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QUICKSILVER DEPOSIT AT BUCKSKIN PEAK NATIONAL MINING DISTRICT HUMBOLDT COUNTY, NEVADA

A PRELIMINARY REPORT

BY

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NATIONAL MINING DISTRICT, HUMBOLDT COUNTY, NEVADA
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By Ralph J. Roberts

ABSTRACT

The Buckskin Peak quicksilver deposit lies near the summit of Buckskin Peak, in the National mining district, Humboldt County, Nev. Fifty-eight flasks of quicksilver were produced from it in 1938.

The oldest rocks of the district are closely folded phyllites and quartzites of pre-Tertiary age. These are overlain by Tertiary flows of basalt, latite, trachyte, and rhyolite, with which some tuffs and sedimentary rocks are interbedded.

There are two types of ore deposits in the National district: gold-silver veins that locally contain cinnabar and cinnabar-bearing siliceous sinter deposited by hot springs. The sinter, whose maximum thickness probably does not exceed 125 feet, covers an area of about 652,000 square feet. It is of two kinds: one kind is banded and composed chiefly of opal and chalcedony that formed by direct precipitation from siliceous spring waters; the other is composed of rock fragments cemented by chalcedony and opal.

Both kinds of sinter contain cinnabar. The cinnabar is for the most part finely disseminated through certain layers and irregular masses of opaline and chalcedonic silica; locally it fills cavities. The cinnabar-bearing layers appear to be few in number, and they range from a fraction of an inch to 5 feet or more in thickness. Four cinnabar-bearing zones have been recognized in underground and surface workings, but their lateral extent is not fully known. The average content of quicksilver in these zones appears to be about 5 pounds to the ton. One block of about 75,000 square feet is calculated to contain about 1,000 flasks of quicksilver.1/ The estimated reserves of the entire deposit may be as much as 3,000 flasks that can probably be mined profitably when the price is $180 or more a flask.2/

1/ A flask contains 76 pounds.
2/ Eng. and Min. Jour., vol. 141, No. 4, p. 61, April 1940.

INTRODUCTION

The Buckskin Peak quicksilver deposit, in the McCormick group of claims, in sec. 11, T. 45 N., R. 39 E., Humboldt County, is in the southern part of the National mining district (see fig. 20). The deposit is at the summit of Buckskin Peak, which has an altitude of about 8,730 feet (barometric), in the northern part of the Santa Rosa Range.

Buckskin Peak is 75 miles by road north of Winnemucca, the nearest railroad point. The road to the peak leaves the Winnemucca-McDermitt highway (State Route 8) about 60 miles north of Winnemucca; the next 15 miles of road is steep in places but was in good condition in 1939. The last few miles of the road is commonly closed by snow 4 or 5 months during the winter.

During September and October 1939 the writer, assisted by A. E. Granger, spent 9 days in field work in the district. The geology and topography of half a square mile surrounding the deposit was mapped on a scale of 1:6,000, or 500 feet to the inch, and the underground workings were mapped on a scale of 1:240, or 20 feet to the inch. A geologic sketch map was also made of the area on the south side of Buckskin Peak and Canyon Creek. Thanks are due D. C. McCormick, Chalmers McCormick, and John Dermody for their hospitality and assistance. The writer is also indebted to H. G. Ferguson, of the Geological Survey, for helpful advice both during field work and in preparation of this report.

HISTORY

Prospectors, presumably looking for silver and gold ores, had staked claims on Buckskin Peak prior to the discovery of

