or belts characterized by an abundance of certain rock types. West of the zone of volcanic rocks there is, first of all, a belt up to half a mile or more in width composed almost entirely of black fissile slates. This belt is exceptionally poor in mineral deposits. Adjoining it to the southwest, and overlying it, is a zone with a maximum width of about four miles. This zone also contains a large proportion of slaty rocks but is characterized by a great number of limestone beds varying up to 200 feet or more in thickness. The zone has comparatively few mineral deposits, although a few important properties are located in it, their ore deposits being characteristically replacements of limestone along series of parallel cross fractures in the limestone. Such ore deposits occur at the Cork-Province, Lucky Jim, and Whitewater Deep properties. The third zone occupies a wide strip through the central portion of the Slocan series and includes the uppermost horizons in that series. It is abundantly mineralized and is characterized partly by a great variety of thinly interbedded rock types including sandy, argillaceous, and limy strata, but more particularly by the great number of associated porphyritic intrusives, most of which trend with the enclosing formations. These 'porphyries' as they are generally called, are regarded as of extreme

importance, probably not so much from a genetic as from a structural point of view. They have opened channels for rising metalliferous solutions; have bolstered up the ground much after the fashion of reinforcement in concrete, and have thereby preserved the lines of fissuring; and have provided strong confining walls for the ore deposits or furnished good hanging-walls for the mineral deposits to bank against. These minor intrusives are by no means confined to this third zone in the Slocan series but are particularly characteristic of it and have afforded greater assistance to the formation of ore deposits here than elsewhere in the series. Among the more important properties in this third or 'porphyry' zone are the Payne, Surprise, Last Chance, American Boy, Noble Five, Reco, McAllister, and Silver Glance mines. The fourth and broadest zone underlies the third but overlies the second zone, so the rocks composing it also outcrop elsewhere in the area occupied by the Slocan series, as between the second and third zones. They are also overlain within the limits of the fourth zone by rocks identical with those of the third or highest zone. The rock members of the fourth zone, however, are chiefly strong, massive types, including blocky argillities, quartzites, and feldspathic sandstones, all of which may be more or less limy. Some of the largest ore shoots in the district have been discovered within this zone, including the Standard, Slocan-Star-Silversmith, Ruth-Hope, Queen Bess, Hewitt, Van Roi, and Bosum mines.

Post Triassie Intrusives

The Nelson granite outcrops over the southwestern portion of the area. Several stocks probably related to the Nelson batholith outcrops within the area of the Slocan series. In addition various dykes varying in width from a foot or two to several hundred feet cut the sediments. They include both basic and acid types of which the former are much more abundant. The stocks and batholithic rocks contain several important shoots, for example the Molly Hughes, Mountain Con and Fisher Maiden.

Ore Bodies

The ore bodies are fissure veins and replacements in the Slocan series and in the Nelson granodiorite, and are usually located within three or four miles of the contact. Three chief types of deposits are found:

1. The deposits in the Nelson granodiorite consist chiefly of narrow fissure veins, with fairly well marked boundaries. The ore minerals are argentifuous galena, argentiferous tetrahedrite (freibergite) sphalerite, native silver, Chalcopyrite, and pyrite. The gangue is mostly quartz associated with small amounts of calate and siderite. These consitiute the so-called "dry veins," and the silver content of the ore is usually very high, several hundred ounces to the ton being not uncommon. On account of the narrowness of these veins, however, they are not very productive.

2. In the calcareous layers of the Slocan state series a few fairly large bodies of zinc ore have been found which apparently owe their origin to metasomatic replacements of the limestone. With the zinc blende is usually associated pysite, galena, pyrrhotite, quartz, and siderite. These deposits are usually quite low in silver values, and are not very productive.

3. The most important deposits of the district consist of fissure veins outting the Slocan states. These are principally fissure fillings with moderate amounts of metasomatic replacement.

These bodies, which vary in thickness from a few inches to about forty feet, are mineralized zones, rather than well-defined veins. The strite varies from east-west in the eastern part of the district to northeast-southwest in the northwestern part. The location of these zones suggests that they may be continuations into the intruded rocks of the fissure systems of the dry or siliceous silver lead veins of the Nelson granodiorite. The variations in the strike of the various bodes suggest that the fractures in which they occur are radially arranged with respect to the centre of the granodiorite. Rarely are the bodes vertical, in general they dips rather steeply, most of them to the southwest.

