

STATE OF OREGON  
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES  
702 Woodlark Building  
Portland 5, Oregon

Bulletin No. 34

**Mines and Prospects**  
OF THE  
**Mount Reuben Mining District**  
**Josephine County, Oregon**

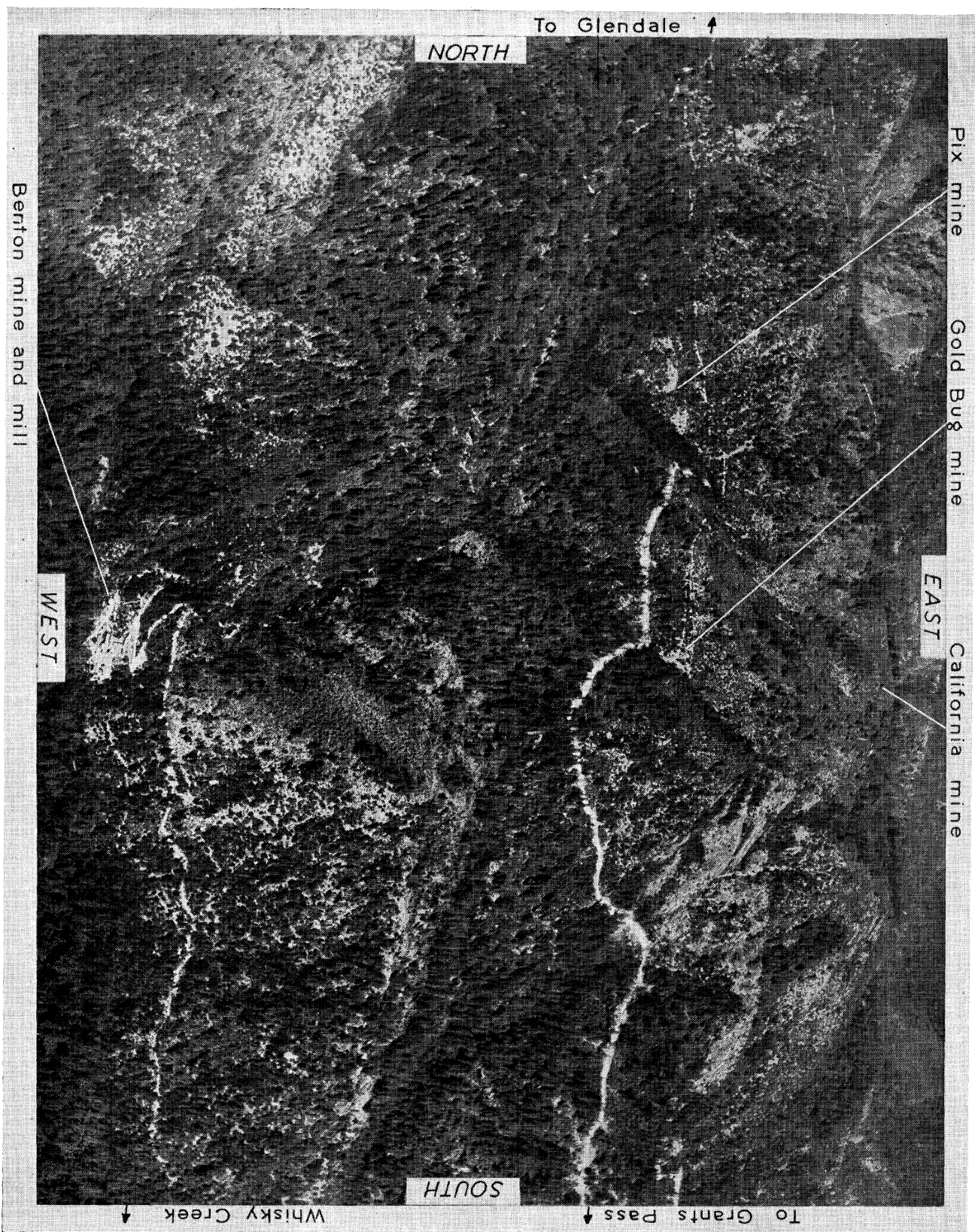
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1947

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Aerial view looking east toward Benton group and some neighboring properties

## FOREWORD

Some mining districts in Oregon were prospected extensively in the early days of mining and then suffered a long period of quiescence until the price of gold was raised in the early 1930's. Such a district was the area near Mt. Reuben in northern Josephine County. This district contains many prospects as well as the Benton mine which was rejuvenated in the 1930's and was the largest producing mine in southwestern Oregon until war conditions closed it down. During the last period of operation at the Benton mine, a large amount of development work was done and a great deal learned concerning the geology and characteristics of the ore bodies.

Almost nothing has previously been published on the ore deposits of this area and the Department decided to make this study and publish the results in an attempt to stimulate prospecting and development. Because of the large amount of work done at the Benton mine, it was hoped to apply the geological knowledge gained from this work to development possibilities at other properties of the district. The study was also designed to collect information on characteristics of ore deposits in the different rock types of the area.

It is believed that the accompanying report will provide valuable information to prospectors, investigators, and possible operators in the district.

F. W. Libbey  
Director

July 2, 1947

# CONTENTS

	<u>Page</u>
Foreword	
Introduction . . . . .	1
Acknowledgments . . . . .	1
Previous work . . . . .	1
Geography . . . . .	2
Geology . . . . .	2
General features . . . . .	2
Sedimentary rocks . . . . .	2
Igneous rocks . . . . .	2
Serpentine . . . . .	3
Gabbro complex . . . . .	3
Quartz diorite and related rocks . . . . .	3
Age relationships . . . . .	3
Mineralogy . . . . .	6
Paragenesis of the ore minerals . . . . .	8
Structure . . . . .	8
Economic considerations and guides to prospecting . . . . .	8
Dothan formation . . . . .	8
Greenstone . . . . .	8
Gabbro complex . . . . .	9
Quartz diorite intrusives . . . . .	9
Ore deposits . . . . .	11
Ajax mine (1) . . . . .	11
Copper Stain mine (5) . . . . .	11
J.C.L. mine (7) . . . . .	13
Saint Patrick mine (17) . . . . .	14
Pix prospect (12) . . . . .	15
Reno mine (15) . . . . .	17
Gold Bug mine (6) . . . . .	17
Moonbeam prospect (10) . . . . .	19
California Gulch prospect (4) . . . . .	19
Molly Hill mine (9) . . . . .	19
Skinner prospect (16) . . . . .	20
Whisky Springs prospect (20) . . . . .	20
Whiteneck prospects (21) . . . . .	21
Looney prospect (8) . . . . .	21
Mt. Reuben mine (11) . . . . .	23
Windy Gap prospect (22) . . . . .	24
Tibbetts Springs prospect (18) . . . . .	24
Unnamed prospect below north workings of Poorman group (23) . .	25
Poorman group (adit on Drain Creek) (14) . . . . .	25
Poorman group (north workings) (13) . . . . .	27
Trade Dollar prospect (19) . . . . .	27
California mine and tunnel (3a,b) . . . . .	29
Benton group . . . . .	31
Benton mine (2) . . . . .	31
Montana claim workings (21) . . . . .	34
Washington prospect (2m) . . . . .	34
Bibliography . . . . .	35



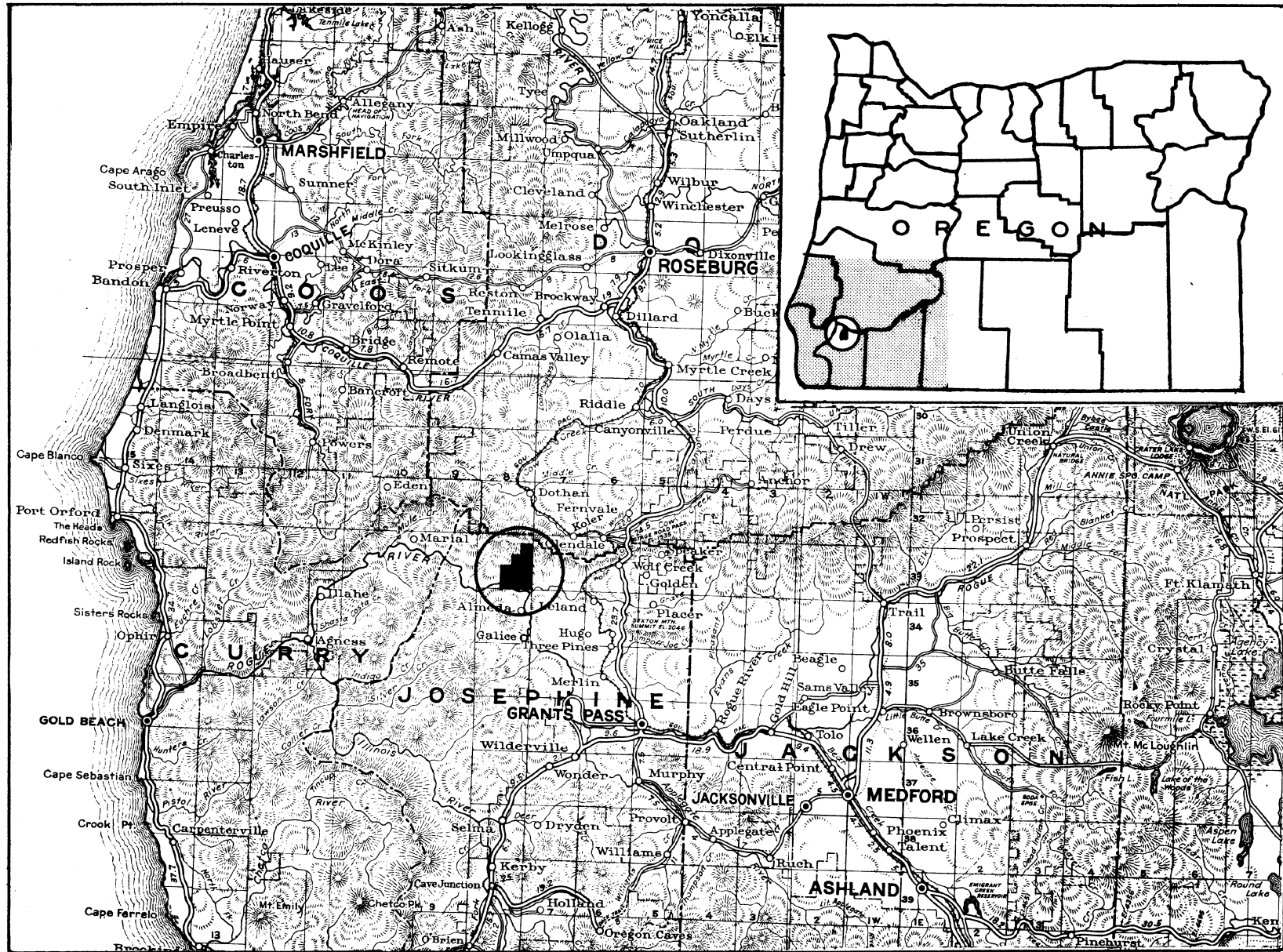
# ILLUSTRATIONS

	<u>Page</u>
Frontispiece - Aerial view of Benton mine	
Index map showing location of Mt. Reuben area . . .	opposite page 1
Mine index map showing principal claims and veins with key to properties . . . . .	4
Geologic map of the Mt. Reuben district . . . . .	5
Plate 1, figures 1, 2, 3, 4 . . . . .	opposite page 11
Plate 2, " 1, 2, 3, 4 . . . . . " "	17
Plate 3, " 1, 2, 3 . . . . . " "	23
Plate 4, " 1, 2, 3, 4 . . . . . " "	27
Plate 5, " 1, 2, 3, 4 . . . . . " "	29

## TABLE

Table 1, . . . . .	opposite page 6
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Index map showing location of Mt. Reuben area, Josephine County, Oregon.

MINES AND PROSPECTS OF THE MT. REUBEN MINING DISTRICT  
JOSEPHINE COUNTY, OREGON

Introduction

The Mt. Reuben district northwest of Galice, Josephine County, Oregon, (see index map) was the scene of important gold lode mining operations as well as placer mining in the early 1900's. More recently, from 1935 to 1942, there has been activity at the Benton mine, which was at that time the largest gold lode mine operation in southwestern Oregon.

Total lode gold production in the area is believed to be in the order of \$1,500,000. This production came largely from the Benton and the Gold Bug mines. The J.C.L. mine was also an important producer. The Copper Stain, Ajax, St. Patrick, Pix, Reno, California, and Poorman mines' combined output possibly totalled \$50,000 to \$75,000.

Whisky Creek has been placered from its junction with the Rogue River to Huckleberry Flat on the East Fork of Whisky Creek, a distance of four miles. There is no record of output but the amount of yardage moved indicates that a substantial amount of gold was recovered.

The purpose of the investigation of the Mt. Reuben district was to study the occurrence of gold at the various mines and prospects and to determine if areas favorable for the occurrence of commercial deposits, other than the Benton mine, are present.

The field work was carried on during the summer months of 1945 as a part of the activity of the writer as Field Engineer at the Grants Pass office of the Oregon Department of Geology and Mineral Industries. The writer was aided in the field by Clement Flickinger of Galice.

Acknowledgments

The author wishes to acknowledge the aid given by the following men: Dr. Francis G. Wells and Mr. Fred Cater of the U. S. Geological Survey for geological information on adjacent areas; Mr. Mason L. Bingham for maps of the Benton and J.C.L. mines and in making available the Benton camp facilities as a field headquarters; Mr. Ray C. Treasher for mine reports which were found to be invaluable in preparation of this report and were drawn upon freely; and Mr. Jack Brady of Grants Pass who supplied valuable information on the early history of the mines in the area. Members of the Department staff made valuable contributions to the report. Dr. Wallace D. Lowry, geologist, made 54 petrographic analyses of rock specimens and ores. Miss Esther Miller made 31 spectrographic analyses of ores from the mines in the area which appear in a table in the report. Mr. L. L. Hoagland, assayer, completed approximately 300 analyses of samples taken from the various mines. Mr. Ralph S. Mason, engineer, prepared the maps and tables for publication. Mr. F. W. Libbey, Director, made valuable constructive suggestions in the field and criticized and reviewed the report.

Previous work

There has been no previous detailed geologic work done in this area. Diller (1914)\* gave a general description of the Galice-Kerby-Waldo region and some of the active mines in the area. Shenon (1933) described the Robertson mine and the geologic formations in its vicinity. The Robertson mine is about 9 miles southwest of the Mt. Reuben district. Lowell (1942) studied the mineralization at a number of mines adjacent to the Mt. Reuben area.

Although the region in the vicinity of Mt. Reuben has not been mapped in detail, the ages of the formations present and their general characteristics were outlined by Diller. The area studied consists of a series of highly folded and faulted sedimentary and volcanic rocks, most of which have been metamorphosed, together with younger intrusive rocks consisting largely of peridotite, gabbro, and diorite. The volcanic rocks, sandstones, slates, and argillites are believed to be of Jurassic age and the intrusive rocks of late Jurassic or early Cretaceous age.

\*Bibliography in back of this bulletin.

The mineralized zones in the area studied are limited to the metavolcanic and the intrusive rocks. The source of the ore-bearing solutions is believed to have been the quartz diorite and related rocks.

### Geography

The Mt. Reuben district lies between the summit of Mt. Reuben and the Rogue River, and is bounded generally on the east by Reuben Creek and on the west by Whisky Creek. The district is approximately 6 miles northwest of Galice and is traversed by the Eden Valley and Mt. Reuben Forest Service roads which extend west from the mouth of Grave Creek. Spurs from these roads lead to the Benton and Reno mines on Whisky Creek, the Molly Hill, and the Old California mine workings on the divide between Whisky and Reuben creeks, and the Looney mine on the east fork of Whisky Creek. The roads are passable except for portions at higher elevations which are closed by snow at times during the winter months.

The terrane is rugged and steep. Altitudes range from 500 feet at the mouth of Whisky and Grave creeks on the Rogue River to 4000 feet at the summit of Mt. Reuben. The valley walls are largely talus slopes on which manzanita is abundant. Less steep portions have scattering growths of pine, fir, and oak trees.

Climate is moderate. Rainfall of about 30 inches falls mostly during the winter months. Snow rarely falls below an elevation of 2500 feet and above that elevation it remains only for short periods.

### Geology

#### General features

Igneous rocks predominate in the area mapped in the Mt. Reuben district. (See geologic map, page 5) They are chiefly serpentine, hornblende gabbro, diorite, quartz diorite, and related rocks, together with metavolcanic rocks which include meta-andesites, altered porphyritic amygdaloidal basic lava, and andesitic tuff. Some schists were found associated with metavolcanic rocks which may have been derived in part from sedimentary rocks in the vicinity of China Gulch. Sedimentary rocks of the Dothan formation are found in the western portion of the area mapped. This formation consists of massive and thin-bedded sandstones and shales. The Galice formation, a sedimentary series believed to be of approximately the same age as the Dothan, lies a short distance to the east of the area mapped.

The attitude of the igneous rocks usually could not be determined; however, exposures along the Rogue River indicate that andesite flows and tuff beds are nearly vertical. The formations in general have a northeasterly strike. Strikes in the Dothan formation range from north to N. 30° E.; dips are steep to the east.

#### Sedimentary rocks

**Dothan formation:** The Dothan formation occurs in the western portion of the area in contact with a body of igneous rocks having a northeasterly trend. The gray to dark-gray sandstone and argillite are changed to a hard dense black rock or hornfels. A bluff of bluish white to gray, banded chert is exposed on the north side of the Eden Valley road in sec. 2, T. 33 S., R. 8 W. The conglomerate is composed of cemented small pebbles of chert.

#### Igneous rocks

**Greenstone:** The term greenstone is here applied to a series of metavolcanic rock consisting of meta-andesite and associated schistose tuffs. These rocks have been called (Diller, 1914) greenstone owing to the development of chlorite, actinolite, and fine-grained green hornblende.

