UNITED STATES
DEPARTMENT OF THE INTERIOR
HAROLD L. ICKES, Secretary
GEOLOGICAL SURVEY
WALTER C. MENDENHALL, Director

—o—

CIRCULAR 2 (pp 15 - 24 only)

—o—

COPPER DEPOSITS IN THE SQUAW CREEK AND SILVER PEAK DISTRICTS AND AT THE ALMEDA MINE, SOUTHWESTERN OREGON WITH NOTES ON THE PENNELL & FARMER AND BANFIELD PROSPECTS

BY

PHILIP J. SHENON

WASHINGTON

1933

Location and access

The copper deposits of the Silver Peak district lie in the southern part of Douglas County, Oreg., in secs. 23 and 26, T. 31 S., R. 6 W. By air line the mines are about 7 miles directly south of Riddle, a shipping point on the Southern Pacific Railroad, but by road the distance is about 9 miles. The road is steep and narrow but except during stormy periods is readily passable.

Topography

The surface of the Silver Peak district is made up chiefly of the steeply sloping sides of many valleys and intervening narrow ridges with fairly flat tops. Altitudes range from 4,000 feet on Silver Peak to less than 2,000 feet in some of the valleys slightly more than a mile distant. Silver Peak is the highest point in the immediate region, and from it a splendid view can be had of the surrounding country. The valley slopes are generally covered with dense growths of timber and underbrush, and hence most of the trails and roads tend to follow the wider valleys or ridge tops.

The three principal streams that rise on the slopes of Silver Peak--the West Fork of Canyon Creek, Middle Creek, and Russell Creek--flow respectively eastward, westward, and northward. This radial drainage pattern is of small extent, however, because all three streams join the Umpqua River. The streams have dissected the region to a stage in which the canyon areas prevail over the rather narrow divides, and the topography of the region can therefore be described as mature.

General Geology

The rocks in the vicinity of Silver Peak belong principally to the Dothan formation, described by Diller, 12/ and to a group of highly altered igneous rocks of several types which are termed greenstones because of their prevailing green color. The contact between the Dothan rocks and the greenstones is irregular but in general strikes northeast and, in the vicinity of Silver Peak, dips at steep angles to the southeast. No quartz diorite or related intrusive rocks are known to crop out in the immediate region.

Dothan Formation

The Dothan formation, of Jurassic age, in the Riddle quadrangle consists predominantly of sandstone but includes also shale, conglomerate, and chert. The strata are usually thin-bedded, yet in places beds about 100 feet thick are found. Some of the rocks have a schistose structure and many of them contain veinlets of quartz parallel to the schistosity. The sandstone is gray and weathers to a yellowish brown and where not strongly metamorphosed breaks with a somewhat rough surface. The shale is usually gray to dark gray and is distinctly slaty. The conglomerate, which occurs in thin beds, contains pebbles that are predominantly siliceous. The chert forms small lentils.

12/ Diller, J.S., U.S. Geol. Survey Geol. Atlas, Riddle folio (no. 218), p. 3, 1924.

Near the Silver Peak mines the Dothan formation is composed principally of k-gray to almost black thin-bedded schist and highly altered fine-grained illite. Many of the Dothan rocks are so completely altered that it is difficult to differentiate them in the field from the altered greenstones. Near the bodies the schist is bleached to light gray or almost white and, because of abundance of sericite, has a talcose appearance. In addition, the ore-bearing ist commonly contains considerable quartz, barite, and disseminated sulphides. ike faults are numerous, some of which agree with the dip of the formation and e do not. The schist lies between dark-gray rocks that are shown by the microscope to be very fine grained, highly altered argillites composed largely of ll rounded quartz grains in a fibrous groundmass of sericite and chlorite. The rtz grains are small, on an average about 0.135 millimeter across, and many are tly recrystallized. In the argillite near the ore bodies there are numerous ins of disseminated sulphides.

Greenstones

Irregular bodies of greenstone are widely distributed in the Riddle quadrangle. ording to Diller[13] they include altered gabbro, diorite, and diabase and finer-ined altered basaltic rocks, all of which show evidence of crushing and veining.

The greenstones in the immediate vicinity of the Silver Peak mines are prelingly fine-grained, although some are porphyritic. All contain abundant epi-e, fine-grained quartz, chlorite, zoisite, saussurite, and other alteration ducts. Some retain a suggestion of igneous texture, but others are entirely nged to rocks composed essentially of epidote and quartz. Ore was not observed greenstone in the Silver Peak district, although elsewhere in southwestern gon ore is generally associated with that rock.

