600381

REPORT ON MINERALOGY

OF

RED HORSE AND OYSTER-CRITERION CLAIMS

MERIDIAN MINING COMPANY

CAMBORNE, B.C.

by

HARRY C. EDWARDS

For credit in Geology 9

Spring Term 1934

Samples collected by

H. V. Warren, Ph.D.

TABLE OF CONTENTS

MINERALOGY OF THE MERIDIAN MINES

CAMBOURNE, B.C.

INTRODUCTION

Gold was discovered near the townsite of Cambourne B.C. in 1899, and a gold rush resulted. Among the many claims staked was the Oyster-Criterion group, on which development started in 1900. There was some activity in the district until 1905, when it became evident that while most of the veins in the area did contain gold, none contained gold in sufficient quantity to pay for extraction.

On the Oyster-Criterion group, 1000 feet of drifting was done on the ore shoot, and 14,000 tons of ore extracted, yielding bullion to the value of $52,469, or about $3.75 per ton. The recent rise in gold prices has aroused further interest in the district, with the result that many of the mines have been re-opened. The Meridian Mining Company, early in the field as the operators of the Red Horse Claim, have acquired the Oyster-Criterion group, the Eva group, and many others nearby.

This report is on the Mineralogy of the ore of the properties of the Meridian Mining Company; the samples being collected by Dr, H. V. Warren, under whose direction the studies were carried out in the Mineralogy laboratory of the University of British Columbia, during the session of 1933-34.

PART I

GENERAL GEOLOGY

Description of the Area.

The properties of the Meridian Mining Company lie in the Lardeau Map Area. This area comprises a long strip of country from the north end of Kootenay Lake across the Selkirk Mountains to Columbia Valley at Revelstoke. The town of Camborne, near where the properties are situated, is on Independence Creek, above the North-East Arm of the Upper Arrow Lake.

The Nelson Batholith forms part of the western boundary, and later granites of the Kuskanax Batholith, the eastern. The sedimentaries which form most of the area, lie in a trough between these granites. The bulk of the sediments are of the Lardeau series, which were laid down in the Late Pre-Cambrian time.

Table of formations

Quaternary	Recent	Alluvium
	Pleistocene	Glacial silts, gravel and till
Mesozoic and Tertiary	Post-Triassic	Kuskanax batholith; granite
		Nelson batholith
	Triassic	Kaslo series; massive and schistose, chloritic eruptives and intrusives; sediments
Unconformity		
Mesozoic and Paleozoic	Triassic and Upper Carbon.	Milford group; conglomerate, slate, argillite, limestone

Unconformity

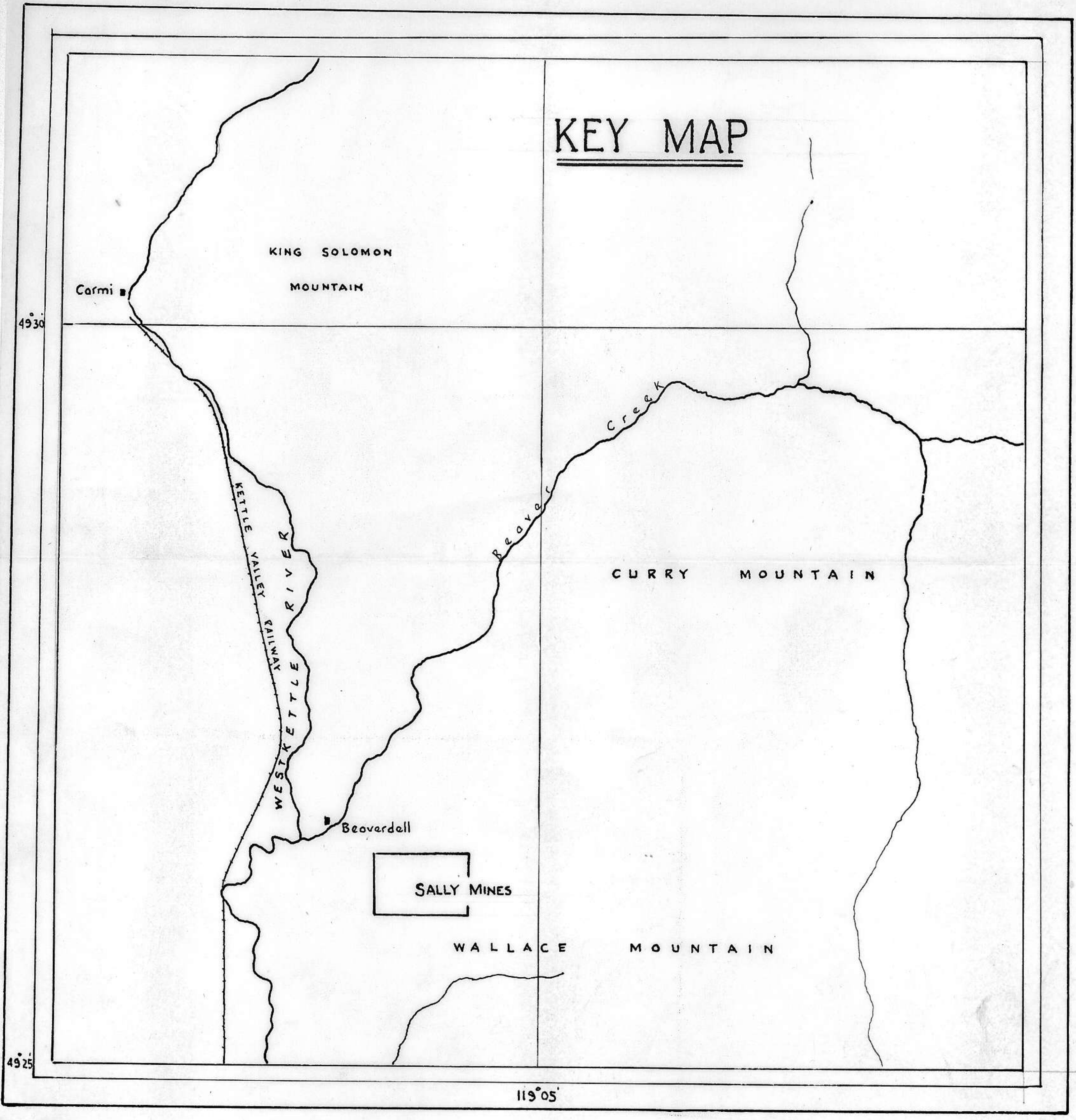
Late Pre-Cambrian	Windermere	Lardeau Series; schists, phyllite slate, quartzite, limestone
		Badshot Formation; crystalline limestone
		Hamill series; quartzites, mica schists, mica phyllites, and limestone

The Lardeau Series.

The Lardeau series, in which the Camborne type of mineralization is present, lie in a synclinal trough extending from Kootenay Lake to near the watershed between Illecillwaet and Alkolkolex Rivers. It is a complex series of metamorphosed sediments, the lowest of which is a black carbonaceous rock, variously altered to slate, phyllite or schist. Above this is a member consisting of grey to greenish phyllites and schists. Near the top of the section is a black, highly carbonaceous rock. In the south, the schists mentioned are succeeded by a bed of limestone (the Lavina limestone), and above this are mica schists and massive quartzites, and then a succession of mica, quartz and chlorite phyllites and schists. The highest member is a prominent band of quartzite. In the neighborhood of Camborne, the country rock is composed of argillaceous and carbonaceous sediments, mainly slates to graphitic schists, and quartz varieties of these, also green chlorite schists and dykes of greenstone altered to carbonate rocks.

The greenstone and chlorite schists are unfavourable to formation of ore deposits, unless the rocks have been rather extensively carbonated, as is the case in the Camborne district. Even then, the veins are irregular and of low grade.

The ore originated in the final stage of cooling of the magmas of the Kuskanax batholith, and somewhat later than the Nelson batholith.



KEY MAP
KING SOLOMON
MOUNTAIN
Carmi
49°30'
KETTLE VALLEY RAILWAY
WEST KETTLE RIVER
Beaver Creek
CURRY MOUNTAIN
Beaverdell
SALLY MINES
WALLACE MOUNTAIN
49°25'
119°05'

PART II

ECONOMIC GEOLOGY

Description of claims.

The properties of the Meridian Mining Company comprise several claims near the town of Camborne, B. C., among them the Eva and Oyster-Criterion groups and the Red Horse claim. The samples studied are from the last two, but as the geology and mineralogy of all the claims are practically the same, the results of the study as noted in this essay will apply, with slight change, to all properties. The company are concentrating development on the Eva Claims, as this shows more promise than the others.

