P. A. ROBBINS.

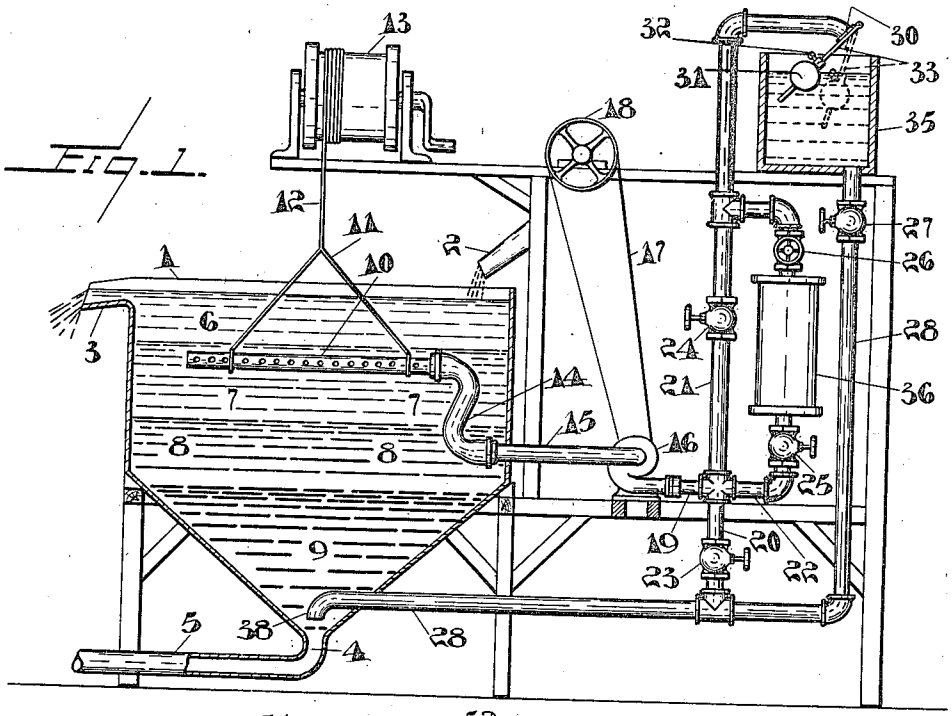
SETTLER FOR FLUID MIXTURES.

APPLICATION FILED JAN. 22, 1917.

1,272,850.

Patented July 16, 1918.

Fig. 1.



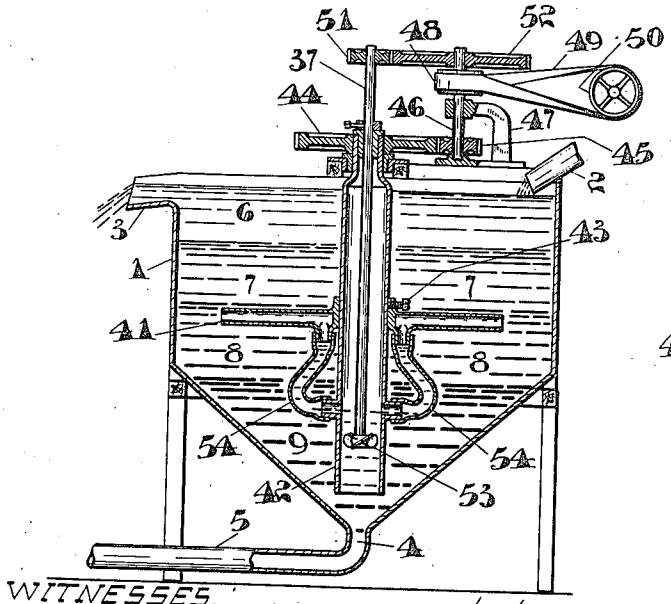


Fig. 2.

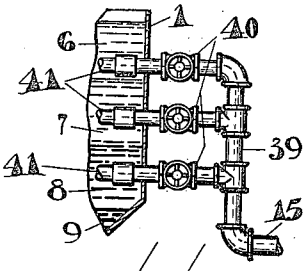


Fig. 3.

WITNESSES.

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SETTLER FOR FLUID MIXTURES.

1,272,850. Specification of Letters Patent. Patented July 16, 1918.

Application filed January 22, 1917. Serial No. 143,688.

To all whom it may concern:

Be it known that I, PERCY A. ROBBINS, a citizen of the United States of America, residing in the town of Timmins, District of Algoma, Province of Ontario, Dominion of Canada, have invented certain new and useful Improvements in Settlers for Fluid Mixtures, of which the following is a specification.

This invention relates generally to the separation of fluid mixtures, which may be either mixtures of liquids of different specific gravities, or else of more or less finely divided solids in a liquid or liquids, and more particularly to the separation of the liquid and solids in a mixture of finely divided ore and water or chemical solution, which is an operation constantly needing to be performed in the practice of the art of metallurgy.

My object is to devise an improvement in the separation of the liquid from the solids in the mixture which will increase the efficiency and capacity of the apparatus as commonly in use, thus reducing the size and hence the cost of apparatus required for handling any given quantity of mixed ore and liquid.