These rocks occupy an area bounded generally on the east by Reuben Creek and on the west by a line extending from China Gulch on the Rogue River to the summit of Mt. Reuben. They are exposed in sections along the bluffs on the north side of Rogue River from the mouth of Grave Creek to China Gulch. Some true schists are present in the area and may possibly be older than the greenstone.

Serpentine: A body of serpentine is exposed on the slope extending from the Reno mine to the Rogue River between Whisky Creek and the Reno mine gulch. Other bodies of serpentine were noted along major shear zones where these zones crossed more basic intrusive rock but were not large enough to be mapped. Some amphibole asbestos was observed in several of these serpentized areas.

Gabbro complex: The area mapped as gabbro occupies an area from several hundred to several thousand feet in width extending from the mouth of Whisky Creek north to the west slope of Mt. Reuben. This belt is composed of a mass of partially altered gabbro and related rocks. These rocks are partially recrystallized hornblende gabbro. At the junction of California Gulch and Whisky Creek these rocks have a distinct banding, varying from a fine-grained, gray-green rock to a crystalline rock in which hornblende crystals are well developed. The banding has a northeasterly strike parallel to the predominant shearing in the area. Several small areas of hornblende were observed in the upper Drain Creek basin.

Petrographic examination of the gabbro shows that most specimens are made up largely of roughly equal amounts of hornblende and labradorite feldspar with a composition ranging from  $Ab_4An_6$  to  $Ab_3An_7$ . In some the hornblende is much more abundant than the plagioclase and in one specimen magnetite constitutes more than 5 percent of the rock. Either chlorite or epidote is present in the specimens of gabbro collected. One specimen of altered pyroxenite showed the augite partially converted to uraltite, a variety of hornblende. However, uraltitization does not appear to have effected most of the alteration shown by the gabbro; recrystallization is largely responsible.

The original texture of the gabbro was hypidiomorphic granular but recrystallization has proceeded far enough so that the term granoblastic may be better applied.

Quartz diorite and related rocks: Quartz diorite occupies only a relatively small portion of the area mapped. This rock occurs as small stocks elongated along their northeasterly trending axes close to the contact between the Dothan formation and the greenstone or gabbro complex. The Benton stock which is 2500 feet wide and 1.75 miles long is the largest exposed in the area. A smaller body crosses the Eden Valley road just west of the Windy Gap mine and extends about 2000 feet to the south.

Petrographic examination of thin sections of the diorite shows that andesine feldspar, ranging in composition from  $Ab_7An_3$  to  $Ab_6An_4$  or even slightly more basic, makes up about 50 percent or more of the rocks. Quartz is present in most specimens in amounts from 5 to 35 percent. Either green hornblende or pyroxene is present and in several specimens may constitute as much as 35 percent. Magnetite may be present as an accessory mineral. The characteristic texture of the diorite is hypidiomorphic granular. Most thin sections show at least slight alteration, probably largely hydrothermal. Sericitization, chloritization, and/or epidotization effects were noted. Chlorite has been formed from the pyroxenes, and epidote with associated chlorite has resulted from alteration of plagioclase.

#### Age relationships

The age and relationships of any of the rocks in the Mt. Reuben district are not entirely clear. Diller (1914) in his regional studies of southwestern Oregon determined, from fossils in the Galice formation and from similar though not as distinctive fossils in the Dothan formation, that both belonged to the Jurassic system. Diller also believed that the greenstone lying between these two formations is of the same age. A body of schist in China Gulch which was mapped as greenstone may possibly be older than the meta-andesites and schistose andesitic

# MAP OF THE MT. REUBEN DISTRICT

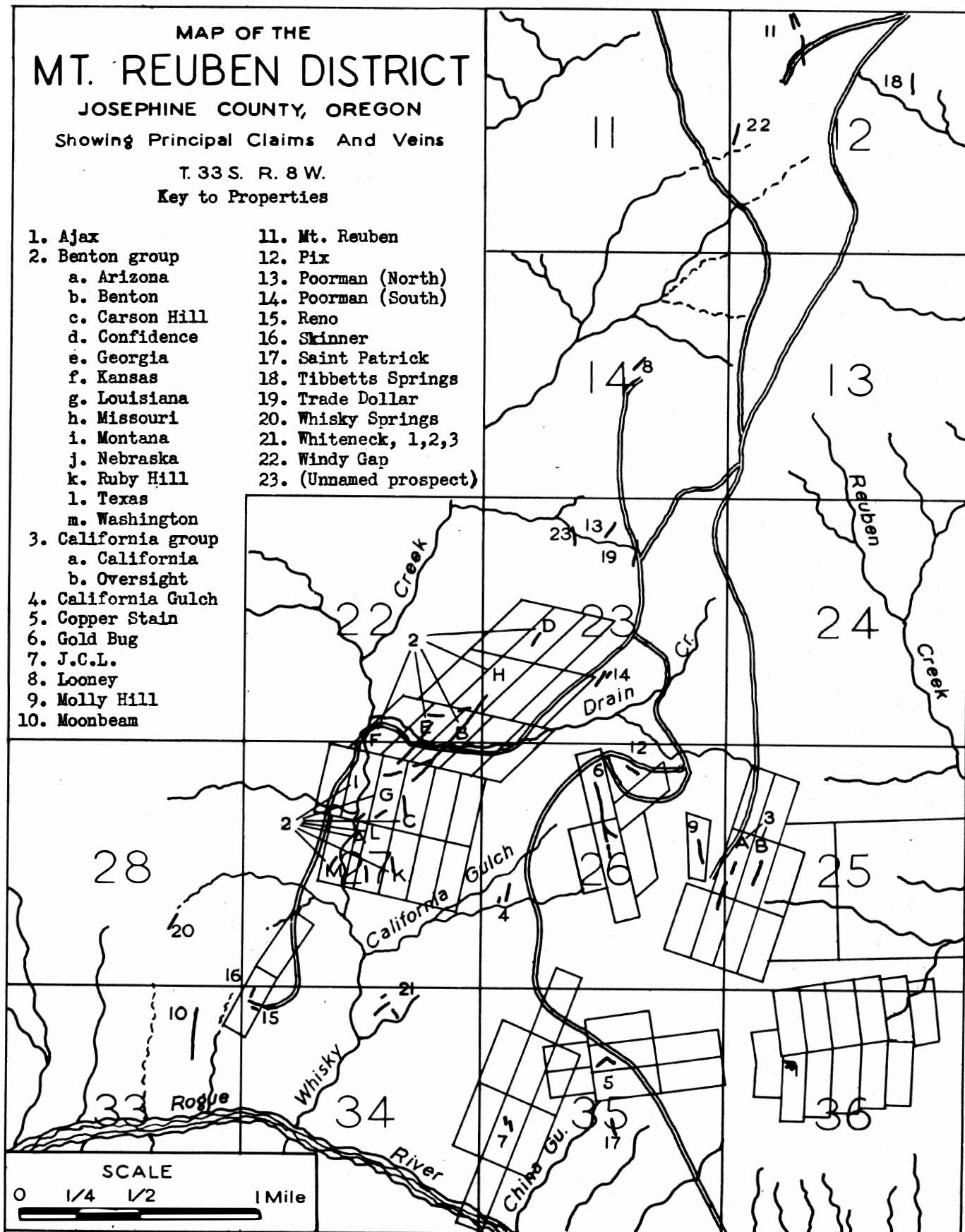
JOSEPHINE COUNTY, OREGON

Showing Principal Claims And Veins

T. 33 S. R. 8 W.

Key to Properties

- |                     |                        |
|---------------------|------------------------|
| 1. Ajax             | 11. Mt. Reuben         |
| 2. Benton group     | 12. Pix                |
| a. Arizona          | 13. Poorman (North)    |
| b. Benton           | 14. Poorman (South)    |
| c. Carson Hill      | 15. Reno               |
| d. Confidence       | 16. Skinner            |
| e. Georgia          | 17. Saint Patrick      |
| f. Kansas           | 18. Tibbetts Springs   |
| g. Louisiana        | 19. Trade Dollar       |
| h. Missouri         | 20. Whisky Springs     |
| i. Montana          | 21. Whiteneck, 1,2,3   |
| j. Nebraska         | 22. Windy Gap          |
| k. Ruby Hill        | 23. (Unnamed prospect) |
| l. Texas            |                        |
| m. Washington       |                        |
| 3. California group |                        |
| a. California       |                        |
| b. Oversight        |                        |
| 4. California Gulch |                        |
| 5. Copper Stain     |                        |
| 6. Gold Bug         |                        |
| 7. J.C.L.           |                        |
| 8. Looney           |                        |
| 9. Molly Hill       |                        |
| 10. Moonbeam        |                        |



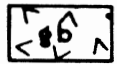
# GEOLOGIC MAP OF THE MT. REUBEN DISTRICT

JOSEPHINE COUNTY, OREGON

## EXPLANATION



Quartz diorite



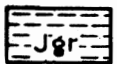
Gabbro



Serpentine



Dothan



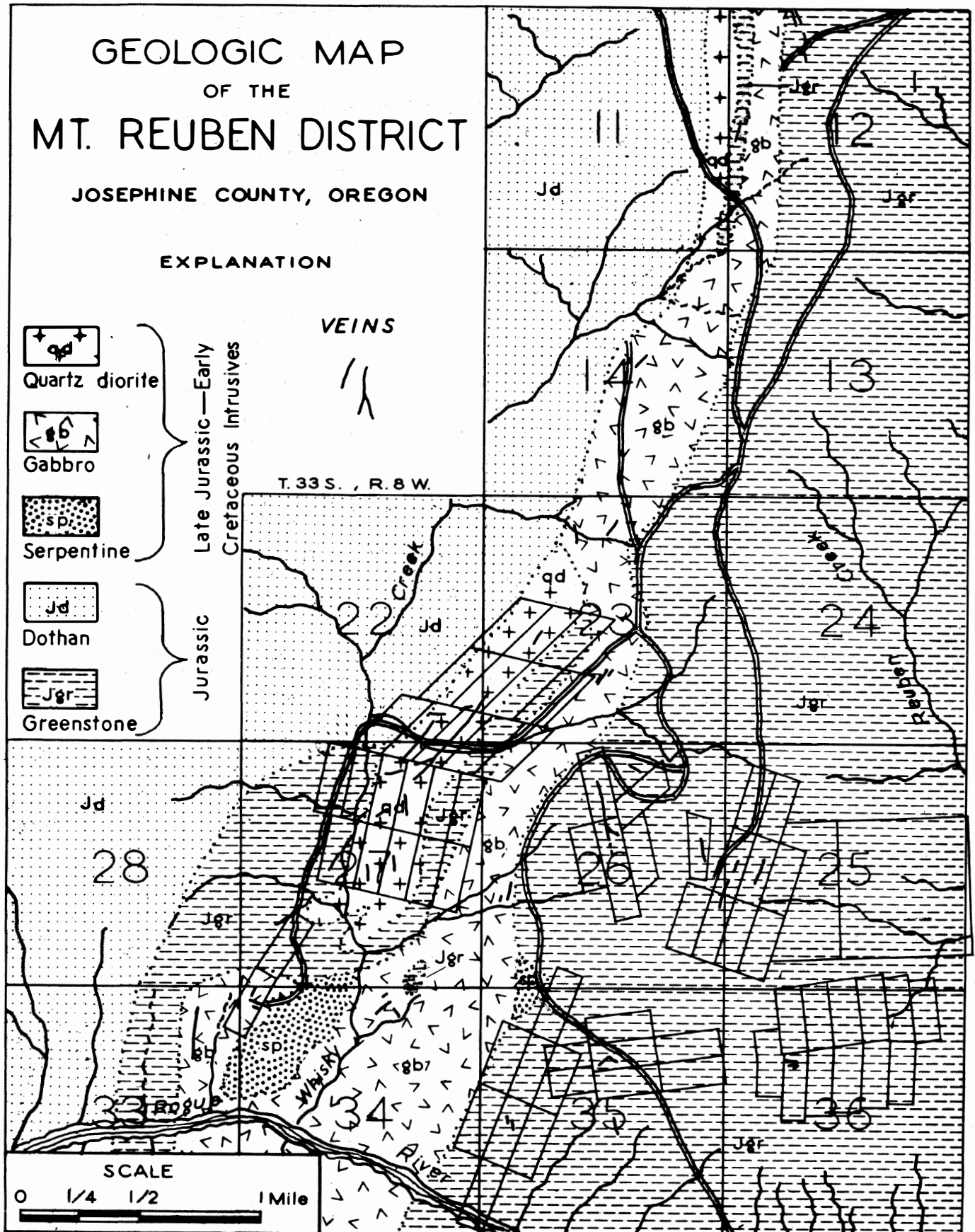
Greenstone

Late Jurassic—Early  
Cretaceous Intrusives

Jurassic

## VEINS

T. 33 S. , R. 8 W.





tuffs and may have been derived from sediments. Petrographic studies of three specimens of the schists showed them to be quartz-actinolite schist, andesine-hornblende schist, and plagioclase (oligoclase-andesine)-quartz-biotite schist.

Contact relationships indicate that the greenstone and Bothan formations were intruded first by serpentine, then by gabbro and related rocks, and finally by quartz diorite. As the diorite intrusives of southwestern Oregon are generally considered to be largely of late Jurassic or early Cretaceous age, all the intrusive rocks of the Mt. Reuben district are assigned to late Jurassic or early Cretaceous. Petrographic examinations of the gabbro and quartz diorite show that the gabbro is more deformed than the quartz diorite. Besides recrystallization of part of the hornblende, there is straining and even slight displacement of some plagioclase grains as well as partial recrystallization. This criterion suggests that the gabbro is older and has been subjected to more stress than the quartz diorite.

The quartz diorite intrusives in the Mt. Reuben area, which probably are genetically related to the region's ore deposits, are believed to be related to other intrusive diorite masses in southwestern Oregon. These masses vary somewhat in composition and have been variously termed diorite, tonalite, quartz diorite and, commonly by prospectors, granite.

In the Mt. Reuben district the most important ore deposit lies within the quartz diorite stock at the Benton mine. Numerous gold- and copper-bearing veins also exist in the adjacent gabbros and greenstones.

#### Mineralogy

**Hypogene minerals:** The minerals in the veins of the district are similar, varying only in quantity. Those seen were pyrite, chalcopyrite, pyrrhotite, galena, free gold, molybdenite, quartz, barite, chlorite, sericite, and calcite. The principal minerals are quartz and pyrite with gold associated with the pyrite. Veins in the quartz<sup>diorite</sup> contain very small amounts of chalcopyrite and pyrrhotite. Minor amounts of molybdenite were noted in several veins. Chlorite, sericite, calcite, and minor amounts of barite are the common gangue minerals. Chalcopyrite is much more common in the veins in gabbro and greenstone, and pyrrhotite also occurs in larger amounts. Gold is almost completely absent in veins occurring in gabbro, and where it does occur it is found as small high-grade pockets. In greenstones gold is found associated with pyrite and chalcopyrite, and as free gold in quartz. Galena was seen only in one specimen which was taken from the Whiteneck prospect on lower Whisky Creek.

Spectrographic analyses were made on ores from 31 of the prospects examined. Results are given in table 1 on page 7. The samples are listed in descending order of gold values contained in each sample. It was thought that gold values might have some relationship to one or several other metals occurring in the ore, but no such arrangement could be found in this group of samples. Several relationships to host rocks were noted. Lead was absent in all samples from ores occurring in quartz diorites, whereas it was found to occur in ores from several veins in greenstones and gabbro. Copper was present in only three samples in quartz diorites which came from veins near the contacts with greenstones, but in samples from veins in gabbro and greenstones, copper was more common. Nickel was found distributed through all the samples with a definite tendency to be of higher content in the gabbros. Molybdenum, tin, and cobalt occurred in several samples but had no particular relation to host rocks or other base metals.

The more common metals are to be found in most of the veins but the quantities differ somewhat, apparently owing to the effect of the host rock on the mineralizing solutions. In addition, temperature and pressure relationships were probably a factor in the distribution of the metallic minerals. The distribution of gold appears to be largely controlled by the host rock and to a lesser degree by temperature-pressure relationships and the mineralizing solutions are therefore thought to have had a common source.

