

QUICKSILVER IN OREGON

By

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History of Quicksilver Production

Oregon mines have produced 101,783 flasks (76 pounds per flask) of quicksilver valued at approximately \$14.1 million. Of this amount, 98,542 flasks have been produced since 1927 when continuous production was begun in the State.

The yearly average of Oregon quicksilver production from 1927 through 1945 was about 4,265 flasks. The greatest production was made in 1940-41 when more than 20 mines contributed in excess of 9,000 flasks each year for an average price of \$180.95 per flask. From 1936 through 1944, Oregon ranked second only to California in annual output.

The major producers during this period were the Black Butte mine in Lane County, reopened in 1927 by the Quicksilver Syndicate; the Opalite and Bretz mines in Malheur County, put in operation by the Bradley Mining Company in 1927 and 1931, respectively; the Horse Heaven mine in Jefferson County, which came into production in 1934 and in 1936 was acquired by Horse Heaven Mines, Inc., a division of the Sun Oil Company; and the Bonanza mine in Douglas County, which began active and continuous production in 1937 when operated by Bonanza Mines, Inc.

Following the cancellation of purchase contracts late in World War II and the attendant purchases of large stocks of foreign quicksilver by the United States Government, prices began a decline which resulted in the closure of nearly all domestic quicksilver mines. Oregon's production in 1950 was five flasks valued at \$81.26 per flask.

In 1951 the market price rose to an average of \$210.13 a flask and remained at about the \$200 level until mid-1954 when purchases for the Atomic Energy Commission created a shortage which forced prices to an all-time peak of \$330 in October 1954. A mercury procurement program enacted by The General Services Administration in July 1954 had the effect of establishing a floor price of \$225 on domestic mercury for the 4½ years ending December 31, 1958. Although the market price remained considerably above the government price until late 1957, the floor price tended to stabilize the market and encourage the revitalization of the quicksilver industry.

Oregon's production, which averaged about 800 flasks for the years 1951 through 1954, was contributed largely by the Bonanza mine. In 1955 the Horse Heaven mine was reopened, but production costs proved too high to allow exploration and development work. Consequently, after removing accessible pillars and broken ore the mine was closed permanently, so far as its owners were concerned, in April 1958. The

Bretz and Black Butte mines came into production again late in 1956. Operations at the Black Butte, however, were short lived. At the Bretz, following the discovery of a new orebody adjacent to the old workings, a 150-ton flotation plant was put in operation by the Arentz-Comstock Mining Venture, Salt Lake City, in November 1956.

Origin of the Deposits

Most of Oregon's quicksilver deposits are concentrated in or adjacent to areas of Tertiary volcanism. For this reason it seems likely that volcanism has been the source of the quicksilver solutions. The five major producing mines and a large number of the lesser deposits occur in Tertiary volcanic rocks or in mixed sediments containing material of volcanic origin. A relatively small number of prospects are found in rocks other than Tertiary volcanics. In southwestern Oregon several deposits occur in pre-Tertiary metamorphic rocks, serpentine, and acid plutonic rocks. Scattered deposits of minor consequence occur in metamorphic rocks in the Blue Mountains of northeastern Oregon and in the Pueblo Mountains of southern Harney County. At least two prospects in Grant County occur in Mesozoic sediments. Most of the deposits in the older rocks are so closely associated both areally and structurally with Tertiary rocks that there is little question of their close genetic relationship with Tertiary volcanics.

The factors controlling the localization of quicksilver deposits from ascending solutions appear to be primarily structural, followed in importance by changes in the physical and chemical characteristics of the solutions as they react with the invaded rock and mingle with ground water on nearing the surface.

Nearly all Oregon deposits occur in fractured or brecciated rocks lying in or near conspicuous faults or brecciated contact zones. In a few of the smaller deposits, and in parts of larger ones, cinnabar is found along joints, bedding planes, and other small partings in an essentially unfractured rock. Deposits in which cinnabar has replaced minerals of the host rock are unknown in the State, although the replacement of secondary silica or carbonate minerals introduced during an earlier stage of mineralization may have occurred in several deposits.

The structural conditions responsible for the fracturing and brecciation which localized the ore bodies are diverse. At the Bonanza mine the host rock was fractured during anticlinal uplift. Fracturing at Horse Heaven occurred within and along the margins of an intrusive plug. In the Ochoco district in central Oregon, the localizing fractures may represent tensional stresses along the crests of anticlines. In southeastern Oregon the deposits are localized along faults of the Basin and Range type.

In some deposits the damming action caused by impervious cappings such as the shale overlying the Bonanza deposit and the clay soil horizon overlying parts of the Horse Heaven deposit is believed to have played an important role in the localization of the ore. However, in many deposits such as the Black Butte, no impervious cappings exist, although clay gouge locally developed along fractures has probably impeded the rising solutions thus promoting deposition.

Wall Rock Alteration

Rocks in the vicinity of the quicksilver deposits have been considerably altered by the hydrothermal solutions from which the quicksilver minerals were deposited. As in the localization of deposits, a governing factor in the degree of alteration of the wall rock is the intensity of fracturing it has undergone. Near many of the deposits, alteration has been so intense that the original character of the rock is indeterminable, and adjacent to some of the larger deposits, areas as large as a square mile have been at least partially altered.

Clay minerals are the most common alteration product. Carbonates (calcite, siderite, and ankerite) and silica (fine-grained quartz, chalcedony or opal) are frequently abundant and widespread. Iron sulphides, pyrite, and marcasite are almost nowhere completely absent and in some deposits are abundant.

In southwestern Oregon many of the deposits are characterized by introduced silica and carbonate minerals which commonly occur as veinlets in softened rock and therefore result in narrow iron-stained ribs on weathered surfaces. Introduced silica and carbonate minerals are not so abundant in central Oregon. Deposits in the Opalite district of southeastern Oregon occur in or near lenticular masses of silicified tuffs and lake beds.

Description of the Occurrences

Distribution

Quicksilver occurrences are widely scattered throughout Oregon. More than 250 deposits in 17 counties have been prospected and quicksilver has been produced from at least 70 of these deposits. Most of the deposits are concentrated in three general areas: (1) southwestern Oregon, including parts of Lane, Douglas, Jackson, and Josephine counties, (2) central Oregon, including parts of Jefferson, Crook, and Wheeler counties, and (3) southeastern Oregon, including the southern parts of Harney and Malheur counties. In addition to these large areas, quicksilver has been produced from isolated deposits in Clackamas, Lake, and Grant counties.

One of the significant features of quicksilver distribution in Oregon is the relative abundance of occurrences as compared to the small number of outstanding producers. More than 90 percent of Oregon's past production has been contributed by five mines: The Bonanza in Douglas County, the Black Butte in Lane County, the Horse Heaven in Jefferson County, and the Bretz and Opalite in southern Malheur County. Each of these mines has produced more than 12,000 flasks, and more than 35 percent of the State's total output has been contributed by the Bonanza mine.

Southwestern Oregon

The principal quicksilver deposits of southwestern Oregon may be included in a zone 15 to 20 miles wide and about 80 miles long, extending along the foothills of the Cascade Range from Black Butte in southern Lane County southward to the Rogue River near Trail in northwestern Jackson County. Although scattered deposits occur in many areas outside this zone, none are known to have produced significant amounts of quicksilver.

The Bonanza and Black Butte mines, which together account for about half of the State's total quicksilver production, lie in Douglas and Lane counties, respectively, within the northern 15 miles of this quicksilver zone. Other occurrences are the small producers and undeveloped prospects of the Tiller, Trail, and Meadows districts which lie in the southern part of the quicksilver zone in southern Douglas County and northwestern Jackson County.

The Bonanza and Black Butte mines occur entirely in rocks of Tertiary age, whereas the deposits of the Tiller, Trail, and Meadows districts occur on both sides of the north-trending contact between Mesozoic schists, metavolcanics, and plutonic rocks to the west and Tertiary sediments and volcanics to the east.

No quicksilver deposits are known in the High Cascades series of Plio-Pleistocene and Recent volcanic rocks which rest unconformably on the volcanics of the Western Cascade series.

Bonanza mine: The Bonanza deposit is contained in the Umpqua formation, which consists principally of tuffaceous sandstones, conglomerates, and shales of Eocene age. The ore occurs in fractured and highly altered tuffaceous sandstone overlain by shale. As stated by Brown and Waters (1951) "These rocks form part of the east limb of an anticline. Differential movement during the formation of the anticline developed fractures in the tuffaceous sandstone that were later mineralized." The average dip of the ore zone is about 45°. The mineralizing solutions were localized primarily by bedding plane shears and the impervious shale capping. Subordinate faults of diverse trends served to spread the solutions throughout the zone of fracture. In some places the footwall of the ore body is a bedding plane shear, in others it must be determined by assay. Near the surface the ore lay along the footwall of the shear zone as much as 60 feet from the shale contact. As the footwall ore shoot was worked out down the dip to the 370-foot level, ore adjacent to the shale contact was encountered. In the lower levels the shale-sandstone contact was encountered. In the lower levels the shale-sandstone contact generally forms the hanging wall of the ore shoots. The ore zone tapers considerably below the 370 level and locally is not of mining width. In places the shear zone passes into the shale in which case the ore shoot ends.

The principal ore body of the Bonanza mine is about 800 feet long and has been developed to a depth on the dip of about 1450 feet. Mining has just recently started on the 1450-foot level.

