The Rose Creek Tungsten Mine, Pershing County, Nevada

by

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Abstract

The Rose Creek tungsten mine is 11 miles southwest of Winnimucca in East Range. No tungsten ore has been produced from the property, but if high prices continue to prevail the mine will probably be brought into production.

The rocks in the area are interbedded argillite, quartzite, and limestone which have been folded into northwest and north trending folds and are complexly faulted. Dolomite has been thrust over the folds, and they have been intruded by granite, granodisute, and many dikes. The effects of contact metamorphism are noticeable over a wide area. Beds of calcareous argillite were completely recrystallized to tactite. The tungsten deposits occur in tactite and in quartz veins which cut the other rocks.

The ore bed in the Rose Creek Mine is explored in the workings xxxxx xxxxxxxxx for 400 feet along the strike and 200 feet down dip. It is as much as 4 feet thick and averages about 2 feet throughout the workings.

The ore reserves are estimated to be about 6,000 tons containing about 1.5 percent WO_3. If the minimum minable thickness is assumed to be 1.5 feet and the portions of the bed containing less than 1 percent WO_3

are disregarded, the reserves are estimated to be 4,000 tons containing about 1.7 percent WO_3. Losses in mining may reduce this figure by 10 percent. These reserves may be increased by finding ore east and west of the present workings. Furthermore, other beds may be mineralized and of commercial grade. Scheelite was found in quartz veins and in granite in the canyon south of the Rose Creek mine and near the Rose Creek ranch, but since these occurrences have not been explored it is not known whether they contain commercial ore bodies. Thorough exploration of the surface by ultraviolet light is suggested.

The Rose Creek tungsten mine, Pershing County, Nevada

Introduction

The Rose Creek mine in section 6, T. 34 N., R. 37 E., is 11 miles southwest of Winnemucca in the northeastern part of East Range (fig. 1). The nearest shipping point is Rose Creek, a station 3 miles north of the mine on the Southern Pacific R. R. and U. S. Highway 40. Dirt roads which will permit heavy hauling except during the winter months lead from Rose Creek station to the mine.

There has been intermittent activity in mining in the northern part of East Range since the 1860's. The Sierra district 7 miles south of Rose Creek has yielded ore containing gold, silver, copper, and lead. Quartz veins in the two canyons south of Rose Creek and near the Rose Creek mine probably attracted attention in the early days of mining but were never worked. The Rose Creek mine was first located for copper and gold, but until tungsten was discovered by Ed Christierson and George Howe in 1936 no exploratory work was done. The property was sold to the U. S. Vanadium Corp. in December 1937 and considerable development work has been done since then. No ore has been treated as yet, but the U. S. Vanadium Corp. is preparing to build a mill in the Osgood Range.

Field work in the Rose Creek area began in 1939 under the direction of H. G. Ferguson as part of the areal mapping of the Sonoma Range quadrangle. Work was continued in the district in 1940 and 1941. The mine area (pl. 2) and underground workings were mapped by the water assisted by A. E. Granger and Manning W. Cox. H. G. Ferguson and S. W. Muller mapped part of the area on plate 1 and gave valuable advice during field work.

Clarence Hall, engineer for the U. S. Vanadium Corp., aided field work

T. B. Nolan and Ward Smith visited the party in the field and made valuable suggestions in preparation of the manuscript. The writer is also indebted to F. C. Calkins for critical reading of the manuscript.

Geology

General statement

East Range is a rugged north-trending range in the central part of the Great Basin. The northern part of the range at the Rose Creek Mine is about 6 miles wide; it rises abruptly from alluvial fan slopes at an altitude of about 4,700 feet and in Lang Syne Peak, its highest point in this area is 7,430 feet above sea level.

The northern part of the range is composed of complexly folded and faulted Triassic sedimentary rocks which have been intruded by small bodies of igneous rock. The sedimentary rocks comprise dolomite, limestone, argillite, and quartizte. The igneous rocks include granite, diorite, and granodiorite and diorite porphyry, lamprophyre, and diabase dikes. Near intrusive bodies the sedimentary rocks have been metamorphosed to hornfels and tactite and are recrystallized. The tungsten deposits occur in the tactite and in quartz veins which cut the other rocks.

Sedimentary rocks

The sedimentary rocks have been grouped into three units on figures 2 and 3: dolomite, forming the upper plate of an overthrust sheet, is the oldest rock exposed in the area; the lower plate includes a lower unit of interbedded argillite, slate, and quartzite, and an upper unit of limestone. These rocks are probably all of Triassic age, but since they have not yielded diagnostic fossils their specific age is not known.

