HYDRO-ELECTROLYTIC TREATMENT OF COPPER ORES.

In a paper presented at the San Francisco meeting of the A.I.M.E., Robert R. Goodrich described the treatment of a porphyry ore by a process including the following steps: Oxydizing roast, leaching with sulphuric acid and electrolytic precipitation of the dissolved metal. A summary of the paper follows:—

The most suitable temperature for roasting the Arizona porphyry copper ore, containing sulphides, in order to render it amenable to acid leaching methods is between 600° C. and 725° C. The more finely ground the material the shorter the time required for the roasting so as to produce the maximum amount of soluble copper: materials which will pass through a 20-mesh screen and remain on 80 mesh require about 2 hours roasting at 600° C. to 725° C.; and when ground to pass through an 80-mesh screen the time required is about 1¼ hours. If the roasting is concluded at temperatures above 800° C., the oxidized copper is converted into a compound which is insoluble in dilute sulphuric acid. The longer the roasting is conducted above 800° C., the greater the amount of insoluble copper produced.

A heated solution is necessary to leach efficiently the copper from the roasted material. A 10% H_2SO_4 solution at 100° C. leached out, in from 3 to 6 hours, all the copper from all roasted materials (through 40 on 80 mesh, through 80 mesh, whole through 20 mesh), except material through 20 or 40 mesh, in which case the extraction was not so high.

The nature of the anode is an important factor in securing depolarization by sulphur dioxide gas.

Depolarization with consequent saving in power is accomplished when using sulphur dioxide gas with a carbon anode, while there is no depolarization with a lead anode.

The depolarization by sulphur dioxide gas, even with carbon anodes, does not reach the theoretical amount, being between 45 and 65%.

The amount of depolarization effected by sulphur dioxide gas when used with carbon anodes varies with the current density, being a maximum at low current density.

The method of introducing the sulphur dioxide gas into the cell is unimportant. All that is necessary is that it be introduced in some way, and in such quantity that the electrolyte is saturated with the gas, so that there is some escaping by bubbling at the surface.

A smoother deposit of copper forms when using sulphur dioxide gas as a depolarizer than when not using it.

In the electrolysis of an acid solution of copper sulphate, when sulphur dioxide is not supplied to the cell and when one is endeavoring to carry electrolysis to the point of complete extraction, a soft spongy deposit begins to form on the cathode before the complete extraction of the copper is effected. There is also a considerable rise in polarization when the copper contents of the electrolyte becomes low.

In the electrolysis of an acid solution of copper sulphate, when sulphur dioxide is supplied to the cell, the copper contents of the electrolyte may be reduced to a very small trace with the formation of a good, firm cathode, without rise in polarization toward the end. Current density and energy efficiency remain high to the end. It is only when prolonging the operation beyond the time when but a small trace of copper remains that sulphide of copper forms as a thin coating on the cathode.

Lead anodes do not peroxidize or deteriorate appreciably when used with or without the introduction of sulphur dioxide into the electrolyte.

A novel idea—step arrangement of process—makes feasible the depositing of copper continuously, while the copper contents of said electrolyte in the respective steps remains constant. A plant composed of several steps of such cells may be operated so that a liquor strong in copper flows to the plant continuously, and the liquor which outflows from the plant is depleted of its copper.

The circulation of the electrolyte by the step arrangement increases the current efficiency. Such rapid circulation is not possible in plants as ordinarily arranged.

PIPE-LAYING ACROSS SMALL STREAMS.

An example of laying a small cast-iron pipe across a narrow stream is presented by Mr. Chas. R. Gow, contractor, Boston, in a paper read recently before the Boston Society of Civil Engineers. The crossing being part of a sewer line, a maintenance of grade was essential. The stream was approximately 75 ft. in width and about 5 ft. in depth at the time when the work was done. As the river was used for boating, no obstruction which would interfere with such use was permitted. The bed of the stream was gravel overlaying a deposit of mud. The crossing was located close to and parallel with an existing highway bridge, from which all of the work was carried on.

A platform steam derrick mounted upon rollers was erected on the bridge so that it could be moved back and forth as the work progressed, the boom being long enough to reach out over the pipe location. A small orange peel bucket was used to remove the gravel slopes at either bank as well as to dredge the shallow trench necessary for the pipe. A pair of wooden leads containing a pile-driving hammer were suspended from the boom end, which was securely guyed in position, while spruce piles were driven in bents of two, the same being spaced 3 ft. on centres. There were 22 piles or 11 bents required in all.

It was necessary to cut and cap the piles at an exact grade, and as the cutting point was more than 5 ft. under water, the following method was devised to accomplish the purpose:

A light riveted steel cylinder 6 ft. in diameter and 10 ft. in length was lowered over a bent of two piles until it rested vertically upon the bottom. To seal the bottom edge, some sand and gravel was deposited around the outside. A pulsometer pump was then swung out by the derrick, the suction lowered into the cylinder, and by means of a steam connection with the hoisting engine the water was removed from the interior of the cylinder so that men could enter, cut the piles with an ordinary cross-cut saw, and cap them at the required grade with 6-in. by 6-in. timbers. When this operation was completed, the cylinder was withdrawn and placed over the next bent of uncut piles.

When all of the pile bents had been thus capped, the pipe was assembled on the bridge, the joints leaded and caulked, and by means of the derrick and a guyed gin pole, the entire length of pipe was suspended over the desired location and lowered through the water till it rested on the pile caps previously placed. A diver was employed to wedge the pipe securely in place, this being the only part of the work on which a diver was used. The pipe was then backfilled with some of the dredged material. The entire cost of this work exclusive of the cast-iron pipe and lead for joints was $561.