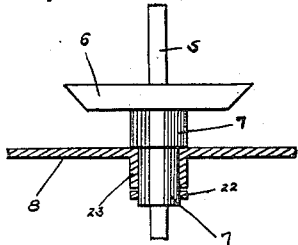
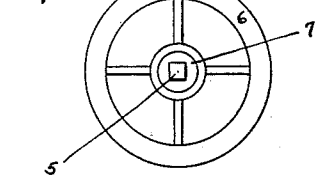
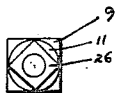
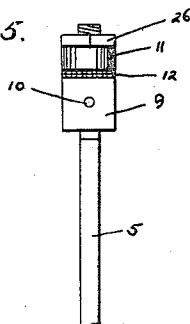
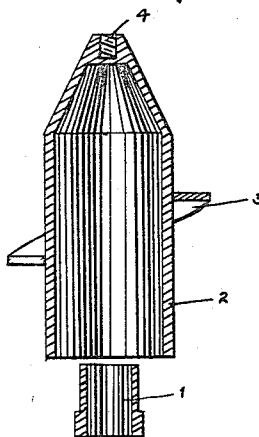
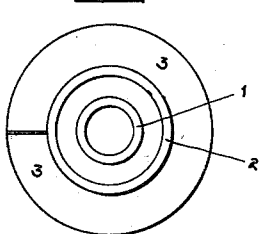


APPLICATION FILED FEB. 14, 1917.

1,265,734.

Patented May 14, 1918.



Witnesses :

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UNITED STATES PATENT OFFICE.

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CLASSIFIER.

1,265,734.

Specification of Letters Patent.

Patented May 14, 1918.

Application filed February 14, 1917. Serial No. 148,589.

To all whom it may concern:

Be it known that I, WILLIAM A. BRUNKER, a citizen of the United States, residing in Salt Lake City, county of Salt Lake, and State of Utah, have invented certain new and useful Improvements in Classifiers, of which the following is a specification.

My invention relates to certain new and useful improvements in classifiers, but more particularly has reference to a device of this description for use in the art of hydrometallurgy, that serves to dewater or thicken the sand product discharged, as well as to separate the same from the slimes.

The principle of my invention is the automatic raising and lowering of a gravity sand discharge valve suspended from a vertical, floating worm or spiral which is continuously revolved in one direction in a bed of sand settling from suspension.

A practical method of applying the invention is clearly illustrated in the drawing and fully described herein, the novel features being particularly pointed out in the claims which conclude this specification.

In the accompanying drawings, Figure 1 is a vertical sectional view of the machine; Fig. 2 is a detail of the driving gear together with its spindle, showing how the spindle is supported by the bed frame; Fig. 3 is a bottom view of the spindle gear; Fig. 4 is a top elevation of the hanger bearing; Fig. 5 is a side elevation of same; Fig. 6 is a cross-section of the vertical shaft; Fig. 7 is a vertical sectional view of the moving part of the discharge valve; Fig. 8 is a similar view of the stationary part of said discharge valve; Fig. 9 is a bottom view of the discharge valve.

1 is the sand discharge bushing for conveying the sand out of the bottom of the tank; 2 is the tubular discharge valve that carries the worm propeller 3 rigidly fastened to it and rotates continuously; 4 is the threaded opening in 2 for screwing in the vertical shaft of square cross-section 5; 6 is the driving gear that rotates the vertical shaft 5; 7 is the spindle hub of the driving gear, formed with a square bore to receive shaft 5 which is free to move vertically up and down in 7; 8 is the bed frame for the gear and pinion and extends across the top of the tank; 9 is the hanger bearing that serves as both a bearing and guide for shaft 5, and is capable of moving in a vertical direction only, at all times allowing the shaft

to rotate freely within it; 10 is the hole formed in two opposite sides of 9 for the bail connection with the counterweight rope; 11 is the ball-bearing collar locked with the nut 26,—the shaft is formed round instead of square with the hanger bearing; 12 is the ball-race between 9 and 11, carrying the ball-bearings; 13 is the guide for the hanger bearing and serves to restrain the latter from rotating or moving sidewise; 14 is the bail rope passing over the sheave 15 and connected to the counterweight 16 that counterbalances the vertical shaft 5; 17 is the water level in the settling tank; 18 is the approximate sand level which varies with the tonnage, rising as the tonnage treated increases; 19 is the agitator for keeping the slimes in suspension while the sand settles to the bottom; 20 is the feed inlet; 21 is the slime and water outlet; 22 is the collar for the gear spindle 7, used to restrain the gear from rising; 23 is the bearing in the bed frame for the gear spindle; 24 is the driving pulley; 25 is the settling tank or classifier body of any suitable shape.

