STATE OF IDAHO
Arnold Williams, Governor

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

A GEOLOGIC RECONNAISSANCE OF THE HAILEY GOLD BELT
(CAMAS DISTRICT), BLAINE COUNTY, IDAHO

By

Alfred L. Anderson and Warren R. Wagner

University of Idaho
Moscow, Idaho
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</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>2</td>
</tr>
<tr>
<td>Previous geologic work</td>
<td>3</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>3</td>
</tr>
<tr>
<td>GEOGRAPHY</td>
<td>4</td>
</tr>
<tr>
<td>Location</td>
<td>4</td>
</tr>
<tr>
<td>Topography</td>
<td>4</td>
</tr>
<tr>
<td>Climate and vegetation</td>
<td>4</td>
</tr>
<tr>
<td>Accessibility</td>
<td>4</td>
</tr>
<tr>
<td>GEOLOGY</td>
<td>5</td>
</tr>
<tr>
<td>Foreword</td>
<td>5</td>
</tr>
<tr>
<td>Idaho batholith and related rocks (Cretaceous)</td>
<td>5</td>
</tr>
<tr>
<td>Quartz monzonite</td>
<td>5</td>
</tr>
<tr>
<td>Aplitic</td>
<td>5</td>
</tr>
<tr>
<td>Pegmatitic</td>
<td>6</td>
</tr>
<tr>
<td>Age</td>
<td>6</td>
</tr>
<tr>
<td>Early Tertiary (? lamprophyre</td>
<td>6</td>
</tr>
<tr>
<td>Tertiary (? basalt</td>
<td>7</td>
</tr>
<tr>
<td>Structure</td>
<td>7</td>
</tr>
<tr>
<td>Late Mesozoic rhyolite</td>
<td>8</td>
</tr>
<tr>
<td>Early Tertiary (? faults</td>
<td>9</td>
</tr>
<tr>
<td>Mid-Tertiary (? faults</td>
<td>9</td>
</tr>
<tr>
<td>GOLD DEPOSITS</td>
<td>9</td>
</tr>
<tr>
<td>History and production</td>
<td>9</td>
</tr>
<tr>
<td>Character of the deposits</td>
<td>10</td>
</tr>
<tr>
<td>Distribution</td>
<td>10</td>
</tr>
<tr>
<td>Structural relations</td>
<td>10</td>
</tr>
<tr>
<td>Mineralogy</td>
<td>11</td>
</tr>
<tr>
<td>Ore shoots</td>
<td>12</td>
</tr>
<tr>
<td>Tenor of the ore</td>
<td>12</td>
</tr>
<tr>
<td>Wall-rock alteration</td>
<td>13</td>
</tr>
<tr>
<td>Origin of the deposits</td>
<td>13</td>
</tr>
<tr>
<td>Outlook</td>
<td>14</td>
</tr>
<tr>
<td>MINES AND PROSPECTS</td>
<td>15</td>
</tr>
<tr>
<td>Camas No. 2</td>
<td>15</td>
</tr>
<tr>
<td>Location and history</td>
<td>15</td>
</tr>
<tr>
<td>Development</td>
<td>16</td>
</tr>
<tr>
<td>Geologic features</td>
<td>16</td>
</tr>
<tr>
<td>Distribution of the ore</td>
<td>16</td>
</tr>
<tr>
<td>Black Cinder</td>
<td>18</td>
</tr>
<tr>
<td>Tip Top</td>
<td>18</td>
</tr>
<tr>
<td>Location and history</td>
<td>18</td>
</tr>
<tr>
<td>Development</td>
<td>18</td>
</tr>
<tr>
<td>Geologic features</td>
<td>18</td>
</tr>
<tr>
<td>Golden Star</td>
<td>19</td>
</tr>
<tr>
<td>Hattie (Treasure Vault)</td>
<td>20</td>
</tr>
<tr>
<td>Rustier</td>
<td>20</td>
</tr>
</tbody>
</table>
MINES AND PROSPECTS (continued)

<table>
<thead>
<tr>
<th>Mine Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wimmer (Jennie May)</td>
<td>22</td>
</tr>
<tr>
<td>Oriental</td>
<td>23</td>
</tr>
<tr>
<td>Burning Moscow-Flemming</td>
<td>23</td>
</tr>
<tr>
<td>Champlain</td>
<td>24</td>
</tr>
<tr>
<td>Happy Day</td>
<td>25</td>
</tr>
<tr>
<td>Jumbo</td>
<td>25</td>
</tr>
<tr>
<td>Red Rock</td>
<td>26</td>
</tr>
</tbody>
</table>

**ILLUSTRATIONS**

PLATE 1: Hailey gold belt topography ............................ 3

2. A. Treasure Trove vein: ........................................ 11
   B. Tip Top vein .................................................. 11

FIG. 1: Index map showing location of the Hailey gold belt (Camas district). .......... 3

2. Topographic and geologic map of a part of the Hailey gold belt ............... 3
   envelope

3. Claim map of a part of the Hailey gold belt .................................. 15

4. Geologic map of the accessible workings at the Camas No. 2 mine ............. 15
   envelope

5. Longitudinal section through the Camas No. 2 mine ................................ 17
A GEOLOGICAL RECONNAISSANCE OF THE HAILEY GOLD BELT

(CAMAS DISTRICT), BLAINE COUNTY, IDAHO

By

Alfred L. Anderson and Warren E. Wagner

ABSTRACT

The virtually unknown but once productive Hailey gold belt (Camas district) in the west-central part of Blaine County, Idaho, contains numerous gold-quartz veins in the granular rock of the Idaho batholith, in part beneath remnants caps of Tertiary (?) basalt. The veins occupy moderately low-angle reverse faults of west-northwest strike and northeast dip, formed apparently during the Laramide disturbance which came at the close of the Cretaceous period.

The veins are fissure fillings of lenticular habit and possess lengths of 300 to 1,000 feet and widths up to 15 feet, locally up to 40 feet. The ore shoots in them are from 200 to 400 feet long and 3 to 8 feet wide. The veins are composed largely of an early barren coarsely granular quartz to which has been added a younger coarse comb quartz, which contains the gold. Sulfides ordinarily comprise less than 2 percent of the filling. Some veins contain a little siderite and show transition into the siderite-galena veins of the Wood River region. None of the veins, however, can be looked upon as a potential source of base metals.

The deposits apparently were formed at considerable depth below the surface under essential mesothermal conditions. The gold probably had a considerable vertical range, and although much may have been lost by erosion, the ore probably extends to depths greater than any yet reached in mining.

The veins are associated with lamprophyric dikes and are probably related to magmas that came into existence at the close of the Laramide disturbance in early Tertiary time.

The outlook for future productive activity in the district is bright. Much ore that was not amenable to early stamp milling practice is believed to remain underground. Some of this ore has been demonstrated to contain from 0.25 to 0.6 ounces of gold per ton and 1 to 2 ounces of silver.

INTRODUCTION

Purpose and Scope

This report presents the findings of a reconnaissance study of the gold deposits along the Hailey gold belt (Camas district) in Blaine County, Idaho, during August 1945. The district attracted considerable attention during the eighties and nineties, but with decline in mining at the turn of the century, interest dwindled, and despite intermittent activity since, the district is today one of the least known in the State, not having
received mention in any geologic report since 1900 and only incidental mention prior to that date. Consequently, there is practically no information on the geology and gold deposits of the district. This lack has prompted the Idaho Bureau of Mines and Geology to make a reconnaissance examination of the gold belt and to make available geologic data desired by operators in the district and by others in search of gold properties with intent to develop and operate.

Because of the long period of inactivity, few of the mines were open and study had to be confined largely to outcrops and mine dumps. Fortunately, the underground workings of the largest mine in the district (Cames No. 2 mine) were accessible; thus much first-hand information on subsurface features was available. A topographic map showing the distribution of the deposits in the main part of the district was prepared and most of the deposits in the remainder of the district were visited. However, a lack of an adequate field map made it impossible to locate accurately some of the deposits in the more remote parts of the district.