TABLE 1.  
QUALITATIVE SPECTROGRAPHIC ANALYSES TOGETHER WITH GOLD ASSAYS  
OF SAMPLES FROM MINES IN THE MT. REUBEN AREA

MINE OR VEIN	Aluminum	Iron	Magnesium	Calcium	Sodium	Titanium	Manganese	Strontium	Vanadium	Zirconium	Chromium	Copper	Barium	Nickel	Lead	Molybdenum	Tin	Cobalt	Silver	Gold <sup>2/</sup>
Pix	10	.1	.1	.1	.1	.01	.01	---	.001	---	.001	.1	.001	.001	.01	---	---	---	.001	3.06
Copper Stain	10	1.	.1	10.	.1	.1	.01	.01	.01	.01	.01	.001	.001	.001	---	---	---	---	---	1.42
Windy Gap	10	1.	.1	1.	.1	.01	.01	.01	.001	---	.001	.01	.01	.001	---	---	---	---	.001	1.24
Rene	10	1.	.1	.1	.1	.1	.01	---	.01	---	.001	---	.001	.001	---	---	---	---	.001	.98
Louisiana Vein No. 1	10	1.	.1	.1	.01	.001	.01	.001	.001	.01	.01	---	.001	.001	---	.001	---	---	.001	.50
St. Patrick	10	10.	10.	1.	.1	1.	.1	.001	.01	.01	.01	---	.001	.01	.01	---	---	---	---	.41
Louisiana Vein No. 2	10	.1	.01	.01	.01	.01	.01	---	.001	---	.001	.1	.001	.001	---	.001	---	---	.001	.40
Montana	10	1.	.1	.1	.1	.1	.01	.01	.01	---	.001	---	.01	---	---	.001	---	---	.001	.41
Meenbeam	10	1.	.1	.1	.01	1.	.01	---	.01	---	.01	---	.001	.001	---	.001	---	---	.001	.36
Texas	10	.01	.01	.01	.01	.001	.001	---	.001	---	.001	---	.001	.001	---	---	---	---	.001	.35
Benton Vein	10	.1	.1	1.	.1	.01	.01	.01	.001	---	.001	---	.01	.001	---	---	---	---	.001	.30
Nebraska Vein	10	10.	.1	.01	.1	.1	.01	.001	.01	---	.001	.001	.01	.001	---	---	---	---	.001	.25
Carson Hill Vein	10	10.	.1	.1	.1	.1	.01	---	.01	---	.001	.001	.01	.001	---	---	---	---	---	.22
Ruby Hill Vein	10	10.	.1	1.	.1	.1	.01	.001	.01	---	.01	.001	.001	.001	---	---	---	---	---	.12
Trade Deller	10	10.	1.	10.	.1	1.	.01	.1	.01	.001	.01	---	.001	.001	---	.001	---	---	.001	.10
Washington	10	1.	1.	1.	.1	1.	.01	.01	.01	---	.01	---	.01	.001	---	---	---	---	---	.08
Whisky Creek	10	.1	10.	10.	.1	1.	.01	.001	.001	---	.01	---	.01	.001	---	---	---	---	.001	.06
Copper Stain	10	10.	10.	10.	.01	1.	.01	---	.001	---	.01	.01	.001	.001	.01	---	---	---	.001	.04
Molly Hill	10	.1	.1	1.	.01	.1	.01	---	.01	---	.01	---	.01	---	---	---	---	---	---	.03
Skinner	10	10.	1.	1.	.01	.1	.01	---	.001	---	.01	.01	.001	---	---	---	---	---	---	.02
Whiteneck No. 2	10	.1	1.	1.	.1	.1	.01	---	.01	---	.01	---	.01	.001	---	---	---	---	---	.02
Whisky Spring	10	.01	.1	.01	---	.001	.1	---	.01	---	.01	---	.01	.01	---	---	---	---	---	.01
Ajax	10	1.	10.	1.	.1	1.	.1	.001	.01	.001	.01	1.	.1	.001	.01	---	---	---	.01	.01
Mt. Reuben	10	.1	.01	.01	.01	.1	.01	.001	.001	.001	.001	.001	.001	.001	---	---	---	---	---	.01
California	10	.1	.1	.1	.01	.01	.01	---	.001	---	.01	.001	.001	.01	---	---	---	---	---	.01
Leoney	10	10.	10.	1.	.1	.1	.1	.01	.01	---	.1	.001	.001	.1	---	---	---	---	---	.01
Whiteneck No. 3	10	.1	10.	10.	1.	1.	.001	.01	.001	---	.01	---	.1	.001	.01	---	.001	.001	.001	Tr.
J.C.L.	10	10.	10.	1.	1.	1.	.1	.01	.01	.001	.01	---	.1	.001	.01	---	---	---	---	Tr.
Peerman, N.	10	1.	1.	.01	.1	.1	.01	.01	.001	.001	.001	---	.001	.001	.01	.01	---	---	---	Tr.
Peerman, S.	10	1.	1.	10.	.1	.1	.01	.01	.001	.001	.01	.1	.001	.001	.01	.01	---	.001	---	Tr.
California Guleh	10	.1	.1	.1	.1	.01	.01	---	.001	---	.01	.1	.001	.001	.01	---	---	---	---	Tr.

<sup>2/</sup> Gold values are in ounces per ten and were determined by fire assay.

<sup>1/</sup> 10. indicates elements present in concentrations over 10%  
1. indicates elements present in concentrations 1% - 10%  
.1 indicates elements present in concentrations 0.1% - 1%  
.01 indicates elements present in concentrations .01% - 0.1%  
.001 indicates elements present in concentrations .001% - .01%  
.001 indicates elements present in concentrations below .001%

Supergene minerals: Oxidation in most veins has reached a relatively shallow depth, usually from 10 to 75 feet. Pyrite has been oxidized to soft limonitic material. Most of the chalcopyrite is oxidized to malachite, staining the ore green. At the Mt. Reuben mine the outcrop is a brilliant red iron gossan. A shaft sunk on the vein exposed some bornite and chalcocite. This was the only occurrence of secondary copper sulphide minerals noted.

#### Paragenesis of the ore minerals

The sequence of mineralization in the veins of the area follows the same general pattern. Quartz mineralization was followed by brecciation which in turn was followed by a second period of quartz mineralization with pyrite, sericite, chlorite, and gold, probably introduced simultaneously. Calcite was introduced later, forming veinlets which cut all other minerals.

#### Structures

At the close of the Jurassic period, Jurassic greenstones and sediments in the Mt. Reuben district were uplifted and tightly folded. The Dothan formation dips generally steeply to the east and the greenstone appears to have a similar attitude. During uplift major regional faults were developed, and into these were injected serpentine, gabbro, quartz diorite, and related rocks. These zones of weakness appear to be at or near the northeasterly trending contact between the greenstone and the Dothan formation. Major regional northeasterly trending thrust faults were developed, marked by major shear zones in the greenstone. These shear zones and accompanying faults formed zones of weakness and openings along which ore-bearing solutions migrated and in places formed ore bodies.

During the cooling stages of the intruded magmas of quartz diorite and related rocks, shrinkage and slumping in these masses and the release of regional stresses caused tension faults along which, in the later stages of cooling, ore-bearing solutions ascended and deposited commercial ore bodies in favorable zones, such as were well developed in the Benton quartz diorite stock.

#### Economic Considerations and Guides to Prospecting

Sampling and studies of individual prospects indicate that the area should be divided into four parts according to the gold values and types of vein structures found. These four parts coincide with the areas occupied by the principal rock formations - namely, the Dothan sediments, the greenstone, gabbro complex, and the quartz diorite intrusives.

#### Dothan formation

In the area studied, the Dothan formation is almost completely devoid of veins. No mining prospects in this formation are known in the district. The sediments north of the Benton mine show signs of contact metamorphism where the sandstones and slates are in contact with the quartz diorite, but there are no indications of ore deposition. Seemingly the sediments were unfavorable for the formation of faults along which mineralizing solutions could migrate, in contrast to the more rigid quartz diorite stock at the Benton mine where conditions were most favorable for development of veins and mineralization. The sediments do not appear to be a promising area for prospecting.

#### Greenstone

The greenstone rock on the east side of the area mapped contains numerous veins from which considerable amounts of gold have been mined. This production has come largely from short and narrow ore shoots along rather prominent major shear zones, usually at their junction with a minor fissure. The ore shoots do not usually exceed 100 feet in length or 5 feet in width; however, they usually have a much greater depth, extending downward for a distance of from 3 to 6 times their horizontal length. Sampling showed that ore values were usually higher in the greenstone than in veins in other parts of the area.

These ore shoots are attractive to the small prospector because of the higher ore values and because they are usually worked on a small scale. The ores are generally largely free milling and can be treated by amalgamation in an arrastre or a stamp mill.

The tonnage of ore present is a limiting factor when a major mining operation is considered. An individual ore shoot in the greenstone does not have large tonnage, and prospecting has invariably failed to locate additional ore shoots within an economic distance along the vein.

The ores commonly contain some sulphide minerals. Copper staining as a result of the oxidation of chalcopyrite has been found to be a good indication of gold values in these ore shoots.

#### Gabbro complex

A number of veins in the gabbro complex have been prospected by shallow cuts and short tunnels. The veins show some persistence along their strike and range in width from a few inches to 3 or 4 feet. They are similar in appearance to those found in the quartz diorite, and occur in shear zones as overlapping lenses of quartz. Replacement of the sheared vein matter and walls by quartz and pyrite is common.

The veins where sampled are persistently low in gold values which range from a trace to 0.03 ounce to the ton. Chalcopyrite and pyrite are the principal sulphide minerals. Copper staining of the oxidized quartz outcrops undoubtedly attracted prospectors' interest because these outcrops are very similar in appearance to the high-grade copper-stained ores found in the veins in the greenstone.

The copper content and the size of the veins do not indicate that they would be a commercial source of copper; however, no work has been done on these veins at depth, and the possibility of extension of the ore may not be entirely dismissed.

#### Quartz diorite intrusives

The Benton quartz diorite stock is the only body of rock of this type that has been explored by underground mining in the area. The veins explored have been shown to be persistent over considerable vertical and horizontal distances. The ore shoots are from a few feet to several hundred feet in length with widths of from 1 to 20 feet. Gold values are rarely less than .06 ounce per ton and may be as much as several ounces. Large ore shoots and continuity of veins and gold values make veins occurring in quartz diorite attractive because of the possibility of developing considerable tonnage of milling-grade ore. The occurrence of economic ore bodies in the Benton stock indicates that attention in the future should be given to locating and prospecting other quartz diorite stocks to the northeast and to the southeast, as conditions favorable for the formation of important commercial deposits appear to be most favorable in these areas.

Both chalcopyrite and copper staining are almost entirely lacking in the veins of the Benton stock. The gold is very closely associated with pyrite and very little free gold can be recovered by panning. Hence prospecting these veins by panning is not a reliable guide as to the gold values. A channel sample should be cut from the vein, and values determined by fire assaying. Presence of pyrite in veins in the quartz diorite is generally an indication of gold values.

FIG. 1

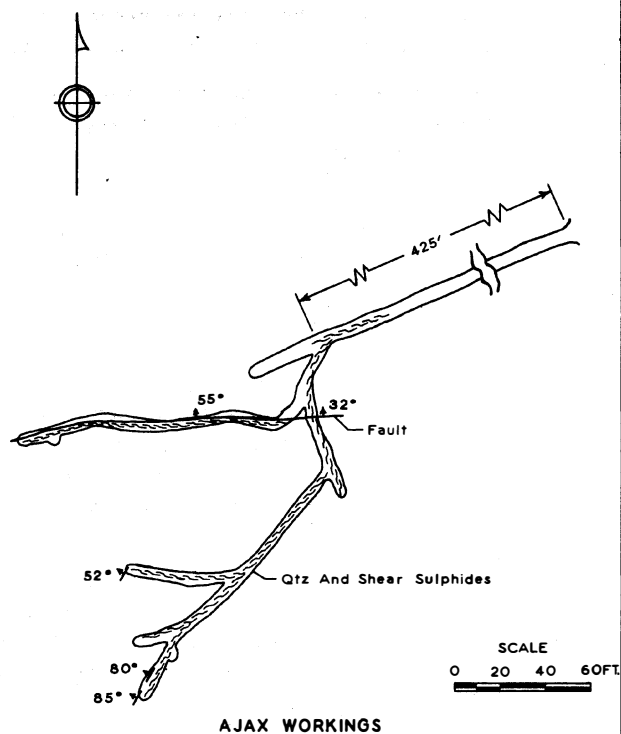


FIG. 2

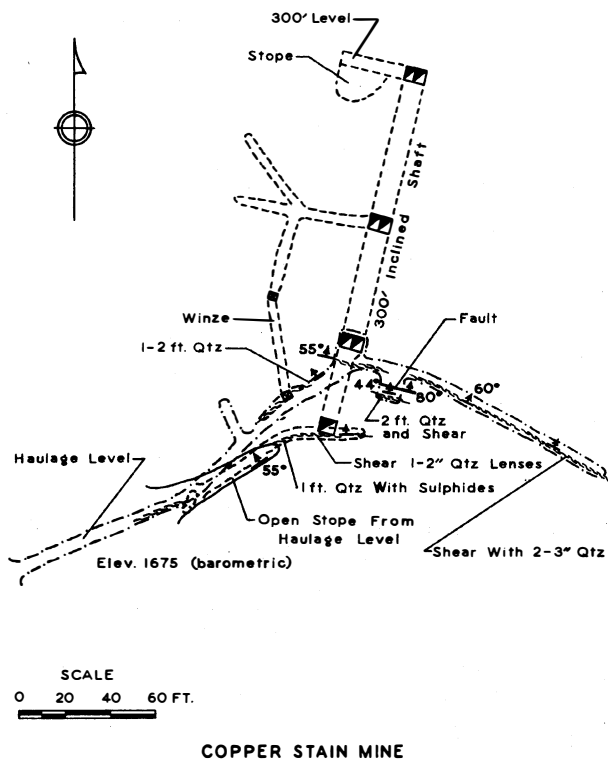


FIG. 3

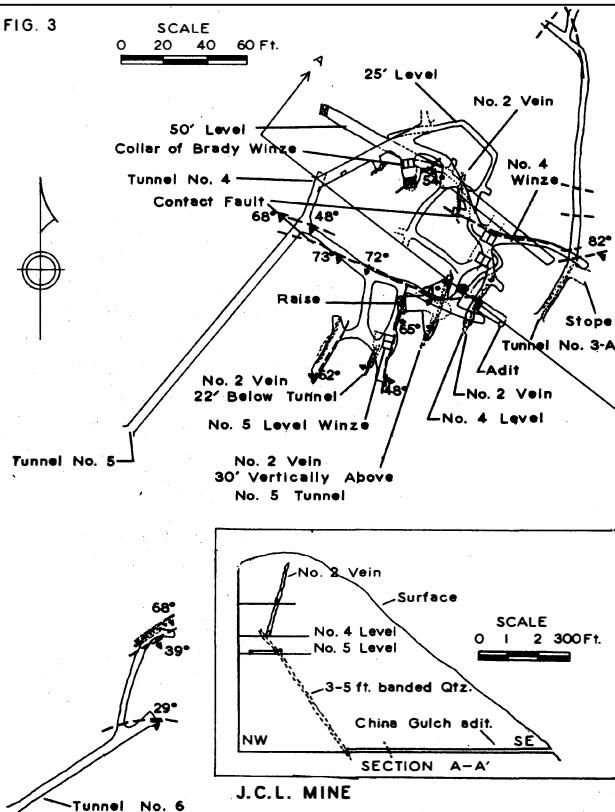
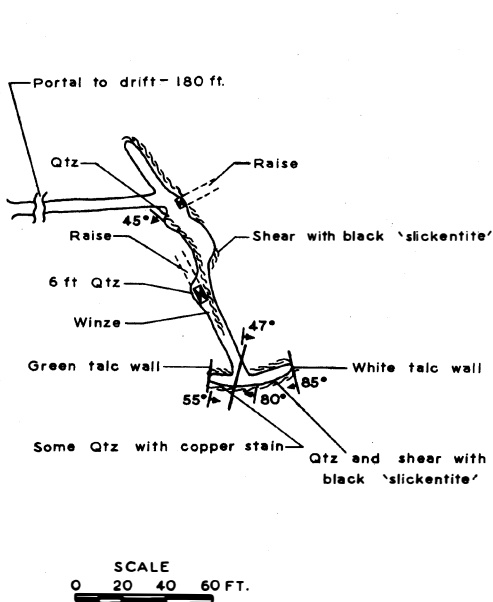


FIG. 4



## Ore Deposits

Following are descriptions of 24 mines and prospects in the Mt. Reuben district. Their locations are shown on the mine index map on page 4.

Ajax mine (1)\*

Location and history: The Ajax group is located in the N $\frac{1}{2}$  sec. 36, T. 33 S., R. 8 W., at an elevation of about 2500 feet. The mine may be reached by a rough road from the camp of the California mine on Reuben Creek, a distance of 2 miles.

The early history of the mine is unknown to the writer; however, the Ajax is said to be one of the early prospects in the region. The remains of an old steam-driven stamp mill can be seen below the lowest workings in Ajax Gulch. Mr. A. Walker, late owner of the group, stated that about \$6000 was recovered by milling, and a like amount was obtained from high-grade shipping ore, making a total production of approximately \$12,000.

Development: At the time the mine was examined, (fig. 1, pl. 1) only the lower adit on Ajax Gulch was open; several levels above were caved. The lower adit intersects a shear zone at a distance of 400 feet from the portal, and branching drifts were driven along more favorable appearing zones. Mr. Walker stated that a tunnel, located over the ridge from the Ajax tunnel, was surveyed and that at an elevation about 400 feet below the Ajax tunnel, it cut a shear zone containing good ore. He also stated that in a northerly direction from the Ajax adit there is a shaft 160 feet deep, sunk on a ledge located above the Ajax road. Total development work on the claims is reported to be about 3000 feet. A second trip was made into the area to locate the additional workings reported by Mr. Walker, but without success.

Geology: The Ajax workings visited are in a schistose, limy, chloritic, andesitic tuff which belongs to the greenstone series in the area. No intrusive rocks were noted in the vicinity of the mine.

The underground workings explored a major shear zone which was exposed over a width of 140 feet. This zone strikes N. 30° to 40° E. and dips about 80° W. The drifts in the shear zone explored more prominent shears along which pyrite and small lenticular bodies of quartz were found. These lenses were usually parallel to the shearing and varied from a fraction of an inch to 3 or 4 inches in width and from an inch to about 2 feet in length. Signs of mineralization were not prominent. Alteration of the shear zone was probably almost entirely due to regional metamorphism rather than from magmatic solutions. The rocks had an appearance of partial recrystallization which may have accounted at least in part for the formation of pyrite and free quartz.

Economic considerations: The workings from which ore was produced were either closed or could not be found; therefore little may be said concerning the occurrence of gold at this property. Seven samples were taken from the more promising looking veinlets. These samples showed gold values from a trace to 0.02 ounce per ton and negligible amounts of silver.

Copper Stain mine (5)

Location and history: The Copper Stain group is composed of 5 patented lode claims and 2 fractions named Copper Stain, Rabbit Foot, Golden Hope, Elbertina, Redeemer, Thirteen, and Susie. They are located in China Gulch in the N $\frac{1}{2}$  sec. 35, T. 33 S., R. 8 W. The U.S. Forest Service Rogue River trail passes the mine workings (fig. 2, pl. 1) about half a mile from its junction with the Mt. Reuben road.

