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A MICROSCOPIC STUDY OF ORES OF RENO AND DENTONIA GOLD MINES

by

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PREFACE

The following mineralographic reports are submitted to the the Department of Geology, University of British Columbia, for credit in Geology 9. They are primarily to deal with the microscopic examination of the ore in order to determine several problems such as the type of deposit, paragenisis of deposit, etc.

In making the report I was handicapped in having a lack of material to work with in the way of literature, information, or an abundance of ore to work with.

In acknowledgment I am indebted to Dr. Schofield for a good deal of information about Reno. Also to Mr. I. M. Marshall and Major A. W. Davies who presented the ore to be examined. I am indebted to Dr. H. V. Warren who supervised and helped the work in general, and also Mr. Langley M.E. for his report on Dentonia. Among others whose suggestions and contributions have helped are Mr. Hatton, who gave permission to mention his new methods of amalgamation, and assisted in assaying the ore, also to J. G. Grey, a student, who helped in preparing the suite for this report. Mr. E. W. Johnson and Mr. H. C. Edwards did the majority of the assay work.

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A MICROSCOPIC EXAMINATION OF THE ORE MINERALS OF THE RENO GOLD MINES LIMITED, SALMO, B.C.

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Geology 9

April, 1934

Department of Geology

THE UNIVERSITY OF BRITISH COLUMBIA

A MICROSCOPIC EXAMINATION OF THE ORE MINERALS OF THE RENO GOLD MINES LIMITED, SALMO, B.C.

INTRODUCTION

The following report will deal with the megascopic and the microscopic examination of a suite of ore from Reno Gold Mines Limited.

The property of Reno Gold Mines Limited is situated at the head of Fawn Creek, a tributary of Sheep Creek. It is approximately fifteen miles from Salmo B.C., and connected by road to Salmo. The mine is situated at an altitude of over 3000'.

Reno Gold Mine, prospected in 1914, was brought into active development in 1928, and started production in 1929.

GEOLOGY

The topic of geology will be divided into two sections, "A" to deal with the general geology of the area, and "B" to deal with the geology of the ore body.

A. Geology Of The Area

The greater part of the area is underlain by sedimentary rocks which are intruded by large and small masses of the Nelson batholith. The sediments, according to Brock and McConnell, belong to the Lower Selkirk and Niskonlith of the

Beltian, and are largely schists and quartzites. The whole sedimentary succession is folded into a series of anticlines and synclines which strike north. Some of the folds expose the grits and quartzites of the lower part of the series, and some of the synclines expose the schists of the upper part of the series.

B. Geology Of The Ore Body

The ore body at Reno is a gold fissure vein along a quartzite anticline. The fissure vein replaces the quartzite in part. The Beltian sediments are a series of interbedded mica schists and quartzites and are intruded by Jurassic stocks.

Two main veins occur on the property, one the Reno itself appears to be the only one carrying good values. This vein cuts a series of quartzites, argillaceous quartzites, and sileceous quartzite. This series is about 1,600 feet thick. The ore is mainly pyrrhotite and is indicative of fairly high temperature.

MINERALOGY

The mineralogy is simple. Pyrrhotite appears as the most abundant mineral. It is finely banded showing replacement of quartzite (R101AG)[1] by the pyrrhotite. It occurs in this way as massive, and quite pure except for the quartzite which it has not quite completely replaced.

1. Numbers refer to samples in collection.

Zincblend (R107AG) and galena occur next in importance, but neither are as abundant as pyrrhotite, in fact very little galena was found in the samples examined and this too finely divided and united with the gangue to separate it out for assay purposes. None of the minerals occur coarsely crystalline.

Chalcopyrite appeared in minute quantities scattered through some of the ore. No free gold is showing, but is apparently closely associated with sulphides as shown by the assays.

The ore occurs with the quartzite, but not with the mica schist. It is in the pyrrhotite and quartz gangue. The metallic minerals then are pyrrhotite, sphalerite, pyrite, galena, and chalcopyrite (R102AG).

ASSAYS

Samples of the ore where ground and screened through a #10 mesh screen. Pure pyrrhotite and sphalerite were the only minerals picked out for assay purposes as there was not enough galena or chalcopyrite to separate out. The pyrrhotite (Assay R2) was pure except for grains of quartzite which the pyrrhotite is replacing and has almost replaced completely.

The sphalerite (Assay R1) was relatively pure containing a small percentage of pyrrhotite which was too finely disseminated throughout the sphalerite to separate the two. This might increase the assay for sphalerite somewhat, as the pyrrhotite carried high values in gold, but the increase will be relatively small and the assay will show largely the values in pure sphalerite.

Chipped samples (R105AG) taken across the vein from the same level (which is level #5) where assayed to give a representative assay of the ore as mined and milled at Reno.

The following are the results of the assay:

Pyrrhotite 8.8 oz. per ton

Sphalerite 4.3 oz. per ton

Chipped samples 4.4 oz. per ton

These assays are remarkably high and indicate a high grade gold deposit. The pyrrhotite is rich in gold and is the most valuable mineral in this mine.

The chipped sample assay gives a relative idea of the average value per ton of the ore as mined. To make a more thorough and complete report the assays of the galena and chalcopyrite should also be taken, but a sufficient amount could not be obtained from the ore at hand.

