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THE STORIES OF THE MAJOR ARIZONA PORPHYRIES

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By

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THE STORY OF THE RAY MINE SINCE 1951

The "Story of the Ray Mine", published by this Department in 1952, gave the production of the mine from the beginning in 1911 to the end of 1951. In 1952 and 1953, the mine produced 10,588,306 tons of ore, 192,762,000 pounds of net copper, about 2,000 ounces of gold and about 495,000 ounces of silver. The total production up to Jan. 1, 1954 is therefore as follows:

92,017,482 Tons ore mined 2,181,901,635 Lbs. copper produced Approximately 25,500 ounces gold recovered Approximately 1,825,000 ounces silver recovered

The story also told how advances in mining technology, especially in the operation of open-pit mines, permitted the removal of larger proportions of overburden and the economical handling of lower grade ores. Kennecott Copper Corporation decided in 1948 to conduct open-pit operations on a section of the ore-body, in conjunction with the underground mining. Open-pit operations began in 1950 and since then the proportion of ore mined underground has been gradually reduced, until it is now planned to cease underground operations by January of 1955. The underground mine has been in production for more than 43 years, and by the time of its closing will have produced over 79 million tons of copper ore.

The capacity of the new open-pit mine will be 15,000 tons per day, as compared with the designed capacity of the underground mine of 10,000 tons per day. However, due to lower grade of ore to be mined from the open-pit as compared to that mined underground, the annual production capacity of copper will be 90,000,000 pounds as compared to 75 million pounds produced underground.

The tonnage of ore reserves is not available, but the recent expenditure of millions of dollars to strip the over-burden, to convert to open-pit mining, and to increase the mill capacity indicates several years' life left in the orebody. And now the Company is expending additional money in large scale development of a leaching and precipitation process for recovering a larger proportion of the oxidized copper occuring with the sulphide and now lost in the tailings. This should bring more and more ore into the reserves of profitable ores, which would otherwise not have been included. Hence the indefiniteness of any ore reserve figures.

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THE STORY OF THE MIAMI-INSPIRATION COPPER DISTRICT SINCE 1951

Operations at Miami since 1951

Up to Jan. 1, 1952, the Miami mine had produced over 140,000,000 tons of ore from which had been recovered over 2,100 million pounds of copper. In 1952 and 1953 the mine produced 7,454,275 tons of ore and recovered 100,309,653 pounds of copper. The total production up to Jan. 1, 1954, is therefore as follows:

> Approximately 147,500,000 tons of ore 2,200,310,000 pounds of copper

The mine also has been producing about a half-million pounds of Molybdenum annually; also minor amounts of gold and silver.

From Miami Copper Company's Annual Report for 1953:

Development of the low-grade ore body was started in the early part of the year(1953) and progressed to the point where a minor production began during March, 1954. This ore body was explored with churn drills in 1952 which proved the existence of approximately 23,000,000 tons, from which it is estimated approximately ten pounds of copper can be recovered per ton of ore.

As of Jan. 1, 1954, after proper allowance for mining losses and including the above, it is estimated that the ore reserves of the Miami Mine are 27,600,000 tons.

The reserves in the old section will be exhausted in approximately two years, and thereafter the entire production will be from the low-grade ore section.

The Miami concentrator has a capacity of 12,000 tons of ore per day, and an annual production of 45 million pounds of copper. Mining accounts for 84 percent of copper production, with the remaining 16 percent attained from cement copper precipitated in the acid leach process. About one-half million pounds of molybdenum are recovered annually; also small amounts of gold and silver.

Operations at Inspiration since 1951

Up to Jan. 1, 1952 the Inspiration mine had produced over 130 million tons of ore and recovered about 2,500,000,000 pounds of copper. In 1952 and 1953, the mine produced 8,028,771 tons of ore and recovered 164,476,727 pounds of copper. The total production up to Jan. 1, 1954 is therefore as follows:

> Approximately 138,000,000 tons of ore mined. " 2,665,000,000 pounds of copper recovered.