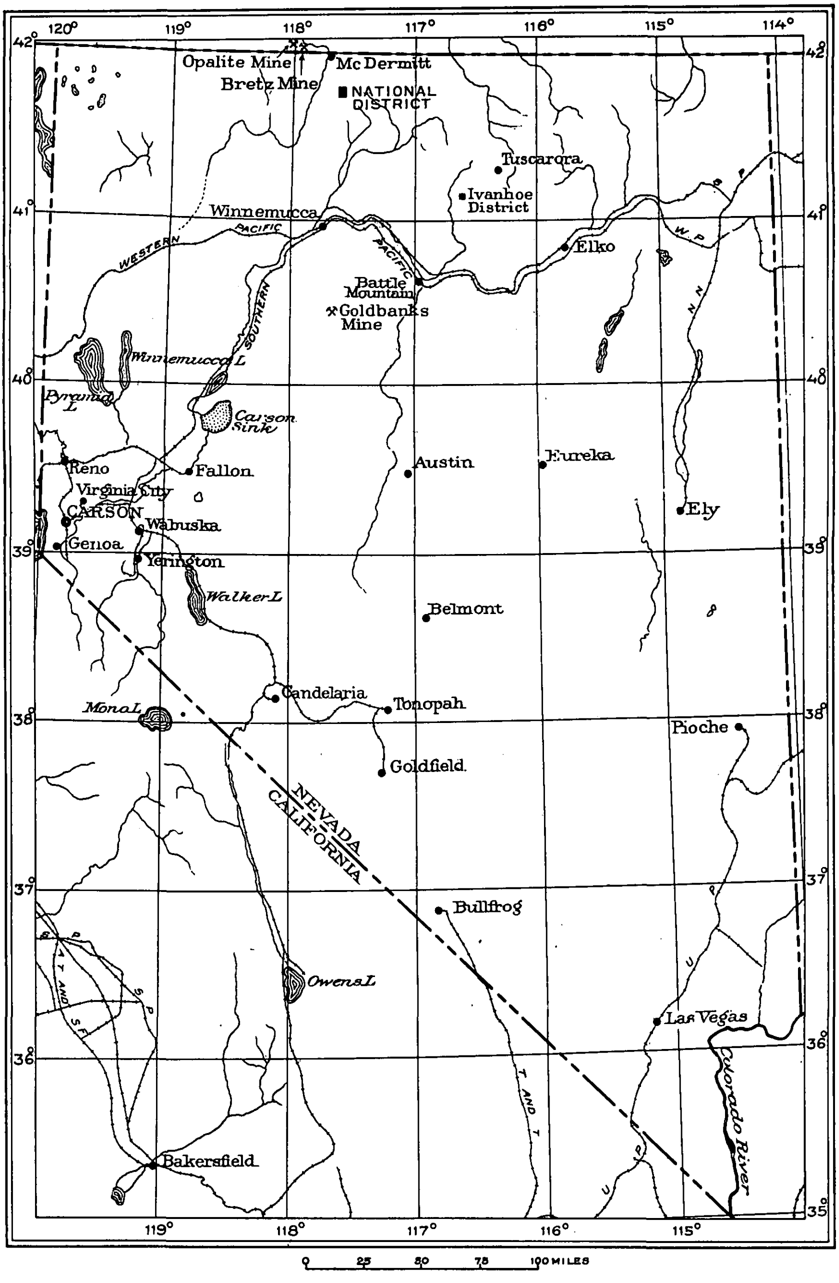

Figure 20.--Index map of Nevada showing location of National mining district and other cinnabar-bearing siliceous sinter deposits.

the gold deposits of the National mining district in 1907.[3] The Buckskin National mine, about 3,500 feet east of the summit, has been worked intermittently since 1912 (fig. 21).

Between 1922 and 1928, while prospecting for gold and silver, Chalmers McCormick located 16 claims and 2 fractions on Buckskin Peak adjacent to the Buckskin National property. These claims, known as the McCormick group, and owned by D. C. McCormick, John Dermody, and Julia C. Ward, cover the peak and include the quicksilver deposit. Although the presence of cinnabar on the peak has been known since 1911,[4] the presence of ore of commercial grade was not recognized until 1928, when John Dermody discovered cinnabar float on the slopes and traced it to the siliceous sinter blanket. Subsequent development work has shown cinnabar at several places in the sinter.

Fifty-eight flasks of quicksilver was produced in 1938 from a one-tube oil-fired retort. This production came from sorted ore, some of which is reported to have yielded as much as 120 pounds of quicksilver to the ton. There was no production in 1939.

The McCormick group was optioned to Clarence H. Hall, of Manhattan Beach, Calif., late in 1939.[5] It is reported that a 30-ton rotary furnace was being installed in April 1940.[6]

3/ Lindgren, Waldemar, Geology and mineral deposits of the National mining district, Nevada: U. S. Geol. Survey Bull. 601, p. 14, 1915.
4/ Idem, p. 51.
5/ Min. Jour., vol. 23, No. 17, p. 31, 1940.
6/ Min. Press, vol. 3, No. 11, April 1940.

GEOLOGIC MAP AND SECTIONS OF BUCKSKIN PEAK, HUMBOLDT COUNTY, NEVADA

1940

GEOLOGY

The northern part of the Santa Rosa range includes a basement of folded pre-Tertiary rocks locally intruded by small granitic bodies.[7] These rocks are overlain by a younger group of eastward-dipping Tertiary lavas with intercalated tuffs and sedimentary rocks. A Tertiary or Quaternary siliceous sinter deposit containing cinnabar rests on the Tertiary rocks (pl. 23, A).

Pre-Tertiary rocks

The pre-Tertiary rocks exposed in Canyon Creek (fig. 21) include phyllite and quartzite. They strike north and dip east and west. The rocks are closely folded where seen along the valley sides. Their exact age is unknown, but they resemble Triassic rocks of the Sonoma Range, to the south.

Tertiary rocks

General features

According to Lindgren[8] the oldest Tertiary rocks that crop out in the National district are lake beds and tuffs. These are overlain successively by latite and trachyte, basalt, and rhyolite. Lindgren's map is generalized in figure 21, and only two units are shown: pre-rhyolite rocks and rhyolite. Lindgren[9] correlated the basalt with the Miocene Columbia River basalt to the north. The other volcanic rocks are possibly also of Miocene age.

The volcanic sequence on Buckskin Peak does not exactly correspond to the sequence shown by Lindgren north of Buckskin

7/ Lindgren, Waldemar, op. cit., pp. 11-12.
8/ Idem, pp. 23-29.
9/ Idem, p. 23.

