MOLYBDENITE IN THE ROCKY BAR DISTRICT, IDAHO.

By Frank C. Schrader.

INTRODUCTION.

This paper describes several deposits of molybdenite, the chief ore mineral of the metal molybdenum, which is used in hardening steel. It is based on a brief examination of the deposits in June, 1923. Hospitality and aid in the field were generously given by Mr. M. E. Rinebold and Mr. Roy Hortenstine. In the chemical and mineralogical determinations aid was kindly given by Messrs. W. T. Schaller and L. M. Prindle, of the United States Geological Survey.

The presence of molybdenite in the Trinity Mountains of Idaho has been known for several years, but no description of the deposits has hitherto appeared.

LOCATION.

The deposits are in Elmore County, Idaho, 40 miles east of Boise, in the Trinity Mountains, which form a part of the great mountain belt of central Idaho. (See fig. 25.) The exact location is on Roaring River, a large southern tributary of the Middle Fork of Boise River about 70 miles north of Mountain Home, the nearest station on the Oregon Short Line Railroad, and about 9 miles in an air line west of Rocky Bar and 12 miles northwest of Featherville, the two nearest post offices, from each of which it is reached by a horse trail several miles longer than the air-line distances. Rocky Bar and Featherville have semiweekly automobile stage and mail service over good roads from Mountain Home except when snowbound in winter. Rocky Bar is noted for its pioneer production of gold, which dates from the early sixties, and includes mines of historic interest, such as the old Alturas mine. The Roaring River part of the country, however, is unsettled frontier. The only habitations in the molybdenite area are a couple of prospector cabins—the Rinebold cabin, about a quarter of a mile above the mouth of East Fork of Roaring River, and the Decker-Hortenstine cabin, 2 miles farther upstream. (See fig 26.) In 1923 the Forest Service was building a trail from Featherville up Trinity Creek, to make this part of the country accessible for summer outing, camping, hunting, and fishing, for which it is admirably adapted.

CLIMATE.

The climate is in general agreeable, with long but mild winters and cool, comfortable summers. The annual snowfall, however, is heavy, amounting to 5 feet or more, and renders the area isolated for nearly half the year and inaccessible till about the middle of June. The region in general is well forested with pine and allied timber suitable