Black Butte mine: The Black Butte deposit occurs in andesitic lavas, breccias, and tuffs of the Calapooya formation of late Eocene age. The principal ore zone lies along a normal fault whose surface expression roughly coincides with the crest of Black Butte. The dip of the fault averages about 58°. Numerous subordinate faults are distributed over a wide zone on both the hanging wall and footwall sides of the main fault. The rocks in and along the multiple shear zone have been extensively brecciated and altered by hydrothermal solutions to the extent that their original character is almost unrecognizable. Silica-carbonate veinlets are thickly massed near the fault zone and being more resistant than the enclosing rocks have sustained the butte above the surrounding country.

Cinnabar occurs as discontinuous veinlets and disseminated specks and blobs throughout almost the entire mass of brecciated and altered rock in the fault zone. The grade of ore is highest in material that has undergone intense silicification and subsequent brecciation prior to the introduction of the cinnabar.

The quicksilver content of the ore has varied between a few tenths of a pound to 30 pounds per ton. The average content of ore treated was about 3½ pounds per ton on recovery. The favorable dip of the ore zone plus the strength of the walls permitted shrinkage stoping from adit levels thus reducing production costs to the point where material of this grade could be mined profitably.

The Black Butte mine has been developed and mined on eight levels from adit tunnels distributed over a vertical distance of about 1,300 feet.

The principal ore shoot of the mine lay along the main fault and has been worked from surface outcrops to the 1,100 level, a vertical distance of about 850 feet. From maps of the workings it is inferred that the ore shoot raked to the northwest. Little mining has been done between the 1,100 level and the 1,650 or lowest level in the mine.

Tiller, Trail, and Meadows districts: The mines and prospects northeast of Tiller and those scattered along the Rogue River east of Trail occur in the gently dipping Tertiary volcanics of the Western Cascades series. None have produced significant amounts of quicksilver. Northeast of Tiller, cinnabar is concentrated in veinlets of calcite and chalcedony within zones of shearing and hydrothermal alteration. In the deposits along the Rogue River east of Trail, no persistent fractures have been found and all veins are low grade. Cinnabar is concentrated in veinlets of chalcedony filling minor fractures in altered flows and tuffs.

In the Meadows district, about 10 miles west of Trail, the deposits lie within a broad zone of minor normal faults on either side of the contact between Mesozoic rocks and Eocene Umpqua sediments. The district has produced about 950 flasks of mercury, nearly three-quarters of which was obtained from the Rainier vein at the War Eagle mine.

Within the Umpqua formation, quicksilver has been recovered from deposits in fractured and altered arkosic sandstones, as at the Cinnabar Mountain mine and on the Chisholm claims, or in fractured coal seams, as at the War Eagle mine. Umpqua shales, though not entirely barren, contain only insignificant amounts of quicksilver. Within the Mesozoic bedrocks cinnabar occurs principally in sheared amphibolites, as at the

Bonita, Mountain King, and Rainier mines, or in silicified metavolcanics, as on the Roxana claims. At the Palomar and Dave Force mines, cinnabar mineralization is confined mainly to altered diabase dikes cutting Umpqua sediments.

Central Oregon

The quicksilver deposits of central Oregon lie within 35 miles of the city of Prineville in parts of Jefferson, Crook, and Wheeler counties. Of these deposits, the Horse Heaven in eastern Jefferson County has been by far the most productive and rates as the second largest producer in the State.

Rocks exposed in the central Oregon quicksilver region consist almost entirely of Tertiary volcanics and associated sediments, although minor occurrences of pre-Tertiary rocks are known. The oldest Tertiary rocks are Eocene lava flows, tuffs, tuffaceous sediments, and volcanic breccias of the Clarno formation. Unconformably overlying the Clarno formation is a varied, and in part unconformable, sequence of lavas and pyroclastics, much of which was apparently extruded from local vents. Numerous plugs, dikes, and small irregular bodies ranging in composition from basalt to rhyolite have been intruded into both the Clarno and post-Clarno rocks.

Except in the Horse Heaven area, all of the known quicksilver deposits occur in rocks correlative with the Clarno formation. In the Horse Heaven area the deposits occur mainly within and along the margins of post-Clarno intrusives. Several deposits in the central Ochoco Mountains and Maury Mountains lie adjacent to intrusive bodies, possibly of post-Clarno age, but the intrusives are not known to contain quicksilver minerals.

Horse Heaven mine: The Horse Heaven ore bodies occur within and along the margins of a biotite-rhyolite plug and its subsidiary dikes and protrusions, intruded into volcanic rocks and derived sediments and clays of Clarno and post-Clarno age.

The main part of the plug as delimited by mine workings is crudely circular in plan and in the upper part of the mine is about 250 feet in diameter. Narrow subsidiary dikes extending to the northwest and to the southeast increase the known length of the intrusive body to roughly 1,300 feet. However, most of the ore found in and along the margins of the dikes occurred within 300 feet of the edge of the main plug.

The rhyolite intrusive was probably emplaced in a highly viscous or almost solid condition. In most places there is obvious evidence of mechanical movement along its walls. As the plug rose, the overlying rocks were domed and both the rhyolite and the wall rocks were intricately fractured and locally converted to breccia. These fractures are short, have little displacement, and trend in all directions, although many tend to parallel the irregular edges of the intrusive. Many parts of the rhyolite intrusives were highly auto-brecciated, probably as a result of differential movement within the viscous mass. Because of the complexity of controlling structural features, the distribution and grade of the ore bodies were almost impossible to predict.

The larger and more productive ore bodies in the mine occur in zones of auto-breccia within the plug and in bodies of breccia along the plug margins. The majority

of the productive ore bodies lay beneath the layer of clay which developed at the surface of unconformity between the Clarno formation and overlying rocks and is now, in many places, in contact with the southwestward pitching margin of the plug. Because of the obvious mechanical movement and extensive hydrothermal alteration which occurred along it, this southwestward pitching margin was called the Horse Heaven fault. The contact is highly irregular in detail, but, as shown by company mine maps, its overall dip is roughly 50° southwest.

The northwestern half of the mine, from which most of the ore was produced, is developed by ten levels and several sub-levels connected by numerous raises, winzes, and open stopes. The levels are 20 to 56 feet apart; the vertical depth of the mine is a little less than 400 feet.

Other occurrences: In the Ochoco Creek and Johnson Creek areas east of Prineville, the principal deposits are contained in two northeast-trending zones of intense shearing and hydrothermal alteration lying about 6 miles apart.

The southeastern zone trends roughly N. 60° E. extending from Lookout Mountain across Johnson Creek to the broad flat of Big Summit Prairie, a known length of about 4 miles. In addition to a number of minor occurrences, four productive mines, the Mother Lode, Amity, Number One, and the Blue Ridge mines, are scattered along this zone. The estimated aggregate production from these four mines is about 1400 flasks.

The northwestern zone trends roughly N. 50° E., extending along Ochoco Creek for 6 or 7 miles. This zone also includes four productive deposits and a number of prospects. The aggregate production of the Byram and Oscar, Staley, Champion, and Taylor Ranch mines is approximately 800 flasks.

In both shear zones, the main northeast-trending faults are cut by cross faults of several specific trends. Cinnabar deposition was localized along faults of certain trends and particularly at fault intersections. In parts of the southern zone, at least, the northeast-trending fractures are offset progressively northwestward by cross faults which may be entirely post mineral. The ore shoots are small and scattered, but often very high grade.

The deposits in these two zones are so distributed laterally that they obviously do not lie along a single major fault. The distribution of the deposits and the orientation of minor structural features within individual deposits indicate that the deposits occupy broad zones of closely spaced subparallel fractures which probably reflect major structural trends within the Clarno formation.

Several dikes and other irregular masses of basalt have been exposed in the two zones. Some of these intrusives, particularly in the Amity mine and in the Mother Lode mine, are aligned roughly parallel to mineralized fractures. The genetic relationship is confused by the fact that the intrusive bodies appear to be related to the mineralized fractures, but are not known to contain cinnabar.

Elsewhere in the central Ochoco mountains several small deposits are confined to fractures cutting bedded rocks adjacent to boldly outcropping masses of intrusive rhyolite.

The Maury Mountain area includes two adjoining properties known collectively as the Maury Mountain mines. The ore bodies here are small but extremely high grade. They occur as pockets, lenses, and kidneys widely scattered along normal faults which border the northern and eastern margins of a basalt plug intruded into volcanic tuffs of the Clarno formation. Here again no quicksilver minerals have been found within the intrusive body, and little ore occurs in the altered tuffs adjacent to the faults. Approximately 5,000 feet of underground development work has been done. Production from the Eickemeyer workings is 584 flasks. Production from the adjoining Towner workings is not definitely known, but is probably about 200 flasks. The overall average grade of ore treated is about 12 percent. From one of the larger ore bodies 5,000 pounds of mercury was recovered from 26,000 pounds of ore.

Southeastern Oregon

Quicksilver has been produced from two principal districts in southeastern Oregon: The Opalite district in extreme southern Malheur County, and the Steens-Pueblo district in southern Harney County.

Opalite district: The Opalite quicksilver district, about 15 miles west of McDermitt, Nevada, straddles the Oregon-Nevada state boundary. The district contains three major quicksilver producers: The Bretz and Opalite mines in Malheur County, Oregon, and the Cordero mine in northern Humboldt County, Nevada.

