STATE OF IDAHO
C. A. Bottolfesen, Governor

IDAHO BUREAU OF MINES AND GEOLOGY
A. W. Fahrenwald, Director

GEOLOGY OF THE GOLD-BEARING LODES OF THE ROCKY BAR DISTRICT,
ELMORE COUNTY, IDAHO

By

Alfred L. Anderson

Prepared in cooperation with the U. S. Geological Survey

University of Idaho
Moscow, Idaho
<table>
<thead>
<tr>
<th>TABLE OF CONTENTS</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>1</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Purpose and Scope</td>
<td>1</td>
</tr>
<tr>
<td>Field Work and Acknowledgments</td>
<td>2</td>
</tr>
<tr>
<td>Previous Geologic Work</td>
<td>3</td>
</tr>
<tr>
<td>GEOGRAPHY</td>
<td>3</td>
</tr>
<tr>
<td>Location</td>
<td>5</td>
</tr>
<tr>
<td>Surface Features</td>
<td>3</td>
</tr>
<tr>
<td>Climate and Vegetation</td>
<td>4</td>
</tr>
<tr>
<td>Population</td>
<td>4</td>
</tr>
<tr>
<td>GEOLOGY</td>
<td>5</td>
</tr>
<tr>
<td>Foreword</td>
<td>5</td>
</tr>
<tr>
<td>Mesozoic Granitic Rocks</td>
<td>6</td>
</tr>
<tr>
<td>Idaho Batholith</td>
<td>6</td>
</tr>
<tr>
<td>Age</td>
<td>6</td>
</tr>
<tr>
<td>Tertiary Intrusive Rocks</td>
<td>6</td>
</tr>
<tr>
<td>Distribution and classification</td>
<td>6</td>
</tr>
<tr>
<td>Dacite porphyry</td>
<td>6</td>
</tr>
<tr>
<td>Quartz monzonite porphyry</td>
<td>7</td>
</tr>
<tr>
<td>Granite porphyry</td>
<td>7</td>
</tr>
<tr>
<td>Granite</td>
<td>7</td>
</tr>
<tr>
<td>Gneissphry</td>
<td>8</td>
</tr>
<tr>
<td>Lamprophyll</td>
<td>8</td>
</tr>
<tr>
<td>Rhyolite</td>
<td>9</td>
</tr>
<tr>
<td>Age of the intrusives</td>
<td>9</td>
</tr>
<tr>
<td>Sedimentary Rocks: (Quaternary)</td>
<td>10</td>
</tr>
<tr>
<td>Structure</td>
<td>10</td>
</tr>
<tr>
<td>Foreword</td>
<td>10</td>
</tr>
<tr>
<td>Dike Faults</td>
<td>10</td>
</tr>
<tr>
<td>General Features</td>
<td>10</td>
</tr>
<tr>
<td>Age</td>
<td>11</td>
</tr>
<tr>
<td>Mineralized faults</td>
<td>11</td>
</tr>
<tr>
<td>General features</td>
<td>11</td>
</tr>
<tr>
<td>Post-mineral faults</td>
<td>12</td>
</tr>
<tr>
<td>General features</td>
<td>12</td>
</tr>
<tr>
<td>Age</td>
<td>12</td>
</tr>
<tr>
<td>GOLD DEPOSITS</td>
<td>13</td>
</tr>
<tr>
<td>Historical Sketch</td>
<td>13</td>
</tr>
<tr>
<td>General Character of the Lodes</td>
<td>15</td>
</tr>
<tr>
<td>Distribution of the Lodes</td>
<td>15</td>
</tr>
<tr>
<td>Structural Relations</td>
<td>16</td>
</tr>
<tr>
<td>Mineralogy</td>
<td>17</td>
</tr>
<tr>
<td>Foreword</td>
<td>17</td>
</tr>
<tr>
<td>Primary Minerals</td>
<td>17</td>
</tr>
<tr>
<td>Quartz</td>
<td>17</td>
</tr>
<tr>
<td>Arsenopyrite</td>
<td>18</td>
</tr>
<tr>
<td>Sphalerite</td>
<td>18</td>
</tr>
<tr>
<td>Golum</td>
<td>18</td>
</tr>
<tr>
<td>Pyrite</td>
<td>18</td>
</tr>
<tr>
<td>Chalcopyrite</td>
<td>18</td>
</tr>
<tr>
<td>Sericite</td>
<td>19</td>
</tr>
<tr>
<td>Gold</td>
<td>19</td>
</tr>
</tbody>
</table>
GOLD DEPOSITS (Continued)
Mineriology (Continued) ............................................ PAGE
Secondary minerals ................................................. 19
Paragenesis ............................................................ 19
Distribution of the Ore .............................................. 20
Tenor of the Ore ..................................................... 21
Wall-rock Alteration .................................................. 22
Oxidation and Enrichment .......................................... 22
Genesis ................................................................ 22
Outlook ................................................................ 24
MINES AND PROSPECTS .................................................. 25
Ada Elmore Lode (Pittsburg and Elmore Mines) ................. 25
Idaho .................................................................. 26
Vishnu .................................................................. 27
Confederate Star ......................................................... 28
Clifton Bell ............................................................. 28
Mountain Buck .......................................................... 29
War Eagle ............................................................... 29
Independence ............................................................ 29
Mountain Goat ........................................................... 30
Empire .................................................................. 30
Commonwealth .......................................................... 31
Ophir .................................................................... 31
West Ophir ............................................................... 32
Lison ...................................................................... 33
Passover ................................................................. 34
Spanish Town ............................................................. 34
Dona ..................................................................... 35
Bonaparte ................................................................. 36
Howard ................................................................... 36
Wide West .................................................................. 36
Keystone ................................................................ 37
Idaho Gold Chief ..................................................... 38
Flag Staff .................................................................. 38
Other Properties ....................................................... 39

ILLUSTRATIONS

PLATE 1. Map of the Rocky Bar District ......................... (in pocket)
PLATE 2. A—Picture of mountainous terrane at Rocky Bar;  
          B—Picture of Steele Mountain .................................. 3
PLATE 3. A—Photomicrograph of a thin section of the ore;  
          B—Photomicrograph of a polished surface of the ore .... 18
PLATE 4. Claim map of the Rocky Bar District ............... (in pocket)

FIG. 1. Index Map Showing Location of the Rocky Bar District .... 3
FIG. 2. Geologic Sketch Map of Accessible Underground  
        Workings of the Spanish Town Mine ........................................... 35
FIG. 3. Geologic Sketch Map of the Accessible Under-  
        ground Workings at the Wide West Mine ..................................... 37
FIG. 4. Geologic Sketch Map of One of the Tunnels  
        on the Flag Staff Property .......................................................... 38
THE GEOLOGY OF THE GOLD-BEARING LODES OF THE
ROCKY BAR DISTRICT, ELMORE COUNTY, IDAHO

By
Alfred L. Anderson

ABSTRACT

This report describes the geology and occurrence of the gold-quartz lodes and veins of the once productive Rocky Bar district in Elmore County in south-central Idaho. These lodes and veins appear to be associated with porphyritic dikes that were intruded into the Idaho batholith, perhaps during early Tertiary time, and are, for the most part, aligned along fissure and fracture zones in the granitic rock of the batholith. Many of these deposits have been appreciably productive, principally in the rather shallow oxidized zone. Most of the veins are about 2 feet and most of the lodes 8 to 10 feet wide. Both may be traced for distances of a few hundred to several thousand feet. The ore in them is confined to comparatively small shoots, nowhere more than 300 feet long and commonly only 20 to 30 feet long. Bunches of notably rich ore have been found.

The quartz of the lodes and veins is commonly accompanied by scant amounts of arsenopyrite as well as scattered grains of pyrite, sphalerite, galena, chalcopyrite, and sericite. Some of the gold is free in the quartz, and some is associated with and replaces the sulphides. Despite the simple mineral composition, the deposits are complex and most of them show three stages of quartz deposition; (1) an early white granular quartz of medium grain which in places is accompanied by a little pyrite; (2) a later fine-grained bluish-gray quartz with disseminated minute grains of arsenopyrite and pyrite; and (3) a still later medium- to coarse-grainedcomb and drusy quartz with some sericite, pyrite, sphalerite, galena, and chalcopyrite. The gold was introduced with this youngest quartz.

These deposits were apparently formed at moderate depths below the surface. Although they have been considerably eroded since, there is some reason to believe that not all the ore has been mined and that further exploration on strike and dip on some of them may be justified.

INTRODUCTION

Purpose and Scope

The Rocky Bar is one of the old gold camps that came to life with the discovery of placer gold in Idaho in the early sixties. Although many lodes were uncovered within a year after the discovery of gold in the stream gravels, they failed to receive much attention until the late sixties. From then on, for the next 20 years, lode mining was active and reached its peak between 1875 and 1885. Although after that time, mining dwindled to the point where Rocky Bar became virtually a ghost camp, it did not pass entirely out of existence. Some of the mines have been reopened from time to time, but the recurren
activity has at no time restored to Rocky Bar the importance that was hers in the early days.

With the general revival of interest in gold mining during the past decade, the Rocky Bar district has attracted its share of attention, but, as is true of many other old gold camps, little published geologic information is available regarding it for those who would like to engage in further work in the district. To supply such information, the writer was authorized by the U. S. Geological Survey in cooperation with the Idaho Bureau of Mines and Geology, to make a geologic examination of the area to determine, so far as possible, the factors that bear on the occurrence and distribution of the ore, and whether the geologic and other conditions offer some hope of material success to any work that might be undertaken.

The fact that no mining in the past extended more than a few hundred feet below the surface and that much of the ore was mined at depths of less than 300 feet, has been interpreted in various ways to mean either that the ore mined in the early days had been enriched by supergene processes, that the early-day operators had not been able to effect a recovery from the base ores below the oxidized zone, or that the shallow depth to which mining extended had really marked the bottom of the primary ore. Blame for the limited operations and unsuccessful attempts at mining has also been laid to inefficient management and to other causes. According to the present study, the ore mined in the early days was not ore enriched by supergene processes, though some of the outcrops apparently did contain a residual concentration of gold from the weathering of the lodes, nor was the ore mined confined entirely to the oxidized zone. Apparently, some of the operators did have trouble in effecting a recovery from the sulphide ore with the stamp- amalgamation method then in use and this fact may have had something to do with limiting the depth of the early work. The reports indicate that the ore mined in the early days was rich but that many of the ore shoots were not very large nor very extensive along strike or dip. It seems probable that inefficient management may have been a factor responsible for the closing of some of the mines, but the size and grade of the mineralized bodies found, at least in the more recent activity, may have had much to do with the success or failure of mining. Although the ore that was mined lay close to the surface, erosion and mining have revealed that the deposits have a vertical range of at least 1,200 feet; therefore, it seems unlikely that the shallow work at any one place has demonstrated the full possibilities of that or nearby lodes. Some further work in the district might well be justified.

Field Work and Acknowledgments

About a month in the summer of 1938 was devoted to the study of all accessible underground workings. Since most of the mines had not been active for many years, few of them could be entered and study at many places had to be confined to the outcrops. In the summer of 1939, a detailed map of the principal part of the district, showing topography and the location of the various lodes and old workings, was prepared. Because the workings of most of the old producing mines were not accessible, the writer had to draw freely on the data available in the few published reports on the district.

During the 1938 field season, the writer was ably assisted by Mr. Warren R. Wagner, and during the 1939 season by Mr. Wagner and Mr. Rhea M. Allen. The making of the map was left entirely in the hands of Mr. Wagner and Mr. Allen.
<table>
<thead>
<tr>
<th>Year</th>
<th>Number of producers</th>
<th>Crude ore (tons)</th>
<th>Concentrates (tons)</th>
<th>Gold (fine ounces)</th>
<th>Silver (fine ounces)</th>
<th>Copper (pounds)</th>
<th>Lead (pounds)</th>
<th>Total value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1908</td>
<td>1</td>
<td>3</td>
<td>---</td>
<td>3.00</td>
<td>275</td>
<td>69,549</td>
<td>65,554</td>
<td>$488</td>
</tr>
<tr>
<td>1909</td>
<td>3</td>
<td>76</td>
<td>---</td>
<td>.09</td>
<td>516</td>
<td>282</td>
<td>69,549</td>
<td>4,048</td>
</tr>
<tr>
<td>1910</td>
<td>2</td>
<td>237</td>
<td>---</td>
<td>.08</td>
<td>739</td>
<td>259</td>
<td>224,025</td>
<td>9,945</td>
</tr>
<tr>
<td>1911</td>
<td>2</td>
<td>418</td>
<td>---</td>
<td>---</td>
<td>4,408</td>
<td>---</td>
<td>269,184</td>
<td>13,213</td>
</tr>
<tr>
<td>1912</td>
<td>1</td>
<td>78</td>
<td>---</td>
<td>---</td>
<td>277</td>
<td>53</td>
<td>48,724</td>
<td>2,300</td>
</tr>
<tr>
<td>1913</td>
<td>2</td>
<td>7,859</td>
<td>1,373</td>
<td>4.69</td>
<td>11,513</td>
<td>506</td>
<td>1,487,350</td>
<td>74,069</td>
</tr>
<tr>
<td>1914</td>
<td>1</td>
<td>18,223</td>
<td>4,862</td>
<td>---</td>
<td>36,404</td>
<td>6,228</td>
<td>8,182,846</td>
<td>362,275</td>
</tr>
<tr>
<td>1915</td>
<td>1</td>
<td>8,226</td>
<td>2,144</td>
<td>1.77</td>
<td>18,118</td>
<td>6,322</td>
<td>4,147,642</td>
<td>172,642</td>
</tr>
<tr>
<td>1916</td>
<td>1</td>
<td>10,299</td>
<td>3,913</td>
<td>2.91</td>
<td>36,500</td>
<td>6,181</td>
<td>5,031,619</td>
<td>255,032</td>
</tr>
<tr>
<td>1917</td>
<td>1</td>
<td>11,349</td>
<td>3,977</td>
<td>---</td>
<td>35,170</td>
<td>7,959</td>
<td>3,305,465</td>
<td>253,825</td>
</tr>
<tr>
<td>1918</td>
<td>1</td>
<td>4,377</td>
<td>835</td>
<td>1.95</td>
<td>29,626</td>
<td>15,128</td>
<td>2,225,469</td>
<td>219,972</td>
</tr>
<tr>
<td>1919</td>
<td>1</td>
<td>799</td>
<td>132</td>
<td>---</td>
<td>3,061</td>
<td>169</td>
<td>490,544</td>
<td>37,889</td>
</tr>
<tr>
<td>1920</td>
<td>1</td>
<td>303</td>
<td>50</td>
<td>---</td>
<td>237</td>
<td>47</td>
<td>47,130</td>
<td>2,356</td>
</tr>
<tr>
<td>1921</td>
<td>2</td>
<td>1,419</td>
<td>267</td>
<td>1.24</td>
<td>14,566</td>
<td>1,124</td>
<td>551,312</td>
<td>54,351</td>
</tr>
<tr>
<td>1922</td>
<td>1</td>
<td>3,567</td>
<td>1,366</td>
<td>.23</td>
<td>8,316</td>
<td>1,284</td>
<td>1,234,922</td>
<td>115,479</td>
</tr>
<tr>
<td>1923</td>
<td>1</td>
<td>1,598</td>
<td>449</td>
<td>.27</td>
<td>4,541</td>
<td>1,271</td>
<td>421,771</td>
<td>42,219</td>
</tr>
<tr>
<td>1924</td>
<td>1</td>
<td>2,201</td>
<td>2,177</td>
<td>3.77</td>
<td>43,112</td>
<td>1,272</td>
<td>2,263,353</td>
<td>175,561</td>
</tr>
<tr>
<td>1925</td>
<td>2</td>
<td>11,359</td>
<td>1,831</td>
<td>.22</td>
<td>31,286</td>
<td>165</td>
<td>2,148,472</td>
<td>142,942</td>
</tr>
</tbody>
</table>

Average content:

- Ounces to the ton: 3.30024
- Per cent: 0.23

Notes:
- No production in 1902, 1903, 1904, 1905, 1911, 1919, 1920, 1922, and 1923.
who spent about six weeks from mid-June until late July in its preparation. The writer is pleased to acknowledge the able and efficient assistance of these two men, as well as the courtesies extended by those who were actively at work in the district. The writer also wishes to express his gratitude to Mr. C. P. Ross of the U. S. Geological Survey for his suggestions made while the work on the manuscript was in progress.

