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THE MARIPOSA MINE,
TERLINGUA QUICKSILVER DISTRICT,
BREWSTER COUNTY, TEXAS

By Robert G. Yates and George A. Thompson,
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The Mariposa mine in Brewster County, Tex., ranks second in all-time production of quicksilver in the Terlingua mining district. It is in Section 59, Block G-12, and is about 7 miles by road west of the Terlingua Post Office (see accompanying maps). The nearest railroad shipping point is Alpine, Tex., which is 93 miles by road to the north. The mine is now controlled by the Esperado Mining Co. of Houston, Tex.

Since 1895 the Mariposa mine has produced between 20,000 and 30,000 flasks of quicksilver. The major production was before 1911, but the mine was active during the first World War, and again during the period from 1933 to 1942. In February 1944, the Esperado Mining Co. was reworking some of the old dumps and exploring an ore showing in the east wall of the Perry pit.

The productive ground, a rectangular area roughly 3,500 feet long and 1,000 feet wide, centers about California Hill (see plate 1). The principal subsurface workings, about 3 miles of drifts, stopes, and crosscuts, are under California Hill, but much of the ore was taken from numerous pits, trenches, and shafts northeast and west of the hill. Of the 121 shafts over 20 feet deep, 6 are over 100 feet deep and 2 of these, the No. 5 (or Cruz) shaft and the White shaft, are 300 or more feet deep. The Contratiro winze (see map of workings) extends 200 feet below the 100 level of the mine. Several thousand feet of drifts and crosscuts extending from the deeper shafts explore the mineralized ground through a vertical range of about 300 feet, but almost all the ore that has been produced came from the uppermost workings.

Geology

The Buda limestone, Del Rio clay, and Devils River limestone, all of Lower Cretaceous age, are the sedimentary rocks in the Mariposa area. They are described in the explanation of the geologic map of the Mariposa mine (plate 1). An erosional remnant of Buda limestone caps California Hill, and protects the underlying Del Rio clay from rapid erosion. The Del Rio clay, 180 feet thick, forms the flanks of California Hill and covers the Devils River limestone in the southwest part of the mapped area. Devils River limestone, stripped of Del Rio clay, crops out in the eastern and western ends of the area. The sedimentary rocks have a general northwest strike and an average dip of about 5° to the southwest.

Dikes and sills of trachyandesite intrude the Devils River limestone and Del Rio clay in the southwest part of the area. In general, the dikes occur in the limestone and the sills in the clay. The large sill that forms the southern part of California Hill connects with a dike that is explored by workings in the vicinity of the No. 11 shaft. Another dike of trachyandesite crops out 170 feet northeast of the Goldby shaft.

Faults along the northwest, southwest, and southeast borders of the mapped area bound a depressed block, or graben, of Devils River limestone. Vertical displacements on the faults do not exceed 100 feet at any place in the mapped area, and the planes of fault movement are largely obliterated by later solution of the limestone.

Most of the fractures in the graben block trend northeast, but a few trend northwest. The northeasterly fractures range from N. 40° E. to N. 85° E., but most of them fall into two sets that trend approximately N. 60° E. or N. 75° E. Only a few fractures have a vertical displacement; however, horizontal grooves and striations indicate minor horizontal movement. East and West of California Hill, this fracture pattern is expressed in elongate outcrops of Devils River limestone, which are separated by narrower zones of altered Del Rio clay. The clay fills solution caverns that developed in the upper beds of the Devils River limestone along the northeasterly fractures. This solution cavern filling will be referred to in this reporat as cave fill. The cave fill as mapped includes many blocks and small pillars of limestone and some small areas of highly altered limestone or extremely cavernous limestone partly filled with calcite. The cave-fill zones also extend under California Hill where they are explored by the mine workings (plate 2).

The cave-fill zones are the hosts of the quicksilver lodes and therefore deserve more detailed description than the other geologic features. Some zones extend across the length of the mapped area; others are only a few feet long. They range from 1 foot to more than 100 feet in width. Many zones are wedgelike in cross section, with the maximum width of the wedge at the Devils River-Del Rio contact; 50 feet below the horizon of this contact, most of the cave-fill zones taper to narrow calcite-filled fractures, commonly less than 4 inches in width. Other zones are flat-bottomed rather than wedgelike, exhibiting a relatively greater influence of bedding planes on solution. Where unaltered Del Rio clay overlies the cave-fill zones, the clay is bowed down as shallow synclines. These die out upward. Along the borders of the fill zones, solution along the bedding planes of the limestone has caused the beds to sag and dip toward the fill zones. The limestone walls of the filled caverns are smooth, curved planes. These walls are commonly coated with calcite crystals, and in some places, particularly where the solution caverns are narrow, the caverns are completely filled with calcite. Limestone pillars extend from the floors of the filled caverns, and blocks and numerous boulders of limestone are present in the clay matrix of the fill.

The matrix of the fill zones is commonly a red structureless clay, which contains abundant nodules of hydrous iron oxides and is crisscrossed with veins of fibrous gypsum. The red color is due to variable amounts of iron oxides, which in places are leached, leaving the clay a pale cream color. In other places, the clay has retained the dark gray color of the normal Del Rio clay. The original bedding of the clay is preserved locally, suggesting that the clay collapsed into the fill zones as blocks; in other places the cave-fill clay shows a rude stratification, suggesting that some of the clay was deposited by water. A relatively small amount of it is residual, derived from the solution of the limestone. The clay is silicified in varying degree; in some places cryptocrystalline quartz has partly replaced the clay minerals; in other places, the clay, as well as the limestone, is completely replaced by silica to form jasperoid.