Ore deposits

Geographic distribution

Three mines have been worked in the vicinity of Silver Peak. Two of these, onging to the Silver Peak Copper Co. and the Umpqua Consolidated Mining Co., lie th of Silver Peak. They include portions of the same ore body and for convenience are described together. The third, the Golden Gate mine, lies about half ile to the north.

Deposits south of Silver Peak

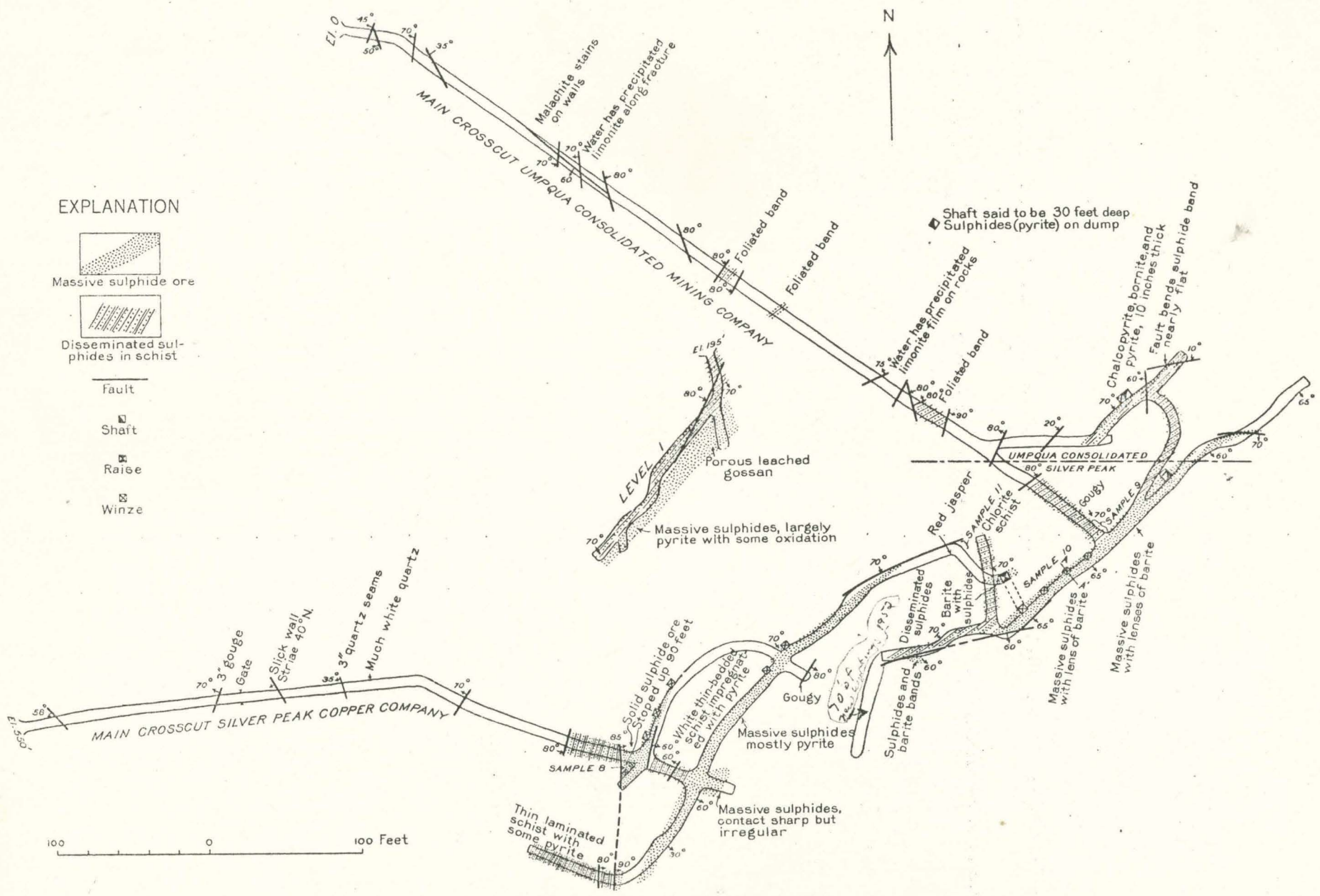
History and development

The mines of the Silver Peak Copper Co. and the Umpqua Consolidated Mining Co. on a steep slope south and slightly west of Silver Peak, at a mean altitude of ut 3,300 feet. The property of the Silver Peak Copper Co. is in sec. 26, T. 31 , R. 6 W., and that of the Umpqua Consolidated Mining Co., which adjoins it on north, is in sec. 23[14]. Ore was first discovered here in 1910 by Robert mason, on what is now Silver Peak Copper Co.'s ground. [15] In 1912 J. E. Reeves rchased a patented timber claim which included a large portion of the ore that has

/ Diller, J. S., op. cit. (Riddle folio), pp. 4-5.

