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1906

### Treatment of a Mexican copper ore

Harold Thomas Mapes

Robert Hardy Bedford

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# THESIS

FOR THE

# Degree of Bachelor of Science

IN

# MINE ENGINEERING.

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SUBJECT:

"Treatment of a Mexican Copper Ore."

7578

HAROLD THOMAS MAPES.

ROBERT HARDY BEDFORD.

JUNE, 1906.

## TREATMENT OF A MEXICAN COPPER ORE

The ore to be treated consists of a sulphide carrying some metallic copper. The question is complicated by two considerations.

- (a) The ore slimes readily, high % of fines.
- (b) Water is scarce and must be economically handled.

Capacity is to be 500 tons per 24 hours. Ore from the mine is fed into storage bins, 2000 tons capacity. In case of running break-downs this allows four days for repairs. From the bins the ore passes through chutes controlled by pin gates to a 30" conveyor which delivers its load upon a grizzly whose bars are about 1' apart, directly below the grizzly is a sheet of perforated metal, (having round holes 1-1/2" in diameter)- set at an angle of 45 degrees. This has the effect of holding up as oversize those long larger fragments whose shape has permitted them to pass <sup>through</sup> to the grizzly's bars. The oversize from this combined grizzly, passes to a 36" picking belt, moving at about 30' per minute, while the screenings fall upon a 16" conveyor and continue toward the concentrator bins. The picking belt is manned by sorters who pick out metallic copper and high grade material, depositing same in tram cars from which it is delivered into bins to await shipment to some smelter. The largest lumps of ore must be broken by the sorters to prevent any trouble at the automatic feeders just ahead.

CRUSHING PLANT. The crushing plant consists of five 10' x 20' Blake crushers and five sets of 36 x 16 rolls to correspond.

Crushers are fed by 12 x 24 plunger feeders, (clogging must be guarded against).

See Flow Sheet.

Having passed the crushers and rolls the ore, now broken to 1" size, falls upon an 18" belt conveyor and is carried up an incline to the bins of the concentrators, intercepting and receiving on its way the screenings from the grizzlies mentioned above, thus delivering to the bins a uniform mixture of ore. The ore is evenly distributed over the bins by an automatic tipper. Samples for assay may be taken by some automatic sampling device in conjunction with the tipper.

DETAILS OF MILL. (See map.) Under the mill bins, conveniently situated, automatic feeders deposit the ore into launders where it is mixed with water and taken to an 18" bucket elevator which elevates it to run through a double line of trommels.

Details of trommels; oversize of 5/8" and 3/8" trommels to coarse jigs, undersize to 3/16" trommels; oversize of 3/16" and ~~2-1/2mm~~<sup>1/10"</sup> trommels to middle jigs, undersize to coarse hydraulic classifier; spigot feed of coarse classifiers to sand jigs, overflow of classifiers to #3 elevator joining crushed material from the <sup>Bryan</sup>Chilian mills. Tailings from coarse jigs through 36" rolls to #2 bucket elevator 18" \* Tailings middle jigs through 27" rolls to #3 elevator. Tailings from sand jigs through <sup>Bryan</sup>Chilian mills to #3 elevator. #2 elevator delivers material into the 3/16" trommels enabling the reground coarse and middle jig tails to have an opportunity to pass to the next finer jigs in the series, or, if sufficiently fine to pass directly through the hydraulic classifier system to the shaking tables and vanners.

Since no jigs make waste tails the above treatment insures that the

\* Concentrates in every case go to Smelter

limiting screens will be those of <sup>Bryan</sup> the Chilian mills, which are 20# mesh.

After being sized, either by the hydraulic classifier or screen, the now impoverished ore is passed to the fine sand and slimes treating department and is worked upon Wilfley tables and True vanners. Upon the tables handling the granular feeds, sand middlings and tailings and muddy water middlings are separated into the table side launders. The concentrates, by shaking launders, go to concentrates bin, the sand middlings to Wilfleys, (see map) at a lower level for treatment; the muddy water middlings through centrifugal pumps to pulp thickeners and thence to vanners; the tailings go to waste.

The pulp thickeners are round tanks 10' in diameter by 18' high. The slimes enter through a 12" pipe, preferably of wood, standing vertically in the center of the tanks. The pipe terminates within a short distance of the bottom and the feed is taken out directly below where the pipe terminates. The tank has a hopper bottom converging to the point from which the feed is taken. The volume of feed taken out is much less than that of the feed coming in and a material overflow of clean water will slip over the level top of the tank in a thin sheet, to be immediately re-used as dressing water upon the Wilfley tables.

This tank has been proved successful as a type of "pulp thickener" by the Detroit Copper Co. at Morenci, Arizona.

UNCLASSIFIED; The thickened pulp is divided into parts and flows <sup>one classified</sup> to the vanners which will give concentrates and tailings. All tailings pass by a common launder to settling tanks and give water for re-use. (See scheme of water economy. Samples for assay can be taken from launder.