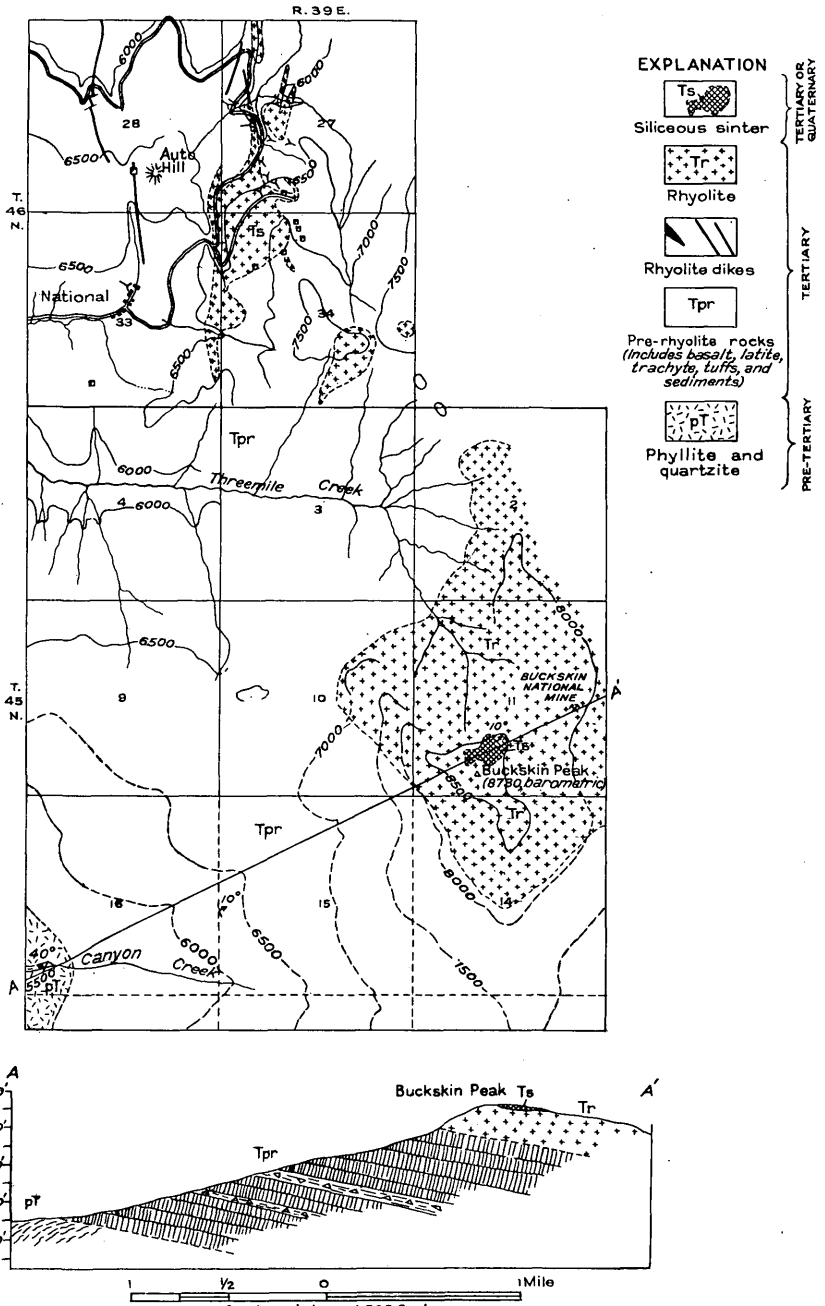

Figure 21.--Geologic map and section of the National mining district and Canyon Creek, Humboldt County. Geology and topography of area northwest of Buckskin Peak after Lindgren (Bull. 601, pl. 1). Geology and topography of Buckskin Peak generalized from plate 21 of this report. Geology southwest of Buckskin Peak sketched by Ralph J. Roberts and A. E. Granger. Topography modified after Paradise quadrangle map of U. S. Geological Survey.

Peak. As the northern part of the district was not visited, only the rocks exposed on Buckskin Peak and farther south are described.

Pre-rhyolite rocks

The pre-rhyolite rocks on Buckskin Peak and in Canyon Creek are predominantly lavas with intercalated thin tuff and sedimentary units. An aggregate thickness of about 5,000 feet is exposed. These rocks strike northwest and dip 10°- 15° NE.

Basalt is the most abundant pre-rhyolite volcanic rock in the district. In Canyon Creek it rests unconformably on the pre-Tertiary rocks and is a continuation of the basalt unit mapped by Lindgren in the National district. It is black and ranges from dense to fine-grained. Some flows are porphyritic. The maximum thickness appears to be about 4,500 feet.

Several thick flows of volcanic rock tentatively classed as trachyte overlie basalt on the southern side of Buckskin Peak. This rock is generally dark gray to brownish black and contains sparse feldspar phenocrysts. The basal parts of the flows are locally glassy. The trachyte appears to be conformably overlain by rhyolite on Buckskin Peak.

Rhyolite

The rhyolite mass that forms the upper part of Buckskin Peak is about 900 feet thick. The rhyolite is massive for the most part, but locally it has well-developed flow structure. Most of it is dense and contains sparse phenocrysts of quartz, feldspar, and biotite. At the summit (pl. 21) it is a pink, white, or light-gray rock with abundant lithophysae as much as an inch in diameter. On the flat just north of the highest point it is silicified and its feldspars have been leached out, but even here the flow structure and lithophysae are mostly well-preserved.

Although most of the rhyolite appears to consist of lava flows, it may be in part intrusive. An elongate area of obsidian on the southwest slope of the peak may be either a chilled border of a flow or an intrusive mass. Lindgren [10] noted obsidian in rhyolite dikes near National. According to Lindgren the rhyolite is overlain by later basalt on the east slope of Buckskin Peak.[11]

Tertiary or Quaternary rocks

Siliceous sinter

The youngest formation exposed near the summit of Buckskin Peak is the cinnabar-bearing siliceous sinter (pl. 22). This rock forms a blanket that has a maximum length of 1,370 feet, a maximum width of 770 feet, and covers an area of about 652,000 square feet. Its maximum thickness is unknown but probably does not exceed 125 feet. The sinter rests everywhere on rhyolite, but the contact is exposed only along the southeastern side of the deposit. Here the sinter overlies silicified flow-banded rhyolite and contains abundant fragments of rhyolite at the base.

Two kinds of sinter, banded and clastic,may be distinguished. The banded sinter is a white to light-gray rock composed chiefly of layers of opal and chalcedony; the layers are commonly wavy or minutely crenulated. This sinter was formed by direct precipitation from siliceous hot-spring waters. It grades into the clastic sinter, which contains fragments of rhyolite, sinter, and quartz and feldspar crystals cemented by chalcedony and opal. The fragments, some of which are as much as 6 inches in diameter, are mostly angular but in part subrounded. They have been

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10/ Lindgren, Waldemar, op. cit., pp. 28-29.
11/ Idem, p. 50.

transported, and were derived in part from the surrounding rhyolite and in part from previously deposited sinter. The cementing silica was produced by the continuing activity of hot springs.

The two kinds of sinter are interbedded in places, but the clastic sinter is the more abundant. Both kinds are locally porous, especially in the lower part of the deposit, apparently because of leaching by spring waters.

Over most of the area the bedding of the sinter strikes northwest and dips 5° to 20° NE. Dips as steep as 35° NW. on the northwest side may indicate a slumped part of the main blanket or the site of a local spring that deposited sinter on a northwesterly slope.

The chief locations of the hot spring or springs that deposited silica and cinnabar appear to have been on the flat just north of the summit. Here the exposed rhyolite is highly silicified, but much of the flat is covered by detritus, and no actual openings were seen. The springs may have issued along a north-trending fissure, parallel to the rhyolite dikes in the northern part of the district (fig. 21).

The age of the sinter is uncertain. Lindgren [12/] regarded it as a surficial deposit formed in late Tertiary time, soon after the extrusion of the rhyolite, and genetically related to the veins of the district. On the other hand, the sinter may be correlative with other cinnabar-bearing siliceous sinter deposits in this region described by Dreyer [13/] and Schuette [14/] and thought by them to be of Quaternary age.