Previous Geologic Work

Most of the scanty data so far published on the Rocky Bar district is contained in the reports by Eldridge and Ballard. A generalized and essentially diagrammatic map of the region based upon broad reconnaissance studies is included in the report by Ballard. Some information on the district is also contained in various annual reports of the State Inspector of Mines, the annual volumes of Mineral Resources of the United States issued from 1862 to 1874 by the U. S. Geological Survey and from 1874 to 1921 by the U. S. Bureau of Mines, and its successor, the Minerals Yearbook.

GEOGRAPHY

Location

The Rocky Bar district, as shown in Figure 1, is about 45 miles by air east-northeast of Boise, the State capital, and 60 miles north-northwest by road from Mountain Home, the county seat of Elmore County. Its geographical center is in T.4N., R.10E., Boise meridian, approximately at 43°40' north latitude and 115°45' west longitude. The most direct approach to the district is from Mountain Home over a road that is gravelled as far as Featherville, 7 miles short of Rocky Bar. The remainder of the road has a natural sandy surface.

Surface Features

The district is in the mountains about 50 miles from the north margin of the Snake River Plain, partly in the Trinity Mountains which lie west of Feather River and its tributary, Elk Creek, and partly in the Sawtooth Mountains which lie to the east of those streams (Plate 1, in pocket). The district is in an area where the mountains are relatively low but are encircled on all sides by others that are considerably higher. These lower mountains stand about 6,000 feet above sea level and 2,000 to 3,500 feet below the level of the surrounding mountains (See Plate 2). Both the low and the high mountains are composed of a maze of ridges, each of which shows an approximate accordance of levels, the lower level of ridges separated from the higher on the west, north, and east by steep, scarp-like slopes. The higher Trinity Mountains on the west rise to

Fig. 1. Index map showing location of Rocky Bar District
A. Mountains at Rocky Bar

Picture shows the abrupt escarpment separating the higher Sawtooth Mountains from the lower group of ridges at Rocky Bar. The south slope of Steele Mountain shows in left foreground.

B. Steele Mountain

Picture shows Steele Mountain of the Trinity Mountain group with the lower ridges of the Rocky Bar district spread out at its base in the foreground.
an altitude of 9,475 feet, Steele Mountain on the northwest edge of the district, to 9,762 feet (see Plate 2, B). Bald Mountain in the Sawtooth Mountains on the north just east of Steele Mountain, reaches 9,389 feet. Farther east the Sawtooth Mountains are even higher.

The relief within the area of low mountains is moderate, the ridges rising from 500 to 1,200 feet above the narrow valley floors (Plate 1) of Bear, Steele, Red Warrior, and Elk creeks. These form the headwaters of Feather River, a short tributary of the South Fork of the Boise River that joins the Boise at Peetherville. Most of the valley floors are bordered by slopes of moderate steepness, but in places the comparatively narrow valleys give way to steep-walled canyons. Some of the ridges between the valleys have narrow crests; some have wide tops, and, except for a rather shallow undulating surface, are relatively flat. The upper valley of Elk Creek is somewhat different from the others. At the head of the area mapped, it is broad, U-shaped, and partly choked with moraines, but to the south it is narrow and steep-sided like the others. There are no other features of glacial origin within the district, but the higher oncoiling ridges show glacial scour and are carved by cirques, some of which hold lakes.

Climate and Vegetation

Because of its location in the mountains, the district has considerable cold weather through the winter months, but the summers, though comparatively short, are pleasantly cool, especially during the evening hours. Most of the precipitation comes during the autumn, winter, and spring months. The nearest recording station at Pino, 16 miles to the south, has perhaps half the precipitation at Rocky Bar. From 1909 to 1930 the yearly average at Pino was 21.89 inches, distributed as follows: January through May, 11.52 inches; June through September, 2.38 inches; and October through December, 7.99 inches. The snowfall is heavy and makes travel to Rocky Bar difficult from December well into June. Fortunately, the snowfall from Mountain Home to Peetherville is scant to moderate and the snow is actually a hindrance only along the remaining six or seven miles into Rocky Bar. Because of the gravelled and the natural sandy surface of the roads, Rocky Bar is easily accessible the remainder of the year, despite the rains. In the higher mountains the ground remains covered with snow for 7 to 8 months of the year.

Whereas the precipitation at Pino is just enough to support a scant timber growth on protected north slopes, it is sufficient at Rocky Bar to support a heavy growth of pino and fir on all slopes (Plate 2). Much of the timber now consists of second growth, but good stands of virgin timber still remain on the higher slopes at the margin of the district. The area is well within the borders of the Boise and the Sawtooth National forests.

Population

Rocky Bar, the only settlement within the district, had about 20 inhabitants at the time this study was made. In the early days its population was reported in the hundreds, but since the inhabitants must depend upon the activity of its single industry, mining, their number has dwindled with decline in mining, until in recent years only a few prospectors and small operators have remained. Rocky Bar has a post office and receives mail tri-weekly by
stage from Mountain Home, which is on the main line of the Oregon Short Line Railway (Union Pacific System). The settlement also has a small store and filling station. The nearest hotel and school are at Featherville, seven miles below Rocky Bar.

GEOLGY

Foreword

Except for some gravels along stream valleys, the district is underlain entirely by the granitic rock of the Idaho batholith and by a few small bodies of porphyritic rock which cut the batholith. The granitic rock of the batholith is considered Mesozoic; the porphyritic dikes, Tertiary; and the gravels, Quaternary.

Because of the uniformity of the bedrock, the structural aspects of the geology are not easily interpreted. There is evidence, however, that the batholith has been disturbed at least three times by fracturing; the disturbance providing for the intrusion of pre-mineral porphyritic dikes and the circulation of the ore-bearing solutions; the second for the intrusion of post-mineral dikes; and the third causing dislocation of the batholithic rock, dikes, and ore deposits.

Mesozoic Granitic Rocks

Idaho Batholith -

Locally, the granitic rock of the Idaho batholith varies from calcic quartz monzonite to granodiorite, but those compositional variations can only be distinguished microscopically. The rock is everywhere light gray, since it has only about 4 to 5 per cent of magmascope dark mineral, exclusively biotite. It is moderately coarse-grained, having scattered biotite crystals 1 to 2 millimeters in diameter occurring with quartz and feldspar grains 3 to 4 millimeters long. The quartz constitutes about 30 per cent of the rock; the feldspars (oligoclase and microcline) about 65 per cent, the proportions ranging from about 2 parts of oligoclase and one of microcline to about equal parts of each. Some of the rock has about as much muscovite as biotite but no other minerals are visible without the microscope. Those microscopically visible include accessory amounts of apatite, zircon, allanite, and magnetite, and variable amounts of chlorite, sericite, and carbonates. The sericite and chlorite seem more conspicuous in the vicinity of the ore deposits than elsewhere and may in part be the product of hydrothermal alteration associated with ore deposition.

The relations of the minerals are such as to suggest that the rock was considerably changed by processes active at the close of the intrusive period, and that some of the quartz, potash feldspar, muscovite, and most of the accessory and secondary minerals were formed in the rock after its consolidation.

Age

From an analysis of the stratigraphic and structural relations of the Idaho batholith, Ross has concluded that the granitic mass was emplaced during late Jurassic or early Cretaceous time 1. Reed, from determination of the lead-uranium plus thorium ratio of pitchblende from a placer in the Warren district, has evidence that the age of at least the last consolidated part of the batholith is probably Upper Cretaceous 2.

Tertiary Intrusive Rocks

Distribution and Classification

The porphyritic intrusives which cut the batholith are more numerous at and beyond the margins of "porphyry belts", that extend across Steele Mountain north of the district and across Feather River between the mouth of Red Warrior Creek and Featherville, south of the district (see map in Ballard's report), or they may be in part members of a narrow zone wedged in between those on the north and south. The bordering "porphyry belts" were not examined in detail, but the dikes that do occur within the borders of the district, though not mapped, were studied.

These porphyry dikes show a considerable range in composition and the varieties include dacite porphyry, quartz monzonite porphyry, granite porphyry, granite, granophyre, rhyolite, and several kinds of basic lamprophyre. Some of these like the dacite porphyry and the granophyre are known to be cut by the ore deposits and, therefore, are older than the mineralisation; but one dike of rhyolite intrudes into one of the ore deposits. Other dikes or varieties of intrusives not mentioned are so isolated that their relations to the other dikes and to the mineral deposits cannot be determined.

Dacite Porphyry

Several dikes whose composition is close to that of dacite porphyry were observed in several parts of the district, but the only one examined microscopically is one that crosses Red Warrior Creek just below the Flag Staff mill about a mile south of Rocky Bar. By float on the hillside and material on old mine dumps, this dike or others like it may be traced eastward up the slope toward the crest of the ridge between Red Warrior and Bear creeks. The dacite porphyry was not exposed in any of the accessible underground workings; but since that on dumps shows evidence of considerable alteration, it has probably been acted upon by the ore-forming solutions, and therefore, belongs to the group of dikes older than the mineralisation.

The rock is conspicuously porphyritic and contains numerous white feldspar,


quartz, and greenish chloritized biotite phenocrysts in a greenish fine-grained groundmass so highly altered that the presence of original quartz and perhaps a little orthoclase is recognized only as remnants among the abundant alteration products. Most of the quartz phenocrysts are rounded or partly resorbed, and some are surrounded by reaction halos. The plagioclase grains are so completely sericitized that the precise composition of those either as phenocrysts or in the groundmass cannot be determined. In addition to much sericite and chlorite in the rock, there is also much calcite.

Quartz Monzonite Porphyry -

A body of quartz monzonite porphyry of considerable size was noted on Cayuse Creek a short distance below the Boneparte mine. It lies about 4 miles southeast of Rocky Bar, apparently as a prominent member of the "porphyry belt" that trends easterly across Feather River. Although it is not within the defined limits of the Rocky Bar district, it is so near the Boneparte mine that its lithologic features are described.

The rock is almost granitoid as viewed in the hand specimen; but it is actually porphyritic and contains numerous white chalky feldspar crystals 1 to 4 millimeters long and fewer crystals of hornblende and biotite of about the same size in a fine-grained, pinkish gray groundmass. The hornblende crystals are little altered, but most of the biotite is represented by pseudomorphous chlorite. The plagioclase crystals are zoned andesine and are also little altered. The minerals of the finely granular groundmass are chiefly quartz and orthoclase with accessory grains of magnetite, sphene, zircon, and apatite. The orthoclase content of the rock is slightly less than that of the plagioclase. Secondary products are epidote, chlorite, and sericite.

Granite Porphyry -

The dikes of granite porphyry are near the borders of the district; one, a dike about 60 feet wide, is at the forks of Bear Creek about 2 miles above Rocky Bar; another, a body nearly 40 feet wide is along Red Warrior Creek about a mile below the Wide West mine. No mineral deposits are known to occur within the immediate vicinity of either.

The granite porphyry, like the dacite porphyry, is conspicuously porphyritic and contains up to 25 per cent of phenocrysts, chiefly dull grayish andesine accompanied by a few grains of quartz and chloritized biotite and scattered crystals of orthoclase, some of which measure as much as 20 millimeters long. These phenocrysts are embedded in a fine-grained, grayish-green to faintly pinkish groundmass, which is micro-granular in thin section and is composed largely of minute grains of orthoclase accompanied by a little magnetite, apatite, and quartz. In the dike above Rocky Bar the rock is considerably altered and contains much chlorite, sericite, calcite, and epidote; that below the Wide West mine on Red Warrior Creek is little altered.

Granite -

Granite is recognized in float along Bear and Elk creeks, derived apparently from exposures somewhere on the south slope of Steele Mountain.

This rock is distinctly pinkish in color, is medium to moderately coarse-grained, and is composed of easily recognizable grains of biotite, white and
pinkish feldspar, and smoky grains of quartz. It also has microscopic grains of allanite, sphene, apatite, zircon, magnetite, epidote, chlorite, and sericite. The biotite in crystals 1 to 2 millimeters in diameter comprises about 5 percent of the rock; the white feldspar (oligoclase) in grains 5 millimeters long, about 20 percent; the pink feldspar (orthoclase and microcline) in grains 5 to 10 millimeters long, 60 to 80 percent; and the quartz in grains also 5 to 10 millimeters long, 20 to 25 percent. The pinkish color of the rock makes it easily distinguishable from the light gray rock of the Idaho batholith.