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\* Numbers after mine names are the same as key numbers on mine index map (see page 4).

The property was first worked at about the time the Saint Patrick and the J.C.L. mines were active in the early 1900's. Mr. W. Davis worked the property for a time, apparently with some success. At his death, the result of a mine accident, the property was closed down. In the early 1930's Mr. K. Dean Butler leased the property from Mrs. Susan Z. Lamerence of Springfield, Illinois. Butler installed an amalgamation and concentrating plant and reopened the mine. He operated the property for a short time and closed down, reportedly because of the inability of the plant to recover the gold values. The shaft was allowed to fill with water and the mine has been idle since that time. There is no record of production available.

Development: The mine is developed by a 300-foot inclined shaft, three working levels, and one winze from the haulage level of unknown depth. Total length of workings probably is in the order of 1000 feet. The lower workings were inaccessible at the time the mine was visited. The workings shown on the map are sketched from data given by Clayton Sanderson of Galice who worked in the mine in 1932.

A mill building and equipment have been removed from the property.

Geology: The Copper Stain mine is located in greenstone which locally is made up of a fine-grained, dense, greenish-gray rock. There are no intrusive rocks in the immediate vicinity of the mine. The gabbros are some 1500 feet to the west, and the southern tip of the Benton quartz diorite stock is a mile to the northwest.

The workings expose two veins, one with a strike of N. 45° E. and a dip of 55° NW., and the other with a strike of S. 70° E. and a dip of 45° to 60° NE. Both veins contain lenticular bodies of quartz; however, all the stoping has been done on the first-mentioned or northeasterly vein from the junction of the two veins to a point 50 feet to the south. The footwall of the southeasterly vein appears to terminate the northeasterly trending vein to the north. The northeasterly trending vein is in a prominent shear zone from 10 to 15 feet wide, and the workings do not expose the foot or hanging walls completely. The wall exposed shows signs of shearing, and in places considerable amounts of disseminated cubic pyrite are present. A thin section shows the following order of mineral deposition: quartz (1) strained, followed by quartz (2), and then intimately associated pyrite, calcite, and sericite. The gold values apparently occurred in lenses of quartz associated with the pyrite and chalcopyrite within the shear zone and partly as free gold in quartz. Several lenses of quartz are exposed on the floor and west wall of the drift for a distance of 20 feet northeast of the first winze, and terminate at the junction with the southeasterly trending vein. A sample across 1.8 feet of quartz assayed 1.42 ounces gold per ton. Remnants of lenses sampled in other parts of the open stope above the level were found to contain similar values.

The southeasterly trending vein is much narrower. It occurs in a shear zone from 1 to 3 feet in width with a quartz lens about 18 inches wide just north of the main shaft. The vein weakens and quartz becomes less persistent to the north. Three samples from the better appearing lenses assayed from 0.04 to 0.10 ounce in gold.

The inclined shaft was sunk on the southeasterly trending vein a distance of 300 feet. Two drifts, driven to the northwest from the 150-foot and 300-foot stations, are reported to have encountered some high-grade ore, and to have shown indications of a considerable amount of milling ore in a wide shear zone. The relationship to the ore stoped on the upper level could not be determined as the shaft was full of water.

Economic considerations: As at other prospects in the greenstone, copper staining is reported to be an indication of good gold values.

Judging from evidence found in the upper workings, the northeasterly trending vein is the only one that contains ore of commercial value. Exploration south of the shaft on the lower levels indicates that this condition may be true at lower levels also. It would appear that future development should be concentrated in the northeasterly trending vein at or near the junction of the two veins.



J.C.L. mine (7)

Location and history: The J.C.L. mine lies on a spur to the west of China Gulch at an elevation of about 1000 feet on the north side of the Rogue River in the  $\frac{1}{2}$  sec. 35, T. 33 S., R. 8 W. It is reached from the Mt. Reuben road via the Forest Service Rogue River trail. The mine is approximately  $1\frac{1}{2}$  miles from the Mt. Reuben road.

History of the mine prior to its purchase by John C. Lewis about 1900 is unknown. Since that time it has been owned by Mr. Lewis and later by the Lewis Investment Company. Early operations were carried on by John C. Lewis and subsequently the property was operated by leasers. Mine production has amounted to about \$100,000.

Property and development: Eight patented claims comprise the property. The mine (fig. 3, pl. 1 opposite p. 11) has been opened by 6 adits and a crosscut 650 feet long driven in China Gulch about 323 feet below the no. 4 level. Workings total perhaps 3000 feet in length. A small mill equipped for amalgamation and gravity concentration was built on the property but has been removed.

Geology: The mine is in a "greenstone" rock close to a contact with gabbro to the west. The "greenstone" in the vicinity of the mine is for the most part a dense, fine-grained black rock, which upon petrographic examination was found to be a plagioclase (oligoclase-andesine)-quartz-biotite schist. Intrusive gabbro and related rocks are found west of the mine. No quartz diorite was noted in the immediate vicinity. The Benton quartz diorite contact is about 4500 feet to the northwest.

The major part of the mine production apparently came from an ore shoot from 20 to 50 feet long with a width of about 18 inches. The shoot was stoped from the surface to the no. 5 level, a distance of 100 feet. Mr. J. C. Lewis reported to W. W. Elmer<sup>1</sup> in 1931 that a lens 10 feet by 6 feet assaying \$40 to the ton, upon which a 6-foot winze was sunk, continued below the no. 5 level. Gold occurred free in quartz lenses in a shear zone. The sulphide content of the ore was apparently small, and the gold was recovered by stamp milling and amalgamation.

The mine workings, except for the China Gulch crosscut, were closed in 1945; however, the author was able to gain access to the no. 5 level in 1941.

Considerable trenching and what appeared to be excavations resulting from pocket hunting extend over several thousand square feet on the surface above the underground workings. It is reported that gold can be obtained by panning the surface dirt there. Time was not available to determine whether the source of the gold was from widely disseminated gold values in the country rock or was the result of residual concentration of gold from a weathered, rich ore shoot. However, characteristics of the gold in the mine are evidence that the values in the surface soil came from a surface shoot.

Seemingly, the China Gulch crosscut was driven to develop the mine at depth. The crosscut was driven 650 feet in a westerly direction in a dark fine-grained schist. At that point it intersects a banded quartz vein, 3 to 5 feet wide, containing a few grains of iron sulphide. Samples taken across both faces, according to W. W. Elmer<sup>1</sup>, gave returns of \$2.00 per ton. No drifting was done on this vein. A shear 3 or 4 inches wide containing small amounts of quartz was encountered 140 feet from the face. Both veins dip 50° to 60° E.; however, the vein from which the major part of the gold was recovered in the upper workings dips equally strongly to the west. If these dips are constant, the gold-producing ore shoot, shown on the map as the no. 2 vein and worked in the upper levels, would be intersected by the vein encountered in the China Gulch adit before it reached that level.

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<sup>1</sup> From report by W. W. Elmer to Lewis Investment Co., 1931.

**Economic considerations:** The major ore production from this mine came seemingly from one small rich ore shoot which was mined from the surface to a depth of about 100 feet. Considerable drifting and crosscutting failed to expose additional ore. The most likely area to prospect for further extension would be in an undeveloped area below the original shoot. Exploration along the strike of the vein would not offer much promise because previous experience has shown that in other prospects in greenstone the ore shoots are so far apart that horizontal exploration underground is generally discouraging. The vein in the China Gulch adit has not been prospected, although it does carry some gold values. This vein intersects the ore shoot stoped above and probably terminates its downward extension.

#### Saint Patrick mine (17)

**Location and history:** The Saint Patrick mine is located approximately east of the J.C.L. mine on the east slope of China Gulch at a slightly lower elevation than the Copper Stain mine. The workings are situated approximately in the center of sec. 35, T. 33 S., R. 8 W.

The early development work was done (fig. 4, pl. 1, opposite p. 11) by Rube Jones and later by J. C. Lewis. The Lewis Investment Company dropped the claim when they patented the J.C.L. mine ground. The claim lay vacant until the early 1930's when it was relocated by Jack Brady of Grants Pass, who is the present owner. Some ore was shipped from the mine. The total production is not known, but it probably was in the order of \$1000.

**Development:** The vein is reached by an adit approximately 200 feet in length and was drifted on 90 feet to the south and 30 feet to the north. Forty feet to the south an inclined winze was sunk 40 feet on the ore shoot. An inclined raise also extends from this point to a sublevel which was inaccessible at the time the mine was examined. An inclined raise, which appears to extend to the surface, starts from the end of the cross-out; the raise is now bulkheaded and is filled.

**Geology:** The workings are in greenstone, locally an andesine-hornblende schist. The rock has some of the properties of the dense greenstone but size of crystals of individual minerals is somewhat greater. There is a distinct thin banding which indicates recrystallization. There are no intrusive rocks in the immediate vicinity of the mine. Some intrusive gabbro is present east of the J.C.L. mine.

The ore shoot occurs on the west side of a shear zone some 40 feet in width. This shear zone which has a strike of N. 30° W. and a dip of 85° W. is highly altered to nearly a gouge with black "slickentite"\* on the shear planes. A reversal of dip was noted in several places. The ore shoot appears to be a feature of fracturing in the hanging wall along which ascending mineralizing solutions migrated and deposited quartz and sulphides. The filling in the main shear zone appears to be resistant and impervious to replacement by mineralizing solutions. The ore shoot extends from the adit south along the hanging wall for 50 feet, and the mineralized zone varies in width from a fraction of a foot to 8½ feet over the shaft. The shoot is badly broken, apparently owing to post-mineral faulting along the major shear zone. Ore is composed of quartz containing chalcopyrite, pyrite, and free gold. Petrographic study shows the order of mineral deposition to be as follows: quartz (1) brecciated, followed by quartz (2), followed by pyrite and calcite. Gold values are indicated by the amounts of sulphides present. In the oxidized zone copper staining is a good indication of gold values.

**Economic considerations:** Seven samples were taken south of the adit along the ore shoot and gave returns from 0.02 ounce to 1.06 ounces of gold to the ton, with minor amounts

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\* A term applied to southwestern Oregon greenstones which have been altered to serpentine-appearing rocks by shearing or faulting.

of silver. Three of these samples have values too low to be economic. However, indications are that this ore shoot may be of economic importance, should development work expose more of the better grade ore.

#### Pix prospect (12)

Location and history: The Pix claim is an unpatented lode claim lying north of the patented U. S. claim and to the east of the patented Silver State claim, both of the Gold Bug group. It is in the NE $\frac{1}{4}$  sec. 26, T. 33 S., R. 8 W. The adit lies about 100 feet below the Mt. Reuben road at an elevation of 2200 feet (aneroid reading). The early work on the prospect was done some 20 or 30 years ago by C. E. Romig and Ed T. Romig, who milled some ore from the shaft in an arrastre and started the lower adit. In 1941, Ed. T. Romig leased the prospect and completed the lower adit. He drifted about 35 feet to the north and south on the vein and relinquished his lease without producing any ore. The claim is now owned by Ed T. Romig of Grants Pass, and Mrs. Annie M. Neil of Portland, Oregon.

Development and production: The outcrop of the Pix vein was first developed by 4 cuts and a 40-foot shaft above the Mt. Reuben road. To explore the vein, an adit 205 feet long was driven from a point below the road to intersect the vein 120 feet below its outcrop. From the adit, drifts were driven along the vein 35 feet to the east and 50 feet to the west.

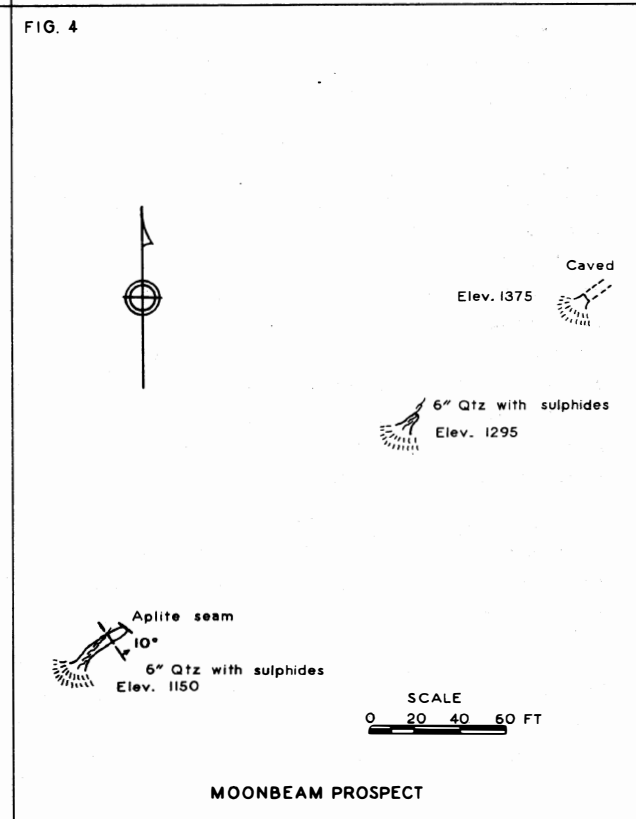
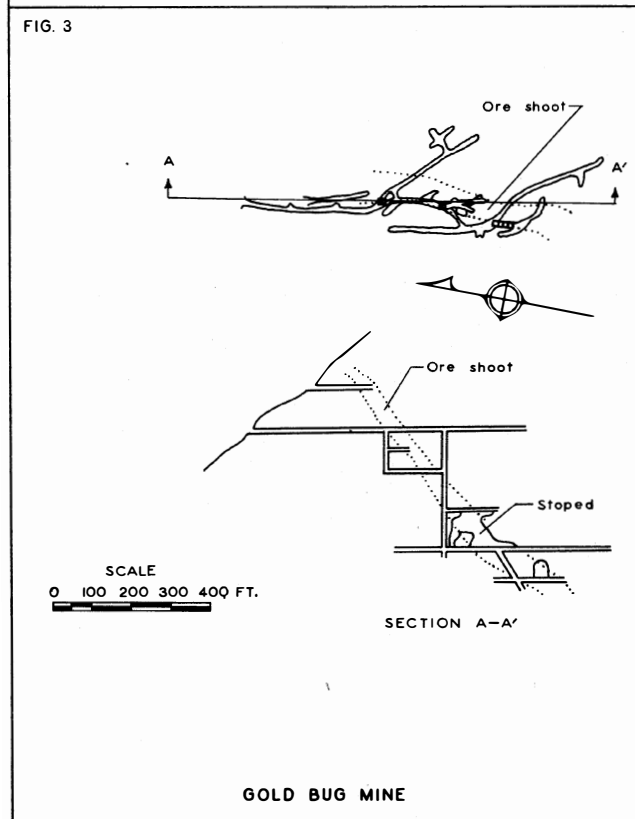
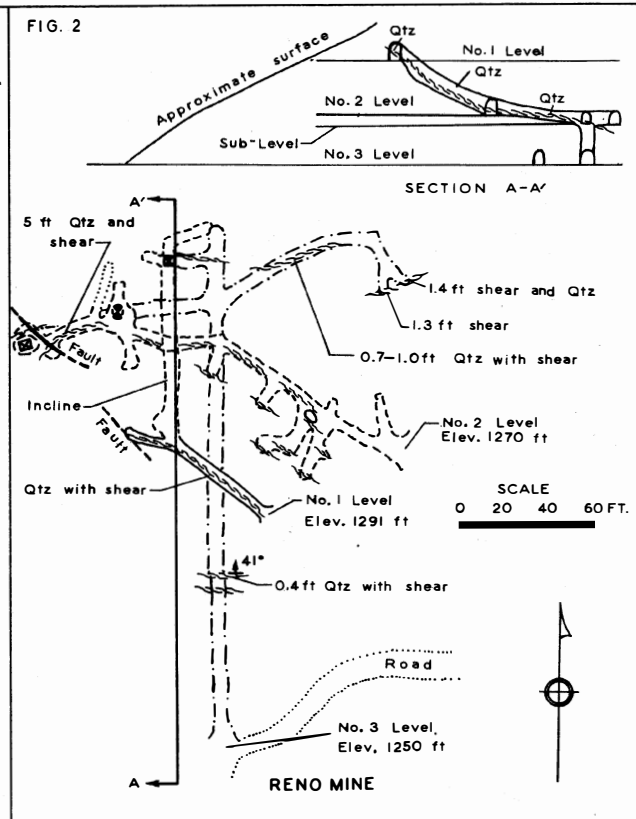
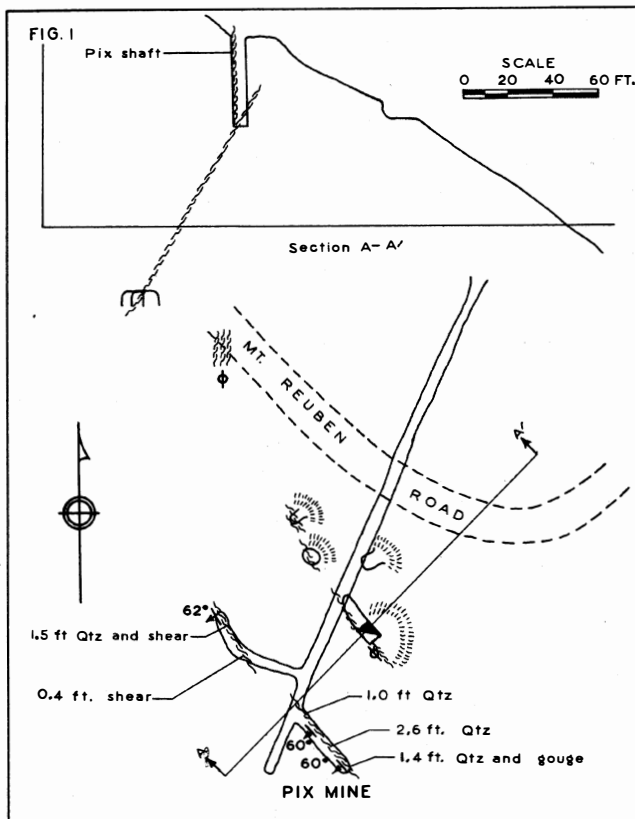
Ore encountered in the shaft was hand-sorted and milled in an arrastre. The exact tonnage milled or the amount of gold recovered is not known but probably the value was in the order of \$1000 or \$2000.