12/ Lindgren, Waldemar, op. cit., pp. 30, 51.
13/ Dreyer, R. M., Goldbanks mining district, Pershing County, Nevada: Nevada Univ. Bull., vol. 34, No. 1, p. 16, 1940.
14/ Schuette, C. N., Quicksilver in Oregon: Oregon Dept. Geol. and Min. Ind., Bull. 4, p. 148, 1938.

The veins and the sinter of the National district are chemically similar in that they both contain gold, silver, and quicksilver (see p. 126). However, this similarity may have no genetic significance, and the two types of deposits may have been formed in different periods of the long-continued hydrothermal activity of the area.

ORE DEPOSITS

The gold and silver deposits of the National mining district were not visited but they have been described in detail by Lindgren,[15] and Winchell,[16] and more recently by Vanderburg.[17]

The veins fill north-trending fissures and dip steeply east and west. They generally show symmetrical depositional banding and are vuggy in some places. Stibnite is the common sulphide; pyrite, arsenopyrite, galena, sphalerite, and other minerals are found locally. The only metals produced from the veins are gold and silver. Cinnabar was found in two prospects on Auto Hill (fig. 21), but it has not been exploited. Lindgren [18] mapped Buckskin Peak and noted silicified rhyolite and siliceous sinter near the summit. It was reported to him that the sinter contained traces of quicksilver, but he found no cinnabar in specimens that he examined.

Cinnabar-bearing siliceous sinter deposits

The fact that quicksilver has been produced from several siliceous-sinter deposits in the surrounding region (fig. 20) suggests that similar deposits in the National mining district

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15/ Lindgren, Waldemar, op. cit., pp. 30-55, 1915.
16/ Winchell, A. N., Geology of the National mining district, Nevada: Min. and Sci. Press, vol. 105, pp. 658-659, 1912.
17/ Vanderburg, W. O., Reconnaissance of mining districts in Humboldt County, Nevada: U. S. Bur. Mines I. C. 6995, pp. 31-37, 1938.
18/ Lindgren, Waldemar, idem, pp. 32-33, 50-51.

and elsewhere, even though not productive now, may become so in the future, especially at times when the price of quicksilver is high. The neglect of such deposits in the past seems to have been due to two main causes: first, the deposits are of such low grade that a large tonnage must be assured before operations can prudently be begun; second, they may long fail to be recognized as quicksilver-bearing, because the cinnabar in them turns dark on exposure to light and shows its typical red color only on freshly broken surfaces.

Three sinter deposits--the Opalite and Bretz properties in Malheur County, Oreg., close to the Nevada line (fig. 20) and the Goldbanks deposit, south of Winnemucca--have produced quicksilver. Their production is as follows:

Deposit	Years	Quicksilver produced (flasks)	Average recovery (pounds per ton)
Goldbanks 1/	1914-18	1,461 +	10 +
Opalite 2/	1926-37	11,300	5.6
Bretz 3/	1931-36	7,751	17.8

1/ Dreyer, R. M., op. cit., pp. 27-28.
2/ Schuette, C. N., op. cit., p. 159.
3/ Idem, p. 163. Most of the Bretz mine production came from cinnabar-bearing lake beds beneath a cap of siliceous sinter that contained sparse cinnabar.

The Ivanhoe district in Elko County, Nev., has made a small production from two mines in siliceous sinter.

Buckskin Peak deposit

Cinnabar-bearing zones in the siliceous sinter of Buckskin Peak (pl. 21) crop out on the northwest and southeast sides of the blanket and are developed in surface cuts and trenches and in underground workings. The blanket contains at least four cinnabar-bearing zones, but the workings do not show their full extent. The cinnabar appears to be confined entirely to the sinter; none has been found in the underlying rhyolite.

Mineralogy

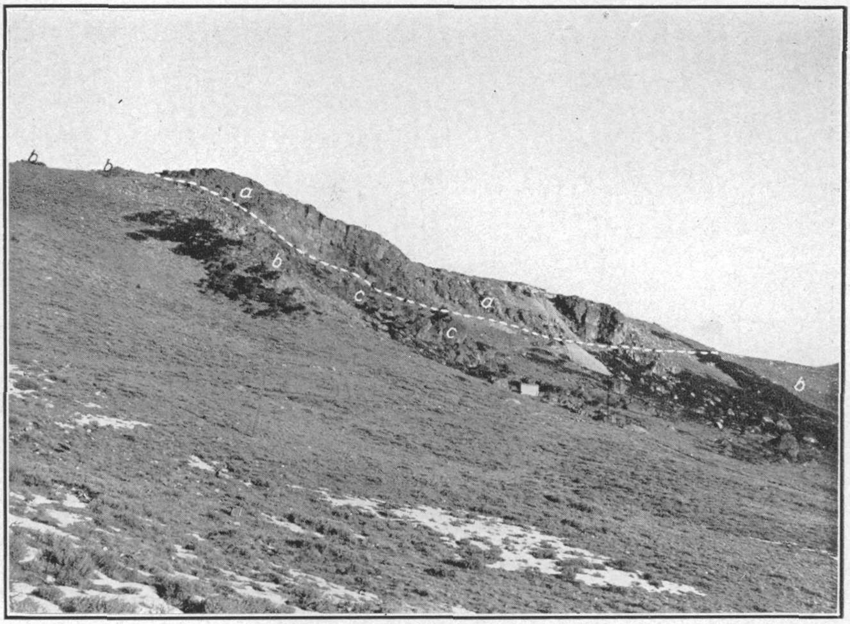
Cinnabar is the only ore mineral recognized in the deposit. In some places massive cinnabar forms layers and small masses, but for the most part it is finely disseminated through a chalcedonic and opaline silica gangue. All gradations from nearly massive cinnabar to barren silica may be found, and the cinnabar-bearing sinter ranges from red to light pink on a freshly broken surface. In the banded sinter the cinnabar-bearing bands are interlayered with barren silica. In the clastic sinter cinnabar is almost entirely confined to the silica cement between fragments. Some cavities in the sinter are lined with cinnabar, opal, and chalcedony. The cinnabar-bearing zones are parallel to the bedding of the sinter (pl. 23); cinnabar and silica were apparently precipitated simultaneously at certain stages of hot-spring activity. Dreyer [19] and Schuette [20] have shown that silica and cinnabar are contemporaneous in similar deposits at Goldbanks, Nev., and in Malheur County, Oreg.

