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EXHIBIT V

DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, DIRECTOR

BULLETIN 414

NOTES ON SOME MINING DISTRICTS IN HUMBOLDT COUNTY, NEVADA

BY

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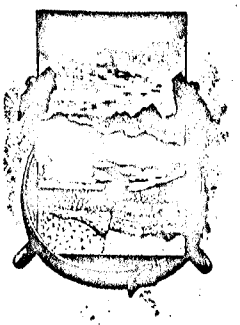

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SONOMA RANGE.

The Gold Run district, in which the most important property is the Adelaide mine, 11 miles nearly due south of Golconda, is on the east slope of the northern part of the Sonoma Range.[a] The rocks of this part of the range are generally similar to those of the Pahute and Humboldt ranges. No attempt was made in this reconnaissance to study their lithology or structure, except at the Adelaide mine, where they have been mapped as Star Peak Triassic by the geologists of the Fortieth Parallel Survey.

The district was organized in 1866. Development apparently was slow, for in 1870 the principal shaft, the Golconda, was only 80 feet deep. South of this were the Cumberland, 50 feet deep, and the Jefferson, with still shallower workings. There were some small mills in the district, and desultory attempts were made to work the partly oxidized ores up to about 1897, when the Glasgow and Western Exploration Company acquired the mines and 15 claims along the ore-bearing zone. This company built 12 miles of narrow-gage railway from Golconda to the mine and erected a smelter and concentrating mill at the junction of its road with the Southern Pacific Railroad. This plant, consisting of two roasting furnaces and three reverberatory smelting furnaces, with the ordinary arrangement of crushing and concentrating machinery, was operated for a time on ores from Battle Mountain and from Adelaide, and some matte was shipped. The process, however, proved unsuited to the Adelaide ore and was abandoned. A few years ago the mill was remodeled and 120 concentrating tubes of the Macquisten type were installed. An interesting description of this remarkable plant has been given by W. R. Ingalls,[b] and from this the reader may obtain some idea of the ingenuity, simplicity, and effectiveness of this novel process, in which the heavy sulphides are floated off while the gangue minerals sink. Some improvements in the first installation were in contemplation in 1908, and the mill was in use by Mr. Macquisten solely for experimental purpose. Its total capacity was given as 120 tons in twenty-four hours. It produced when in full operation a 20 per cent concentrate from 2.7 per cent copper ore, leaving about 0.2 per cent in the tailings. The weakest point in the process appears to be in the relatively low recovery from the slimes.

The main shaft of the Adelaide mine, 300 feet deep, is situated on the south side of Gold Run Creek, close to the site of the old settlement of Cumberland. The general country rock is dark calcareous slate, within which is a layer or series of beds of limestone from 50 to 75 feet in total thickness. This bed strikes north and dips 65° E.

[a] The Havallah Range of the Fortieth Parallel Survey reports.

[b] Concentration upside down: Eng. and Min. Jour., vol. 84, 1907, pp. 765–770.

This limestone layer carries the ore, which in some places occupies the full width from one slate wall to the other, although as a rule the zone contains horses of altered limestone that is nearly free from sulphides. The ore body is unusually large and has been extensively stoped above the 100-foot level for 400 feet without any indication of a diminution in size. Below this level, which is approximately at the bottom of the zone of partial oxidation, exploratory drifts have been run at vertical intervals of about 50 feet, revealing abundant ore. The bottom level was under water at the time of visit.

