

Caballo Mountain Vanadium Mines

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Promising deposits of vanadium ores in New Mexico, but the metallurgy is still in the experimental state. Complex ores contain lead, copper, molybdenum and vanadium.

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The Caballo or Horse mountains of New Mexico comprise a small range lying about the center of Sierra county. The north end begins just south of Elephant butte, the site of the Government or Eagle dam, and extends about 20 miles south. They are bounded on the west by the Rio Grande and on the east by the Jornada del Muerto plains. The foot hills proper on the east are composed of Cretaceous sand, shales and some small coal seams, of poor grade.

The next higher in altitude and lower geologically comes the red beds of the Carboniferous, in which is the beginning of the mineral-bearing veins. The fissures here are mostly filled with barren quartz, with occasional bunches, pockets or seams of copper ores. The main mountains above are composed almost wholly of Carboniferous limestone and shales, the former predominating and having a thickness of about 1200 ft.

About seven miles from the north end of the range the mountains are cut by Palomas pass, separating them into North and South Caballos, and within a distance of two miles on each side of this pass both on the east and west slopes the principal veins are found. The lead-bearing minerals are on the east and the copper on the west. On the east side directly opposite, and to the north of this pass are found the vanadium-bearing veins. A peculiar condition of deposits exists here. Directly opposite the pass the veins carry both vanadates and molybdates of lead. To the north the veins carry the vanadates with little or no molybdates, and to the south the veins contain the molybdates without the vanadates. Beginning at the south end of the district the veins have a course of 20 to 25 deg. north of west, at the north end of the district they trend southwest.

THE VEINS

The primary vein-filling material consists of galena imbedded in fluorite, barite and quartz gangue. The oreshoots range from 25 to 200 ft. in thickness and from seams to 20 ft. in width between walls. The best example of the veins to the south of the district where only galenite is present, is that of the Rosa Lee mine. Here the vein outcrops about 800 or 900 ft. This mine has a tunnel driven on the vein some 600 ft., and the oreshoot with the exception of a few feet from the mouth of the tunnel, lies entirely above. A 60-ft. shaft is driven through the shoot at the lowest point east on the claim, and a 100-ft. shaft cuts through the shoot at the highest point to the west. The distance between these shafts is 1000 ft. The upper shaft is driven in a large body or blow out of quartz, carrying 3 or 4 per cent. of galenite.

The veins to the south of the Rosa Lee show no indication whatever of vanadinates, molybdates or other secondary minerals. In the Rosa Lee blow out there is a small shoot of oxidized material showing some molybdenum but only on the surface, and no vanadium. The next parallel vein lying to the north 15,000 ft., is the Napoleon, similar to the Rosa Lee but not so extensively explored. In addition to the primary ores this mine shows in a limited portion of the shoot, a leached material from 1 to 2 ft. thick, consisting of a honey-combed quartz, carrying considerable galena rounded into pebble-shaped forms by the action of the solutions, together with yellow cubes of lead molybdate cemented to the quartz shells and to the outside of the galena pebbles. This mine does not show any vanadium.

THE RED TOP MINE

The next deposit of importance is that of the Red Top mine and extensions, opposite to Palomas pass, lying about three-fourths of a mile north of the mines mentioned. This vein promises to be the largest producer in the camp. Although the development here is not so extensive as the Swan and Dewey mines farther north, the ore outcrops a distance of about 1500 ft. on the surface, as compared to 100 and 150 ft. outcrop on the Dewey and Swan mines. On the extension claims of the Red Top the top of the shoot is reached by shafts at 60 to 100 ft. These shafts are about the center of this group and from them has been shipped several cars of crude ore assaying from 2 to 4 per cent. vanadium. At the bottom of the Red Top shaft where they are just beginning to get into the oreshoot proper, caverns and water courses are encountered, lined with vanadium ores. In the vicinity of these water courses the soft "sand carbonates" of the miners, which consists of needle crystals of vanadinite and calcite are found in large bodies 15 to 20 ft. thick. All of these orebodies dip rapidly to the east, and the east extensions have proved to be the most valuable mining claims, although showing little on the surface.

What was supposed to be the biggest deposit in the camp until recently was that of the White Swan mine owned by the Vanadium Mines Company, of Pittsburgh, Penn. Development however, has shown that this shoot is passing rapidly on its dip into the Benjamin claim, the east extension of the Swan. The discovery shaft on the Swan is only 600 ft. from the east-end line and this shaft passes through the first shoot at about the 100-ft. level. This shoot is dipping into the Benjamin claim at the rate of 150 ft. to 100 ft. in depth. The Dewey shoot lying 900 ft. to the north is similar and about of the same value.

The vanadium-ore gangue is composed in the greater part, of calcite, barite, fluorite and quartz, as a soft spongy mass in which the crystals of vanadinite are mingled. The finer crystals of vanadinite are of gold-yellow color, the larger ones a dark reddish brown, needle-shaped hexagonal and often hollow centered. Beautiful specimens may be had showing masses of large brown crystals in quartz. The most beautiful ones, however, come from the lower levels where the crystals are held together by a clear almost colorless calcite. These specimens are so frail that they rarely survive transportation to the top of the mine. Other vanadium minerals and some pyromorphite and cerussite are present.

As has been noted the ores are confined to certain lime strata, and only deposited in these where there are evidences of water courses. The White Swan and Dewey mines will probably produce 20,000 tons of 1 per cent. vanadium ores carrying about 4 per cent. lead. The really large production of the camp will be from the Benjamin or Swan extension and the extension claims of the Red Top mine.

THE METALLURGY

The cart has been put before the horse in the building of reduction and oxide plants for the treatment of concentrates before the orebodies were developed and the results of concentration known. The Vanadium Mines Company is experimenting with a small mill that was originally constructed for the concentration of the galena ores, but the results from this mill have not been satisfactory. Experiments have shown that with proper equipment from 75 to 80 per cent. saving can be made with the production of a high-grade concentrate, and an additional saving by taking out a lower-grade middling product. Leaching of the concentrates with sulphuric acid is not practicable unless the concentrates are high grade. Owing to the basic qualities of the gangue ordinary smelting is not permissible, but experiments are being made with a special process of smelting.