Also, only one assay of each of the minerals was taken so only a relative idea of the values of the separate minerals to each other can be obtained. Gold was the only mineral assayed for and is undoubtedly associated with the sulphides, which fact is confirmed in the microscopic examination of the polished sections as so far no free gold has come to light.

MEGASCOPIC EXAMINATION OF THE SPECIMENS

A tray with the following specimens which were specially picked to show the various minerals and rocks found at Reńo, accompanies this report. The specimens are as follows:

Specimen R101AG [1]

This is a sample of pyrrhotite showing banding which is due to the replacement of quartzite by the pyrrhotite. The pyrrhotite is subject to speedy tarnish and much of this is seen. Even on a fresh fracture this stain is abundant. It is massive with a granular structure.

Specimen R102AG

This sample is merely to show the association of the minerals occuring at Reno. They include chalcopyrite (very little) pyrrhotite (much tarnished in places) galens, and sphalerite. All of these occuring in a gangue of quartz.

Specimen R103AG

This sample was chosen to show the veining of the quartz by pyrrhotite.

Specimen R104AG

This also shows the regular association of the ore at Reno, but the samples also show slickensides. The ore occurs in a gangue of quartz and mica schist, which appears to be sericitized.

1. See Appendix.

Specimen R105AG

These are chipped samples taken across the vein and give a representative type of ore as mined. They include the usual minerals in a quartz gangue. The quartz appears in part, glassy, which is indicative of a fairly high temperature.

Specimen R106AG

This is a sample of the wall rock which is composed mainly of quartzite. It shows fine black bands probably due to sericite. The wall rock appears to be slightly mineralized.

Specimen R107AG

This is a sample of sphalerite. Some pyrrhotite is disseminated through it. This carries faily high gold values as shown in the assays.

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MICROSCOPIC EXAMINATION OF THE SPECIMENS

Many sections of the ore were polished and examined under the microscope. The following illustrations described represent a few of the polished sections examined.

Section R101S

The beds at Reno are beds of schists and quartzites. This section shows quartz veining the mica schist. The schist as a rule does not carry ore, but here it is shown to be slightly mineralized by chalcopyrite.

Section R102S

This is a section of the usual type of ore, showing a replacement of the quartzite by the mineral. The mineral here is pyrrhotite and has fairly completely replaced the quartzite. The replacement process has left a slight banding appearance in the ore as has been already referred to.

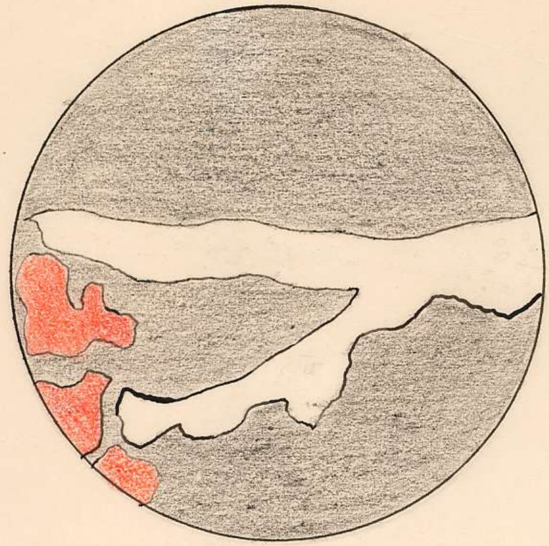
Section R106S #1

The minerals present are sphalerite, pyrrhotite, and chalcopyrite. All through this section well shaped crystals of quartz were shown enclosed by the minerals. This appears to be a replacement of the quartzite as in the preceding description, and a simultaneous introduction of sphalerite, pyrrhotite, and chalcopyrite.

Section R106S #2

This section shows the pyrrhotite veined by sphalerite. The veins of sphalerite enclosed large crystals of quartz.

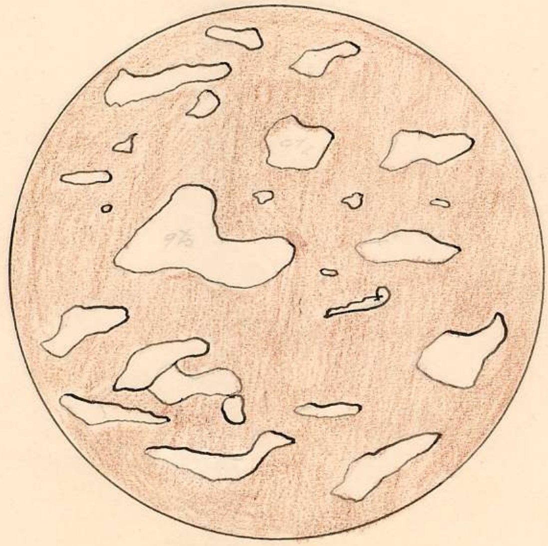
Section
R101S



x4

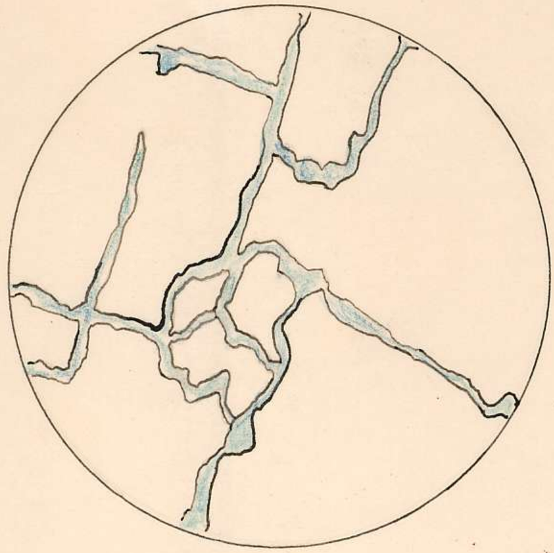
Pyrrhotite - brown, Chalcopyrite - red,
Quartz - white, Mica schist - grey.