The chief ore minerals are galena, tetrahedrite, and sphalerite, all of which are argentifuous, but not as highly so as the corresponding minerals of the dry veins. On the average the ores contain between sixty and eighty ounces of silver to the ton of concentrates (50-70 % Pb). Pyrite and Chalcopyrite also occur but pyrrhotite is rare. The characteristic gangue mineral is siderite, or "spathic iron," of a cream yellow color; minor gangue minerals are quartz and calcite, white horses of schist and slate are common within the bodies.

There is considerable evidence that at dysth galena gives place to syhalerite and phrrhotite; it is possible also that the copper ore did parts of the sphalerite bodes were richer in galena than the portions now exposed. The increase of sphalerite and pyrrhotite in depth may depend on the propimity of the intrusive granodiorite. Generally in these bodes the ratio of sulphides to the vein gangue is very much greater than in the dry ores which are typically mineralized quartz veins.

Mineralogy of the deposits

The following description of the mineralogy of the deposits is an extract from a paper by Bateman.

1. Allan M. Bateman. Noteson Silver Lead Deposits of Slocan, B. C. Econ. Geology vol. XX No. 6.

"The ore minerals that have been observed by the naked eye and by means of the microscope are: galena, sphalerite, Chalcopyrite, pyrite, tetrahedrite and freibergite, ruby silver (both proustite and pyargyrite), argentite, pyrrhotite, native silver, and covellite. Considerable cerrusite occurs in places and also a little calamine and smithsonite. A few small fragments of boulangerite were identified, and numerous specks of a soft creamy to grayish white mineral, too small to be identified, were seen under the microscope. The introduced gangue minerals consist of quartz, siderite, and calcite."

"The most striking feature of the silver-lead ore is its banded or gneissic texture a feature that has been described in an excellent paper by Dr. Uglow. The term, gneissic, aptly describes the texture since, except for the composition it looks like a coarse granite gneiss. The galena is arranged in bands, discernible by the difference in the size and orientation of the galena grains. It gives the impression, of flowing and sliding under compression, and the microscope brings out forcibly, especially upon etched polished surfaces, the curving and destortion that the galena crystals have undergone. The galena plates curve around eye-like knots of tetrahedrite, sphalerite, guartz or siderite, indicating that the softer galena flowed around the other harder and more resistant minerals. The origin of this structure has been taken up by Uglow.

The crushing of the ore must be considered in connection with age relationship of the different minerals."

"The impression conveyed in a microscope study of the ores is that galena is later in age than the quartz, siderite, sphalerite, tetrahedrite , and pyrite. Most of the latter minerals are shattered and traversed by galena, but in the case of the crushed ores this cannot be used as a criterion of the later age of the galena, for the harder minerals have undergone fracturing while the galena has undergone flowage and recrystallization and, therefore, gives the appearance of being of later age, whereas it may not have been so. Age relations of different minerals, then, in shattered ores of this type may be no criterion whatever of the original sequence of mineral deposition a point which should not be overlooked in building deductions upon mineral sequences. Similarly, the numerous indusions of wall rock enclosed by galena may not be replaced residuals as they appear to be, but fragments in corporated during the rearrangement of the galena."

"In the unchanged or only slightly crushed ores the quartz, pyrite, and tetrahetrite appear to have formed earlier than the other minerals. Sphalerite and chalcopyrite were formed simultaneously and the galena was formed contemporaneously with, and also slightly later than, the sphalerite; there appears to have been a slight overlapping in deposition. The siderite was contemporaneous with the

blende and galena. Siderite, blende, and galena were all observed to replace quartz, tetrahedrite, and country rock."

"Much of the sphalerite contains haphazardly arranged pin-points of chalcopyrite visible only under higher magnifications - a mode of occurrence familiar to all who have microscopically examined ores containing zéne and copper."