Geology: The Pix vein as shown in the workings cuts a fine-grained greenstone having the typical greenish cast. The rock has a porphyritic texture, and petrographic examination indicates that it is an altered porphyritic andesite. The prospect is located about 800 feet east of the contact of the greenstone with the gabbro. No quartz diorite intrusive was noted in the immediate vicinity of the prospect.

The vein encountered in the lower adit strikes N. 20° to 30° W. and dips 60° S. The shaft on the surface appears to have followed a vein that was approximately vertical, which indicates, as shown on the map (fig. 1, pl. 2. opposite p. 17) that either the shaft was sunk on a split of the vein encountered below, or the dip of the vein steepened above the adit level. However, the ore found on the dump of the shaft is similar to that found in the adit level. The vein is a shear zone 1 to 3 feet wide which has overlapping small lenses of quartz containing sulphides. The amount of sulphides was usually small, consisting of only a few scattered blebs and grains. The sulphides were partially oxidized, with some copper staining indicating the presence of chalcopyrite. No free gold was seen in the ore, but it is reported that about \$20 per ton was recovered by amalgamation from the ore taken from the shaft. A thin section showed that there were two generations of quartz with pyrite accompanying the last.

Economic considerations: Samples taken along the vein on the adit level gave values from a trace to 0.32 ounce to the ton in gold. A picked sample taken from the dump of the shaft gave returns of 3.06 ounces to the ton in gold. Sampling indicates that gold values increase with the amount of sulphides and copper staining.

Ore containing the values found in the shaft has not been found in the lower adit, but sufficient drifting has not been done on this level to expose this ore shoot if it should have a pitch along the strike of the vein as is characteristic of other veins in the area.



Reno mine (15)

Location and history: The Reno mine is in the NW $\frac{1}{4}$  sec. 33, T. 33 S., R. 8 W., between Whisky Creek and Alder Creek on the north side of the Rogue River at an elevation of 1250 feet (aneroid reading). The mine may be reached from the Mt. Reuben-Eden Valley road via the Benton mine and a road down the west side of Whisky Creek for a distance of 3 miles from the Benton mine.

The mine is at present owned by Alex Watts of Grants Pass, who holds 2 claims by location. There have been numerous owners and the property was reported active by Diller (1914). A 15-ton mill was installed on the property in the early 1930's and operated only a short time. Mine production probably has not exceeded \$5000.

Geology: Workings of the Reno mine (see fig. 2, pl. 2 opposite p. 17) explore a gently dipping quartz vein in hornblende-magnetite-rich gabbro close to a mass of serpentine. The vein strikes N. 50° W. and dips 10° to 20° E. The lower crosscut intersects a second small vein, about 80 feet from the portal, upon which no development work has been done. The vein strikes due east and dips 41° to the north. The veins are formed along shear zones with replacement of country rock and sheared material by quartz containing free gold and pyrite. The quartz in the main vein is usually quite narrow, from 3 to 10 inches; locally it widens to several feet. The quartz in the vein forms rather short overlapping lenses. A specimen of ore shows the vein minerals have the following sequence of deposition: quartz (1) introduced and brecciated, then pyrite, quartz (2), sericite and zoisite. Gold values are persistent throughout the vein; However, 75 samples taken at 5-foot intervals showed that these values are erratic. Of the 75 samples taken, 26 gave values in excess of 0.10 ounce to the ton in gold, and of these 6 contained gold in excess of 0.30 ounce to the ton. Four of them ranged from 0.96 ounce to 18.94 ounces to the ton. These results confirm reports that most of the production came from small bodies of high-grade ore from which the gold was recovered by mortaring and panning.

Economic considerations: The gentle dip of the vein and the lenslike form of the quartz within the vein make it difficult to follow. It appears that the major portion of the workings on the lower level are not on the vein except for a short portion of the east drift. The crosscut would have to be extended several feet to intersect the vein on that level. The vein on the intermediate level is terminated by a fault with a throw to the northeast. There is no indication that the vein does not continue beyond this point. Sampling indicates that a small ore shoot exists between the fault and the raise. The small vein exposed in the crosscut, 80 feet from the portal, warrants some prospecting as several pieces of quartz containing free gold were found during sampling; however, a cut sample assayed only 0.045 ounce to the ton. There appears to be small chance of developing any substantial tonnage of milling-grade ore. If further development is undertaken, it will probably be limited to searching for "pockets."

Gold Bug mine (6)

Location: The Gold Bug group is located in sec. 26, T. 33 S., R. 8 W., on a spur of Mt. Reuben at an elevation of 2400 to 2600 feet (aneroid reading). The Mt. Reuben road crosses the west and north sides of the property.

The group is composed of 5 and a fraction patented claims - namely, the Gold Bug, Oregonian, Silver Dollar, Silver State, U. S., and Bimetallic. The property is owned by Ed. T. Romig of Grants Pass and Mrs. Annie M. Neil of Portland, Oregon.

Development and production: The Gold Bug mine is developed by two adits; two vertical shafts, one of which is 150 feet deep; and the main hoisting shaft 300 feet in depth, together with an inclined winze 125 feet in depth to a level below the bottom of the hoisting shaft (see fig. 3, pl. 2 opposite p. 17). There are four levels below the no. 2 adit. The ore has been stoped for a distance of about 600 feet on the dip of the ore shoot.

The original mill was an amalgamation and cyanide leaching plant having a capacity of 15 tons per day. Grinding equipment consisted of a primary jaw crusher and a 5-stamp mill. Power was steam with cordwood for fuel.

Production was reported to have been about \$750,000, produced from ore having a gold content of \$50 per ton. The author has not been able to substantiate the production by mill records or mill receipts.

Geology: The vein at the Gold Bug mine is a mineralized shear zone in greenstone which forms a major part of the eastern half of the area studied. The greenstone locally is an altered amygdaleidal, perphyritic basic lava. No intrusive rocks were noted in the immediate vicinity of the workings. A belt of gabbro lies about 800 feet west of the workings, and the Benton quartz diorite stock is approximately 4000 feet to the west.

The ore shoot from which ore was produced is at the junction of a tension fissure with a major north-trending shear zone. This shear zone, which was drifted on to its intersection with the tension fault containing the ore shoot, is not fully exposed in cross-section. However, several short dog holes to the east indicate that it may be from 10 to 20 feet in width. Fairly large amounts of sulphides were seen in places in the shear zone, but quartz was present only in small amounts. The shear zone was composed largely of chloritic material.

The split in the vein which contains the ore shoot strikes S. 45° E. and dips 45° to 50° to the southwest. This vein showed little evidence of movement, as very little shearing was developed. The old stopes, where observed, indicate that the ore is about 2 feet in width. At its junction with the main shear zone, it is said to have been stoped for a width of 15 to 20 feet. The ore shoot appears to be a fissure filling with little replacement of the wall rocks by ore minerals. The vein was explored on the no. 2 level for about 300 feet to the southeast. It was widest at the point of juncture and weakened to the southeast, finally splitting into several tight seams. The ore shoot appears to have had an average length of about 100 feet. The shoot is reported to continue below the no. 6 level but with some decrease in value. Ore minerals are quartz, free gold, pyrite, and chalcopyrite. A thin section of a typical ore specimen showed the order of mineral deposition to be: quartz (1), followed by calcite, pyrite and quartz (2), and chlorite. Calcite veinlets were last to form.

Economic considerations: Gold content of the ore milled is reported to have been about 2.5 ounces to the ton but the report has not been verified. Several samples taken from remnants of the ore shoot in old stopes above the no. 2 level contained about 0.60 ounce gold to the ton. Gold value contained in the last ore milled from the lower levels also is reported to have been about 0.60 ounce to the ton.

As the mine is inaccessible below the no. 2 level and the condition of the ore shoot cannot be observed, it is impossible to make predictions as to the possibility of ore continuing below this no. 6 level. The ore shoot has been mined for a much greater distance down the dip of the vein than is reasonable to expect for a shoot having such a short horizontal length. However, ore shoots of this type are characteristic in the veins found in the greenstone.

Further drifting along the north-trending shear zone, with the expectation of finding another ore-bearing branching fissure, is hazardous unless surface exploration gives favorable indications. Experience at the J.C.L., California, Copper Stain, and Oversight mines has shown that usually only one ore shoot exists.

Moonbeam prospect (10)

Location and history: The Moonbeam prospect is in the NE $\frac{1}{4}$  sec. 33, T. 33 S., R. 8 W., about 500 feet west of the upper portion of the slide which is west of Whisky Creek and the Reno mine. The lower cut and adit are at an elevation of 1150 feet (fig. 4, pl. 2 opposite p. 17). The names of previous locators are unknown. The prospect has had no known production.

Geology: The country rock is a dark-gray, fine-grained, hornblende-rich gabbro. The Bothan formation occurs a few hundred feet to the west. Serpentine, diorite, and related rocks are exposed approximately 500 feet to the east. The formations trend northeasterly, approximating the trend of the vein which strikes N. 15° E. and dips 40° E. The vein is exposed in three places by short drifts and cuts over a distance of 350 feet. Vein material is quartz containing pyrite and is a replacement of gabbro along a shear zone. No free gold was noted in the ore; however, it probably occurs both in the free state and associated with pyrite. A sample of quartz with sulphides from the upper cut assayed 0.36 ounce to the ton in gold and 0.27 ounce to the ton in silver. A sample from no. 2 cut across 6 inches assayed 0.02 ounce to the ton in gold and a trace in silver. A sample from the lower portal across 6 inches of quartz with sulphides assayed 0.115 ounce to the ton in gold and 0.30 ounce to the ton in silver.

Economic considerations: This vein has not been sufficiently explored to determine its economic importance.

California Gulch prospect (4)

Location and history: Several shallow cuts expose a vein at the head of California Gulch on its north slope about 1500 feet west of the Mt. Reuben road. The prospect is in the SW $\frac{1}{4}$  sec. 26, T. 33 S., R. 8 W. (see mine index map on p. 4).

History of the prospect is unknown, but the ground does not appear to be covered by any lode claims.

Geology: The vein is in gabbro about 1000 feet west of the contact with greenstone. The Benton quartz diorite stock lies about the same distance to the west of the contact. A 20-foot cut leads to a tunnel 6 feet long which exposes a shear zone about 4 feet wide with 4 inches of quartz containing sulphides on the footwall. Quartz veinlets and sulphides are also visible in the shear zone with some copper staining. Petrographic examination of the ore shows the order of mineral deposition to be: quartz, quartz with pyrite, epidote, and chlorite. The vein strikes N. 25° E. and dips 60° to the east. Several shallow cuts expose the vein for a distance of about 200 feet along the strike.

Economic considerations: A sample across 4 inches of the quartz with sulphides in the cut returned only a trace of gold and silver. The quantity of chalcopyrite present is not commercial. The vein and values are typical of other veins found in the gabbro. It does not appear that continued prospecting on this vein would expose ore of commercial value.

Molly Hill mine (9)

Location and history: This property, consisting of the Molly Hill patented lode claim, is in sec. 26, T. 33 N., R. 8 W. (see mine index map on p. 4) on the Whisky Creek side about 500 feet west of the Old California mine workings which are on top of the ridge between Whisky Creek and Reuben Creek west of the Gold Bug mine. The claim is owned by the Kamm estate of Portland.

The early history of the property is not known to the author. The last work was done on the property in the 1920's when C. E. Romig sank a shaft for the owners to a depth of 90 feet.



Development and ownership: Two shafts have been sunk on the vein. Depth of the shaft farthest north is unknown. The last shaft, sunk by Mr. Romig, is 52 feet to the south of the first. It is not known whether any drifting was done from these shafts.

Geology: The mine is in a series of greenstone rocks. Locally the country rock is a gray porphyritic andesite similar to that found in the California mine. There are no intrusive rocks in the vicinity of the workings. The two shafts expose a shear zone from 1 to 2 feet wide which contains quartz 1 or 2 inches wide on the footwall. Quartz on the dump from the south shaft indicates that a lens 1 to 1½ feet wide was encountered at depth. The vein strikes N. 10° W. and dips 83° E. Sulphides are rare in the quartz on the dumps. Several pieces were found with copper staining which elsewhere has indicated gold values in veins in greenstone.

Economic considerations: Because of the caving of the shafts, the vein could be observed only near the surface. A grab sample of material on the dump showing copper stain returned 0.06 ounce to the ton in gold and 0.20 ounce to the ton in silver. Good ore was reportedly found in the south shaft by Mr. C. E. Romig but because the shaft was caved the report could not be verified.

#### Skinner prospect (16)

Location and history: The Skinner prospect is located about 200 feet south of the Alder Creek trail in the NW¼ sec. 34, NE¼ sec. 33, and the SW¼ sec. 27, T. 33 S., R. 8 W., (see mine index map on p. 4). Ownership of the claim could not be determined; it may be on ground belonging to the Reno group. Workings consist of a trench and a shallow pit on the top of the ridge northwest of the Reno mine workings.

Geology: The workings were caved so that strike and dip of the vein could not be determined. Country rock is fine-grained greenstone. A band of serpentine and gabbro is located about 600 feet to the southeast. The vein consists of replacement of the greenstone by quartz and pyrite along a shear zone.

Economic considerations: Although the vein was not sufficiently exposed to determine economic value accurately, a sample taken across 3 feet of quartz and sheared vein matter assayed 0.04 ounce to the ton in gold and 0.16 ounce to the ton in silver. Geologic conditions are similar to those at the Reno mine where a small tonnage of ore of exceptional grade has been found. Prospecting might be conducted with this in mind.

#### Whisky Springs prospect (20)

Location and history: The Whisky Creek Springs prospect is on the Alder Creek trail, which leaves the road about 300 feet east of the Reno mine. The prospect is in the SE¼ sec. 28, T. 33 S., R. 8 W., (see mine index map on p. 4) and lies about 50 feet southwest of the trail at the head of Alder Creek at an elevation of 2400 feet (aneroid reading).

Date of discovery and name of previous owners are unknown. A trench and a cut about 20 feet long expose the vein.

Geology: The prospect is at or near the contact between the Dothan formation and greenstone. No intrusive rocks were noted in the vicinity of the prospect. The vein has a northeasterly strike and dips steeply to the east. The cut exposes a shear zone 6 feet in width of which 3 feet on the west side is heavily mineralized with pyrite and partially replaced by quartz. A sample across 3 feet of the mineralized portion of the vein assayed 0.02 ounce to the ton in gold and a trace in silver.

**Economic considerations:** Although highly mineralized and of fair width, the vein contains values that are not encouraging for further development. Geological conditions do not show that a major change in gold values is to be expected.

#### Whiteneck prospects (21)

**Location and history:** A series of cuts and short adits on several outcrops on the east side of Whisky Creek and south of California Gulch are locally called the Whiteneck prospects (see mine index map on p. 4). They are in the NE $\frac{1}{4}$  sec. 34 and the SE $\frac{1}{4}$  sec. 27, T. 33 S., R. 8 W., at an elevation of about 1000 feet. The early history of these workings is not known. Cy Whiteneck, however, was the last to prospect these veins.

**Geology:** Veins on the property are in gabbro and associated rocks. A portion of these rocks probably is recrystallized metavolcanics and greenstone and the remainder is intrusive gabbro. The veins are in shear zones in which quartz and sulphides have filled fissures and replaced wall rocks. In the most northerly out the vein was not exposed but the dump contains considerable quartz with massive white iron sulphide indicating that the width of the vein is about 2 feet. Approximately 100 feet south of the cut at the same elevation, a shallow out exposes a vein 2 feet wide which strikes N. 75° E. and dips 85° S. The vein has fairly definite walls and shows some shearing. The quartz contains scattered grains of white iron pyrite and some scattered copper stains which indicate the presence of a small amount of chalcopyrite. This vein extends several hundred feet down the hill from the outcrop. Another vein is exposed at approximately the same elevation several hundred feet farther south in the bottom of and on the north side of the gulch just south of California Gulch. A short adit, 15 feet long, on the east bank exposes a silicified and mineralized shear zone about 10 feet wide. The sulphides are massive and consist largely of pyrrhotite; minor amounts of chalcopyrite were noted with a hand lens. The mineralized zone strikes N. 25° W. and dips 35° E., but to the south across the gulch it is apparently cut off by a shear zone of considerable width striking N. 75° E. The outcrop of the mineralized zone to the north is obscured by overburden. The rocks in the shear zone, which cuts off the extension of this deposit to the south, are intensely altered and in part have been changed to serpentine.

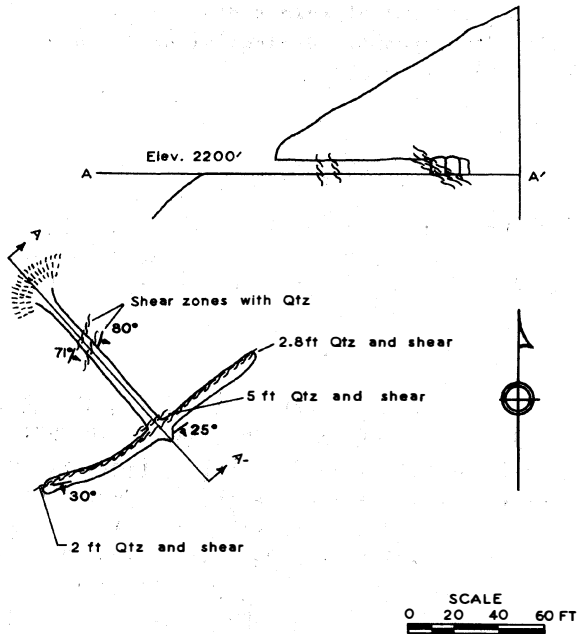
**Economic considerations:** Samples taken by the Department and the Lewis Investment Company show that these veins contain only from 0.01 to 0.03 ounce to the ton in gold, although they contain an abundance of pyrite which generally means high gold values in the Benton quartz diorite stock. Low gold values in this type of vein in gabbro are consistent in the area studied and consequently do not encourage prospecting.