Of the Oyster-Criterion group, Dean R. W. Brock says "This group of claims....is situated southeast of the Eva Group on the extension of the same lode....While the veins are partly fissure fillings, replacement of the country rock by vein material has also been important. The country, which is mostly lead-grey carbonaceous phyllite, may be seen in all stages of alteration to solid vein material....In places, therefore, the lead may consist of reticulating veinlets of quartz with phyllite inclusions between. The gold is often concentrated around these inclusions, which are frequently graphitoidal; Consequently the mottled parts of the vein are often rich (?)....Gold may be panned from the quartz almost anywhere, but the values are not evenly distributed... The veins are of quartz, carrying siderite and sulphides, together with the free gold. The veins are usually of higher grade where a cross vein joins... In the Criterion shaft the vein, with some phyllite inclusions, is about 15' wide. The Criterion tunnel runs in a northerly direction for 135', when a galena vein, 5' wide, is encountered, which strikes 43 degrees. The tunnel then follows the galena vein. This vein lies between two slips, with gouge and slickensided walls. In about 65' along the galena lode, the Criterion quartz vein is encountered, striking 261 degrees, angle 65 degrees north. The galena vein, here narrowed to about 1', cuts the quartz vein and faults it." (1)

The Red Horse claim is staked on a quartz vein, with some ankerite, striking north 5 degrees west and dipping east. It cuts grey to black schists and light grey carbonate rock, and is about 15' wide. Small fissure veins accompany the main vein. Pyrite is the gold carrier, and galena is found in small quantity. Values are said to have averaged $5 to $6 across 10 or 12 feet. (2).

Minerals and mineralization.

The mineralization of the two claims under examination is simple, particularly that of the Red Horse. In both, quartz veins with sulphides and a Ca-Mg-Fe carbonate have been deposited in fissures by ascending thermal waters. While fissure filling has been the chief method of mineralization, replacement in the wall rock has been important. This replacement in the carbonated and altered phyllite (?) is seen best in sample #5, the rock,

---

(1). Brock, R. W.: Geol. Surv. Canada, Ann. Rept. 1903, Pt. A, p. 58.

(2). Gunning, H. C.; Gel. Surv. Canada, Mem. 161, 1929, p. 40.

altered to sericite, is silicified, and heavily mineralized with pyrite. There seems to have been only one epoch of mineralization, which took place during the cooling of the Kuskanax batholith (1).

The deposit follows closely in classification with Lindgrens description of Mesothermal deposits; there are no characteristic high temperature minerals, but on the other hand no low temperature minerals such as arsenopyrite, argentite or stibnite, though a little chalcopyrite is present, mainly from the Galena vein (see sample 'G').

The vein samples show a common origin, differing only in the individual and collective proportion of sulphides and carbonate. The Red Horse sample is from a quartz vein relatively heavily mineralized with pyrite, but only minor amounts of other sulphides. Sample 'P', from the Oyster-Criterion group, is much the same. Sample 'G' contains galena as the chief constituent, and sample #12 contains both galena and pyrite in large amounts. Sample #8 is the poorest in sulphides, but shows the most sphalerite. The explanation is simple; the ascending waters, finding different fissures at different times, would naturally have varying percentages of dissolved minerals, and deposit these minerals in different manner.

For purposes of examination, the samples might be considered as part of the same vein; the conclusions reached will be effective for any vein, after allowing for certain reservations, such as gold distribution, effect of wall rock, etc.

---

(1). Gunning, H. C.; Geol. Surv. Canada, Mem. 161, P.31.

As stated previously, the primary minerals are Quartz, pyrite, galena, sphalerite, chalcopyrite, and a calcium-magnesium-iron carbonate, approximating ankerite.

Quartz-

The quartz is milky, but sometimes watery. It appears to have been deposited before the appearance of the sulphides, with continued deposition during the entire mineralization period. Pyrite, sphalerite, and galena are seen to have been accompanied by quartz. It is the principal gold carrier, but no samples assayed sufficiently high in gold to justify the term ore.

Pyrite-

This was the first sulphide deposited, and is present in the largest proportion. It is mainly in the form of small to medium sized cubic crystals, with some pyritohedrons replacing wall rock and carbonate (and quartz?). All pyrite carrys gold, but only in small, non-commercial amounts.

Sphalerite-

Sphalerite followed immediately after pyrite, and in some cases accompanied pyrite; probably the deposition of these and other sulphides overlapped in some veins if not all. In sample #8 the sphalerite occurs as small isolated masses of crystalline form in contemporaneous quartz. Tray #8b is an example of these masses in the process of formation; small crystals of sphalerite and quartz form intergrowths in cavities in the quartz, illustrating crystallization from the aqueous solution, the solution draining out before the cavity had been filled completely, or else becoming impoverished or undersaturated. In most sections, particularly where the sphalerite gives evidence of being deposited late (as seen by its relation to pyrite), it is seen to include small 'blebs' of chalcopyrite, which are taken to be the result of unmixing of this sulphide from the sphalerite; the chalcopyrite being soluble in the sphalerite in the aqueous liquid, and so brought up from the magma and deposited with the latter before conditions were ripe for chalcopyrite deposition. Not being soluble in sphalerite in the solid state, the chalcopyrite separated out, as seen in figs. 2, 7, (samples #8 and 12). Fig. 2 also shows galena probably deposited in the same way, but the same section, from sample #8, shows galena in a similar structure, but due to replacement of the sphalerite. Samples of sphalerite assayed for gold showed its presence, but in very small amounts.

Chalcopyrite

Chalcopyrite occurs in the form mentioned above, and in small quantities as true vein material in other samples, but in appreciable quantities only in the sample from the Galena vein (Oyster-Criterion claim). In time of deposition, it lies between sphalerite and galena.

Galena-

Galena is present in most if not all veins, as the latest mineral to be deposited. It replaces the other sulphides or forms a primary vein constituent, depending on the conditions. It also contains gold, but again in negligible amounts.

Carbonate-

The Ca-Mg-Fe carbonate, approximately of the same composition of the normal ankerite, was apppdrently deposited very early, along with the first quartz, as it is replaced by all but the earliest pyrite

In part, the carbonate was enriched by iron, so that it appears not unlike siderite, but the microscope shows varying shades of brown from the normal creamy white to dark brown, indicating the extent and amount of enrichment by the supergene solutions responsible. In sample #7 (section #7, fig. 1) the siderite appearance is marked; this figure also shows pyrite being converted to a carbonate, probably siderite. Away from the oxidized zone the carbonate has a normal appearance (see sample 5).

The presence of carbonate was necessary in the mineralization of the greenstone and chlorite schists forming the country rock (1), such rocks being unfavourable to mineralization unless heavily carbonated, and the extent of mineralization being roughly proportional to the extent of carbonization.

Paragenesis-

The paragenesis of the deposit shows a normal sequence of deposition was followed in all veins. As mentioned before, some overlapping occurred, most noticeable with the pyrite and sphalerite. The whole mineralization must have taken place in a relatively short time

TABLE SHOWING PARAGENESIS

```
Quartz........ ------------------------------------------
Carbonate..... ------
Pyrite........     --------------
Sphalerite....               ---------
Chalcopyrite..                         -----
Galena........                                 ---------
```

PART III

EXAMINATION OF SAMPLES

Nine samples were supplied for examination, four from the Red Horse Claim (samples #6and 7, and two marked 'oxide' and 'box-work' respectively), and five from the Oyster-Criterion (samples #5, 8 and 12, and two samples marked 'pyrite' and 'galena' respectively).

RED HORSE SAMPLES .. SAMPLE #6.

1. Macroscopic examination.

This sample is of quartz containing pyrite. The pyrite is in small crystals, but unconsolidated. No carbonate was noticed and no other sulphides. The pyrite and quartz are evidently contemporaneous, as shown by the nature of the pyrite, and its well formed crystals.

2. Microscopic examination.

No polished sections were made of the sample, due to simple nature, and also as the pyrite showed too much tendency to shatter.

SAMPLE #7.

1. Macroscopic examination.

The sample is mainly carbonate, and some quartz, pyrite, and oxidation products. The carbonate I believe to have been ankerite originally, but decomposition of the pyrite and enrichment in iron by descending solutions has converted it to a form more approximating siderite; some calcium and magnesia still remaining, but in too variable a proportion to be worth assaying. The pyrite can be seen in various stages of conversion to carbonate.

2. Microscopic examination.

Polished section #7..

This section shows the crystalline carbonate, and also pyrite. The pyrite is being replaced by siderite (see fig. 1). It is evidently contemporaneous with the original ankerite, and consequently with the quartz, as the quartz and carbonate are clearly seen to be of the same age.

SAMPLE 'oxide'

1. Macroscopic examination.

This sample was given for assay purposes primarily. It consists of quartz, enclosing limonite, secondary after pyrite, and has the characteristics of the following sample (box-work). The assays showed that the oxide, and most likely the original pyrite, was not the gold carrier, to any extent, as it assayed only 0.01 oz. of gold per ton. The quartz did not carry much more; only 0.04 ounces per ton.

SAMPLE 'Box-work'

1. Macroscopic examination.

The sample, also of quartz and limonite, shows the 'box-work resulting from the oxidation of the original sulphide, and removal of the resulting limonite. The sulphide was most likely pyrite, as is shown by the cubic aspect of the cavities, and a few unchanged pyrite crystals in the same relative form. This sample was probably taken from the same vein and locality as the two samples last noted.

Resumé, Red Horse samples-

These samples represent a quartz vein, carrying pyrite and ankerite, all of which represent a single stage of mineralization.