"The high silver content of these ores may be accounted for by the abundant presence of minute specks of silver-bearing minerals that can be seen only under the microscope. The ruby silvers, and the unknown mineral, presumably a silver ore, are confined almost entirely to the galena. They occur in shapeless forms with smooth outlines against the galena. Some of them contain inclusions of galena. They, and the galena, apparently were formed at the same time."

The author examined twenty-seven poli-sections from respectively seventeen mines in the Slocan mining area. On the basis of the labatory work alone it was impossible to draw, with any confidence, conclusions such as those stated above by Bateman. Bateman's con lusions were based on observations made in the field as well as in the laboratory.

The laboratory work conducted by the author did not, in many cases, confirm the above conclusions. The general sequence of the ore minerals appeared to be pyrite (earliest) sphalerite, Chalcopyrite, tetrahedrite, galena.

Definite evidence was obtained in many of the specimens that galena was the latest mineral. Tetrahedrite occurred in numerous small rounded or regular grains in the galena, suggesting a contemporaneous origin of the two minerals. Sphalerite in many cases was definitely older and in some cases appeared to be contemporaneous with the galena. In one specimen it was found to be older than tetrahedrite. Chalcopyrite occurred typically in rounded spots in the sphalerite--several instances were found however of it veining the sphalerite. Pyrite, although it has been placed above as the earliest mineral, was in several specimens found to be younger than the sphalerite. Of the gangue minerals only quartz and sederite occurred in any of the specimens, in spots or veins of large enough size to determine. Quartz in many instances appeared to be younger than the sphalerite white in other instances it appeared to

be older than any of the ore minerals. Definite siderite relations were found only in one specimen where it was veined by pyrite.

The following contains brief descriptions of some of the properties from which ore specimens were examined. The descriptions are in each case followed by brief summaries of the results of the laboratory work.

Bosun

The property is located on the east shore of Slocan lake about 1½ miles south of New Denver.

The vein is a fissure varying in thickness from a few inches to over 5 feet. The pay-streak is much narrower and is composed of galena and sphalerite, associated, in the richer portions of the ore-shoots, with a more or less abundant dissemination of grey copper. The vein is offset to the right at intervals along its course by strong zones of shearing closely in line with the bedding planes of the enclosing rock. In addition to these larger offsets the course of the vein has proved most difficult to follow by reason of numerous small irregularities, the general lack of definition to the foot-wall, and the common occurrence of slips or faults leading off into the hanging-wall. These slips are commonly occupanied by more or less mineralization and are in many places difficult to distinguish from the true vein which on occasion may itself roll in the direction of these slips for considerable distances before assuming its regular course. The rocks are mainly sedimentaries composed of massive argillaceous and quartzitic types, including some limestone beds and a large proportion of more or less calcareous strata. These sediments are intersected by a number of dykes varying in width up to 85 feet and with a strike about that of the bedded rocks.

A specimen of galena sphalerite ore taken from above No. 2 level was studied under the microscope. The galena sphalerite boundaries were straight, smooth and curving, suggesting a contemporaneous origin.

A specimen from No. 6 level consisted of galena, sphalerite, pyrite, siderite, quartz and a little Chalcopyrite and tetrahedrite. Veins of quartz and chalcopyrite cut the sphalerite but stopped at the galena boundaries. Pyrite occurred as splintery masses in the quartz.

Irregular masses of siderite were traversed by quartz and in many cases were surrounded by pyrite, possibly indicating replacement by the pyrite. A few small regular spots of tetrahedrite occurred in the galena. On the basis of the above evidence the mineral sequence indicated is siderite (earliest), pyrite and quartz, chalcopyrite, sphalerite, tetrahedrite and galena. (Fig. 1)

Charleston

The Charleston group is located in the basin of Whitewater creek, within a short distance of the Whitewater mine road and about 2½ miles from Retallack station. The veins are zones of shearing and fissureing following, or cutting at small angles, the rock formation, which is composed chiefly of black, slaty sediments interbedded with narrow bands of limestone. The veins vary in thickness from a few inches to several feet and contain lenses and shoots of silver-lead-zinc ore.