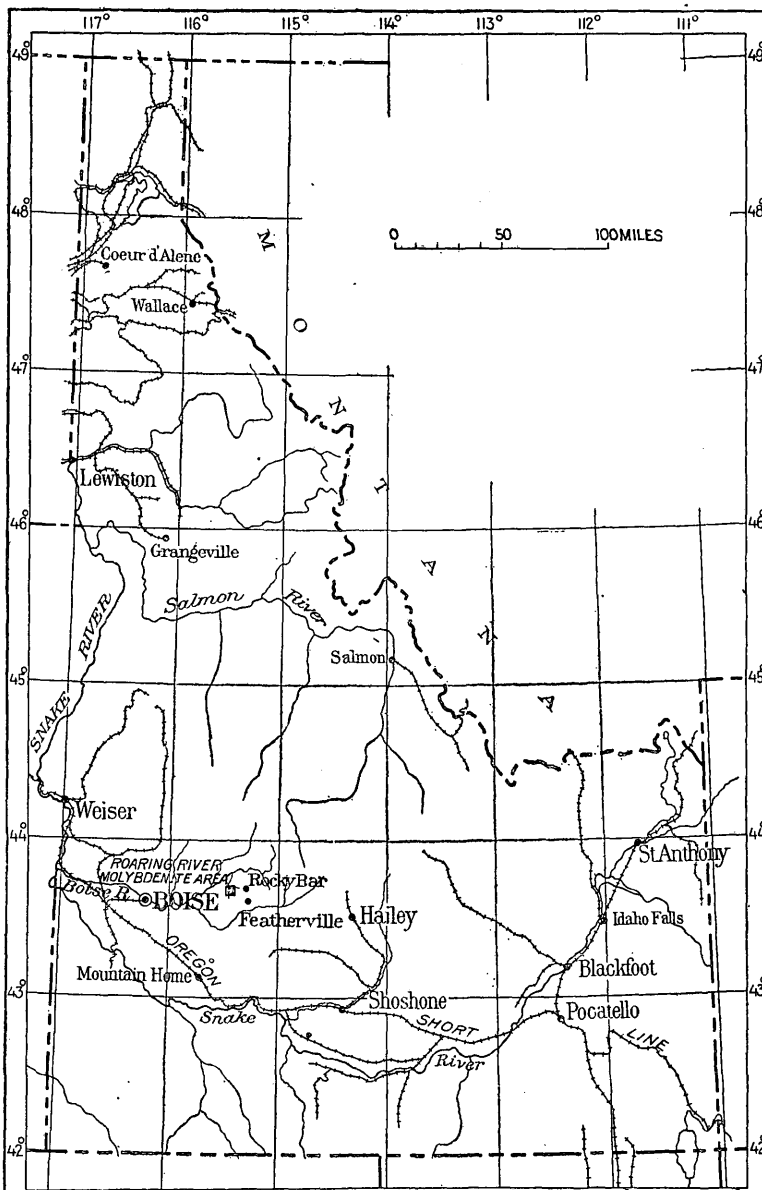


FIGURE 25.—Index map of Idaho showing position of the Roaring River molybdenite area, in the Rocky Bar district.

for mining purposes and for lumbering. It also contains considerable good forage and an abundance of excellent water and has long been used as a sheep range.

TOPOGRAPHY.

The topography of the area is of the eroded granitic mountain type of central Idaho. The area is in the northern Rocky Mountain province, and its surface has reached the mature stage, consisting chiefly of slopes, as expressed in the accompanying map (fig. 26). The

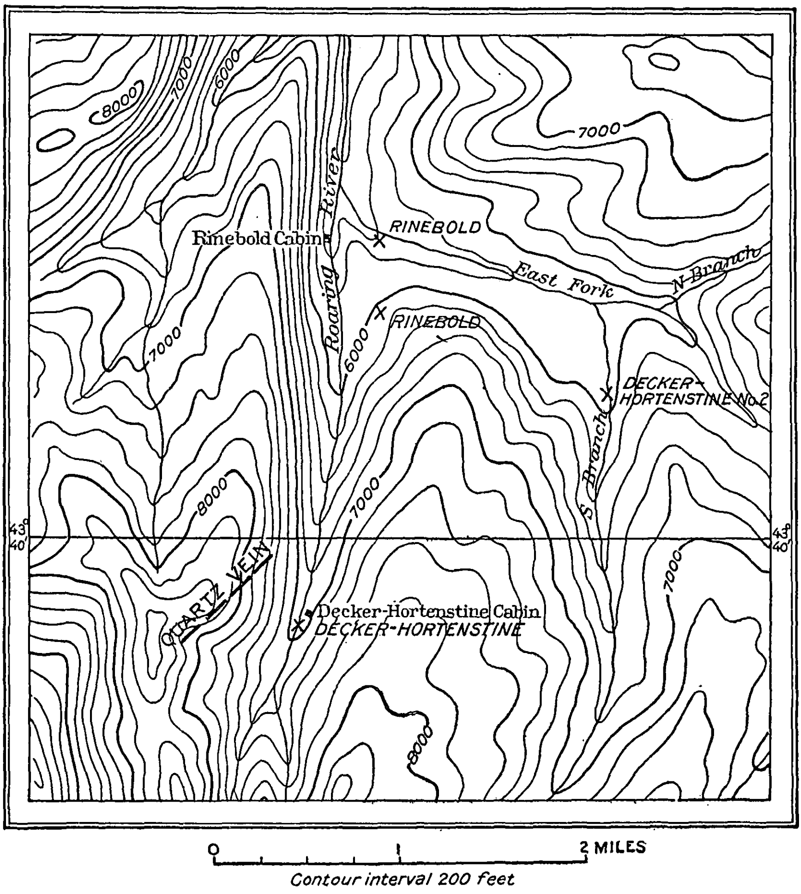


FIGURE 26.—Topographic map showing the position of the molybdenite prospects on Roaring River, Rocky Bar district, Idaho.

streams are torrential, with gradients of about 500 feet to a mile, and they flow in well-intrenched canyons cut to depths of 1,000 to 2,000 feet below the neighboring ridges, with side slopes ranging from precipitous to gentle. Roaring River, which has a length of 10 miles or more, flows northward and joins the Middle Fork of the Boise at an altitude of 4,000 feet. Its headwaters drain the north slope of the highland mass that culminates in Trinity Mountain, at an altitude of 9,400 (see topographic map of Rocky Bar quadrangle), and during the year are fed by waters from melting snow. The U-shaped cross section and smooth uniform slopes of the upper reaches of the valleys seem to denote that they have suffered pronounced glaciation, as described by Eldridge.[1]

The abnormal course of Roaring River, which is northeasterly, in a nearly opposite direction to that of the Middle Fork of Boise River, which is southwesterly, together with the steepness and general uniformity of the valley walls on each side, suggests that this is probably a fault valley.

GEOLOGY.