From the results of the assays, the vein does not constitute ore; the amount of gold carried by the pyrite is negligible, and the quartz does not hold worth-while values. No free gold could be seen, either by eye or under the microscope.

OYSTER -CRITERION SAMPLES..

SAMPLE #5

1. Macroscopic examination.

The sample represents an inclusion of the wall rock in the quartz vein. The wall rock, which is phyllite, in part altered to sericite, has been mineralized in these inclusions with pyrite which is in the form of pyritohedrons in this sample. A calcium-magnesium-iron carbonate, pale cream in color, is also present, contemporaneous with the quartz and pyrite, as seen from the perfect crystalline shape of pyrite, and also of the carbonate.

R. W. Brook[1] reports that these inclusions were found to be often rich in gold, but assays on this particular sample showed it to be worthless.

No polished samples were made.

SAMPLE #8

1. Macroscopic examination.

This is a sample from a quartz vein containing a small amount of sulphides,- sphalerite, pyrite and galena, with a very little ankerite. The sulphides occur in small masses, particularly the sphalerite, pyrite being more in isolated crystals and scaly seams of minute cubic crystals, and galena as meandering veinlets filling fractures in the quartz and also replacing some of the sphalerite and pyrite.

In cavities in the quartz, intergrowths of crystals of quartz and sphalerite are seen (see tray #8b), apparently formed contemporaneously. Further macroscopic evidence of contemporaneity is given by the well-formed, sharp-boundaried

(1). R. W. Brook: Geol. Surv., Canada, Ann. Rept. 1903, Pt. A.

masses of sphalerite. Pyrite also seems to be contemporaneous with the above minerals.

2. Microscopic examination.

Polished section #8...

This section shows quartz and sphalerite, with some chalcopyrite inclusions in the sphalerite.

1. The quartz is evidently contemporaneous with, but continued to flow longer than the sphalerite; the crystal boundaries of the minerals being sharp, showing but little corrosion of the sulphide.

2. Small 'blebs' of chalcopyrite, and also some of galena, in the sphalerite, are the result of unmixing, or separation, of the former from the latter on crystallization and cooling, and not the remnants of replacement by sphalerite. While these inclusions are contemporaneous with the host, it is not likely that the main masses of the chalcopyrite and galena were so deposited; other sections show proof that both are definitely later .

Polished section #D8-a...

This section shows the galena filling fractures in the quartz.

1. By oblique light the quartz is seen to be crystalline, with the galena between the grain boundaries, and along fracture surfaces in the quartz (see fig. 3.). This indicates that the galena is either replacing other minerals contemporaneous with the quartz, or is itself of the same age, since the replacement of quartz by galena does not seem possible. In this case, the

structure and clean boundaries seem to prove contemporaneity.

Section #D8-b...

In this section are shown sphalerite, galena and quartz.

1. The quartz appears to be of a second or younger generation, as it is definitely later than the sphalerite.
2. It again seems to be of the same age as the galena, which is seen as inclusions in the quartz and sphalerite.
3. The galena was deposited with the quartz, at the contact of the quartz and sphalerite, replacing the latter, as shown in figs. 4, 5, and 6, and forming a narrow zone at the contact.
4. In fig. 6 is seen some interesting inclusions of galena in the quartz; the quartz has fractured, and the planes so formed have been filled by galena, The angles of the thin planes of galena appear (without measurement) to the angles of fracture as given by Dana,- parallel to $r(10\bar{1}1)$, $z(01\bar{1}1)$, and $m(10\bar{1}0)$. In fig. 5 is shown a portion of the section in fig. 4 (medium power) under higher power; the quartz is veining the sphalerite.

From the above, the paragenesis is as follows,-

1st.-quartz
sphalerite
pyrite
chalcopyrite (?)
2nd.-galena
quartz

SAMPLE 'P'

Macroscopic examination.

This sample is largely pyrite in quartz; galena and chalcopyrite are present but in negligible quantities. The vein has been subjected to shearing, subsequent to the mineralization, with the developement of slickenside and streaks of gouge material; some of these streaks are probably due to the re-opening of the fissure at odd times during mineralization.

The quartz and pyrite are contemporaneous, as shown by the structure; large well-shaped crystals of pyrite form tabular bodies separated by thin sheets of quartz.

Wall rock, altered to sericite, is present in streaks through the vein. As in sample #5, the wall rock has been much mineralized by pyrite.

The traces of galena and chalcopyrite are so rare as to lead me to the conclusion that the samples were taken from the vein at the junction of this vein and the galena vein, which cuts the pyrite lead and faults it. This faulting was most likely the cause of some mineralization of the pyrite vein at the contact by galena and chalcopyrite , shown in section #9 by small specks of these sulphides.

No figures were made of the section (9), as the relation of pyrite to quartz is evident from the macroscopic examination.

SAMPLE 'G'

1. Macroscopic examination.

This sample is from the 'Galena' vein (see report of R. W. Brock, page 6). The specimens are from the oxidized zone. Pyrite, chalcopyrite, galena and the carbonate are present, in the usual quartz. Several secondaries have been formed, chiefly limonite and chalcocite. Chalcopyrite is veining the pyrite, and is in turn replaced by the galena.

2. Microscopic examination.

Polished section #10-a ... Figure 11.

In this section are seen the primary minerals chalcopyrite, pyrite, and the secondaries limonite, chalcocite and covellite.

1. The chalcopyrite has been altered to covellite then chalcocite, as shown by the characteristic alteration boundaries. Chalcocite appears to have been formed directly as well as through the initial change to covellite.
2. Chalcopyrite veined the mineral now altered to limonite, as shown by the remnants of chalcopyrite in the veins of chalcocite running through the limonite. From the appearance of the "veins" it is more likely they are really fillings between the original particles.(see figs. 11, 12.)
3. The limonite is secondary after pyrite. This is shown by the present structure; chalcocite shows cubic alignment, such as would result from the cutting in of the chalcopyrite into the pyrite.
4. The chalcopyrite is veining the quartz, thus making it later than both quartz or pyrite.

....

Polished section #10-b... Figures 12, 13, and 14.

This section gives the relation between the galena and chalcopyrite, also the quartz and chalcopyrite.

1. The galena is replacing the chalcopyrite (fig. 13).
2. Quartz is also cutting into the chalcopyrite. In section #10-a the order was reversed; this section apparently being composed of a new generation of quartz, of the same age as the galena.
3. Oxidation of the chalcopyrite is clearly shown to be first to covellite and then to chalcocite, as shown in fig. 12.
4. Galena is being converted to anglesite, which is apparently then converted to limonite and (or) cerrusite.
5. The section also shows an interesting replacement of the galena by covellite,, as seen in fig. 13. The chalcocite in fig, 14 is from the further oxidation of this covellite, which is plainly the result of alteration of the chalcopyrite to covellite, and passage of the solution from fissures in the chalcopyrite to cleavage planes in the galena. The oxidation of galena to anglesite apparently overtook the replacement, leaving a framework of chalcocite surrounding the anglesite.

Polished section #10-c... Figure 15.

Here is shown the relation between the quartz and carbonate.

1. They are apparently contemporaneous; the long crystal of quartz in well shaped crystals of carbonate show this.
2. The carbonate has been replaced along the boundaries of the crystals by chalcocite, probably as the galena was replaced in the previous section.

Polished section #10-d......Figure 16.

This section gives the relation between galena, pyrite and chalcopyrite. It also shows the fineness of grain in much of the vein, indicating the difficulty in making a clean pyrite and galena concentration.

1. The pyrite and quartz are of the same age; these two alone, show a structure much the same as the sample 'P' (from a vein mostly of pyrite).

2. The galena is later, veining the quartz (see fig. 16), and cutting into the pyrite.

3. Under the high power lens (magnification 300x), sixty particles of pyrite of the small size common in the sample, could be counted across a diameter. Since these particles are bound by galena and quartz, it would be necessary to grind to 300 mesh at least to give a fair separation for concentration by flotation; gravity concentration could not give any kind of a separation. However, the pyrite in this sample does not give enough gold to make treatment necessary, so the fineness is of no account, at present, anyhow.

Resumé,-

The paragenesis of the sample is the same as that of other samples; there has been three periods of mineralization, as follows,-

first- quartz
pyrite
carbonate

second-----chalcopyrite (and quartz?)

third-----------galena
quartz

SAMPLE #12

1. Macroscopic examination.

This sample is from a vein of quartz, pyrite and galena, with some ankerite. Sphalerite occurs in minor amounts, with a very little chalcopyrite held in the sphalerite as inclusions. Some wall rock (altered) is present. The sulphides are more massive in this sample than in any other, particularly the pyrite and galena.

2. Microscopic examination.

Polished section #12....Figures 7 and 8.

In this section the whole list of minerals show up.

1. Pyrite again is the first to appear, with quartz.
2. Sphalerite followed the pyrite; in part it fills fractures in the pyrite and is evidently later, but also seems to have been laid down at the same time in other sections. Apparently the deposition of the sulphides was somewhat overlapped.
3. Galena replaces sphalerite and cuts into the pyrite; it is thus later than either (see fig. 7, 9, 10 and 11)
4. Quartz follows the galena, as seen in fig.9 and 10; the quartz seen if fig. 8 may be the same, but was more likely earlier in age, carrying sericite with it.
5. The sericite appears as streamers in the quartz, and of the same age, but the exact age of the quartz is doubtfut, as noted above.

