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METHOD OF AND APPARATUS FOR CONCENTRATING OXIDIZED ORES BY FLOTATION.

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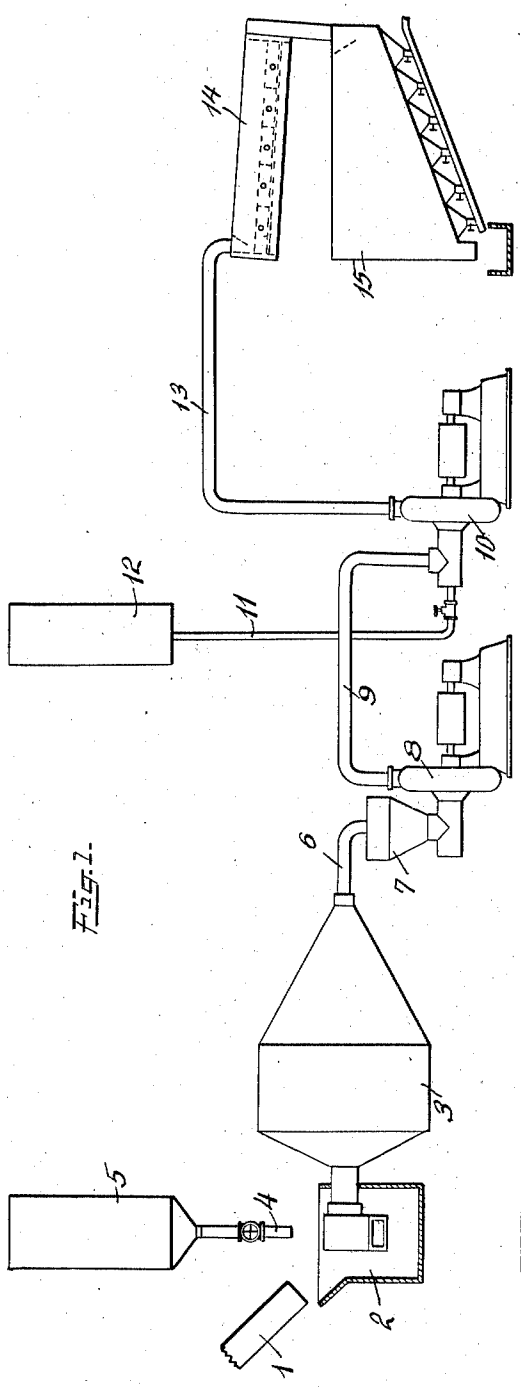


Fig. 1.

