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# A DEPOSIT OF MANGANESE ORE IN WYOMING

## Introduction

Few manganese deposits are known in Wyoming, but one deposit occurring in the Laramie Mountains was visited by the State Geologist in October, 1929. At that time the deposit was owned by Messrs. Kyle & Borton of Medicine Bow and Cheyenne, but was lying idle. It had been exploited during 1916 and 1917 by the Poverty Mining Company of Laramie and several hundred tons of ore containing about 40% of manganese was racked on the dumps and it was reported that several thousand tons of the ore had been hauled to Medicine Bow and shipped. The deposit is opened by a tunnel and a drift approximately 190 feet in total length, which connect with a shaft 25 feet deep.

## Geography

This deposit lies on a gently sloping mesa on the western flank of the Laramie Mountains, near the head of Sheep Creek, at an altitude of approximately 8,000 feet above sea level. It is accessible from Medicine Bow, on the Union Pacific Railroad, by a fair wagon road 38 miles long. Near the deposit Sheep Creek has eroded in the mesa a channel 250 feet deep, which affords a measure of the relief. The rainfall is moderate, and the vegetation consists principally of grasses and small shrubs. Water level has not been reached in the workings.

## Geology

The core of the Laramie Mountains is a coarse-grained red granite of pre-Cambrian age, but flanking it on the west side is a series of limestones and sandstones which range in age from Carboniferous to Cretaceous. These rocks underlie the mesa toward Medicine Bow. The manganese deposit is interbedded in limestone and sandstone of the Casper formation, of Carboniferous age, which here overlies the granite. In the vicinity of the mine the beds dip generally at low angles to the southwest. Granite crops out a short distance east of the deposit and is exposed in the bed of Sheep Creek half a mile northwest of the deposit, where the stream has eroded its channel through the Casper formation.

## Ore Deposit

The manganese ore is contained in two beds of chert a few feet apart,

each ranging in thickness from 1 to 8 feet, which are intercalated in beds of pink and maroon limestone and thin sandstone. The average thickness of each chert bed is about 6 feet. Chert float occurs abundantly over a wide area in the vicinity of the mine, and probably several beds of manganiferous chert are included in the Casper formation. The extent of the manganiferous chert beds of the mine beyond the workings is not known. The beds are exposed from the portal of the tunnel to a point near the shaft. From the portal the tunnel is driven north for 120 feet, to a point from which a drift to the east 70 feet long connects with the shaft at a depth of 25 feet. Both chert beds are explored by the workings, the upper bed being followed by the tunnel and the lower bed in part by the shaft and in part by the drift. Near the right-angled bend in the tunnel a cave of considerable size was found along an easterly fissure in the limestone. It is reported that the walls of the cave were covered with crusts of manganese oxide and quartz crystals, but the cave is now filled with waste rock.

The ore consists of the manganese oxides manganite and pyrolusite in mammillary crusts and nodular aggregates which have wholly or partly replaced the chert and to a less extent the beds that inclose it. The ore occurs irregularly in the chert beds, though generally most of the high-grade ore is obtained from the upper parts of the beds. The writer estimates that 2 feet of ore could be sorted from each bed; but the greater part of the manganiferous chert is too siliceous to be valuable unless some economical method of treating the material could be devised. Two varieties, one dark and one light, were noted. The dark chert is a dense, hard material that is believed to have been originally deposited in the limestone, and the light chert is a chalcedonic variety which was deposited secondarily after the dark variety. Masses of the dark chert are incrusted with manganese oxides and fractures in the chert are filled with manganese oxides and secondary silica. Several cycles of solution and replacement of the chert are represented, for the light chert is in process of replacement by arborescent growths of manganese oxides, and the chert which they replace is redeposited in cavities of the ore in bluish layers. Small quartz crystals project from the outer layer into the cavity. Quartz crystals were in places deposited over layers of manganite crystals in vugs in the ore, but here and there the process was reversed and scattered small manganite or pyrolusite crystals were deposited on quartz crystals. A thin section of the light chert that

was undergoing replacement by manganese oxide was studied under the microscope. The chert is fine grained, and the silica has been deposited in laminae and in aggregates of nodules which show radial and concentric structure. The borders of the growths of manganese oxides are marked by prismatic crystals and minute spindles that extend into the chert.

Manganite and pyrolusite are the oxides of manganese present. The deposit is unusual for the abundance of crystals developed in the ore. Owing to its mode of formation the ore contains many cavities, and these are lined with botryoidal clusters of sparkling small wedge-shaped crystals whose crystal form is that of manganite but which in hardness and streak correspond to pyrolusite. The crystals break down readily into a bluish-black powder which soils the fingers. However, the inner layers of the nodules are manganite, and manganite crystals compose the arborescent growths in the light chert. The pyrolusite is therefore regarded as an alteration product of manganite. Psilomelane was not observed in the ore. Where clay or sandy limestone has been replaced by manganese oxides the ore is a cellular aggregate of small manganite crystals.

Barite occurs in vugs in the ore in large tabular crystals, but it is nowhere abundant, and calcite also occurs sparsely. Iron oxides are probably contained in the dark chert, but they could not be detected in association with the manganese oxides.

The source of the manganese oxides is believed to be the dark chert, which was deposited with the limestone and sandstone. By processes of weathering and leaching, probably by carbonated waters, the manganese minerals of the dark chert were dissolved and redeposited in their present form, replacing the chert and wall rocks.