The study reveals that the gold is in quartz veins along faults which cut the Idaho batholith. The veins, however, are not related genetically to the batholith (Cretaceous) but apparently came into existence in early Tertiary time as the product of igneous activity associated with the closing stages of the Laramide orogeny. Some of the veins are large but they contain ore shoots of only moderate size. The ore has by no means been exhausted.

Previous Geologic Work

The district received a little attention from geologists in the early days but reports made were always included in regional studies or reports on other districts and never exceeded a paragraph or two in length. Since 1900 the Cames district has not been mentioned in any geologic report.

The first information on the district was given by Blake in 1887, who wrote a brief account on the mining activity, then at its height, and included a few words on the grade of the ore and problems of gold recovery. This report was followed in 1896 by one written by Eldridge, who added a few descriptive details on the Cames No. 2 mine. The third and last report, published in 1900, was by Lindgren, who contributed further details on the Cames No. 2 and the Tip Top mines, each receiving a paragraph. Since then there has appeared a report by Unkeby, Westgate, and Ross in which some of the mines at the extreme east end of the gold belt are described, but these mines, which are near Bellevue, are not in the Cames district and are separated from those in the Cames district by several miles. The reports alluded to above are listed below:


Unisley, Jr., Westgate, Jr., and Ross, C. E., Geology and ore deposits of the Wood River region, Idaho; U. S. Geol. Survey Bull. 814, pp. 129-134, 1930.

Acknowledgments

The writers wish to acknowledge their indebtedness to Mr. Sam Frank Fluchel of Hailey, Idaho, for his generous cooperation in providing copies of claim and mine maps of the Camas mine and in sharing much valuable historical data on the districts. Without his assistance this report would hardly have been possible. The writers also wish to acknowledge their gratefulness to Professor W. H. Steily of the University of Idaho School of Mines, who assisted in the preparation of the topographic base map by serving most efficiently as recorder while the plane table work was in progress.

GEOGRAPHY

Location

The Camas district is in the west-central part of Blaine County from 6 to 15 miles southwest of Hailey, the county seat (Fig. 1). The district covers the area drained by Camp and Rock Creeks, tributaries of Camas Creek, and by the headwaters of Grey Creek, which joins Wood River at Hailey. The gold belt extends over the more central part of the district and most of the deposits are in the eastern half of T. 19 N., R. 106 E., and the western half of T. 18 N., R. 176 E., Boise meridians.

Topography

The district lies in the foothills of the Sawtooth Mountains, which form a part of the mountainsous terrain that extends over central and west of northern Idaho. The local relief is several hundred feet, the altitude ranging from 4,000 to 6,400 feet, but in contrast with the higher mountainsous country to the north the region is low and hilly and has the appearance of a low, gently dissected erosion surface composed of broad ridges and valleys with bordering slopes that are gentle to moderately steep (Fig. 1). Pits of the surface are capped by erosional remnants of basalt which formerly dissected the region. Apparently the surface has only recently been exhumed by erosion of the basalt. Camp and Rock Creeks have cut little below the level of the basaltic cover; tributaries of Rock Creek have incised rather deeply. The exhumed surface as well as the basalt slope gently southward toward the Snake River Plain.
Hailey Gold Belt Topography

View of the west part of the Camas district showing the low, maturely dissected land surface which comprises the foothills of the Smoky Mountains. Ridges in the foreground are carved in the granular rock of the Idaho batholith; the flatter ridge crests on the left retain caps of basaltic lava. Picture taken from the outcrop of the Camas vein, just above the Camas No. 2 mine camp. The outcrop of the Treasure Trove vein may be traced across the low ridges in the foreground.
Fig. 1. Index map showing location of Hailey gold belt (Camas district).
Climate and Vegetation

The district has a climate that is fairly rigorous and characterized by long, generally cold winters, and short, relatively cool summers. Autumn snows may come in September or early October, but a long season of clear open weather, lasting into December, usually follows. Subzero temperatures are not uncommon during the winter but generally are of short duration. Snowfall may be considerable after December and the strong winds may cause heavy drifting with the larger drifts on the northeast sides of ridge crests lasting well into May. During the summer, daytime temperatures may at times be rather high, but uncomfortably hot nights are rare.

More precipitation falls during winter than in summer months, but the total is insufficient for tree growth though ample for grass and sagebrush. This natural cover was destroyed by fire several years ago and is now largely replaced by weeds. The annual precipitation may be only slightly less than that at Hailey where the total over a period of 13 years was 16.46 inches, of which 3.39 inches fell in the months of May to August.

Accessibility

The Camas district is easily accessible (Fig. 1). State Highway No. 22, which extends from Hailey to Fairfield (county seat of Camas County), crosses the district. This highway has no steep grades and is either gravelled or has a natural sandy surface of disintegrated granite. Limes in the west part of the district are linked to the highway by graded roads which have a natural sandy surface. Limes in the east end of the district are reached by way of Rock Creek over a road that is muddy in rainy weather.

A branch of the Union Pacific Railroad (Shoshone-Hill City) passes just south of the district (station at Blaine), but operators in the district apparently prefer the highway to the railroad as a means of access.

GEOLOGY

Foreword

The district is underlain by the granular rock of the Idaho batholith and some of its associated epilitic and pegmatitic dikes, but parts of the batholith are concealed beneath caps of basalt, which was poured out after the granular rock had been exposed by deep erosion. Long before extrusion of the basalt, however, the batholith had been fractured during an earth disturbance and quartz veins were formed and lamprophyric dikes

were intruded along some of the fractures. The most outstanding feature of the local geology is its apparent simplicity, but the fracture (fault) patterns in the batholith rock reveal not less than three structural disturbances.

Idaho Batholith and Related Rocks (Cretaceous)

Quartz Monzonite

The granular rock of the batholith may be traced from its contact with Paleozoic sedimentary rocks a mile or two east and north of the gold belt into the main body of the batholith a few miles to the northwest. To the south and west the batholith is almost entirely concealed beneath younger volcanic rock, caps of which remain in the district.

The rock is not much different from that of the main batholith, much of it is moderately coarse-grained, light in color, and has a liberal sprinkling of pinkish potash feldspar in what otherwise would be a grayish rock composed of quartz, plagioclase, and scattered grains of biotite and hornblende. The pinkish feldspar (microcline) forms from 20 to 30 percent of the rock; the plagioclase (andesine), from 30 to 45 percent; the quartz, about 30 percent; and the biotite and locally hornblende, from 5 to 10 percent. Various accessory minerals include sphene, magnetite, apatite, and zircon; secondary minerals are epidote, chlorite, sericite, and leucoxene.

Depending on the relative proportions of microcline and andesine the composition of the rock ranges from granodiorite to quartz monzonite, rarely granite. The prevailing composition is probably quartz monzonite, closely approaching granodiorite.

Aplitic dikes are widely distributed but are not particularly abundant. They are rather conspicuous because their superior resistance to weathering and erosion makes them project above the surface of more easily weathered batholithic rock. Dikes may range up to several feet, exceptionally 20 feet wide, but few of them may be traced for lengths of more than one hundred feet.

The aplites are fine to medium-grained, pinkish rocks almost devoid of dark minerals and have a marked "sugary" texture. They are composed largely of quartz, potash feldspar, and sodic plagioclase and contain only insignificant quantities of biotite, muscovite, sericite, magnetite, and apatite. The quartz forms about 40 percent of the rock, but the proportions of potash and plagioclase feldspars vary. The potash feldspar at least doubles the amount of plagioclase and is generally microcline, locally accompanied by orthoclase. The plagioclase may be either oligoclase or andesine but neither comprises more than 25 percent of any rock. Apparently the highly silicious nature of the rock is partly responsible for its superior resistance to weathering and erosion.
Pegmatite

Dikes of pegmatite are small in size and few in number, being much less numerous and conspicuous than theplitic bodies. Dikes are rarely more than a foot or two wide nor more than 50 feet long. In some places the pegmatites shrow the same dikes with the splits, the pegmatites forming minor gneissoidal folios within the splits.

The rock of the pegmatite resembles a very coarse-grained granite but the grain is of variable size and may range from a fraction of an inch to several inches in longest dimension. From a distance the rock is conspicuously pinkish, but at close range it shows a white and pink netlike produced by an admixture of white soda pegmatite with a much more abundant pinkish or reddish microcline. Quartz also is present but in the pegmatites that were examined, it was much subordinate to the microcline.