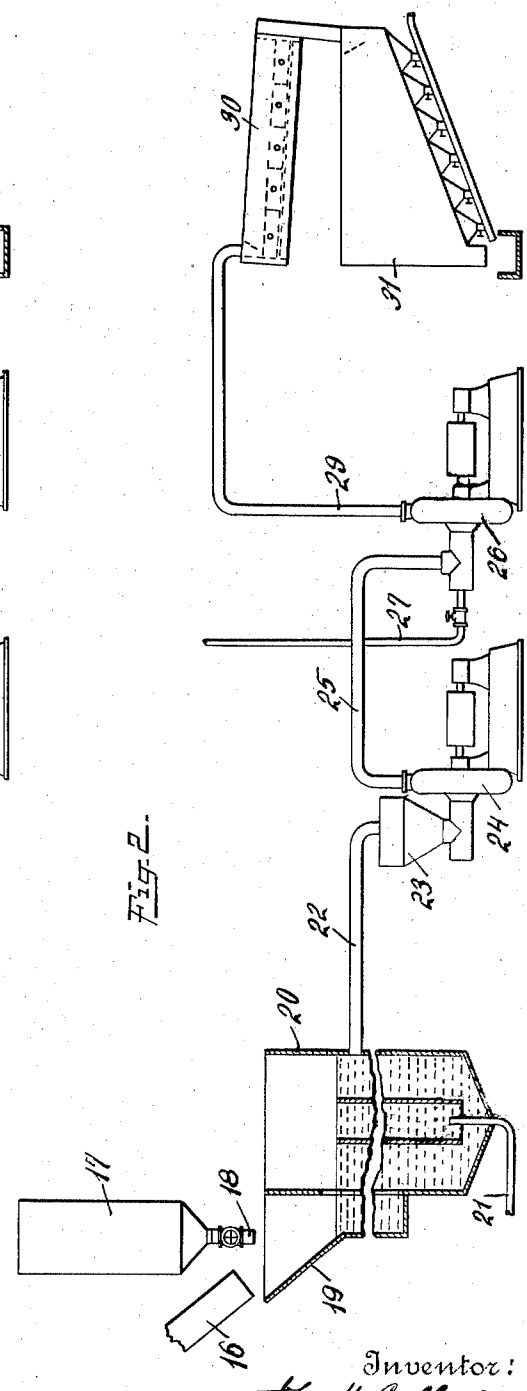


Fig. 2.

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METHOD OF AND APPARATUS FOR CONCENTRATING OXIDIZED ORES BY FLOTATION.

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To all whom it may concern:

Be it known that we, JOHN M. CALLOW, a subject of Great Britain, residing at Salt Lake City, county of Salt Lake, State of Utah, JOHN W. THOMPSON, a citizen of the United States, residing at Superior, Pinal county, State of Arizona, and JOSEPH T. TERRY, JR., a citizen of the United States, residing at Salt Lake City, county of Salt Lake, State of Utah, have invented certain new and useful Improvements in Methods of and Apparatus for Concentrating Oxidized Ores by Flotation; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a novel method and apparatus for effecting the concentration of oxidized ores, such as oxid, carbonate and silicate ores, etc.

It has been heretofore proposed to effect the concentration of oxidized ores by converting the oxidized constituents superficially into sulfids, and by thereafter effecting the flotation of the sulfidized ore. Such prior proposals, in so far as we aware, have involved a preliminary sulfidation treatment and a subsequent treatment of the sulfidized ore in a manner similar to that which is used in the treatment of natural sulfid ores; that is to say, the preliminary sulfidized ore has thereafter been mixed with oil, cresol, phenol, or other frothing agents, and subjected to an aeration and flotation treatment.

We have found that the flotation of oxidized ores can be promoted by subjecting the ore pulp to a preliminary intermixture with the oil or other frothing agent before the sulfidation treatment, this preliminary frothing-agent treatment taking place either during or after the grinding of the ore pulp.

The invention will be described more in detail in connection with the accompanying drawing, in which—

Figure 1 shows one embodiment of the novel apparatus of the invention in which the novel process of the invention can be practised; and Fig. 2 shows a modified form of apparatus.

In the apparatus of Fig. 1 the ore pulp is fed through the pipe or spout 1 to the feed box 2 of the ball mill 3. The oil or other frothing-agent, in regulated amount, is fed through the pipe 4 from the supply tank 5, and enters the ball mill 3 with the ore pulp. The outlet 6 from the ball mill discharges into the feed hopper 7 of a centrifugal pump or the like 8, which in turn discharges through the pipe 9 to a second centrifugal pump or mixing device 10. Provision is made for admission of hydrogen sulfid gas or a solution of hydrogen sulfid or its equivalent through the pipe 11 from the generator or storage tank 12, in regulated amount, the sulfidizing agent entering the ore pulp between the pumps 8 and 10 or at the inlet of the pump 10. The outlet pipe 13 from the pump or mixing device 10 discharges into a blowing cell 14 and thence into the flotation cell 15, which is shown as one of the so-called Callow tanks.

The ore pulp may be one which has been given a preliminary grinding before it reaches the ball mill 3. In this mill a further grinding operation takes place and the oiling of the ore pulp simultaneously takes place, a most intimate intermixture of the oil or other frothing agent and the pulp being effected in this way. The pulp is then subsequently sulfidized by the introduction of hydrogen sulfid or its equivalent and by intimately intermixing said sulfidizing agent with the ore pulp in the centrifugal pump 10 which acts as an efficient mixing device. The sulfidized pulp is then subjected to a blowing operation in the cell 14 for removing therefrom the excess hydrogen sulfid or such other volatile and removable gaseous constituents as are prejudicial to the flotation treatment. The ore pulp is then discharged into the flotation cell 15 where the flotation is effected by the introduction of air in a finely divided form through the porous bottom of the cell, the froth formed being removed and recovered in a manner which will be readily understood.