Section
R102S



x30

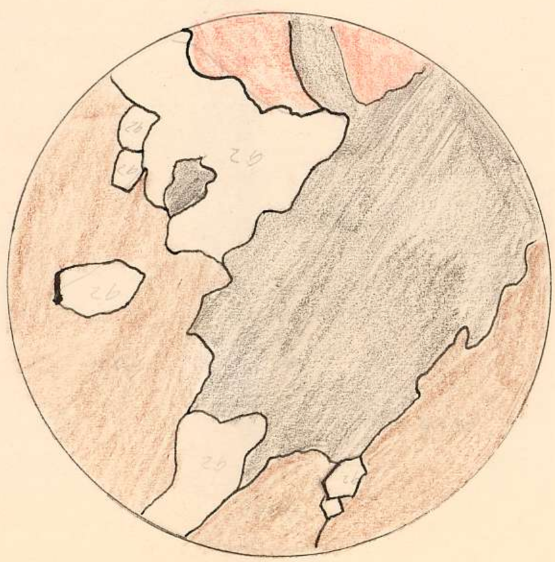
Section
R107S



x30

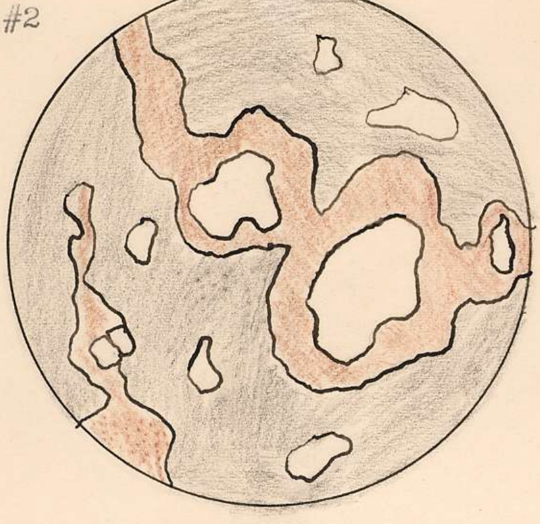
Galena - blue, Sphalerite-grey,
Pyrrhotite - brown, Chalcopyrite - red,
Quartz - white.

Section
R106S



x30

Section
R106S #2

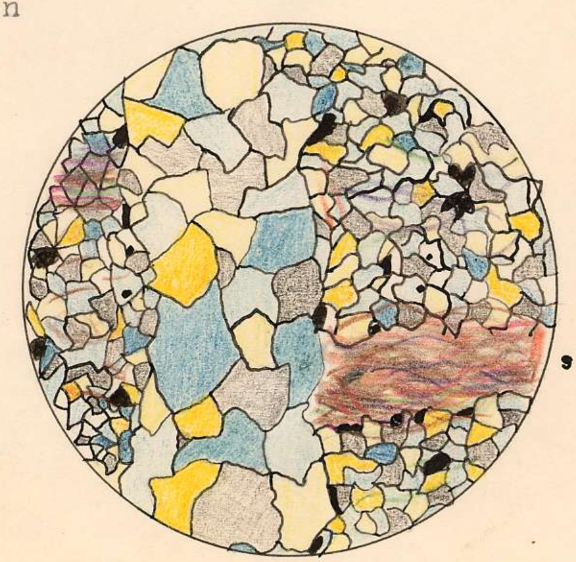


x30

Quartz - white, Pyrrhotite - brown, Sphalerite - brown

A thin section of the quartzite wall rock shown between crossed-nicols of a petrographic microscope.

Section
R108S



x65

The sphalerite appears to flow around the quartz, apparently both the sphalerite and pyrrhotite are just beginning to replace the quartz--a stage not quite so far advanced as in the previous sections.

Section R108S

A section of the wall rock was ground down to a thin section and examined under a petrogaphic microscope.

It is a metamorphosed quartzite, more or less equigranular, and the grains are rounded to sub-angular. Narrow quartz veins are cutting the quartzite. These appear merely as pathways of larger quartz crystals running through smaller ground mass of the quartzite. The cement of the quartzite is not noticeable. Much sericite is found all through the section and is also in bands which give a banded appearance to the wall rock. Some unaltered biotite is also present. The grains are all set closely to each other and the cement is probably siliceous.

The wall rock appears to be slightly mineralized by pyrrhotite.

CONCLUSIONS

In conclusion it can be said that Reno is a replacement deposit. This fact, together with the occurrance of pyrrhotite, indicate a hypathermal deposit, or at least a high mesothermal deposit.

