Aug. 25, 1931. L. M. BARKER 1,820,210

REAGENT FEEDING

Filed March 18, 1929

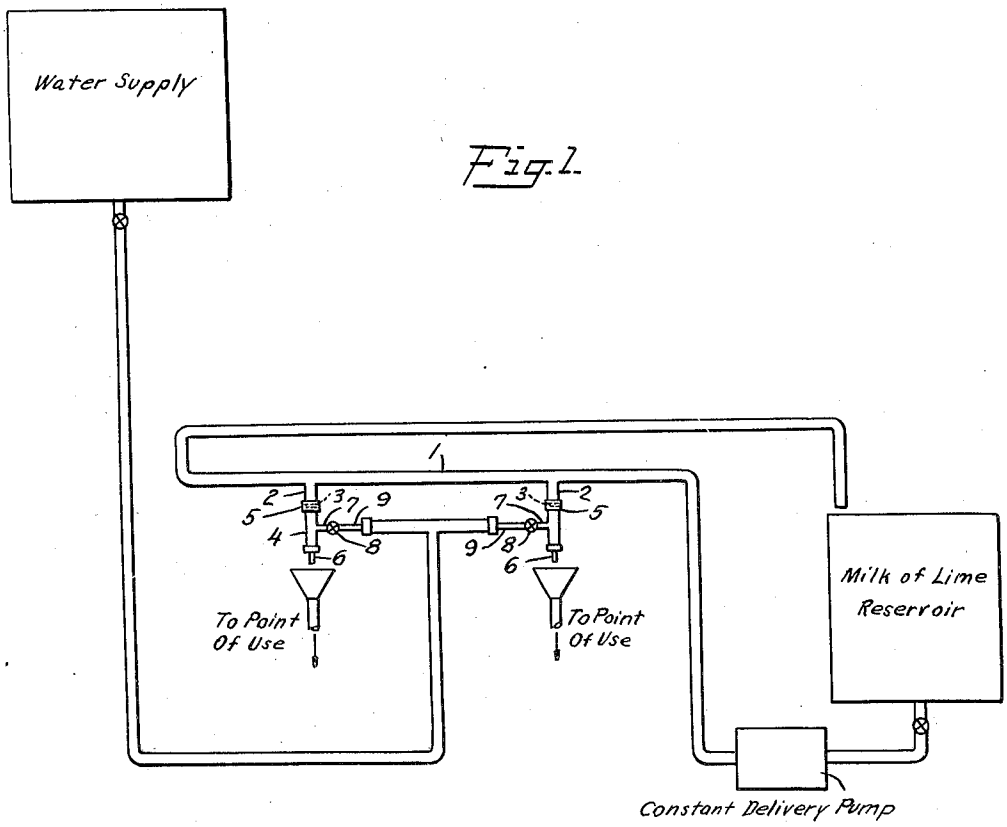


Fig. 1.

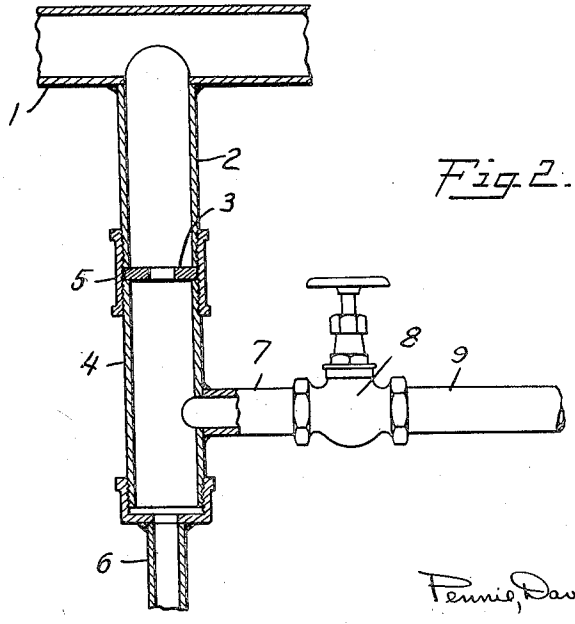


Fig. 2.

INVENTOR
Lyle M. Barker
BY
Pennie, Davis, Marvin & Edmonds
ATTORNEYS

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LYLE M. BARKER, OF CLARKDALE, ARIZONA, ASSIGNOR TO UNITED VERDE COPPER COMPANY, OF CLARKDALE, ARIZONA, A CORPORATION OF DELAWARE

REAGENT FEEDING

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This invention relates to the feeding of reagents and has for an object the provision of a method and apparatus for feeding reagents in continuous streams and at substantially regular and controlled rates. In one of its more limited aspects the invention contemplates the provision of an improved method and apparatus for feeding milk of lime. The method and apparatus of the invention are particularly adapted for use in conjunction with processes involving the concentration of ores by flotation.

The characteristic feature of the apparatus of the invention resides in the provision of means for balancing the hydraulic pressure of a column of reagent against the hydraulic pressure of a column or stream of water in an appropriate chamber with a restricted outlet. The amount of reagent entering the chamber, mixing with the water, and passing through the outlet is dependent upon the pressure of water within the chamber, which is in turn determined by the pressure of the water supply system, the volume of water entering the chamber and its relation to the discharge capacity of the chamber outlet.