Age

From a consideration of the broad structural and stratigraphic relationships Ross 1 has concluded that the Idaho batholith was emplaced late in the Mesozoic, probably in late Jurassic or in Cretaceous time. Reed 2 has since found from an age determination of a radioactive mineral, presumably derived from a pegmatite, that some of the rock is at least as young as late Cretaceous.

Early Tertiary (?) Lamprophyre

Lamprophyric dikes are associated with the gold veins at both the Comus No. 2 and Tip Top mines and are reported at other places. These dikes lie along and across the veins and apparently were intruded during later stages of mineralization, for in some places they have been somewhat altered by the mineralizing solutions. Dikes are rarely more than a few feet thick and possess lengths less than those of the veins.

The lamprophyres contain a predominance of dark minerals and consequentlty are dark gray to greenish black. They have a fine grain and their minerals are indistinguishable without the microscope. The rock is slightly porphyritic (unnoticed in the hand specimen) and contains small scattered hornblende phenocrysts in a groundmass composed of slender elongated euhedral leuks, hornblende needles, subhedral biotite and magnetite, and accessory orthoclase and quartz. Secondary chlorite and acteite, the

latter in patches and veinlets, are abundant. The composition of the rock suggests membership in the diorite family and a classification as spessartite (diorite lamprophyre).

Inasmuch as the dikes and veins are along fractures believed to have been formed during the Laramide disturbance and the features of the veins are those of the gold-quartz veins that came into existence at the close of that disturbance, the dikes were probably intruded in early Tertiary time, just as the mineralization came to a close.

Tertiary (?) Basalt

The basalt has been stripped from most of the district but remnant caps remain over parts of the gold belt and flows form a continuous cover to the south.

Much of the basalt is highly vesicular and the surface of the flow scoriaceous. Otherwise the rock is dark gray, porphyritic, and contains numerous plagioclase laths in a grayish black, in part glassy groundmass. The phenocrysts include both labradorite and augite crystals generally distributed among the small grains of labradorite and augite and the glass of the groundmass.

The basalt covers an erosion surface of variable but low relief cut across the granular rock of the batholith, but just where the erosion surface was carved and the basalt was poured out upon it are not precisely known. The basalt is on a slope inclined toward the Snake River Plain and is therefore older than the olivine basalt (Quaternary) that covers much of the Snake River Plain. The basalt could represent basal flows of the Challis volcanics (Oligocene), but if so, all andesitic, latitic, and rhyolitic flows and tuffs that lie above have been removed by erosion. On the other hand, the basalt is more silicic than that ordinarily found in the lower part of the Challis volcanics and is more like the silicic basalts (middle or upper Miocene) that make up much of the Columbia Plateau. Until more exact data are available the age of the basalt must be regarded as Tertiary, either middle or late.

Structure

The only structural features recognizable in the granular rock of the batholith are joints and faults, but of these only the faults have any bearing on the economic problems of the district. The faults have directed the intrusion of the dike magmas and have served as channels for the circulation of mineral-bearing solutions and are thus in part marked by veins. Faults have also caused minor offsets in veins and dikes. The faults are apparently the product of not less than three crustal disturbances: the first in late Mesozoic, the second in early Tertiary, and the third in mid-Tertiary time. The first involved the emplacement of the Idaho batholith and the formation of fractures that guided the slightly younger but genetically related aplite and pegmatitic magmas. The second, the Laramide disturbance, fractured the batholith and produced the faults occupied by the veins and lamprophyric dikes. The third, the mid-Tertiary disturbance,
also faulted the granular rock and produced minor offsets in the earlier veins and dikes. Further deformation other than uplift and regional tilting in probable late Tertiary or early Quaternary time has left no record in the rock of the batholith.

Late Mesozoic Faults

The faults that directed the intrusion of the aplite and pegmatitic dikes trend in several directions. Most of the dikes and hence the faults strike N.10° - 20°E., but a few strike N.40°E., N.60° - 70°E., N.15° - 20°W., N.40°W., and N.80°W. In some places faults that strike N.40°W. merge to N.40°E. In one place two dikes that strike N.10°E. are joined together by one which strikes N.60°W. In general, however, the dikes and therefore the directing faults appear to favor the N.20°E. direction. All of these faults are of minor magnitude. They are apparently short and rarely direct dikes more than 100 feet long. Their displacement may be measured in inches.

The faults are parts of a complex system of fracturing initiated apparently during the later stages of consolidation of the batholith while regional stresses were still in existence. The fracture system has apparently had no influence on later faulting. The individual fractures were completely healed by the aplite and pegmatitic magmas and resisted any attempts at later reopening.

Early Tertiary (?) Faults

Most of the early Tertiary (?) faults appear to be confined to three rather closely spaced parallel west-northwest extending zones which are known locally from north to south as the Hettle, the Tiptop, and the Ocmas. These Hettle and Ocmas zones may be traced for several miles but the Tiptop zone is short. Individual faults within the zones outrun the veins that mark them and may have lengths up to several thousand feet, even up to a mile or two.

All the faults regardless of distribution trend in a west-northwest direction with individual strikes ranging from N.50°W. to N.80°W. All of them dip to the northeast at angles of 30° to 60°. Individual faults may show considerable variation in trend and dip, in some cases as much as 20°. Some change their strike from N.50°W. to N.70°W. and their dip from 50°NE. to 80°W.E.

Because of the absence of horizon markers in the massive rock of the batholith the amount of movement along the faults cannot be determined. The relations of the veins to the faults indicates, however, that the hanging wall has moved relatively upward with respect to the footwall and that the faults are reverse faults of moderately low angle. The structure of the veins also indicates that movement continued intermittently along the faults during mineralization and even after the intrusion of the lempophyric dikes. The zone of disturbance associated with the faulting is commonly 10 to 15 feet wide, locally as much as 40 feet wide.

8
These reverse faults probably resulted from compressive stresses acting on the batholith during the Laramide disturbance. Similar faults and fault patterns in Boise Basin 1/4, Rocky Bar 1/2, and Atlanta 3/4 have also been interpreted as the product of Laramide deformation when stresses were directed through the batholith against the weak trough of sediments on the east and northeast then undergoing folding and faulting.

Mid-Tertiary (?) Faults

Faults interpreted as belonging to the mid-Tertiary deformation, which arched and faulted Challis volcanics and other rocks in south-central Idaho 4/ locally slice obliquely across the early Tertiary faults and vein fillings. These faults strike N. 65° − 70°E, and dip for the most part steeply south-east. The fault plane is slickensided and commonly has grooves of striations which are nearly horizontal or pitch northeast at angles of about 20°. Displacement is slight, never more than a few inches.

These minor faults have the same trend and in part the same dip and direction of movement as the mid-Tertiary faults in Boise Basin 5/1. The slight displacement locally introduces no problems in the mining of the ore.

GOLD DEPOSITS

History and Production

The first gold discovery was made in 1865 at what has since been known as the Camas No. 2 mine, but no work was carried on in the district until 1879 and no other discoveries were reported until the eighties. Most of the mines now known came into existence at that time. The camp flourished until the late nineties. In 1886 the Camas mine suspended operations; the Black Cinder closed down in 1900; the Tip Top, in 1904; the Golden Star, in 1907. The old town of Doniphon on the flat below the Camas mine was vacated. Many of the mines have since remained idle but a few have been worked intermittently to the present time, the Camas No. 2 and the Hettie having been active off and on during the past two decades.

Production records are incomplete and the actual production of the district may never be known. The production from the Camas No. 2 mine is reported by Mr. Plughoff to exceed $1,250,000. According to the U. S. Mint Reports the total gold production of Blaine County from 1874 to 1900 was 175,770 ounces of which 492 ounces have been credited to placerers.

More than half of this probably came from the Camas district. The total production from the Wood River district from 1880 to 1901 is given as 68,935 ounces, much of which may have come from the part of the gold belt east of the Camas district.

