Sept. 23, 1924. 1,509,391

A. L. BLOMFIELD

ORE TREATING SYSTEM

Original Filed Jan. 30, 1919

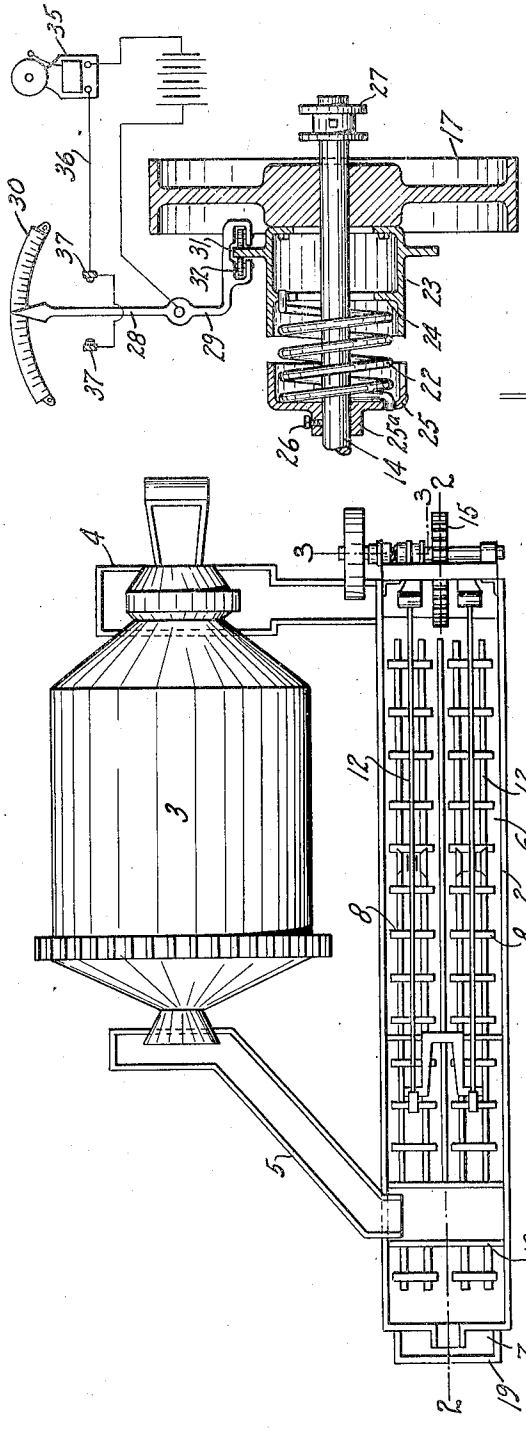


FIG. 3

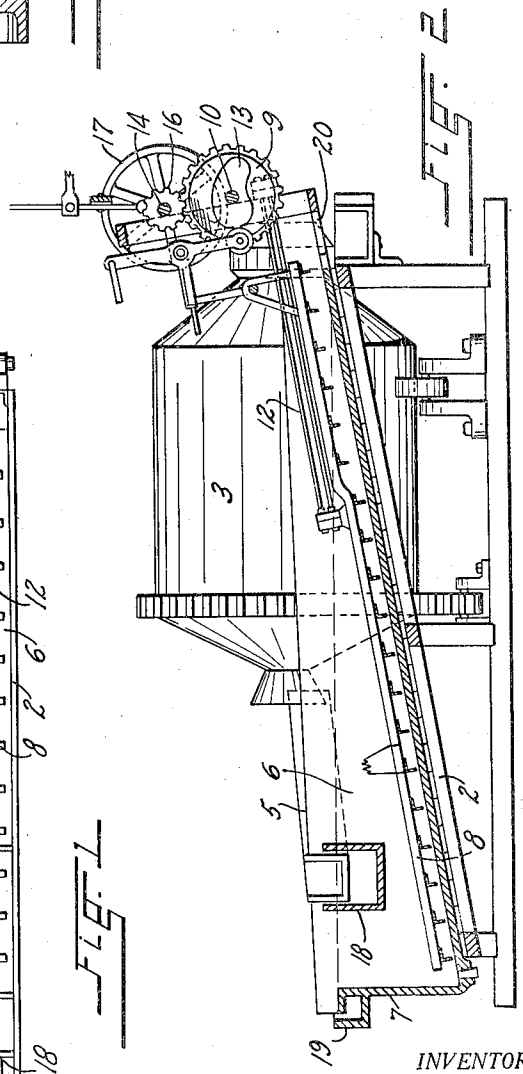


FIG. 2

FIG. 1

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Patented Sept. 23, 1924. 1,509,391

UNITED STATES PATENT OFFICE.