Polished section #D12-a.... Figure 9.

This section shows pyrite, galena and quartz. It emphasizes the relationship between pyrite and galena.

1. Galena is undoubtedly later than the pyrite; the flow of galena-bearing solution seemingly came in through the reopened fissure, tearing some pyrite loose from the walls, as shown by the regular cubic appearance.

2. Quartz has entered later, encroaching on the galena and pyrite, the pyrite being much corroded where not protected by the galena.

Polished section #D12-b...Figure 10.

In this section, the same minerals are shown, and the relations as above determined are again proven. The sphalerite in this section is apparently younger than the pyrite, having replaced it to some extent, instead of appearing as filling in between the pyrite grains.

The sample therefore, shows the same paragenesis and structural features as the previous samples

SUMMARY OF EXAMINATION.

The veins sampled are all of the same type of mesothermal or intermediate temperature fissure veins of quartz, carrying sulphides in varying proportions, and also a calcium-magnesium-iron carbonate approximating ankerite. The sulphides in order of their relative proportions, are, pyrite, galena, sphalerite and chalcopyrite.

The paragenesis is normal for deposits of this type, as seen in the table on page 11.

All minerals were identified by the determinative tables given by DAVY & FARNHAM, and by M. N. SHORT. The carbonate was assayed for calcium, magnesium and iron, and the values found, though not accurate, showed it to be ankerite. Much of it was higher in $FeCO_3$ than the normal ankerite.

The altered wall-rock inclusion was found to be a hydrous aluminium silicate, which, with its talcy appearance, proved it to be sericite.

PART IV.

GOLD DISTRIBUTION

To study the distribution of gold in the samples, the following assays were made,-

Red Horse samples-

1. Sample #6: one assay of pyrite and two of quartz.
2. Sample 'oxide': one assay of oxide.

No free gold had been seen in these samples, even under the microscope. The assays showed further that little gold was present even in sub-microscopic particles; no assays gave the equivalent of more than 0.04 oz. per ton, for one sample of quartz; the oxide and pyrite assayed less than 0.01 ounces.

Oyster-Criterion samples-

1. Sample #5: one assay each of pyrite and quartz, and one of quartz containing a streamer of sericite. This was made to test a statement of (Dean) R. W. Brock to the effect that the inclusions of wall rock had often been noticed to have induced concentrations of gold[1].
2. Sample #8: two assays of quartz, one of sphalerite.
3. Sample #12: one assay each of galena and pyrite.
4. Sample 'P': one assay each of quartz and pyrite.
5. Sample 'G': one assay each of quartz and galena.

Again no free gold was seen, and the assays were as low as in the Red Horse samples. Quartz assays varied from negligible amounts to traces, but on the whole were better than

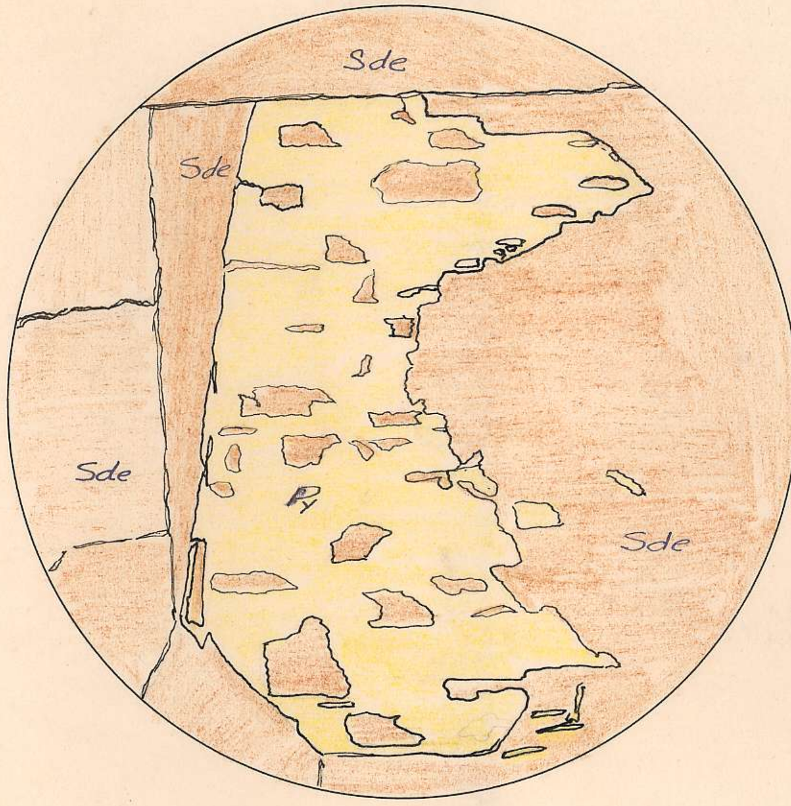
(1). Brock, R.W., Geol. Surv. Canada, Ann. Rept. 1903, Pt. A, p. 58.

the pyrite assays, except in the 'Pyrite' sample; in that the quartz did not carry enough gold to weigh. Galena and sphalerite both showed traces of gold, with sphalerite the better.

The inclusion assay showed that no concentration had taken place; only 0.01ounces per ton were reported.

No definite conclusion as to gold distribution can be made from the very low assay results; if anything, the quartz is the chief gold carrier, except in the 'Pyrite' vein. One thing is certain, however, that no vein can be said to be ore; the average value for even the best vein is far below the value necessary for profitable extraction, judging from the assays. Apparently the gold taken out of the claims in the early production period was from richer pockets now depleted, and unless more of the same are found, it is evident that the claims will never be put into production.

Fig. 1



35x

SECTION #7

FROM SAMPLE RH '7'

MINERALS-

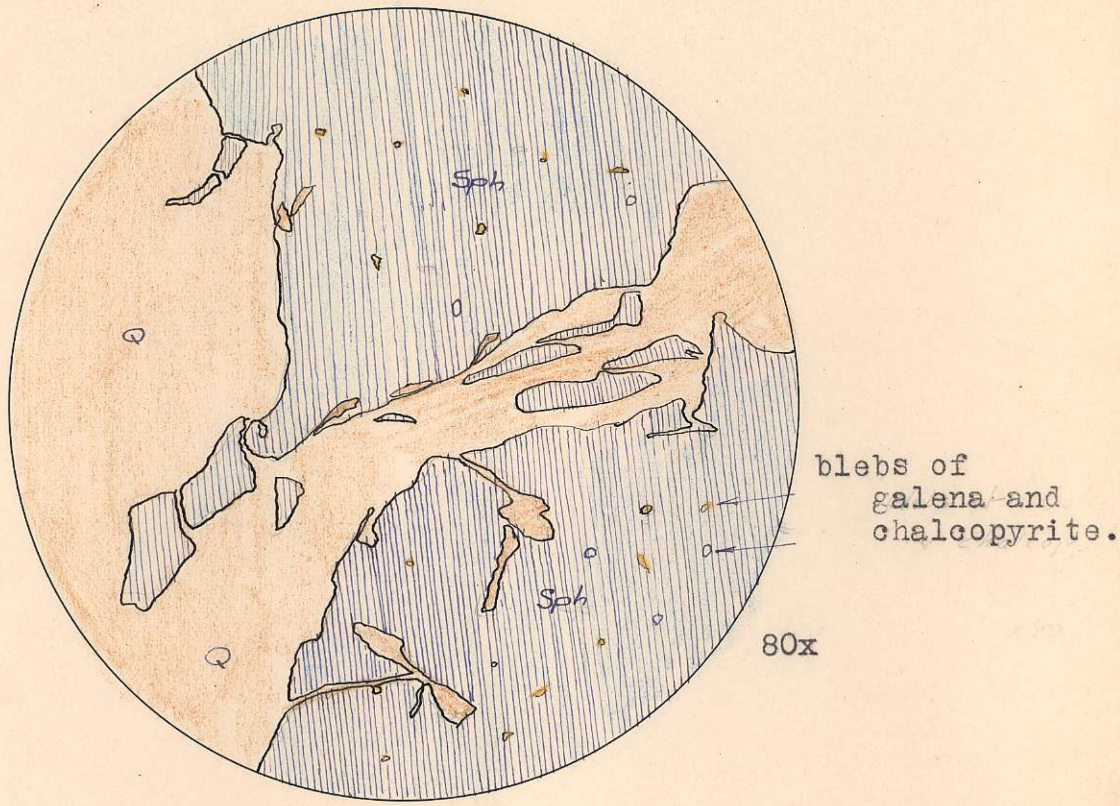
1. Pyrite (Py)...yellow

   As a primary being replaced by siderite.

2. Siderite (Sde)...brown

   As a secondary after pyrite.

Fig. 2.



SECTION #8 FROM SAMPLE 0-C'8'

MINERALS-

1. Sphalerite (Sph)...light blue

   As a primary cut by quartz.