In operation, the vertical shaft 5, the worm 3, and the tubular discharge valve 2 are rotated continuously in one direction. When the feed is turned into the machine the sand quickly settles out of suspension building up in and around the surface of the worm, which is thereby enabled to gain a firm footing and propel itself up through the sand, causing the discharge valve 2 to be lifted and uncover the discharge bushing 1 thereby allowing the settled sand to flow out through 1 by gravity. Meanwhile, the fine slime and water are discharged together at the top of the tank through 21.

With a uniform feed, the worm soon reaches and remains at a point of equilibrium, allowing a continuous and uniform discharge of sand, or thickened pulp, at the bottom. When the feed varies, the worm automatically adjusts itself and the discharge valve to the new condition, so that the product discharged is maintained at the same consistency regardless of the rate of feed.

When started up the first time, the machine must be primed with sand to a sufficient level to partially submerge the worm. This bed of sand makes it difficult for water or other solution to reach the sand discharge opening. Should the shaft stop rotating, the valve will close and the tank fill up with

sand, if the feed is not cut off. However, the machine will clear itself automatically to the sand level when the shaft is started rotating again.

5 The rotating parts suspended in the tank are partially counterbalanced, in order to reduce the load that the worm must support and lift. The effect is to minimize power required for operation, and also wear on the worm.

10 The discharge bushing is projected above the bottom of the tank so that a small amount of sand is trapped on the tank bottom to serve as a seat for the tubular discharge valve which fits very loosely over the bushing. when in the closed position. This tube is revolving continuously while the bushing is stationary. The relation between the tube and the bushing is such that the tube throttles off all sand discharge until it has risen to a certain point, after which it allows the same to discharge in gradually increasing quantity, until it reaches its discharge capacity. This type of valve is essential to the successful operation of the machine described.

25 A classifier of this type has numerous advantages over other machines designed for similar work. It has enormous reserve capacity; for a large gravity discharge opening is practicable, on account of the throttling action of the valve and its height of lift. The principle on which the machine operates is such that one machine can handle successfully widely varying tonnages.

35 The amount of floor space necessary per ton of capacity is very small. Little power is required to operate the machine, as the classified and dewatered material is not elevated above the water level, but discharged by gravity through the bottom of the tank. Counterweighting is also a factor in cutting down the power. The power required does not vary with the tonnage treated, but remains constant. The repairs are few and far between, for the wearing parts are thick castings that have long life. Considerable wear can take place without impairing the efficiency of the machine. Finally, the machine is very simple in construction and operation.

50 In general, this classifier can be used whenever it is necessary to make a rough separation of sand and slime, and to dewater or thicken the sand. It can handle mixed material ranging in size from about $\frac{1}{2}$ " to 80 mesh.

The invention may be applied to: de-

watering tailings preliminary to stacking them, thereby recovering much water; dewatering and classifying material fed to tube mills, ball mills, pebble mills, Chilean 80 mills, fine crushing rolls, etc., dewatering concentrates for direct loading into cars for shipment to the smelter.

Throughout the specification and claims, the term "sand" is used to designate that 85 portion of the material fed to the classifier, which will settle readily from suspension.

Having thus described my invention, I claim as new and useful improvements in classifiers and desire to secure by Letters 90 Patent the following:

1. A classifier comprising a settling tank with inlet and overflow means at the top, a discharge orifice at the bottom, a bushing extending up into said tank, a revolving 95 tubular valve yieldably supported for vertical movement and fitting loosely over said bushing, said valve carrying a worm propeller rigidly fastened to said tube and axially disposed around it, means for revolving said tubular valve, external weights applied so as to counterbalance said revolving valve.

2. A classifier comprising a settling tank with inlet and overflow means at the top 85 and a sand discharge orifice at the bottom, a vertical shaft of square cross-section having at its lower end a tube valve rigidly fastened to it, said tube being formed with a worm or spiral disposed around the outside remote from the lower end, a bushing 90 extending through said discharge orifice and projecting above the bottom of said tank and being partly inclosed by said tube valve, a gear and pinion for imparting rotary motion to said vertical shaft, said gear having 95 a square hole in the hub to receive said vertical shaft in such a manner that the shaft is free to move vertically with respect to said gear, a weight to counter-balance the weight of the shaft and its fittings, suitable connection between said weight and the upper end of said shaft to allow the shaft to revolve freely and move vertically up or down, means for agitating the solution above 105 the sand level in the tank.

In testimony whereof, I affix my signature in the presence of two subscribing witnesses.

WILLIAM A. BRUNKER.

Witnesses:

R. B. HARKNESS,
J. E. REPINSKI.