ALFRED L. BLOMFIELD, OF COLORADO SPRINGS, COLORADO, ASSIGNOR TO THE DORR COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

ORE-TREATING SYSTEM.

Continuation in part of application Serial No. 274,052, filed January 30, 1919. This application filed May 18, 1922. Serial No. 561,873.

To all whom it may concern:

Be it known that I, ALFRED L. BLOMFIELD, a citizen of the United States, residing at Colorado Springs, in the county of El Paso and State of Colorado, have invented certain new and useful Improvements in Ore-Treating Systems, of which the following is a specification.

This invention relates to ore treating apparatus and its object is to provide an appliance which automatically indicates by visual or audible means, certain variations in the condition of the material under treatment that require the attention of the operator in order to prevent a decrease in the efficiency of the plant.

My invention is particularly adapted for use in association with a classifying apparatus in which a separation of finely divided ores into sizes is obtained by the subsidence of the heavier and coarser particles and their continuous removal by the action of a mechanical contrivance and it comprises with this end in view, a combination of parts which actuate a pointer, alarm or other indicatory device when the resistance to the impellent action of said contrivance is varied by either an increase or decrease in the density of the subsiding solids.

The knowledge of an irregularity in the state of the material under treatment obtained by the operation of the indicatory appliance, permits of promptly correcting the abnormal condition by regulating the feed of either solids or liquids and thereby maintaining the apparatus at or near its point of greatest efficiency.

In case a classifier to which the invention is applied is connected in circuit with a ball mill or other comminuting apparatus, the resistance of the oversize in the classifier to the movement of the mechanism by which it is compelled to reenter the mill for return treatment, may thus be utilized to regulate the feed to the mill of either ore or liquid or both, and thereby insure a regular supply of material to all the elements connected in the circuit.

In the accompanying drawings I have shown the indicatory appliance as applied to a classifier of the Dorr type, connected in circuit with a ball-mill of conventional construction. I desire it understood, however, that the appliance may be effectively employed in connection with other apparatus in which a regulation of feed in proportion to variant densities of the material under treatment is desirable in order to maintain a maximum efficiency and in which the variations in density are influential upon the operation of a mechanical contrivance with which the indicating system can be associated.

As an illustrative embodiment of the invention, the accompanying drawings show in association with the driving shaft of a Dorr classifier, a simple mechanism which by a resistance to the rotary movement thereof, actuates a pointer co-operating with a graduated scale and closes the circuit of an electrically operated alarm. My invention is, however, not limited to the use of any special mechanism and means other than those shown in the drawings, either mechanical or electrical, may be employed within the spirit of the invention as defined in the hereunto appended claims.

This application is a continuation in part of my application Serial No. 274,052, filed January 30, 1919.

In the drawings in which similar characters of reference designate corresponding parts throughout the several views.

Figure 1 represents a plan view of a closed circuit grinding system including a classifier to which my invention is applied;

Figure 2, a section taken on the line 2—2, Figure 1; and

Figure 3, a section of the indicatory appliance taken along the line 3—3, Figure 1, and drawn to an enlarged scale.

Referring more specifically to the drawings, the reference numeral 2 designates a classifier of the Dorr type, and 3 a ball or tube-mill of ordinary construction. The ore-pulp is as usual fed to the ball-mill through the medium of a scoop working in a box 4 and the ground product is discharged at the opposite end of the mill into a chute 5 which conveys it to the classifier.

The classifier consists of a trough-shaped settling chamber 6 having a sloping bottom and an overflow 7 above the lower end thereof. A pair of rakes 8 which are suspended for reciprocation along the bottom surface of the trough, are operatively connected with a crank wheel 9 on a shaft 10 by means

of pitmen 12, and a lifting mechanism but partially shown in the drawings, and actuated by a cam 13 on the same shaft, serves to raise the rakes above the material on the bottom of the trough during their idle movement.

A driving shaft 14 imparts a slow rotary movement to the crank-shaft through the intermediary of a pair of gear-wheels 15 and 16, one of which may be formed at the periphery of the crank wheel, and a pulley 17 connects the driving shaft with a conveniently located motor or other source of energy.

