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Geology of the Tungstar and Hanging Valley Tungsten Mines

by Paul C. Bateman

This report is preliminary and has not been edited or reviewed for conformity with U. S. Geological Survey standards and nomenclature.

CONTENTS

	Manuscript page
Introduction	3
Tungstar mine	5
Hanging Valley mine	10

ILLUSTRATIONS

Plate 1. Underground geology of the Tungstar mine.

Plate 2. Hanging Valley Mine, Inyo County, California

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Introduction

The Tungstar and Hanging Valley tungsten mines are in the Sierra Nevada west of Bishop, California. They are about one mile apart, on opposite sides of a high talus-filled valley on the west side of Mt. Tom, between the Pine Creek and Horton Creek drainages. The Tungstar mine is in the SE¼ sec. 15, T. 7 S., R. 30 E., at an elevation of about 12,000 feet, and the Hanging Valley mine is in the NW¼ sec. 22, T. 7 S., R. 30 E., at an elevation of about 11,740 feet.

The mines are in the south part of the Pine Creek pendant, the locus of a number of important tungsten deposits, including the highly productive Pine Creek mine of the U. S. Vanadium Corporation. The Tungstar mine, although much smaller, ranks second in production amoung the mines in the pendant, largely because of the high grade of the ore mined. The average grade of all ore mined was about 2.00 WO_3. Production from the Hanging Valley mine has been comparatively small, but the current development work may lead to significant production. The average grade of ore mined has been in excess of 1.0 percent WO_3.

The best means of access to both mines is by jeep, driving up the Hanging Valley mine road. This road follows Horton Creek, on the south side of Mt. Tom, to Horton lake then switches spectacularly up a steep 2,000-foot high escarpment north of the lake. The Hanging Valley mine is at the road terminus; a branch road that joins the main road at the top of the escarpment leads to the Tungstar mine. Because of heavy snows, access by road is ordinarily possible only during the summer and fall months. The mines can also be reached from Pine Creek canyon by a 7-mile trail that follows Gable Creek and the Tungstar tram line.

Tungstar mine

The Tungstar deposit, discovered in 1937 by Bill Vasso and Gerard Crawford, was acquired by the Tungstar Corporation in 1938. It was brought into production in 1939 after erection of a mill and a 2.6-mile aerial tram. The mill was in Pine Creek Canyon at 7,400 foot elevation, near the junction of Gable Creek with Pine Creek. Mining operations were carried on from November 1939 to October 1946, when the mine installations and upper tram terminal burned, but with interuptions to replace first the mill, then the aerial tram. In 1951, the mill and office buildings were destroyed by snow slides.

The productive part of the Tungstar mine, called the Greene ore body, is developed in a mass of metamorphic rock that is enclosed in mafic quartz diorite. (Pl. 1.) A second ore body, the Stephens ore body, which crops out a few hundred feet south and uphill from the Green ore body, has supplied only a little ore. It also is enclosed in quartz diorite.

Ore remains only in the deepest parts of the Greene ore body, and exploration and development in depth are required before additional mining can be undertaken.

The Greene ore body was originally developed by means of a glory hole, an adit level (A level) which intersected the ore body 65 feet beneath the lowest outcrop, an intermediate level between A level and the glory hole, and several raises and sub-levels. An inclined winze was later sunk from A level to a depth of 180 feet, and levels were extended into the ore body at 70, 100, 130, and 180 feet vertically beneath the winze collar. Subsequently, a two-compartment vertical shaft was sunk to a depth of 280 feet beneath A level, and connections made with the existing levels; in addition a new level was extended into the ore body from the bottom of the shaft. Company records show that a 320-foot level was developed at the bottom of a winze sunk from the 280 level, and that several diamond drill borings were made from the 320 level, but accurate surveys were never made of either the level or the borings.

The ore above A level was mined by means of the glory hole and in open stopes. Mining in open stopes proved unworkable for extracting the ore beneath A level when a stope above the 100 level caved, resulting in the loss of both the level and the stope. As a consequence, practically all the block between A level and the 280 level was mined by square setting and back filling. The ore above the 180 level was hoisted through the winze, but the ore beneath the 180 level was transferred through the shaft.