It is a primary ore body with an oxidized zone of 200 or 300 feet, but the suite examined is from the fifth level of the mine and shows neither oxidation or secondary enrichment. The probable depth of the ore is not determinable by the preceding examination and could only be partly determined by an examination of the property.

The sequence of the deposition of the ore is hard to determine from the rather limited examination of the specimens at hand, but the apparent paragenisis from the illustration is as follows: 1. quartz 2. sphalerite 3. pyrrhotite 4. chalcopyrite 5. galena.

The gold is closely associated with the sulphides, but is not chemically united with them or is it in solid solution. This fact was proven by a Mr. Hatton who extracted very fine gold, from a sample of the ore, by his improved amalgamation methods.

Quote:

Vancouver, B. C.
March 3, 1934

I, the undersigned, hereby certify that on the above date, that Mr. William Patmore, of Vancouver, B. C., brought to me in person, a finely ground sample supposed to be classed as "Pyrrhotite" and containing 8 oz. in weight, and after amalgamating in a "solution" for thirty minutes in the presence of mercury, made a recovery of an unknown percentage of free gold, by reducing the same with C. P. Nitric acid.

The extraction would appear to be commercial. I give permission for the use of my endorsement to the above.

John A. Hatton

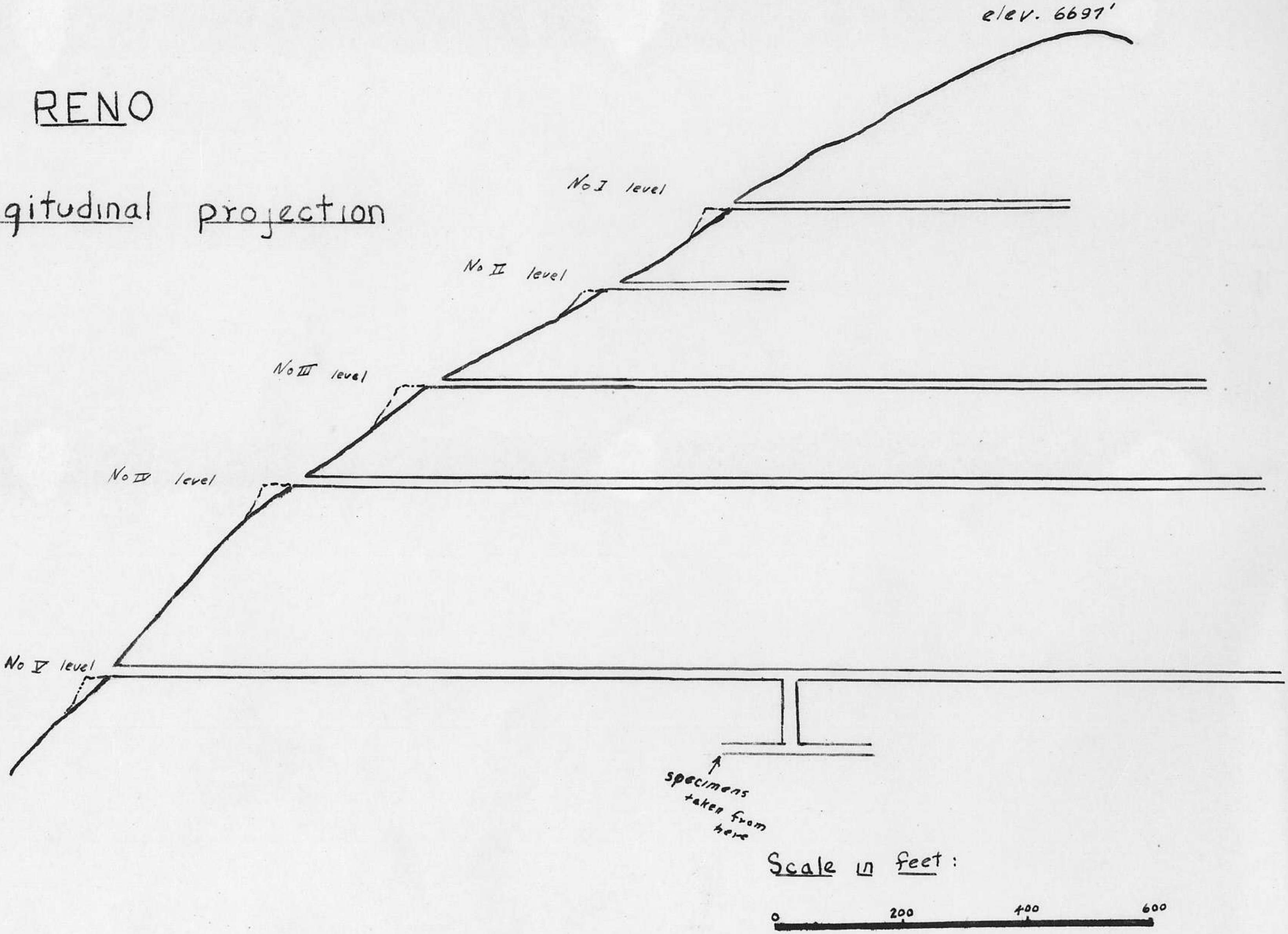
A cyanidization process is used at present at the mine and a good recovery is obtained. The old methods of amalgamation fail to remove the gold as the gold is no doubt too fine.