2. Galena

   As blebs in the sphalerite.

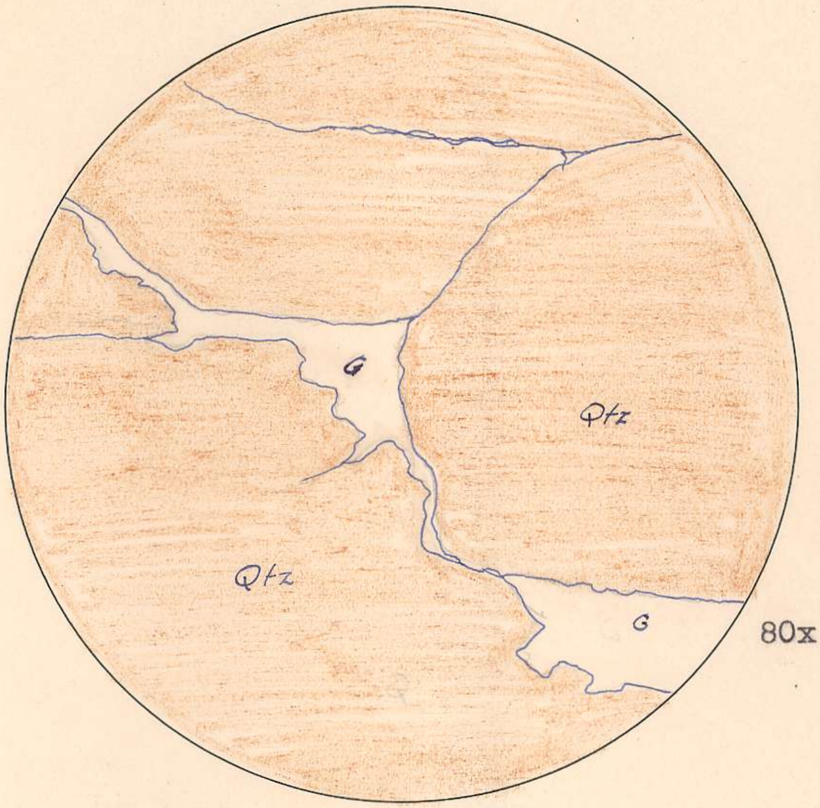
3. Chalcopyrite

   As blebs in the sphalerite.

4. Quartz (Q)...brown

   As a filling in the Sphalerite.

Fig. 3.



SECTION #D8-a

FROM SAMPLE O-C '8'

MINERALS-

1. Galena (G)...white

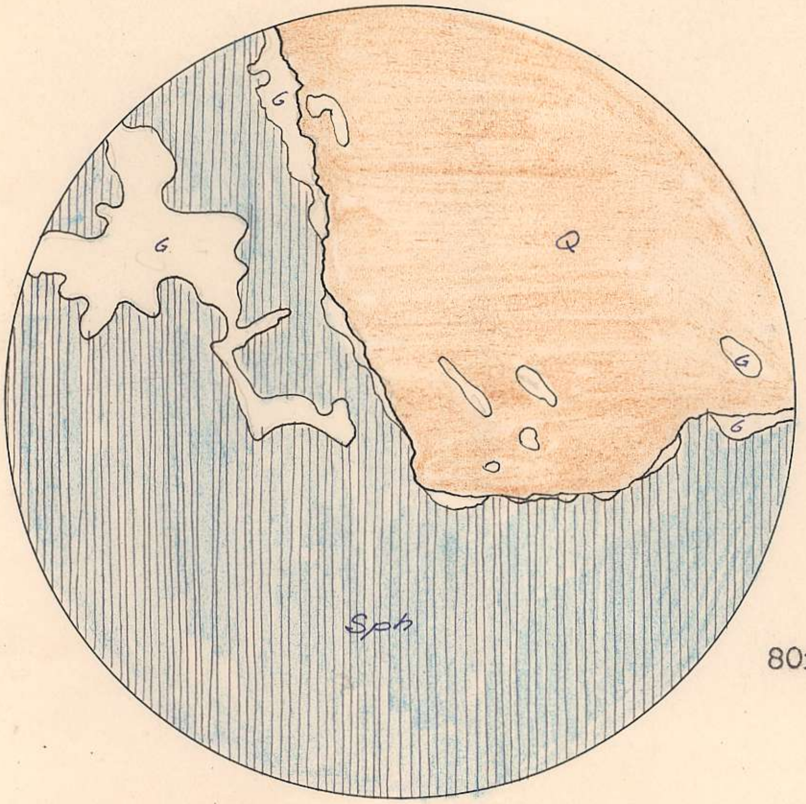
As a filling between quartz crystals.

2. Quartz (Qtz)...Brown

As the ground mass.

D8

Fig. 4



80x

SECTION #D8 -b

FROM SAMPLE O-C '8'

MINERALS-

1. Sphalerite (Sph)...light blue

As a primary

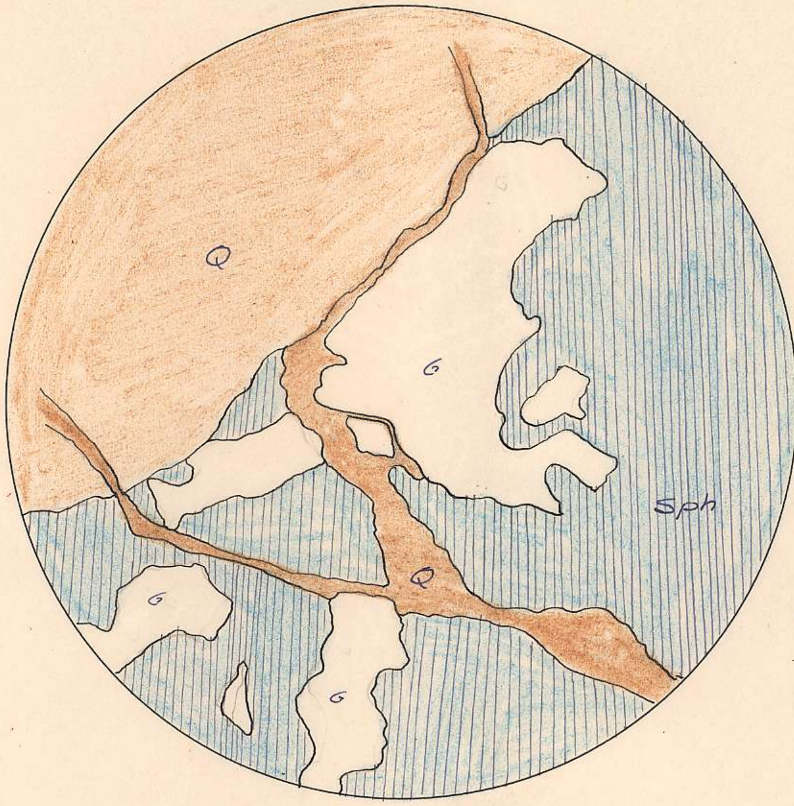
2. Galena (G)...white

As a primary replacing sphalerite.

3. Quartz (Q)...brown

As an intrusion into the sphalerite.

Fig. 5



300x

SECTION #D8-b FROM SAMPLE O-C '8'.

MINERALS-

1. Sphalerite (Sph)...light blue

   As a primary

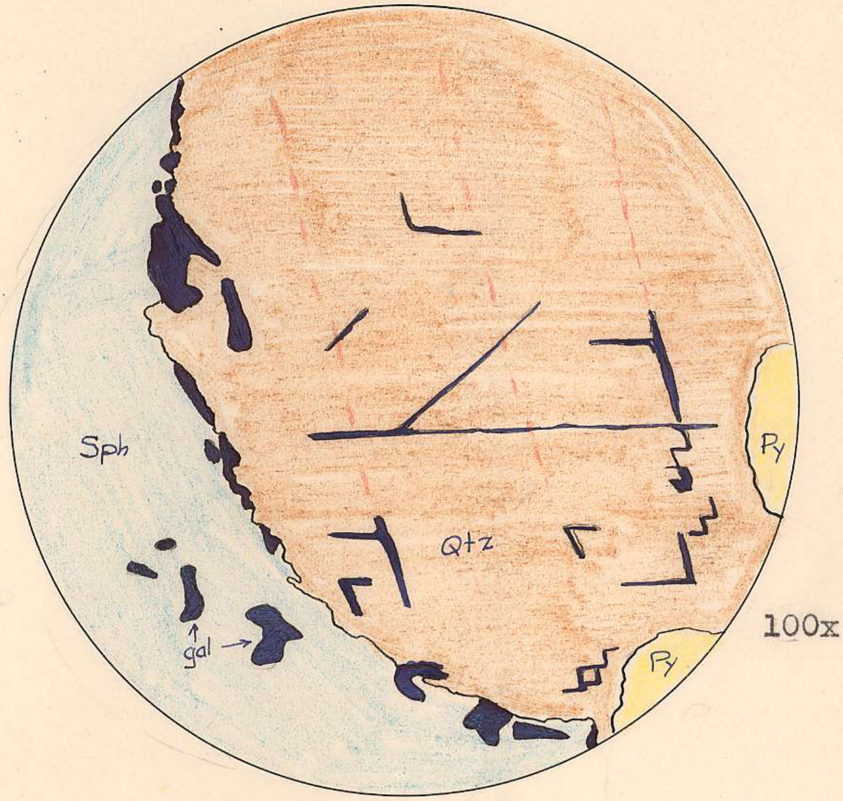
2. Galena (G)...white

   Replacing the sphalerite (primary).