The country rock is granite, apparently the normal monzonitic granite of central Idaho. It is a part of the large batholith described by Lindgren[2] and corresponds in general with his description. Lindgren refers the granite, together with the accompanying gold and silver deposits it contains, to the Cretaceous or early Tertiary, which is probably also the age of the molybdenite deposits here described. On Roaring River the rock is a light-gray biotite granite with a slightly reddish tinge and presents a more or less speckled appearance due to contrast in the dominant minerals—reddish and white feldspar, light quartz, and black biotite. It is medium grained with a general sugary aspect and is moderately porphyritic, with phenocrysts as much as 0.4 inch in diameter.

The microscope shows it to be composed of irregular xenomorphic crystals and grains of orthoclase, perthite, oligoclase, and quartz, with accompanying biotite. The groundmass shows graphic structure, as do also some of the perthite phenocrysts. The phenocrysts are nearly all pink orthoclase or perthite, and some are twinned. The biotite is mostly pale brown, but some of it is changed to greenish chlorite. Usually in association with the biotite are some ilmenite and a little magnetite and sphene. Apatite in the form of needles is sparingly present as an accessory mineral. A little disseminated molybdenite occurs in the form of small irregular bodies which seem to be intercrystallized with other constituent minerals of the firm fresh granite, and it is therefore regarded as primary. In this connection, however, it may be noted that Hess, who has investigated the subject extensively, believes that all molybdenite occurring in granite is secondary.[3]

---

[1] Eldridge, G. H., A geological reconnaissance across Idaho: U. S. Geol. Survey Sixteenth Ann. Rept., pt. 2, p. 223, 1895.

[2] Lindgren, Waldemar, The mining districts of the Idaho Basin and the Boise Ridge, Idaho: U. S. Geol. Survey Eighteenth Ann. Rept., pt. 3, pp. 617–719, 1898; U. S. Geol. Survey Geol. Atlas, Boise folio (No. 45), 1898.

[3] Hess, F. L., The molybdenum deposits of the world: U. S. Geol. Survey Bull. 761 (in press).

In general the granite is more or less fractured, and locally it is cut into thin slices by sheeting. The dominant sheeting strikes about N. 10° E., with a steep or nearly vertical dip to the east. A subordinate sheeting dips about 40° S.

The granite is locally traversed by narrow dikes and associated quartz veins, all of which were probably derived from the granite magma and were intruded soon after the consolidation of the granite. The dikes include aplitic, pegmatitic, dioritic, and lamprophyric types. The veins consist chiefly of massive medium to coarse grained gray quartz, with locally a little associated feldspar and pegmatitic materials. They are essentially without crustification or banding, seem to have been intruded or injected probably as an aqueo-igneous viscous or gelatinous fluid into the fissures or fractures they now fill, and apparently correspond to the "veindikes" described by Spurr.[4]

The northeast corner of the area covered by the map (fig. 26) is occupied mostly by a hard massive lead-gray felsitic rock, which is locally called "limestone" or "lime dike" but which the microscope plainly shows to be igneous. It forms the prominent shoulder of the mountain just east of the Rinebold property and is probably younger than the granite. It is very dense, with a hornlike or flinty aspect, has a hackly fracture, and is composed chiefly of short microscopic lath-shaped feldspars forming with quartz and mica a sort of parallel flowlike structure. It is sufficiently fine grained to be regarded as a surface flow but does not show any glass. One or more dikes of this rock are said to extend into the molybdenite area, but the rock does not seem to be associated with the origin of the molybdenite.

DEPOSITS.

The molybdenite deposits are found mainly in or closely associated with the intrusive dikes and quartz veins and in the adjoining granite wall rock. The molybdenite occurs chiefly as scales and flakes that form irregular masses, partly radial, in and along the quartz veins. It is present in the borders of the veins and along their contact with the inclosing rocks (Pl. XII, *B*) and is associated with the pegmatitic phases of the rocks. In its occurrence along the border of the veins its outer surface may be more or less conformable with the rock wall and thus fairly regular and smooth, whereas its inner surface, penetrating the quartz vein, is very irregular and jagged, apparently indicating that the quartz and the molybdenite solidified simultaneously and intercrystallized. (See Pl. XII, *B*.) In some places the molybdenite has replaced the wall rock. The concentration of the molybdenite at the borders of the veins is probably due to earlier cooling of that part of the vein material in contact with or near the wall rock.

[4] Spurr, J. E., The ore magmas, vol. 1, p. 70, 1923.

The molybdenite occurs also in a fine-grained state in brecciated quartz, forming an ore breccia in which it appears to be later than the quartz (Pl. XII, *A*).