The quicksilver deposits in the Opalite district occur near the margins of the broad grabenlike valley of McDermitt Creek. The rocks consist of nearly flat-lying Miocene lavas ranging from basalt to rhyolite overlain by upper Miocene tuffaceous lake beds. The lake beds, which in places are more than 200 feet thick, contain the Bretz and Opalite ore bodies.

The lake beds consist mainly of well-bedded tuffs, shales, and sandstones whose constituent fragments are dominantly of volcanic origin. The rocks are cut by steep normal faults, some of which formed pathways for the mineralizing solutions. Minor faulting related to the larger faults occurs in all the mineralized areas. In places, the tuffs and lake beds adjacent to the faults have been silicified into lenticular masses called "opalite," a rock consisting of a mixture of chalcedony, quartz, and opal.

All the ore bodies are either in or in contact with silicified rocks. The Opalite mine ore body occurs in a mass of chalcedony, some 1200 feet long, 800 feet wide, and more than 100 feet in maximum thickness. During a late stage in the hydrothermal activity responsible for the silicification, finely divided cinnabar accompanied by silica filled open fractures in the chalcedony. At the Bretz mine about 7 miles east of the Opalite mine, several small, but relatively high-grade ore bodies occur in

unsilicified shales and sandstones along the south side of an east-trending fault. Masses of chalcedony lie along the north side of the fault directly opposite the ore bodies. Since the quicksilver solutions are believed to have followed the same channels as the silicifying solutions, it seems probable that fracturing similar to that at the Opalite deposit did not exist or that earth movements were insufficient to hold them open during the time cinnabar was being deposited. Consequently, the solutions were diverted into adjacent unsilicified rocks.

Steens-Pueblo district: An abundance of small quicksilver deposits occurs in southern Harney County in a belt about 40 miles long and half a mile wide extending northward from the Nevada state line along the lower eastern flanks and foothills of the Steens and Pueblo mountains. Total production from this district has been about 70 flasks of quicksilver.

The Steens and Pueblo mountains form a north-trending range nearly 100 miles long and 25 miles in maximum width. Broadly speaking, the two mountains are parts of an enormous fault block tilted gently westward and bounded on the east for much of their length by a high precipitous fault scarp. Two ages of rock assemblages are exposed along the scarp. Pre-Tertiary metamorphic rocks, largely metavolcanics, and acid to intermediate plutonic rocks occupy the eastern flank of the Pueblo Mountains. Overlying these older rocks and composing the bulk of both the Steens and Pueblo mountains is a varied succession of Tertiary volcanics.

Three distinct types of quicksilver deposits occur. These can be delineated to a certain extent geographically. At the northern end of the area on the slopes of Indian, Toughey, and Pike creeks are several deposits in which cinnabar occurs in small pockets or seams along narrow, well-defined breccia zones or open fractures in rhyolitic rocks. Between Andrews and Fields, a distance of about 12 miles, a multitude of minor occurrences of cinnabar and mercury-bearing tetrahedrite and other copper minerals are contained within long, narrow reefs of brecciated and silicified andesite. These reefs, which formed by silicification along faults, are much more resistant than the enclosing rocks and as a result form prominent ridges about 25 feet wide and as much as half a mile in length. On the eastern slope of the Pueblo Mountains, several deposits occur in reefs similar to those in the Fields-Andrews area except that the mineralized rocks are metamorphosed sediments and volcanics of pre-Tertiary age.

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April 19, 1941

Mr. Art Champion
Prineville
Oregon

Dear Mr. Champion:

John Allen has sent in your report on the quicksilver mines in the Ochoco District. We are exceedingly glad to have this report as it gives us valuable up-to-date information on the district by one who is thoroughly familiar with it. I was particularly interested in your estimate of the Glass Butte Mine owned by H. A. Miller of Bend. We have had little in the way of precise information on this property. It would appear that it might make one of the big mines of the State, especially in times of better than average prices for quicksilver.

Sincerely yours

F. W. Libbey
Mining Engineer

FWL:hk

RECEIVED
APR 18 1941

STATE DEPT OF GEOLOGY
& MINERAL INDS.

Dear Fay:

The enclosed is from Art Champion. Early in March Walther Pierce wrote him asking him to write a summary of the eastern Oregon quicksilver situation, with a view towards getting aid for the industry. Pierce has talked to Ross (USGS) and Ross has said that Champion was the man who knew the most about the area.

Pierce wrote Champion upon receiving the enclosed report, thanked him for it, and suggested that he send us a copy. Here it is. He also said that he was having a copy made for the Bureau of Mines. I saw the two letters from our esteemed congressman.

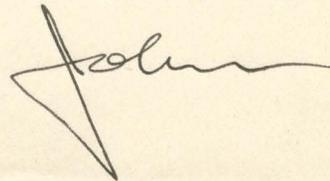
Anyway, here she be, and do as you see fit. Or dont fit and see if I care.

The trip is going swell, except that for the last three days it has been snowing and hailing in spurts, and this morning there was over an inch of snow at Ochoco R.S. I nearly got stuck getting in to Whittings; but after noon it had cleared off the south slope so that I had no trouble getting up to Staleys.

Went out to Horseheaven, Oregon King, Swansons yesterday; to Maury Mountain daybefore; to Bear Creek tomorrow; up Mill Creek dayafter. Probably will still be here Saturday night, thence to Burns or to John Day, dunno which yit. Last Sunday and Monday I spent visiting pumice and diatomite deposits out of Bend. No pumice without xtals to be seen. The limestone deposit was also a frost.

About the Champion report, it might not be a bad idea to write the old boy and tell him what a swell report he made. I think he feels kind of proud of it. It has its points, too! I especially like the remark about the Independent.....

No other news seems to come to mind at present. Best regards to Earl, and all the gang.



THE MERCURY MINES OF THE OCHOCO DISTRICT,
THEIR PRODUCTION AND FUTURE.

Sent in March
8, 1941

Also, the Glass Butte District in Lake County
Seventeen miles East of Hampden Buttes, Oregon.

Art Champion

Mines up the Johnson Creek Fault thirty-three miles east of Prineville, Oregon, are as follows: Blue Ridge, Number One, Johnson Creek, Independent and Mother Lode, owned by the R. F. C.

PRODUCTION

<u>Mine</u>	<u>Flasks</u>
Blue Ridge	300
Number One	70
Johnson Creek	310
Independent	none
Mother Lode	600
Taylor Ranch	130
Champion	100
Staley Barney	300
Byram-Oscar	150
Eickemeyer Bros. Maurey Mountain	320
Towner Claim, Maurey Mountain	100
Dunham Bear Creek	12
Platner Bear Creek	20

Flasks...2,412

REMARKS:

The Blue Ridge, Number One and Johnson Creek mines if consolidated and worked under one management by deepening the Blue Ridge Shaft to the 300 level, 200 feet to sink at cost of \$50.00 per foot, a cost of \$10,000, development work would be on ore along this level and could be charged to mining. After sufficient work would say install a Ghould 30-ton or more furnace at a cost of \$20,000 as the writer

treated 200 ton of Blue Ridge at Mother Lode mine in 1940 in a Gould rotary furnace and made a good recovery so at a cost of \$40,000 for development work and installation of recovery plant these three mines should yield during their life and should produce 30,000 or more flasks.

THE INDEPENDENT MINE:

Their statement that they have 20,000 tons of five-pound ore blocked out by drill somewhat doubtful in regard to value or tonnage.

THE MOTHER LODE MINE:

Historic mine of the region first produced in 1906. Has a production of 600 flasks or more and is well equipped with 15 ton furnace compressor and mining tools. The writer formed the Champion Mining Co. in July 1939 and took this mine over from R. F. C. under purchase agreement and did 300 feet of underground work and stiped 300,000 yards of surface dirt and produced 100 flasks of mercury but gave the mine back to R. F. C. due to the illness of the financial partner. This mine still has a future as several ore shoots were discovered by striping that would warrant development at depth and as there is a long tunnel on this property and equipment, \$10,000 should prove or disprove a mine.

MERCURY MINES ALONG THE OCHOCO FAULT

BARNES BUTTE MINE.

Commencing at Prineville this fault or valley runs east for thirty-two miles and has five producing mines and ten prospects along it. Two miles east of Prineville rising from flat plains is Barnes Butte, composed of andesitic lavas, the flank being covered by younger flows. This mass of andesite has been brecciated and highly silicified and cinnabar has been deposited in the breccia and along the slip planes. This mine is equipped two pipe retort and has produced six flasks of mercury. The owners are short of funds and are doing their own work and as the mine was discovered in the fall of 1940 and the amount of development work so small it would be hard to make a statement as to its merits; however, the geological conditions are favorable for the disposition of ore.

BYRAM-OSCAR MINE.

This property comprising 120 acres of patented land lying on the south side of the Ochoco fault eighteen miles from Prineville and is developed with a shaft 120 feet deep and four levels and has produced 140 flasks. The levels are all in ore and a strong downward extension of the ore, in places four feet wide of 100 pound ore with the lower grades running ten to twenty pound mercury per ton. This mine has the most favorable geological structure of any mine in the Ochoco District as it has

a large fault gouge capping the ore at the surface, erosion being just enough to explore the ore under the cap. Recommended development:--sinking of shaft 100 feet deeper at a cost of \$40.00 per foot or \$4000.00, drifting 100 feet each way at the bottom, \$10.00 per foot or \$2,000.00. As future development would be on ore it could be charged to mining.

Within six miles of this mine there are three mines and two prospects and might be advisable to install forty-ton plant at a cost of \$30,000 and treat ore from the other adjacent mines and prospects, as at present there are no large treatment plants in the district.