I attain my object by providing means for withdrawing a portion of the fluid mixture from a zone of relatively low specific gravity and for discharging it with a part of relatively high specific gravity, whereby the discharge of the solids is effected with a minimum of liquid.

The invention is hereinafter more specifically described and is illustrated in the accompanying drawings in which—

Figure 1 is an elevation partly in section showing one embodiment of my invention;

Fig. 2 a similar view illustrating a modification; and

Fig. 3 a detail showing a modification of the means for drawing off the fluid mixture from intermediate zones.

In the drawings like numerals of reference indicate corresponding parts in the different figures.

1 is a settling tank into which the fluid mixture to be separated is discharged by means of a launder 2. The tank is provided with an overflow lip 3 and a conical or pyramidal bottom having a central opening 4 preferably provided with a discharge pipe 5.

In the tank the mixture of ore particles and liquid discharged from the launder 2 spreads itself and moves slowly to the discharge points practically free from agitation, thus permitting the ore particles to settle out of the mixture, leaving a clear liquid 6 at the top of the tank, which clear liquid is decanted through the lip 3, while the ore particles continue to settle through the various intermediate zones 7, 7, 8, 8, and 9 of the tank, finally reaching the discharge opening 4, through which they pass together with a certain amount of liquid.

With certain ores in a finely comminuted state a colloidal slime is formed when the ore is mixed with the liquid and these colloids are of such a nature that they tend to accumulate in the settling tank, being too light to sink quickly to the bottom of the tank under ordinary conditions of operation. These colloids tend to collect in a well defined zone just beneath the clear liquid which floats at the top of the settler, and their effect is to reduce the capacity of the settler.

My object is to provide means for facilitating the discharge of these colloids from the settler. It is found in practice that in order to operate a settler uninterruptedly a certain amount of liquid must be discharged with the settled ore particles, which liquid imparts to the mixture the necessary fluidity to enable the mixture to pass easily through the discharge opening 4 and pipe 5. If the amount of liquid be reduced below the necessary quantity, the discharge opening and pipe become choked and the tank will fill up with settled ore particles and become inoperative. With certain ores with which I am familiar, it has been determined that settling may be carried on until the moisture contained in the ore particles is 25% of the entire weight of the mixture discharging from the opening 4, but in order to insure continuous operation of the settlers demanded by commercial practice it is necessary to raise the percentage of moisture until it constitutes approximately 40% of the mixture discharged through the opening 4.

In the case of the cyanidation of gold ores, the liquid is the valuable component of the mixture and it is desirable to discharge as small a quantity as possible in order to maintain the waste of the valuable liquid at a minimum.

In carrying out my process by means of

the apparatus shown, the mixture in the zone 9 of the settler may be settled until the amount of liquid is at a minimum and the necessary fluidity to insure a continuous discharge is obtained by drawing a quantity of thin pulp from the colloidal zones 7—7 of the settler and ejecting it into the mixture in the zone 9, thus supplying the surplus liquid required for maintaining a flow through the orifice 4 and the pipe 5. The advantage of so handling the mixture lies in the fact that the colloids are constantly skimmed off and are used instead of the more valuable liquid to facilitate the discharge of the settled solids, thus enabling an increased quantity of pulp to be settled in a settler of given dimensions.

In the embodiment of my invention shown in Fig. 1, I show a perforated skimming pipe 10 suspended in the tank by any suitable means, such, for example, as the ropes 11—11 and 12, connected with the winch 13 by means of which the pipe 10 may be lowered to the desired depth according to the portion of the colloidal zone from which it is desired to withdraw the colloidal pulp. A flexible hose 14 connects the skimming pipe with the pipe 15, which passes through the side of the tank and is connected to the suction inlet of the pump 16 driven by means of the belt 17 from the driving pulley 18 on a suitably rotated shaft.

The pump 16 delivers into the pipe 19, which connects with the branch pipes 20, 21 and 22, provided respectively with the stop valves 23, 24 and 25 for regulating the flow through the said branches. In the simplest mode of operation the valves 24 and 25 are closed, and also the valve 27 in the pipe 28 with which the pipe 20 connects. This pipe 28 leads to the bottom of the settler and discharges through the terminal opening 38 into the thickened material flowing out through the orifice 4. In operating in this manner, the pump 16 furnishes the force necessary to withdraw the light colloidal pulp from the settling tank and discharge it through the opening 4 against the pressure at the tank bottom due to the weight of the volume of material in the settler.

A nice adjustment will be necessary of the flow of colloids from the intermediate parts of the settler to the discharge opening 4, and while this could be done by regulating the speed of the pump 16 or by regulating the opening of the valve 23, I prefer to provide other means for effecting a close regulation of the flow.