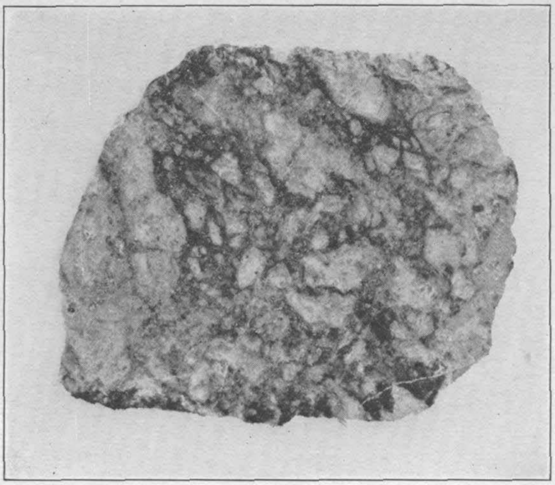
The ore breccia in general is iron-gray and mottled and has a sugary aspect. It consists mainly of angular fragments of quartz and a little feldspar, as much as half an inch in diameter, cemented by a fine-grained dark siliceous matrix in which the dark material is mostly molybdenite. The margins of some of the quartz fragments have been corroded, seemingly by hot mineral-bearing solutions. The molybdenite occurs chiefly in small bodies and minute dustlike particles and veinlets or seams. The particles form mantles enveloping many of the breccia fragments, and minute veinlets traverse some of the fragments as well as the cement. The extreme fineness of some of the molybdenite veinlets in the hard quartz suggests that they may have been deposited by gaseous solutions having great power of penetration. Elsewhere casts of quartz plainly pseudomorphic after divergent forms of molybdenite seem to denote deposition of quartz after the molybdenite had been deposited. It is possible, however, that this pseudomorphism may be due to simultaneous consolidation and intercrystallization of the quartz and molybdenite, as illustrated in Plate XII, *B*.

Associated with the molybdenite there are, in addition to the quartz, considerable pyrite, phlogopite-biotite mica, some hematite, specularite, a little chalcopyrite, marmatite, and locally light-green fluorite and calcite. The calcite occurs mostly in coarsely crystalline form in fractures. The fluorite appears generally in the borders of the quartz veins and replacing the country rock an inch or more from the veins. Pyrite that seems to have replaced the phlogopite-biotite mica is conspicuous.

The deposits also contain a little yellowish molybdite or molybdic ocher ($Fe_2O_3.MoO_3.7\frac{1}{2}H_2O$), derived through oxidation from the molybdenite. Wulfenite, lead molybdate ($PbMoO_4$), has been reported from the Rinebold prospect.

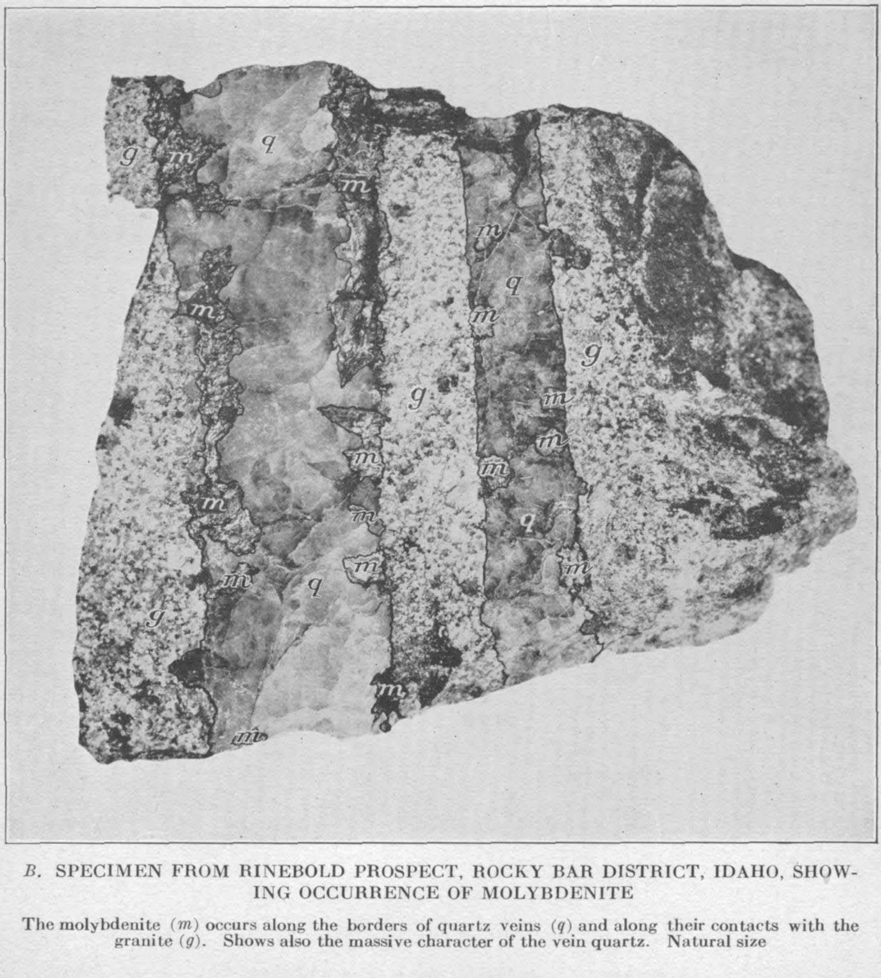
As the molybdenite deposits occur on streams whose rapid erosion has brought them to view, there has been but little opportunity for the accumulation of oxidation products, especially on the lower slopes. In places on the Rinebold prospect, however, the croppings consist of a yellowish and reddish-brown deeply iron-stained gossan a foot or more in thickness. In a few places, as at the location monument on the Florence claim, the croppings are made up chiefly of leached porous honeycombed quartz.