STALEY AND BARNEY MINE.

This mine is twenty-one miles east of Prineville and lying on the north side of the Ochoco fault comprising 400 acres of patent land, having produced over 300 flasks of mercury and at present is producing with a small retort. This mine has a fair chance to develop ore and if plant was installed on Byram-Oscar mine it could be carted and treated there.

TAYLOR RANCH MINE.

This mine is 26 miles east of Prineville on the north side of the Ochoco fault, comprising 1400 acres of patent land with cinnabar showing over most of the acreage. There is a 130 feet shaft with drifts on the 42 and 82 levels at present. The 132 level drifts have not reached the ore. In July, 1940

a 3-ton rotary retort was installed to treat the high grade and up to the present has produced 130 flasks paying for the development work and leaving 300 flasks in reserve ore above the 82 foot level. The owners expect after completing the 130 foot level drifting to have sufficient ore to warrant the installation of a 30-ton reduction plant. Owners are Ray. R. Whiting, Prineville, Oregon, and Lewis Mills, American Bank Building, Portland, Oregon.

CHAMPION MINE.

The Champion Mine is located twenty-five miles east of Prineville and on the south side of the Ochoco fault. It is owned by the Johnson Brothers of Portland, Oregon. Production over 100 flasks of mercury. Incline shaft down 120 feet, drifting being carried on in the lower levels and retorting of the high grade ore.

GLASS BUTTE MINE.

This mine is owned by H. A. Miller, Bend, Oregon, situated in Lake County, Oregon, seventy-five miles southeast of Bend, Oregon, three miles south of highway No. 54.

Commencing at the east of Glass Butte is a large deposit of opalite comprising 48 claims. Here considerable work has been done in the form of short tunnels and shafts proving a large body of surface ore that will run from three to four pounds per ton that can be mined by open pit methods at a cost not to exceed \$.25 per ton. At present there is sufficient ore developed to warrant the installation of a 100-ton Ghould rotary furnace as their furnaces are very successful in treating this type of ore. Furnacing cost \$.75 per ton.

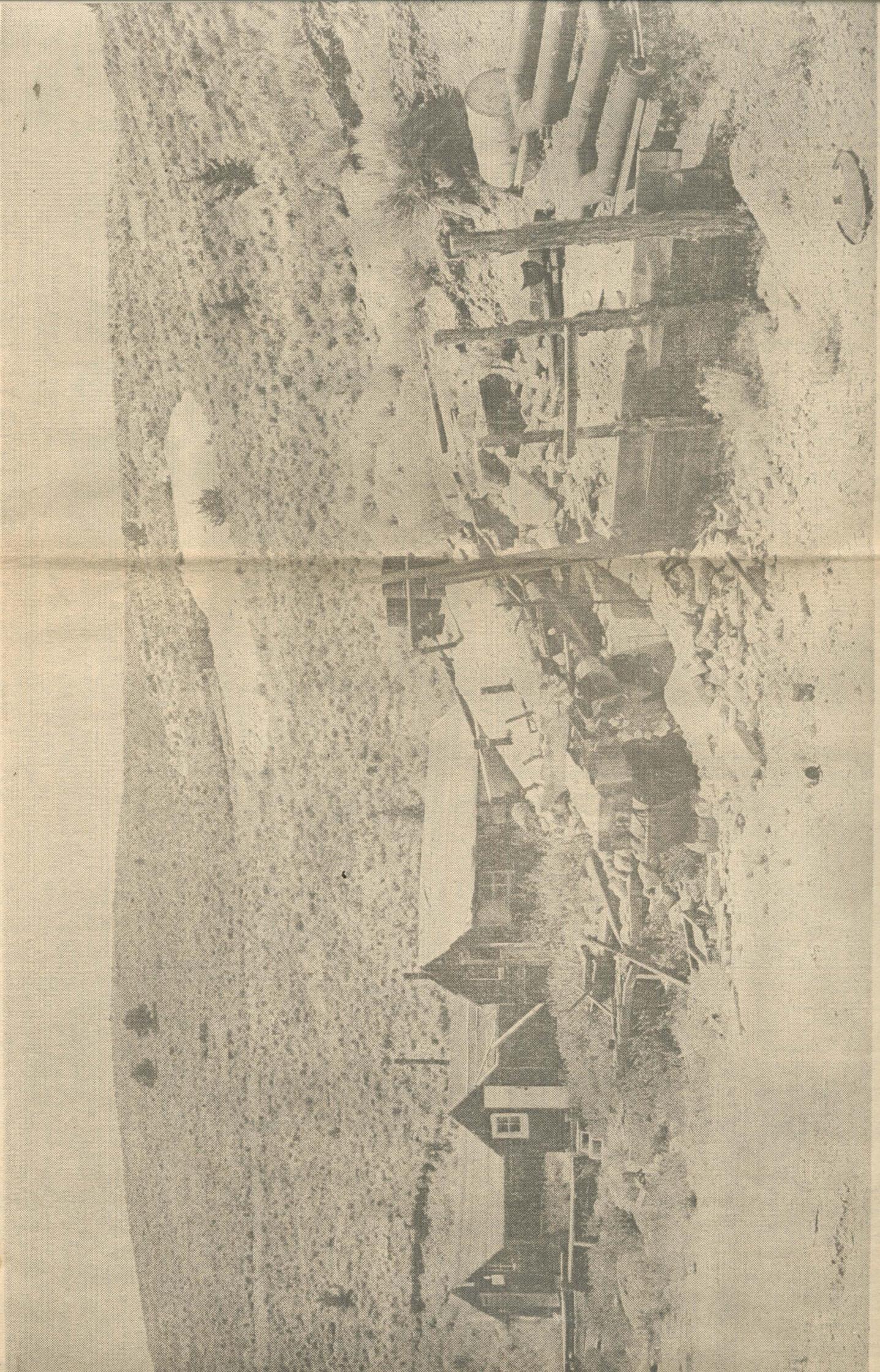
Cost to bring this property up to 100 ton operating capacity would be as follows:

Sampling and surface pits.....	\$ 10,000.00
Equipment, compressor	10,000.00
Caterpillar, tractor, bulldozer and scraper.....	15,000.00
Ghould rotary furnace 100-T.cap.	40,000.00

This unit would be capable of producing 1300 to 1500 flasks per year. After operating this unit six months, thereby proving the ore by direct plant sampling on recovery and the extent of the ore, add four more units bringing treatment up to 500 ton per twenty-four hours. Mining costs could be lowered and the \$35,000.00 for mining machinery would be sufficient to mine 600 ton per day. This mine could

produce 7,000 flasks a year or more and if under Government control could be closed down during the period of low price quicksilver as the mine would be an open pit and the machinery housed there. In this way there would be very little deterioration and this ^{large} ~~joint~~ ore body could be held in reserve for the time of shortage in quicksilver so would recommend this deposit for investigation. While it is low grade it is so situated that mining and furnacing would not exceed \$1.25 per ton, making it possible to mine two pounds ^{ore} with mercury at \$1. per pound and show a net profit.