#### Looney prospect (8)

**Location and history:** The Looney mine is on the south slope of Mt. Reuben on the headwaters of the east fork of Whisky Creek at an elevation of 2200 feet (aneroid reading). The workings (see fig. 1, pl. 3 opposite p. 23) are about 300 feet below the end of the road which branches from the Mt. Reuben road at the Trade Dollar mine. The prospect is in sec. 14, T. 33 S., R. 8 W.

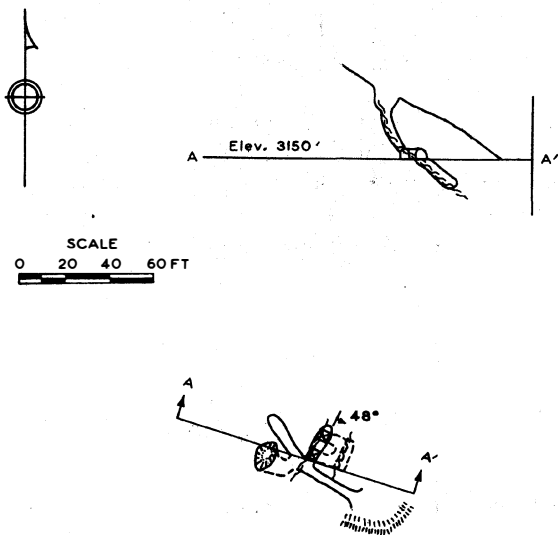
Mr. Looney developed the prospect over a period of years. A crosscut 73 feet long was driven to the vein, and a drift about 100 feet long was completed on the vein. A drift, now caved, was driven on the vein from a point about 100 feet south of the present workings. A small gasoline-driven muller-type mill was installed to treat the ores. So far as known, there was no production.

FIG. 1



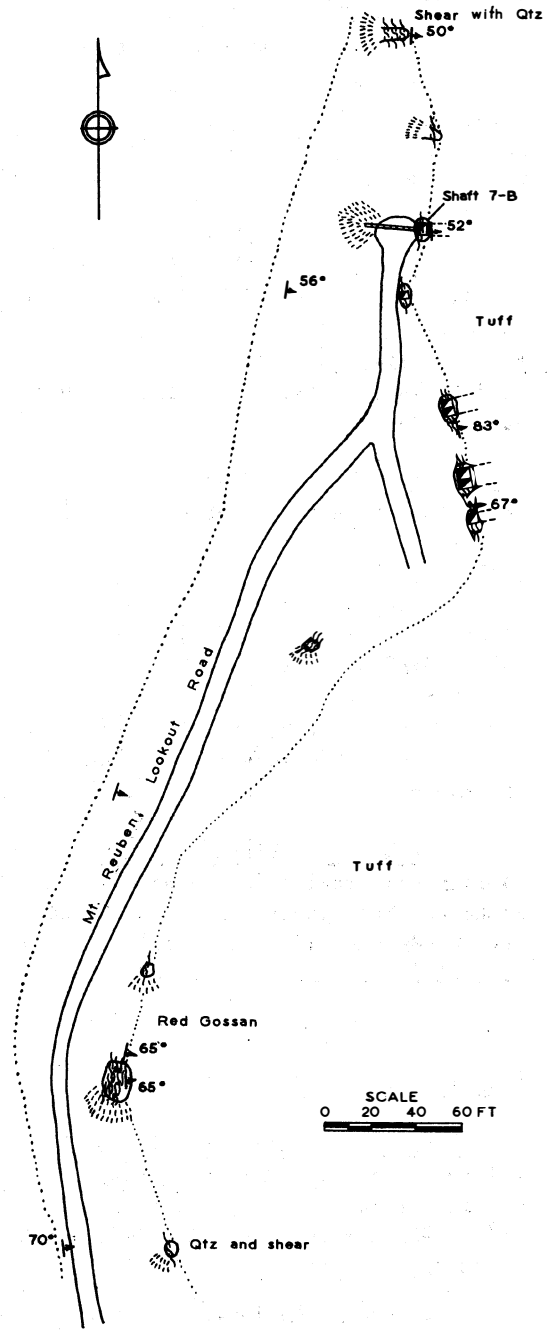
LOONEY MINE

FIG. 3



WINDY GAP MINE

FIG. 2



MT. REUBEN MINE

Geology: The prospect is in hornblende gabbro and related rocks which locally are dark and fine-grained with evidence of recrystallization. An intrusive body of quartz diorite or a related rock occurs several hundred feet to the northwest. The main vein strikes N. 55° E. and dips 25° to 35° E. At a point 20 feet from the portal of the cross-cut there is a small vein which strikes N. 35° E. and dips 71° E. This vein has not been prospected. A sample across 1 foot of sheared material with minor amounts of quartz assayed 0.04 ounce to the ton in gold. The main vein is a replacement consisting of white quartz with inclusions of wall rock along a shear zone 2 to 3 feet in width. No sulphides were noted in the quartz. Eleven samples were taken across the vein. One at the southwest face assayed 0.19 ounce to the ton in gold and the others, 0.03 ounce per ton or less.

Economic considerations: Development work to date has net exposed ore of commercial grade. The geological conditions observed do not indicate that an increase in gold values other than possibly localized enrichments called "pockets" will be found with further development work. Surface pits southeast of the mine indicate considerable work by pocket hunters. No substantial amount of gold is known to have been recovered.

#### Mt. Reuben mine (11)

Location and history: The Mt. Reuben mine is located on the summit of Mt. Reuben about 800 feet north of the Forest Service lookout tower in sec. 12, T. 33 S., R. 8 W. The Mt. Reuben lookout road crosses the property a quarter of a mile from its junction with the Glendale road. Elevation at the property is 3650 feet (aneroid reading). Snow which closes the roads is frequently encountered at this elevation during January and February.

The prospect has been owned for a number of years by the Gary Johnson estate. Little work has been done on the property. Development consists principally of 7 cuts and 4 shafts (fig. 2, pl. 3 opposite p. 23), the deepest of which is 40 feet. Recent development has been limited to assessment work. A 5-ton mill, situated just below the Glendale road about a mile from the property, treated a small tonnage of ore in the summer of 1938. Information as to tonnage treated or gold recovered is not available.

Geology: The prospect is along the hanging wall of a shear zone in greenstone having a width from 50 to 115 feet. Locally the greenstone is a dense, fine-grained rock with a characteristic greenish-gray color which petrographic study showed to be an andesitic meta-sediment. Intrusive rocks in the immediate vicinity are gabbro and quartz diorite which crop out on the west slope of Mt. Reuben. The shear zone trends northerly and dips from 50° to 85° E. Mineralization is concentrated in lenses along the east side of the shear zone and in places extends some distance into the shear zone on the footwall side. The shear zone, normally a gray-green schist, is leached to a white friable sugary mass containing variable amounts of white pyrite in the mineralized areas. The outcrop in areas of greatest mineralization is a stained, red-to-brown porous gossan which, in most places, is 1 to 5 feet wide and confined to the hanging wall of the shear zone.

The mineralized zone contains very little quartz. Light gray pyrite is disseminated in the leached portions of the shear zone on the footwall side of the lenses. Present development work has not gone below the oxidized zone. Ore on the dump from shaft 7-B shows several specimens containing massive chalcopyrite and chalcocite; the major portion of the vein material on the dump is porous red gossan.

To determine the approximate gold, silver, and copper content of the vein material exposed, 23 samples were taken. The gold content of the samples ranged from a trace to 0.145 ounce to the ton and the silver content was about 0.50 ounce to the ton. A picked sample of ore containing massive chalcopyrite and chalcocite assayed 6.9 percent copper. The oxidized ore assayed only 0.1 to 0.4 percent copper.

Economic considerations: The property has not been prospected to sufficient depth to expose primary ore or to determine if a zone containing secondary copper and silver minerals exists below the gossan. The indications of secondary copper ore from shaft 7-B lead one to believe that a secondarily enriched zone may exist which might contain ore of shipping grade. The occurrence of the ore in rather small detached lenses is an indication that no large tonnage will be found unless further development exposes ore in the mineralized shear zone on the footwall of the vein. The average gold content of the ore in the primary mineral zone possibly would be somewhat higher than the oxidized samples cut on the surface, as a portion of the gold liberated as a result of oxidation of the primary sulphide probably has been mechanically removed. Further development work is required to prove the merit of the prospect.

#### Windy Gap prospect (22)

Location and history: The Windy Gap prospect is in the W $\frac{1}{2}$  sec. 12, T. 33 S., R. 8 W. (see fig. 3, pl. 3 opposite p. 23), about 500 feet north of the Eden Valley road at an elevation of 3150 feet (aneroid reading). The early history of the prospect is unknown, but in recent years the Shultz brothers of Medford, Oregon, have prospected intermittently. There has been no production.

Geology: The prospect is in a zone of highly sheared and altered greenstone, which appears to be a contact zone about 200 feet wide, with dikes of diorite and related rocks, increasing to the west where the greenstone is in contact with a northeasterly trending body of quartz diorite. To the east, 500 feet from the portal, there is a northeasterly trending mass of gabbro.

The vein is a shear zone about 12 inches wide and contains small bodies of quartz which are from 2 to 4 inches in width on the footwall. The vein strikes N. 30° to 35° E. and dips 42° to 48° to the east. Two samples taken on the crosscut level across one foot of the vein, which was nearly entirely sheared material with very little quartz, assayed 0.045 and 0.015 ounce to the ton in gold. A dump sample of sulphide ore, which probably came from the bottom of the winze, assayed 1.24 ounces to the ton in gold. Cleavage of the ore on the dump indicates that the vein was from 4 to 6 inches in width in the winze. The ore consists of partially replaced greenstone, quartz, and iron pyrite. No copper minerals were noted. An ore specimen studied indicated that the order of mineral deposition was, first, quartz and pyrite, followed by quartz, sericite, and possibly a minor amount of pyrite.

The source of the ore-bearing solutions probably was the quartz diorite and related rocks lying to the west. The sulphide ore from the shaft is characteristic of the ore found in the Benton quartz diorite stock.

Economic considerations: Present workings have not exposed an ore shoot of large size, although some ore of high value apparently was encountered in the winze. The width of the ore probably was less than 6 inches. The amount of development work is not sufficient to determine the merit of the property.

#### Tibbetts Springs prospect (18)

The Tibbetts Springs prospect is in the NE $\frac{1}{4}$  sec. 12, T. 33 S., R. 8 W. (see mine index map on p. 4). The vein is exposed by two outs approximately 300 feet east of the junction of the Mt. Reuben road and the spur to Mt. Reuben Guard Station. The early history of the prospect and present ownership was not determined.

The vein is opened by two cuts approximately 150 feet apart. The cuts expose a shear zone ranging in widths up to 4 feet, containing lenses of red limonitic gossan. A sample across 4 feet of the gossan assayed 0.09 oz. gold. The rocks enclosing the vein are greenstones which locally are andesitic tuffs. The vein strikes N. 8° to 20° E. and dips 70° to 80° E.

Economic considerations: Development work is not sufficient to determine the economic value of the prospect.

Unnamed prospect below north workings of Poorman group (23)

Location and history: The prospect is on the creek below the north workings of the Poorman group in the NW $\frac{1}{4}$  sec. 23, T. 33 S., R. 8 W. (see mine index map p. 4). The creek is a tributary of the East Fork of Whisky Creek. Date of the original location of the prospect is unknown.

Geology: The country rock in the vicinity is hornblende gabbro, partially recrystallized. Locally it is intruded by numerous acid dikes a few inches to several feet in width. The Benton quartz diorite stock crops out about 500 feet south of the discovery point. Sediments of the Dothan formation are about 800 feet farther east. An 8-foot long adit on the south side of the creek exposes a shear zone from 2 to 3 feet wide which dips steeply to the east and strikes S. 10° E. Lenticular bunches of quartz containing pyrite and chalcopyrite occur in the shear zone which is a major structural feature causing a falls in the creek of 10 to 20 feet.

Economic considerations: A sample across 6 inches of quartz in the face of the adit gave the following results: gold, 0.10 ounce to the ton; silver, 0.26 ounce to the ton; and copper, 1.5 percent. The occurrence of copper in the veins in gabbro in the area is quite common. The occurrence of gold values in amounts as much as 0.10 ounce to the ton is, however, unusual. The numerous acid dikes and the nearness of the Benton quartz diorite stock suggests that gold-bearing solutions from this source may account for the higher gold values. Geological conditions indicate that further prospecting of the shear zone along its strike to the south toward the Benton stock might prove profitable.

Poorman group (adit on Drain Creek) (14)

Location and history: The Poorman group consists of a number of claims held by Messrs. Baker and West of Glendale, Oregon (see mine index map p. 4). The claims extend in a northwesterly direction from Drain Creek to Johnson Springs, which is one-eighth of a mile north of the Trade Dollar mine on the Mt. Reuben-Glendale road. An adit is on the Drain Creek drainage and lies at an elevation of 2100 feet (aneroid reading) about 200 feet east of the Benton mine road. The adit is in the S $\frac{1}{2}$  sec. 23, T. 33 S., R. 8 W.

Geology: The adit, 225 feet long, follows a shear zone in gabbro which strikes N. 23° E. and dips 80° E. In the shear zone there are lenses of quartz as much as 2 feet wide containing chalcopyrite and pyrite in small amounts. Petrographic studies indicate two periods of quartz mineralization, with pyrite accompanying the latter. A small band of greenstone occurs about 300 feet west of the tunnel. The greenstone is in turn in contact with the Benton quartz diorite stock.

Economic considerations: One sample taken across 1 $\frac{1}{2}$  feet of mineralized quartz contained only a trace of gold and silver and 0.15 percent copper. These values are similar to those in other veins found in gabbro and are not encouraging for further prospecting along this vein, although it has the appearance of a persistent vein with quartz lenses of moderate size.

FIG. 1

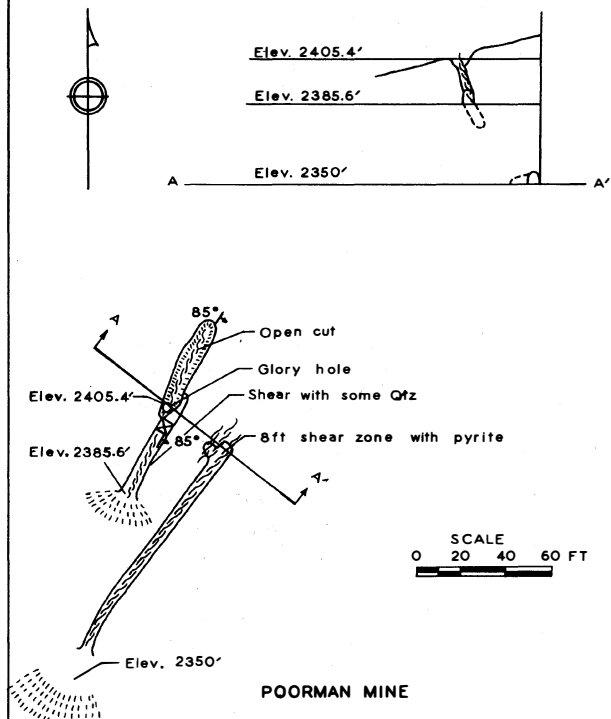


FIG. 2

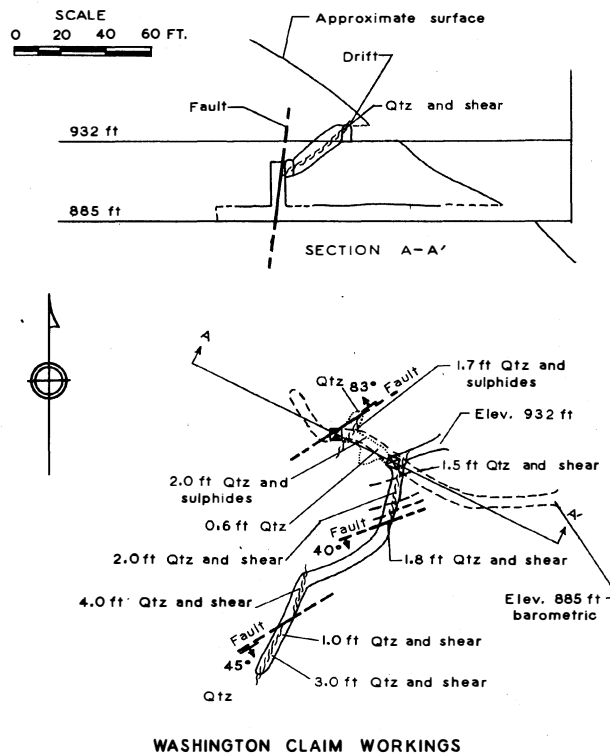


FIG. 3

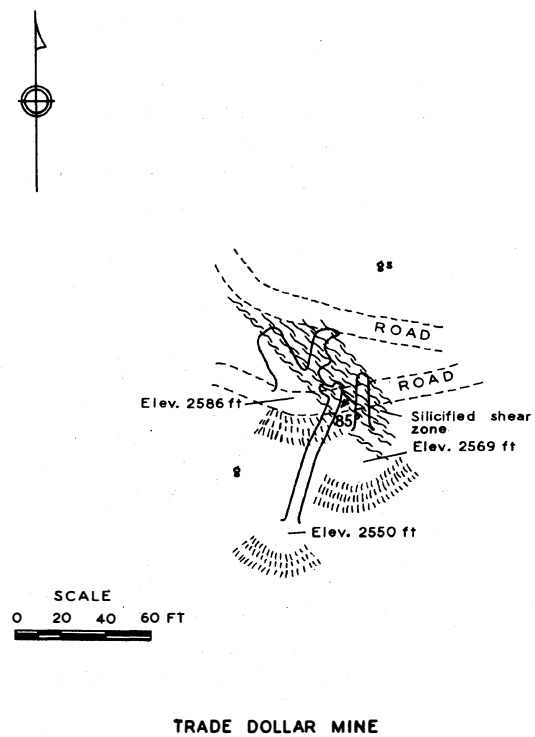
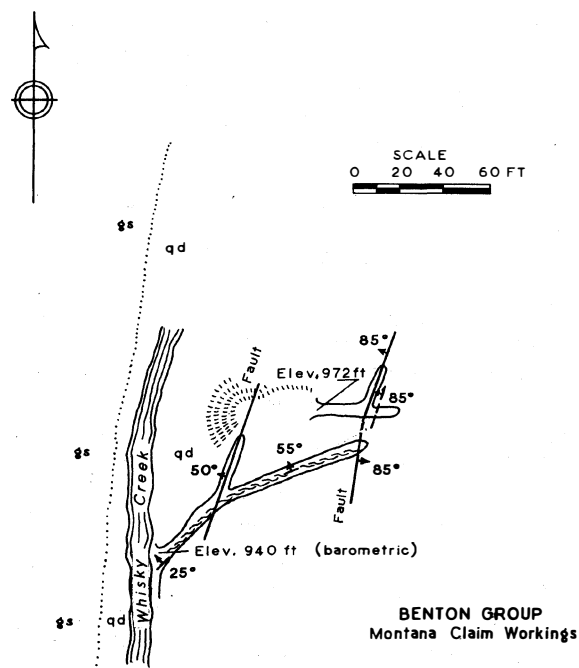


FIG. 4





Peerman group (North workings) (13)

Location: The north workings (see fig. 1, pl. 4 opposite p. 27) of this group are in the N $\frac{1}{2}$  sec. 23, T. 33 S., R. 8 W., about 600 feet east of the Trade Dollar mine and 200 feet below the Looney mine road.