Nearly all the deposits are reported to contain also, particularly in the pyritic or unoxidized portions, a high content of gold and silver, attaining in some portions $1,000 to the ton and said to occur mostly in the form of tellurides. However, as careful tests made in



A. SPECIMEN FROM DECKER-HORTENSTINE PROSPECT, ROCKY BAR DISTRICT, IDAHO, SHOWING OCCURRENCE OF MOLYBDENITE

The molybdenite is the dark mineral in matrix cementing quartz breccia. Natural size



B. SPECIMEN FROM RINEBOLD PROSPECT, ROCKY BAR DISTRICT, IDAHO, SHOWING OCCURRENCE OF MOLYBDENITE

The molybdenite (*m*) occurs along the borders of quartz veins (*q*) and along their contacts with the granite (*g*). Shows also the massive character of the vein quartz. Natural size the chemical laboratory of the Geological Survey of four of the most promising-looking specimens—two collected by Mr. Rinebold and two by the writer—gave no trace of tellurium, it is inferred that tellurides are probably not present and that the gold and silver are contained in the associated pyrite, quartz, and iron and manganese oxides in some other form than that of tellurides. Gold and silver in notable quantity are reported to be present also in a few small veins, which so far as known do not contain molybdenite.

PROSPECTS.

RINEBOLD PROSPECT.

The Rinebold prospect is on the East Fork of Roaring River about one-third of a mile above its mouth, between altitudes of 5,500 and 6,000 feet. (See fig. 26.) It is owned by M. E. Rinebold, of Rocky Bar, by whom it was discovered and located in 1904. The property comprises a group of five claims, bisected by the steep valley of the East Fork. (See fig. 27.) The deposits are contained in a mineralized zone about 1,600 feet wide and extend about 2,000 feet along the strike, which is about N. 60° E. They have been explored by about 800 feet of workings, of which 600 feet consists of drifts and the rest mostly of cuts and pits. The country rock is the biotite granite above described. It is intruded by dikes of a finer-grained aplitic rock, locally called porphyry. The dikes mostly parallel the mineralized zone. They are locally pegmatitic and at such places may contain molybdenite.

The best showing is toward the west, on the Mira B. claim. It is in a subzone of mineralization or lode about 22 feet wide which extends from the discovery monument, near the stream, southwestward for a distance of about 1,000 feet and through a vertical distance of about 200 feet. It is composed largely of intrusive aplitic granite and quartz, and it contains three main molybdenite-bearing stringers, which are about equally spaced but are not wholly continuous or regular. The stringers range from mere films on seams or joint planes to deposits 6 or 8 inches in width. The molybdenite occurs largely in the edges of the quartz veins, and in smaller quantity in the adjacent rock. Small stringers and bunches of molybdenite occur sporadically both in the vein and in the adjacent granite.

The best showings are opened by two prospect tunnels driven southwestward into the steep slope and by open workings below the lower tunnel. The workings are nearly all in the oxidized zone. Owing to caving near the portals the tunnels were not accessible at the time of visit. They are 60 feet and 110 feet above the stream. The upper tunnel has a reported length of 250 feet, and the lower of 125 feet. Both are said to contain good showings of molybdenite and a little wulfenite. The dumps contain several tons of ore carrying about 1 per cent of molybdenite, but this material is of too low grade to be shipped in its present form. From these dumps specimens of quartz and granite containing bodies of pure molybdenite as much as one-third of an inch in diameter, films 2½ inches in diameter by one-tenth of an inch in thickness containing about 40 per cent of molybdenite, and portions of veins or stringers nearly 2 inches in width containing 60 per cent of molybdenite were collected.