Dolomite

The dolomite is exposed in several Klippen 1/ south and southeast of the mine; the largest is a half-mile long and a thousand feet wide. Most of the Klippen are downfaulted by normal faults and have thus been preserved from erosion. The dolomite has a maximum thickness of about 200 feet. It is massive to thick bedded and its colors range from light to dark gray. In most places it is silicified and cut by networks of small quartz veins. No fossils have been found in the dolomite but it may be correlative with a similar middle Triassic dolomite of the Sonoma Range, seven miles to the east.

1/ A Klippe is an outlier of an overthrust plate or sheet.

Argillite, quartzite, and limestone

Argillite, quartzite, and limestone

The older of the two units of the lower plate is composed largely of interbedded argillite and quartzite. Argillite predominates in the lower part of the unit, but near the Rose Creek Ranch several limestone beds are intercalated with the argillite. The middle part of the unit is composed on interbedded brown quartzite and argillite. Black slaty argillite forms the upper part of the unit. The thickness of the unit was not accurately measured but may be as much as 3,000 feet. The argillite has been altered to nornfels over much of the area mapped. Some of the beds, as the ore bed in the Rose Creek mine, which were originally calcareous argillite have been entirely recrystallized near intrusives.

The limestone unit which is exposed on the slopes of Rose Creek Mountain and southeast of the mine is the youngest sedimentary rock. Its thickness is more than two hundred feet but since the upper part has been eroded its total thickness is not known. It is thin to medium bedded and contains thin layers of shaly limestone; for the most part the limestone is light to dark.gray in color, but it has been bleached white locally along faults. According to S. M. Muller _/ fossils collected

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Muller, S. M. Personal communication.

from the limestone indicate that its age is middle Triassic.

Igneous rocks

The intrusive igneous rocks (shown on plates 2 and 3) are stock-like bodies which commonly cut sharply across bedding. They are composed mainly of granite, granodiorite, and diorite. Many varieties of dike rocks which cut the granitic and sedimentary rocks are found in the area.

The intrusives east and southeast of the Rose Creek mine are granite with a thin granodiorite border. The granite is medium grained and contains pink orthoclase crystals. The bordering granodiorite is generally only a few feet wide; it is fine to medium grained and dark gray in color. A well developed joint system striking N. 10°-20° W. cuts these intrusives. Many of the joints contain thin quartz and quartz-feldspar veins.

The intrusive southeast of the Rose Creek ranch is chiefly of granodiorite. It ranges from fine grained and dark gray in color to medium grained and light gray.

The dike rocks comprise many rock types. Granite and granodiorite dikes and offshoots cut the sediments adjacent to intrusives. Small pegmatite and aplite dikes, ranging from a fraction of an inch to a foot wide follow joints in the intrusives and some extend a short distance into the sediments.

Many lamprophyre, diorite porphyry, and diabase dikes were noted throughout the area; since they do not crop out prominently and only a few of them were mapped, they are grouped as basic dikes on plate 2.

In the mine workings (see pl. 3) lamprophyre and diabase dikes make up 30 percent of the volume of rock cut by the drift. The lamprophyres fill irregular fractures which have no systematic strike and dip. The diabase dikes trend north and northeast for the most part; they are younger than the other dikes.

The age of the intrusive rocks is not definitely known. They cut Triassic rocks and are therefore Triassic or younger. The diabase dikes were probably intruded later than the other igneous rocks. In nearby areas similar dikes are found to be feeders of basalt flows of Tertiary age.

Contact Metamorphism

The effects of the granite and grano diorite intrusions are noticeable throughout most of the area shown on figure 2. Contact metamorphism was naturally more intense at the borders of the intrusive masses. Commonly the wall rocks were feldspathized for a few feet from the contacts, and they were recrystallized as much as a mile away from the contacts.

Limestone and quartz etc. beds were the least effected; their mineral composition was changed only slightly, but their grain size became coarser. In places tremolite nudles formed in the limestone and its color was changed from gray to white.

The argillite has been altered to harnfels over a wide area. The harnfels is a tough, gray, green, or brown rock, composed chiefly of quartz, mica, epidote and actinolite, and is commonly minutely fractured.

Calcareous argillite beds, such as the ore bed is the Lose Creek Mine, were entirely changed to tactite for hundreds of feet away from the contact. The tactite consists ef largely of diopside, actinolite, epidote, quartz and calcite in varying proportions. Small quantities of schulite and sulphides are present in some places.

Structure

The rocks of the Rose Creek area are complexly folded and faulted.

Because of poor exposures in many places the details of structure have not been worked out and the contacts are generalized.

Folds

For the purpose of this report the Rose Creek area may be (conveniently) divided into three structural blocks, separated by normal faults. (1) The Rose Creek Mine block bounded by the Valley and Hall faults, is an anticline with syncline pitching northwest on its west flank. The block southeast of the Hall fault is partly covered by the main dolomite Klippe but dips in the lower plate rock indicate that the structure is also anticlinal. The block southeast of the Valley and Peaks faults is a syncline pitching southeast.