In the apparatus of Fig. 2, the ore pulp enters through the pipe or feed spout 16 into the feed box 19 of a mixing device for mixing the pulp and oil. The oil or other frothing-agent enters through the pipe 18 from the supply tank 17 in regulated amount. The mixing device 20 is shown as a Pachuca

tank in which the mixing is effected by a strong air current introduced through the pipe 21. In this mixing tank the pulp is intimately mixed with the oil or other frothing-agent so that the preliminary frothing-agent treatment takes place before the pulp is discharged through the pipe 22 to the sulfidizing apparatus. The centrifugal pump or mixing device 24 is similar to the pump 8 of Fig. 1, having a feed box 23 and discharging through the pipe 25 to the centrifugal pump or mixing device 26. Hydrogen sulfid or other sulfidizing agent is introduced through the pipe 27 and the sulfidized pulp is discharged from the mixing device 26 through the pipe 29 to the blowing cell 30 and the flotation cell 31 in the manner above described.

It will be noted that the ore pulp is given a preliminary intermixture with oil or other frothing-agent before the sulfidation, and that the pulp thus preliminarily treated is subjected to a sulfidation treatment which causes an effective sulfidation of oxidized constituents. In the apparatus of Fig. 2, and the process practised therein, the frothing-agent treatment of the pulp takes place after it has been reduced to the required fineness; while in the apparatus of Fig. 1 and the process practised therein a simultaneous grinding and frothing-agent treatment takes place prior to the sulfidation; each of these procedures having characteristic advantages.

It will be evident that different types of apparatus for intermixing the pulp and oil or other frothing-agent, either with or without simultaneous grinding, and for effecting the subsequent sulfidation and flotation, are available for use without departing essentially from the procedure above described.

We claim:

1. The method of effecting the concentration of oxidized ores by flotation which comprises subjecting the pulp to a preliminary intermixture with a frothing agent, subjecting the pulp thus treated to sulfidation, and subjecting the resulting sulfidized pulp to a flotation operation; substantially as described.

2. The method of effecting the concentration of oxidized ores by flotation which comprises subjecting the ore pulp to a preliminary grinding operation with simultaneous intermixture therewith of a frothing-agent, subjecting the pulp thus treated to sulfidation, and subjecting the resulting sulfidized pulp to a flotation operation; substantially as described.

3. The method of effecting the concentration of oxidized ores by flotation which comprises subjecting the pulp to a preliminary intermixture with a frothing agent, forcing the pulp under pressure into a mixing device and simultaneously intermixing therewith a suitable sulfidizing agent, and subjecting the resulting sulfidized pulp to a flotation operation; substantially as described.

4. An apparatus for effecting the concentration of oxidized ores by flotation, comprising means for preliminarily mixing the ore pulp with a frothing agent, a mixing device of the centrifugal type, means for mechanically forcing the pulp from said preliminary mixing means under pressure into said mixing device, means for subjecting the pulp to sulfidation in said mixing device, and means for effecting the flotation of the thus sulfidized pulp; substantially as described.

5. An apparatus for effecting the concentration of oxidized ores by flotation, comprising means for subjecting the ore pulp to a combined grinding and frothing-agent treatment for intermixing the pulp with frothing agent during the crushing, a mixing device of the centrifugal type, means for mechanically forcing the pulp from said grinding means under pressure into said mixing device, means for subjecting the pulp to a sulfidizing treatment in said mixing device, and means for effecting the flotation of the thus sulfidized pulp; substantially as described.

6. An apparatus for effecting the concentration of oxidized ores by flotation, comprising means for preliminarily mixing the ore pulp with a frothing agent, a mixing device, means for mechanically forcing the pulp from said preliminary mixing means under pressure into said mixing device, means for introducing a sulfidizing agent into said mixing device, and means for effecting the flotation of the thus sulfidized pulp; substantially as described.

7. An apparatus for effecting the concentration of oxidized ores by flotation, comprising means for preliminarily mixing the ore pulp with a frothing agent, an inclosed mixing device of the centrifugal type, means for mechanically forcing the pulp under pressure into said mixing device, means for introducing into the pulp as it enters said mixing device a sulfidizing agent whereby the sulfidizing agent and pulp are simultaneously and together forced into the mixing device, and means for effecting the flotation of the thus sulfidized pulp; substantially as described.

In testimony whereof we affix our signatures.

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