3. Quartz (Q)...brown

   As an intrusion into the sphalerite.

Fig. 6



SECTION #D8-b FROM SAMPLE O-C '8'

MINERALS-

1. Sphalerite (Sph)...light blue

   As aprimary

2. Galena (Gal)...inked

   As a primary replacing sphalerite.

3. Quartz (Qtz)...brown

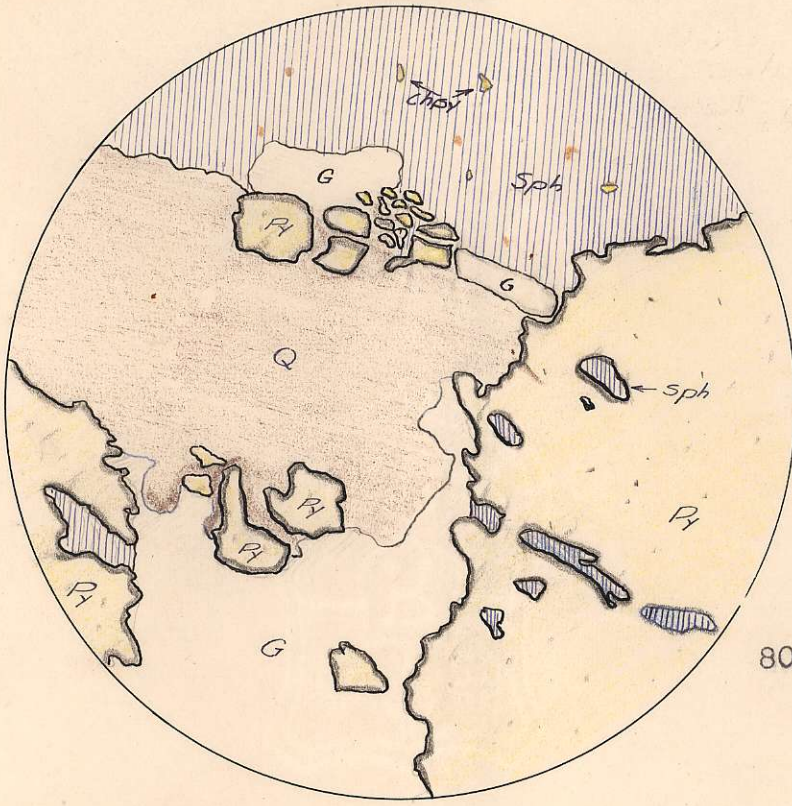
   As an intrusion in the sphalerite.

   (Note fracture planes filled by galena.)

4. Pyrite (Py)...yellow

   As a primary

Fig. 7.



80x

SECTION #12. FROM SAMPLE O-C '12!

MINERALS-

1. Pyrite (Py)...yellow

   As a primary.

2. Sphalerite (Sph)...light blue

   As a primary replacing pyrite.

3. Galena (G)...white

   As a primary cutting the sphalerite.

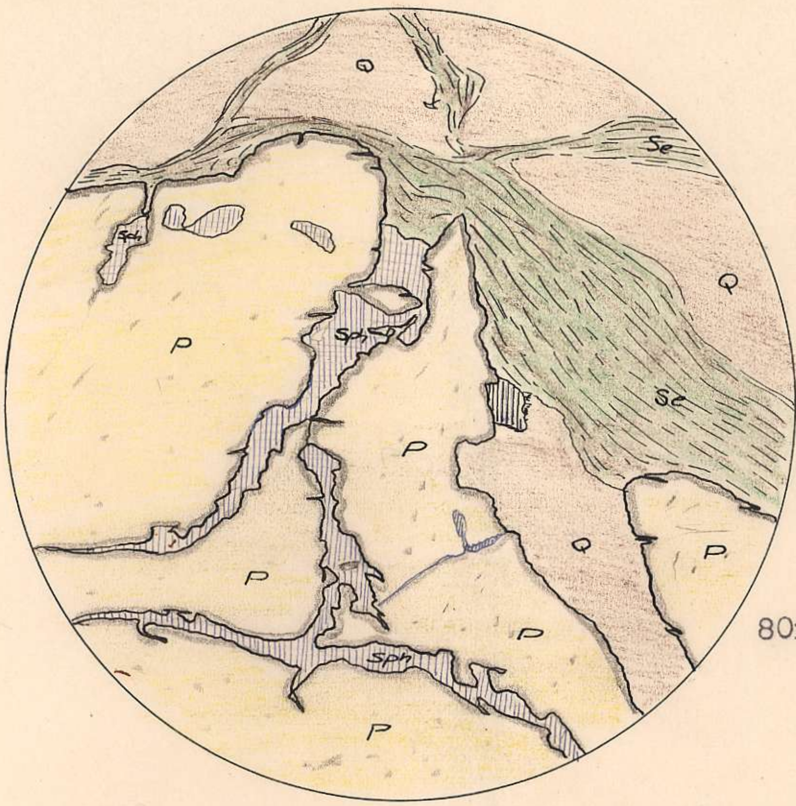
4. Chalcopyrite (Chpy)...orange

   As inclusions in the sphalerite.

5. Quartz (Q)...brown

   As an intrusion in the sulphides.

Fig. 8.



80x

SECTION #12 FROM SAMPLE O-C '12'

MINERALS-

1. Pyrite (P)...yellow

   As a primary replaced by sphalerite.

2. Sphalerite (Sph)...light blue

   As a primary replacing pyrite?

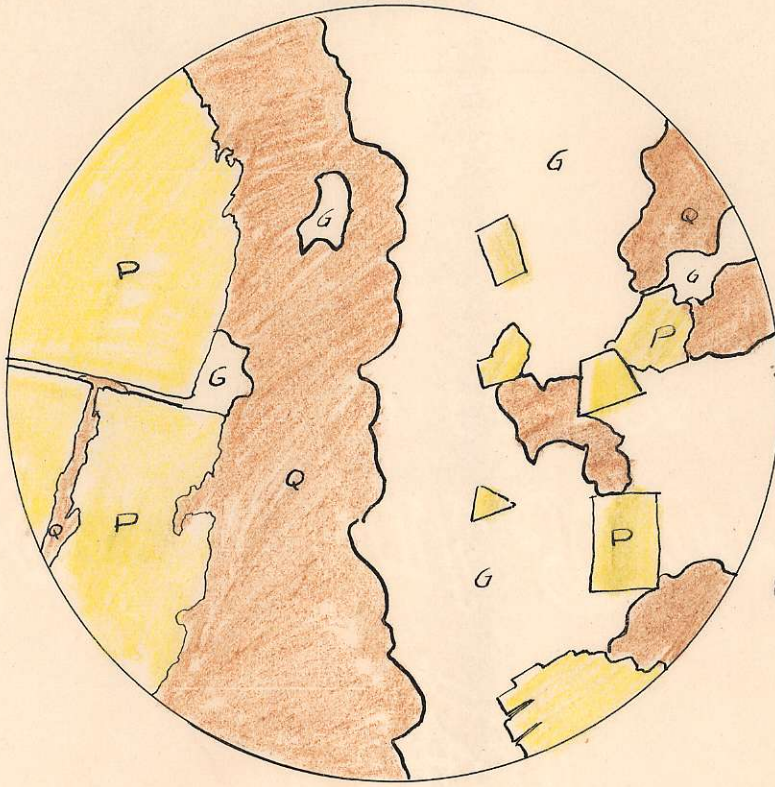
3. Quartz (Q)...brown

   As an intrusion in the sulphides.

4. Sericite (Se)...green

   As an inclusion in the quartz.

Fig. 9.



80x.

SECTION D12-a

FROM SAMPLE O-C '12'

MINERALS-

1. Pyrite (P)...yellow

   As a primary.