/ The broken line shown on plate 4 as dividing the two properties was pointed out derground as the boundary line.

/ Historical data furnished by J. E. Reeves.



MAP OF THE UNDERGROUND WORKINGS OF THE SILVER PEAK MINING CO. AND UMPQUA CONSOLIDATED MINING CO.

since been developed. Little work was done until 1920, when the Oregon Exploration Co. located mineral claims over part of the timber claim. From 1922 to 1929 the property was in litigation, but during this period and in the following year 2,266 tons of ore was shipped from workings now owned by the Silver Peak Copper Co.[16] In 1929 the Oregon Exploration Co. was reorganized as the Umpqua Consolidated Mining Co. This company shipped one car of ore (38 tons) in 1930. Both mines were idle at the time the writer visited them in September 1930. The gross value of the ore shipped, not including zinc, is estimated at $73,000.

The ore bodies have been explored on three principal levels. The lowest, the main level of the Umpqua Consolidated Mining Co., is a cross-cut adit 600 feet long with two drifts aggregating about 600 feet. The main level of the Silver Peak Copper Co., 55 feet higher than the working mentioned and connected to it by a raise, is another crosscut adit about 480 feet long with 550 feet of drifts. The third level, known as No. 1, 195 feet above the Umpqua level, is an adit 170 feet long driven near the dividing line of the properties. There are in addition several shallow workings including a 30-foot shaft at a point 75 feet higher than level 1 and 270 feet above the main level of the Umpqua Consolidated Mining Co. Comfortable camps have been built on both properties, and at the Silver Peak Copper Co.'s mine a No. 10 Ingersoll-Rand compressor and a Fairbanks-Morse 120-horsepower engine, both new, were installed in 1930.

Ore bodies

The ore minerals occur as massive tabular bodies and disseminated in highly foliated schist. The two principal workings expose a zone of mineralized schist more than 100 feet wide. Across most of this zone sulphide minerals are rather sparsely distributed, but in at least two places bodies of nearly solid sulphide ore occur. One of these, in the main crosscut of the Silver Peak Copper Co., the "northwest band," is about 15 feet wide and another, the "southeast band," is over 30 feet wide. (See pl. 41) Both pinch out to the northeast, one within a distance of 200 feet and the other within 60 feet. Two sulphide bodies are exposed also on the main level of the Umpqua Consolidated mine, but there the northwest body is only about 10 inches wide, whereas the southeast body is about 10 feet wide. Normally the massive ore grades into schist with disseminated sulphides, but in some places, especially where the massive ore pinches, one or both walls are slickensided fault surfaces commonly lined with several inches of gouge.

The massive sulphide ore is distinctly banded, probably in part because the ore minerals have replaced schistose rocks and in part because the minerals were introduced along parallel fractures in the rock. The sulphides include pyrite, sphalerite, chalcopyrite, bornite, galena, tennantite, chalcocite, and covellite, named in the relative order of their abundance. The last four mentioned occur in relatively small amounts. In addition the occurrence of native copper is reported by Mr. Reeves. The gangue minerals are principally quartz, barite, and sericite. Epidote was seen in one thin section of the ore.

16/ Production data furnished by Victor C. Heikes, of the U. S. Bureau of Mines.

At the surface oxidation is almost complete. Level 1, for example, follows a porous, iron-stained, and greatly leached gossan in which no sulphides are visible. A short distance from the portal sulphides become visible and are abundant near the face. Sulphides were struck also in the 30-foot shaft on the Umpqua Consolidated property. Traces of oxidation extend as deep as the lower levels, as shown by thin films of oxide minerals along fractures.

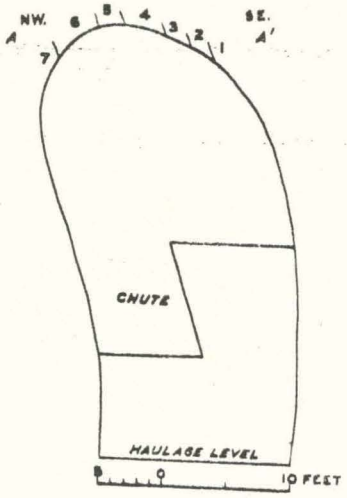


Figure 2.-Cross section through stope along line A-A, plate 4, Umpqua Consolidated level.