No free gold was seen in the microscopic examination whatsoever, but it occurs no doubt as free gold but in too finely divided a condition to be seen in ordinary microscopic work. The sulphides carry the majority of this fine gold as was seen in the assays. All the metallics carried gold in payable quantities.

This is a high grade gold deposit which would be profitable to work with gold even at its former price, and the success of the mine appears to depend largely on the size of the ore body.

RENO

Longitudinal projection



A MICROSCOPIC EXAMINATION OF THE ORE MINERALS

OF DENTONIA MINES LIMITED, GREENWOOD, B.C.

by

H. W. Agnew

PART 11

Geology 9

April, 1934

Department of Geology

THE UNIVERSITY OF BRITISH COLUMBIA

A MICROSCOPIC EXAMINATION OF THE ORE MINERALS OF DENTONIA MINES LIMITED, GREENWOOD, B.C.

INTRODUCTION

This report deals with an examination both megascopically and microscopically, of the ore of Dentonia Mines Limited.

The suite to be examined was presented by Major A. W. Davies, general manager at the mine.

The property is situated on the shore of Long Lake about eight miles from Greenwood B.C., and ajoins the main highway from Greenwood. It is situated at an altitude of 4000', and ideal mining conditions exist the year round.

An ample water supply is available on the property and electric power is supplied under contract by the West Kootenay Power and Light Company at Trail, B.C.

HISTORY

This mine was, according to government reports, first prospected and staked in about 1896. It consisted originally of the Jewel claim and was known as the Jewel Mine.

In 1898 the Jewel claim was acquired by the Jewel Development syndicate which was organized in London by Gilbert Mahon of Vancouver. In this year the first steam mining plant was brought into the district and installed at this mine. During this year 2000 tons of ore were shipped to Granby.

Operations at the mine were intermittent to 1909 when construction of a stamp mill was commenced and finished in 1913. Production from then was intermittent and finally ceased altogether in 1915.

In all it is estimated half a million dollars in gold have been produced in this mine.

Why the mine closed down is not known, but it is suggested that the fact that the company owned only the Jewel claim, together with the fact that conditions of war time were not favourable to gold mining, appear reasons enough to have closed down.

Today the Dentonia Company has acquired a groupe of nine claims in all, namely, the Jewel, Anchor, Ethiopia, Massachusetts, Enterprise, Imperial fraction, Lakeside fraction, and Perserverance.

GENERAL GEOLOGY

Not having been on the property or been able to obtain a full report on the district, the geology of the area is rather indefinite.

Apparently the area covers a contact zone between granodiorite and quartzites.[1] Intrusions of granitic rock in the surrounding area together with intrusive flows ressembling

1. A. G. Langley M. Inst. M.M. Report on the property of Dentonia Mines Limited October, 1933

diabase, and lamprophyre and porphyritic dykes make the geology of the area very complex.

Regarding the geology of the ore body, without going into detail, it is sufficient to say that the main veins are true fissure veins in a granodiorite formation. They are strong, well defined fissures running north and south and dipping to the east at an angle of 45 degrees.

The fissure zone has been traced for over 3600 feet and is persistent except were slightly faulted by the intrusion of post mineral dykes.

Owing to the depth of the overburden in certain places the continuity of the fissure can only be determined by further work.

MINERALOGY

The metallic minerals are pyrite (the most abundant) with small quantities of galena and chalcopyrite. Silver and gold is reported--none has so far been seen in the ore examined. Gold and silver occur in a ratio of seven to one. The ore occurs in a gangue of quartz. Tellurides are claimed to be present, but none were determined from the ore at hand although efforts were made to find them. An unknown antimony sulphide was found in the ore in very small quantities.

ASSAYS

Tests made at Ottawa show an average analysis as follows:

Gold .73 oz. per ton

Silver 4.18 oz. per ton

Copper .15%

Lead .37%

And a trace of zinc.

In 1898 Guess Brothers had assay values for Dentonia Mines (old Jewel mine) running as high as $401.00 to $523.00.

The ore as mined runs from $10.00 to $70.00 per ton on the average.

From the suite at hand ore was taken and crushed. It was screened through a #10 mesh screen and pure pyrite (Assay D1), relatively pure galena (containing a small amount of quartz), and pure chalcopyrite were picked out and assayed separately. The results are as follows:

Pyrite (pure) 4.34 oz. per ton in gold

Chalcopyrite (pure) .1 oz. per ton in gold

Galena (relatively pure) contained some gold, but the exact assay is not known.

Gold was the only mineral assayed for.

Other reports give assays for pyrite as $57.00 per ton, and galena assayed $300.00 a ton.

From our own assays pyrite appears to be richest in gold. Chalcopyrite is valuable, but there is very little of it in the ore, likewise galena.

In conclusion, it appears from these assays that the gold is closely associated with the sulphides.

MEGASCOPIC EXAMINATION OF THE SPECIMENS

The suite consists of seven samples picked from along the first level of the mine (see map). They all merely show the persistence of the quartz fissure and the mineralization by galens, pyrite, chalcopyrite, etc.