Granophyre -

Dikes of granophyre appear to be more numerous within the borders of the district than those of any other kind. One lies along the granite porphyry dike below the Wide West mine on Red Warrior creek and others are scattered in and near Hardcore Gulch about 1 1/2 miles northeast of Rocky Bar. One in Hardcore Gulch may be traced on the surface for several hundred yards. It is of particular interest because it has been fractured and some of the fractures contain stringers of ore.

The granophyres are grayish, fine-grained rocks that resemble aplite. They differ, however, from aplite in containing small, widely-scattered phenocrysts of plagioclase and biotite or of quartz and orthoclase in groundmasses composed either of orthoclase and quartz in micrographic intergrowths or of orthoclase and quartz in fine to coarse microspheuritic intergrowths. Most of the larger microspherulites are built around quartz and orthoclase phenocrysts. The micrographic intergrowths are in part built around small orthoclase laths. Some quartz grains also appear between and at the margins of the microspherulites. Minerals other than those mentioned include magnetite, considerable sericite, and some chlorite and muscovite after biotite.

Lamprophyre -

Lamprophyric dikes are scattered through the district, most of them in or near the mineralized fracture and fissure zones. They were actually observed in the underground workings at two mines, the Wide West and the Canada Gold, but their presence in many of the others is inferred from the fragments of rock on a number of the mine dumps. Because these dikes show such a close structural association with the ore deposits, it is thought that they were intruded about the time of the mineralization, but whether shortly before or shortly after could not be learned from the two available exposures.

These dikes are composed of at least two varieties of rock; one, which may be classed as hornblende vogesite; the other, as hornblende spessartite (diorite lamprophyre). These varieties are difficult to differentiate, except microscopically, as the rock of each is fine-grained, grayish to greenish black, and inconspicuously porphyritic, the phenocrysts comprising altered ferro-magnesian minerals of the same color as the minerals of the groundmass. Both contain more dark than light minerals. Since the microscopic studies showed no more specimens to be of vogesite than spessartite, it is likely that the vogesite dikes are actually the more numerous.

In the hornblende vogesite, the phenocrysts include large scattered grains of olivine completely altered to calcite and chlorite and numerous but smaller rod-shaped crystals of hornblende. The groundmass is a mixture of smaller greenish hornblende nodules and small orthoclase laths accompanied by a little
zonod oligoclase or andesine and rather abundant apatite and magnetite. The
diorite lamprophyre on the other hand has biotite phenocrysts in addition to
those of hornblende and altered olivine, and a groundmass composed largely of
hornblende, biotite, and highly zoned plagioclase laths accompanied by accessory
orthoclase and quartz and numerous needles of apatite and small crystals
of magnetite. Chlorite, sericite, and calcite are abundant in both varieties
of lamprophyre. Fractures in the rock are commonly filled with calcite.

Rhyolite

A dike of rhyolitic composition has been exposed by placer operations
along Elk Creek at old Spanish Town about 2 miles northeast of Rocky Bar. As
the dike cuts directly across a mineralized fracture zone and is itself
neither fractured nor altered by the mineralizing solutions, it is of more than
general interest; its relations afford some evidence of more than one epoch of
post-batholithic igneous activity.

This rock is fine-grained, essentially aphanitic, and if its intrusive
nature was not definitely known, it might easily be mistaken for rhyolite that
had cooled on the surface. It has a few small, widely-scattered quartz,
plagioclase, mica, and orthoclase phenocrysts embedded in a groundmass of
somewhat bostonitic character made up of ill-defined and sutured granules of
orthoclase and probably quartz in which are engulfed numerous microlitic laths,
perhaps of a feldspar. The rock apparently is unaltered, except for muscovite
and coarse sericite grains, which may represent original grains of biotite.

Dikes identical and in no way distinguishable from it are numerous along
a part of a "porphyry belt" that the writer has studied in the Boise Basin. There
the dikes belong to a group of intrusives of early Miocene age.

Age of the Intrusives

As these dikes cut the Idaho batholith and show evidence of rather rapid
chilling as well as other features of dikes emplaced at moderate to compara-
tively shallow depths, they must have been intruded not only after the rock
in which they occur had grown cold, but also after it had been considerably
eroded. For this reason a considerable interval of time must have elapsed
after the batholith had consolidated (probably in Cretaceous time) and before
the dikes were injected in Tertiary time. These dikes may be expressions of
the igneous activity that was widespread throughout the Western States during
the Tertiary period.

As some of the dikes are older and one, at least, is younger than the
mineralization, it is evident that they were not all intruded during the same
epoch. Since the youngest of the dikes, the rhyolites, may be correlated with
identical rhyolites in the Boise Basin "porphyry belt" and since the members
of that belt have been correlated with intrusives that cut the Challis volcan-
ics (Oligocene or Miocene) and have been assigned an early Miocene age, the
rhyolite at Rocky Bar also was probably intruded during early Miocene time.

1/ Anderson, A. L., Geology and ore deposits of Boise Basin, Idaho: U. S.
    Geol. Survey Bull. in press.
2/ Ross, C. F., Some lode deposits in the northwestern part of the Boise Basin:
As the dacite porphyries and the granophyres are of pre-mineral age, and as the lamprophyric dikes are closely associated with the mineralization, they may well have been intruded in early Tertiary time when igneous activity was widespread in other states in the Rocky Mountain area.

**Sedimentary Rocks (Quaternary)**

The only sedimentary deposits in the district are the narrow strips of coarse alluvium found along the present stream courses. Below the mineralized zones the gravels have been highly auriferous and have been placered extensively, though, along such places as Bear Creek at and below Rocky Bar, numerous large boulders have hindered hydraulic mining. Such boulders have been and still are a serious obstacle to dredge and dragline operations along Feather River and even on the South Fork of the Boise River at Featherville. Many of the large boulders are composed of the porphyritic igneous rocks.

**Structure**

**Foreword**

Since the district is underlain almost entirely by igneous rocks, the structural features that can be discussed are necessarily limited to those within each rock and those that account for the relations of these rocks to one another. No attempt, however, was made to study the structural phenomena associated with the intrusion and consolidation of the Idaho batholith, as the jointing and other structural features related to emplacement apparently have exerted little if any influence on the occurrence and distribution of the mineral deposits; instead, attention has been directed to the fractures that controlled the intrusion of the porphyritic magmas, those that permitted circulation of the ore-bearing solutions, and those that have since caused offsets in the mineralized bodies and displacement of topographic features. Despite the difficulty of proving displacement along fractures in massive igneous rock like that of the Idaho batholith, the fractures that guided the porphyritic magmas and the ore-bearing solutions are regarded as faults; and, for convenience, those that provided for dike intrusion are described as dike faults, those that served as channels for the circulation of the ore-bearing solutions, as mineralized faults, and those that are later, as post-mineral faults.

**Dike Faults**

**General Features:** Most of the dikes, and therefore, the inferred guiding faults trend about due east or a few degrees south or north of east. However, a few strike northeast and some nearly due north to north-northwest. Those not conforming with the general easterly trend are granophyric dikes that strike about 35°E., the rhyolite dike that strikes about due north, and the lamprophyric dikes that favor west-northwest directions. As these dikes were not mapped, the precise structural pattern is not certainly known. Some of them appear to be marginal to the zone of rather widely scattered dikes that extend in a general easterly or east-northeasternly direction over Steele Mountain, and some seem to be outliers and members of the very prominent "porphyry belt" that crosses Feather River and extends in a general east-northeasternly direction up Cayuse Creek (see Ballard's map of the Rocky Bar quadrangle). Until the members of those dike zones are mapped, little can be said about the dike, and therefore,
the fault pattern. Judging from the lack of curvature of dike outcrops on hill and ridge slopes and from the few observations of dike contacts below and on the surface, the dikes evidently have steep dips.

As these faults are so intimately associated with dike intrusion, they were probably formed just prior to or concurrently with igneous activity affiliated with structural disturbances of considerable consequence. Faults produced by the disturbance evidently tapped a deep magmatic reservoir and provided space for the repeated injections of partly crystalline magma into the cold rocks well toward the surface.

As the rhyolitic dike is younger than the minor deposits and may be correlated with similar dikes of early Miocone (?) ago in the Quartsburg-Grimes Pass "porphyry belt" of Boise Basin, it probably was injected along a fault produced during the middle Tertiary disturbance. But since some of the other dikes are known to be definitely older than the minor deposits, or are believed to be closely related thereto, they must have been injected along faults produced during an earlier period of crustal disturbance, presumably during early Tertiary time, as a consequence of the Laramide orogeny.

Mineralized Faults

General Features: Most of the mineralized faults and fault zones trend N.70° W. to N.80° E., but a few strike about N.30° W., and some not so highly mineralized as the others strike from N.70° E. to N.80° E. Thus, there is close correspondence in the trends of the dikes and the mineralized bodies, though locally there may be departures that permit the mineral-bearing faults to cut the dikes. Enough of the mineralized faults were mapped at Rocky Bar (Plate 1) to show the dominant structural trend. This map is very similar to those showing the distribution and trend of the lodes and veins in the Atlanta 1/ and Cambrinus 2/ districts and portrays the tendency of the mineralization to favor faults of general west-northwest trend. Most of the mineralized faults and fault zones at Rocky Bar dip steeply, those of west-northwest trend mainly to the north, those of north-northeast trend either to the east or west, and those of east-northeast trend either to the north or south.

From the distribution of the ore on these faults and the relations of associated fractures and slickensided surfaces, it is evident that some of the faults had a vertical direction of movement and others, a prominent horizontal or strike-slip component of movement. In some with vertical movement the hanging wall apparently moved upward with respect to the footwall; in others the movement was just the opposite. Because of the absence of markers in the granitic rock, it has not been possible to determine the amount of movement. As the ore has been broken and in part healed by more mineral matter, it is evident that movement was somewhat prolonged and not only preceded but also acted concurrently with mineral deposition and even afterward.

**Age:** Because some of the granophyric and, in particular, the lamprophyric dikes are closely associated with the mineralized fracture zones, there appears to be little difference in the age of the late dikes and of the mineral deposit. Since the mineralized fractures cut the dacite porphyries (?) and the granophyre, they must have been formed late during the crustal disturbance that opened the fractures for the porphyritic magmas. They must have been formed before igneous activity had entirely ceased as indicated by the concentration of lamprophyric dikes in mineralized areas and along mineralized faults (Ballard, p. 29). The close correspondence in the trends of dikes and mineralized fractures also suggests that both are products of the same crustal disturbance, and that the faults that guided the ore-forming solutions, formed during the later part of the disturbance. This would place the mineralized faults also as having been formed during early Tertiary time.

**Post-Mineral Faults**

**General Features:** Some movement has taken place along many of the mineralized faults since ore deposition, but the movement has done little more than fracture lode or vein filling and produce easings of gouge along one or both of the walls. There has, however, been considerable post-mineral faulting in a direction transverse to the trend of the mineralized fissure or fracture zones that has caused slight to appreciable lateral offsets of the ore bodies. These faults have general trends from northeast to north-northwest. Some ore bodies are reported to have been lost against them during the early days of mining. Where these faults cross the mineralized fault zones, the ore and the bordering wall rock are generally much shattered and need support where exposed in underground workings.

There are also some faults at the margin of the district which may be inferred from certain topographic discordances, particularly by the abrupt escarpments that separate the high ridges on the west, north, and east margins of the district from the low ridges in the district itself. The main escarpment, though sharply incised by the drainage, may be readily traced around the west and south sides of Steele Mountain and thence for a short distance along Elk Creek. From there it may be traced many miles across the mountainous terrain to the southeast. On upper Elk Creek where almost precipitous slopes partly encircle Steele Mountain (Plate 2B), the base of the escarpment is outlined by a zone several hundred feet wide in which the rock has been shattered extensively and locally crushed and ground to gouge. This structural evidence of faulting suggests that perhaps the entire escarpment has been produced by faulting and that other escarpments to the west and small escarpments along minor asymmetrical ridges in the district may also represent faults. The largest and most conspicuous scarp-like slopes extend in a northwesterly direction. Scarp-bounding the northeast side of the district face southwest; those on the west side face northwest and southwest. A few escarpments extend east-northeast and face north. These end against the escarpments of northwest trend. Although the topographic suggestion of faulting has not been verified by structural evidence, except at Steele Mountain, the topographic discordances throughout the area suggest that a fault mosaic exists and that the basin-like area in which the district lies has been produced by structural collapse. Until more data are available, this interpretation of topographic and structural relations must be considered as hypothetical.

**Age:** Although some of the movement along the ore bodies may have taken
place at or shortly after the closing stages of ore deposition and may represent
a dying phase of the early Tertiary disturbance, some may have been associated
with and may represent adjustments to later disturbances, such as those that
have produced offsets in the mineralized bodies. As the area has been affected
by the middle Tertiary structural disturbance, which provided a fracture for the
intrusion of at least one exposed rhyolite dike, it is possible that some of the
offsets of mineralized bodies by faults of northerly and northeasterly trend
may have been produced at that time. It is also possible, however, that some of
the offsets by faults of north-northeast direction may in part have been asso-
ciated with the faulting responsible for the topographic escarpments. Because
erosion has done so little to obliterate the escarpments, the faulting must have
taken place rather recently, perhaps during the close of the Tertiary and in
early quaternary time. This timing has been suggested for similar faults in the
nearby Atlantis 1/ and Boise Basin 2/ areas and in other parts of Idaho 3/.

GOLD DEPOSITS

Historical Sketch

Discovery of the lode deposits at Rocky Bar came in 1863, a year after gold
had been found in the stream gravels. Because of the isolation of the district,
little attention was given the lode deposits until the late sixties, but from
then until the early nineties mining was active and, as mentioned in the intro-
duction, reached its peak between 1875 and 1885. Within the next decade most
of the mines had closed, but since then a number have been active intermittently
but apparently with little success, as no appreciable production has been record-
od.

Few data are available on the early-day activities of the camp. Such data
as are available are summarized in a report on the history of mining in Idaho
written for the U. S. Geological Survey by Walter P. Jenny and published in part
by Ballard in his pamphlet on the geology and ore deposits of the Rocky Bar
quadrangle 4/. According to Jenny's summary, the Ada Elmore, Idaho, Confederate
Star, and Vishnu were among the first lodes discovered in the district; but
little information concerning them appeared until 1873 when the annual report
of that date on the mines of the Territory by Brown and Raymond was published.
In earlier reports mention had been made of the operation of a few arrastres
in 1869 and of considerable activity at the Wide West mine, which then had ore
blocked out for milling. Three stamp mills in the district were reported to
have been idle at the time. The Boneparte mine was reported as the most active
operation in 1870. This mine, several miles southeast of Rocky Bar, was then
being worked by the New York and Ohio Company and by the Boneparte Company, but
these companies suspended operations in October 1873.