The Greene ore body is a tabular tactite mass that dips steeply to the west (Pl. 1.) It occupies almost all of a metamorphic inclusion, but barren mica-quartz schist is present on A level, and unmineralized horses of marble are found on the 280 level. The longest axis of the ore body is nearly vertical; in plan the ore body is elongate in a northerly direction. On all the levels the south part of the ore body is thickest. On A level the thinner northern part is separated from the thicker southern part by quartz diorite, possibly through faulting, but on the deeper levels the ore body thins gradually to the north. Company maps of the surface and upper mine workings show a diorite core in the south central part of the ore body, which extends downward from the surface for about 65 feet.

According to Lemmon, the outcrop was 100 feet long and 20 to 40 feet side. _/ On A level it was 70 feet long and averaged 20 feet wide.

Lemmon, D. M., Tungsten deposits in the Sierra Nevada near Bishop, Calif.: U. S. Geol. Survey Bull. 931-E, p. 93, 1941.

Downward, the long horizontal dimension increased to a maximum of 160 feet on the 130 level, then diminished to less than 100 feet on the 180 level. The 280 level was briefly examined in 1946, before the mine installations burned, but the geology was not mapped. Nevertheless, it was evident that the plan dimensions of the ore body on the 280 level were less than on the 180 level. The borings from the 320 level intersected tactite only near their collars; the cores are largely of mafic quartz diorite. Fractures filled with clay gouge which are prominent in the upper part of the mine, are thought to be faults of small displacement.

The tactite of the ore body consists largely of garnet and epidote, but includes quartz, pyrite, sphene, apatite, oligoclase, potash feldspar, and alteration products. In the upper parts of the mine the pyrite is oxidized, but in the lower levels it is altered very little. The scheelite, fluorescent in blue-white, commonly is present in coarse crystals, some of which are several inches in mean diameter. Some of the best ore was composed of oligoclase, potash feldspar, pyrite and scheelite.

Decrease in the WO_3 content of the mill heads during the life of the mine suggests that the scheelite content of the ore body diminished with depth. The grade of the mill heads diminished from 2.6 percent WO_3 for the first 17,000 tons mined in 1939 and 1940 _/ to about 2.0

Lenhart, Walter B., Milling scheelite at Tungstar mine: Mining Cong. Jour., Vol. 27, No. 4, pp. 67-71, April 1941.

percent in 1943, then to a little more than 1.0 percent in 1946. The weighted average of assays of the ore intersected in the borings from the 320 level shows further decrease to 0.73 percent WO_3. Examination of the ore body under ultra-violet light, made at intervals of one to two years, support the interpretation that the grade of the ore decreased with depth. The alternative explanation of the decreasing grade of the mill heads, that the ore was diluted with increasing amounts of waste in mining from greater depths, is unsupported by factual data.

The decrease of grade with depth is similar to relations between grade and depth in deposits in the Deep Canyon area of the Tungsten Hills near Bishop, where the deposits are also in metamorphic inclusions. The marble on the 280 level of the Tungstar mine suggests less intense additive metamorphism, as in the Deep Canyon mines.

The Stephens ore body is largely marble which is penetrated by anastomosing sheelite-bearing silicate bands. The scheelite content of the ore body as a whole is too low for profitable exploitation, but that of the silicate bands is high. Attempts at selective mining of the silicate material have not been successful because significant amounts of marble were still present in the product. In milling, the marble breaks down to slime and interfers with the gravity concentration of the scheelite. The ore body is evidently underlain at a shallow depth by quartz diorite; B level passes beneath it in quartz diorite, and a raise through the center of the ore body is in quartz diorite to within a few feet of the surface. The Stephens ore body is suggestive of the roots of an inclusion, which may have contained rich ore in its eroded upper parts.

Hanging Valley mine

The Hanging Valley deposit was located in 1939 by Mike Millovitch and Pete Jono, but because of the inaccessibility of the deposit development has been slow. Construction of the mine road was expensive and consumed several years time. In 1950, the Hanging Valley Mining

Corporation merged with the Tungstar Corporation to form the Tungstar-Hanging Valley Mining Co. Since the merger, development of the Hanging Valley mine has continued, and some ore has been shipped.

The Hanging Valley deposit crops out through talus at only one place, but regional relationships indicate that the deposit is along or very near to a northeast-trending contact between quartz monzonite on the southwest and metamorphic rocks of the Pine Creek pendant on the northeast. It is developed by means of two adit levels separated vertically 115 feet, and by several raises, a 45-foot winze, and several small stopes. Only the upper adit is shown on Plate 2; the lower adit was driven in 1952, and reached the ore zone after the writer examined the deposit.

