

per ton of \$53.71. Placer operators reported the production of \$606 in gold and 8 ounces of silver.

Aura district.—Some silver ore containing a little gold from the Big Four property, operated by a lessee, was the only production reported in the district.

Centennial district.—Small test lots of ore came from the Gold Dollar and Red Cloud properties in 1917.

Contact district.—All the ore produced in the district, reported by eight operators, was of shipping grade, and amounted to 253 tons, containing 1.88 ounces of gold, 746 ounces of silver, 65,665 pounds of copper, and 5,215 pounds of lead. Production was reported from the Bellevue, Valley View, Champ Clark, Bonanza, Blue Bird, and Hanks copper properties.

Delkar district.—A lessee operated the Copper Belt property and shipped to the smelters an oxidized copper ore.

Ferber district.—The Salt Lake group was operated by the Ferber Copper Co. There were two kinds of ore produced, oxidized copper ore and lead ore. The ore was hauled to Erickson on the Deep Creek branch line of the Western Pacific Railroad operated from Wendover to Gold Hill, Utah.

Ferguson district.—The Bullion group and two other properties were producers of copper and lead oxidized ores.

Gold Circle district.—Sixteen producers reported the production of 19,523 tons of ore containing \$242,198 in gold and 182,844 ounces of silver, valued in all at \$392,861, or an average value per ton of \$20.12. Only 102 tons of gold and silver ore were shipped from the district directly to smelters. The remainder of the production was milled, yielding gold and silver bullion by cyanidation. The principal producer was the Elko Prince property, which is opened by a 700-foot adit and a 450-foot shaft. The cyanide mill on the property has a capacity of 50 tons. There was also a 2-stamp amalgamation mill operated in the district which treated some ore from the Esperanza and Queen properties. The Rand & Massey, Missing Link, June Bell, Lucky Boy, and Rex properties were also producers.

An interesting paper¹ recently published describes the Elko Prince mine and mill and gives a brief history of the district as follows:

The Elko Prince mine is in the Gold Circle district, Nevada, about 14 miles (2.4 kilometers) from the town of Midas, 55 miles (88.5 kilometers) west of Battle Mountain, and 50 miles (80.5 kilometers) northeast of Golconda. The district is described by Emmons in United States Geological Survey Bulletin 408, 1910. Little was said of the Elko Prince, however, as only a small amount of work had then been completed.

The geological structure of the region is simple. The oldest exposed formation, covering most of the area, is rhyolite, which has a light-colored devitrified groundmass inclosing phenocrysts of feldspar, quartz, and magnetite. It has been somewhat weathered and partially stained with oxide of iron. There are several outcrops of andesite which cut the rhyolite. The ore deposits occur as fissure veins, replacement veins, and sheeted zones. The Elko Prince vein is of the first type. The rhyolite near the veins is silicified, stained with oxide of iron, and, at some localities, replaced by ore, or is so permeated by metals as to be classed as ore. The vein filling consists chiefly of quartz, and the values consist entirely of gold and silver. Part of the gold exists as the native metal and part is associated with pyrite. Silver occurs free and as argentite in

banded streaks through the vein. These veins trend in a northwesterly direction, with dips varying from 65° to vertical.

Gold was discovered in the district in the fall of 1907, and a characteristic rush followed. The town of Midas was laid out and shortly had 2,000 inhabitants. Several small mills were built, one of which, the Rex, ran several years. After the first excitement, the people drifted away rapidly, and at present only about 150 remain. The Elko Prince claims were located in 1907 by Paul Ehlers, a prospector, and 10 claims were patented in 1913 after considerable development work had been done. * * *

The outcrop of the Prince vein is insignificant, only a narrow seam of low-grade quartz, or an obscure fissure containing no quartz or metals. The first work on the property was a 60-foot shaft sunk on the cropping. A narrow seam of mineralized quartz was followed, but nothing of importance was found; then a 240-foot drift on the vein gave similar results. Later, a 700-foot crosscut reached the vein 270 feet below surface, and cut an ore shoot almost in the center. Subsequent work developed a vein having an average width of 14 to 15 inches, a total tonnage of 30,000, and a gross value of approximately \$1,000,000, the limits of the ore body being quite well defined.

In June, 1915, the Elko Prince Mining Co. made an agreement with the Dorr Co., whereby the latter was to design, finance, and build a cyanide mill of at least 40 tons daily capacity, furnish additional mine equipment, and operate the property until certain financial results had been attained. Milling was begun in November, 1915, and the original terms were completed in June, 1917, but the Dorr Co., operating through the Elko Prince Leasing Co., has continued in charge of the property to the present time.

The Prince vein has a uniform northwest-southeast strike and a dip varying from vertical to 85° NE. One horizontal fault of a few feet occurs in the 1,400 feet of development on the property, and a second, of much greater extent, probably occurs just beyond the south end line.

The vein filling is hard but brittle quartz, with a very small amount of sulphides. Partial oxidation extends from the surface to the deepest openings. Manganese in oxidized form is found in spots. No enrichments due to leaching and redeposition have been observed, except as to a small portion of silver. The gold is mainly free but very fine; about 50 per cent can be amalgamated. Thin flakes of native silver are found in the footwall and penetrate its seams in places to a depth of an inch. The silver exists chiefly as argentite and polybasite, giving the quartz the characteristic banded appearance that usually accompanies the presence of these minerals.

A characteristic analysis of the ore is:

| | Per cent. | | Per cent. | | Per cent. |
|--------------------------------------|-----------|---------|-----------|------------------------|-----------|
| SiO ₂ | 85.0 | S..... | 0.1 | Ignition loss..... | 2.0 |
| Al ₂ O ₃ | 2.0 | As..... | .1 | Cu..... | .0 |
| Fe..... | 3.0 | Sb..... | .1 | Au (ounce per ton).... | .7 |
| CaO..... | 4.0 | Mn..... | Trace. | Ag (ounces per ton)... | 10.0 |

A second vein, the June Bell, is parallel to the Prince, and lies a short distance to the west. It is of the same type but much smaller, and gives promise of producing but little metal. * * * The financial arrangements allowed the mill to be designed so that when the ore body already developed had been worked out and the plant scrapped, the greatest net profit would have been made. The treatment of 50 tons of sorted ore daily promised a life of about three and one-half years, with the chance of an extension by finding other ore bodies or obtaining custom ore.

Labor was scarce in the district, and, although there was no labor union, the Tonopah scale of \$4 minimum for eight hours had been paid.

Redhouse, on the Western Pacific, the nearest freight station, is 34 miles away, and hauling by wagon costs from \$13.50 to \$15 per ton. The road from Redhouse to Midas is a good desert road, with a large increase in grade in the last 5 miles. The chance of heavy snow at the upper end in winter, and the certainty of very heavy hauling in spring, made it essential to stock up by December to run until May. Hauling by team has proved more satisfactory than by motor truck. Oil storage of 22,000 gallons was provided at the mill. No electric power was available. * * *

The treatment follows the standardized lines of ball-mill crushing and fine grinding with countercurrent decantation and zinc-dust precipitation. * * *

Water is pumped from a well below the town of Midas, a distance of 11,000 feet with a lift of 700 feet. A crude-oil engine was first installed, but it re-

¹ Dorr, J. V. N., and Dougan, L. D. Elko Prince mine and mill: Am. Inst. Min. Eng. Bull. 140, pp. 1235-1254, August, 1918.