Using reports by A. Walters, Superintendent of the U. S. Assay office at

3/ Anderson, A. L., A preliminary report on recent block faulting in Idaho;
4/ Capps, S. R., Faulting in western Idaho, and its relation to the high placer
4/ Ballard, S. M., Geology and ore deposits of the Rocky Bar quadrangle; Idaho

13
Boise, Idaho, who visited the district in 1873 and in 1874, Raymond was able to supply more reliable information not only on camp activities but also on many features of the mineralization. By then the Ada Elmore, owned by the Pittsburg Gold Mining Company, was the leading mine in the camp. The work there was reported to have been handicapped by the inability of the operators to cope with the water as the workings gained in depth, so that the mine closed temporarily in 1875. Mention also was made that the Idaho lode had produced some very rich ore but that in 1874 all the ore within reach of tunnels had been exhausted, leaving the mine idle. Later it was consolidated with the Vishnu which in 1874 was being worked from tunnel levels. Mention also was made of the uncovery in 1873 of the General Grant, General Sherman, and Poorman lodes by the Pfeiffer brothers while working their placer claims about 2 miles northeast of Rocky Bar.

Jenny also got considerable data from Strahorn 1/ who wrote that in 1881 the Ada Elmore had been worked to a depth of 240 feet below the creek bed and that the total production of the mine to the close of 1881, as given by the superintendent, was $1,200,000. At that time the Confederate Star had been worked to a depth of 250 feet and its production was given as $350,000. The work at the Vishnu had gone to a depth of 300 feet; the total production as estimated by the owners was given at $850,000. Strahorn also mentioned that the Idaho Bonanza and Alturas in Blakes Gulch, half a mile north of Rocky Bar, had been opened by a 1,600-foot tunnel and that the production from the mines was estimated at $100,000. At the same time he wrote that the Wide West had been worked to a depth of 300 feet and that the gross yield of the mine was then $300,000 or more.

Subsequent data on the activities of the district are scarce; and much of the story has to be pieced together from bits of information gleaned from the various U. S. Mint reports, the Annual Reports of the State Inspector of Mines, and the Mineral Resources of the United States reports published annually by the U. S. Geological Survey until 1925 and since then by the U. S. Bureau of Mines.

After an idleness of several years, the Ada Elmore resumed operations in 1881 and continued active until 1884. In 1886, the mine, again idle, was sold and work was resumed, lasting until 1892. Since then the mine has not been reopened. According to Ballard, the Ada Elmore is supposed to have had a gross production of about $2,500,000, and the Pittsburg, adjoining it on the same lode, a production from one-fourth to one-half that amount. He interprets these figures to mean that the mines were important producers in their day 2/.

Work at the Vishnu continued after 1881 and has been carried on intermittently to the present day. In 1889 work was begun on the Vishnu shaft and when stopped in 1893, the shaft had reached a depth of 700 feet. After that, the property apparently was idle for many years, but in 1921 a new work program was started by the Idaho Gold Corporation which included some work on the Vishnu as well as on nearby lodes. This activity ended in 1923 and no work was again done until the late thirties.

Work also continued intermittently on the old Pfeiffer property, particularly

---

1/ Strahorn, R. E., Resources of Idaho, pp. 39-40, 1881.
in 1918 and 1919, again in 1923, and in 1934 and 1935, each by a different company. No data were obtained on the Wide West concerning its activities since the seventies, but it was reopened and worked from 1935 to 1937 when financial difficulties forced it to shut down. Ballard writes that local estimates credit the Wide West with a gross production until 1928 of $1,250,000.

Other mines also have been active. The Cphir, which according to the U. S. Mint reports, had until 1860 a production of $80,000, has since, according to Ballard, been reported to have a reputed production of $2,250,000 \(^1\). Little work has been done on it in recent years. Some work has been done on what is now known as the Idaho Gold Chief, the last between 1932 and 1938. The Mint reports give the Boneparte a production of nearly half a million dollars from 1869 to 1883. Some work about 1910 added little to the production.

When the district was examined in 1938 and 1939, the only activity was at the Flag Staff, Empire, Vishnu, and Cphir mines; but some work had been done shortly before at the Idaho Gold Chief, Wide West, Lisan (the old Pfeiffer property), and at a property in old Spanish Town.

**General Character of the Lodes**

Although it has been the custom to refer to these deposits as lodes, not all of them are lodes in the strict sense of the word; that is, not all of them are more or less tabular mineral-bearing bodies composed of an aggregate of small seams and stringers of ore, closely spaced and mineable as a unit. Many are tabular, compact, massive bodies that may be classified more precisely as veins. In either case, the ore is a filling of the openings along complex fracture and fissure zones and along simple fault fissures, ordinarily with little more than negligible amounts of replacement of the bordering rock. The deposits, therefore, may be classified as filled-fissure lodes and veins; or, since the filling is preponderantly quartz, as gold-quartz lodes and veins.

**Distribution of the Lodes**

Most of the deposits are concentrated in sec. 3, 4, 7, 8, 9, 17, and 18, T.4N., R.10E., Boise meridian, in a belt about 3 miles long and 1-1/2 miles wide that stretches in a northeasterly direction through Rocky Bar, beginning about a mile southwest of the town (see Plate 1). The main part of the mineralized area is in the Bear Creek mining district, according to the usage of the State Mine Inspector and others, but extends southwest into the Red Warrior mining district, and northeast into what Ballard calls the Spanish Town district \(^2\). A few outlying mines to the south, including those near the head of Cayuse Creek about 3-1/2 miles southeast of Rocky Bar, are probably within the limits of the Red Warrior district. With the exception of the Boneparte mine on Cayuse Creek, practically all the mines that were active and contributed to the production of the camp in the early days are within a mile of Rocky Bar (Plate 4).

\(^1\) Ballard, S. M., op.cit., p. 27.

Structural Relations

Some of the broader structural relations of the lodes and veins have already been considered in the discussion of the mineralized faults in the part of the report dealing with the general structural geology (pp. 11-12). It has been pointed out there that most of the ore deposits are along faults and fault or fracture zones that trend from west to slightly north of west, that a few trend about N.30°W., and some, not so highly mineralized as the others, from N.70°E. to N.80°E. It is also pointed out that the faults have rather steep dips, those that strike west-northwest tending to have northerly dips, whereas the others dip either to the north or south; also that some of the faults are reverse, and others normal, and that some have distinct strike-slips. These faults and fracture zones appear to be concentrated in the vicinity of Rocky Bar, particularly along the three-mile long belt that extends northeasterly through the town.

The fault and fracture zones along which the quartz is distributed in such a way as to give lode-like rather than vein-like characteristics vary somewhat in structural details. Some of them are essentially fault fissures, but with as many stringers of quartz in the fractured wall rock along side that stringers as well as whatever quartz may lie along the fissure itself must be mined together. With decrease in the number of stringers, these deposits show transitions into regular quartz veins. On the other hand, many of the lodes are along closely-spaced parallel fractures and fissures separated by less extensively shattered rock, the quartz forming parallel bands or lenses along the principal fractures and stringers in the fractured rock between, the whole again being minesbloc as a unit. Some lodes, however, have no relations to fissures but are simply zones of complicated fractures along which the quartz forms an intricate net of reticulated veinlets. Some of the fracture zones are essentially shooted zones in the granitic rock, the quartz along the parallel shooted planes being joined one with another by transverse and oblique stringers.

Where the deposits have vein-like characteristics, they are simply fillings of fissures along which the bordering wall rock has not been much shattered or at least does not contain many stringers of quartz. Some of these fissures contain continuous veins of quartz, but some are occupied by lenticular masses of quartz separated by baren stretches, where the fissure walls are held tightly together. In some places, particularly where fissures intersect, the filling tends to swell into nearly vertical chimneys of somewhat lenticular cross section. Many quartz lenses and veins feather marginally into a fringe of stringers, and some lenses along the fissures are connected by stringers.

The mineralized fissures and fracture zones are from 3 to 30 feet wide, exceptionally 50 to 60 feet wide. The greater number are perhaps from 8 to 10 feet wide. Those that are 50 to 60 feet wide may be made up of two or more closely-spaced fissure or fracture zones. Most of the lodes cannot be traced very far on the surface, but they are at least a few hundred feet long and some several times that length. Where there are lenses of quartz along the main fissure, the lenses are ordinarily from a few inches to several feet wide and from 20 to several hundred feet long.

Most of the veins are only a few inches to a foot or two wide, and those with a lenticular habit are from 30 or 40 feet to 100 or 200 feet long. Several of the veins, however, have been traced for several thousands of feet on the surface with 2 to 6 feet of quartz exposed along the outcrop.
Mineralogy

Foreword -

Associated with the dominantly quartz-filled lodes and veins are comparatively insignificant amounts of arsenopyrite, pyrite, sphalerite, galena, chalcopyrite, and sericite. Gold is contained in the quartz and in the sulphides, commonly as microscopic grains, but in places in grains large enough to be megascopically visible.

Because of the small quantity of primary sulphides, the upper parts of the lodes and veins show few secondary or supergene minerals, the most notable being limonitic and scattered patches of scorodite. To avoid confusion, the secondary minerals will be treated by themselves. Both the primary and secondary groups will be described in order of abundance insofar as such treatment is possible.

Primary Minerals -

Quartz: Quartz comprises from 85 to 100 per cent of the filling in practically all the deposits. From differences in grain size and in textural and structural relations, the quartz shows that it is the product of three separate, interrupted stages of deposition, each successive stage being represented by a quartz with certain diagnostic characteristics. Although some of the lodes and veins were subjected to only one stage of quartz deposition, either the first or last stage, many have been built up by successive additions; first, as a filling of the fractured country rock, and thereafter as fillings of breccias of the earlier quartz as well as of the country rock. As certain other minerals also were deposited during the early stage of deposition, the assemblages make the quartz of each stage even more distinctive.

The early quartz is a massive, milky white, moderately coarse-grained variety, barren of all other minerals, except some amounts of pyrite that appear in a few places. Some large non-productive veins in the district are completely filled with quartz of this kind, but in the productive veins and lodes, it is either absent or is subordinate to the other varieties of quartz which also have been added to the filling. This early quartz not uncommonly occurs as numerous to scattered fragmental inclusions in the younger quartz, or as shadowlike forms almost obliterated by replacement. The quartz represented by shadowlike forms has clearly been brecciated and then cemented or largely replaced by the younger quartz.

The second-stage quartz is altogether different from that of the first stage. Whereas the older is moderately coarse-grained, the younger is very fine-grained, almost chaledonic; and, whereas the older is milky white, the younger is distinctly grayish-blue, so colored because of disseminated minute grains of arsenopyrite and pyrite. Some deposits contain a preponderance of quartz of this kind; but most of them do not; and those that do not may be filled largely with the earlier quartz which has been penetrated along fractures by the second-stage quartz. The second-stage quartz, in turn, may show invasion by a still younger quartz in which this grayish quartz is contained as inclusions. The second quartz apparently has the power to penetrate and replace the earlier quartz as well as to fill fractures in it.
The third-stage or latest quartz is as different from the first and second as the second is from the first. It is a white, generally coarse-grained quartz, which instead of being massive like the first, has a distinct comb and drusy habit. This quartz not uncommonly is accompanied by scant amounts of sulphides, particularly pyrite, sphalerite, chalcopyrite, and galena, and also contains the gold found in the deposits. Much of it fills or partly fills fractures or cement brocias of the earlier quartz, but some actually penetrates into and partly replaces inclusions of the fine-grained bluish-gray quartz and fragments of the still earlier quartz (Plate 3A). Some deposits contain none of this quartz whatsoever, and some contain no other kind. Some of the veins and lodes composed of this quartz alone have been among the most productive in the district. Those filled with the early or bluish-gray quartz have not been productive unless this latest quartz has been added to them. Deposits containing all three varieties of quartz commonly resemble vein or lode breccias.

Arsenopyrite: The arsenopyrite is perhaps the most abundant and widespread of the lesser minerals, but it is found nowhere, except as minute crystals disseminated in second-stage fine-grained quartz. Most of the crystals are so small that they merely impart a grayish color to the quartz and can be recognized only as individual rhombic crystals beneath the microscope. Where the bluish-gray quartz has been invaded by the younger quartz, the arsenopyrite may be retained as inclusions in the younger and may be engulfed without much evidence of its being replaced by the sulphides associated with the youngest quartz.

Sphalerite: Small grains of sphalerite may show in most of the deposits that contain the comb and drusy quartz but nowhere in sufficient abundance to form even 1 per cent of the filling. In some of the deposits its small grains have impregnated engulfed inclusions of the earlier quartz or the walls bordering the veinlets filled with the comb and drusy quartz. Such dispersed grains may contain minute rhombic or irregularly embayed grains of arsenopyrite and pyrite inherited from the replaced second-stage quartz.

Galena: The galena is about as abundant and as widely distributed as the sphalerite and like the latter is more conspicuous in polished surfaces than in the hand specimens. Its grains are small and generally lie along those of the sphalerite. In some places the grains are large enough to hold those of sphalerite as inclusions; but, where its grains are smaller, they may form veins in the sphalerite. Like sphalerite, the galena may hold crystals and remnant inclusions of arsenopyrite and pyrite.

Pyrite: The crystals and grains of pyrite are ordinarily less numerous and less conspicuous than those of sphalerite and galena; and, except for a few scattered cubic crystals in some of the early white granular quartz and in some of the late comb and drusy quartz, they are ordinarily not visible in the ore. Where pyrite is associated with the arsenopyrite in the second-stage quartz, its grains are microscopic. Where it is not in contact with other sulphides, its outlines are cubic, but against galena and sphalerite its borders are irregular; where enclosed within these minerals it appears as though it has become fragmented into island-like remnants. Regardless of the variety of quartz with which the pyrite is associated, it appears to be replaced or partly replaced by any of the other sulphides in contact with it.

Chalcopyrite: In most of the lodes and veins, chalcopyrite is limited to minute microscopic blobs arranged along crystallographic partings in the
A. Photomicrograph of thin section of ore

Shows an inclusion of the fine-grained, somewhat sericitized second-stage quartz in the more coarsely crystalline third-stage quartz. Crossed nicols. Mag. ×42.