Geology: Two adits have been driven in a northeasterly direction along a shear zone in gabbro. The country rock is largely gabbro with possibly some acid dikes to the southeast. The workings are about 2000 feet northeast of the Benton mine diorite stock. The shear zone has small lenses of quartz containing iron pyrite in both the quartz and the sheared rock. At the face of the lower adit is exposed a shear zone about 8 feet wide, highly mineralized with iron pyrite and minor amounts of quartz; the upper adit is caved and inaccessible. It is reported that about \$2000 in gold was recovered from a small high-grade ore shoot extending from the surface to about 12 feet below the adit level. The extension of the ore shoot has not been found. Ore was free milling and apparently was not associated with the pyrite. Thirteen samples were taken across the vein in both adits and on the surface. Assay values ranged from a trace to 0.04 ounce of gold per ton.

Economic considerations: The presence of sulphides in the vein seemingly has no relation to gold values and cannot be used as a guide for further prospecting. The lower adit has not fully explored the possibility of finding the pay shoot on that level. The survey of the prospect indicates that the lower level should be extended at least another 15 or 20 feet to reach a point below the winze which was in the ore shoot. The gold recovered was apparently from a small lens, and it does not appear that the chances of finding a substantial tonnage of additional ore are favorable.

Trade Dollar prospect (19)

Location and history: The Trade Dollar prospect is at the junction of the Looney mine and Mt. Reuben roads on the east slope of the east fork of Whisky Creek in sec. 23, T. 33 S., R. 8 W.

The early history of the prospect is unknown. Ed Romig of the Gold Bug mine completed a short tunnel in the early 1930's. Hugh Scott and Elton A. Youngberg relocated the prospect in 1941 and completed about 75 feet of trenching and some sampling to locate extensions of the exposed ore bodies; results were not conclusive. No work has been done on the prospect since 1942. There has been no production.

Geology: The prospect lies near the contact between gabbro and greenstone. Small areas of serpentine crop out in the vicinity of the Trade Dollar prospect in or near major shear zones. Gold values are in a siliceous fine-grained greenstone body of undetermined shape overlying gabbro. The greenstone is sheared and broken with thin, iron-stained gouge seams. Northwesternly trending shears dip steeply to the south. Apparently the mineralized greenstone terminates against gabbro a few feet below the no. 2 adit (see fig. 3, pl. 4 opposite p. 27). No. 1 adit, 20 feet below, is entirely in gabbro. A composite of three samples across 18 feet of the west wall of no. 2 adit averaged 0.12 ounce to the ton in gold. Three samples taken from no. 3 adit also averaged 0.12 ounce to the ton in gold.

The mineralized zone has not been exposed below the zone of oxidation. Free gold may be panned from the iron-stained gouge seams. It appears that the gold was liberated by the oxidation of pyrite.

FIG. 1

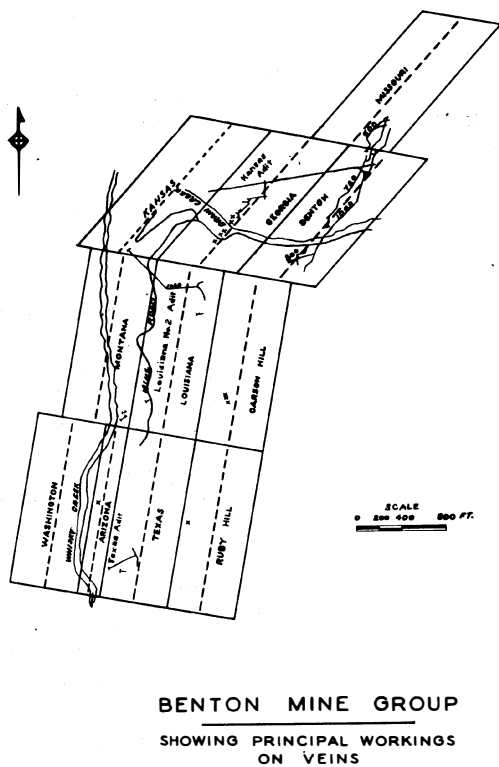


FIG. 2

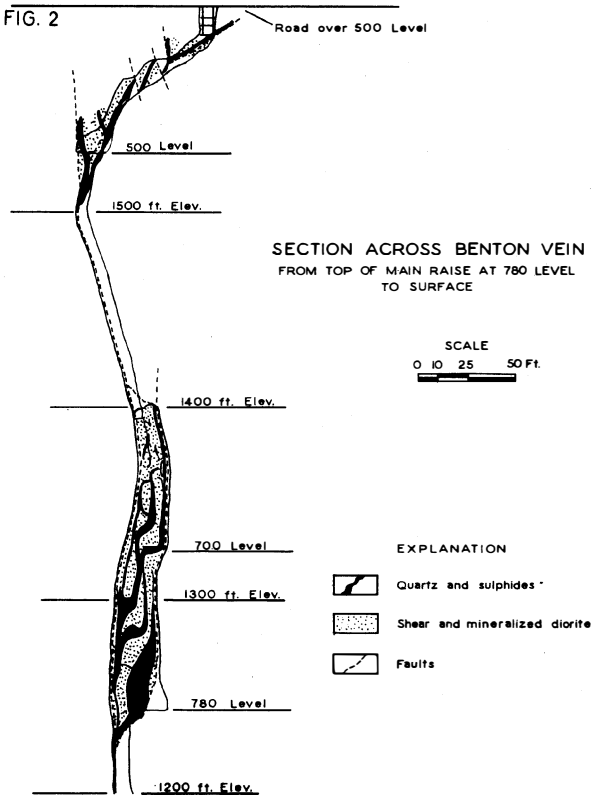


FIG. 3

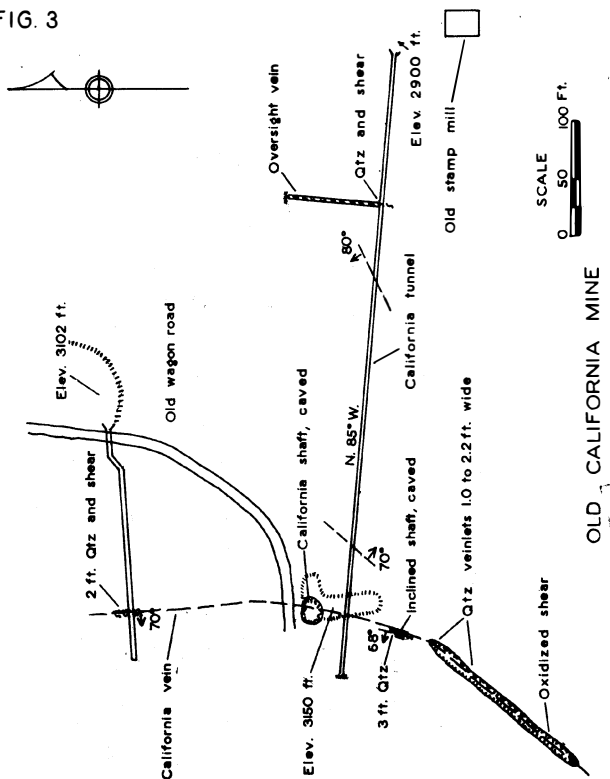
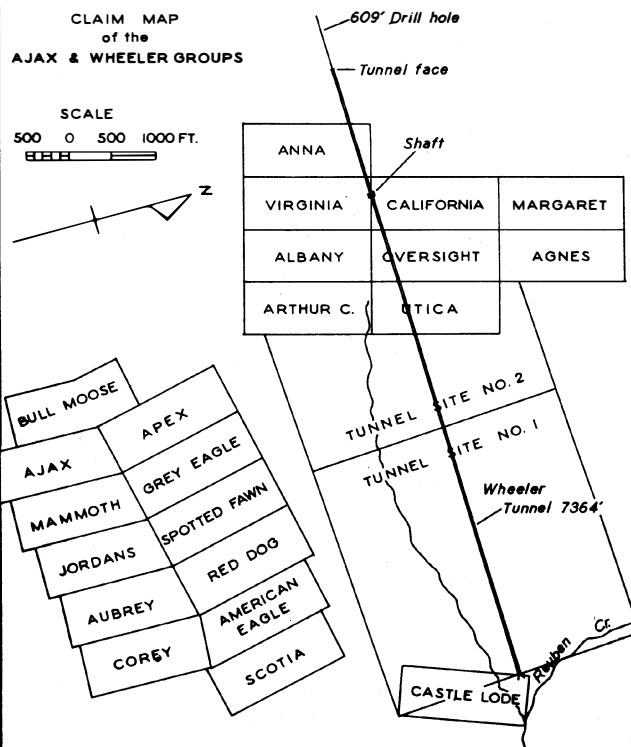


FIG. 4



Economic considerations: Not enough work has been done on the prospect to determine the limits of the gold-bearing greenstone. No gold values have been found in the no. 1 adit which is entirely in gabbro. The no. 2 and no. 3 adits show gold values averaging about 0.12 ounce to the ton. Extension of the ore body to the northwest and southeast will have to be proved by further underground development. The presence of a major shear zone 50 to 100 feet east of the present workings indicates that this block of greenstone may be only a segment of the original body.

#### California mine and tunnel (3a,b)

Location: The California mine includes most of sec. 25, T. 33 S., R. 8 W., and parts of several claims lie in sec. 26. The California tunnel and camp may be reached by a road from Grave Creek up Reuben Creek, a distance of  $2\frac{1}{2}$  miles. The old California workings (see fig. 3, pl. 5 opposite p. 29) may be reached by a spur of the Mt. Reuben road which branches about 300 feet south of the junction of the Eden Valley and Glendale roads. This road follows the top of the ridge for 3 miles in a southerly direction. The California vein crops out at the end of the road where there are several old shafts. The old stamp mill and crosscut are approximately 800 feet down the east slope of the ridge.

History and ownership: The old California mine was discovered and worked by Rube Jones about 1890. A shaft was sunk 112 feet on an ore shoot from 20 to 40 feet long, which was mined from the shaft. The mine subsequently was owned by the Mt. Reuben Mining Company, from which it was purchased by E. R. Wheeler who, from January 1, 1922, to April 11, 1929, drove the Wheeler tunnel (see fig. 4, pl. 5 opposite p. 29). The property was leased in 1938 to Philip Suetter. The Hercules Mining Company subsequently took over Mr. Suetter's lease and carried on exploration of the California mine holdings and adjacent properties. The Hercules Mining Company ceased active development in 1941. The California mine and Wheeler tunnel are now owned by the Wheeler estate.

The property consists of the following 8 unpatented lode claims: the Anna, Virginia, Albany, Arthur C., California, Utica, Margaret, Agnes, and one patented lode claim, the Oversight (see fig. 4, pl. 5 opposite p. 29). There are also two tunnel site claims, no. 1 and no. 2, as well as several claims covering camp and mill sites.

Development and production: The first work at the property was the sinking of a shaft 112 feet on the ore body discovered on the ridge which is a spur of Mt. Reuben. A small amount of drifting is reported to have been done from the bottom of the shaft. The ore recovered from the drift is said to have assayed \$50 per ton in gold. To explore the vein at a lower elevation a crosscut from the east side of the ridge was driven about 550 feet to cut the vein 240 feet below the outcrop. A vertical raise was driven from the crosscut in the footwall side of the vein to connect with the original shaft. At the point where the adit cuts the vein, the fissure is strong, but the ore shoot was not encountered until a point 50 feet farther north had been reached. Ore is said to have assayed about \$40 per ton. The amount of drifting on the vein at this level is not known. The adit also cuts another vein, known as the Oversight, 410 feet east of the California vein. A drift 270 feet long was driven on this vein in a northerly direction from the adit. About 50 feet from the portal of the adit a shaft 18 feet deep was sunk on the vein. At this point an ore shoot 40 feet long was reportedly encountered having gold values of \$9 to \$10 per ton at the old price.

The total value of ore produced has been reported to have been from \$3000 to \$10,000. No mine reports or smelter receipts are available to substantiate these estimates.

To explore the California vein and other known veins at depth, E. R. Wheeler drove a tunnel 7364 feet long from Reuben Creek. Trend of the tunnel is S. 87° W.; elevation of the portal is 1179 feet. A horizontal core drill hole 609 feet long was drilled from the

face of the adit making a total of 7973 feet of horizontal distance explored. The face of the tunnel is 2325 feet below the surface. Numerous shear zones were encountered on which short drifts were driven, but no ore was found.

**Geology:** The Wheeler tunnel and California mine workings above explore a mass of greenstone which is largely altered porphyritic andesite. Phenocrysts are usually elongated in a vertical direction of shearing or flow. No intrusive rocks were noted in the Wheeler tunnel or California mine workings. The nearest intrusives are gabbro and quartz diorite some 4000 feet to the east of the California vein. Some dacite porphyry intrusives are also known to exist to the east along the contact of the greenstone with the Galice slates.

The known veins have a northerly trend and dip steeply to the east or west, coinciding with the general attitude of the geologic formations. Veins exposed in the workings are all similar, which is to be expected where the rock formations are the same. The greenstone is a fairly competent rock but not strong enough to develop open fractures. Instead the rock has a tendency to flow and to develop shear zones from 10 to 15 feet in width along major faults. The shear zones show metamorphism; chlorite and sericite are well developed. Small veinlets of quartz have been formed along the shear planes and at times cut across the shearing. Some pyrite may be seen in the shear zones, usually in cubes in the sheared material rather than in the quartz. The veins have the appearance in general of being tight, and impervious to migrating mineralizing solutions. A specimen of vein matter taken from the California tunnel showed the following order of mineral deposition: quartz followed by brecciation, then calcite followed by quartz, sericite, pyrite, and chlorite.

Ore shoots encountered in the old California workings were emplaced along the wall of the vein. The ore bodies are from 30 to 40 feet long, measured on the strike of the vein, and extend a hundred or more feet down the dip. Gold occurs largely as free gold within the quartz gangue. Only one ore shoot was found on the California vein and one on the Over-sight vein. The California vein has been explored a considerable distance along its outcrop and only one ore shoot of importance has been found. The vein was stripped for a distance of about 100 feet just south of the discovery shaft exposing a quartz lens from 1 to 3 feet wide for a distance of 45 feet. Samples were cut across the vein at 5-foot intervals; assay values did not exceed 0.015 ounce to the ton.

The occurrence of isolated ore shoots in the northerly trending shear zones apparently is a characteristic feature in this area.

**Economic considerations:** Sixteen shear zones or veins were encountered in the Wheeler tunnel. The no. 8 vein is the only one which carries values. A. B. Yates, in his report of November 6, 1926, to E. R. Wheeler, stated that a sample across the quartz assayed \$1.80 in gold, 1.5 ounces silver, and 6.0 percent copper. The width of the quartz was not given; apparently it was only a small lens as no ore was mined. The infrequent occurrences of small ore shoots along these shear zones are not encouraging for underground exploration by drifting, as indicated by the isolated outcrops of ore shoots along known shear zones. The possibility of encountering ore shoots of short horizontal length like the ore body found in the upper California tunnel by crosscutting 2000 or more feet below their outcrop appears rather remote. However, the occurrence of a small lens of ore of commercial grade, as reported by A. B. Yates, indicates that there is a possibility of an ore shoot occurring at the Wheeler tunnel level, but it is not likely to appear as an outcrop on the surface 2000 or more feet above unless it is much larger in size than the California ore shoot or those observed at other prospects in greenstone.

## Benton Group

Benton mine (2)

Location: The Benton mine is at the junction of Drain and Whisky creeks at an elevation of approximately 1100 feet. The Benton mine road branches from the Mt. Reuben road about three-quarters of a mile north of the Gold Bug mine. Distance from the road junction to the mine is  $2\frac{1}{2}$  miles. The road is a good, but steep and winding, graveled, mountain road. The property is east of Whisky Creek in secs. 22, 23, 26, and 27, T. 33 S., R. 8 W.