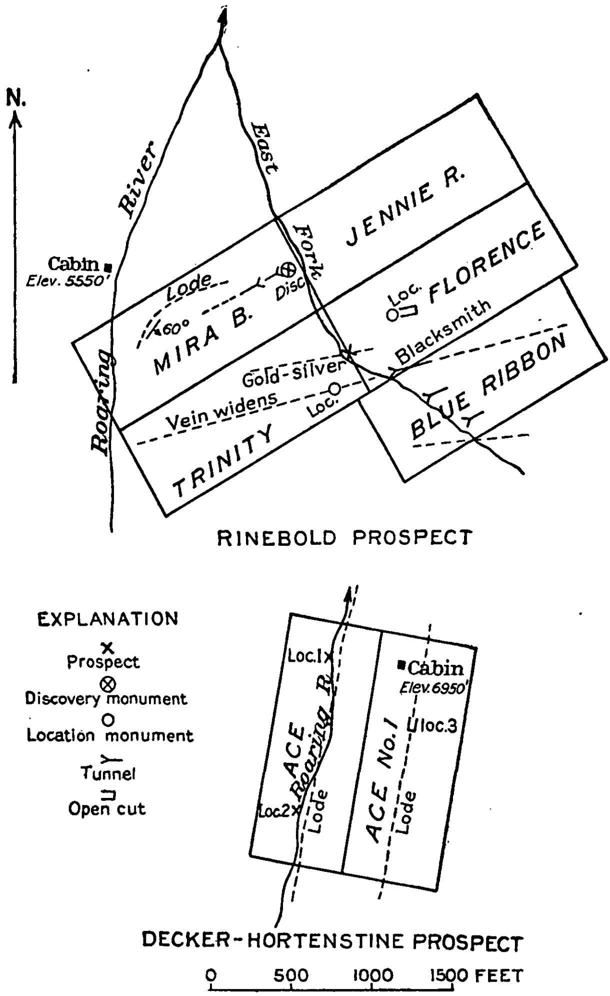


FIGURE 27.—Claim map of molybdenite prospects on Roaring River, Rocky Bar district, Idaho.

Of the deposits on the northeast side of the stream, the vein opened by the 90-foot adit known as the Blacksmith tunnel, on the Florence and Blue Ribbon claims, presents the best showing. For convenience of reference it is here designated the Blacksmith vein. It ranges from a few inches to 2 feet in width, dips 75° SSE., and seems to be continuous throughout the length of the tunnel. Besides quartz it contains as gangue minerals some coarse feldspar or pegmatitic material and a little fluorite. As the tunnel is but a few feet above the stream there is also present considerable pyrite, which, like the molybdenite, occurs sporadically, chiefly in tabular sheets or thin lenses half an inch in maximum thickness penetrating the quartz of the vein or filling fractures. The ore is reported to carry considerable gold and silver.

Beyond the east end of the Blue Ribbon claim the vein is said to extend to the felsitic rock or supposed "limestone" and probably passes beneath it. On the west the vein is exposed in the bed of the stream, and with fair showings of molybdenite it is said to continue beyond the stream and up the steep slope through the greater part of the Trinity claim.

The southwestward-projected course of the Rinebold molybdenite zone crosses Roaring River about half a mile above the mouth of East Fork and thence diagonally ascends the steep mountain slope, in which little or no prospecting has yet been done. On this slope, however, at points about a quarter of a mile downstream from the course as thus projected and back of the Rinebold cabin, the writer found boulders more than a foot in diameter of decidedly pyritic and slightly copper-stained granite and quartz, indicating the probable occurrence of mineralized rock near by.

DECKER-HORTENSTINE PROSPECT.

The Decker-Hortenstine prospect is on Roaring River 2 miles upstream from the Rinebold prospect, at an altitude of about 7,000 feet. (See fig. 26.) It is owned by William Decker[5] and Roy Hortenstine, both of Pine, Idaho, by whom it was discovered and located in 1920. The topography is hilly, but the valley at this point is relatively open. The country rock is the biotite granite, and the associated intrusive rocks and the mineralogic conditions are about the same as on the Rinebold prospect. The granite is coarsely sliced by a N. 16° E. sheeting, which dips 85° W.