Sphalerite is the most abundant ore mineral and is associated in places with an abundance of grey copper carrying good values in silver. Galena is irregularly distributed through the ore. Quartz and siderite are the chief gangue minerals and the vein filling includes a large proportion of the associated country rock.

A specimen of sphalerite tetahedrite ore was studied. Chalcopyrite occurred in two vein-like streaks cutting the sphalerite--the streaks stopped abruptly at the tetrahedrite boundaries. Irregular quartz masses surrounded by islands of quartz occurred in the tetrahedrite and sphalerite. The mineral sequence was apparently quartz, sphalerite, chalcopyrite, tetrahedrite. (Fig. 2)

Cork Province

The cork Province mine is situated on the east side of Mansfield (south fork of Kaslo) creek at a distance of 9 miles from Kaslo and 4½ miles from Zwicky station (Nashton post office). The ore-bodies of the Cork-Province mine occur where a well-defined vein intersects beds of crystalline limestone. The limestone is interbedded with more or less metamorphosed and argillaceous sediments and forms beds up to about 90 feet in thickness. Three of these beds have been encountered in the underground workings and have developed ore at the vein intersections. The vein is a fissured and sheared zone, averaging from 5 to 6 feet in width, in which the hanging-wall side has dropped with

respect to the foot-wall and thereby offset the limestone beds in each case about 80 feet to the west.

The vein filling consists chiefly of altered limestone and siderite with somequartz and calcite. Galena and zinc blende are the important ore minerals, but subordinate amounts of pyrite and chalcopyrite are also present. In general the vein is sparsely mineralized, but important ore-shoots occur where the limestone beds have been intersected. The vein at these intersections is much enlarged, since the ore replaces the limestones for distances up to 100 feet from the vein on the hanging-wall side. On the foot-wall side the concentration of ore minerals is less noticeable.

Paragenesis

The specimen studied, consisted of small cubed galena, pale brown siderite, pyrite and quartz. The pyrite occurred in the galena as irregular masses and was veined by the galena. It occurred in the siderite as crystals. Quartz veins cut the siderite but stopped at the galena boundaries. One crystal of pyrite was broken and cut by quartz.

The sequence of events revealed by the specimen may be interpreted as follows:

(1) deposition of pyrite and siderite

(2) fracturing and filling of fractures by quartz

(3) replacement by galena

Lucky Jim

The lucky Jim mine is located just above the Nakusp and Slocan railway at Zincton station near the lower end of Bear lake.

The ore-bodies were formed through replacement of a band of limestone and calcareous sediments at the intersection of cross-veins or fissures. The main lime band consists of limestones and other calcareous strata and varies from 50 to 100 feet or m re in thickness. This band has been considerably brecciated and deformed by regional stresses and is interbedded on either side with argillaceous sediments which are commonly thinly bedded but include more massive types. These sedimetns are cut by a great number of acid porphyritic intrusives, chiefly in the form of sills. The productive part of the veins is in the calcareous rocks only. The ore occurs in chimney-like shoots by replacement along the bedding for 50 feet or more on either side of the major vein fractures.

Zinc blende is the predominant ore mineral and the mine is essentially a zinc mine. The blende is associated with galena which was more abundant in the upper levels and is showing up well as development is carried farther into the hill. Pyrite is an abundant mineral and appears to be more intimately mixed with the blende in the lower than in the upper levels. Pyrrhotite and arsenopyrite are present in minor proportions.

A specimen of zinc ore from No. 4 level was studied. It consisted of sphalerite dotted with a few small rounded spots of chalcopyrite. The chalcopyrite was probably formed by exsolution from thesphalerite.

Lucky Thought

The Lucky Thought mine is situated on the south side of Silverton (Fourmile) creek about 4 miles by road from Silverton.

The vein is sheared zone cutting blocky argillaceous sediments. The hanging-wall is well defined and mostly underlain by a heavy gouge. Sphalerite, galena, and grey copper are the important ore minerals. The blende is the most abundant ore mineral, whereas the grey copper is erratic in distribution and usually associated with the lead ore. Some very rich pockets of galena mixed with the grey copper have been obtained from this property.