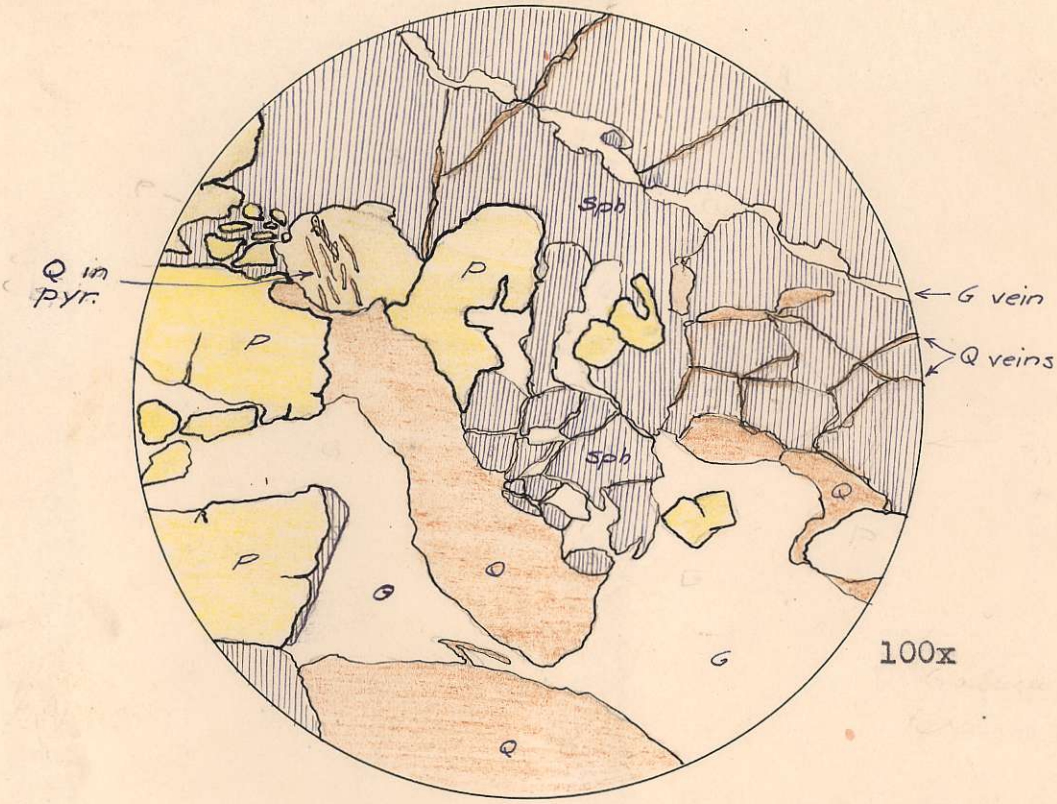
2. Galena (G)...white

   As a primarycutting into the pyrite.

3. Quartz (Q)...brown

   Replacing the sulphides.

Fig. 10.



SECTION D12-b FROM SAMPLE O-C '12'

MINERALS -

1. Sphalerite (Sph)...light blue

   As a primary.

2. Pyrite (P)...yellow

   As a primary.

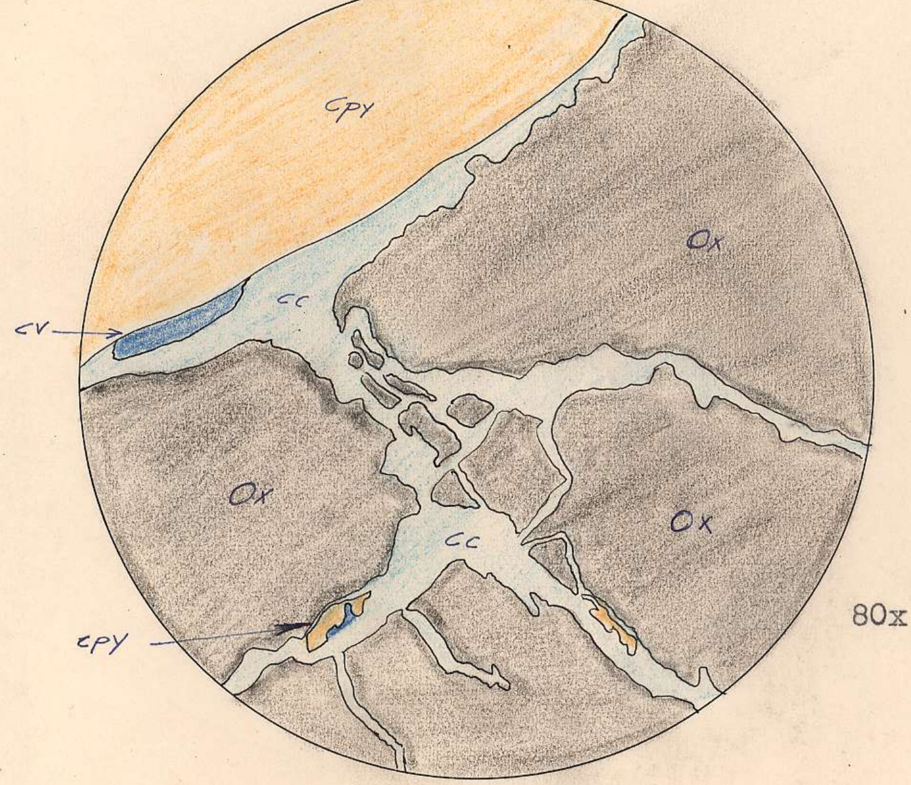
3. Quartz (Q)...brown

   Veining the sphalerite and pyrite.

4. Galena (G)...white

   Veining and replacing the sphalerite, etc.

Fig. 11.



SECTION #10-a FROM SAMPLE O-C 'G'

MINERALS-

1. Chalcopyrite (Cpy)...orange

   As a primary veining material.

2. Limonite (Ox)...grey

   As a residual secondary after pyrite.

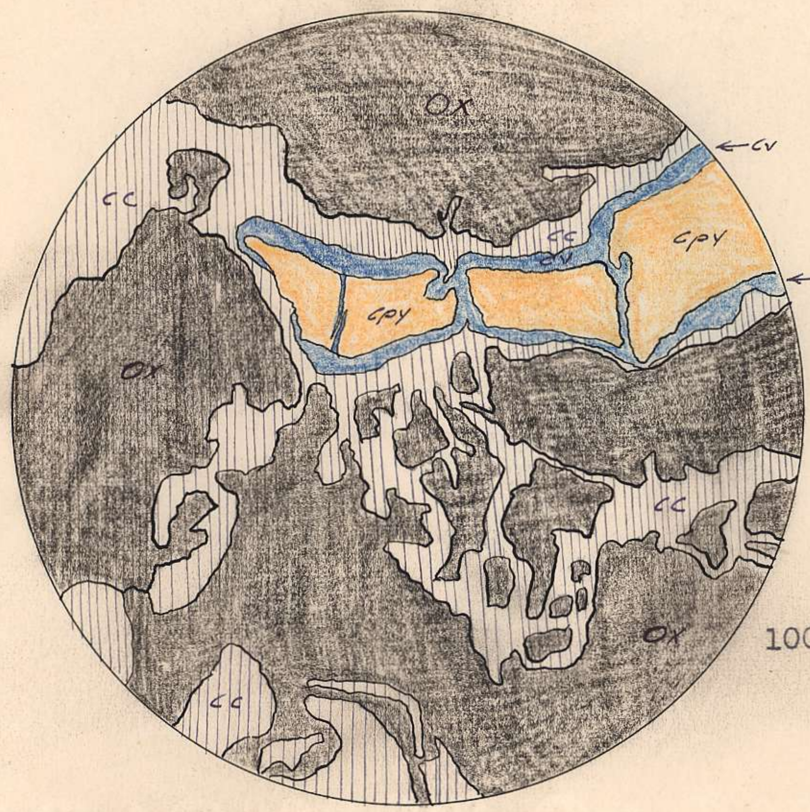
3. Chalcocite (Cc)...light blue

   As a secondary after covellite.

4. Covellite (Cv)...dark blue

   As a secondary after chalcopyrite.

Fig. 12.



100x

SECTION #10-b FROM SAMPLE O-C 'G'

MINERALS-

1. Chalcopyrite (Cpy)...yellow

   As a primary.

2. Covellite (Cv)...dark blue

   As a secondary of chalcopyrite.

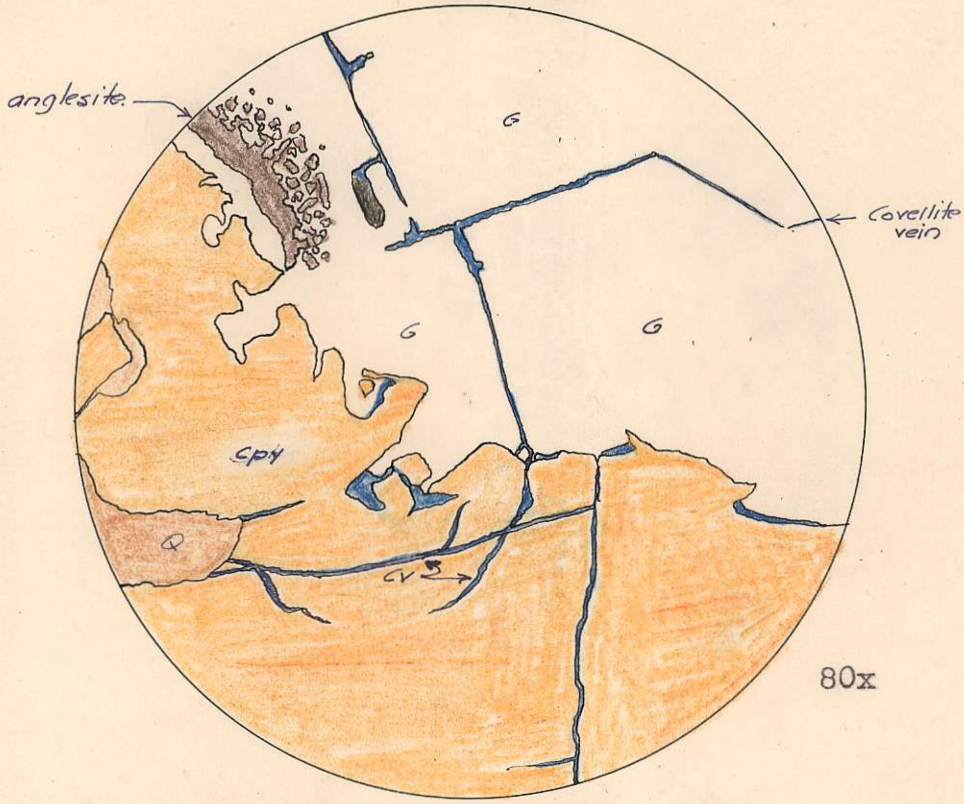
3. Chalcocite (Cc)...light blue

   As a secondary of chalcopyrite (covellite)

4. Limonite (Ox)...grey brown

   As a secondary of pyrite (and chalcocite ?)