The property consists of two claims (fig. 27), of which the upper end is timbered, and the deposits occur mainly in two mineralized bands or lodes. The lodes strike about N. 10° E., nearly parallel with the sheeting in the granite, and are about 500 feet apart. The owners regard the space between the lodes as mineral bearing, but evidence to confirm this belief was not obtained in the present examination. The principal showing is on the west or Ace lode, whose course is approximately the same as that of the river. A considerable extent of the lode lies in the stream bed, where most of the best

[5] It is reported that Mr. Decker has recently died.

exposures of molybdenite occur. The lode is opened at irregular intervals, chiefly by shallow cuts and pits that show sporadic occurrences of molybdenite through the greater part of the length of the claim and toward the north end by a short prospect tunnel, at which it has a width of about 40 feet and is associated with a 3-foot greenish lead-gray dense lamphrophyric dike which cuts the granite on a strike of N. 30° E. and dips 70° E. The tunnel, which was not accessible at the time of visit, is the source of the ore breccia described on page 92 and shown in Plate XII, *A*.

The lode is composed of parallel slices of granite and dike rocks, mostly granitic, and intervening quartz veins and stringers from half an inch to 4 inches wide. As on the Rinebold prospect, the molybdenite occurs mostly along the borders of the quartz veins and stringers and at their contacts with the several rocks and in parallel fractures in the veins and rocks. It is mostly in tabular form, but nearly equidimensional bodies as much as 1¼ inches in diameter are also present. It coats joint planes in areas that reach a foot in diameter. Some molybdenite is also disseminated in portions of the granitic rocks, mostly in fine particles. At locality 2, near the center of the south half of the Ace claim, in the west bank of the river at the lower edge of the tall timber, a 2-foot band of granitic rock, regarded as a dike, presents a good showing, the molybdenite content, which is fairly uniformly distributed, being by estimate about 5 per cent. Toward the south the dike diverges about 15° westward from the general course of the lode.

On the east lode the principal prospect is at locality 3, near the middle of the Ace No. 1 claim, in a shallow cut in the hillside about 150 feet above the river. It shows relatively little molybdenite. The largest and best-looking quartz vein is from 2 to 10 inches in width and is cleft longitudinally by a nearly vertical joint plane or fault.

Associated with the molybdenite in the Decker-Hortenstine prospect are more or less pyrite, specular hematite, bronze-colored phlogopite-biotite mica, marmatite, a ferriferous variety of sphalerite, gold and silver, and a little galena. The pyrite occurs mostly in tabular form, as at the Rinebold prospect. In the breccia ore, however, it is fine grained and is fairly uniformly disseminated, chiefly in the matrix associated with the molybdenite. The phlogopite-biotite mica occurs in books and plates as much as three-quarters of an inch in diameter. It is conspicuous in the east lode and is partly altered. Some bodies and crystals of molybdenite terminate unconformably against flat faces of books and plates of the mica, apparently denoting that the mica is older than the molybdenite. The marmatite, which resembles specular hematite in appearence, occurs mainly in oxidized granite and was not observed to be intimately associated with the molybdenite. In the specimens examined it contains an unusually large quantity of iron. The muscovite also occurs chiefly disseminated in altered granite and seems to be secondary. The gold and silver occur chiefly in the west lode, where assay returns of $20 in gold and 8 ounces in silver to the ton, or more than enough to pay for working the deposit, are reported.

DECKER-HORTENSTINE PROSPECT NO. 2.

The Decker-Hortenstine prospect No. 2 is on a large southern tributary of the East Fork, about half a mile above its mouth (fig. 26). It is owned by Messrs. Decker and Hortenstine, who discovered and located it in 1920. It is on a 20-foot zone or lode of crushed and sheared granite and quartz, in which molybdenite is sporadically distributed in the form of small bodies and stringers. The lode trends about due west across the course of the stream for a distance of about 2,000 feet and is staked by two claims joining end to end at about 200 feet west of the stream. It is opened on the west slope of the valley by two cuts, one on each claim.

OTHER PROSPECTS.

In the 2 miles intervening between the Rinebold prospect and the Decker-Hortenstine prospect along Roaring River no molybdenite or other metallic mineral has yet been found. In the steep rugged west slope of the valley, however, at about half a mile west of the Decker-Hortenstine prospect (fig. 26), occurs a conspicuous large vein of white quartz, which strikes about northeast, extends for more than half a mile between altitudes of about 7,500 and 8,500 feet, and seems to dip steeply to the northwest, into the mountain. The writer did not learn whether this vein is mineralized or had been prospected.

PROBABLE ZONE OF MINERALIZATION.