Paragenisis

The specimen studied consisted of medium-cubed galena dark-brown sphalerite and a little quartz. The galena sphalerite boundaries were smooth, straight and curving, suggesting a contemporaneous origin. The sphalerite however was veined by the quartz and no quartz veins occurred in the galena, suggesting that the galena may have been a bit later than the other two minerals.

Monitor

The Monitor mine is situated to the south of Three Forks opposite the mouth of Kane (North fork, Carpenter) creek. The vein is a fissure cutting blocky, argillaceous, carbonaceous, and calcareous sediments, and a couple of quartz porphyry sills or dykes.

The vein filling commonly lies between smooth, slickensided walls. It is composed of more or less crushed country rock with lenses or bands of quartz, siderite, calcite, and ore. The ore consists of galena (banded, steel, and fine cube) zinc blende, and pyrite.

Paragenesis

A poli-section of the ore from No. 3 level was studied. It consisted of sphalerite, galena, pyrite and quartz. The boundaries of all the minerals were very irregular. Irregular veins of pyrite cut the sphalerite, and quartz veins cut both the sphalerite and the pyrite. No definite galena relations were established. It would seem in this case that mineral sequence from oldest to youngest was, sphalerite, pyrite, quartz and (galena?).

RICHMOND-EUREKA

The Richmond-Eureka mine is situated about 1,500 feet above Sandon on the steep eastern slope of the East fork of Sandon creek. The country rocks are quartzitic, argillaceous, and calcareous sediments intersected by a few basic, micaceous dykes and dykes of quartzbiotite porphyry.

The vein is the eastern extension of the Slocan Star vein and has a general strike of north 80 degrees east, with an average dip of 45 degrees south. It occasionally turns and follows formational planes, especially near the basic dykes. In thickness it varies from a few inches to 42 feet, the thicker parts being filled largely with crushed rocks and h horses of the same. The vein seems best developed in the softer slaty rocks. Two important shoots have been developed. Of these the "Main" shoot was much the larger, varying, as stoped, from a few inches to 10 feet in thickness and with a maximum width on the dip of about 267 feet. Streaks or bands of steel galena from 1 to 2 inches wide were found close to the foot-wall, but the main pay-streak of clean galena occurred on the hanging-wall side and ranged up to 8 feet thick.

The metallic minerals are steel and cube galena, zinc, blende, pyrite, and a little chalcopyrite. Grey copper is usually present, and leaf silver, though rare, has been noted. The gangue minerals include siderite, quartz and a little calcite.

Paragenesis

The specimen studied consisted of cube galena, pale brown siderite, and pyrite. The pyrite occurred as irregular veins cutting the siderite--the veins stopped at the galena boundaries and did not occur in the galena; This was fairly definite evidence of the following sequence from oldest to

youngest: siderite, pyrite, galena. (Fig. 3)

Ruth Hope

The property lies to the south and southwest of Sandon between elevations of 3,5000 feet and 5,8000 feet.

The rocks in the vicinity of this property include slaty, argillaceous, siliceous, and calcareous sediments having a general strike of about north 35 degrees west and dipping mostly to the southwest at angles varying from 20 degrees or less to vertical. These rocks are intruded by a number of quartz porphyry dykes. The vein has a general east and west strike and dips to the south at angles varying from 25 to 40 degrees. It varies in thickness from less than a foot to about 40 feet, the walls being in many places ill-defined. The filling consists largely of crushed country rock with calcite, siderite, quartz, and ore. The ore is chiefly clean clean galena and blende; grey copper, chalcopyrite, and pyrite also occur. Limonite and anglesite occur in the oxidized parts of the ore-bodies. Some of the zinc ble blende carried high values in silver.

In the specimen studied sphalerite occurred as irregular broken grains in galena. Small crystals of pyrite occurred in the sphalerite. Small spots of an unknown mineral closely resembling galena, but somewhat harder and darker in colour occurred in the galena. (This mineral is probably tetrahedrite.) The sphalerite grains showed a definite alignment, probably indicating that the one had suffered

shearing--the harder mineral, sphalerite, fractured while the softer mineral, galena, flowed.