B. Photomicrograph of polished surface of ore

Shows grains of gold (light gray) bordering and embayed in the galena (dark gray), associated with the third-stage quartz (black). Mag. ×50.
sphalerite. Rarely is it found in separate grains.

Sericite: Minute grains of sericite commonly appear in the quartz that is impregnated by sphalerite and galena. Much of the sericite, therefore, has replaced fine-grained second-stage quartz (Plate 3A), having formed before the sphalerite and galena, apparently as the first product of the third-stage metallizing process. Its presence is revealed only with the microscope.

Gold: The last and the most important of the minerals is the gold which may appear as visible grains in some of the richer ore, in some places as grains and thin scales in fractures in the country rock (Passover lode), but more commonly as grains in fractures in the second- and third-stage quartz or as grains mixed with and replacing the sulphides. In most places the gold seems to have a preference for the sulphides, showing a special tendency to vein and replace galena (Plate 3B) and to lesser extent, sphalerite, pyrite, and arsenopyrite. Because of this association, the presence and the relative abundance of the sulphides may in many deposits be taken as a measure of the relative richness of the ore. Since the gold not only replaces all sulphides and fills fractures in the third-stage quartz, it obviously was the last mineral to be deposited. It was apparently brought in with the solutions that deposited the comb and drusy type of quartz and the scant sulphide assemblage, but evidently did not come out of solution until the other minerals had been deposited.

Secondary Minerals -

The minerals of secondary origin derived from those of the primary ore by supergene processes are not abundant and are of little more than academic interest. At or near the surface the quartz may show pale greenish films or thin scattered patches of scorodite, the hydrous iron arsenite, formed from the oxidation products of the arsenopyrite. The quartz may also have scattered patches and stains of limonitic oxides; but, since the amount of pyrite and other iron-bearing minerals in the ore is small, the quantity of alteration products also is small and in many deposits almost wanting. Small patches of black manganese oxides may appear in a few of the outcrops and in some of the fractures in the quartz not far below. Polished surfaces of the ore show incipient stages of alteration of galena to anglesite, the lead sulphate. The number and quantity of secondary minerals are about what one would expect from deposits composed preponderantly of quartz with scant amounts of sulphides.

Paragenesis -

The relations and associations of the minerals indicate three stages of deposition, each characterized by the deposition of a distinctive type of quartz and generally also by insignificant quantities of other minerals. During the first stage a white granular quartz barren of all minerals, except locally a little pyrite, was deposited; during the second, a fine-grained quartz containing scant pyrite and arsenopyrite; and during the third, a coarse comb and drusy type of quartz in places accompanied by a little sericite, pyrite, sphalerite, chalcopyrite, galena, and gold. During the third stage, much of the quartz was deposited before the sulphides; but, since some of the sulphides are partly enclosed in and between quartz crystals, and since some have fractures filled with quartz, some quartz also was deposited concurrently with and a little later than the sulphides. The gold, since it fills fractures in the quartz and replaces the sulphides, was evidently added last. From replacement relationships and structures developed in the ore by minor faulting adjustments during the
depositional period, the scant minerals of the third stage show a sequence of sericite, pyrite, sphalerite and chalcopyrite, galena, and gold.

**Distribution of the Ore**

As the gold was carried by the solutions that deposited the third-stage quartz, the ore is limited to those veins and lodes that contain the third-stage mineral assembly. Consequently, the fissures and fractures that were filled with the early white granular quartz and were not subsequently reopened so as to receive later additions of minerals from the gold-bearing solutions, contain no ore and remain today as barren veins of so-called "bull" quartz. Many of the fissures and fracture zones that received considerable amounts of the early-stage quartz were never reopened, possibly because subsequent structural adjustments were more easily taken care of along faults and fault zones that had not been sealed with massive quartz. However, where the lodes and veins of the early quartz were reopened by renewed faulting, they did receive additions of the second-stage quartz and commonly also of the third-stage quartz. Apparently, only the persistently "active" faults were made ore-bearing. In some of the deposits of early quartz, the second-stage quartz was added in only small quantities, but in others the amount added was so much as to virtually wipe out the earlier filling, except for scattered, residual, unreplaced remnants. A few deposits are made up almost entirely of this bluish-gray fine-grained quartz, but they invariably contain scattered stringers of the third-stage quartz that have entered along fractures. Such deposits, therefore, are auriferous, many of them highly so. On the other hand, the second-stage fill has in many places been extensively shattered and the third-stage quartz, added in such amounts as to comprise the main filling. In many places the third-stage solutions entered entirely new fissures and fracture zones, forming lenticular veins and stringer lodes of the third-stage quartz alone. These have comprised some of the most productive veins and lodes of the camp. The distribution of the ore, therefore, is determined largely by the distribution of the third-stage quartz and is confined to the parts of the deposits that received additions of the gold from the third-stage solutions.

Most of the ore is confined to shoots of rather limited extent; and, although ore shoots from 4 to 6 feet wide and 200 to several hundred feet long have been reported, those now accessible are less than 30 to 40 feet long and are separated one from another by long stretches of barren vein matter. In general, the ore seems to be spotty. According to one private mine report, the bunches of "high-grade" were more widely scattered and the general tenor of the ore was somewhat less with increasing depth than nearer the surface. Lodes at the Wide West mine and at the Idaho Gold Chief mine southwest of Rocky Bar show much third-stage comb and drussy quartz in the outcrop and in the shallow workings just beneath, but show surprisingly little of it in the deeper exposures or in the material removed from the now inaccessible deeper workings.

Since the presence of ore depends primarily on the presence of the third-stage minerals, its distribution thus depends largely on the presence or absence of the structural movements that took place after the second stage of deposition and that opened channels for the circulation of the younger gold-bearing solutions. Where reverse faults provided openings for the mineralizing solutions, the ore shoots occupy the more gently dipping parts of the fissure or fracture zone; along normal faults, the ore is in the more steeply dipping
parts. Ore shoots along the strike-slip faults occur at a bend or where there is a change in the curvature of the fault or fault zone. The distribution of the ore, therefore, depends on renewed movement along these faults of uneven surfaces at the proper time to provide openings for the ore-bearing solutions. Whether the faulting has been of the reverse, normal, or strike-slip kind and the ore in turn mainly confined to the "flats," "pitches," or "bends" may generally be determined from subsurface relations, such as the attitude of the ore lenses, grooves, and striations on slickensided fault surfaces.

Most of the lodes and veins and, in turn, the ore shoots have been interrupted or displaced by transverse faults. The offsets are generally to the left, in some places a few inches, in other places for considerable distances. Claims are made that some of the ore bodies mined in the early days were lost against faults of this kind and that the offset parts were never explored. This may afford some basis for the statements current that ore remains unexploited in some of the old workings.

Tenor of the Ore

Because assay records were not available, few reliable data could be obtained on the richness or tenor of the ore of either that mined during the early days or that mined more recently. According to the report by Jenny, quoted by Ballard Y, ore mined at the Wide West in 1869 was reported to have milled $40 to the ton; fifty tons milled at the Ada Elmore in 1872 was reported to have yielded $4000 ($80 to the ton); thirteen tons at the Idaho, $97.50 per ton; and ore at the Vishnu, $100 per ton, decreasing to $60 on the lower levels. Quoting Strahorn in 1881, Jenny writes that the Ada Elmore averaged $60 to the ton with some of the best going as high as $900 to the ton; that the Confederate Star averaged $60 to the ton with the cropping yielding as high as $350 to the ton in an arrestra; that a run of 98 tons at the Vishnu yielded $200 to the ton; that crushings from the Idaho Bonanza notted $175 per ton with the average of all ore at $80 per ton; that the Mountain Buck ore averaged $40 per ton; and that the Wide West ore averaged $35 to the ton.

Recent attempts to operate the Wide West, the Lisbon, and several other properties have met with financial losses from which it might be inferred that the ore found was not so rich as that reported in the early days or that the ore shoots were too small to bear the cost of extensive development and relatively high overhead. Shortly before the writer visited the district, a small body was milled at the Commonwealth that is reported to have assayed 3 to 4 ounces to the ton. During 1938 and 1939 ore was being blocked out and milled at the Empire that assayed about 1/2 ounce to the ton with some streaks of "high-grade" containing 3 to 4 ounces of gold per ton. At both the Commonwealth and Empire mines the ore was mined very near the surface. An old report on the Ada Elmore states that the ore below the 200-foot level was not so rich as that above and that just before operations were suspended the recovery was less than $3 per ton. This report would imply either a decided decrease in the tenor of the ore with depth or at least a decrease of the ore amendable to stamp-amalgamation.

Wall-Rock Alteration

The ore-bearing solutions have had surprisingly little effect on the rock along the fault and fissure zones. In and for a few feet on either side of a lode or vein, the country rock appears somewhat bleached through the disappearance of a part of the biotite and the partial conversion of some of the feldspar to coarse sericite; but the rock otherwise has not been much changed in appearance; and, around some of the deposits composed of only the third-stage quartz, it has been scarcely changed. In places the alteration is largely indicated by a few widely-scattered crystals of pyrite. Crushing of the rock bordering the lodes and veins by post-mineralization movement has in some places produced effects that might be confused with softening produced by hydrothermal action.

Oxidation and Enrichment

Although there was little opportunity to study the subsurface features of most of the formerly productive mines, it was possible to examine the upper parts of many of the lodes and veins and from these disclosures to learn that the oxidized zone is shallow and generally extends less than 50 feet below the surface. This conclusion does not bear out the claim made by Ballard that the oxidized zone extended from 200 to 300 feet below the surface \( \frac{1}{2} \). In many places the primary sulphides appear among the oxidation products within a few feet of the surface.

Whether the rich ore mined in the early days was primary or the product of supergene enrichment has caused much speculation. Considerable of the early-day production came from the ore of the oxidized zone where the gold had been partly or completely freed of any associated sulphide minerals and thereby prepared for easy recovery by the stamp- amalgamation methods then in vogue; but much production also came from the ore below the oxidized zone, though the recovery apparently was not so high. It is unlikely that the rich ore mined in the early days and found in occasional small shoots today was or is other than of primary origin. Absence of manganese oxides from most of the deposits raises doubt that much enrichment by supergene processes could have taken place.

Since the sulphides comprise such an inconsequential part of the filling of the deposits, their removal from the oxidized zone could hardly account for any notable increase in the tonor of the ore. Weathering of the outcrops, however, has produced some residual enrichment or accumulation of the gold by removal of the disintegrated vein matter. Although the evidence is not wholly conclusive, the available data suggests that little or no secondary enrichment took place except for mechanical concentration on the surface, and that the distribution of the rich ore is a result of the original primary deposition.

Genesis

The timing of the mineralization so closely to the intrusion of the dikes, particularly the granophytic and lamprophyric dikes, and the close accord in structural relations between the lodes and veins and the dikes suggest a close genetic relationship between them. This accordance is so intimate as to suggest

that the dikes and the mineralizing solutions had their origin in a deeper magma that was undergoing differentiation and that was tapped at more or less regular intervals by faults which permitted fractions of the partly crystalline and progressively changing magma and the end-products of the differentiation, the mineralizing solutions and the lamprophyric magmas, to be moved or injected along fault channels into the rock above.

The compositional, textural, and structural features of the deposits indicate that the mineralizing solutions first emitted from the source region were rich in silica and carried a little iron and sulphur, depositing quartz and pyrite. Since the quartz is the milky white variety and of moderate grain size, and since the silica apparently lacked the power to combine with other elements to form silicates, the deposition must have taken place when the temperature was well within the mesothermal range. When recurrent structural movement cleared the way for renewed circulation, the character of the solutions had changed somewhat; though still highly siliceous, they contained some arsenic as well as iron and sulphur, and deposited quartz as well as scant amounts of pyrite and arsenopyrite. As arsenopyrite is generally regarded as a mineral formed at comparatively high temperature, it is possible that these solutions were at higher temperatures than those of the first stage; but the fineness of grain of the quartz and arsenopyrite indicates that the solutions were quickly chilled, preventing the minerals from developing larger grain sizes. The rapid chilling is a phenomenon commonly associated with deposits formed in cold rock at comparatively shallow to moderate depths. Reopening of the channels by further structural movement then permitted the ore-forming solutions to move upward into the newly made openings above and to fill or partly fill them with more quartz, scant amounts of the sulphides, and the gold. The fact that these solutions were too impotent to alter the wall rock materially and that the quartz deposited was coarse and tended to develop a comb and drusy habit suggests that the solutions were not highly heated and that deposition took place at comparatively low temperatures. Indeed, the association of gold and scant sulphides with comb quartz and the absence of notable wall-rock alteration are features which characterize deposits that Nolan classes as epithermal 1/.

Although there are few data on which to estimate the depth below surface at the time when mineral deposition took place, the presence of the porphyritic (hypabyssal) dikes suggests moderate rather than great depths. The chilling that some of the minerals show, the fairly extensive brecciation of first-stage quartz, and the comb and drusy structure of the ore also suggest that deposition may have taken place at moderate or rather shallow depths, perhaps within a few thousand feet of the surface. Since then erosion has cut rather deeply, has exposed the dikes and lodes, and has added much gold from the upper parts of the lodes to the stream gravels.

Because the structural data indicate relatively little difference in time between the intrusion of granophyre and lamprophyric dikes and the formation of the lodes and veins, mineralization, like the intrusion of the dikes, probably took place during early Tertiary time. The fact that one of the lodes is cut by a dike of the kind found in a Miocene (?) "porphyry belt" is evidence that the deposits are older than those associated with the middle Tertiary igneous activity. That the deposits are not genetically related to the Miocene (?)

intrusives is further supported by the fact that their composition and paragene-
sis show no accordance whatsoever with the Miocene (?) deposits, for, whereas
the Rocky Bar deposits are highly siliceous, the Miocene (?) deposits in Boise
Basin and elsewhere generally contain a preponderance of base metals with sub-
ordinate quartz, and show two rather than three stages of mineral deposition 1/.
The deposits at Rocky Bar, therefore, comprise an entirely different type of
deposit, one that may be correlated with the early Tertiary gold-silver lodes in
the nearby Atlanta district, where the same three stages of quartz deposition
are recorded, that of the second stage being accompanied by very finely crystal-
line quartz and arsenopyrite, that of the third stage by comb and drusy quartz
with silver minerals and gold 2/.