The invention will be better understood from a consideration of the following description of a method and apparatus for feeding milk of lime in conjunction with the accompanying drawings in which

Fig. 1 is a diagrammatic outline of a reagent supply system constructed in accordance with the invention; and

Fig. 2 is an enlarged sectional elevation showing the mixing chamber employed in the complete apparatus of the invention.

In the drawings, the numeral 1 indicates a pipe through which the milk of lime is supplied—the source of supply may be a tank or a pump or any other device which will insure a reasonably constant head in pipe 1. This pipe may pass to many lime feeders of the same design as the one herewith described. To this is connected pipe 2 which leads through an orifice 3 to mixing chamber 4. Mixing chamber 4 may consist of a pipe nipple of the same diameter as pipe 2, being connected to the latter by sleeve 5 or any other appropriate means. Orifice 3 may consist of a disc of metal or other suitable material, having an opening centrally located, and being inserted within the sleeve 5 so that it is interposed between pipe 2 and chamber nipple 4 and rigidly held by these elements. At the bottom of chamber 4 is attached spigot 6. This may be made up of appropriate pipe fittings. For instance, it may consist of a small pipe nipple screwed into a hole tapped into a cap which will screw onto the pipe forming chamber 4, or again may consist of a sleeve, in one end of which may be screwed appropriate bushings, the whole being then attached to the pipe forming chamber 4. If bushings are used a series of different sizes of spigots can be obtained by changes in bushing sizes. Attached to chamber 4 at a point intermediate between sleeve 5 and spigot 6 is water supply pipe 7 connected through valve 8 to water supply line 9. As shown, pipe 7 is attached to chamber pipe 4 by welding, but this connection can as well be made by the use of appropriate pipe fittings.

The hydraulic pressure of the clear water supply in pipe 9 must exceed that of the milk of lime supply in pipe 2, and volume of the water fed to chamber 4 must be controllable by valve 8—(the maximum volume available being in excess of the discharge capacity of spigot 6). Orifice 3 and spigot 6 should contain openings of sufficient diameter to accommodate the maximum anticipated amount of milk of lime needed, assuming no dilution with balancing water. However, if the milk of lime contains suspended particles of such size that the openings of orifice 3 and spigot 6 must be increased beyond the dimensions stated above to prevent choking and in which case the spigot opening could pass more than the maximum required lime, then part of the discharge capacity of the spigot must be satisfied with water.

The apparatus above described has proven especially useful in feeding milk of lime to the flow of pulp in flotation concentration mills which operate with a lime circuit. These mills operate with continuous feed of ore and need a continuous stream of milk of lime in the proper proportion such as can be

furnished by this apparatus. The feeder has very great advantages due to its relative freedom from choking with consequent regularity of flow of lime. The only valve in the apparatus is valve 8 through which clear water only is introduced and therefore the apparatus requires cleaning only infrequently. A valve may be introduced in pipe 2 in order to completely shut off the feeder from the supply line 1, but is not essential to the apparatus.

In order to avoid fluctuations I find it advisable to have the water enter through valve 8 under reasonably constant head and in the same manner the milk of lime suspension should remain under reasonably constant head. To provide the latter condition I have found it advantageous to circulate the milk of lime by means of constant delivery pumps from a reservoir through pipe 1 and back to the reservoir. Such constant head provisions are advisable and convenient but not essential.

I claim:

1. Apparatus of the class described comprising a mixing chamber provided with a discharge outlet, means for delivering a fluid reagent to said mixing chamber under substantially uniform pressure, means for delivering a fluid diluent to said mixing chamber under relatively higher substantially uniform pressure, and means for controlling the amount of fluid diluent admitted to said mixing chamber to control the relative amounts of reagent and diluent passing through said discharge outlet.

2. Apparatus of the class described comprising a supply conduit, a source of supply of fluid reagent communicating with said supply conduit and adapted to deliver a fluid reagent to said supply conduit under substantially constant pressure, a mixing chamber provided with a restricted discharge outlet communicating with said supply conduit, means for delivering a fluid diluent to said mixing chamber under relatively higher substantially constant pressure, and means for controlling the amount of fluid diluent admitted to said mixing chamber to control the relative amounts of reagent and diluent passing through the discharge outlet.

3. Reagent feeding means comprising a supply conduit, a source of supply of fluid reagent communicating with said supply conduit and adapted to deliver a fluid reagent to said supply conduit under substantially constant pressure, two or more mixing chambers each provided with a restricted discharge outlet communicating with said supply conduit, means for delivering a fluid diluent to said mixing chambers under relatively higher substantially constant pressure, and means for controlling the amount of fluid diluent admitted to said mixing chambers to control the relative amounts of reagent and diluent passing through the discharge outlets.

4. The method of feeding milk of lime which comprises introducing the milk of lime into a mixing chamber having a discharge outlet under substantially constant pressure, and introducing water into the mixing chamber under relatively higher substantially constant pressure.

5. The method of feeding milk of lime which comprises introducing the milk of lime into a mixing chamber having an unobstructed discharge outlet under substantially constant pressure, and regulating the amount of milk of lime passing through the discharge outlet by introducing a regulated amount of water under relatively higher substantially constant pressure.

LYLE M. BARKER.