Major New Mercury Mine Sprouting Out Of High

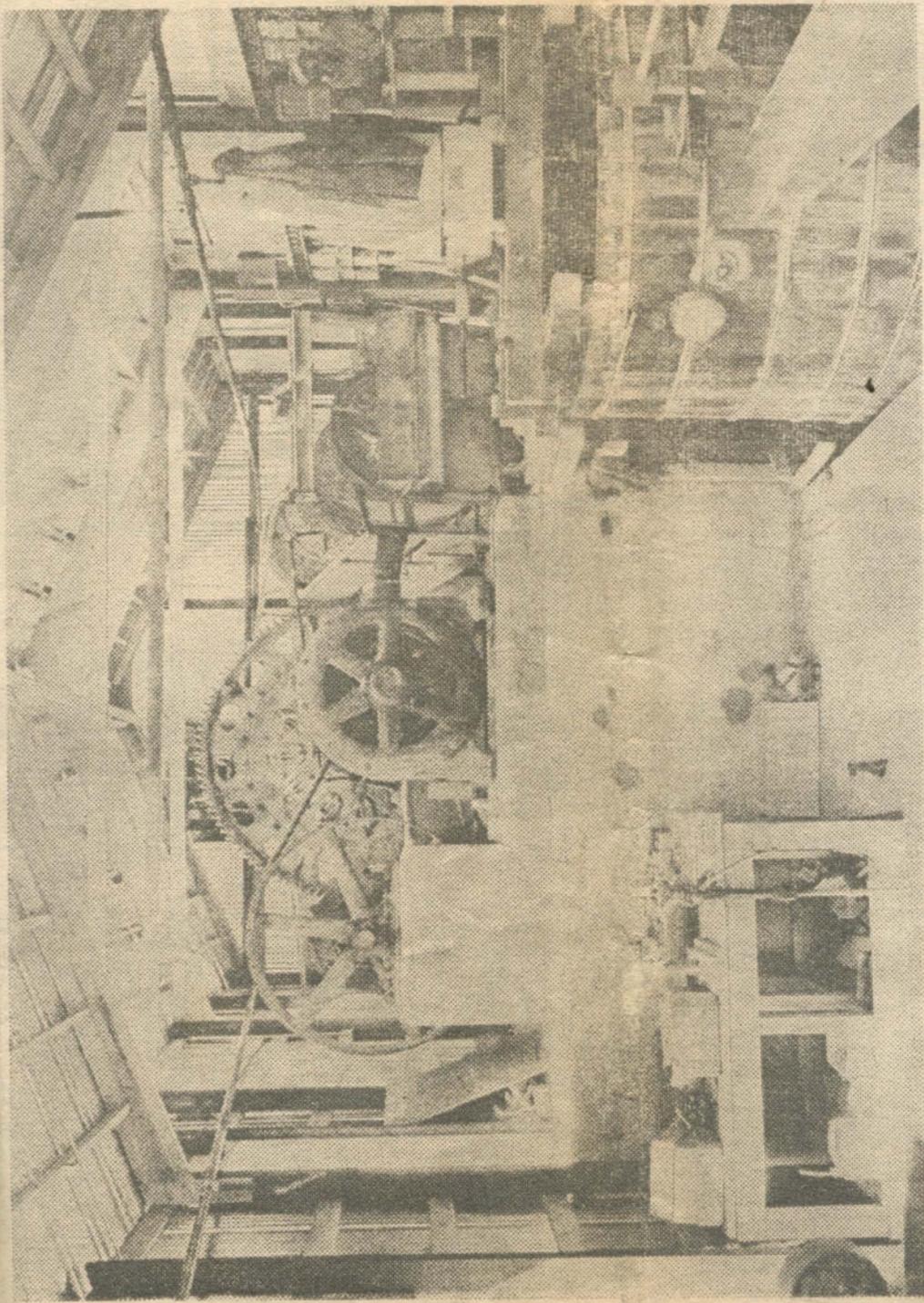




HARRY Trollop, mining engineer, located new body of cinnabar ore, is directing construction of new flotation plant, retort.

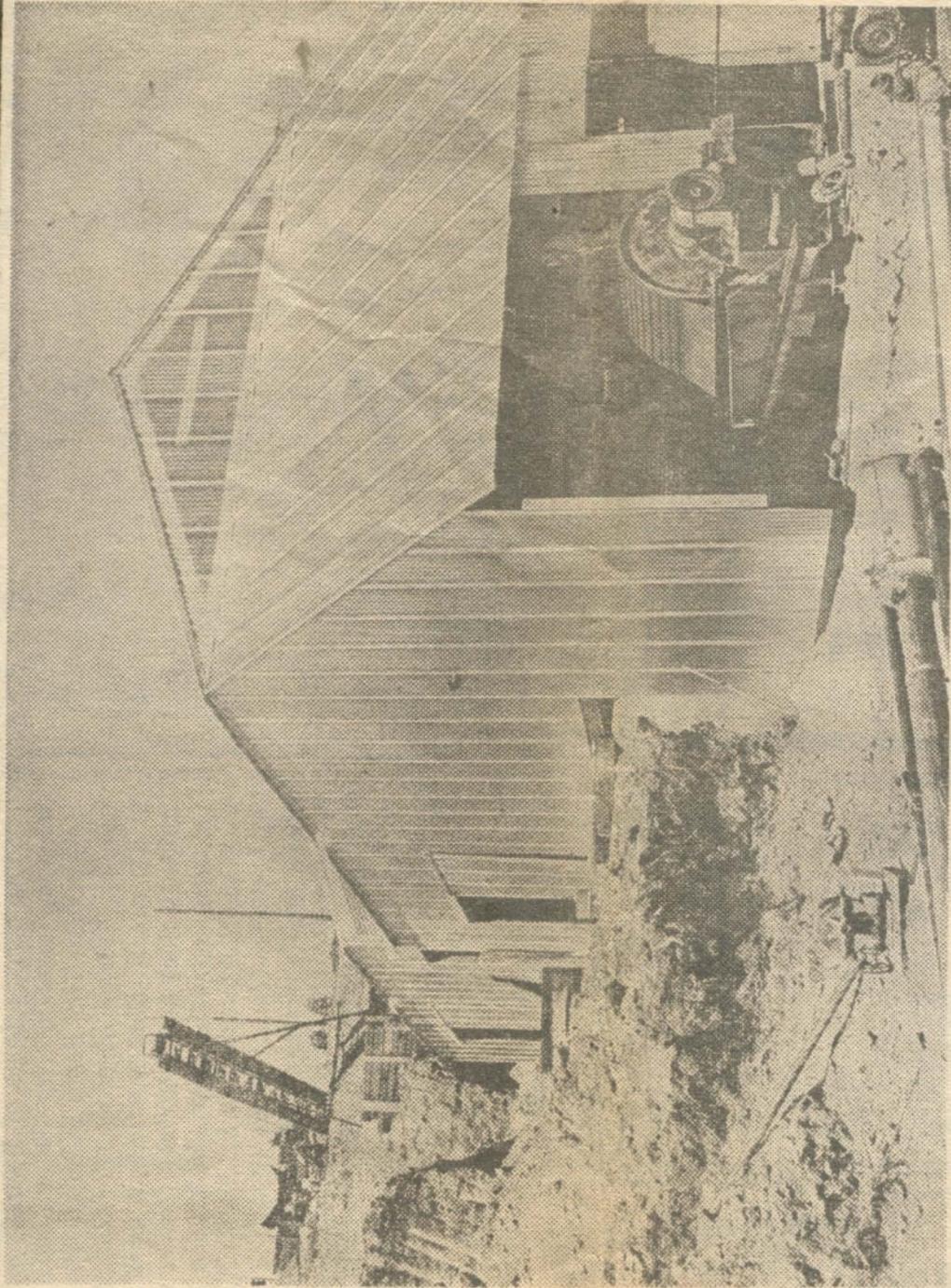
MODERN mill, in stark contrast to hand-built rig above, includes rotary ball mill, in background, feeding flotation tanks at right. Mill will handle 200 tons of raw ore per day.

NEW SHED houses main mill, with rotary drier peeking out of end. Here ore concentrates are dried ready for roasting in retort that will handle ton and a half per day.



↓
MODERN mill, in stark contrast to hand-built rig above, includes rotary ball mill, in background, feeding flotation tanks at right. Mill will handle 200 tons of raw ore per day.

↑
NEW SHED houses main mill, with rotary drier peeking out of end. Here ore concentrates are dried ready for roasting in retort that will handle ton and a half per day.



By LEVERETT RICHARDS

Staff Writer, The Oregonian

GLASS BUTTES (Special)

A major new mine will start operation in this high desert country within a month, nearly doubling Oregon's production of quicksilver (mercury).

The Jackson Mountain Mining Co. of Winnemucca, Nev., has a \$100,000 flotation plant and retort nearly completed on the site, 83 miles east of Hampton, three miles south of highway 20 at the east end of the ridge of hills known as Glass Buttes.

The mine and mill together are planned to process 200 tons of ore per day, producing 40 to 600 pounds of pure mercury per day, 100,000 to 150,000 per year — 1,300 to 2,000 flasks. At the present price of \$50 per flask, it would be worth nearly \$500,000 per year.

The ore assays 2 to 3 pounds per ton, with some much richer pockets, Harry Trollop, mining engineer and superintendent for G.W. De La Mare, reports. The company is solely owned by De La Mare in partnership with the W.G. Austin estate. There is no stock for sale.

The new mine is just over a 5,000-foot ridge from the original Glass Buttes Mine, discovered in 1933 and owned by Verne Ryan of Coos Bay, who leased the area to the Jackson Mountain company.

The ore is not particularly rich, but the cinnabar in the altered opalite is the purest he has seen, Trollop said. The devitrified rock is so soft and friable that it can be scooped up by power shovels in an open pit bench mining operation, Trollop explained.

The heart of the proved ore body, which lies at the intersection of two major fault lines, is at least 250 by 300 feet and extends at least 140 feet deep, Trollop said. He has bored that deep and assayed the whole area of initial operations. Other prospect holes indicate the merchantable ore body may extend through the ridge known locally as Antelope Ridge.

A crew of a half dozen men is employed full time laying out the operation and constructing the mill. Burns contractors are installing the extensive electrical equipment.

About 15 men will be employed full time on a permanent basis to operate the mill 24 hours a day, Trollop reported. Operations are expected to start in August.

The mill includes two jaw - rotary grizzly crushers and a rotary grinder, feeding a rotary ball mill which grinds the ore to fine dust.

The cinnabar is then floated to the top of the liquid mixture in a flotation cell that resembles a huge bubble bath. The cinnabar is reconcentrated in a second flotation cell before being dried and fed to the retort.

About 1½ tons of concentrate, containing about 40 percent mercury, will be obtained from each 200 tons of raw ore, Trollop estimates.

The concentrate is roasted at about 1,000 degrees Fahrenheit, which vaporizes the mercury. The liquid mercury is condensed out in a conventional still.

The mill equipment is a standard flotation mill that comes from an abandoned gold mine at Beaton, Nev., where it has lain idle for 30 years. Other equipment comes from the Jungo iron mine, about 70 miles west of Winnemucca.

Trollop had experience building and operating a similar mill, in the Bottle Creek district of Nevada last year.

About 4 tons of water is required to process each ton of ore — about 200,000 gallons per day, Trollop reports. He

has drilled a 700-foot well about 1,000 feet from the mill, which he hopes will supply the needs of the mill. Tests cannot be made until the Harney County Public Utility District finishes building the power line in to the mine.

Temperature of the water is 70 to 80 degrees as it comes out of the ground, which is a strong indication of the kind of residual underground heating from volcanic action that geologists expect to find in a vitrophyre formation conducive to the production of cinnabar, Trollop explained.

A second well on the flat below the mine, used by range stock and wild antelope, is also lukewarm.