Commonly the folds are asymmetrical with the steeper dips on the west and southwest flanks of the anticlines. This was probably caused by the overriding dolomite thrust block, steepening dips which were opposed to the direction of thrusting.

Faults

The overthrush fault at the base of the dolomite dips gently northerly. The actual thrust plane was not seen but its location is fairly certain in most places. The rocks near the thrust plane, both above and below, are fractured and brecciated. The direction of thrusting appears to have been

to the southwest or west. Overthrusts in the Sonma Range, 7 miles to the east, also indicate movement to the west. The overthrust fault has been broken by many normal faults and because of subsequent erosion small Klippen have been isolated west and south of the main Klippe.

The normal faults may be divided into two systems, one striking northwesterly and the other striking north to northeast. The amount of displacement along them ranges from a few feet to more than a hundred feet, but accurate measurements cannot be made on most of them. The downthrown block is commonly on the southwest side of the northwest fault system and may be on either side of the northerly system. Several small faults displace the ore layer in the workings, but the throw largest one is only about 10 feet. Some of the diabase and lamprophyr dikes follow faults.

Ore Deposits

The schulite - bearing tactite bed explored in the Rose Creek Mine workings is the only ore body of commercial size and grade thus far discovered in the area. The bed is similar in occurrence and general mineralogy to the tungsten bearing beds mined in the Nevada-Massachusetts Mine in the Eugene Range 17 miles to the southwest.

Kerr, P. F., Tungsten deposits near Mill City, Nevada: Univ. of Nevada Bull., Vol. XXVIII, No. 2, p. 21, 1934.

Claims have been located on tactite near the grano diorite contact at the Rose Creek Ranch, but only a few grains of schulite have been found in the rock. The quartz veins and granite in the canyon east of Rose Creek contain scattered schulite grains, but further exploration will be needed to prove whether the ore bodies are of commercial size.

Mineralogy

The tactite, formed from alteration of calcareous argillite is composed chiefly of diopside, actinolite, quartz, calcite, epidote, and zoisite; in addition it contains small amounts of apatite, sphere, schulite, pyrite molybdenite, sphalerite, arsenopyrite, and chaleopyrite. The relative proportions of the silicates are variable, but commonly diopside, actinolite, and quartz predominate. The sulphidis occur in small quartz veins and are disseminated throughout the tactite and adjacent rock. Pyrite, the most abundant sulphide, is widespread; the others are present only locally.

The schulite occurs in subhedral to euhedral grains, commonly disseminated throughout the tactite, but locally the grains follow cracks or occur in small quartz veinlets. The schulite ranges in size from crystals too small to be seen with the unaided eye to crystals ¼ inch in length. Under the ultra violet lamp its fluorescence color ranges from bluish white to yellow; commonly the yellow color is most pronounced on the borders of the crystals, but some crystals fluoresce yellow throughout. Presumably the yellow color is due to a small amount of molybdrum in the schulite. It is reported that concentrates of the ore contain about 1½ percent of molybdenan, but part of this comes from molybdenite is locally present.

The ore is reported to contain as much as 1½ percent copper and $5 a ton in gold.

Size and Grade

The ore body in the Rose Creek mine is developed for a length of 400 feet and for 200 feet down dip (a vertical distance of 110 feet). The ore bed is as much as 4 feet thick in underground workings and averages about 2 feet in thickness; it contains as much as 5 percent WO_3 and averages about 1.5 percent. Its average thickness in surface workings appears to be about 2.5 feet and the average grade about 1 percent WO_3.

The schulite-bearing quartz and quartz-feldspar veins in the canyon south of Rose Creek range from a fraction of an inch to more than 6 inches wide but do not average more than 2 inches. The veins are spaced 6 inches to two feet apart and follow a joint system in the granite. In the veins examined, schulite crystals are erratically distributed throughout the quartz and the veins do not appear to be of commercial size and grade. in places the granite adjacent to the veins contains sparse schulite crystals.

Reserves

Although little ore can be considered to be blocked out in the workings, sufficient exploration has been done to allow fairly accurate estimation of

reserves. The ore bed has been proved to be continuous throughout the workings with the exception of areas where it is cut out by dikes. On the drift level dikes occupy about 30 percent of the distance from the portal to the face, and in the winze about 20 percent as far as the ore extends. Because of poor exposures on the surface between trenches it is impossible to estimate the relative percentage of dikes and vigillite, but it is assumed to be about the same as in the drift.

In mining there will naturally be less of segments of the ore bed because it will not be profitable in some places to cut through wide dikes in search of them.