Another mineral thought to be a telluride, but definitely determined as not being a telluride, was found in the ore. It appears to be an antimony sulphide of some sort as both sulphur and antimony were determined. Traces of copper and iron were found in the mineral, but were not conclusive enough to go on im naming the mineral. They were probably merely due to impurities. This mineral is very rare and enough could not be obtained either for assay or complete determination.

The samples are all more or less alike showing the usual mineralization in a gangue of milky white quartz. (see suite)

MICROSCOPIC EXAMINATION OF THE SPECIMENS

This topic is confined to a discription of the illustrations on the following pages. Polished sections of the minerals were made and examined under the microscope. The discriptions are as follows:

D107S #1

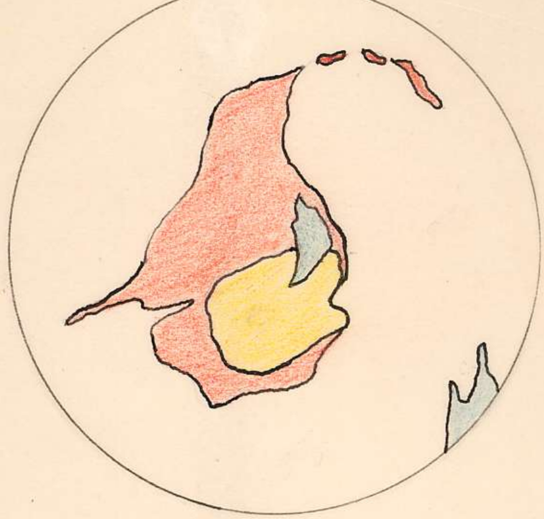
The minerals present are pyrite, chalcopyrite and galena.

In this section there is a grain of galena enclosed by pyrite and chalcopyrite. Half the grain of galena is enclosed by pyrite, and the other half is enclosed by chalcopyrite. The chalcopyrite itself encloses the pyrite. The apparent sequence of the minerals is galena, then pyrite and chalcopyrite simultaneously.

D107 #2

The minerals present are chalcopyrite and galena in the quartz gangue. This shows the galena veining the quartz, and also the galena enclosing quartz crystals as well as partly enclosing some chalcopyrite. Galena shows well developed crystal outlines and appears to vein the quartz where the quartz is fractured or has crystal edges. The galena also shows cleavage pits. The quartz crystals in the galena are well developed. This gives an apparent sequence of quartz and chalcopyrite, then galena which does not agree with the above section.

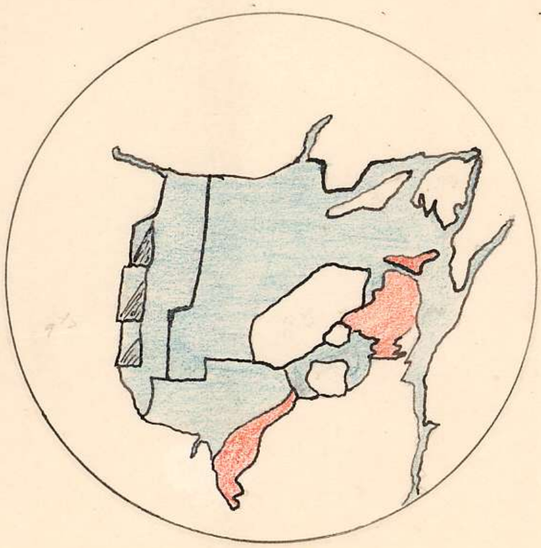
Section
D107S #1



x4

Pyrite - yellow, Chalcopyrite - red,
Galena - blue, Quartz - white.

Section
D107S #2



x30

D105S

The minerals present are chalcopyrite, pyrite, and galena.

This shows the typical mineralization of the ore. The metallica are all more or less rare and finely divided throughout the ore. Crystallization is poor and the minerals tend to follow the fractures. in the quartz. No particular sequence is evident in this illustration. The quartz appears much fractured which is characteristic of the ore.

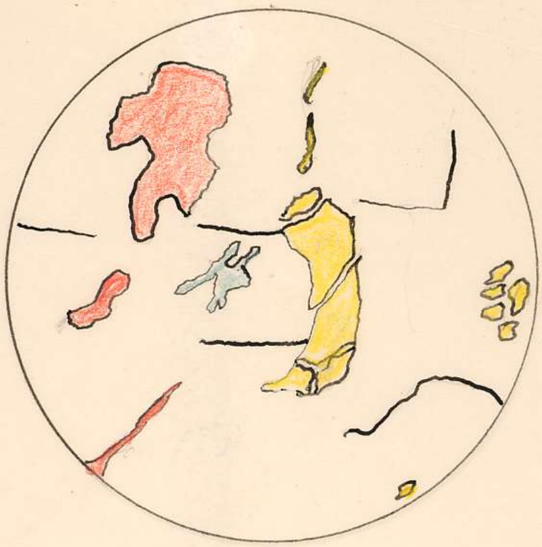
D109S #1

Here is shown pyrite which is veined by quartz. The quartz appears to be following a fracture in the pyrite, or is following in along the crystal edges of seperate grains of pyrite. The quartz vein in the pyrite is partly filled with chalcopyrite and no chalcopyrite is found in the pyrite. Therefore, the probably sequence is pyrite, then quartz, then introduction of chalcopyrite into the quartz vein, which partly agrees with some of the other sections.