A 30,000 gallon steel tank is in place above the mill for water storage.

Pumping Required

A 175-horsepower electric motor will be required to pump from the deep well. The plant will use motors totaling about 600 horsepower 24 hours a day. Mining and grinding operations will be conducted on an eight-hour shift.

A trailer park is being built on the site. Meantime Trollop and a couple of other single workmen live on the site, while three families live in Hampton and two families with school-age children live

in Burns, 47 miles to the west. Trollop started looking the area in the fall of 1963 before mercury took its traditional jump to a price of \$50 per flask (76 pounds). Assays showed little value.

"It wasn't until we took a bulldozer and dug down five feet that we uncovered real pay dirt," Trollop explained.

Oregon has two other cinnabar mines producing quicksilver — the Bretz Mine 13 miles west of McDermitt on the southern border of Malheur County; and Black Butte near Cottage Grove.

The Bretz Mine, leased to Samuel S. Arentz of Salt Lake City, was discovered in 1890. It was closed then reopened in July, 1964, to produce 150 flasks of mercury per month, with a crew of 25 men.

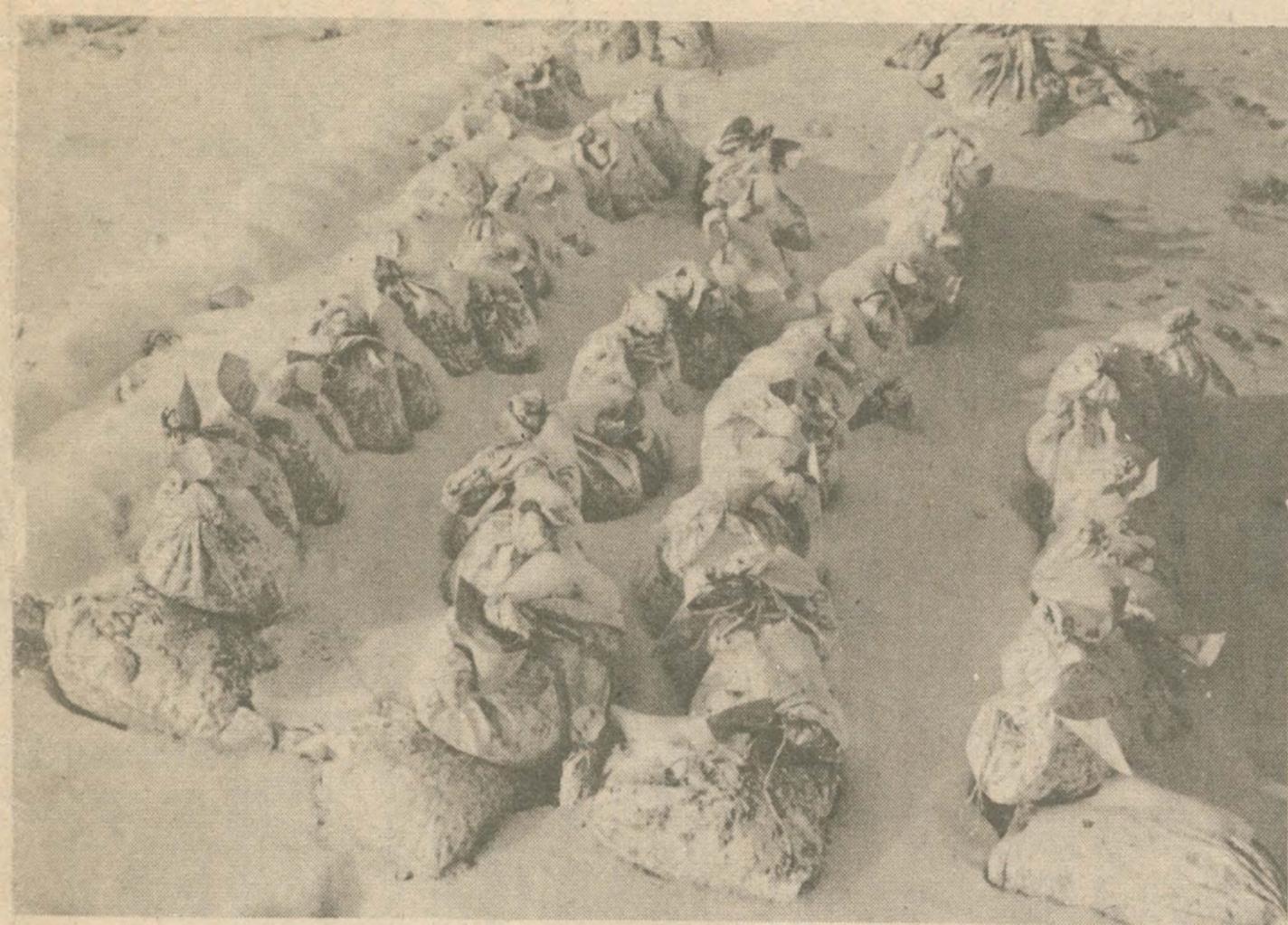
The Black Butte Mine in southern Lane county, discovered in 1890, was reopened by the American Mercury Corp. in 1964 with a present output of about 70 flasks per month and a crew of 30 persons.

Oregon, which once ranked second in mercury production, now ranks about fourth. More than \$15 million worth of mercury has been produced since the first discovery of cinnabar in the state, the Oregon Department of Geology reports.



OPALITE ore in nearby Glass Buttes claim is harder, vitreous rock, with streaks of red cinnabar ore, which has not proved profitable to mill.





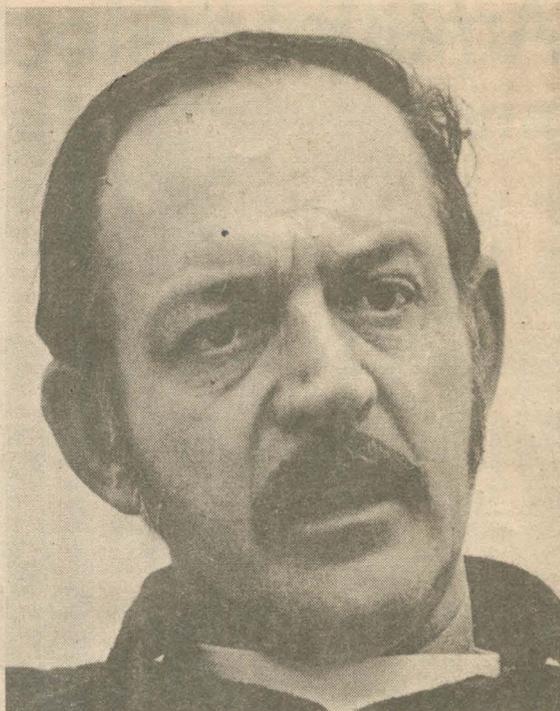
SAMPLES — Sacks of ore samples sit along roadside in snow waiting to be picked up.



LONELY — Rig is set up, right, to drill another sample hole. After hole has been drilled, it is marked, above.

and hides terloppers

Story by LARRY SHAW,
photos by DAVID FALCONER
of The Oregonian staff



VIC BOTTS JR.

McDERMITT, Nev. — Caution, and mum's the word. Don't start a stampede here on the range.

There might be gold in them thar hills, but there definitely is a 13 million-ton ore deposit containing uranium or U-308.

The uranium find, lying under the frozen surface and the rugged terrain of Oregon's southeastern Malheur County, lies high in the mountains on Bureau of Land Management land about 15 miles northwest of here.

Drilling and prospecting began in late summer, and hit a crescendo in late fall when 10 companies were drilling sample holes. The announcement of the find came in early December from Placer Amex Inc. of San Francisco and McDermitt Mine, located here.

Both companies are subsidiaries of Placer Development Inc. of Vancouver, British Columbia, a company which did \$177 million in mining business throughout the world in 1977.

Vic Botts Jr. sits impeccably dressed in blue jeans, black shirt and boots behind the desk he uses as manager of the McDermitt mercury mine. No Brooks Bros. suit and striped tie for him.

Botts is in charge of the largest mercury mining operation in the Western Hemisphere, producing just under half of all the mercury in the United States.

Company policy and caution prevent Botts from commenting completely on the full impact of the uranium find.

"We're just not in a position to talk about it (the economic impact) yet," he said. He added that all information was at company headquarters being evaluated.

Botts did say, however, that the find would yield 0.05 percent of uranium oxide per ton of ore. "That's the equivalent," he said, "of one pound (of uranium oxide) per ton."

Uranium oxide is selling on the world market at \$43 per pound. If that price were to continue, it would mean \$559 million worth of uranium oxide.

The 45-year-old Botts, who was graduated from UCLA, said it would "take quite awhile to evaluate the data" and the company would have to "make a capital investment to return" before

making a decision.

However, with all the corporate guardedness, it would appear a uranium mine would be feasible.

Portland General Electric Co., for example, uses 440,000 pounds of U-308 at its Trojan nuclear plant near Rainier. "We are constantly looking for a supplier," a PGE spokesman said.

And, according to Botts, there are 69 nuclear power reactors licensed to operate and 89 others with construction permits in the United States.

But the mining company would have to take into consideration the absence of a work force at McDermitt — a town which sits astride the Oregon-Nevada border, although many of the businesses are located in Nevada for an obvious reason — gambling.

The population of McDermitt is about 275 persons. Of those, 43 work at the McDermitt mercury mine. Others work on nearby ranches, or in the Say When Casino or other small businesses.