Outlook

Although the exposures underground and on the surface were not all that
might be desired, the rather scanty information that could be gathered suggests
that the gold mined in the early days came from shoots of ore that had been en-
riched, if at all, only by mechanical processes of concentration at the surface.
The ore which was mined apparently was rich and in the oxidised zone was amen-
able to stamp-amalgamation with good recovery; but below the oxidised zone the
operators evidently had difficulty in making a satisfactory extraction. Low
recovery from the refractory "base" ore may, therefore, have had much to do with
curtailing production and closing some of the mines. If so, there seems to be
little reason why some of the old mines, if intelligently managed, might not
still be productive under the more efficient present-day milling methods and the
current higher price of gold.

It should be kept in mind that the ore shoots are comparatively small and
at the best have not exceeded a stope length of 300 feet and that shoots may be
separated by long stretches of low-grade or barren vein matter. Although the
shoots have been reported as rich at or near the surface and poor a short
distance below, this decline may in part reflect the change from the oxidised to
the unoxidised ore and the failure to obtain a full recovery from the ore in
which the gold is more or less admixed with primary sulphides.

That the shallow depth of the mines has reached the bottom of the ore
shoots seems doubtful in view of the fact that the most notable production came
from lodes below the level of Bear Creek, which are topographically several
hundred feet beneath the outcrops of important lodes on the slopes above or in
other parts of the district. The maximum topographic relief is about 1,200 feet
and ore has been found in the highest as well as in the lowest parts of the
district. It seems unlikely, therefore, that the few hundred feet of development
has disclosed the full vertical extent of the ore at any given place. Since
geologic evidence suggests that the deposits were formed at moderate depths
beneath the surface, the ore might be expected to have a range of more than a
few hundred feet; and, although considerable gold has been fed to the placers,
it does not seem possible that erosion has reached the roots of all the deposits.

2/ Anderson, A. L., Geology and oro deposits of the Atlanta district, Elmore
County, Idaho; Idaho Bur. Mines and Geol. Pamph. 49, p. 44.
The presence of much comb quartz in the outcrop and in the upper workings at the Wide West and Idaho Gold Chief mines may suggest that the shoots have a lesser vertical range than one might logically expect; yet the fact that the rich ore occurred at the Ada Elmore far below these levels suggests that the downward termination of the ore shoots may be structurally controlled and that, as along the strike, other shoots may appear at greater depth separated from those above by stretches of barren quartz or low-grade ore.

There may be some justification for encouraging search for ore along the extensions of known veins and lodes as well as search for possible undiscovered deposits. In any exploration, it should be kept in mind that the gold, introduced during the last stage of mineralisation, is invariably associated with comb and dray quartzs and that unless this quartz is present, whether in quantity or as scattered stringers in the fine-grained bluish-gray second-stage quartzs, there is little likelihood of finding valuable bodies of ore. As there have been at least two epochs of faulting since the deposits were formed, the claim that undeveloped faulted segments of ore remain in some of the old mines may be based on actual geologic fact.

MINES AND PROSPECTS

Ada Elmore Lode (Pittsburg and Elmore Mines)

The two most famous mines in the district, the Pittsburg and the Elmore, are on the Ada Elmore lode discovered in 1863 along the bed of Bear Creek about a mile west and above Rocky Bar (Plate 1). These mines have not been worked since the early nineties and all that may be seen today are two wrecked shaft houses a few hundred feet apart in the brush-covered creek bottom, a few old mine dumps strewn with decayed timbers, and the five partly dismantled batteries of 10 stamps, each of which is no longer housed but stands exposed at the margin of the valley flat a few hundred yards below the old mine camp.

By piecing together the bits of information contained in the reports by Jonny and Ballard and in an old report on the property by company engineers, the writer learned that the Pittsburg on the west end of the lode was worked by inclined shaft to a depth of 240 feet and drifted on and stope'd from 100 to 200 feet on either side. Work at the Elmore mine was carried on from a vertical shaft about 500 feet east of the Pittsburg shaft. The Elmore shaft was started on the outcrop and was sunk to a depth of 325 feet in the footwall of the lode. At the 200-foot level connection is reported to have been made with the Pittsburg workings leading east from the bottom of the inclined shaft. At a depth of 300 feet the Elmore shaft cut a vein parallel to the Elmore lode, which had a dip of 30 degrees to the north. A 100-foot incline was sunk on this relatively "flat" vein and drifts were driven each way from the bottom. According to the company report, drifts were driven from the Elmore shaft for distances of 740, 1100, and 1080 feet on the first, second, and third levels. Later, what is reported to be the eastward extension of the Elmore lode was explored by cross cuts from the 700-foot shaft on the nearby Vishnu property, first by a 215-foot cross cut when the Vishnu shaft had reached a depth of 540 feet and then by a cross cut from the bottom of the 700-foot shaft. From the first cross cut, drifts are reported to have been run for distances of 350 and 360 feet to the east and west, and, from the bottom cross cut, 285 and 255 feet to the east and west. These did not connect with nor extend beneath the workings in the main part of the mine which was then filled with water.
From the alignment of the Elmore and Pittsburg shafts, it appears that the Ada Elmore lode apparently strikes about N. 80° W. and dips about 66° N. According to Wolters, as quoted by Jenny, that part of the lode mined in the early seventies measured 4 feet wide and contained 2 1/2 feet of hard bluish quartz for a length of 270 feet on the 100-foot level. According to Strahorn, the vein averaged 2 feet wide throughout all the workings of the mine. It is reported to be as wide where exposed by the cross cuts and drifts from the Vishnu shaft. The second vein cut at a depth of 300 feet by the Elmore shaft and opened by the 100-foot winze is reported in places to have been as wide as 15 feet.

According to Strahorn, the $1,280,000 production up until 1881 came from a segment of the vein 275 feet long and 180 feet deep. In information given by Ballard, most of the high-grade, free-milling ore is reported to have come from the flat-dipping vein cut at the bottom of the Elmore shaft. The company report credits much of the production from a vein segment about 300 feet long between the first and third levels. Below the 500-foot level the ore was reported not to be so rich as above and little stoping was done. This report also states that the ore uncovered from the Vishnu shaft, though rich in spots, did not contain enough gold to be of commercial value.

Some of the ore mined in the early days is reported to have been very rich and to have contained much gold visible to the eye. Four thousand dollars was reported from 60 tons of ore mined in 1872, and $4,500 from 9 tons of the best ore mined at another time. Up until 1881 the ore is reported to have averaged $60 per ton. Even today, fragments of ore in which gold is visible may be found on the dumps. These ore fragments also show scant amounts of arsenopyrite, sphalerite, and galena, and appear to be fragments of breccias made up of each of the three varieties of quartz. On some of the dumps the second-stage, fine-grained quartz with arsenopyrite is present in considerable abundance.

Those who have a long familiarity with the district claim that the ore is far from exhausted and that a change from free-milling to "base" ore made it impossible for the two mines to operate at a profit. Just before operations were suspended the recovery was reported at less than $2 per ton.

Ballard points out that there seems to be no record of any exploration of the "flat" vein of the Elmore mine at the adjoining Pittsburg. If extended, the Pittsburg shaft should cut this vein at an added depth of about 175 feet.

From what can be learned from reports on the two mines, it does not seem that they were as judiciously developed and mined as they might have been. Although the lode has been exposed to a depth of 600 feet below creek level, only about 200 feet of exploration has been on known ore shoots, the work from the Vishnu shaft not having been extended beneath any known ore shoots above. Against the report that mining was suspended because of the change from free milling to "base" ore must be weighed the statement that the ore did not seem to be so rich below the 300-foot level as above. The fact that some experimenta-
tion was being done with cyanidation about the time the mine closed suggests that low recovery from "base" ore was a factor in the suspension of operations.

Idaho

The Idaho lode, discovered the same year as the Ada Elmore, also has had an early-day reputation as a producer. Before 1874 the lode is reported to have
been developed by cross cuts 120 and 400 feet long at depths of 70 and 170 feet below the surface, and to have been drifted on for distances of 200 and 400 feet at the two cross cut levels. Nearly all the good ore above the levels had been stopped and in 1874 the mine was idle. Later the mine was consolidated with the Vishnu and, according to Strahorn, it and the Vishnu lode had, by 1881, been developed by tunnels to a depth of 300 feet with more than 1,000 feet of drifts on different levels. What work has been done on the Idaho lode since has not been learned, though it is presumed that something was done later from the Vishnu shaft.

The Idaho lode is reported to be parallel to the Ada Elmore and to dip about 50°N. According to the information in Jenny's report, the ore shoot was 2 feet wide and yielded large amounts of good ore, the last lot of 13 tons giving returns of $97.60 a ton. As inferred from the length of the drifts and their vertical spacing, the ore shoot may have been about 200 feet long and at least 300 feet deep.

**Vishnu**

The Vishnu (Plate 1), discovered at the same time as the Ada Elmore and the Idaho lodes, has likewise been an important early-day producer, which by 1881, had been credited with a total production of $850,000, the production perhaps including that from the Idaho lode. The Vishnu lode lies close to the Idaho and not far from the Ada Elmore. It had been opened by a 254-foot cross cut in 1874 to a depth of 150 feet and in 1881 by tunnels to a depth of 500 feet. Since no additional depth could be gained by tunnels, a shaft was started well in the hanging wall of the lode about 100 feet above the creek. From 1889 to 1893, this shaft was sunk vertically to a depth of 700 feet, passing through the Vishnu lode at a depth of 400 or 500 feet. Some drifting and stoping was reported between the 500- and 250-foot levels. Cross cuts from the shaft were also driven, one a distance of 225 feet to the north at the 250-foot level and two to the south from near the bottom of the shaft. Apparently no further work was done on the property until 1921 when the Idaho Gold Corporation, which had acquired control and had consolidated several of the old producers, including the Emeraldas, Vishnu, Bullhide, Clifton Bell, and Mountain Goat groups, began work on the Montana cross cut. This cross cut was driven into the slope a few hundred feet east of the Vishnu shaft at a point about 300 feet north and 50 feet above Bear Creek. The new tunnel was driven because all the old tunnels and the shaft had caved. The Montana was driven for a distance of 640 feet and cut the Vishnu lode 380 feet from the portal. At that point a 300-foot drift was driven toward the Vishnu shaft and the lode stopped overhead.

The lode is reported to be parallel to the Idaho and Ada Elmore and to dip north but at a somewhat steeper angle than the others. In the Montana cross cut its strike is about N.80°W. and its dip 65° to 70°W. On the surface, the lode is about 4 feet wide and in Jenny's report is credited by Wolters with having had a 10-inch pay streak. At a depth of 80 feet the ore body was reported to have widened to 2 feet and at 150 feet, to 4 feet. According to Strahorn (1881), the width ranged from 2 to 6 feet. According to Ballard, the stopes above the drift driven from the Montana cross cut measured from 2 to 15 feet.

Wolters, as quoted in Jenny's report, states that the surface ore yielded at the rate of $100 to the ton and that to a depth of 150 feet it was made up of quartz seams with pyrite and what he called "gray antimony". The ore on the
lower level was reported not so rich as that nearer the surface and as averaging but $60 per ton. According to Strahorn, the ore was free-milling to the 300-foot level, and for three years prior to 1881, it yielded $25,000 to $45,000 a month, one run of 98 tons yielding $200 per ton. According to Ballard, the ore above the drift from the Montana cross cut was free-milling and of good grade. Small bodies of sulphide ore were reported mixed above the 500-foot level, the values there ranging from $7 to $16 per ton in gold and silver, but the average recovery by amalgamation was given as only $2.65 per ton.

A surface exposure above the Montana cross cut shows the lode to be made up of numerous, closely-spaced, rather small seams or stringers of comb and drusy quartz in fractures in the granitic rock. Some fragments of ore at the shaft dump contain small widely scattered grains of galena, sphalerite, and pyrite, and very scant amounts of arsenopyrite.

Confederate Star

The Confederate Star, like the Ada Elmore, Idaho, and Vishnu, had a notable early day production estimated by Strahorn at $350,000 to 1881. It was worked by tunnels to a depth of 250 feet, the drift on the lowest level having a length of 760 feet. The lode lies close to the Vishnu (Plate 1) and was exposed by a cross cut from the Vishnu shaft and also by the Montana cross cut, but whether any work was done on the lode at these points was not learned. Some work in 1932 was confined to an 80-foot tunnel on the slope just above the old Vishnu shaft.

The Confederate Star is approximately parallel to the others, but in the new workings appears to strike about N60°E. and to dip steeply northeast. It was described by Strahorn in 1881 as a "strong vein" with pockets of very rich ore. In the new workings the lode shows about 2 feet of quartz, most of which is the third-stage variety. The ore is reported to have been easily worked and to have averaged about $60 per ton. It is reported to have been particularly rich in the outcrop and to have yielded as much as $360 per ton in an arrestera.

Clifton Bell

The Clifton Bell is not among those listed as important producers in the early days and the only mention of it is in the report by Ballard 1/ who states that it is the last of 7 lodes exposed in the Montana cross cut, 600 feet in from the portal. When Ballard visited the district in 1925, the work then being done by the Idaho Gold Corporation was on this lode and was confined to a 50-foot winze a few feet east of the Montana cross cut. From the bottom of the winze a short cross cut had been driven to the north. Earlier drifting had extended about 350 feet to the east and 40 feet to the west of the Montana cross cut, and cross cuts had also been driven north and south from a point within the east drift. In former years a short intermediate drift, 30 feet above, had been driven. This drift had connection with the surface.

The Clifton Bell appears to be parallel to and lies about 300 feet north of

the Vishnu. Ballard described the Clifton Bell as consisting of 3 to 4 feet of considerably sheared and highly altered granite, with here and there lenticular masses of quartz from a few inches to 20 inches wide and from a few feet to 40 or 50 feet long. He also mentions that the other lodes exposed in the Montana cross cut between the Clifton Bell and the Vishnu had the same general features and that stopeing had been done on most of them. At a few places the workings reached the surface. The quartz lenses in some of them are reported to have widths of 5 or 6 feet.

**Mountain Buck**

The Mountain Buck, also one of those worked in the early days, lies about a quarter of a mile east of the Vishnu. According to Strahorn it was worked to a depth of 40 feet, but he gives no data on production. The crushed ore was reported to average $40 to the ton.

It is possible that this lode may continue to the west and may be one of those that Ballard mentions as cropping out on the surface a short distance ahead of the face of the Montana cross cut, 2/3. There had been no work at that point, but Ballard mentions that the lode was highly productive at a few places some distance to the east.