In Fig. 1 I show an elevated tank 35 with a bottom discharge connected to the pipe 28. The pipe 21 is adapted to discharge into the top of the tank 35 through the flap valve 30, which is controlled by the float 31 mounted on the rod 33 connected to the flap valve. The float is adjustable on this rod 33 by means of a set screw 32. If the valve 23 be closed and the valves 24 and 27 opened, it is evident that the pump will discharge to the tank 35 and that the discharge through the pipe 21 will be regulated by means of the float valve described to maintain a constant water level in the tank. By adjusting the position of the float 31 upon the rod 33, I am able to adjust within certain limits the level at which the surface of the pulp in the tank 35 is maintained, and by adjusting the opening of the valve 26, I am able to regulate the flow of material out of the tank 35 so that by this means the flow of colloidal pulp from the intermediate zone of the settler to the discharge orifice 4 may be delicately regulated.

36 is a filter through which the whole or part of the colloidal pulp from the pump 16 may be caused to pass, the flow being controlled by means of the valves 25 and 26.

In Fig. 3, instead of showing the perforated skimming pipe 10 as vertically movable, I show a plurality of skimming pipes 38 located at different levels, all connected by a pipe 39 to the pipe 15 leading to the pump. Controlling valves 40 are provided, by adjusting which any one or more of the skimming pipes may be brought into operative connection with the pipe 15.

In Fig. 2 I show another embodiment of my invention. The skimming pipes 41 are connected to a hub slidable upon the central tube 42 and adjustable thereon by means of a set screw 43. This tube is rotatably mounted on the top of the frame of the apparatus and has a gear wheel 44 secured thereto which meshes with a gear pinion 45 secured to a spindle 46 journaled on the bracket 47 secured to the top of the frame of the machine. This spindle is provided with the pulley 48 suitably driven by means of the belt 49 from the pulley 50 secured to a suitably driven shaft.

Within the tube 42 is journaled the spindle 37. To the upper end of this spindle is secured a pinion 51 meshing with the gear wheel 52 secured to the spindle 46. From this arrangement of the gearing, it follows that a rapid movement of rotation is given to the shaft 36, to the lower end of which is connected a propeller 53, and a slow movement of rotation is given to the skimming arms 41, thus enabling them to collect material from all parts of the colloidal zone. The arms are connected by means of flexible pipes 54 with the interior of the tube 42 and the lower end of the pipe 42 is located just above the opening 4. A constant discharge of the colloidal pulp to effect the discharge of the settled solids is thus obtained, and the rate of flow may be governed by governing the speed of the pulley 50. The arms 41 are easily raised or lowered to cause

them to draw from a colloidal zone of any desired specific gravity. Various other embodiments of the invention are possible and I do not desire to restrict myself to the exact construction shown.

What I claim as my invention is:

1. The combination with apparatus used for the separation by settlement of a fluid mixture of component parts having different specific gravities comprising a vessel in which the parts tend to settle in such sequence that the parts of relatively low specific gravities float upon the parts of relatively high specific gravities, said vessel being provided with discharge openings at different levels, of means for conducting a part of relatively low specific gravity to be discharged with a part of relatively high specific gravity and for imparting pressure to the part of relatively low specific gravity to facilitate the discharge of the part of relatively high specific gravity.

2. The combination with apparatus used for the separation by settlement of a fluid mixture of component parts having different specific gravities comprising a vessel in which the parts tend to settle in such sequence that the parts of relatively low specific gravities float upon the parts of relatively high specific gravities, said vessel being provided with discharge openings at different levels, of means for withdrawing a part of relatively low specific gravity and forcing it through a common orifice with a part of relatively high specific gravity.

3. The combination with apparatus used for the separation by settlement of a fluid mixture of component parts having different specific gravities comprising a vessel in which the parts tend to settle in such sequence that the parts of relatively low specific gravities float upon the parts of relatively high specific gravities, said vessel being provided with discharge openings at different levels, of means for withdrawing a part of relatively low specific gravity and forcing it through a common orifice with a part of relatively high specific gravity, and means for regulating the rate of flow of the part of low specific gravity.

4. The combination with apparatus used for the separation by settlement of a fluid mixture of component parts having different specific gravities comprising a vessel in which the parts tend to settle in such sequence that the parts of relatively low specific gravities float upon the parts of relatively high specific gravities, said vessel being provided with discharge openings at different levels, of means for conducting any desired part of relatively low specific gravity to be discharged with a part of relatively high specific gravity and for imparting pressure to the part of relatively low specific gravity to facilitate the discharge of the part of relatively high specific gravity.

5. The combination with apparatus used for the separation by settlement of a fluid mixture of component parts having different specific gravities comprising a vessel in which the parts tend to settle in such sequence that the parts of relatively low specific gravities float upon the parts of relatively high specific gravities, said vessel being provided with discharge openings at different levels, of means for conducting a part of relatively low specific gravity to be discharged with a part of relatively high specific gravity having an inlet vertically adjustable to different zones and for imparting pressure to the part of relatively low specific gravity to facilitate the discharge of the part of relatively high specific gravity.

6. A process of separating fluid mixtures of component parts having different specific gravities which consists in passing the mixture into and through a settling tank having an overflow and an opening adjacent the bottom and in which the parts settle in sequence according to their specific gravities, and withdrawing part from an intermediate zone imparting pressure to it and discharging it with a part of higher specific gravity through the lower opening.

Signed at Timmins, this 8th day of January, 1917.

PERCY A. ROBBINS.

Witnesses:
D. E. McCoy,
S. P. McCoy.