The ore is in a zone of metamorphic rocks consisting of tactite, hornfels, and marble, which is penetrated irregularly by quartz monzonite. Bedding is obscure at most places, but where it is discernable it strikes westerly and dips vertical or steeply south. Near-vertical north-trending fractures of unknown, but probably small, displacement cut the beds. Quartz monzonite exposed in the faces of the two longest forks of the upper adit may be part of the main quartz monzonite mass on the southwest, but neither exposure has been penetrated far enough to demonstrate that it is not a dike. Other exposures of quartz monzonite are apparently parts of dike-like masses.

The ore is discontinuous in plan; eight separate small shoots are distinguishable in the upper adit. Exploration through raises, winzes, and by diamond drilling demonstrates that, in contrast with their limited extent in plan, the or shoots are vertically very persistent. One shoot has been explored in a raise to 40 feet above the upper adit level, and another has been followed in a winze to 45 feet beneath the level. Furthermore, ore intersected in diamond drill borings at depths as much as 90 feet beneath the upper adit level seem to represent extensions of ore shoots exposed on the level. Some of the ore shoots are obviously confined between east-trending near-vertical beds and north-trending near-vertical fractures, but others show no apparent relationship to either bedding or fractures.

Exploration in the lower adit probably will result in materially increased ore reserves, but the adit has not yet been extended far enough for evaluation of the reserves. On the upper level, exploration of the ground both to the north and to the south of the existing workings may result in finding more ore. In addition, the extension of at least one of the adit faces now in quartz monzonite to determine whether ore is present beyond the quartz monzonite seems worth while.

Plate 1

VERTICAL PROJECTION OF ORE BODY
(Plane of projection is N25W)

UNDERGROUND GEOLOGY OF THE TUNGSTAR MINE

40 0 40 80 Feet

Paul C. Bateman, 1946

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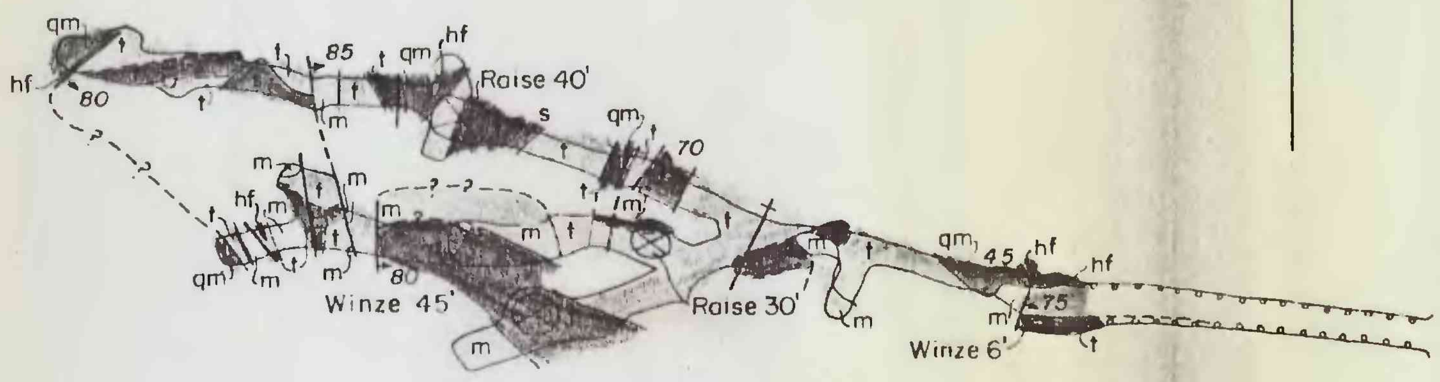

EXPLANATION

Scheelite-bearing tactite

Tactite and light colored calc silicate rock

Sulfide

Marble

Dark colored hornfels

Quartz monzonite

Contact, showing dip (Dashed where approximately located)

Fault, showing dip (Dashed where approximately located)

Vertical fault

Ore chute

Lagging along adit

Paul Bateman, July 1948

HANGING VALLEY MINE, INYO COUNTY, CALIFORNIA

0 50 100 150 Feet

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