1. Massive sulphide band; mostly pyrite with a little visible bornite and other sulphides.
2. Massive barite with sulphide stringers.
3. Massive sulphide band; pyrite with considerable bornite and chalcopyrite and lesser amounts of other sulphides.
4. Massive sulphide band, largely pyrite.
5. Sulphide band with barite stringers.
6. Massive sulphide band, pyrite with considerable bornite; some chalcopyrite, and small amounts of other sulphides.
7. Massive sulphide with some small stringers of barite; this band itself consists of banded sulphides. Pyrite prevails in some bands, sphalerite in others. Bornite and chalcopyrite and small amounts of other sulphides occur with them.

Quartz was the first gangue mineral to be deposited. It is everywhere fine-grained but tends to be coarser in the fractures along which it was introduced. Barite was introduced next, then fracturing occurred, and pyrite was deposited. After a second fracturing sphalerite, tennantite, chalcopyrite, bornite, galena, and chalcocite were deposited as an overlapping series and probably in the order named, although the relation of galena and chalcocite was not well established. (See fig. 3.)

The mineral composition differs in the different ore bodies and within the layers of a single ore body, as shown, for example, by the northwest and southeast ore bodies in the Umpqua Consolidated mine. The sulphides of the northwest ore body are associated with abundant quartz but very little barite, whereas the southeast ore body contains much barite and smaller amounts of quartz. The southeast body in the stopes above the level consists of nearly solid sulphides with some layers of barite. The barite is lenticular in outline, and any one layer does not persist very far. The sulphides are distinctly banded. One stope shows seven distinct bands with parallel structure. (fig. 2).. The composition of the northwest ore body resembles that of layers 3 and 6 of the southeast ore body as shown in the illustration. The ore exposed on the Silver Peak Copper level more nearly resembles the ore of the southeast ore body of the Umpqua Consolidated level. However, in some places -- for example, near the top of the connecting raise -- the copper sulphides are less abundant and the proportion of barite is greater than normal. At the turn in the drift, 30 feet northwest of the raise, the rocks are largely replaced by very fine grained silica that has irregular red jasperlike streaks.

Four carefully cut samples taken at selected places serve to show the relative proportions of the metals to one another but do not necessarily illustrate the average metal content of the ore, which may be more closely determined from the production figures that follow. Analyses of the samples made in the chemical laboratory of the United States Geological Survey are given below:

Analyses of ores from the Silver Peak district, Oreg.
[E. T. Erickson, analyst]

Sample no.	Silver (ounces per ton)	Gold (ounces per ton)	Copper (percent)	Zinc (percent)
8.....	0.59	0.09	4.05	5.5
9.....	.30	.01	.90	.9
10.....	4.58	.03	5.13	7.5
11.....	.46	.01	.93	.6

8. Silver Peak Copper tunnel, northwest ore body. Sample taken in stope 33 feet above tunnel level across 5½ feet of massive sulphide ore.

9. Umpqua Consolidated tunnel, main crosscut immediately northwest of massive sulphide band. Sample taken across 9 feet of schist with disseminated sulphides.

10. Umpqua Consolidated tunnel. Sample taken across 7 feet of massive sulphide ore in stope along line A-A', plate 4.

11. Silver Peak Copper tunnel, 30 feet northwest of top of connecting raise. Sample taken across 6 feet of intensely silicified rock containing some visible sulphides.

The results show that copper and zinc increase and decrease together, but indicate no similar relations between those metals and gold and silver or between the gold and silver themselves.

The following table is based on the production figures furnished by V. C. Heikes, of the United States Bureau of Mines:

Average metal content of ore from Silver Peak and Umpqua Consolidated mines

Year	Ore produced (tons)	Gold (ounces per ton)	Silver (ounces per ton)	Copper (percent)
Silver Peak				
1926	389	0.12	7.3	6.0
1928	937	.044	2.7	6.7
1929	1666	.07	3.6	5.6
1930	264	.057	3.0	4.4
Umpqua Consolidated				
1930	38	.24	2.2	3.9