The quicksilver deposits

As all the known ore bodies have been mined, little can be said of their detailed character and maximum dimensions. According to old reports, considerable ore was mined from calcite veins which filled solution openings and some was also mined from the limestone, but undoubtedly almost all the ore came from the altered clay in the cave-fill zones. The ore bodies were distributed within and along the borders of the cave-fill zones as veinlike bodies and as irregular tabular bodies and pockets. In some places their general form corresponded to that of the cave-fill zone which enclosed them, but in only a few places did they completely occupy the cave-fill zone.

No record of the average grade of ore that has been mined from the Mariposa mine is available. In the early years of the mine, only the better grade ore was treated and the lower grade ore was put on the dumps, most of which have been reworked by recent operators. According to an old report, ore that was being treated in retorts in 1901 averaged from 8 to 25 percent quicksilver, and ore that was being treated in the furnaces about 3 percent. During this early period, numerous rich pockets were mined. One of these yielded more than 20 tons of ore which contained more than 50 percent quicksilver.

The principal ore mineral is cinnabar (HgS), but important quantities of native mercury and other rare mercury minerals were mined. The cinnabar occurs as disseminations and as solid masses in the clay matrix of the cave fill, and to a much lesser extent as veinlets and disseminations in the limestone. Some cinnabar was found in the altered trachyandesite dike near the No. 11 shaft. Some cinnabar is finely crystalline, but most shows no crystal form. The rare mercury minerals include calomel (HgCl), terlinguaite (Hg_2ClO), eglestonite (Hg_4Cl_2O), montroydite (HgO), kleinite (mercury ammonium compound), and mosesite (complex mercury-ammonium compound). The Mariposa mine is the type locality for all these minerals except calomel.

Origin of quicksilver deposits

The cave-fill zones and ore bodies are closely associated, but they were not formed at the same time, nor were they necessarily formed by similar processes. Solution caverns in the limestone that are now filled with clay may have been formed by the solvent action of cold surface waters, or they may have been formed by hot water rising from a cooling igneous mass. The latter interpretation relates both the formation of the caves and the deposition of the ore to a similar origin, hot water. The ore bodies, however, formed definitely later than the cave-fill zones and from solutions which were chemically different from those which dissolved the limestone; consequently, the presence of an unexplored cave-fill zone does not assure presence of a hidden and undiscovered ore body. Regardless of the source and nature of the solutions which formed the caverns, the cave-fill zones and ore bodies were both controlled by the northeast fractures; therefore, any cave-fill zone in the mineralized area is a possible, but not a positive, host for an ore body.

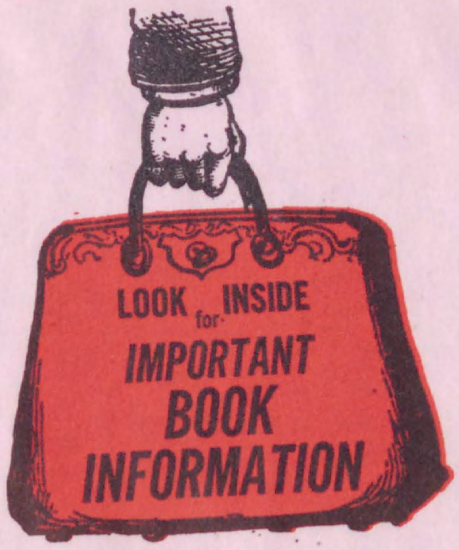
Future of the mine and suggestions for prospecting

In February 1944, the Mariposa mine had no known ore reserves, other than a very limited amount of dump material, which was being screened by hand and trucked to the Chisos mine for furnacing. Its past production, a maximum of 30,000 flasks since 1895, came principally from the cave-fill zones. The accompanying geologic map shows that about 75 percent of the cave-fill zones have been mined or explored. Less than 50 percent of the remaining cave-fill area is unexplored or inadequately prospected by widely spaced trenches and pits. A large number of the prospect pits and trenches shown on the map, as well as extensive underground workings and core drill holes, represent exploration done during the last 10 years. Even though the ground with the best indications of cinnabar was explored during this period, few ore bodies were found. The unexplored ground that remains shows less mineralization than did these places; therefore, it is not likely to be any more productive.

Small ore pockets probably remain in the area covered by the geologic map (plate 1), but because of their small size and scattered locations, the cost of exploration may not justify their development. These pockets can be most economically searched for by sinking pits on the better showings of cinnabar, as determined by panning the surface cave-fill clay. The ground that is covered by alluvium east of the Perry pit and that in the west end of the mapped area deserves special attention in any exploratory program.

Small quantities of cinnabar can be panned from much of the cave-fill clay, but this material is too low in grade to be worked under the present price by existing mining practice. Future conditions of price and improved technology may make possible the mining of much of this material.

It does not seem advisable to explore the Devils River limestone at depths of more than 50 feet below the base of the Del Rio clay. In the mapped area over 25 percent (about 1 mile) of the total underground workings are below this depth, and judging from the number and size of the stopes on these lower levels, the ore mined probably did not compensate for the expenditure necessary for its discovery and extraction. The small ore bodies that have been found were on fractures that were the channelways for the ore solutions that mineralized the cave-fill zones at the base of the Del Rio clay. In the lower levels of the mine these fractures are tight, calcite-lined cracks, which locally open up to small lenslike caverns, which may or may not be filled with clay. The ore was largely formed in those caverns that had clay fillings. The small size and the erratic distribution of these clay-filled caverns make discovery difficult and their mining costly.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