A few dark specks that may be pyrite were seen in some specimens under the microscope. Porous iron oxides locally coat the cinnabar.

The typical red color of cinnabar can be seen only on freshly broken surfaces, for the cinnabar turns dark upon exposure to light. This change has been noted in the other cinnabar-bearing sinter deposits of the region.[21]

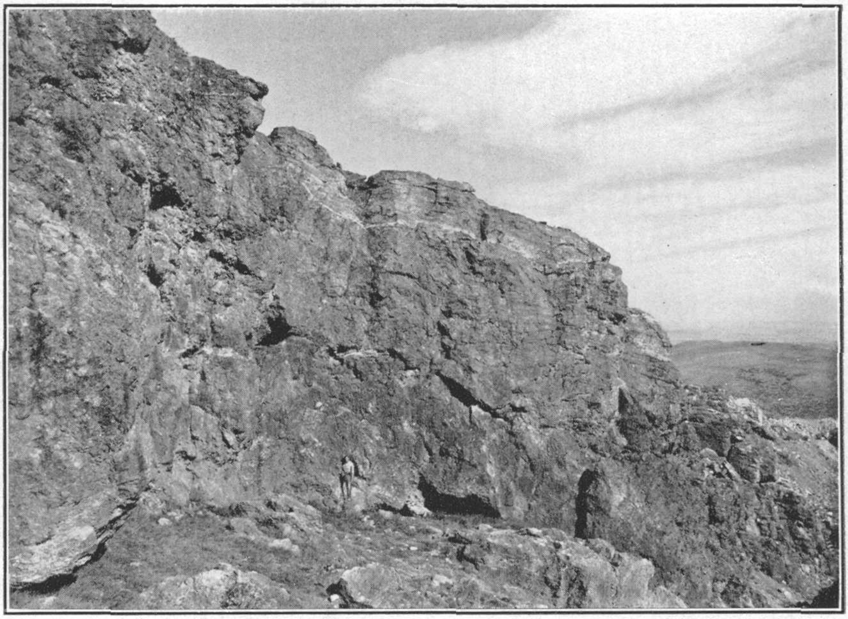
According to Lindgren [22] the sinter was reported to contain traces of gold and silver. Of two specimens collected by the present writer and assayed by Ledoux & Co., New York, the one showed a trace of gold and 0.10 ounce of silver to the ton; the other showed a trace of gold and a trace of silver.

19/ Dreyer, R. M., op. cit., pp. 33-36.
20/ Schuette, C. N., op. cit., pp. 151-152.
21/ Schuette, C. N., op. cit., p. 152. Dreyer, R. M., op. cit., pp. 30-31.
22/ Lindgren, Waldemar, op. cit., p. 51.



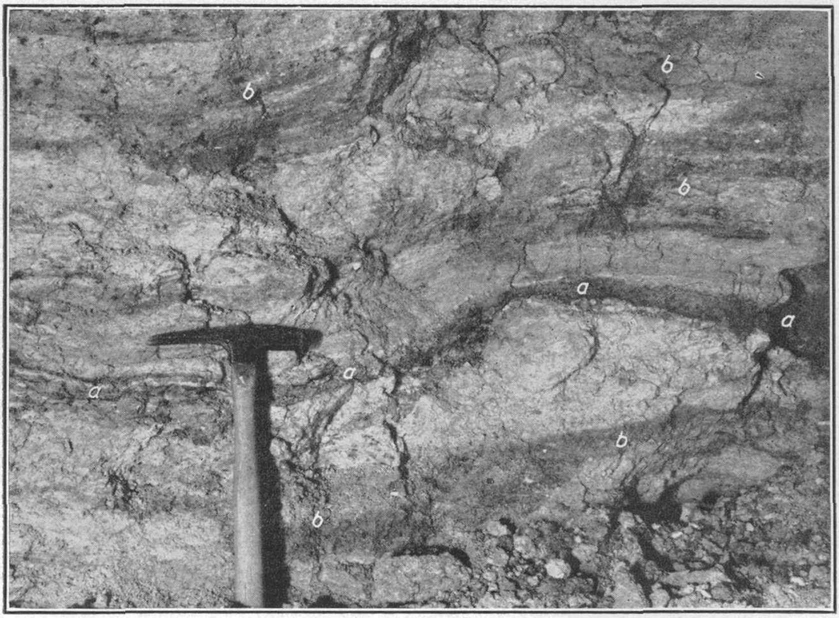
A. VIEW OF SILICEOUS SINTER BLANKET FROM THE SOUTH.

The mine dump is at the portal of the 8518 adit. Siliceous sinter (*a*), rhyolite (*b*), talus (*c*).