Character of the Deposits

The gold is confined exclusively to quartz veins which occur as fissure fillings along moderately low-angle faults in the batholith. Some of the veins contain enough sulfides to interfere with the recovery of the gold by stamp amalgamation but not enough to warrant recovery for lead and zinc. Ordinarily the ore contains two to four times as much silver as gold by weight, but the silver content is materially higher in some of the veins in the eastern part of the district. Thoro argentiferous galena is more abundant and supergene enrichment has locally changed the ore to one relatively rich in silver. Some of the veins contain a little siderite and show transitions into the siderite-galena veins of the Wood River region but none of the veins can be looked upon as a potential source of base metals.

Distribution

The distribution of the gold-quartz veins accords with the distribution of the early Tertiary (?) reverse faults and the veins, some of which are shown in figure 2, are aligned along a west-northwest and east-southeast belt about 8 miles long and up to 2 miles wide with most of them along the Camas zone on the south and the Hattie zone on the north. The only vein not in these zones or in the Zig Zag zone between is the Golden Star, which lies about half a mile south of the Camas at the most southerly limit of known mineralization. Most of the veins in the eastern part of the belt are shown in figure 2 but those in the western part (northwest of the Halesville-Fairfield road) have not been mapped and the zone to which each belongs has not been determined. Both the Camas and Hattie zones appear to extend through the western part of the district.

The veins are confined to the batholithic rock and the associated bodies of aplite and pegmatite. Some of the veins pass beneath caps of Tertiary basalt; others appear along valley bottoms where the basalt has been pierced by the streams.

Structural Relations

The reverse faults which contain the veins are persistent and may be traced for several thousands of feet, but the actual veins are much shorter and in part form a series of recurring lenses separated by barren zones or gouge. The individual lenses have lengths of 300 or 400 feet up to 1,000 feet but may be so closely spaced as to give essentially continuous veins with lengths exceeding 3,000 feet (Fig. 2). The veins are only a foot or two wide in the extreme eastern part of the district but they commonly measure 12 to 15 feet in their widest parts through the remainder of the district and locally may be even wider. Where the veins have their greatest
they usually rise boldly above the surface, giving very conspicuous outcrops (Pl. 2).

The distribution of the quartz lenses along the faults has been determined by the location of openings made by movement along the fault planes and accords everywhere with a local flattening of the dip. As the faults are reverse, the walls were forced tightly together along the more steeply dipping parts of the fault plane, as the hanging wall rose over the footwall. On the other hand, where there was a local flattening, the hanging wall was lifted from the footwall and openings were made available for vein filling. Most of the veins, therefore, are found along faults where the dip is less than 50° and the widest bulges occur where the dip is close to 30°. As the dip increases the lenses pinch and as the dip exceeds 60° the veins commonly die out completely. As the change in dip also involves a change in strike the lenses, as they appear underground and on the surface, are more or less curved. Because of their relatively low dip, some of the veins have a notably winding course in crossing ridges and valleys (Fig 2).

Mineralogy

In most of the gold-quartz veins the sulfides comprise less than 2 percent of the filling and consist chiefly of pyrite or of pyrite and lesser amounts of chalcopyrite, sphalerite, and galena. Some molybdenite has been found in veins in one part of the district, and tetrahedrite, in veins in another. Several veins also contain minor quantities of siderite.

The sulfides are generally confined to scattered grains and crystals which are distributed irregularly and sporadically through the quartz filling. In most veins pyrite is the only sulfide readily distinguished; small grains of chalcopyrite appear infrequently, sphalerite and galena are more widely and abundantly distributed, particularly in the eastern part of the district. In the two veins in which it has been found, the molybdenite forms widely scattered grains and veinlets in quartz, here and there accompanied by chalcopyrite. Tetrahedrite occurs sparsely as small grains with galena in some of the narrow veins in the eastern part of the district.

In only a few places have the sulfides been found in appreciable quantity, mostly as irregular bunches and small masses composed largely of galena and lesser chalcopyrite and sphalerite. Core of this kind occurs at the Black Cinder, in part as impregnations of the country rock. In some of the veins in the eastern part of the district the galena forms fairly closely spaced grains of relatively large size. Lenses and pods composed of massive galena with subordinate sphalerite and measuring some feet in length have been found as impregnations of a lamprophyric dike at the Camas No. 2 mine. This ore is different and does not appear to be a part of that which comprises the gold-quartz veins.

The quartz, which ordinarily forms about 96 percent of the vein filling, is for the most part exceptionally coarse grained. A part of the quartz is coarsely granular, the remainder forms coarsely crystalline combs. The coarsely granular quartz was deposited first and in most of the veins makes up the bulk of the filling. The comb quartz fills or partly fills openings in the granular quartz and was added after the granular
PLATE 2A

Treasure Trove Vein

Close view of a part of the outcrop of the Treasure Trove vein where it rises boldly above the surface. The quartz is more or less discolored by iron oxides from the weathering of scant sulfide. Note the vein’s moderately low angle of dip.
Tip Top Vein

Outcrop of the Tip Top vein on the crest of the knoll above the east shaft of the Tip Top mine. Two 16-inch veins of coarse comb quartz (white) are visible along and just below the hanging wall of the main body of quartz. The mass below is composed mostly of somewhat iron-stained early-stage quartz.
filling had been fractured and locally brecciated by renewed faulting. In places the crystals of comb quartz measure up to 8 inches long and make veins up to 16 inches wide that lie in and along the earlier filling.

Most of the scattered sulfides are associated with the earlier quartz; the gold was introduced with the comb quartz. The curiferous parts of the veins, therefore, are those parts which contain the younger quartz. Some of the gold, however, apparently penetrated into the earlier filling and has in part been precipitated by the sulfides. In some of the veins, sulfides, particularly galena, also appear to have been introduced and deposited with the comb quartz.

The siderite has been found in only a few places. Minor quantities of it are associated with the gelenc and sphalerite in the pile of ore near the Black Cinder shaft. Its most notable occurrence, however, is at the Tip Top mine where it is reported as relatively abundant in the deeper workings. The siderite there forms a filling between quartz crystals in the comb end of fractures in the quartz. The siderite in turn is cut by veinlets and impregnated by grains of pyrite.

**Ore Shoots**

The gold is not distributed uniformly through the veins but is mostly confined to ore shoots of moderate size which, however, form but a small part of the filling as a whole. These ore shoots range from 200 to 400 feet long and from 3 to 8 feet wide. They appear to lie in or along the thicker parts of the quartz lenses, particularly along or close to the hanging wall. These shoots exist only because of the presence of the younger stage curiferous quartz. Thus, structural reopening after the deposition of the early quartz has played a most essential role in the formation and localization of ore shoots. In many places the reopening lifted the hanging wall from the early quartz filling permitting the younger quartz to be deposited as a vein alongside the older one; in other places the reopening took place within the earlier quartz filling or even along the footwall. The widest ore shoots in general were formed where the vein had the lowest angle of dip, for it was there that the hanging wall was separated most widely from the footwall and that the greatest amount of space was provided for the deposition of the younger gold-bearing quartz. The younger quartz may also be distributed as stringers along fractures through the early quartz.

Ore shoots may be recognized by the distribution and local abundance of the lato comb quartz, but actual limits of the ore can be determined only by systematic sampling.

**Tenor of the Ore**

According to Blake $\frac{1}{f}$ the value of the gold recovered on the plates

$\frac{1}{f}$ Blake, W. F., Wood River, Idaho, silver-lead mines; Eng. and Min. Jour., vol. 44, p. 3, 1887.
of the 20-stamp mill at the Cameo No. 2 mine in 1887 was $9 - $10 to the ton with as much gold lost in the tailings. High values were also reported at the Black Cinder and Tip Top mines and recovery was reported good as long as mining was confined to the oxidized ore.

Good ore is also indicated by recent sampling at the Cameo No. 2 mine where blocks 2-1/2 to 5 feet wide and up to 185 feet long totalling some thousands of tons, carry from 0.26 to 0.6 ounce of gold and 1 to 2 ounces of silver per ton.