D109S #2

The minerals present are galena, chalcopyrite, and pyrite. This section shows chalcopyrite veining the fractures in the quartz, also it shows the close association of the different metallics with no apparent sequence showing in this section. The fracturing in the quartz, which the chalcopyrite is following, is again characteristic of the ore.

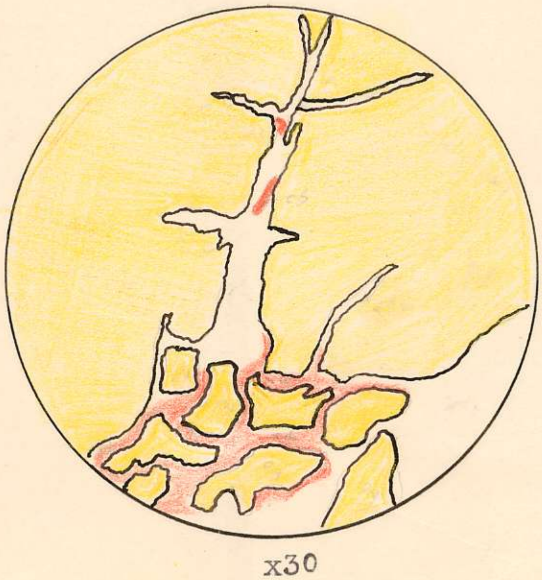
Section
D105S



x4

Pyrite - yellow, Chalcopyrite - red,
Galena - blue, Quartz - white.

Section
D109S



x30

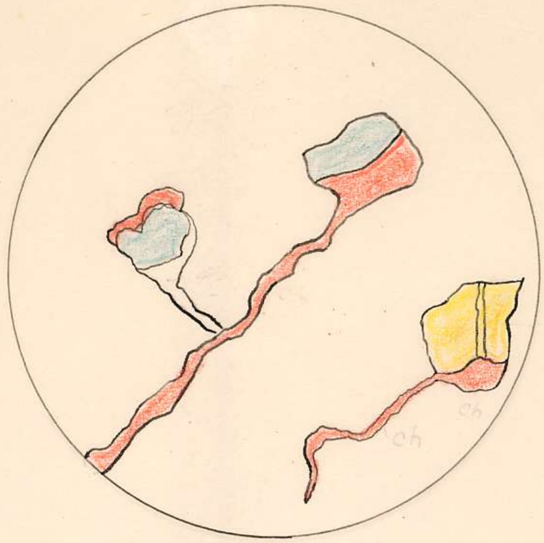
D110S

The minerals present are chalcopyrite, galena, and an unknown antimony sulphide. This mineral gave characteristic tests under the microscope for antimony sulphides and antimony and sulphur where determined by blow-piping. By successive polishings the mineral is now nearly worn away in the section as it appears in only this section spread over the surface of the ore. Very little was found in the ore and enough could not be obtained for further analysis. Tests for copper where sometimes positive, but as can be seen in the illustration the mineral is closely associated with amounts of microscopic grains of chalcopyrite which might easily give positive results in a copper or iron test which was also positive. The mineral has all the characteristics of tetrahedrite, but the copper test was not positive enough and often negative altogether. With a larger amount of this mineral the determination would have been made easier. Officials at Dentonia claim a telluride in the ore, but none has so far been seen in the ore examined and this mineral was tested for tellurides but none of the tests gave any signs of tellurium whatsoever.

CONCLUSIONS

From an examination of the ore it is apparent that Dentonia is a gold quartz fissure vein of the mesothermal type

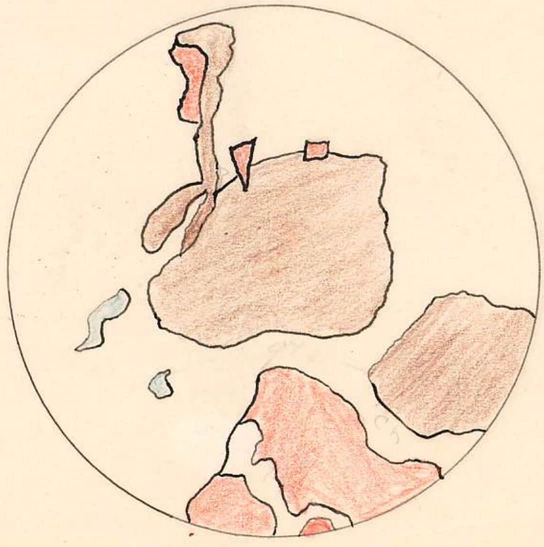
Section
D109S #2



x4

Pyrite - yellow, Chalcopyrite - red,
Galena - blue, Quartz - white,
Unknown - brown.