In the "Story of Inspiration", it was told how an open-pit development and construction program was completed in March, 1948, and since that time the proportion of open-pit ore has been increased until it accounted for 76.79% of total ore output in 1953. It is expected that this ratio will continue to increase, and eventually the open-pit will supply the total ore needs of the plant. The stripping ratio in 1953 was 3.26 to 1. Of the open-pit ore mined, almost half was put through an ore pass to underground haulageways and transported to the main shafts where it was hoisted to surface bins. This method is very satisfactory and eliminates a long truck haul over steep grades. The balance of openpit ore was hauled by truck to the primary crusher. That portion of the overburden carrying copper values recoverable by leaching-in-place was segregated and placed in areas set aside for such treatment. The main shafts coarse crushing equipment, which had been in use since 1915, was due for replacement and modernization and this work was largely completed in 1953.

Leaching-in-place operations, begun in April 1950, are producing about 10 million pounds of copper annually. This is essentially a salvage operation employed to recover copper values remaining in mined-out areas, as well as extract some of the copper content of open pit material of a grade too low to qualify as ore for plant treatment. It is to be expected that the production from this source will fluctuate from year to year as old areas are gradually worked out and new ones become available for leaching. The operation on the lowgrade overburden helps pay for the increased stripping costs due to the high stripping ratio.

Ore reserves as of Jan. 1, 1954 were estimated at almost 45 million tons of ore containing slightly less than 1 percent copper. The capacity of the ferric sulphate leaching plant is better than 9,000 tons of ore per day, and about 60 million pounds of copper per year. The capacity of the slimes treatment plant is about 1,000 tons per day, and about four million pounds of copper per year.

Operations at Castle Dome since 1951

Castle Dome ore reserves were exhausted on Dec. 4, 1953, having been in production since June 10, 1943. A detailed summary of Castle Dome operations follows:

Castle Dome Operation Summary

June 10, 1943 Milling started Dec. 5, 1953 Milling completed 0.725 percent copper Grade of Ore 0.689 11 11 Sulfide 11 11 0.036 Oxide 41,442,617 Tons of ore milled 514,390,317 Pounds of copper recovered 12.412 pounds per ton Net recovery 48,484,188 Tons of waste handled 1.17 to 1.00 Stripping ratio Total gold and silver credits \$777,024.00

"Castle Dome" to "Copper Cities"

In anticipation of the exhaustion of the Castle Dome ore-body, the Miami Copper Company began in 1943 to delimit the Copper Cities ore-body by means of churn drills, was interrupted until 1946, and completed it in 1948. The inplace reserves, after establishment of final pit limits, were estimated, according to Miami Copper Company's 1951 Annual Report, at 33,000,000 tons of ore. The overlying waste material totaled 35,000,000 tons. It was estimated that 20 million tons of waste would have to be removed to expose the ore-body before

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the operation of the concentrator. The deposit is a typical low-grade dissemination of chalcopyrite and chalcocite in quartz monzonite and quartz monzonite porphyry. It is bounded on three sides by faults.

Financed in part by an RFC loan, the project will represent a total investment of about \$15,000,000. The General Services Administration has agreed to buy, at 23 cents (subject to escalation) a maximum of 170,000,000 pounds of the first 192,500,000 pounds. Of the first nine million dollars expended to Jan. 1, 1954, about four million were obtained through the RFC loan. It is estimated that further expenditures necessary to bring the Copper Cities Mine into production will total about \$6,200,000, of which amount \$3,500,000 may be financed at Copper Cities' option through the RFC.* Copper Cities is located three miles northeast of Miami, Arizona.

The mill equipment and concentrator building has been moved from Castle Dome to Copper Cities and was ready to begin producing concentrates in August of 1954. It is a 12,000 ton flotation mill and is expected to produce copper at an annual rate of 45 million pounds. The deposit will yield a considerable amount of molybdenum.