History and production: During the period from 1891 to 1905, Mr. J. C. Lewis acquired the J.C.L. and Benton groups of claims. Mr. Lewis had completed approximately 5000 feet of development drifts and raises on the Benton and J.C.L. when the project was discontinued.

With the increase in price of gold in 1935, development work was resumed by the Lewis Investment Company. A cyanide plant of 40-ton capacity was completed in September 1937, and the plant was enlarged to 60-ton capacity in 1940. Production continued until April 15, 1942, when mining and milling operations were discontinued because of Government regulations relating to the purchase of supplies, and high war prices of supplies and labor.

During the period 1935 to 1942, 64,282 tons of ore was mined and milled. A large proportion of this tonnage came from development work.

Land development: The Benton group of the Lewis Investment Company consists of 8 patented claims and 16 unpatented claims as follows:

Patented claims: (Pat. no. 164, 539-M. S. no. 496)

Benton	Missouri
Georgia	Carson Hill
Louisiana	Texas
Ruby Hill	Arizona

Unpatented claims: (Recorded in Josephine County)

Nebraska	Utah
Berkeley	Kansas
Confidence	Dawn
Poser	Colorado
Maryland	High Ore
Idaho	Nevada
Montana	Hazel
Washington	Iowa

Recent development work has been carried on almost entirely on the Missouri, Georgia, Benton, and Louisiana claims. The portals of the two haulage adits, also the mill and camp site, are on the Kansas claim. Development work of the Benton mine (see map in pocket) proper consists of approximately 10,000 feet of crosscuts, drifts, and raises, in addition to about 200 feet of drifts on the Georgia vein and 500 feet of crosscuts and drifts on the Texas vein. The Washington vein has about 350 feet of development work and the Montana vein 100 feet. Several short adits, drifts, and numerous cuts expose other veins on the Carson Hill, Ruby Hill, and the Louisiana claims. The principal workings of the Benton are shown on the accompanying claim map (see fig. 1, pl. 5 opposite p. 29). Individual maps of the Benton, Washington, and Montana workings show these in greater detail (see pls. 4 and 5).

**Geology:** The vein system of the Benton group is in a stock of quartz diorite except the Washington vein which is described separately. The quartz diorite stock whose major axis trends N. 20° to 40° E. is 1.75 miles long with an average width of 2500 feet on the surface. The stock is in contact with greenstone on the east and with greenstone and Dothan sandstone and shale on the west. The greenstone at the eastern contact is a relatively narrow band lying between gabbro and the quartz diorite stock. The north end of the stock terminates against hornblende gabbro which is cut by numerous light-colored dikes.

Rocks along the contact show varying degrees of metamorphism. The greenstone quite often shows some evidence of shearing with development of scattered grains of pyrite along shear planes and fractures. At the contact with the Dothan formation, the sandstones have been altered to a dense, black, fine-grained hornfels. In places the contact zone is marked by a number of acid dikes which range in composition from almost pure quartz to normal quartz diorite. The contacts between the intrusive dikes and the host rock are sharp and show little effects of the mineral constituents on each other. Grain size appears to be finer in the smaller dikes and at the outer edges of larger dikes as the result of differences in rates of cooling. No gold values have been found to occur in the contact metamorphic zone other than in several small fissures. Pyrite developed in the contact zone has been found to be void of gold. However, near the southern boundary of the Benton group along the contact between greenstone and quartz diorite, a shear zone exists which contains gold and associated pyrite. Samples from this shear zone indicate ore of possible commercial grade.

**Vein system:** The veins of the Benton mine were formed in a system of intersecting faults and include the following eight known veins: the Benton, Georgia, Nebraska, Louisiana No. 1 and Louisiana No. 2, Texas, Ruby Hill, and Carson Hill. It is quite likely that others exist which have not yet been encountered underground and do not reach the surface. The first four of these veins are exposed in the Benton mine workings. The major part of development work and mining has been done on the Benton vein which has been explored for about 1500 feet horizontally and 500 feet vertically. The Georgia and Benton veins strike N. 20° to 40° E. and dip 80° to 85° E. Intersecting these veins diagonally on the west side of the Benton vein are the Nebraska, Louisiana No. 1 and Louisiana No. 2 veins with a common strike of N. 80° E. and a dip of 45° to 50° N. To the east of the Benton are the Ruby Hill, Carson Hill, and the Texas veins striking from due north to N. 10° W., with dips of 30° to 45° E.

The fissures in and along which the veins have formed are normal tension faults developed in the quartz diorite stock during the period of cooling and shrinking. Some movement has taken place along the faults, developing shears and thin gouges. Amount of movement cannot be determined because of the lack of geological markers; however, the displacements are not believed to be great.

Structural control within the original faults have had an important effect upon the location of ore bodies which occur in lenses with a dip of about 45° to the south along the vein. These lenses fill fissures in and along the original faults where migrating mineralizing solutions deposited quartz and gold-bearing pyrite and replaced considerable amounts of wall rock. These ore bodies were formed where the dip of the vein steepened or the strike changed and where differential movement of the walls resulted in an enlargement of the fault fissure. In the hanging wall above the 780 level, tension cracks developed from 50 to 75 feet out into the hanging wall along which mineralizing solutions migrated, forming several veins which split from the Benton on a reverse dip. At and near these junctures, considerable amounts of country rock were replaced, or partially replaced, with quartz and gold-bearing pyrite, forming commercial bodies. The tendency for fractures to form in the hanging wall is repeated on the lower levels but on a smaller scale. However, as the cross section area was smaller, the process of replacement was carried farther, developing ore bodies of considerable importance. This is shown in several stopes where mining was carried on over widths of from 20 to 30 feet. The accompanying cross section of the Benton vein shows the occurrence of one of these ore bodies (see fig. 2, pl. 5 opposite p. 29).

Mineralogy: The veins consist of quartz-filled fissures and replaced and sheared diorite. Iron pyrite, varying in size from small grains to blebs several inches in diameter, is disseminated through the quartz and partially replaced diorite. Gold occurs intimately associated with the pyrite. Native gold visible to the naked eye is rarely found. The only other sulphide mineral visible to the unaided eye is molybdenite which has been found in isolated spots in the mine.

The American Cyanamid Company identified the following minerals microscopically in a sample of tailings: marcasite, chalcopyrite, sphalerite, magnetite, quartz, sericite, chlorite, and calcite. Chalcopyrite and sphalerite occur in only very small quantities. Sericite, chlorite, and calcite are products of the alteration of wall rock of the vein. The hanging-wall side of the vein is much more altered than the footwall.

A study of ore specimens from the various veins indicates the following mineralization sequence: quartz, brecciation followed by sericite, pyrite, and quartz, and finally calcite. The second generation of quartz appears to have been introduced simultaneously with the pyrite.

The vein minerals are those usually found in the zone classified by Lindgren (1933) as mesothermal or the intermediate zone. Although the presence of molybdenite in minor amounts may indicate that the mineral deposition took place under conditions approaching the pyro-metasomatic zone, the alteration of the wall rocks to sericite and chlorite with the development of pyrite is characteristic of the mesothermal type vein.

Economic considerations: The ore shoots in the Benton vein occur in a series of overlapping lenses where the dip of the vein steepens to nearly vertical and in some places is in the opposite direction. In these areas the fault had a tendency to open up and to permit the migration of magmatic ore-bearing solutions. Such areas should be prospected for further ore shoots. These openings in general coincide with the shape of the ore bodies which have a rake of about  $45^\circ$  to the south along the strike of the vein. To encounter the extension of the ore bodies below the 1020 level, allowance for rake of ore shoots should be made.

There has been no marked change in the average gold content of the ore bodies from the 500 to the 1020 levels nor has any change in the vein minerals been noted which would lead one to expect any raising or lowering of the average gold content with depth.

Each lens of ore may vary considerably in values within itself, and on initial development may expose only marginal ore. Mining has shown that most lenses contain localized bodies of higher grade ore which usually brings the average up to milling grade. The gold content of ore milled has ranged from 0.22 to 0.35 ounce to the ton. However, development ore which had sufficient value to pay for milling was treated since it had to be trammed anyway.

Little is known about the mineral content of the other veins to the south of the Benton workings. Samples taken from surface cuts show values from 0.20 to 3 ounces to the ton in gold, which are comparable to values found in the Benton vein. However, the gold values from surface cuts on the Benton vein are usually lower in grade. This may indicate that the gold content will be somewhat greater in these veins than in the Benton. This has been found to be true in the ore shoot found on the Louisiana no. 2 vein where it was drifted on from the south end of the 1020 level.

The minerals found in the vein are known to occur over a wide vertical range in fissure veins of this type and it would not be unusual for mineralization to extend several thousand feet below present workings.

Montana claim workings (21)

Location: The claim is in the NW $\frac{1}{4}$  sec. 27, T. 33 S., R. 8 W. The east sideline of the claim is common with the west sideline of the patented Louisiana claim of the Benton group.

History and development: The early history of these workings is unknown. The Lewis Investment Company located this claim in 1941 and it has been made a part of the Benton group. Workings consist of an adit 125 feet long in the east bank of Whisky Creek at water level, and another adit 32 feet higher in elevation, 95 feet to the northeast (see fig. 4, pl. 4 opposite p. 27). Remains of an old arrastre may be seen about 75 feet downstream from the portal.

Geology: As exposed in the lower adit, the vein lies entirely within the Benton quartz diorite stock about 50 feet west of the contact with greenstone. The vein is in a shear zone in which quartz and pyrite replaced sheared diorite. Quartz forms a series of small lenses along the strike of the vein. The first lens is exposed about 10 feet inside the lower portal. A lens of ore, 15 feet long and 3 feet wide, occurs in the floor of the drift and has been partially stoped. The shear zone continues with some mineralization to the face of the drift with several small lenses 2 to 3 feet long and 4 to 6 inches in width exposed in the back. A fault offsets the vein at the face apparently to the south. The accompanying map (fig. 4, pl. 4 opposite p. 27) shows the strike and dip of the vein and the faults.

Economic considerations: Two samples were taken from the lower adit to determine the approximate ore value. A sample across 1.2 feet of quartz and sheared material from the first lens showed values of 0.41 ounce to the ton in gold. A sample across 0.4 foot of quartz and sheared material just west of the fault at the face assayed 1.65 ounces to the ton in gold.

The vein is similar to other ore-producing veins found elsewhere in the Benton quartz diorite stock, and undoubtedly extends beyond the fault encountered at the face. It should be explored by crossing the fault and drifting to the south where the extension of the vein should be found.

Washington prospect (2m)

Location and history: The Washington prospect is in sec. 27, T. 33 S., R. 8 W. on the west bank of Whisky Creek approximately 3000 feet down the creek from the Benton mill. It may be reached by trail down the creek from the Benton mine camp.

The north workings of the Ewalda or Reno group were originally on the ground of this claim which was relocated in 1941 as the Washington claim. It joins the west sideline of the Arizona claim of the original Benton group.

Property and development: The prospect is now a part of the Benton group owned by the Lewis Investment Company. Development work consists of 300 lineal feet of drifts and crosscuts and 55 feet of raises on two levels (see fig. 2, pl. 4 opposite p. 27). Ore mined during development work has been piled on the dump. There has been no recorded production.



**Geology:** Country rock is highly metamorphosed greenstone occurring from 100 to 200 feet from its contact with quartz diorite to the east and south of the workings. The greenstone is so fine-grained and altered that its original mineral constituents cannot be recognized with the aid of a hand lens. The rock shows some shearing, and disseminated iron pyrite is present on the cleavages.

The vein consists of a shear zone from 1 to 3 feet wide which strikes S. 28° W. and dips 50° W. Quartz has replaced the original rock and formed overlapping lenses along the shear zone. Gold apparently is associated with pyrite, the only sulphide observed; some gold may occur free. Sixteen samples were taken across the vein where it appeared to carry values. Gold content ranged from a trace to 3.20 ounces to the ton. Silver content ranged from a trace to 1.12 ounces to the ton. Only two samples contained more than 0.12 ounce to the ton in gold.

A fault which dips 40° to the south in the upper tunnel offsets the vein 30 feet to the west. The vein in the winze from the upper level is cut off by a fault 15 feet vertically below the level. This fault strikes approximately S. 45° W. and dips 83° NW. The lower adit was driven to explore the vein at creek level, but without success. The fault which cuts off the vein in the winze was encountered and raised on to the bottom of the winze without finding the faulted segment.

**Economic considerations:** Present openings on the vein do not expose it on the dip beyond the bottom of the winze and the fault mentioned above. The fault is very tight and no evidence of drag was noted to suggest direction of movement. Due to the angle at which the fault cuts the vein, the segment of the vein above the fault would be encountered by drifting southwesterly along the fault on the lower level.

No ore shoot of commercial value is exposed in the present workings. One sample contained values of 3.2 ounces gold per ton, which indicated that small bunches of high-grade ore may be found. This characteristic, rather than persistent ore shoots, is common in this type of vein. The vein is quite similar to the vein at the Reno mine to the southwest.

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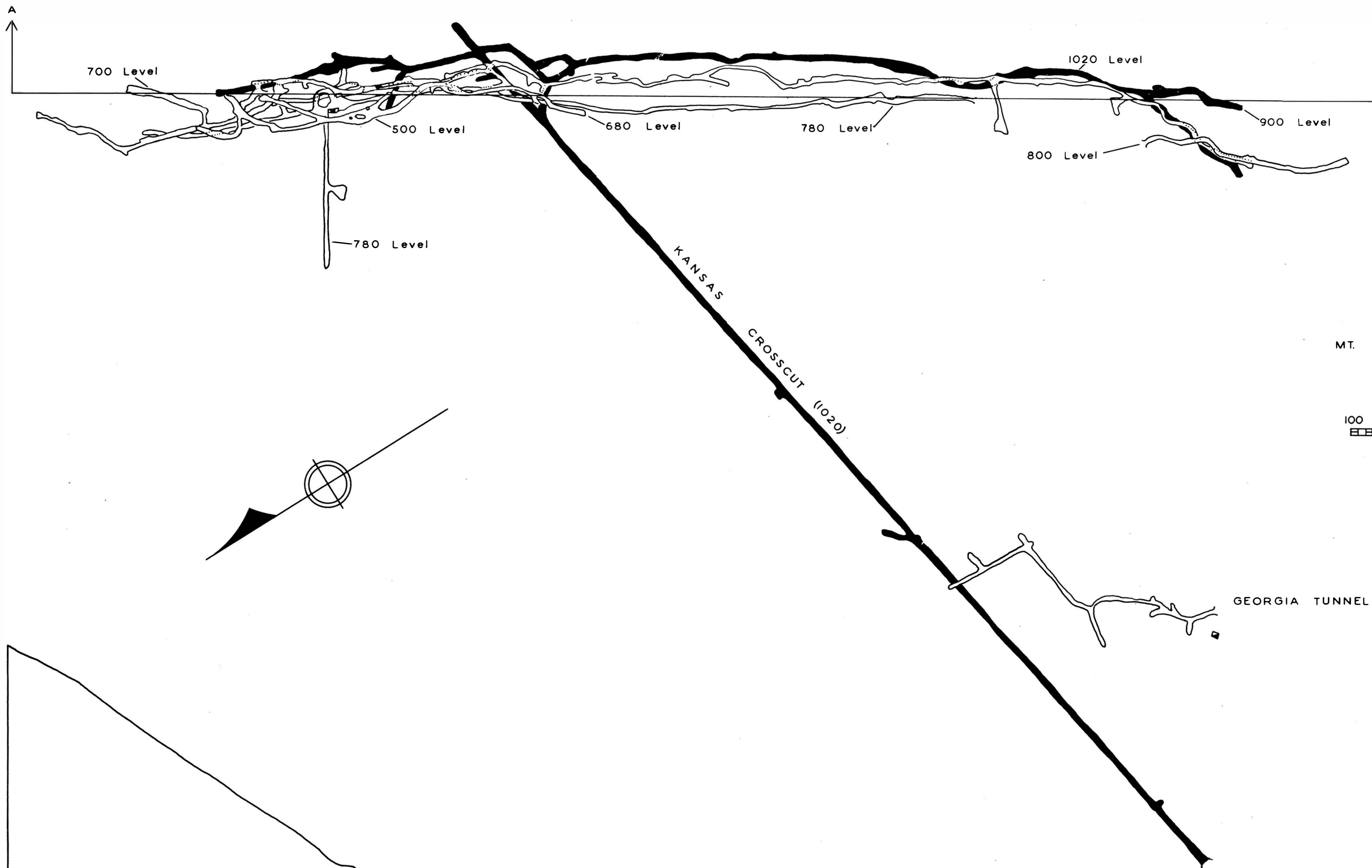
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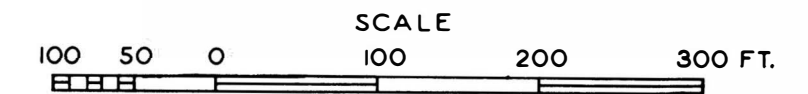
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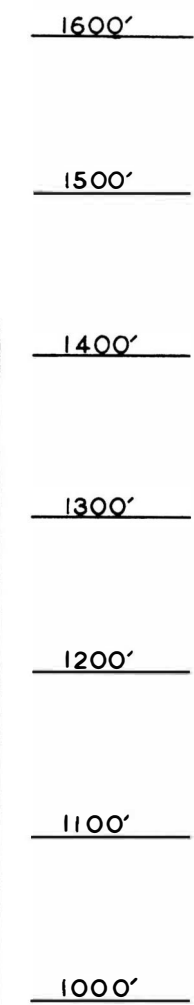
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COMPOSITE PLAN AND SECTION  
of the  
**BENTON MINE**  
MT. Reuben District, Josephine County, Oregon  
Secs. 22, 27 T. 33 S. R. 8 W.



ELEVATION



LOUISIANA CROSSCUT  
(1020)

SECTION A-A' LOOKING S. 58° E