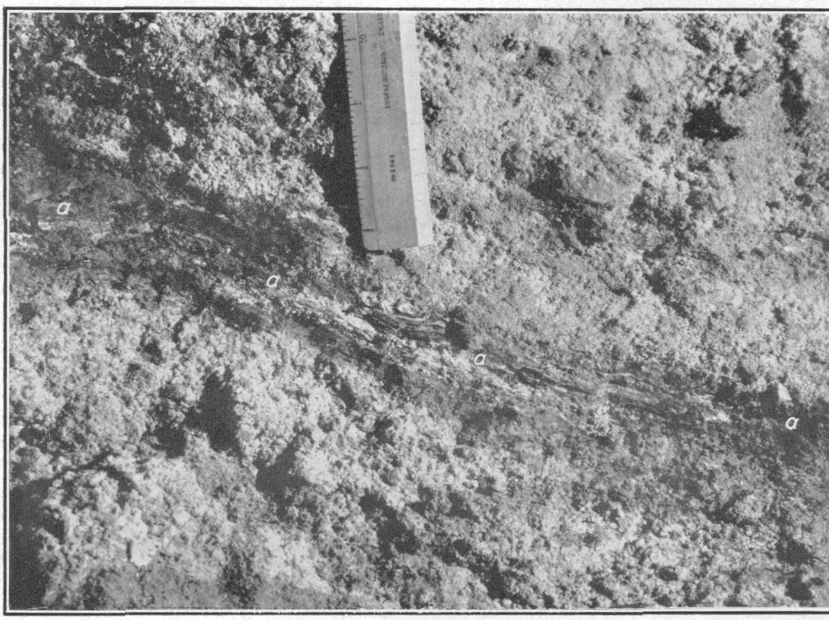


B. CLIFF EXPOSURE OF SINTER ON THE SOUTHEAST SIDE OF THE BLANKET.

The lower part is chiefly porous and clastic sinter; the upper part is banded and clastic sinter. Scale is shown by the man in the central foreground



A. CINNABAR-BEARING LAYER (*a*) IN POROUS SINTER LOCALLY STAINED BY IRON OXIDES (*b*) IN FACE OF ADIT, WEST WORKINGS.



B. CINNABAR-BEARING LAYER FINELY LAMINATED (*a*) IN POROUS SINTER, WEST WORKINGS.

The left side of the scale is graduated in inches.

Lindgren also reported that small, reddish-brown spots in the sinter gave a test for selenium. By spectrographic analysis K. J. Murata, of the Geological Survey, found appreciable quantities of titanium in two specimens of cinnabar-bearing sinter.

Mine workings

The underground workings at the time of visit included the East workings, in the northwestern part of H. & M. 2 claim; two shafts in the central part of the deposit; and the West workings, near the line between the Florence and Lone Eagle claims. The underground workings aggregate about 450 feet in length. The surface workings include several shallow pits and open cuts. The shafts and adits are designated by their respective altitudes.

East workings.--The East workings, on H. & M. 2 claim (fig. 22) for the most part follow cinnabar-bearing bands in the sinter. The 8518 adit is in porous, locally iron- and manganese-stained sinter that does not contain cinnabar. The raise to the 8548 level (fig. 22, section A-A') passes into banded and clastic sinter that contains patches of cinnabar (zone 1) extending from the shaft 25 feet northeastward. This zone is as much as 6 inches thick but the ore is of low grade in most places. A little cinnabar also coats fragments in rubbly sinter at the northeast end of the 8548 level.

The 8566 and 8570 adits follow two other cinnabar-bearing zones, known as zones 2 and 3, in banded and clastic sinter, which crop out along the cliffs. As shown in figure 22, sections A-A', B-B', the two zones are separated by 4 or 5 feet of barren sinter. Zone 2 is as much as 4 feet thick and contains discontinuous layers and small masses of cinnabar, generally intermixed with silica. A few layers of nearly pure

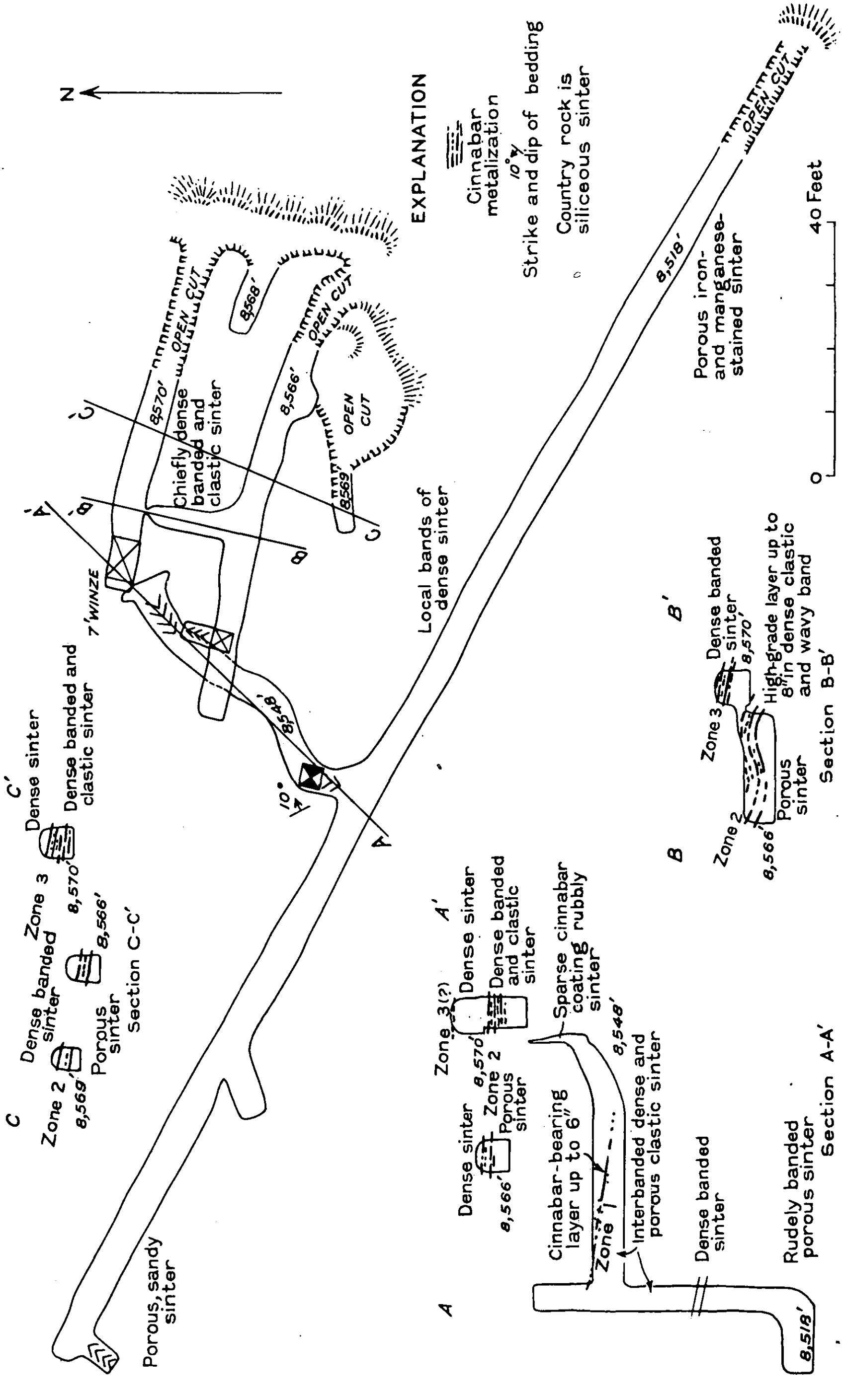


Figure 22.--Map and sections of the East workings, McCormick group.