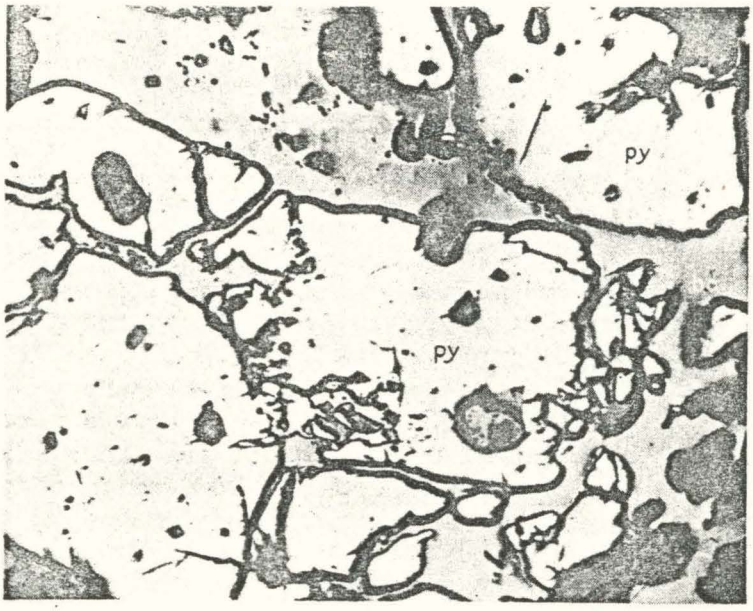
Origin of the ore

The mineralogy of the ores described above is evidence of their hypogene (deep-seated) origin -- that is, the mineral assemblage as shown by the careful observations of many geologists belongs to Lindgren's mesothermal type, deposited at moderate depths by hot solutions. The source of the solutions is not evident from the geology in the immediate vicinity of the deposit, but quartz diorite and related rocks, which are believed to be the sources of many ore deposits in southwestern Oregon, are exposed a few miles distant and are probably not far below the surface at Silver Peak.

The ore-bearing solutions, whatever their source, deposited gangue and sulphide minerals as they moved through the schistose rocks. The solutions apparently rose along planes of schistosity and replaced the adjoining material. Certain beds in the schist were apparently either more susceptible to replacement or were more readily penetrated by the solution than others, because solid sulphides occur interbedded with schist in which sulphides are sparsely distributed. The composition of the ore-bearing solutions probably changed during the period of deposition, because minerals of different composition have been deposited in an overlapping succession. Movements occurred within the rocks during the mineralization, once after the gangue minerals were deposited and again after the deposition of the pyrite. The later sulphides were deposited as a continuous series. After the deposition of the sulphides, strains within the rocks were relieved along faults, some of which have displaced the ore. More recently the sulphides near the surface have been oxidized, and much of the metal content of the outcrops has been removed by leaching. Erosion has kept pace fairly well with the oxidation, for at no place in the vicinity are oxide minerals known in abundance very far beneath the surface.

Economic aspects

The ore bodies at the Silver Peak Copper and Umpqua Consolidated mines have not been sufficiently developed to permit exact tonnage estimates, nor has the ground in the immediate vicinity been sufficiently explored to indicate the probility of undiscovered ore bodies nearby, but enough work has been done to demonstrate that fairly large bodies of good-grade massive sulphide ore are present. Also sampling shows that there is a possibility, when metal prices recover, of mining and milling lower-grade disseminated ore along with the higher-grade material.



A. Bornite (bo) replacing pyrite (py). Reflected light, Enlarged 100 diameters.

B. Sulphide ore, illustrating intimete relations of minerals. ba, Barite; sp, sphalerite; g, galena; py, pyrite; b, bornite; stippled areas, chalcopyrite. Enlarged 100 diameters.

Figure 3. – Photomicrographs of ores, Silver Peak mine.

Only a very small percentage of the sulphides found on the lower levels are supergene (descended from above), and therefore it follows that there is not much likelihood of any material change in the metal content of the ore for some little distance below the present deepest level. However, owing to the fact that the outcrop has been almost entirely oxidized and much of the metallic content removed, more or less sulphide enrichment is to be expected immediately below the zone of oxidation.