Wall-rock Alteration

Alteration of the wall rock by the mineral-bearing solutions generally does not extend for more than a few inches from the veins. In the narrow altered zone the feldspars appear somewhat dull and the rock has in part assumed a somewhat greenish cast, but except for loss of biotite, the rock looks little different from the fresh quartz monzinite alongside. The feldspars, however, have been partly changed to aggregates of sericite, and the biotite, to sericite or muscovite, but the texture of the granitic rock has generally been preserved. In some places the rock has been impregnated by a little quartz and small widely scattered grains of pyrite.

Origin of the Deposits

The close association of the gold-quartz veins with lamprophyric dikes points to a relationship between mineralization and igneous activity and suggests that the veins may have been formed by hydrothermal solutions which had their source in a deep-seated magma. These solutions apparently found little resistance to their passage along the more open parts of the moderately low-angle reverse faults and under appropriate conditions of temperature and pressure gave up their dissolved silica and metals, which form the veins. The upward flow of solutions, however, was hampered by channel plugging from mineral deposition and therefore did not continue uninterrupted. The early, highly siliceous solutions filled the fissures with coarsely crystalline granular quartz and scant sulfides, apparently bringing the mineralization to a temporary halt. Renewed faulting, however, reopened the channels and again provided access to solutions which then deposited the coarse comb quartz, gold, and locally scant sulfides. In most places the mineralization ended with the deposition of comb quartz and associated minerals, but at least in two veins the same or somewhat younger solutions permitted deposition of siderite and sulfides, mostly as a filling between the quartz crystals and as a filling of fractures in the quartz. As the mineralization came to a close, renewed faulting again reopened the fissures and permitted the injection of lamprophyric magmas. Later at the Cameo No. 2 mine, mineral-bearing solutions quite unlike those that existed earlier ascended along fractures in and along one of the lamprophyric bodies and impregnated it with galena and subordinate sphalerite.

The structural and textural features of the ore suggest that mineral deposition took place at considerable depth below the surface and preceded at a leisurely rate. Near surface conditions would have meant deposition in breccia or fracture zones rather than in fissures and also would have
meant minerals of relatively fine grain induced by rapid cooling of solutions rather than minerals of coarse grain, permitted by slower cooling and lower thermal gradients, possible at greater depth. The ore contains no minerals particularly diagnostic of either high or low temperatures and the deposits, therefore, were probably formed at moderate temperature or under mesothermal conditions. Consequently, the veins should have had an appreciable vertical range when formed and the ore a range of several thousand feet prior to erosion.

As the veins are contained in fissures of probable Laramide age and are associated with lamprophyric dikes intruded at the close of the Laramide disturbance, they were probably formed in early Tertiary time. They have the same structural associations with west-northwest faults as do the early Tertiary (?) gold-quartz veins in Boise Basin 2/, Rocky Bar 3/, and Atlanta 4/ and also possess most of the mineralogical and textural features of the ores of those districts. Any differences merely reflect the fact that the deposits in the Camas district were formed at moderate depths below the surface whereas those in the other districts were formed at relatively shallow depth. Thus the deposits in the Camas district are not so extensively brecciated nor so fine grained as the others and are confined to fissures rather than to zones of extensively fractured rock.

The base-metal ore which impregnates one of the lamprophyric dikes at the Camas No. 2 mine may represent a later phase of the early Tertiary (?) mineralization or it may have been added during Miocene time when mineralization was again widespread through parts of south-central Idaho and gave rise to most of the lodes in Boise Basin 5/ and in the Lava Creek district 6/.

Outlook

The early decline in mining activity apparently came about through exhaustion of oxidized ore readily amenable to amalgamation rather than to any material decrease in the gold content of the ore. Mining in the early days appears to have been plagued by low recovery rather than by lack of ore and apparently much ore had to remain unmined, because the large milling losses did not justify the removal of the ore from the ground. Recent development work at the Camas No. 2 mine has proven the existence of some thousands of tons of ore which carry from 0.25 to 0.50 ounce of gold per ton. According to reports by those familiar with the early work in the district, large blocks of ore also remain in some of the other mines.

The veins do not contain ore throughout but the ore shoots are of moderate size, and unless erosion has carved more deeply and has taken

off more of the top of the veins then seems likely, the ore shoots should continue downward to depths greater than any yet searched in mining. The veins cannot be condemned because they are contained in the batholith, for the source of the veins is not in the megasc of the batholith but in megasc of younger cgo which consolidated at some unknown depth below the present surface. The district holds some promise and is worthy of more attention than it has received in recent years.

MINE AND PROSPECTS

Camas No. 2

Location and History

The Camas No. 2, the largest and most productive mine in the district, is about one mile from the Hailey-Fairfield road in Secs. 18 and 19, T.1N., R.17E. (Fig. 3) at an altitude of 6,100 to 6,200 feet (Fig. 2). It is about 12 miles from Hailey and lies just above the old townsite of Doniphan.

The mine was discovered and the discovery recorded on September 11, 1868, but apparently no work was carried on prior to 1879 and very little until about 1886. The mine was then active until 1896 when operations ceased and were not resumed until 1924. Work was then started on the Daisy tunnel. About 17,000 tons of ore were blocked out on the Treasure Trove vein above the tunnel level and a mill was installed, but apparently little if any stoping was done. Operations were suspended in 1928, but the mine was unwatered in 1932 and some development work was carried on until 1934. A flotation plant was then added and an attempt was made to oxidize the tailings. The venture apparently was not altogether successful. The mine was idle until 1940 when the shaft was again unwatered. In 1942 the operation of the mine was taken over by the Camas Trust Co. Since then the mine has been kept open, exploratory work has been pushed, and some ore has been shipped. When the gold belt was swept by fire, the surface plant was destroyed; but the mill has since been replaced.

The mine is reported to have produced ore valued at about $1,250,000. According to Lindgren, the mine yielded $41,046 in gold and $1,836 in silver in 1886, and $42,524 in gold and $270 in silver in 1888. The bulk of the production apparently came later. In 1902 an official report credited royalties of $96,000 in oxidized mill tailings. Production in 1940, presumably from tailings, is reported at $76,000. During 1942 and 1943 the Camas Trust Co. shipped 8,200 tons of ore direct to the smelter.

Development

The accessible workings at the mine are shown in figure 4 and include an inclined shaft on the Camas vein with drifts along the vein on four levels and along the Treasure Trove vein on the 200 and 400 levels. Some

Footnotes:
1/ Plughoff, Frank, Oral communication.
of the old workings including the Daisy tunnel have not been reopened; consequently the total development is greater than that shown. There are also open cuts and shallow tunnels along the outcrop of both the Camas and Treasure Trove veins.

Geologic features

Both the Camas and Treasure Trove veins have conspicuous outcrops and may be readily traced on the surface. A third vein is exposed underground on the 400 level a short distance southwest of the Treasure Trove, but the ore in it is of low grade and has received little attention. Much of the development has been confined to and most of the production has come from the Camas vein, the most northerly of the three.

The Camas vein may be traced on and below the surface for about 900 feet and may possibly join the Black Cinder, giving an additional length of about 1,000 feet, but apparently it pinches not far northwest of the shaft and cannot be traced on the surface across the gulch (Fig. 2). The Treasure Trove vein appears to be much longer than the Camas and may be traced along the outcrop for 3,000 feet (Fig. 2), forming three lenticular bodies that project boldly above the surface (Pl. 2.A). The veins trend in a west-northwesterly direction, the Camas averaging about N50°W, the Treasure Trove ranging from N50°W to N70°W. Each dips 35°NE to 65°NE.

The Camas vein is cut by several lamprophyric dikes exposed in the underground workings (Fig. 4). The main dike is relatively short and very irregular. Its pitch of 45°SE. causes it to pass from the northwest side of the shaft in the upper levels of the mine to the southeast side in the lower levels. The granitic rock is much broken along and close to the dikes and much of the ground is heavy and needs support. Faults also are relatively numerous, but as shown in Figure 4, few are of much consequence. The most prominent faults closely parallel the Camas vein but in part lie along and across the vein. These faults apparently dip more steeply than the vein and points where they cut the vein appear to determine the limit of the stoping ground. The Treasure Trove vein is also cut by an irregular lamprophyric dike, exposed in the far northwest end of the drift on the 400 level (Fig. 4), and is also split by a few east-northeast slits with nearly horizontal grooves, but these produce offsets of only a few inches.