cinnabar as much as 1 inch thick were seen. Zone 3, as shown in the 8570-level workings, is in places as much as 4 feet thick and consists of interbanded dense and porous sinter with layers and small masses of high-grade ore 2 inches or less in thickness.

Surface outcrops indicate that these zones pinch out to the south; they are covered by detritus to the northwest.

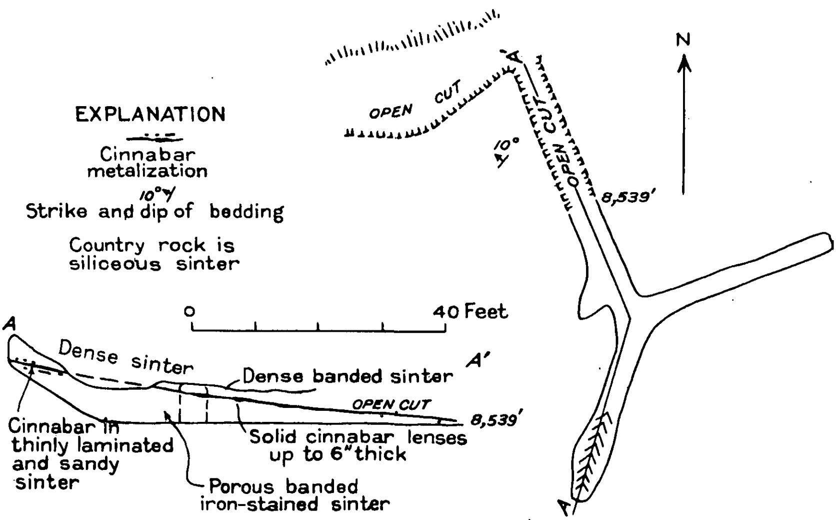


Figure 23.--Map and section of West workings, McCormick group.

West workings.--Only one cinnabar-bearing zone is exposed in the West workings (fig. 23, section D-D'). Here the zone in porous sinter is continuous throughout the workings and ranges from 1 inch to 24 inches in thickness. It locally contains a layer of nearly pure cinnabar as much as 6 inches thick and some small masses of cinnabar that occur in the porous sinter adjacent to the main band (pl. 23). Whether this zone is identical with any of the other three is not definitely known, for it can only be traced about 30 feet south and 20 feet north of the west adit portal; but it may be a continuation of zone 3, as suggested in figure 24.