"When we built this mining operation (it was completed in June 1975)," Botts said, "we predicted an influx of 50 people. It was actually six. Local residents took most of the jobs."

Housing is another problem. There just isn't much available, although the McDermitt community board, of which Botts is chairman, has approved a tract of land south of the city for a development.

Frank Reeves, 50, who was born and raised in McDermitt, owns one of the two motels and at one time was part owner in the Say When Casino. He is confident that the mining operation will take place.

"I've talked to everybody who will talk," he said, "and it sounds to me like it would take three to five years to get a permit and from \$40 million to \$100 million to build a mill."

"They'll be hiring two to three times more people (than the mine currently employs) and there's talk of a second (mercury) mine a little farther south."

But the evaluation has yet to be made, and company officials continue with caution, and mum's the word.

MERCURY
PROSPECTING

October 21, 1965

Mr. Joe Ferguson
Box 3
McDermitt, Nevada

Dear Mr. Ferguson:

I have received your letter that was forwarded by Howard Brooks inquiring about geochemical prospecting for mercury.

The only methods I know of that are very successful in mercury prospecting are: (1) the gold pan, (2) willemite screen, and (3) the Lemaire mercury detector. There are chemical tests, one of which I am enclosing. My experience is that the chemical tests are involved and are not as sensitive as either the willemite screen nor the Lemaire detector.

I imagine you are experienced with the pan, which is still a very good method to use. The willemite screen is a little more sensitive than using a pan and will detect mercury in other forms than as cinnabar and free quicksilver. The Lemaire detector is essentially a willemite screen in a box with an electronic method of reading the mercury concentration and more sensitive and portable than the willemite screen. However, it costs more too.

If you are not now using either one of these methods I would recommend them to any serious prospector. The willemite screen is used in conjunction with a short wave length ultraviolet lamp and a burner. The sample is heated in the dark with the ultraviolet light source shining through the sample container (a test tube) onto the screen. The presence of mercury shows as a dark shadow on the screen. This is because the ultraviolet rays are absorbed by the mercury vapor being driven off by heating the sample. Mercury is the only thing I know that produces a shadow on the screen.

The Lemaire detector does the same thing electronically and is a little more sensitive as a photo cell is more sensitive than the eye. An advantage in the Lemaire detector is that it can be used in the light.

Cordero Mining Company, Winnemucca, has an ultra sensitive mercury detector they use in prospecting, and they will check samples at a charge of about \$5.00 per sample. However, for prospecting the sensitivity of their machine is probably greater than necessary.

Willemite screens are for sale by: Eckert Mineral Research, 110 East Main Street, Florence, Colorado, for \$6.75 and shipping costs. The Lemaire detector is available from the Lemaire Instrument Company, 3800 No. Virginia Street, Reno, Nevada, for about \$200.

If you have any further questions I would be happy to try to answer them.

Sincerely yours,

R. G. Bowen
Geologist

RGB:lk
Encl.
cc Howard C. Brooks

COPY

October 15, 1965

Mr. Joe Ferguson
Box 3
McDermitt, Nevada

Dear Mr. Ferguson:

I am happy to hear of your prospecting efforts. I would not be surprised if some day another good mine is developed in the Bretz - Opalite area.

Your letter is being forwarded to Dick Bowen at our Portland office. Mr. Bowen is familiar with the latest developments in geo-chemical prospecting and is in charge of an extensive sampling program being conducted by this department. I am sure he will give you all the help he can.

Sincerely,

Howard C. Brooks

COPY

McDermitt, Nevada
Oct. 7, 1965

Dear Mr. Brooks,

I didn't have the pleasure of meeting you when you were out to visit Bretz Mine out of McDermitt, Nevada.

I am a driller and powderman out at the mine and have been prospecting for cinebar for several months in this area.

I would like to know if you would have any information on Geo-Chemical prospecting. I have some information H. E. Hawkes drew up in economic Geology Vol. 58, but would like to know more about field prospecting.

Any information on the Dithizone field tests would be a great help.

Sincerely

Joe Ferguson

Joe Ferguson
Box 3
McDermitt, Nevada

MERCURY
THERMOMETERS

November 14, 1966

Miss Linda Hoggatt
1206 Ross Street No.
Kelso, Washington 98626

Dear Linda:

Your letter addressed to the University of Oregon Department of Geology has been referred to this Department. We regret that the University was unable to answer your question.

Mercury is used in thermometers to indicate changes in temperature because: (1) it expands and contracts with changes in temperature, (2) it is a long lasting material, and (3) it has good light reflecting properties which make it easy to see even though the column of mercury is extremely fine. We would like to suggest that you consult a standard physics textbook or a handbook on chemistry which contains information on the relative coefficient of expansion for various liquids and metals.

A further reference is the Encyclopaedia Britannica which contains quite a bit of information on the use and manufacture of thermometers.

Sincerely yours,

Ralph S. Mason
Mining Engineer

RSM:lk

1206 Ross St. No.
Kelso, Wash. 98626
Nov. 7, 1966

University of Oregon
% Geology Department
Eugene, Oregon

Dear Sirs:

Would you please send me some information on "What Causes The mercury inside of a thermometer to rise and fall with the temperature?" I need it to prepare a report for Science class with.

Thank-you
Linda Woggatt

RECEIVED
NOV 8 1966

STATE DEPT. OF GEOLOGY
& MINERAL INDS.

FIRM DISCOVERS MERCURY DEPOSIT

PRINEVILLE -- Werdenhoff Mining Co. of Tacoma reports that its test crews have discovered a rich deposit of high-grade cinnabar ore five miles southwest of Summit Prairie in the Lookout Mountain area.

Stan Sepic, chairman of the mining firm's executive board, said the company will install a mercury mill on the site.

It was indicated that the mill will be capable of producing 240 tons a day. Until it is completed, the company will process 10 tons of cinnabar ore a day from the deposit with a leased mill.

An open pit type mine is planned. Bulldozers and drag lines will be used to extract the ore. Richard Ruffo, a representative of the Werdenhoff firm, said housing already is under construction for 20 men who will be working at the new mining operation.

Werdenhoff has leased 140 acres in the area for \$300,000 and has filed seven claims.