The Camas and Treasure Trove veins have a lenticular habit, the Camas vein being composed of a single lona, three main lenses (Fig. 2). These lenses measure up to 15 feet thick. The veins are composed of both early granular and late comb quartzes and in places contain some sulfides, mostly pyrite, and lesser galena and chalcopyrite. The ore is restricted to those parts of the veins containing the younger quartzes.

Distribution of the Ore

An attempt is made in Figure 4 to show the distribution of the ore along the Camas vein, and where it is possible to do so, also along the Treasure Trove. The ore bodies range from about 2–1/2 feet to 5 feet thick and apparently show no particular localization within the veins, being found near the footwall as well as along the hanging wall. The
distribution of the main ore shoots (stopes) is shown in figure 5. Because of the current price of gold, the ore now extends beyond the limits of the old stope.

Sampling has shown that there are about 106 feet of ore on the two sides of the Camas shaft on the 200 level, the ore body averaging about 4 feet thick and containing about 0.35 ounce of gold and 1.39 ounces of silver per ton. This ore may in part extend nearly to the surface. There is also a segment about 45 feet long at the southeast end of the old stope, which averages about 5 feet thick and carries about 0.35 ounce of gold per ton, and another segment about 70 feet long at the northwest end of the 200 level, which averages 4-1/2 feet and carries about 0.3 ounce of gold per ton. A part of the ore in the latter block has been stoped. The ore may extend well toward the surface. Sampling has also shown a block of ore 106 feet long extending above the 300 level, only partly stoped to the 200 level, which averages about 5 feet thick and carries up to 0.46 ounce of gold per ton. Additional ore may continue beneath the old stope on the Camas vein on the 400 level; a triangular segment about 110 feet long on this level contains 0.60 ounce of gold and 2 ounces of silver per ton over an average thickness of 3 feet. Other small bodies of ore are also known west of the Camas shaft on the 400 level.

The Treasure Trove vein has also been sampled. No ore body has been found at the southeast end of the old stope. It is about 40 feet long and 2 feet wide and is estimated to contain about 600 tons of ore that assays 0.25 ounce in gold per ton. The toner of the ore in the new drift on the 200 level was not learned, but sampling along the drift on the 400 level southwest of the Camas shaft has shown one segment of ore 60 feet long and 2-1/2 feet wide with 0.23 ounce of gold and 0.8 ounce of silver per ton and another segment 70 feet long and 2 feet wide with 0.48 ounce of gold and 1.91 ounces of silver per ton. Northwist of the crosscut from the Camas shaft is a 185-foot segment about 4-1/2 feet wide that contains 0.3 ounce of gold and 1.09 ounces of silver per ton. About 2,583 tons of ore averaging 0.248 ounce of gold per ton have been shipped from this segment. Ore is also revealed in some of the cuts on the outcrop of the Treasure Trove vein on the ridge west of the main workings.

Except for a 120-foot winze with two short drifts sunk from the 400 level on the Camas vein, no work has been done to demonstrate the persistence of the ore below the 400 level. The winze was sunk through the lempophytic dike and the results were not particularly encouraging. However, more extensive development is needed on both the Camas and Treasure Trove veins. The main production in the future may be expected to come from the Treasure Trove vein.

The lead ore that has been found in the mine is confined to a lempophytic dike exposed between the 300 and 200 levels in the workings on the Camas vein. The ore tends to form a body 15 to 18 feet long made up of smaller lenses or bunches of galena 3 to 4 feet long. The deposit has doubtful commercial value.

\footnote{Data on sampling and size of ore segments were provided by Mr. Pluhoff.}
Black Cinder

The Black Cinder mine is in Sec. 19, T4N, R3E, a few hundred yards southeast of the Camas No. 2 (Figs. 2 and 3). The mine has been opened by inclined shaft sunk at an angle of 60° on the outcrop and has been developed by drifts and raises on 6 levels. The largest amount of work was done on the lowest level where the drift was extended 500 feet northwest of the shaft almost to the Camas No. 2 workings. Water from the adjoining mine then drained into the workings and put an end to further development.

Small bunches of oxidized ore close to the surface were mined but the ore on the lower levels would not yield to amalgamation and consequently, most of the ore in the mine is reported to remain in place. Apparently little work has been done since the mine was flooded in 1900, but some of the ore that was piled on the dump has subsequently been milled at the Camas.

Two parallel veins 40 feet apart are reported but only the one exposed by the shaft is visible at the surface. This vein strikes west-northwest and apparently dips about 60° N.E. Ore is reported in both veins but the size of the ore shoots, which extend in both directions from the shaft, was not learned.

The outcrop shows about 5 feet of rusty quartz. Below, both veins are reported to carry considerable argentiferous galena, sphalerite, and chalcopyrite, accompanied apparently by a little manganese siderite. A minor amount of this ore still remains in two small piles at the side of the dump. The ore is auriferous and that near the dump is reported to assay 0.40 ounce of gold per ton.

Tip Top

Location and History

The Tip Top mine is about 3/4 mile northeast of the Camas No. 2 in Sec. 17, T4N, R3E, (Fig. 3) and extends across the summit of a broad knoll at an altitude just above 6,300 feet (Fig. 2).

The mine was located in 1887 and shortly after became one of the most important in the district, ranking next to the Camas. At first the ore was treated in a 10-stamp mill at the mine with water pumped from a point several miles away; later the mill was moved to the water on the valley flat 2 miles to the east. The mine was active from the time it was located until 1904. No information was obtained on production.

Development

The mine has been developed by two inclined shafts 600 feet apart and by several thousand feet of drifts, raises, and crosscuts. The one shaft sunk on the west side of the ridge, reaches a depth of 500 feet and is connected with the shaft on the east side by drifts on the 200 to the 600
levels. The east shaft has been sunk 1000 feet and a mine extends from the 1,000 level to the 1,100s. A drift also extends from the east shaft to the west on the 800 level. Stoping was carried on wherever the ore was free milling, but a large block of ore, which would not yield to amalgamation, is reported to remain. A crosscut and drift has been driven into the ridge at a point a short distance below the east shaft; another crosscut has been driven on the west side of the ridge. The one on the east side is at about the 200 level of the west shaft. The workings are not now accessible.

Geologic Features

The Tip Top vein has one of the most conspicuous outliers in the district. On the east side of the knoll it projects about 15 feet above the surface (Pl. 2, B) and makes a landmark that can be seen from points several miles away. The vein strikes about N 70° W, and dips 40° = 50° NE. It may be traced for about 1,800 feet on the surface, attaining its greatest size and productivity across the knoll between the two shafts. It reaches a maximum thickness of 15 feet in the outlier, but in the workings below it is reported locally to measure 40 feet thick with well defined walls enclosing quartz, gouge, and altered granitic rock. The productive part of the vein, however, is reported to be 5 to 8 feet thick. The length of the ore shoot and its pitch were not learned. A lamprophyric dike appears here and there against the vein on the surface and is reported along the vein throughout the mine.

The outlier contains up to 15 feet of somewhat iron-stained quartz with a few, small, widely scattered vugs formerly occupied by sulfides. A part of the quartz forms coarsely crystalline masses containing sporadically distributed sulfides (oxidized); the remainder is the coarsely crystalline comb variety with crystals as much as 8 inches long. The comb quartz fills fractures that cut the massive granular quartz, forming veins and veinlets. Some of the veins of comb quartz are as much as 16 inches thick. These lie mostly along the upper part of the vein, in or against the hanging wall. One part of the outlier (Pl. 2, B) shows three of these veins, one upon another, apparently made by successive deposition as upward movement associated with faulting (concurrent with mineralization) lifted the hanging wall from the vein and provided open fissures which were then filled by crystal growth from walls. The structural movements along the vein apparently had little effect on the footwall and the part of the vein just above, the few fractures that were formed were filled with thin seams of the younger quartz. Slickenlines along some of the fractures in the quartz show that the movement was upward on the side of the hanging wall.

The zone of oxidation is reported to extend downward for 75 feet. The ore is then reported to carry in addition to the gold minor amounts of pyrite, pyrrhotite,chalcopyrite, and sphalerite, and a very little galena. On the 800 level siderite is reported in the ore in considerable quantity and in even greater quantity on the 1,000 level. Some of the sideritic ore is reported to carry 0.5 ounce of gold per ton.