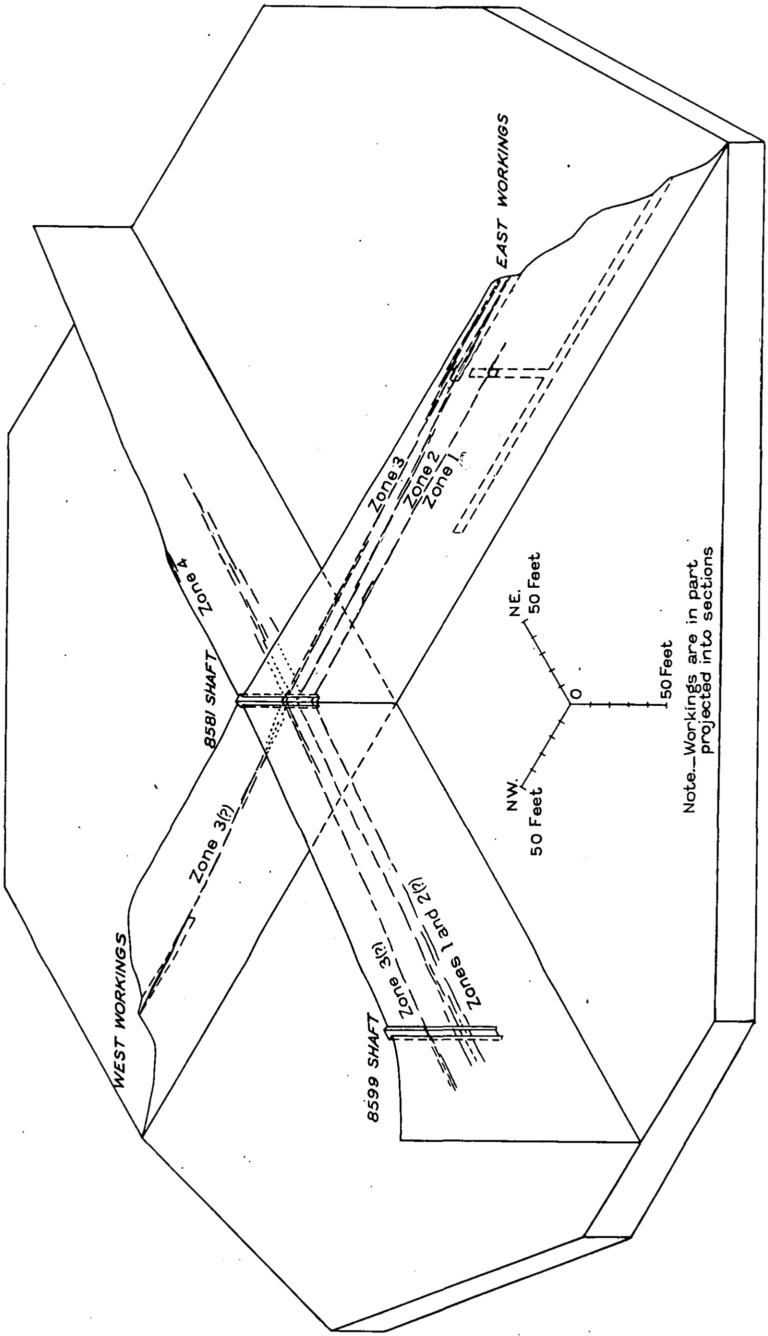
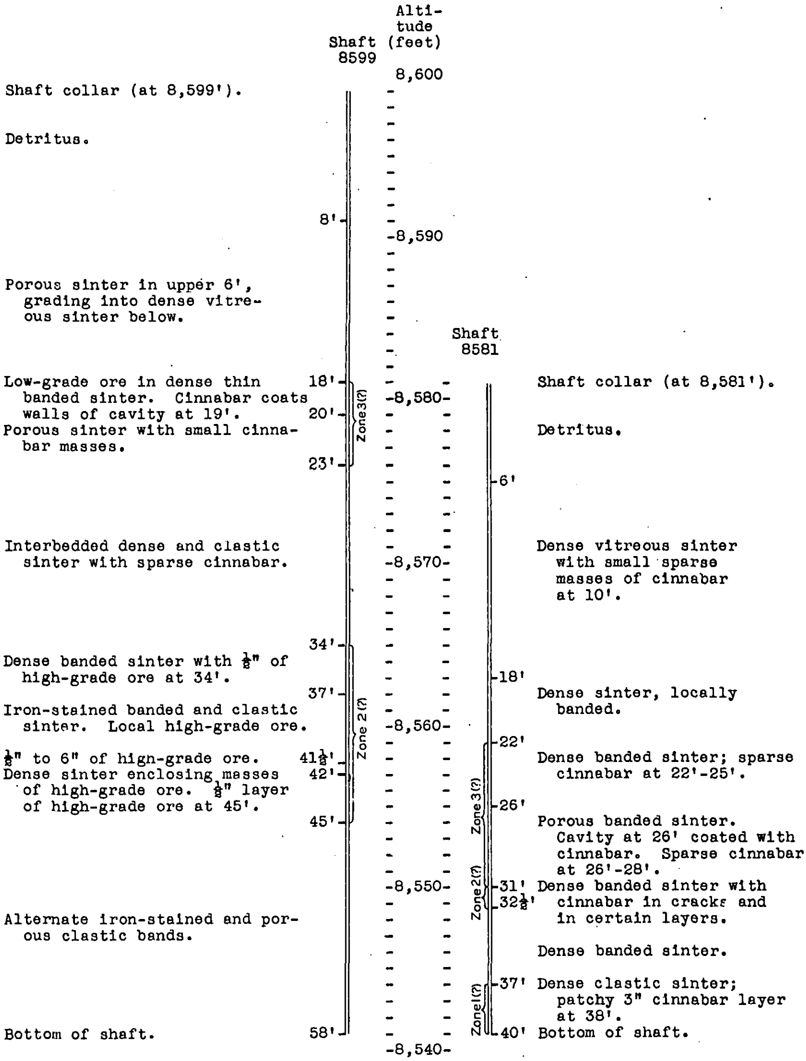


Figure 24.--Diagram showing possible extension of ore zones, McCormick group.

<u>Shafts</u>.--The two shafts in the central part of the sinter deposit penetrate ore zones that may be continuations of zones 1, 2, and 3. Detailed sections in these shafts are as follows:

Correlation of sections in shafts 8599 and 8581



The ore zones at depths of 18 to 23 feet and 34 to 45 feet in the 8599 shaft are probably continuations of zones 2 and 3 mapped in the east adits (fig. 24). Only one thick zone was cut in the 8581 shaft; this zone may be a continuation of zone 3. Two thin zones at 31-32½ feet and at 38 feet in the 8581 shaft may be continuations of zones 2 and 1 respectively.

8575 open cut.--The open cut on the 8,575-foot contour northeast of shaft 8581 shows an ore zone (zone 4) as much as 3 feet thick in clastic and banded sinter. This zone appears to thin out to the northeast, but it contains some high-grade ore.

Reserves

The surface and underground workings (pl. 21) show that there are cinnabar-bearing zones along the northwest and southeast sides of the sinter blanket. Pits, open cuts, and shafts on the surface of the blanket have exposed cinnabar-bearing sinter at many places. Whether any single zone will prove to be continuous throughout the entire deposit is doubtful. However, as indicated in the isometric diagram (fig. 24), cinnabar-bearing sinter is probably present throughout the area of about 75,000 square feet bounded by the East workings, shaft 8599, West workings, and 8575 open cut.

Zone 1 appears to be too thin to mine at any likely price, but the ore in zones 2 and 3 has a net thickness of as much as 8 feet (not including the intervening barren sinter). Zone 3 (?) in the west adit ranges from an inch to 2 feet in thickness, and zone 4 in the 8575 open cut is as much as 3 feet thick. Preliminary sampling by the owners indicates that the exposed ore zones contain, on the average, about 5 pounds of quicksilver to the ton.

If it may be assumed that the cinnabar-bearing zones in this block (fig. 24) average 3 feet in thickness and contain 5 pounds of quicksilver to the ton, a minimum of 1,000 flasks of quicksilver may be present there.

The reserves in the rest of the deposit are speculative, but it is probable that the ore zones shown in figure 24 extend beyond the limits of the block, and there may be other zones below the shaft bottoms. Furthermore, the cinnabar showings in the southwestern and southeastern parts of the blanket are probably not correlative with any of the zones that have been described, and they may prove to be of commercial grade and quantity. It is thus reasonable to assume that the total reserves of the deposit may be as much as 2,000 or even 3,000 flasks of quicksilver.

Inasmuch as the ore appears to be of low grade and mining would entail the stripping of considerable barren sinter or the use of expensive underground methods, quicksilver would have to be high in price to make mining profitable. The ore can probably be mined profitably so long as the price of quicksilver remains at or above $180 a flask.

O