Fig. 13.



SECTION #10-b

FROM SECTION O-C 'G'

MINERALS-

1. Chalcopyrite (Cpy)...yellow

   As a primary

2. Galena (G)...white

   Replacing chalcopyrite.

3. Quartz (Q)...brown

   Cutting chalcopyrite.

4. Covellite (Cv)...dark blue

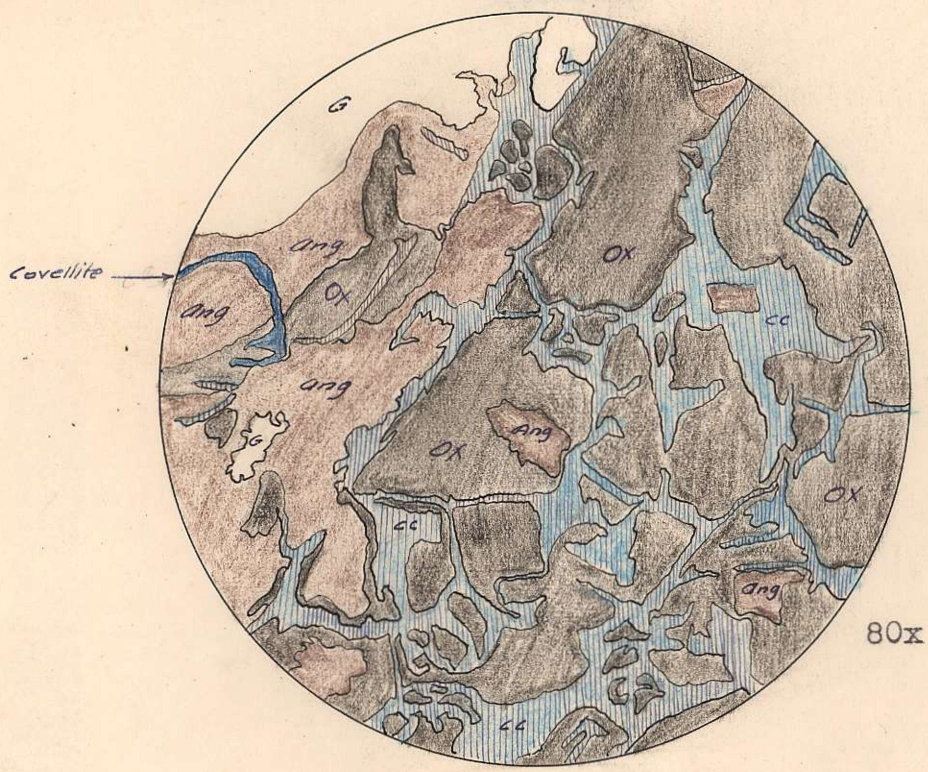
   As a secondary veining chalcopyrite and galena.

   (Note replacement of galena along cleavage pl.)

5. Anglesite....dark brown

   As a secondary of galena.

Fig. 14.



SECTION 10-b FROM SAMPLE O-C 'G'

MINERALS-

1. Galena (G)...white

   As a primary.

2. Anglesite (Ang)...brown

   As a secondary after galena.

3. Covellite...dark blue

   Replacing galena. (secondary)

4. Chalcocite (Cc)...light blue

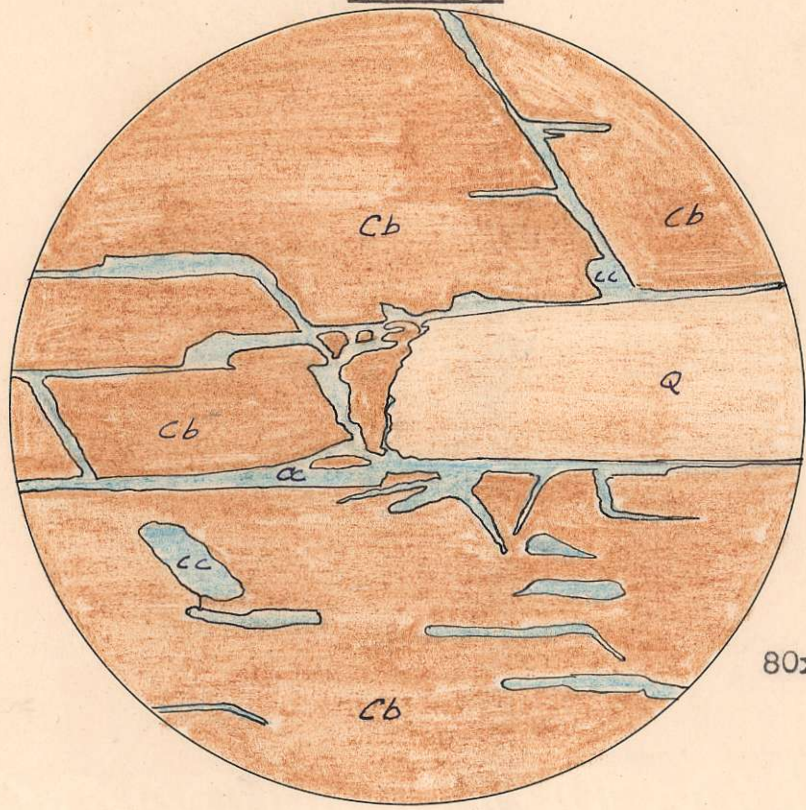
   Replacing galena (secondary to covellite)

5. Limonite (Ox)...dark brown

   Replacing Anglesite and chalcocite (?)

   (some of this may be cerrusite)

Fig. 15.



SECTION #10-c FROM SAMPLE O-C 'G'

MINERALS-

1. Ankerite (Cb)...dark brown

Primary carbonate of Ca, Mg, and Fe.

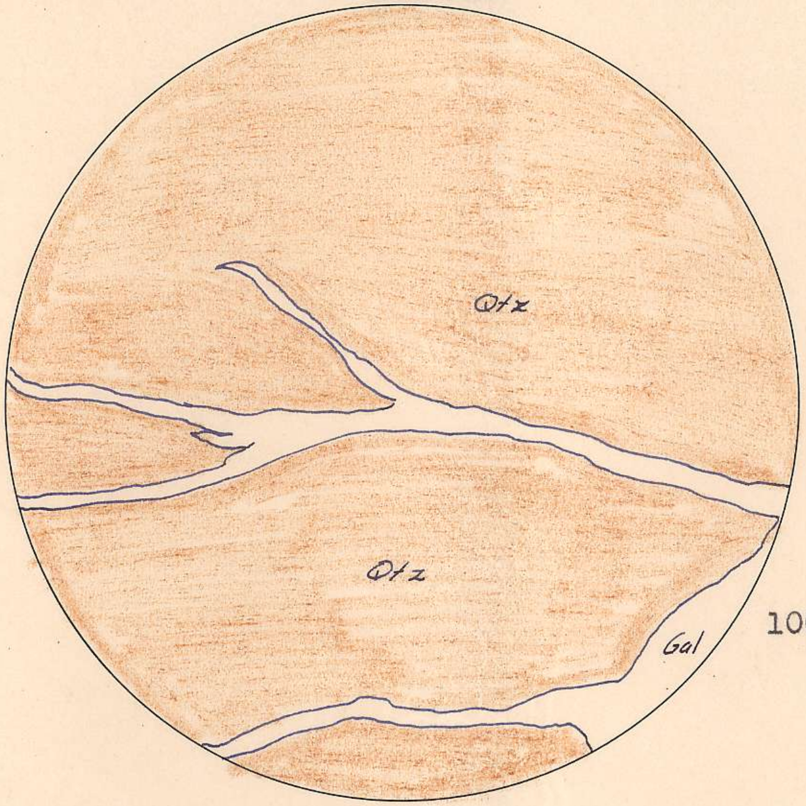
2. Quartz (Q)...light brown

A crystal deposited conformably with carbonate.

3. Chalcocite (Cc)...blue

Replacing the carbonate along boundaries.

Fig. 16.



100x

SECTION #10-d FROM SAMPLE O-C 'G'.

MINERALS-

1. Galena (Gal)...white

   As veins through the quartz.

2. Quartz (Qtz)...brown

   As the ground mass.