The Tip Top vein has been prospected in cuts both east and west of the shafts. In cuts across the gulch west of the shafts the vein is 3 to 4 feet wide and is composed of fractured, somewhat iron-stained early quartz. A shaft on the projected strike of the vein on the crest of the ridge east of the shafts shows only fractured granitic rock.
Several mineralized fracture zones near the Tip Top vein have yielded no ore. One is on the slope a short distance southwest of the west shaft, but the tunnel is caved and the vein, which apparently has about 12 inches of quartz, was not seen. Quartz piled on the bank has patches of malachite as surface coatings and has fractures filled with chalcopyrite. Another vein on a ridge about 800 feet southwest of the west Tip Top shaft has been explored by a 16-foot inclined shaft. The vein may be traced for about 60 feet, measures up to 6 feet wide, strikes N.85°W, and dips 65°NE. It is composed of quartz stained by brownish and reddish oxides of iron.

Golden Star

The Golden Star mine is about 1 mile due south of the Tip Top in Sec. 20, T.11N., R.17E. (Fig. 3). It is one of the larger mines, ranking next to the Tip Top, and has been developed by an 800-foot inclined shaft with about 200 feet of lateral workings on each of the levels. The shaft is sunk along the footwall of the vein and levels below are connected with the shaft by short crosscuts. The mine was formerly equipped with a 20-stamp mill but all surface installations have been destroyed by fire. The mine closed in 1907, when the mill was burned. Data on mine production were not available.

The vein, the most southerly one in the district, strikes about N.85°W, and dips 45°NE. Its dip decreases somewhat with depth and the shaft, started in the outcrop, passes into the footwall. The vein may be traced for several hundred feet on each side of the shaft. It then pinches and is concealed by surface debris, but expands again and forms a prominent outcrop about 1,000 feet northwest of the shaft. A short distance beyond this point the vein passes beneath basement. It also disappears beneath basement about 300 yards southeast of the shaft.

The vein is about 5 feet thick at the top of the shaft but becomes thicker below as the dip flattens. According to reports, it has two ore shoots, one on either side of the shaft; one measures 120 feet long, the other 100 feet. The ore bodies are reported to average about 4 feet wide, bordered on each side by bands of gouge. Ore was stopped above the 600 level, but sulfides are reported to have prevented successful amalgamation below.

Much of the quartz exposed in the outcrop and on the dump is the coarse granular variety cut by seams of coarsely crystalline comb quartz. Some chalcopyrite and pyrite are reported in the ore shoots, but the outcrop suggests that sulfides are present in very small quantity. Ore that was mined is reported to have averaged above 0.5 ounce of gold to the ton.

Hattie (Treasure Vault)

The old Hattie mine, renamed the Treasure Vault, is about a mile north of the Tip Top in Secs. 7 and 8, T.11N., R.17E., at an altitude of 5,800 to 5,900 feet (Fig. 2). It is reached from the Hailey–Fairfield road half a mile to the north.

The mine was one of those worked in the early days but it is also
one of those that has been active in more recent years, particularly since
the late twenties. In the early days the ore was milled at a plant on the
creek about half a mile below the mine but in late years the ore has been
treated at a mill near the mouth of the main shaft.

The development comprises a 180-foot inclined shaft with drifts about
100 feet long on each side, also a number of tunnels, particularly in gulches
adjacent to the one that contains the shaft. When the property was visited,
all tunnels were caved and water was draining from the top of the shaft.

The Hattie vein is one of the most persistent in the district and
has been mapped on the surface (Fig. 2) for 4,000 feet. Its full length
is not known. It is also reported to extend the length of three claims
on the Rustler property, which lies just to the east, and may even continue
into Oriental ground, fully a mile away. The vein may not be traced con-
tinuously for this distance, but forms a series of lenses or thick bulges
aloined along the Hattie "fissure" or fault. This fault trends nearly
east-west. It has a low angle of dip (about 30°NE), consequently, the
fault and the contained vein bend notably to the north in crossing gulches
and swing back to the south across the ridges.

The inclined shaft apparently has been sunk just below a local swelling
of the vein. At this point the vein is about 6 feet thick, and dips about
28°NE. The ore body is reported to be about 200 feet long with drifts
along it for 100 feet on each side of the shaft. The ore body is reported
to be stopped above the 180-foot level. The vein at the mouth of the shaft
is composed mostly, if not entirely of comb and druzy quartz with small and
widely scattered crystals of pyrite.

The vein also reappears in the gulch west of the shaft and has been
prospected by tunnels, now caved. At one place the vein stands about
6 feet above the ground and blankets the surface to the bottom of the gulch
about 60 feet below.

Another lenticular body is also exposed on the west side of the gulch
that lies east of the shaft. The body dips 30°NE, and is 7 feet thick
where it is exposed at the portal of a caved tunnel. In the bold cutover
just above, it is more than 10 feet thick. The body is composed of both
the early coarse-grained granular quartz and the later coarsely crystalline
comb quartz. In places the younger quartz forms 12 inch veins cutting the
earlier filling. The quartz contains some leached vugs and is coated or
stained here and there with films of malachite and limonite. Old workings
also lie in the gulch bottom and on the slope on the other side. On the east
side is a dump on which is a small pile of ore composed largely of white
granular quartz impregnated and locally veined by coarse pyrite and scant
galena. This ore is also cut by a few scattered stringers of comb quartz in
which are small grains of pyrite. On the crest of the ridge between this
gulch and the one containing the shaft is a heavy goasan which has not
received much attention.

On the upper slope and crest of the high ridge southwest of the
Hattie shaft is a huge chimney-like mass of quartz which has no discernible
trend but apparently dips 30°N. This body may have been localized by the
intersection of a north-south fracture with one of westerly trend. About
12 feet of quartz are exposed in a cut on the cutover. Most of the quartz
is the granular variety, which contains a few vugs and in places a small amount of sulfides.

Two other mineralized fracture zones have been prospected by cuts and short tunnels in the gulch above the mine camp about 1,200 feet north of the Hattie vein. The zones of fractured rock are about 2 feet wide, trend N 80° W, dip 85° NE, and contain stringers of quartz up to 2 inches wide. In one cut the stringers swell into a small lens 8 inches thick. Several tons of quartz have been piled on the dump.

**Rustler**

The Rustler extends across 3 claim lengths east of the Hattie end-line in Sec. 9, T11N., R17E. A shaft more than 100 feet deep from which 2 carloads of lead ore were shipped is reported at the Hattie boundary, but most of the work has been done in two tunnels some distance to the east, one on each side of a gulch. These tunnels are now inaccessible. One is reported to be 600 feet long. Considerable ore was treated in an arrastras and later some ore was hauled to the Hattie mill. The production was not learned.

The Rustler vein is said to be a continuation of the Hattie and extends east-southeast across the property. It is 6 to 8 feet wide at the portal of the main tunnel and is reported to average 8 feet wide to the face 600 feet within.

The ore exposed at the portal is partly oxidized and contains much reddish lead oxides and casts of galena in coarsely crystalline quartz of both granular and comb habit, resembling the quartz at the Tip Top mine.

**Winner (Jennie May)**

The Winner (Jennie May) lies between the Rustler and the Oriental in Sec. 9, T11N., R17E at an elevation of about 5,500 feet (Fig. 2). It is reached from Rock Creek. The mine is one that has been located many times, in July 1939 as the Jennie May, in February 1942 as the Winner. Much of the work, except on the west side of Cheney Gulch, is old. Five veins on the east side of the gulch have been explored by shafts, cuts, and tunnels, all saved but one. The more recent work on the west side of the gulch has been confined to a single vein, which has been explored by a 200-foot tunnel, driven a short distance below a prominent quartz cropping.