SLOCAN-STAR SILVERSMITH

The property lies mostly between the East and West forks of Sandon creek about ½ mile to the south of and between 500 and 1,500 feet above the town of Sandon. The country rocks are largely slaty to massive, argillaceous and siliceous sediments, intersected by a number of porphyry dykes including some distinctly basic types. One stock-like mass of feldspar-quartz porphyry, from 400 to 500 feet wide is closely associated with the ore deposits and intervenes between the Slocan Star and Silversmith ore-bodies. The Slocan Star-Silversmith vein has a general northeasterly trend and dips southeast at an average angle of about 45 or 50 degrees.

The vein varies in width from a few inches to about 80 feet and contains crushed fragments as well as large and small horses of country rock and quartz gangue and ore. Many of the bands and lenses of siderite and quartz strike diagonally across the vein, cutting off at the walls, and cross fractures are more numerous in the porductive parts of the vein. The ore consists of galena, zinc blende, grey copper, chalcopyrite, and pyrite in a gangue of siderite and quartz. Bands and lenses of clean ore are commonly found and may follow either wall, but, in general, the ore and vein filling are intimately mixed with the better ore predominating on the hanging-wall side.

Paragenisis

A specimen of the ore from the main Silversmith shoot was studied. It consisted of course cube galena and tetrahedrite. The boundaries of the minerals were smooth and flowing probably indicating a contemporaneous origin.

A specimen of the ore from the outcrop of the Slocan Star ore body consist of galena, sphalerite, chalcopyrite and quartz. The sphalerite occurred as irregular grains in the galena and the grains were veined by quartz. Chalcopyrite occurred in small spots in the sphalerite. The order of mineralization suggested by the above relations is from oldest to youngest: sphalerite and chalcopyrite, quartz, galena.

Standard

The standard mine occupies the lower southwestern slopes of Idaho peak above the valley of Silverton creek and are reached by wagon road from Silverton. The rocks in the vicinity of the mine workings include dark grey to black, argillaceous, siliceous, calcareous, and carbonaceous sediments with both massive and laminated slaty types. These are intersected by a few dykes and sills, one of which, a quartz diorite porphyry, forms the foot-wall of the Standard vein for some distance in the upper levels. A stock or boss of coarser-grained granodiorite occurs along the east side of the Standard claim and is doubtless connected at depth with the large area of batholithic rocks to the south of Silverton (Fourmile) creek. The so-called "Standard vein"

is a strong fissure along which much subsequent movement and more or less intense shearing, have taken place. The vein filling includes much broken, crushed, and slicksided country rock. The chief gangue minerals are siderate, calcite, and quartz, the first two being most abundant in the main ore-shoot. The ore minerals include galena, sphalerite, grey copper, and chalcopyrite, with, in places, some ruby silver. The ore-body was composite in character, being made up of distinct tubular-shaped lenses and rounded masses of clean galena, and other lenses of mixed, ore and gangue minerals.

A specimen of gneissic galena ore was studied. Sphalerite, and chalcopyrite occurred in irregular grains, which showed a definite alignment with the gneissic structure. This is another excellent example of the effects of shearing--fracturing of the harder minerals and flowage of the softer mineral.

VAN ROI

The Van Roi mine is situated south of Silverton (Fourmile) creek and west of Granite creek. The country rocks include well-banded and dense, light grey, quartzitic beds, carbonaceous and siliceous argillites, and dark grey shales. There are a few dykes, but the mine is fairly free of such intrusives, although in close proximity to the great batholith of granitic rocks to the south.

The veins so far developed have proved remarkably

continuous and average several feet in width. The angle they make with the enclosing rocks is small and produces slabby ground and, to some extent, a lack of clear definition to the walls. Ore-shoots have been encountered at irregular intervals and, in general, where cross-fissuring is best developed.

The vein filling includes much gouge and broken rock, together with gangue and ore minerals. The ore consists mainly of galena and zinc blende in a quartz gangue. Grey copper and ruby silver are fairly plentiful in places, both in a low r and upper levels. Native silver, chalcopyrite, and pyrite also occur, the silver, however, being in very small amounts. Siderite and calcite are present in small quantities.

