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EXPLORATION AND DEVELOPMENT OF THE SAN MANUEL ORE BODY*

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The early history of the San Manuel mine, the principal geologic features of the deposit, the methods of drilling and sampling, and some of the results of the drilling and sampling have been ably described in previous reports, namely Bureau of Mines Report of Investigations 4108; a paper entitled "San Manuel Prospect" by H. J. Steele and G. R. Rubly given before the Arizona Section, A.I.M.E. at Tucson, Arizona, October, 1946; and a talk given by Philip Kraft at a meeting of the New York Section, A.I.M.E. in March, 1948.

The San Manuel property is in the Old Hat mining district about 45 miles north of Tucson, Arizona. The town of Mammoth about 3 miles further north is one of the oldest towns in Arizona and has been the center of mining activity off and on for over 75 years. The old stage road from Tucson to Globe, as well as the present State highway 77, crosses the property over the ore body.

A prominent hill of monzonite, stained red with iron oxide, attracted early prospectors to the property but shallow prospecting and two churn drill holes put down in 1915 failed to discover anything of economic interest. Most of the area surrounding the red hill is covered with a layer of conglomerate. Two small outcrops of copper silicate stained monzonite lie at the base of the hill. The largest of these outcrops covers less than two acres in a triangular shaped patch.

J. M. Douglas, R. B. Giffin, V. Erickson and H. W. Nichols were owners of a group of claims covering the San Manuel property. In 1942 they applied to the R.F.C. for a development loan and the U.S.G.S. was requested to examine the property, which they did. The Survey recommended that the United States Bureau of Mines test the ground and early in 1943 the Bureau decided to put down some churn drill holes in the outcrop and through the surrounding conglomerate to determine the value and extent of the copper mineralization. I believe that Dr. B. S. Butler of the United States Geological Survey who was then head of the Department of Geology at the University of Arizona, was instrumental in convincing the Bureau that an important and valuable body of copper ore might exist under the conglomerate cover.

The U.S.G.S. mapped the area and the Bureau of Mines drilled a few shallow holes starting in November, 1943. A coordinate grid system was laid out on 200-foot centers to conform to the estimated axis of the ore body. The preliminary drilling showed that the ore body did extend under the conglomerate and that it continued in depth beyond 350 feet which was the deepest hole drilled. The Bureau secured additional funds and continued drilling.

The Magma Copper Company became interested in the property and upon the recommendation of Dr. John Gustafson, who was engaged in geological work for the

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THE HISTORY AND DEVELOPMENT OF THE SAN MANUEL MINE

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THE HISTORY AND DEVELOPMENT OF THE SAN MANUEL MINE

By John F. Buchanan

Frank H. Buchella

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Location and History

The San Manuel copper deposit is located about 45 miles northeast of Tucson. The concentrator, smelter, administration building, and other plant facilities are located about seven miles southeast of the mine area at the new town of San Manuel as shown on Figure 1.

The chief producer in the area formerly was the Mammoth-St. Anthony Mining Company, operating the Mammoth and Mohawk Mines; located a mile north of the San Manuel Mine. These mines were worked intermittently from the 1800's to 1952. The Mammoth-St. Anthony property is now owned by the San Manuel Copper Corporation.

Interest was attracted to the prominent surface exposure of the San Manuel deposit because of its proximity to an operating mine. There are records of claims on the property to 1900, but these early claims were soon abandoned.

The first exploration work of consequence on the San Manuel property occurred in 1916, when several churn drill holes were put down by a group of mining men who had obtained an option. One of these holes intersected what is now considered oxidized ore, but at that time there was little interest in low grade copper deposits and the option was allowed to expire.

The San Manuel group of claims, which have been maintained continuously, and from which the mine obtained its name, were staked in 1925. These claims eventually were acquired by four men who actively promoted the property. As a result of their efforts, engineers from the United States Bureau of Mines examined the property in March of 1943, and recommended a limited amount of test drilling which was started in November of that year. The results were encouraging, and drilling was continued by the Bureau until February, 1945. At that time, 17 churn drill holes had been put down with a total of 15,844 feet drilled. This exploration disclosed substantial tonnages of ore which was mainly oxidized, but which conformed in grade to what was subsequently found to be the average of the deposit. This was too low-grade for a small-scale operation, but the possibility that further drilling would extend the discovery created considerable interest in the property.

In 1944 Magma Copper Company obtained an option to purchase the property and started Churn drilling in December of that year. Magma exercised its option on September 17, 1945, and also purchased and located additional adjoining claims. All of the property so acquired by Magma was deeded to San Manuel Copper

San Manuel Prospect by H. J. Steele and G. R. Rubly in AIME TP 2255 Min Exp Sept 1947.

The area is in southeastern Arizona near the Tiger Mine at Mammoth. The mineralized area is triangular roughly bounded by faults with a reddish gosson on the surface as indication.

The rocks here are quartz monzonite (coarse granitic) and monzonite porphyry with secondary quartz flooding fairly common expecially near the ore zones. These rocks forma a large part of the region and are bounded by faults on the side mapped possibly a stock with strong faults due to movement while still being emplaced and later movement along those lines.

Diabase is infrequent as is felsite. The diabas is in dikes cutting the quartz monzonite porphyry and it is mineralized with chalcopyrite and pyrite.

The Gila conglomerate covers much of the region. Faults include the San Manuel which is flat (25 to 35°SW forming the contact of the conglomerate over the monzonite. The fault formed after the secondary enrichment and oxidation and deposition of the Gila over the intrusives. The fault was 60 or so originally and normal. Regional tilting was 25 to 35°NE and flattened it out.

At right angles there are apparantly antithetic faults which cut of segments of the San Manuel. The inference by these faults is of doming in the East since the dip of these faults is 50 to 70°E. The displacement of these faults is 400 on the westward one and 200' on the eastern one.

The oxidized ores are typical with chalcocite predominate and similar to those at Bagdad. Chalcopyrite is the chief ore in the primary zone with chalcocite secondary.

The sulphides are disseminated well through out the monzonite. The proportion of chalcopyrite to pyrite is the footwall boundary being an assay boundary. Silver and gold are found here too.

Discussion of the San Manuel Properties in AIME TP 2377, May 1948

The structures here are N10W in general and at right angles, 1 mile to the Mamoth mine's intersecting faults. The mamoth mine runs n10W going to San Manuel.

L.K. Wilson suggest this sequence of events.

1. Regional Stress opening compression fractures give NW veins and the Mammoth (NW) veins but not the Mammoth fault.

2. This was interupted by N.-W. tear lines . These prepared the ground for the intrusions.

3. Metalized solutions came up these fractures with only some copper in them.

4. The region was of compression w th faults formed including the

Mammoth fault. The veins were buckled by these movements.

5. The last mineralization was with copper coming in.

6. Generally there was slumping from relase of pressure and this gave the last movement on the Mammoth fault.

Steele then says that the suggestions be Willson are that all mineralization was post Gila but the felsite was post mineral and cut by the San Manuel fault etc.

Other references include:

The Geothermal Gradient at San Manuel by T. S. Lovering in Econgeol vol 43 #1. This is geothermal gradient in relation to the oxidation etc and tied in with recent happenings and climatic changes of the district.

San Manuel Copper Deposits, Pinal Co, Arizona by T. L. Chapman in the USBM Report of Investigation 4108 Aug 1947, 93 pages.