The facts available permit some conclusions as to the probable vertical and horizontal extent of the ore. Foliated schists similar to those containing the ore are exposed at the surface for some distance north and south of the known ore bodies. In places they are mineralized--for example, at the Golden Gate mine, to the north, described below. Some mineralization was also noted in a schist of similar appearance about half a mile to the southwest. Underground the ore has been followed along the strike for a total distance of over 450 feet, and in at least two places it continues beyond the present workings. Both bodies of solid sulphide ore were sheared off in the northeast drifts of the Silver Peak Copper Co.'s main level but continue into the walls to the southwest of the present workings. The southeast ore body on the Umpqua Consolidated level appears to turn into the southeast wall of the drift about 50 feet from the face. It appears also to have undergone shearing, and further work may prove that it is displaced. At the south end of the same drift the ore appears to end against an east-west, southward-dipping fault. Sulphide ore interlayered with barite is exposed on one side of this drift about 20 feet from the face, and it seems likely that the ore body may continue southwestward from this point. Thus the evidence underground does not suggest that the horizontal limits of the ore bodies have been reached. Even where the ore is sheared off by faulting there is no known reason why the segments may not be recovered. Outcrops of partly oxidized sulphide ore occur 140 and 270 feet above the ore bodies found on the two main levels. No raises have been driven through to the surface to prospect the ground between these outcrops, although at one place ore has been stoped above the Silver Peak Copper Co.'s level for a vertical distance of about 90 feet. It seems reasonable, however, to expect the ore to continue to the surface, though not necessarily as one continuous body, because of the possibility of fault displacement. It is generally recognized that there is usually a relationship between the horizontal extent of an ore body and its downward extension, and as the ore bodies under discussion are exposed on the lower levels over a horizontal distance of 450 feet without having ended, they can reasonably be expected to extend for some distance below the present workings.

Deposits north of Silver Peak

Most of the mining on the north side of Silver Peak has been done by N. A. Bradfield on the Golden Gate property. He located seven claims in 1919, and although lessees have since worked the property, he still retains the ownership. According to Mr. Bradfield[17] two cars of ore have been shipped. One car containing 36 tons gave gross smelter returns of $1,000, mostly in gold, and another car shipped by lessees is reported to have returned $1.76 a ton.

17/ Personal communication.

In all, about 600 feet of underground development work has been done. Most of the work has been concentrated on the claims near the road in the vicinity of the Bradfield cabin; the remainder on claims about half a mile to the east.

The production has come chiefly from an open cut and some shallow workings close to the Silver Butte road. The ore occurring here is a dark grayish-green chlorite schist striking N. 30°- 60° E. and dipping 50°- 70° SE. A layer in the schist contains pyrite cubes and some stringers of chalcopyrite, and according to Mr. Bradfield free gold can be panned from some of the rock. The pyrite cubes range in size from those that are barely visible to some with faces over half an inch across. The cubes cut across the schistosity of the enclosing rock, thus indicating that they were formed later.

Two tunnels have been driven on a mineralized bed in foliated schist at a point several hundred feet east of the workings just described. The two tunnels, which differ in altitude by 90 feet, have explored the mineralized bed for a total distance of about 170 feet. The schist is similar to that containing the disseminated ore at the Silver Peak Copper and Umpqua Consolidated mines and probably was mineralized under similar conditions and at the same time. In contrast, however, very little quartz or barite was noted in the deposit at the Golden Gate mine.

Almeda mine

Location and access. - The Almeda mine is on the north bank of the Rogue River in the SE¼ sec. 13, T. 34 S., R. 8 W. Willamette meridian, 26 miles below Grants Pass and 4 miles from Galice. Merlin, on the main line of the Southern Pacific Railroad 19 miles to the southwest, is the nearest accessible shipping point. A road to connect the mine with Leland, also on the Southern Pacific Railroad but only 10 miles distant, was started but never completed. High water carried away the bridge that once connected the mine with the Merlin road, and at present to reach the mine it is necessary to cross the Rogue River on an aerial tram or by boat.

History and production. - The Almeda mine has been known for many years because of the great extent of the mineralization and because some fairly large masses within the mineralized zone contain enough gold and other metals to attract notice. Consequently, a small smelter was built in 1908, but no production was reported until 1911. From 1911 to 1916, 16,619 tons of ore that yielded 1,539.87 ounces of gold, 48,387 ounces of silver, and 259,800 pounds of copper was produced. A total of 7,197 pounds of lead was also reported as produced from 5,189 tons of ore during 1913, 1915, and 1916. No lead was reported in 1911, 1912, or 1914. The gross value of the ore produced, on the basis of these figures, is, in round numbers, $108,000.

Development. - The Almeda mine is one of the most extensively developed mines in southwestern Oregon. A mineralized zone has been prospected for more than 1,000 feet along its strike and for about 900 feet vertically. Five adits have been driven, and a shaft with levels at intervals of 100 feet was sunk to a depth of about 450 feet below the Rogue River (pl. 5). The shaft is no longer accessible, but most of the workings above the river are open.