**War Eagle**

The War Eagle is apparently one that had little, if any, early-day production. It lies on the ridge between Steele and Bear creeks about a half mile north-east of Rocky Bar (Plate 1) and has been explored by cuts on the outcrop and a tunnel 30 to 40 feet below. This tunnel was blocked 150 feet from the portal. Another tunnel about 100 feet below this one had been driven a distance of about 250 feet but not enough to reach the lode.

As exposed in the surface cuts the lode strikes about N.70°E., and consists of a few, thin, scattered seams of quartz in fractured granitic rock.

**Independence**

The Independences, on the ridge separating Steele Creek from Blakes Gulch (Plate 1), scarcely more than half a mile north of Rocky Bar, is reputed to have had a production of about $60,000. The workings are along Steele Creek and include several blocked tunnels driven in a northerly direction. The lower tunnel is reported to have a length of 400 feet and to have a 55-foot winze near the face.

In cuts above the tunnels, quartz stringers with a north trend and about 65°E. dip are contained along a zone of fractured granitic rock. The upper tunnel appears to be driven along this zone. The winze in the lower tunnel is reported to be on 3 feet of grayish quartz.

---

Mountain Goat

The Mountain Goat is on the east side of Blakes Gulch about half a mile above Rocky Bar. No mention is made of this mine in the early day reports unless it was then known as the Idaho Bonanza or Alturas which, according to Stra- horn, had until 1881 a production of about $100,000. When Ballard visited the district in 1925, the lower tunnels of the Mountain Goat workings were accessible, but the stopes, which reached the surface approximately 160 feet above, were caved. According to Ballard, the deepest workings did not exceed 200 feet. Both cross cuts to the workings were blocked when the writer was in the district. One of these is a 500-foot cross cut at creek level near the east end of the property. The other was driven obliquely to the workings from a point farther down the gulch.

According to Ballard, the old workings were located where four veins, each striking about N.80°E., were intersected by a prominent north and south vein, the stopes being confined to the immediate neighborhood of these vein intersec-
tions. The veins are described as lenticular and much like tabular chimneys, some of which pinched before reaching the surface. Because of post-mineral faulting along the veins, the ore was reported to be greatly shattered and partly encased in gouge. From other sources the writer was informed that the bodies of ore were along a northeast trending fracture zone 8 to 40 feet wide which was offset repeatedly by transverse faults. Ore shoots were reported to occur on both foot and hanging walls of the fracture zone, those on the foot wall averaging 4 feet in thickness and those on the hanging, 6 to 15 inches. Those on the foot wall were said to contain a "fair grade" of ore and those on the hanging wall, some very rich ore. In one place the ore body is reported to have widened to 56 feet, but the increase in size did not persist far in depth because the body pinched a short distance below the main working level.

Much of the quartz strewn over the mine dumps is the white, rather coarsely crystalline variety, cut by thin and widely scattered stringers of the late comb and drussy quartz.

Empire

The Empire is on the west side of Blakes Gulch directly across from the Mountain Goat (Plate I). The property covers two claims which extend from the floor of Blakes Gulch across the ridge to Steale Creek. The property included in these claims is an old one and might possibly be the old Idaho Bonanza or Alturas. Five tunnels with caved portals may be recognized on the slope above the Gulch. One at creek level is reported to be 600 feet long. From it ore was staked to the surface, 50 to 100 feet above. In 1938 and 1939 work was being done in shallow workings, including a glory hole undercut by a 30-foot tunnel on the slope about 100 feet vertically above the portal of the old tunnel at creek level. This glory hole was circular in plan and funnel-shaped in cross section, the diameter at the surface being about 20 feet and the depth, 18 feet. It lies on the side of one of the old stopes. Ore from this and from other cuts and short tunnels was being treated in a half ton mill. Prospecting for the extension of the Mountain Goat veins also was in progress.

Mineralization at the Empire appears to be confined to a zone 50 to 60 feet wide of highly fractured rock that trends about N.20°-30°W. from the floor of Blakes Gulch to and beyond the top of the ridge. The zone is apparently made
up of several closely spaced parallel fracture zones in which the individual fractures strike N.30°W. and dip vertically to steeply southwest and strike N.80°W and dip vertically to steeply south. The set of northwest fractures is the more prominent, contains the more gouge, and appears to have more ore. These more prominent fractures control and accentuate the northwest trend of the mineralized zone as a whole.

Along the mineralized zone the ore occurs as stringers, small lenses, and irregular bunches, in places producing ore shoots up to 6 feet or more in width. Thin seams of quartz are also scattered through the fractured granite. Much of the ore is made up of an assemblage of the fine-grained bluish-gray quartz with rather abundant arsenopyrite and of the younger comb and drusy quartz. Visible grains of gold appear in this admixture as well as in fractures in the wall rock. Some of the ore is high-grade and assays of selected ore show as much as 3 to 4 ounces of gold to the ton. When the property was visited, much ore averaging about half an ounce of gold to the ton had been blocked out for milling.

**Commonwealth**

The Commonwealth is near the head of Blakes Gulch nearly on the line between sec. 4 and 9, about a mile northeast of Rocky Bar (Plate 1). The property is an old one that has had some work done in recent years in a cross cut and drift on the crest of the ridge separating Blakes Gulch from Hardestable Gulch. Former workings are indicated by a series of waste dumps at spaced portals from the bottom of Blakes Gulch to the crest of the ridge. Some ore was stoped and milled during the early days, but the extent of the workings and the amount of ore produced was not learned. The cross cut at the crest of the ridge is about 40 feet long and a winze from it is about 30 feet deep. The property is reported to be owned by the inactive Blakes Gulch Mining Company.

From the alignment of dumps and cuts, the Commonwealth lode may be traced in a general easterly direction for several thousand feet. In the workings at the crest of the ridge, the strike is N.80°-85°W. and the dip, 50°N. There the width is about 3 feet and includes ore in stringers and small lenses or irregular bunches from 1 to 24 inches thick. Where stoped, the ore body appears to have been about 10 feet long and 3 feet wide, and to have extended down the dip just to the bottom of the 30-foot winze. Much of the quartz apparently was along the footwall of the narrow fracture zone and was made up largely of the comb and drusy variety with inclusions of the early white and the bluish-gray second-stage quartz. Some pyrite, galena, and sphalerite occur with the coarse comb quartz. Gold is microscopically visible in polished surfaces of the ore, forming grains that have replaced quartz and sulphides. The ore that was stoped from the winze is reported to have contained about 3 ounces of gold per ton.

**Ophir**

The Ophir mine is about 1 1/2 miles north-northeast of Rocky Bar near the head of Ophir Gulch in sec. 4. (See Plate 1). The mine is an old one, which, according to the U. S. Mint reports, had a production of $30,000 prior to 1881. Since then the mine has been worked intermittently and the total production, according to Ballard, is reported to be $2,269,000.1

1 Ballard, S. M., op.cit., p.27.
include 2 adits at creek level on opposite sides of Ophir Gulch and a vertical shaft 285 feet deep about 200 feet up the gulch. The adits were partly accessible in 1939 and 1939.

Most of the work has been confined to a single vein, the Ophir, which may be traced by surface exposures for several thousand feet east and west of the main workings. It is one of the most prominent and persistent veins in the district. Its strike is about N.80°W, and its dip, 50°-65°W. Its thickness ranges from 2 to 6 feet, but locally may be much thicker.

Near the portal of the adit drift on the east side of the gulch the thickness is 6 to 7 feet; but as the adit was open only for a short distance, it is not known whether the thickness persists for any great distance. Ballard reports that an ore shoot was found about 300 feet from the portal which was stope to the surface and to a depth of approximately 150 feet below the adit level, the work below the level being carried on through cross cuts from the 285-foot shaft 1/2. The ore is reported to have been mined from a 185-foot segment of the vein, included between two transverse faults. According to Ballard, no effort was made to locate or explore the vein beyond this segment.

Across the gulch and at the same level the adit drift was open for a distance of 225 feet. For most of this distance the vein is about 3 feet wide, but in places pinches to 1 foot. In a cut across the cut off above the tunnel level the vein, including stringers in the fractured country rock, appears to be about 30 feet wide, three feet of it made up of massive quartz. According to data obtained by Ballard from Mr. E. C. Towne of Rocky Bar, the adit follows the vein for about 400 feet. At 200 feet from the portal the vein was explored by an inclined raise to the surface and at 170 feet, by an inclined winze to a depth of 45 feet. About 20 feet down the winze the vein is reported to have changed its dip from north to south and was not explored further. From the bottom of the winze, a 42-foot cross cut driven to the north exposed a 5-foot vein (possibly the one followed by the drift on the east side of the gulch) which was drifted on to the east for 26 feet. At that point a 90-foot winze was sunk on the vein, which there had the same strike and dip as the vein in the adit drift. The several inclined workings were along an ore shoot; and, according to Towne, the bottom of the 90-foot incline was still in ore.

In the east adit drift the exposed part of the vein shows a 12-inch band of fine-grained, dark gray quartz, exceptionally rich in finely disseminated arsenopyrite, bordered above by an irregular band of the early white granular quartz and below by both the early granular and the late combo quartz. On the west side of the gulch much of the exposed quartz is the early white granular variety, cut by irregular masses of the fine-grained greyish quartz and by scattered seams of comb quartz. On the west side of the gulch the vein shows less evidence of intraminalization disturbance than on the east side. Sulphides in the ore other than arsenopyrite and scattered grains of early pyrite are negligible.

West Ophir

The West Ophir of the Apex Gold Mining Company is near the head of Blakes

\[ Ballard, S. M., op. cit., p. 27 \]
Gulch in sec. 4 (Plate 1) and covers what is believed to be the westerly extension of the veins and lodes exposed across the ridge in Ophir Gulch. The development comprises 200 to 300 feet of workings in several short tunnels and a number of open cuts on the surface. A car of ore was reported shipped to a smelter in 1926.

Several mineralized fracture zones extend across the property each striking about N.85°W. and dipping about 45°W. The principal one is about 16 feet across and has 6 inches of quartz along the foot wall and 12 to 14 inches of quartz on the hanging wall. Another has a thin lenticular vein about 30 feet long. This vein has been stoped. Much of the quartz visible in the accessible exposures is of the early white granular and the younger fine-grained bluish-gray varieties, but a little of the late comb quartz also is present.

Lisón

The Lisón workings are in Hardcabraible Gulch about a half mile south and below the Ophir in secs. 4 and 9, or 1-1/2 miles in airline northeast of Rocky Bar. Three of the lodes on the property, namely, the General Grant, the General Sherman, and the Poorman, were uncovered during placer operations in 1873. Others since found include the Republic, Gold Bug, and the Homestake. Nothing was learned of the early operations nor of the amount of gold produced, either then or since. Considerable work was done in 1918 and 1919 by the Treasurco Mines Company, particularly along an 800-foot cross cut to gain depth under some shallow workings from which there had been some production in the early days. In 1922 the property was worked by the Rocky Bar Mining Company and later, by the Canada Gold Mines, Inc. The latter did considerable work in rehabilitating the mine in 1934 and 1935 and in enlarging the mine plant and mill. From 1936 to 1939 the mine was in the hands of a caretaker. When the property was visited in 1938 and 1939, all except parts of some of the upper workings were inaccessible, but the Diesel-powered 20-stamp mill was still intact. The Lisón group is reported to include 5 patented and 7 unpatented claims.

The four most prominent lodes that cross the property, named in order from north to south, are: the Republico, the Poorman, the Gold Bug, and the General Grant, spaced at distances of 600, 1200, and 2400 feet respectively. The Homestake lies between the Gold Bug and the General Grant, but no work has been done on it. Only the Gold Bug and General Grant have been developed extensively, each by shallow tunnels below the outcrops on both sides of the ridge and by the long cross cut which is connected with the workings above by a raise.

The lodes strike N.60°-85°W. and dip 55°-60°W. and appear to be entirely in the granitic rock of the batholith. Several lamprophyric and granophyric dikes are in the vicinity of the workings and broken pieces of a diorite lamprophyric dike on the dump and in the ore bin near the portal of the long cross cut. A narrow granophyre dike of northeasterly trend extends obliquely across the portal of the cross cut and diagonally up the slope to the Passover claim where it has stringers of ore in fractures. Where exposed, the numerous lodes are 2 to 3 feet wide and have stringers of quartz 2 to 3 inches thick along iron-stained fractures in the granitic rock. In places, the stringers are accompanied by scattered small lenses and bunches of quartz. Much of the quartz in the Gold Bug and General Grant lodes is the fine-grained variety and contains minute crystals of arsenopyrite. This quartz encloses some inclusions of the early white granular quartz and is cut by scattered stringers of the third-stage quartz.

33
In parts of some of the lodes the arsenopyrite is present in considerable abundance but is reported to contain only negligible amounts of gold.

Passover

The Passover, a claim near the old workings on the Gold Bug and General Grant lodes on the east side of the ridge, covers a part of the granophyric dike that crosses the portal of the Lison cross cut. The lode had been concealed beneath placer tailings in the early days and has been uncovered only in recent years. In 1938 the development included several cuts and a glory hole about 15 feet in diameter and 20 feet deep, connected with a caved stope in one of the old tunnels on the General Grant or Gold Bug.

The lode appears to lie in and along the granophyre and strikes about N. 30° E., the same direction as the dike. Most of the ore seems to be in the fractured granitic rock along side the dike but stringers also extend into fractures in the dike. Apparently the granitic rock was more readily fractured by recurrent movements along the fault occupied by the dike than was the dense, fine-grained dike rock itself. Most of the fractures extend transversely across the fracture zone in a N. 70°-80° W. direction.

At the glory hole the mineralized zone appears to be 10 to 15 feet across and to be made up of iron-stained fractures, in places coated by small but plainly visible grains of gold either on the surface of the fractures or in thin seams of late quartz. Some of the fracture surfaces also have small scattered cubes of pyrite, in part altered to pseudomorphous limonitic oxides. Most of the gold-bearing fractures trend N. 70°-80° W. and dip 85° NE. This is one of the few known places in the district where the gold occurs free in fractures in the country rock.

According to the operators, one-half cubic yard of the auriferous material gave 5 ounces of gold on crushing. A 14-foot channel sample across the lode gave about 0.25 ounce of gold to the ton. The small amount of quartz present in the lode is the third-stage variety.