The veins are parallel or nearly so and trend in a west-northwest direction, but only one on the west side of the gulch appears to be of much consequence. This vein measures about 5 feet across in the outcrop, strikes N 80° W, and dips 50° NE. In the workings below the vein is about 10 inches thick and dips 40° NE. There it is cut by a prominent fault containing drag ore which strikes N 60° W, and dips 30° NE. The vein may be traced along the outcrop for about 80 feet. It is exposed again in a cut about 100 feet to the northwest. The vein is composed largely of the coarsely crystalline second-stage quartz, about 40 feet of the
outcrop are heavily stained by reddish oxides of iron and lead. The ore also has scattered grains of coarse cubic galena and a little pyrite, mostly in the openings between the quartz combs and locally in the altered country rock.

The fracture zones across the gulch appear to be more lightly mineralized. The most southerly one has a half inch stringer of comb quartz with a little galena and chalcopyrite. Its neighbor on the north is apparently more highly mineralized and each of the dumps shows considerable quartz, except in an open 200-foot tunnel at the bottom of the gulch. The third vein is exposed in a shallow shaft at the top of the ridge. Much quartz is scattered over the dump, but none was seen at or near the portal of a caved tunnel about half way down the slope. The trace of the fourth vein is indicated by several caved tunnels; quartz, in part stained by malachite, is found on the dumps. Workings on the fifth vein have uncovered stringers of comb and drusy quartz from 1 to 5 inches thick.

Oriental

The Oriental mine is at the east end of the district near the center of Sec. 9, T.11N., R.17E., at an altitude of about 4,500 feet (Fig. 2), and may be reached by road from Rock Creek. The old workings are caved, but some of the mineralized ground is visible in trenches and cuts. The mine is known for its silver rather than for its gold, but information on production was not obtainable.

The property has two west-northwesterly trending zones of mineralization from 800 to 1,000 feet apart. Much of the work has been confined to the northerly one—a prominent zone of shearing 200 foot wide and about 2,000 feet long, which strikes N.65°W. In the sheared zone are small veins or mineralized fractures containing thin seams and buncches of ore. One vein exposed in the sides of a newly sunkon 15-foot shaft on the lower valley slope, strikes N.60°W., and dips 30°-50°NE. It contains 1 to 6 inches of comb quartz, the thickness depending on the angle of dip, decreasing as the dip increases. Associated with the quartz is a little galena, sphalerite, and tetrodrite, locally some pyrite. There are some patches of malachite and azurite. The ore apparently is scattered in small but high-grade veins and pockets, which are enriched in secondary silver. All work has been confined to the oxidized zone.

The lower or southerly mineralized zone strikes about N.60°W. All workings are caved but the quartz on some of the dumps indicates the presence of a vein as much as 10 inches thick. Except at one place, the quartz is the coarse comb variety with little if any sulfides. A little chalcopyrite in addition to the comb quartz has been found on one of the dumps.

Burning Moscow - Fleming

The Burning Moscow is on the west side of Camp Creek about 1,200 feet west of the Hailey-Fairfield road in Sec. 13, T.11N., R.16E., just across the creek from the Fleming (Fig. 3). Whether the two properties are on the same or on different veins is not entirely clear. The veins
are exposed in the canyon walls beneath flows of basalt, but the exposures give little indication of the direction of strike. They are along the projection of the Omahas zone and presumably have a west-northwest trend. Both have been opened by tunnels, now caved. Some ore from the Burning Mosquito was treated at the Fleming assay on the east side of the creek.

The Burning Mosquito has an imposing outcrop, apparently 30 feet wide, and stands out conspicuously in the canyon wall beneath the capping basalt. The structural relations are confusing. The ledge appears to trend N 30°W, but should it be aligned with the one across the creek, the trend should be N 50°W. The dip appears to be 30°NE, but may increase to 50°. Most of it is composed of early coarse-grained, somewhat iron-stained quartz, but there is some coarse comb quartz on the northeast or hanging wall (?) side. The caved tunnel is about 60 feet vertically below the outcrop.

The Fleming has been explored by two tunnels, one at creek level, the other 30 feet above. From 3 to 4 feet of quartz are exposed above the portal of each of the caved tunnels. The vein appears to dip about 40°NE.

Champlain

The Champlain mine is near the head of a branch of Camp Creek about 1-1/2 miles northwest of the Bailey-Fairfield road. The mine has been worked sporadically since its discovery in the early days. The development comprises several tunnels and a number of surface cuts, but the tunnels, two of them fairly recent, were not accessible in 1945. The knoll above the tunnels is covered with quartz float which in large part conceals the outcrop of the vein and prevents tracing of its boundaries. The mine is reported to contain some of the highest grade ore in the district, but the quantity of ore put through the mill a short distance below the mine was not learned.

As the outcrop is so effectively concealed by float, the size and structural relationships of the vein remain in doubt. The broad mantle of quartz, however, suggests that the vein is a large one or has a very low angle of dip. The size of the vein may be accentuated by chimney-like swellings. Some low, projecting, quartz ledges, which rise a foot or so above the float, suggest the possibility of two veins about 100 feet apart. It is reported, however, by those familiar with the mine that there is but one vein and that it strikes about N 60°W, and dips about 45°NE. Underground the vein is reported to range up to 14 feet wide. Filling near the surface may increase the breadth of the outcrop, which locally appears to be 30 to 40 feet across. The vein is reported to have been cut by a fault which has rotated the segment on the southeast side into a horizontal position. This part of the vein has been mined from the lowest tunnel level. Northwest of this fault the vein is said to continue downward without interruption. No work, however, has been done on it below the upper tunnel.

The ore is very much like that at the Omas No. 2 mine and contains an abundance of the coarsely crystalline comb quartz and subordinate granular quartz, which contains some pyrite, and perhaps minor amounts of
other sulfides. Some of the ore is reported to have contained 3 ounces of gold per ton, but that which was milled is reported to have contained little more than 0.5 ounce per ton.

Happy Day

The Happy Day mine is along the main fork of Camp Creek about the same distance from the Hailey-Fairfield road as the Champlain mine, which lies in the gulch to the west. The mine had some work done on it in the early days, but much of the development has come in later years with work underway on a new shaft in 1945. The production is reported to exceed $35,000.

One vein has been opened by a 60-foot tunnel; a second, by two shafts, a 125-foot crosscut joined by 80 feet of drifts, and by surface cuts. A third vein has no workings on it. Both tunnels are caved and neither of the two shafts is accessible.

The three veins are approximately parallel and are within 300 feet of each other. They trend in a general west-northwesterly direction and dip steeply northwest. The more northerly one, on which the 60-foot tunnel was driven, is 6 to 10 feet wide and is reported to extend the length of two claims. The middle vein has the most work. It strikes N45°W, dips steeply northeast but at depth may change its dip to steeply southwest. This vein may be traced for some hundreds of feet on the surface. It is about 8 feet wide and lies along a fracture zone in which the walls are about 20 feet apart.

The more northerly vein contains minor amounts of chalcopyrite and a little molybdenite in the over-abundant coarse-grained quartz. The middle vein contains some galena and pyrite and is also reported to carry a little molybdenite. Some rich gold ore has been mined along the outcrop.

Jumbo

The old Jumbo mine is in the upper Camp Creek drainage less than 2 miles northwest of the Hailey-Fairfield road. It was worked in the early days, also in 1939 and 1940. Much subsurface work has been carried on, but because of the abundant gouge and swelling ground, tunnels and drifts were not readily maintained and the workings now are inaccessible. Both gold and lead have been mined but the production apparently has not been large.

Like the other veins in the district, the Jumbo has a general east-west trend and a low northerly dip. The vein, which is reported to be 3 to 4 feet wide, may be traced for some distance on the surface, in part by quartz float scattered over the hill slope. The ore is chiefly auriferous but has enough galena to induce attempts at its recovery.
Red Rock

The Red Rock mine is about 1-1/2 miles northwest of the Healy-Fairfield road in the upper drainage of Camp Creek, apparently along the southern margin of the gold belt. The development comprises some shallow tunnels and a 60-foot shaft. There has been little, if any, production.

The Red Rock vein is well exposed on the surface, having a bold outcrop. The vein trends \( N_70^\circ \sim W_8 \), and dips about \( 40^\circ NE_8 \), its thickness ranging from 8 to 12 feet. No data were obtained on the grade of ore.
Fig. 2. Topographic and geological map of part of the Hailey Gold Belt.