DAILY JOURNAL OF COMMERCE, September 22, 1958

*Short copy to John Gysin
W. H. Gysin
3-26-59*

LAKE COUNTY EXAMINER

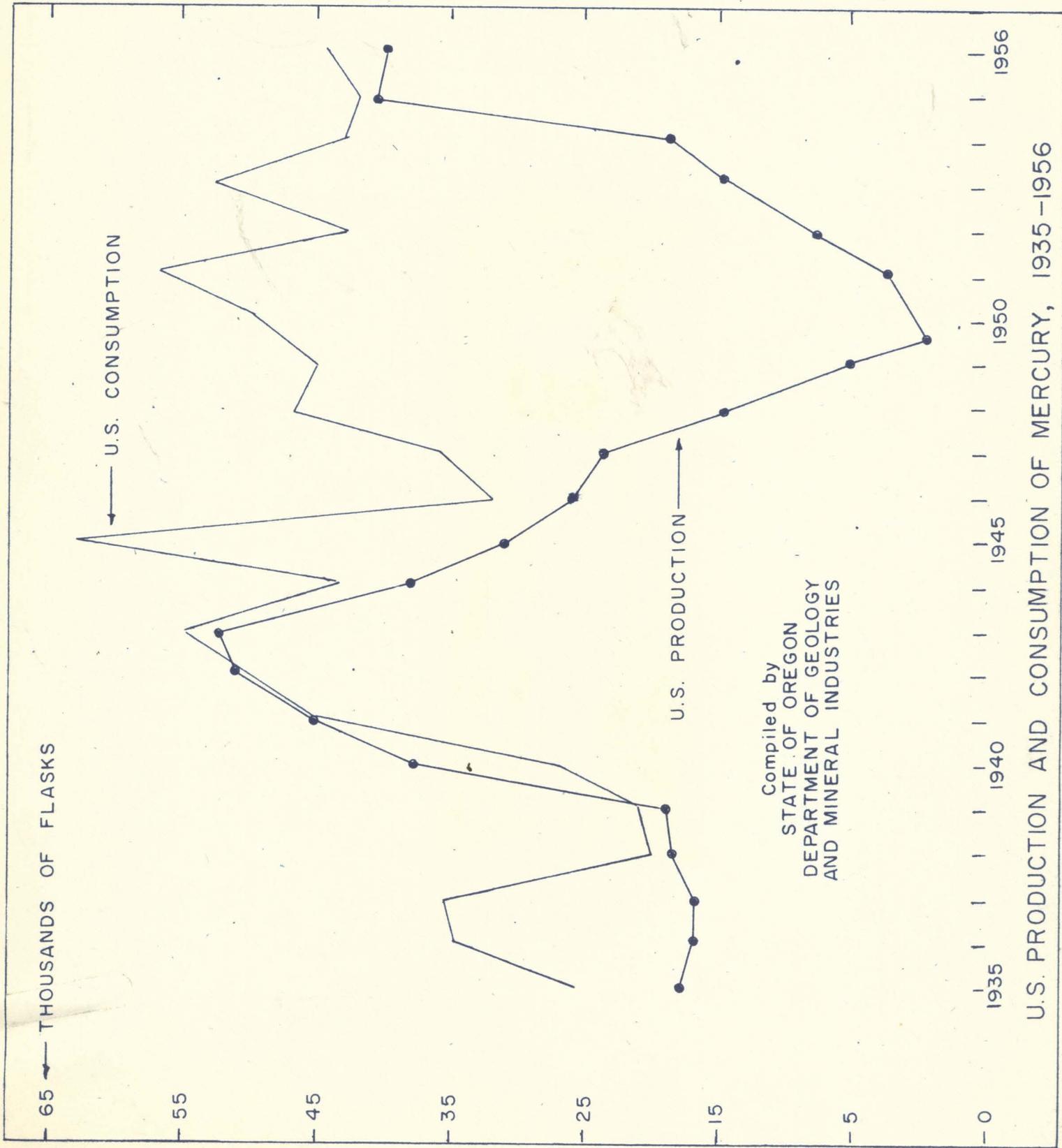
June 12, 1958

**Cinnabar Ore
Discovery In
Harney County**

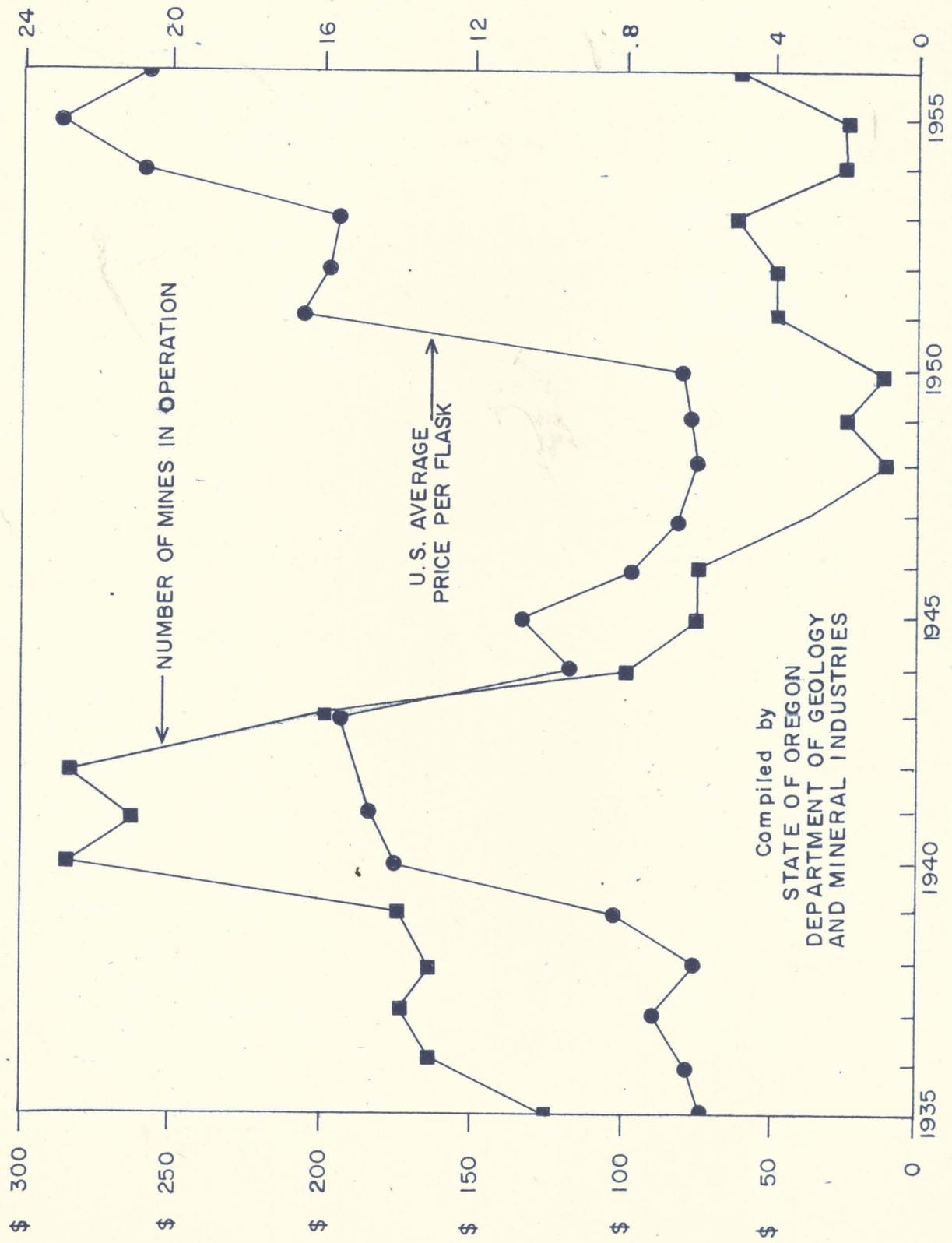
A cinnabar (quicksilver) discovery which now assays 17.9 pounds per ton has been announced by Fred E. Me-whinney, Lewis A. York and Arthur Johnson, of Lakeview. The men have explored the location during the past winter.

The first assay, made on surface rock last winter, showed only a trace of the metal. The most recent analysis, the fourth made by the State Department of Geology and Mineral Industries, Portland, was taken from a depth of about 10 feet.

The men have 10 claims, the Horsehead group, in an area about 10 miles southeast of Wagonire in Harney County, on the East Pass road. Exploration work continues, and no estimate of volume has been attempted by the three prospectors.



COMPARISON BETWEEN NUMBER OF MERCURY MINES
IN OREGON AND U.S. AVERAGE MERCURY PRICE



February 6, 1967

Mr. John N. Fegan
Assistant Administrator
U.S. Securities & Exchange Commission
900 Hoge Building
Seattle, Washington 98104

Dear John:

This is in reply to your letter of January 18 and concerns Golden Key, Inc.

Both Mr. Hoagland, our assayer-chemist, and I have reviewed the material you enclosed which consisted of a contract, the October issue of GOLDEN KEY ENTERPRISES, INC., a letter to Mr. H. Lebrock from L.M. Parson, Secretary-Treasurer of Golden Key Enterprises, Inc., and a report to the stockholders of Golden Key Enterprises, Inc. dated January 10.

I believe it is a demonstrated fact that mercury can be obtained from its ores by electrolysis but I could find no good description of the method in the literature you forwarded to us that would allow us to evaluate the process. I should remark, however, that our experience in the Department (and it is considerable) has taught us that of all the many processes for recovering mercury from its ores, the tried and true method of simple grinding, followed by furnacing, has proved to be the most satisfactory, the cheapest, and most efficient. Consequently I would be inclined to view Mrs. Parson's so-called "secret process" with considerable doubt.

Perhaps you would like to send the material to the U.S. Bureau of Mines Mineral Resource Office (P.O. Box 70, Albany, Oregon). This organization is well known for its research in electrometallurgical processes and they might be able to advise you further.

The problem with all this material, as you well know, is that nothing definite is ever said but plenty is left to be read between the lines.

As far as the October issue of GOLDEN KEY ENTERPRISES, INC. goes, the newspaper report that is quoted, of course, is erroneous in many places - e.g., page 2, paragraph 3, "But the government and also the state questioned my not having a college degree, and a state mining engineer threatened to arrest me if I didn't stop my research." The only State mining engineers in Oregon are with our Department and, of course, we would never make such a statement as we do not have authority to arrest anyone. I would imagine, however, that material such as this has little bearing inasmuch as it is a newspaper report.

Mr. John N. Fegan

- 2 -

February 6, 1967

I am sorry to learn that we have another one of these in the State and it is my hope that Mrs. Parson does not become too active.

Regards.

Sincerely yours,

Hollis M. Dole
State Geologist

HMD:jr



UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
REGIONAL OFFICE
900 HOGE BUILDING
SEATTLE, WASHINGTON 98104

January 18, 1967

Mr. Hollis M. Dole
State Geologist
State of Oregon
Department of Geology
& Mineral Industries
1069 State Office Bldg.
Portland, Oregon 97201

Re: Golden Key, Inc.

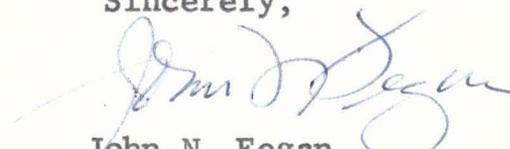
Dear Hollis:

Here is the material we talked about on the telephone this morning concerning Lillian M. Parsons, the white-haired inventor.

We would be pleased to have the benefit of your suggestions and comments.

Best personal regards,

Sincerely,


John N. Fegan
Assistant Administrator

Enclosures

RECEIVED
JAN 19 1967

STATE DEPT. OF GEOLOGY
& MINERAL IND.

AMERICAN QUICKSILVER INSTITUTE

HEAD OFFICE: 206 NORTH VIRGINIA STREET
ROOM 412
RENO, NEVADA

July 16, 1968

ADDRESS REPLY TO:

10836 West Loyola Drive
Los Altos, California 94022

Mr. Hollis M. Dole
Department of Geology and Mineral Industries
State of Oregon
1069 State Office Building
Portland, Oregon 97201

Dear Hollis:

Enclosed are ten copies of THE HARBEN LECTURES by Leonard J. Goldwater, M.D. We would appreciate it if you would pass these on to any of the small mercury producers in Oregon. Also if you would send a copy to the Oregon State Health Department - all with the compliments of the American Quicksilver Institute.

If more copies are wanted, we have them.

Very truly yours,



S. H. Williston

SHW:L

Enc.

P.S. If you take the trouble to read this, you will notice that mercury in urine is no indication of mercury poisoning.

RECEIVED
JUL 17 1968
DEPT. OF GEOLOGY
MINERAL ENDS.