The tailing area consists of three adjoining gulches which will be dammed with earth fill and built up to a height of 80 feet. Cuts will be made in ridges to interconnect the gulches and prevent washouts in case of flash floods. The dam will be further built up by mill tailings discharged progressively across the face of the dam from a wooden trestle near the crest of the dam. Tailing will slope back from the face of the dam to create a pond for reclaiming water. Tailing will eventually cover the ridges between the gulches to provide one continuous storage area.

Fresh water will be supplied from two sources, one of which is the Old Dominion Mine near Globe. Water is pumped from the mine shaft to the Copper Cities pumping plant at Burch. The second source comes from a water development across the Miami Wash at Burch. An 8 by 8 foot shaft was sunk 190 feet to solid conglomerate below the water-bearing sands, and a drift was driven westerly under the dry wash. Churn drill holes were drilled through the sands into the drift, and were cased with perforated stainless steel pipe. Water is collected in the drift and pumped with three deep well pumps from the shaft to a water treatment plant. Water will be pumped from the Burch pumping station by three Byron-Jackson pumps, rated at 750 gallons per minute, to the 3,500,000-gallon mill storage reservoir located at Copper Cities.

* On Nov. 16, 1954, the Miami Copper Co., announced that the last two sections of the new seven-section mill of the Copper Cities Mining Co., are in operation.

The Company also said the entire loan of \$7,500,000 owed by Copper Cities to the Reconstruction Finance Corp., had been paid off, partly from cash resources and partly from the proceeds of a bank loan of a smaller amount, bearing a lower rate of interest.

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THE STORY OF NEW CORNELIA SINCE 1951

Up to Jan. 1, 1952, the New Cornelia mine had produced 151,795,312 tons of ore and had recovered approximately 2,500,000,000 pounds of copper. In 1952 and 1953, the mine produced 18,834,541 tons of ore and recovered 259,585,228 pounds of copper. The total production up to Jan. 1, 1954 is therefore as follows:

170,629,853 tons of ore mined.

Approximately 2,760,000,000 pounds of copper recovered.

Since the "Story of New Cornelia" was written in 1952, the annual tonnage of ore treated has increased from 7,108,000 tons in 1947 to 8,790,000 in 1950 and 9,537,000 in 1953. Copper production has increased from 101 million pounds in 1947 to 131 millions in 1950 and 1953. The ratio of waste to ore was 1.53 in 1953, compared with 1.18 in 1952. Present mining plans call for the continuation of this higher stripping ratio for some years.

Ore reserves are not published but the mine is unquestionably good for many years' life. The erection of an eight million dollar smelter in 1950 indicates that.

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THE STORY OF MORENCI SINCE 1951

Up to Jan. 1, 1952, the Morenci mine had produced 127,326,400 tons of ore and had recovered 2,354,391,000 pounds of copper. In 1952 and 1953, the mine produced 31,836,058 tons of ore and recovered 500,336,834 pounds of copper. The total production up to Jan. 1, 1954 is therefore as follows:

> 159,162,458 tons of ore mined 2,854,727,834 pounds of copper recovered Approximately 80,000 ounces of gold recovered " 5,120,000 ounces of silver recovered

Since the "Story of Morenci" was written in 1952, the 50 thousand ton mill has been continuously operating with an annual ore production of 16 million tons and copper production of 250 million pounds. The grade of ore has dropped, which accounts for a 40 to 50 million pounds of copper drop in annual production.

In 1951, Morenci produced 487 tons of molybdenite concentrates; in 1952, 1170 tons; and in 1953, 808 tons.

Ore reserves are not published, but assuming the reported tonnage of 400 millions at the beginning of operations in 1942, to be a fair estimate, then there should be in the neighborhood of 241 million tons left since the removal of 159 million tons during the period 1942-1953 inclusive.

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