Section
D110S

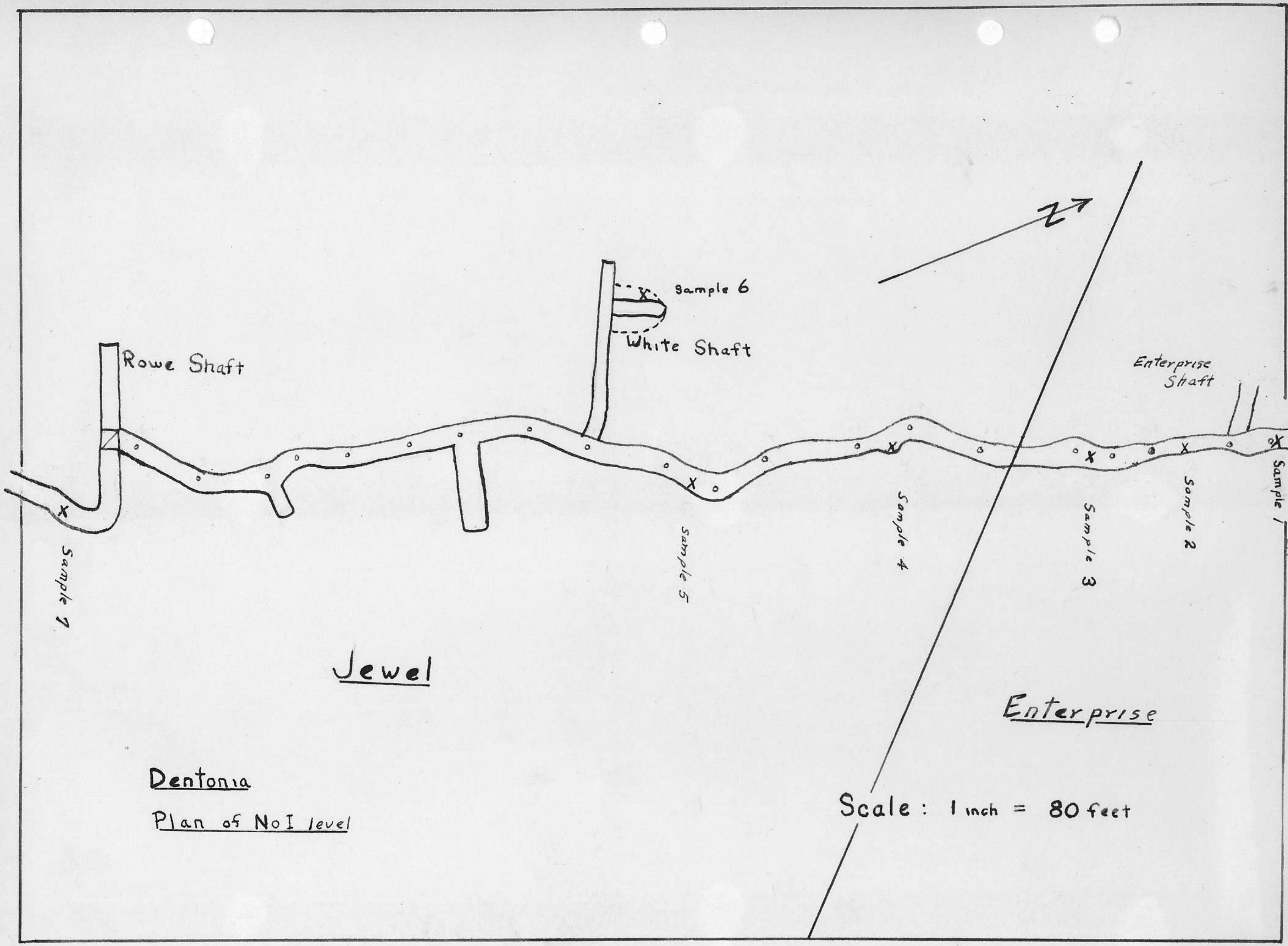


x30

of deposit. No free gold was showing in any of the ore examined and is undoubtedly associated with the sulphides. Whether the gold is in solid solution or just in a very finely divided state is not known, but the gold would undoubtedly have to be extracted by cyanidization. As shown by the assays all the metallics carry gold.

It is a primary ore body.

From the illustrations an extensive examination of all the polished sections it was hard to determine any definite sequence or paragenisis of the minerals. They appear to have been introduced simultaneously and the sections have been so polished that one mineral on another, when polished, appears to be enclosed by the other and gives a more or less pseudo-paragenisis. From the illustrations the paragenisis, if any, appears to be as follows: quartz with the introduction of galena and pyrite followed by a second generation of quartz with galena, then pyrite, then chalcopyrite crystallizing in that order.


Dentonia
Plan of No I level
Scale : 1 inch = 80 feet
Rowe Shaft
White Shaft
sample 6
Enterprise Shaft
Jewel
Enterprise
Sample 1
Sample 2
Sample 3
Sample 4
Sample 5
Sample 7
N

APPENDIX A

The Reno suite consists of the following:-

Hand specimens:-

Polished sections:-

[1]have illustrations

The initial in front of the number is the initial of the name of the mine. The initials "AG" after the numbers, in the case of the hand specimens, are used to designate the combination of Agnew and Grey who arranged the suite and reported on it. The letter "S" is used to designate polished sections

APPENDIX B

The Dentonia consists of the following:-

Hand Specimens:-

	Page
D101AG	
D102AG	
D103AG	
D104AG	
D105AG	
D106AG	
D107AG	
D108AG	

Polished sections:-

D105S	22
D107S	20
D109S	22
D110S	24

All have illustrations.

The same method of lettering and numbering the specimens and sections is used here as is used in Reno.