Using two feet as the average thickness of the ore body and subtracting 30 percent for the volume of dike rock about 6,000 tons of ore may be present in the block between the portal and present face. Assays indicate that the average grade will be about 1½ percent WO_3.

In actual mining, however, it may be found that only the richer and thicker portions of the ore bed can be profitably mined. If 18 inches is assumed to be the minimum stoping thickness, and 1 percent WO_3 the minimum grade that can be mined, the reserves may be about 4,000 tons. By disregarding the portions of the bed containing less than 1 percent WO_3 the average grade will be about 1.7% WO_3.

In addition, there may be some faulted blocks and blocks isolated by dikes which cannot be profitably mined. It is difficult to estimate these losses in advance of mining, but they may reduce the tonnage by 10 percent more.

The reserves may be increased considerably by finding ore east and west of the present workings, and at depth.

Mine Workings

The ore bed in the workings strikes easterly and dips 30-45° northerly, but locally the strike is northeast. The bed has many minor warps caused by folding. It parallels bedding of the enclosing harnfels, and is lenticular, thinning and swelling along the strike and down dip.

Surface Workings

The ore bed was first explored in shallow workings (see Pl. 3) which extend along the surface for 500 feet. In these workings the ore bed averages about 2½ feet in thickness. It pinches completely in the raise connecting with the underground workings, but elsewhere its outcrop width ranges from a foot to 9 feet. The sample cuts in the trenches were made parallel to the slope, and since the ore bed dips into the hill the outcrop width is greater than the true thickness.

The surface ore is oxidized; the sulphides have been altered to limonitic iron oxides and the silicates to clay minerals. The altered rock is commonly stained with copper carbonates and silicates and is porous. The depth of oxidation is shallow, extending from 3 to about 10 feet and is greatest where the rock is fractured.

Thru lampraphyre dikes were mapped in surface cuts, but there are probably many more between the cuts judging from float seen on the slopes.

A parallel ore bed was cut in the long trench at the southwestern end of the surface workings; the outcrop width of this bed is 10 feet, but the grade is low. Further exploration of this bed appears to be warranted.

Underground Workings

The underground workings consist of an adit-drift which follows the ore bed for 400 feet, a winze following the ore down dip, and 3 raises. An adit was being driven at a lower level to intersect the winze in October 1941.

The ore bed is exposed at the portal and in a pit east of the portal. In the pit the ore ends against a fault, and although the contact is not exposed, will probably run into the diabase dike exposed in the open cut. The ore bed may continue beyond the dike but its extension has not been found as yet.

In the adit the ore bed is first cut 30 feet from the portal in the roof. Beyond this point it is displaced by several faults of small displacement and passes out of the drift. It is encountered again in the crosscut at the head of the winze.

The bed is split into two parts separated by barren rock where it enters the West drift. This apparently is due to an original irregularity in bedding of the calcareous argillite from which the bed was formed. In raise No. 1 the ore bed thins, and pinches completely near the surface. It also thins between raise No. 2 and raise No. 3, and is cut out by faults and two dikes at the 4-foot winze. When the ore bed is found again at the south crosscut it is 30 inches thick; it was explored upward in a short raise, but was cut out by a lampphyre dike 10 feet above the drift, and is cut off west of the crosscut diabase dike. Ore was found in the northwest drift, but it is low in grade. Ore probably continues beyond the face, although its position on the other side of the diabase dike is uncertain.

The main winze follows the ore down dip for 120 feet. In the upper part the ore is high grade, assaying as high 5.07 percent WO_3, but between the lomprophyre and diabase dike, it is thinner and for the most part is low in grade. The layer below the diabase dike has not been assayed but is estimated

to be low in grade; 170 feet down dip below the top of the winze the ore is only 6 inches wide and is cut off by a fault. Below this level it may be present again but short drill holes into the roof and floor did not locate the bed.

The Lower adit is in dike rock and argillite to the present face. The ore layer, if present, may be cut before the adit intersects the bottom of the winze or it may be necessary to run a crosscut to the south in the block between the lower adit and the winze. The faults which displace the ore layer on the surface and adit level near the winze crosscut will probably cause a similar displacement on the Lower adit level.

Prospects near Rose Creek

O'Leary claims Frank R. O'Leary and M. W. Tyler have located claims in Sec. 25, T. 34 N., R. 36 E. on tactite exposed in the stream bed east of the Rose Creek Ranch. A few crystals of schulite were seen in the rock, but the grade appears to be too low to be of commercial value.

Canyon south of the Rose Creek Mine. In the canyon south of the Rose Creek Mine two occurrences of schulite were found by prospecting with the ultraviolet lamp. No. 1 is in granite near the granite - limestone contact and the other is in quartz and quartz-feldspar veins which cut the granite on the west wall of the canyon. The material is low in grade, but further prospecting may be warranted in this area.