A specimen studied under the microscope consisted of small cube galena containing irregular grains of quartz, sphalerite and chalcopyrite. The same alignment that we have discussed is previous sections was shown in this specimen. (Fig. 4)

WHITEWATER

The property is located to the west of the lower valley of Whitewater creek and north of Kaslo creek. The formations encountered include states, blocky argillites, limestones, and other calcareous, carbonaceous, and siliceous sediments. The strike is about east and west and the dip, except where influenced by faulting and local folding, is dominantly to the south.

The Whitewater vein on its strike is closely in line with the enclosing formation, but dips south at an average angle of about 45 degrees, It is a strong fissure which, with minor or local exceptions, cuts across the dip of the bedded rock and is the site of considerable movement accompanied by shearing and cross-fissuring. In thickness it varies from a few inches to 50 or 60 feet. The filling consists of crushed country rock containing irregular lenses of siderite quartz and ore. The pay-streak varies in thickness from little or nothing up to several feet. The principal ore minerals are galena, zinc blende, grey copper, pyrite, and chalcopyrite. Both siderite and quartz are common gangue minerals.

A specimen of ore, taken from a stope between No 5 and No. 6 levels consisted of fine grained galena with numerous small spots of sphalerite, pyrite and quartz. It showed brecciation and flowage very clearly. (Fig.5)

WONDERFUL

The mine is situated a mile west and 800 feet above Sandon and is connected with the railway up Carpenter Creek valley by an aerial tramway. The vein is a sheared fissure having a ganeral east-west trend. The dip is to the south and the vein cuts massive to slaty argillaceous sediments and a number of porphyry dykes. The sediments have a general north 15 to 20 degrees west strike and dip to the northeast at angles which are mostly low and some places almost flat.

They are conspicuously jointed in a direction which is closely in line with the main vein. In part, and particularly near the ore-bodies, these sediments are in many places heavily mineralized with pyrite.

The vein filling varies up to 8 or more feet in width and includes more or less crushed wall-rock associated, in the productive parts, with quartz gangue and ore minerals. The latter, including principally galena and sphalerite, are rather irregularly distributed in bands, bunches, or small lenses and are commonly associated with more or less pyrite. Both galena and zinc blende contain good values in silver.

A specimen studied under the microscope consisted of large cube galena, pyrite, sphalerite and quartz. The pyrite occurred in the sphalerite largely as splintery masses. Quartz veins cut the sphalerite. All boundaries with the exception of those between pyrite and sphalerite were quite regular. The probable mineral sequence indicated in the specimen was: pyrite, sphalerite (and galena?), quartz.