The chute 5 delivers the material discharged from the mill into a distributing box 18 at the lower or feed end of the classifier trough in which the coarse matter or oversize settles to the bottom while the liquid and suspended fines are constantly discharged across the overflow 7 into a launder 19.

The settling oversize is mechanically impelled to an outlet 20 at the upper end of the trough above the liquid-level established by the overflow, by the action of the rakes which during their upward working strokes, move along the bottom of the chamber and during their return movement, are lifted to move clear of the settled mass.

It is the resistance to the upward movement of the rakes that is utilized for the operation of the indicatory appliance, the construction of which will now be described.

The driving connection between the pulley 17 and the shaft 14 is established through the medium of a helical spring 22 which at its ends, is rigidly connected with the two elements through the medium of the normally spaced members 23 and 25 of a protective casing which encloses the spring. The pulley 17 moves freely on the shaft and when not in motion, engages with a stop-collar 27 which limits its outward movement.

The member 23 of the casing which extends co-axially around the shaft, is bolted to the hub of the pulley wheel and it has interiorly, a flange 24 to which the spring 22 is attached.

The other member 25 of the casing is fixedly mounted on the shaft by means of a hub 25^a and a set-screw 26, and the spring is attached to said member at its end opposite to that which is fastened to the member 23.

It will be evident that the spring functions as a medium to transmit the rotary movement of the pulley to the shaft and that in the operation of the mechanism, it will maintain the pulley in a determinate position relative to the stop-collar 27 as long as the resistance to the impellent action of the pulley is uniform. When the resistance to the movement of the shaft is increased or decreased, as by variation in the density of the oversize on the bottom of the classifier of the apparatus shown in the drawing, the pulley will move proportionately forward or backward on the shaft, it being understood that the extent of its movement is not sufficient to detrimentally disturb the position of the belt by which it is connected with the motor.

The sliding movement of the pulley on the shaft is transposed into a rotary movement of a pivoted pointer 28 along a graduated scale 30, an arm 29 of the pointer being to this end engaged by a circular flange 31 on the member 23 of the casing. In order to transmit the movement of the pulley to the pointer in either direction with a minimum of friction, the arm 29 of the latter is equipped with two small rollers 32 which bear on the flange at opposite sides thereof.

If, after a variation in the resistance to the driving action of the pulley, the condition causing said variation is restored to normal, the spring 22 will automatically return the pulley to its original position on the shaft.

It will thus be seen that any change in the density of the oversize in the classifier, resulting in a corresponding displacement of the pulley on the shaft, is indicated by the pointer on the graduated scale and that by these means the operator is enabled to promptly correct the abnormal condition by regulating the feed to the classifier, or other expedient.

Overloading of either the classifier or the grinding mill is thus avoided and an underload although less material, may be similarly corrected.

In order to audibly give warning of a change of the condition of the material under treatment, an electric alarm 35 is connected in a circuit 36 with normally insulated contacts 37 placed at opposite sides of the lever so as to be engaged thereby when moving in either direction from its normal condition of rest.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In combination, a classifier adapted to separate solids in a liquid according to their size and having a reciprocatory member for actuating oversize to a point of discharge, and mechanism for reciprocating said member including an indicatory appliance for indicating variations in a resistance to the movement of the oversize.

2. In combination, a classifier adapted to separate solids in a liquid according to their size and having a reciprocatory member for actuating oversize to a point of discharge, and mechanism for reciprocating said member including a drive shaft and an indicatory appliance having a rotary element connected with and actuated by the drive shaft.

3. In combination, a classifier adapted to separate solids in a liquid according to their

size and having a reciprocatory member for actuating oversize to a point of discharge, and mechanism for reciprocating said member including a drive shaft and an indicatory appliance having a rotary element yieldably connected with and rotated by the drive shaft and movable to different positions with relation to the driving means for operating the indicatory appliance to indicate variations in the oversize.

4. In combination, a classifier adapted to separate solids in a liquid according to their size and having a reciprocatory member for actuating oversize to a point of discharge, and mechanism for reciprocating said member including a drive shaft and an indicatory appliance having a rotary element yieldably connected with and rotated by the drive shaft and movable to different positions with relation to the drive shaft for operating the indicatory appliance to indicate variations in the oversize.

In testimony whereof I have affixed my signature.

ALFRED L. BLOMFIELD.