Spanish Town

The Spanish Town mine, so named because it embraces the former site of Spanish Town on upper Elk Creek, is 2-1/4 miles by air and more than twice that distance by road northeast of Rocky Bar. It marks the northeast end of the mineralized zone that extends through the Rocky Bar district. The camp was active in the early days but there seems to be no available record of the early development and production nor of the work done from time to time since. The last work was in 1937 and 1938 by the Elk Creek Spanish Town Mines, Inc.; but after rehabilitating some of the old tunnels and placering some of the hillside wash, the company suspended operations for financial reasons. The most extensive workings are below the camp on the west side of Elk Creek and include a 500-foot adit at creek level and a 390-foot adit on the slope high above the creek. There are also some workings of lesser extent on the other side of the creek. Much of the late work was confined to placering the slope near these workings on the east side of the creek.

Several granophyric and other porphyritic dikes are exposed on the property
as well as several mineralized fracture zones of general northeasterly trend. In places, the fracture zones are cut off and displaced by faults of northwest trend. Probably because of the transverse faulting, the fracture zones on one side of the creek are not aligned with those on the other side. Of the different fracture zones only one on the west side of the creek contains significant amounts of quartz.

One of the fracture zones on the lower valley slope on the east side of the creek had just been uncovered by the recent placer operations. This zone comprises about 60 feet of fractured and sheeted granitic rock, offset slightly by a fault of northerly trend along which a rhyolite dike has been intruded. The rhyolite is unfractured; but the granitic rock is broken by a series of rather closely spaced fractures, each trending about N70°E and dipping 30°-35°NW. Some of the fractures are iron-stained and some are filled with thin seams of fine-grained quartz accompanied by arsenopyrite and comb and drusy quartz. In places the seams swell into lenses as much as 4 inches thick and 3 to 4 feet long composed of both the fine-grained and the late comb quartz. Other fracture zones on the slope above have been explored by tunnels only one of which was open in 1938. This had about 100 feet of workings and showed a few thin quartz seams in fractures.

The main workings on the west side of the creek are along a quartz vein or lode that averages from 2 to 2½ feet in width and is said to be a continuation of the North Ophir vein. The structural relations and the distribution of the quartz that make up the lode or vein are shown in Figure 2. The zone of complex fissuring or fracturing occupied by the lode strikes about N70°E. Near the portal the dip is gently to the north, but farther in the adit it steepens, becomes vertical, and then changes to steeply south. As the dip steepens, the amount of quartz present becomes less. As shown in Figure 2, quartz lenses may break up or end against seams that extend transversely across the fracture zone. In places the fracture zone is 20 feet wide. Some stoping had been done from the lower adit level, but the stopes were not accessible. According to reports, much of the ore assayed between 2 and 3 ounces of gold to the ton with less than 10 per cent of it saved by amalgamation. Much fine-milling ore was reported in the upper levels of the old workings. Much of the quartz exposed in the lower adit level at the sides of the stoped areas is the early white granular variety which in places carries a little pyrite. Small amounts of the fine-grained bluish-gray quartz also show.

The outcrop of a 20-foot vein stands above the crest of the ridge not far from the lode just described. It appears to be composed largely if not entirely of the early "bull" quartz. A 390-foot tunnel north of the vein and with a 65-foot cross cut from the tunnel toward the vein had not been driven far enough to disclose the subsurface relations.

Done

The Dona is a prospect on the east side of Elk Creek about 3½ mile above where it joins Bear Creek to form Feather River. Its position is about 2 miles due east of Rocky Bar. The development comprises a short tunnel, several cuts, and two old shafts, a hundred feet or more above the level of the creek.

Most of the work has been confined to one of several lodes which strike about N30°-40°E, and dip 60°-65°NW. The lode is best exposed at a shaft on the
Fig. 2. Geologic sketch map of the accessible underground workings at Spanish Town Mine
of the ridge and in a cut on the slope a short distance to the southwest. The
some of fractured rock is as much as 4 feet wide, and in places contains lenses of
quartz 6 to 8 inches thick. In other places, the quartz forms pods, irregular
bunches, and narrow stringers. This lode has been traced for several hundred feet,
but southeast of the shaft the quartz is not so abundant as on the southwest side.
Another lode parallel to this one has been exposed in a cut on the other side of
the ridge. Several others cross the property but have not been prospected. All
of them are parallel to the first and all show some quartz in seams and stringers.
In all the lodes, the fill is largely with coarse comb quartz, but in places there
are also inclusions of very fine-grained dark gray quartz with minute grains of
disseminated arsenopyrite.

Boneparte

The Boneparte mine is about 4 miles southeast of Rocky Bar near the head of Cayuse
Creek in sec. 24, T.4N., R.10E. and, therefore, is well to the side of the main
center of mineralization at or near Rocky Bar. Work was carried on at the mine as
early as 1888 and, according to Mint reports, the production up to 1883 was close
to half a million dollars. Little information concerning the early and later day
activities of the camp is available, but apparently after its early activity there
was a long period of idleness with no further work recorded until 1900, and from
then, not until 1910. The last work may have been done some distance from the old
workings. No data were found concerning the extent of the old workings, all of
which are now caved. Apparently, the mine was worked from tunnels, none of which
gained much depth below the surface.

Judging from the alignment of tunnels, the lode must strike about N.86°W. and dip
steeply north. Where it extends across the ridge east of the main workings, it is
about 3 feet wide and has some stringers and bunches of quartz along fractures.
Much of the quartz in the outcrop and on the dumps at the old tunnel portals is the
white granular variety, but some fine-grained grayish and some comb quartz is associ-
ated with it.

Howard

The Howard workings are on the ridge west of the old Boneparte mine, probably in
sec. 23, T.4N., R.10E. The development comprises three shallow tunnels with about
385 feet of accessible workings. One of the tunnels is an adit drift about 80
feet long; the other two are cross cuts, each about 90 feet long; one is joined by a
drift 75 feet long; the other, by a drift 60 feet long. Stoops from the drifts
reach the surface no more than 60 feet above.

The lode explored by these workings strikes about N.80°E. and dips 66°-70°S. It
is about 3 feet wide and contains bunches and stringers of quartz along fractures.
Much of the quartz is the comb variety, but there is some fine-grained grayish
quartz containing disseminated arsenopyrite, and a little of the white first-stage
quartz. Some of the comb quartz contains scattered, rather large crystals of
pyrite.

Wide West

The Wide West mine is in the Red Warrior district just over the ridge and about a
mile southwest of Rocky Bar (Plate 1). The mine is one that was worked as early

36
as the late sixties and as late as 1937, but periods of activity were interspersed with long periods of idleness. According to Strahorn, the mine had a recorded production of $200,000 up until 1881, and according to Ballard, a locally credited production of $1,260,000 in 1925.

The older development comprises a number of tunnels and cuts on the slope above Red Warrior Creek, some of which, according to Strahorn, gained a depth of 300 feet. All of these are now inaccessible and the last work, beginning in 1935, was in two adits, one about 100 and the other about 160 feet above the creek. Work from these adits continued through 1937 when the mine was shut down because of financial difficulties. During this last active period, the mill, formerly a 20-ton ball mill operated by an 80 H.P. Diesel engine. The two adits were open in 1936 and 1939. (See fig. 3).

Apparently several lodes cross the property, but the Wide West lode is the only one that has had a noteworthy production. This lode strikes about N.75°W. and dips steeply north. According to Raymond (1870), the lode was 2 to 5 feet wide, and according to Strahorn (1881), it averaged 2 feet and gave an average milling return of $35 to the ton. It had then been worked to a depth of 300 feet. The lode is not now visible, but material on the old dump indicates that the ore filling contained considerable amounts of comb quartz.

The later work apparently was on a lode that lies to the south of the old Wide West lode. As shown in Figure 3, this lode is along and is guided by a very complicated zone of fracturing. The strike of the fracture zone ranges from N.70° - 80°W. to N.70°-80°E. and the dip, from 46° to 80° north. In places the fracture zone is offset by faults of northerly trend and a part of the zone is occupied by a lamprophyre (hornblende vogesite) dike. The fracture zone is not uniformly or persistently mineralized. The mineralized part of the zone is, for the most part, 6 to 8 feet wide, but here and there it virtually disappears. The quartz is contained in scattered stringers, irregular bunches or pockets, and in lenses. Many of the lenses terminate in a swarm of stringers. Many veins and stringers also occupy fractures far out in the country rock. In general, the quantity of quartz or the size of the lenses increases where the dip of the fracture zone increases, and pinches where the dip decreases. Much of the quartz exposed in these two lower adits is massive, granular, in part impregnated with a little pyrite and cut by stringers of fine-grained quartz, rarely by comb quartz. In some open cuts along the outcrop, 200 feet vertically above the adit levels, the comb quartz appears to be comparatively abundant. This distribution of the third-stage quartz may be significant and may afford a clue to why the work in the lower adits was not so profitable.

Keystone

The Keystone is reported by Ballard to be close to the divide that separates Red Warrior Creek from Bear Creek. Old workings show several lodes or veins, but these workings were not open in 1936 or 1939, though two adit drifts were open to Ballard in 1925.

The distribution of these workings indicates that several lodes or veins extend about N.75°W. across the property, and, according to Ballard, show some very significant relationships to several kinds of igneous dikes exposed in the underground workings. Aplitic (granophyre (?)) and diorite (dacite (?)) porphyry dikes

Ballard, B. H., op.cit. p.28
Fig. 3. Geologic sketch map of the underground workings at the Wide West Mine
are reported to be older than the mineralised faults, and basic (lamprophyric?) dikes are believed to be about contemporaneous with them. Two systems of faults are recognised; one striking N.20°W., the other, N.80°W. The basic dikes lie along the faults which strike N.20°W.; and the veins, along both sets of faults, the more prominent ones along those that trend about N.80°W. Two of the faults of N.80°W. trend are occupied by both veins and dikes. Post-mineral movement has caused some offsets along vein-dike contacts.

The main ore bodies are reported to be lens-shaped masses of quartz along the faults that trend N.80°W. They begin a few feet from the dikes and continue many feet beyond. These lenses are reported to be 6 to 12 inches wide and to contain some scattered crystals of pyrite below the oxidised zone. Ballard reports no arsenic, antimony, or copper in the ore and quotes assay returns of 0.48 ounce of gold and 0.8 ounce of silver in a grab sample from a pile of ore at the uppermost tunnel.

Idaho Gold Chief

The property of the Idaho Gold Chief Mining Company extends from Rocky Bar south across the divide between Bear and Red Warrior creeks and covers a considerable part of the upper slope facing Red Warrior Creek (Plate 1). The earliest and latest work has been done near the crest of the ridge above Red Warrior Creek, but the most extensive workings are two tunnels driven into the ridge at and just above Rocky Bar. The lowest tunnel is at creek level and is reported to have a length of 2,500 feet. The other is 100 feet above and is reported to have a length of 800 feet. When the present operators began work in 1932, a 350-foot stretch of the lower tunnel was reopened and a 75-foot winze sunk at its inner end. Later the work was transferred to the top of the ridge and a shaft sunk on one of the ledges. By 1934, this shaft had reached a depth of 100 feet and 166 feet of drifting had been carried on from the bottom of the shaft. When the property was visited in 1938, all workings were inaccessible. Nothing was learned of the past production.

The position of the numerous old cuts and tunnels suggests the presence of several lodes or veins of west-northwest trend. The inclination of the shaft indicates that one of them dips 55°N. Whether these lodes or veins out porphyritic and lamprophyric dikes could not be determined. A dacite porphyry dike crops out on the surface about 100 feet southeast of the shaft and numerous fragments of porphyritic and lamprophyric rock appear on the dumps of the lower tunnels.

In the few accessible exposures along the outcrops, the mineralisation appears to be confined to stringers and seams of quartz in the fractured granitic rock. This quartz is largely of the comb variety. The little ore on the dumps at the portal of the tunnels on Bear Creek shows only a little of this late quartz but a considerable amount of the earlier fine-grained variety. Some of the ore piled near the shaft on top of the ridge had scant amounts of pyrite, arsenopyrite, sphalerite, and galena.

Flag Staff

The Flag Staff is a short distance north and northwest of the Wide West mine.

\[\text{Ballard, S. M., op.cit. p.29.}\]
Fig. 4. Geologic sketch map of one of the tunnels on the Flag Staff property.
It was one of the few properties active in the district in 1938 and 1939, when some of the old tunnels on the property were being reopened and a 30-ton mill was being installed along the creek a few hundred yards above the Wide West mill. The development comprised about 1,600 feet of underground workings, divided between several tunnels driven east along the Flag Staff lode from the west side of the ridge above the Wide West mine, and two tunnels driven west from the other side of the ridge. The higher tunnel on the east side of the ridge was mapped (Fig. 4), but the 665-foot tunnel 300 feet below was blocked at the portal. Nothing was learned of either the old or recent production.

There are a number of mineralized fracture zones extending in a general easterly direction across the property and some of them are exposed in the tunnel that was then open (See Fig. 4). These fracture zones strike N.70°W. to N.80°E., and dip 50°-60°N. In each the fissuring is pronounced and the quartz is distributed as thin seams and lenses a few inches to several feet long or as small bunches. Each of the ore shoots is about 20 feet long and marks the zones where the quartz veins and stringers appear in the fractured rock. These shoots are separated by stretches of fractured rock free of quartz. Most of the quartz occurs where there is a local flattening of the dip. Tunnels on the other side of the ridge are apparently along one of the fissures exposed in the tunnel that was mapped.

Most of the stringers and lenses exposed in the east workings appear to be composed of the comb or third-stage quartz, but the ore on the dump of the intermediate adit on the west side contains as much of the second-stage, fine-grained variety as of the third-stage quartz. This second-stage quartz locally contains exceptionally large amounts of arsenopyrite. Just above the intermediate adit the only quartz exposed is the third-stage variety.

Other Properties

There are a number of other properties on the north side of Red Warrior Creek, among them the Dewey, Doolittle, Quil Pig, and the Vibrator. Most of these are little more than prospects, and none of them, except for a few open cuts on the higher slopes, have accessible workings. Most of them are on mineralized fracture zones that strike from N.55°W. to N.80°W. Many of them contain only occasional stringers of quartz or small quartz pods in the little altered country rock. Much of the quartz is the comb variety.

Other properties are also scattered through other parts of the district. Most of them have been opened by tunnels, but, since the portals are blocked and the lodes poorly exposed on the surface, there is little to be said about them.
Claim Map of the Rocky Bar District

Compiled from data maps provided by William Neace, state miner, Rocky Bar, Idaho. The base map was entered on from township plats, Township No. 1 S., Range No. 1 E., of the New Medicine, Idaho. Lines represented show all northeast and east sides extended.