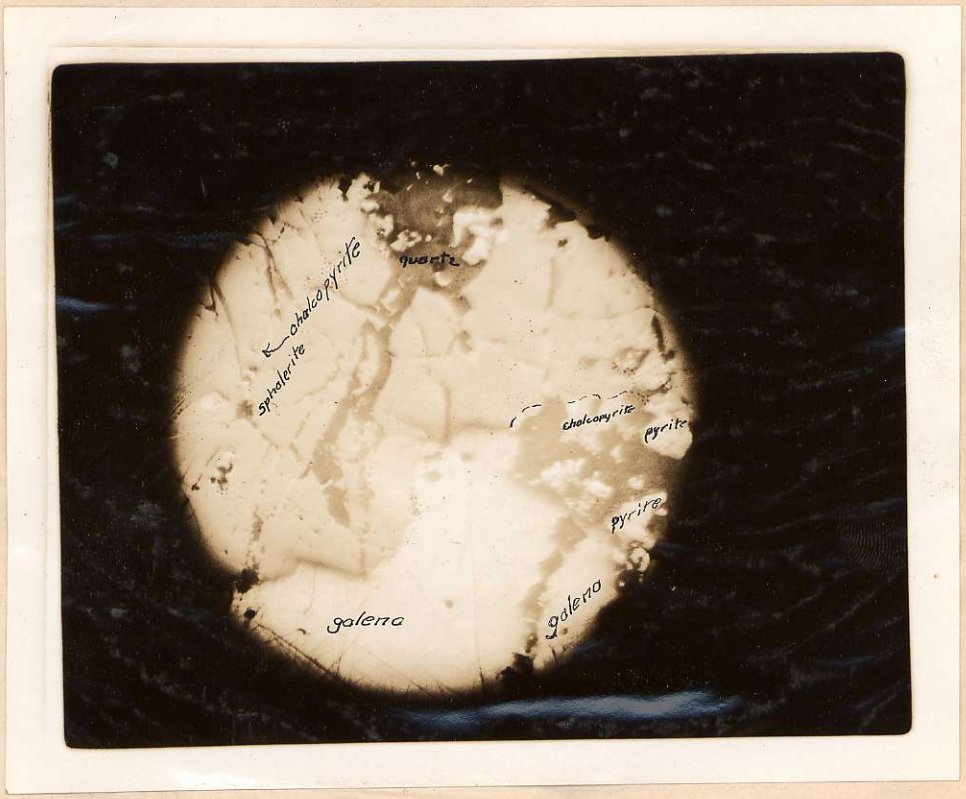

Figure 1

Photomicrograph of ore from the Bosun mine. Quartz and chalcopyrite replace sphalerite and galena replaces all.

Figure 2

Photomicrograph of ore from the Charleston mine. Chalcopyrite replaces sphalerite and tetrahedrite replaces chalcopyrite and sphalerite.

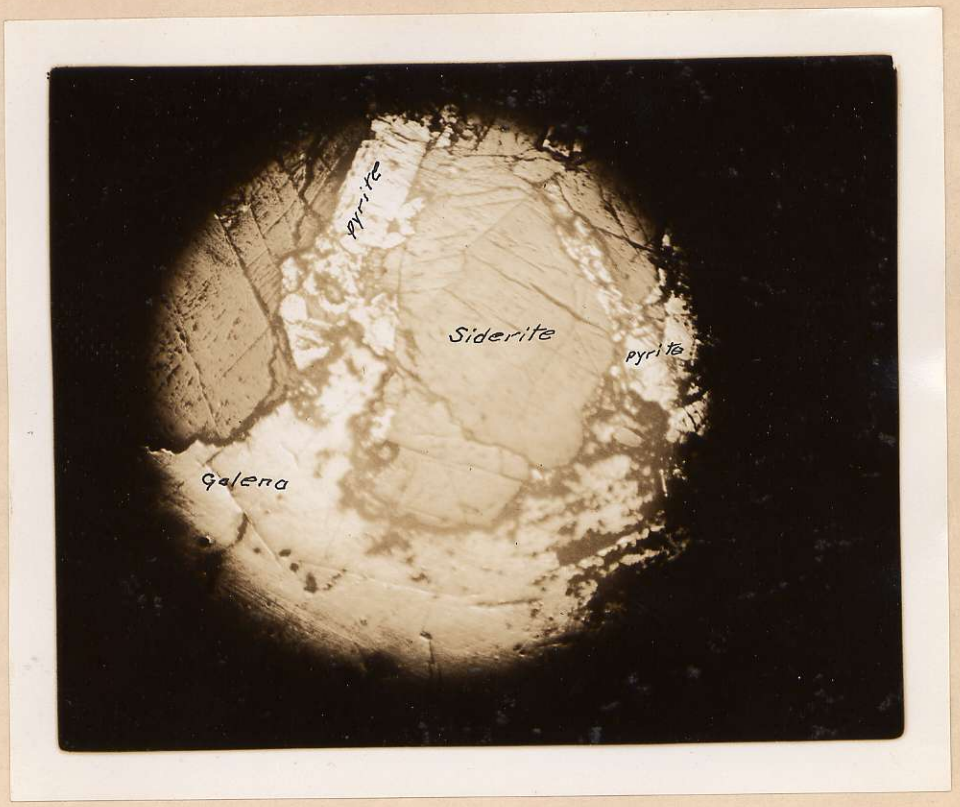

Figure 3

Photomicrograph of ore from the Richmond Eureka mine. Pyrite replaces siderite and galena replaces pyrite and siderite.

Figure 4

Photomicrograph of ore from the Van Roi mine.

Figure 5

Photomicrograph of ore from the Whitewater mine. Galena (white) contains broken pieces of sphalerite chalcopyrite, quartz, and tetrahedrite.