The ore is a metasomatic replacement of the limestone and consists of pyrrhotite, chalcopyrite, sphalerite, and a little galena, in a gangue of garnet, vesuvianite, diopside, calcite, orthoclase, and a very little quartz. Common pyrite is probably not altogether absent, although it does not appear in the specimens of ore collected. The presence of orthoclase is uncommon in this mineralogic association, but adularia has been noted by Spurr and Garrey [a] in the altered limestones of the Velardeña contact zone. At Adelaide the orthoclase is poikilitic and contains inclusions of vesuvianite, garnet, diopside, and quartz. The ore is definitely bounded only where it is in contact with the slates. Elsewhere it merges gradually and irregularly into limestone containing silicates but very little of the sulphide constituents. A banding of the limestone, due to alternations of silicate and calcite layers, is common, particularly near the ore, and the bands in places are contorted and crumpled. As a whole the ore is of low grade, averaging about 3 per cent of copper; but the quantity available appears to be large, and the difficulties in the way of its successful concentration and treatment will probably soon be overcome.

The present workings do not afford much evidence of secondary enrichment. The old stopes between the 100-foot level and the surface were in mixed sulphide and oxidized ore, but whether chalcocite was present in quantity is not known.

About 600 feet north of the main shaft, on the opposite side of the little creek, is a tunnel that runs north in the ore zone for 2,000 feet. For a distance of 500 to 600 feet from the portal the tunnel is in ore. Beyond this the limestone zone is generally lean or barren, although there are a few bunches of ore near the face and some stopes above the tunnel were formerly worked from a now abandoned shaft on the hilltop.

A notable feature of the Adelaide ore bodies, in view of the fact that the nearest area of eruptive rock (mapped as granite on the Fortieth Parallel Survey map) is fully a mile east of the mine, is their close correspondence to ores of typical contact-metamorphic deposits. The granitic rock was not examined in 1908. For at least a quarter of a mile east of the mine the rocks are dark clay slates alternating

[a] Ore deposits of the Velardeña district, Mexico: Econ. Geology, vol. 3, 1908, p. 708.

with thin-bedded limestones. All are much crumpled but maintain a generally east dip and are on the whole much less metamorphosed than the limestone beds in which the ore occurs. It is probable that an intrusive mass underlies the sedimentary rocks at the Adelaide mine, and that the hot mineralizing solutions rose along what is now the ore zone, in consequence of favorable fissuring in this particular belt of limestone.

West of the mine the slopes, seen from a distance, show many outcrops suggestive of rhyolitic porphyries, which accord in general with the mapping of the higher part of the range by the geologists of the Fortieth Parallel Survey as Koipato Triassic. Within these a number of prospectors are developing veins that carry some gold and silver. None of these prospects was visited.

MINERALOGY OF THE ORE DEPOSITS.

Introductory statement.—For convenience of reference the minerals noted in the ores or closely associated with them are here given in alphabetic order, with brief notes on their occurrence. The list is obviously not an exhaustive one for the region, which contains many deposits not visited.

Amphibole.—A fibrous mineral, not certainly identified, but closely resembling tremolite, occurs with epidote, vesuvianite, garnet, and sulphides in the metamorphosed calcareous rocks at Coppereid. A similar fibrous mineral was noted in some of the altered limestone at the Ryepatch mine.

Annabergite.—A bright-green, hydrous nickel arsenate, probably annabergite, is an important constituent of the ore of the Nickel mine in Cottonwood Canyon, west of Boyer post-office.

Argentite.—Sulphide of silver has been found in shallow workings in rhyolite at Rosebud, associated with kaolinite, limonite, and jarosite. Presumably it was present also in some of the rich silver ores mined in former days near the surface in the Humboldt Range. A specimen of ore seen in Unionville and said to have come from the Arizona mine apparently contains argentite.

Arsenopyrite.—The sulpharsenide of iron was noted only in material on the dump of the Auld Lang Syne mine, near Chafey, associated with pyrite and quartz.

Axinite.—Axinite, a complex borosilicate of calcium, aluminum, and other bases, occurs in the altered calcareous shales of the Coppereid contact zone.

Azurite.—The blue hydrous copper carbonate is nowhere abundant in the region examined, but is present in small quantity in the Red Butte copper district and at the Lovelock cobalt-nickel mine, in Cottonwood Canyon.