About 20 miles N. 60° E. of the Rinebold deposits, and on their strike, is the formerly famous Atlanta gold-silver mining district, the strike of whose principal lode also agrees with this strike. The reported mineralized areas of the intervening Steel Mountain and of Grey Lock Peak, 2 miles beyond Atlanta, are on the same general line. All these deposits are locally regarded as being on the same zone of mineralization, which is said to continue 10 miles beyond Grey Lock Peak, into the Sawtooth Range. This supposed zone could not be investigated in the present work, but it is worthy of note that the strike of this zone parallels the prevailing strike of the foliation in the granite in the Rocky Bar camp, 4 miles to the east, as described by Eldridge,[6] where most of the veins strike and dip with the foliation planes. From these facts it is inferred that the

[6] Eldridge, G. H., op. cit., p. 282.

Rinebold prospect is probably on a more or less extensive and locally mineralized zone of fracture in the granite, which seems to be referable in origin to the same forces that produced the Rocky Bar mineralized foliation.

SOURCE OF THE MOLYBDENITE.

From the manner of occurrence of the molybdenite in association with the intrusive dikes and quartz veins, notably along their contact with the granite, and in quartz veins cutting the dikes, in fractures, seams, and as disseminated small bodies in the granite, and in quartz breccia, associated with pegmatitic material of the granite, and from its association with phlogopite-biotite mica, the source of the molybdenite seems beyond doubt to be the granite magna. The sequence of events leading up to its deposition appears to have been as follows: Soon after its intrusion and consolidation the granite was fissured and intruded by the dikes, after which and perhaps in part simultaneously therewith, quartz veins were formed, probably as hot viscous solutions both in new fissures and in reopened dike fissures alongside and within the dikes. The intrusion or deposition of the quartz veins was probably accompanied by meager mineralization through the deposition of pyrite and molybdenite. This deposition, however, was soon followed by further fracturing or adjustment that reopened preexisting fissures and formed new ones, especially in the quartz veins, in which the accompanying or closely following injections of mineral-bearing magmatic fluids, probably including gaseous solutions and vapors, the end products of the granite magma, made the principal deposition of minerals, notably the molybdenite.

PROMISE OF THE DEPOSITS.

Not enough development work has yet been done on the Roaring River molybdenite deposits to permit an adequate estimate of their value, but from the manner of their occurrence, their freedom from copper, and the gold and silver said to be associated with them they seem to be worthy of further exploration. As the oil-flotation process has recently been applied to concentrating molybdenite, deposits containing as low as 0.8 per cent of molybdenite can be worked profitably if there is sufficient demand for the product to warrant large-scale operations.

From the generally thin tabular forms in which the molybdenite occurs and the lack of alteration of the including rocks, the deposits probably do not contain large ore shoots. Those who exploit the deposits should not lose sight of the fact that molybdenite deposits in general the world over do not extend to great depths.

OTHER OCCURRENCES OF MOLYBDENITE IN IDAHO.

Several other deposits of molybdenite in Boundary, Idaho, and Lemhi counties, Idaho, have been described by Livingston.[7] To all of them the deposits on Roaring River are more or less similar. The deposits are all in or associated with granitic rocks and are similar to many deposits of molybdenite in such rocks in various parts of the world. Campbell[8] reports the occurence of molybdenite in Custer County and of molybdenum as molybdenate of lead in fissure veins in limestone.

BIBLIOGRAPHY.

The following list contains references to a few of the more important papers on molybdenum and molybdenite:

BONARDI, J. P., Analytical methods for certain metals: U. S. Bur. Mines Bull. 212, pp, 71-130. (Contains also a bibliography on the qualitative and quantitative chemistry of molybdenum.)

CROOK, A. R., Molybdenite at Crown Point, Wash.: Geol. Soc. America Bull., vol. 15, pp. 283-288, 1904.

HESS, F. L., The molybdenum deposits of the world: U. S. Geol. Survey Bull. 761 (in press).

RASTALL, R. H., Molybdenum ores: Imp. Inst. Monographs on mineral resources, with special reference to the British Empire, London, 1922. (Contains a relatively full bibliography on molybdenum.)

U. S. BUR. MINES, memorandum for the press, November, 1923.

U. S. GEOL. SURVEY, Contributions to economic geology. Contain papers by various geologists, mostly as follows: Bull. 260, pp. 197-199; 340, pp. 231-239; 430, pp. 154-163; 640, pp. 73-76; 666, pp. 9-11; 692, p. 329; 750-A, pp. 5-8.

U. S. GEOL. SURVEY, Mineral Resources. Contain numerous references to different occurrences of molybdenite. Those for 1906 to 1922 include papers by Frank L. Hess.

[7] Livingston, D. C., Tungsten, cinnabar, manganese, molybdenum, and tin deposits of Idaho: Idaho Univ. School of Mines, vol. 14, Bull. 2, January, 1919.

[8] Campbell, Stewart, Idaho Insp. Mines Twenty-fifth Ann. Rept., p. 33, 1924.