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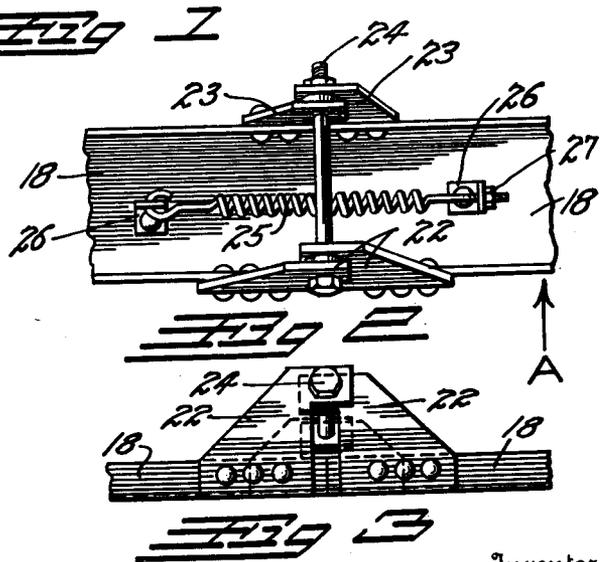
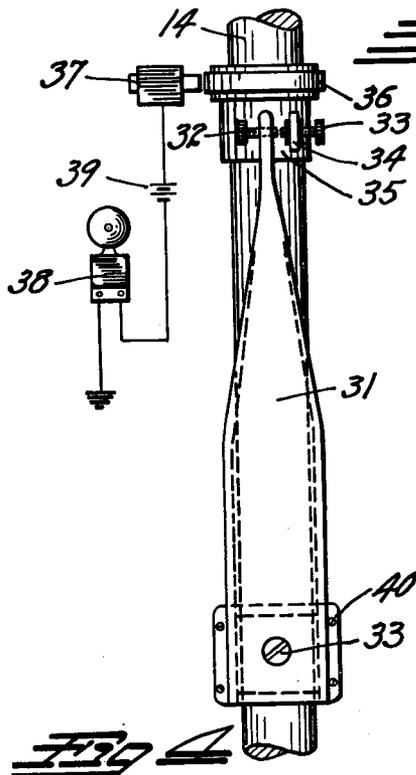
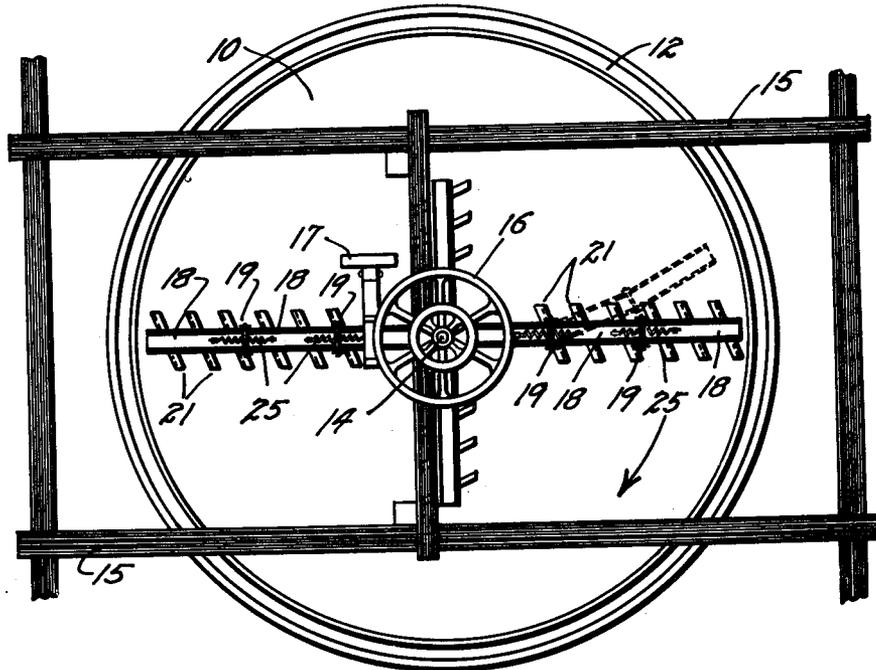
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1,907,746

THICKENER

Filed June 25, 1928

2 Sheets-Sheet 1



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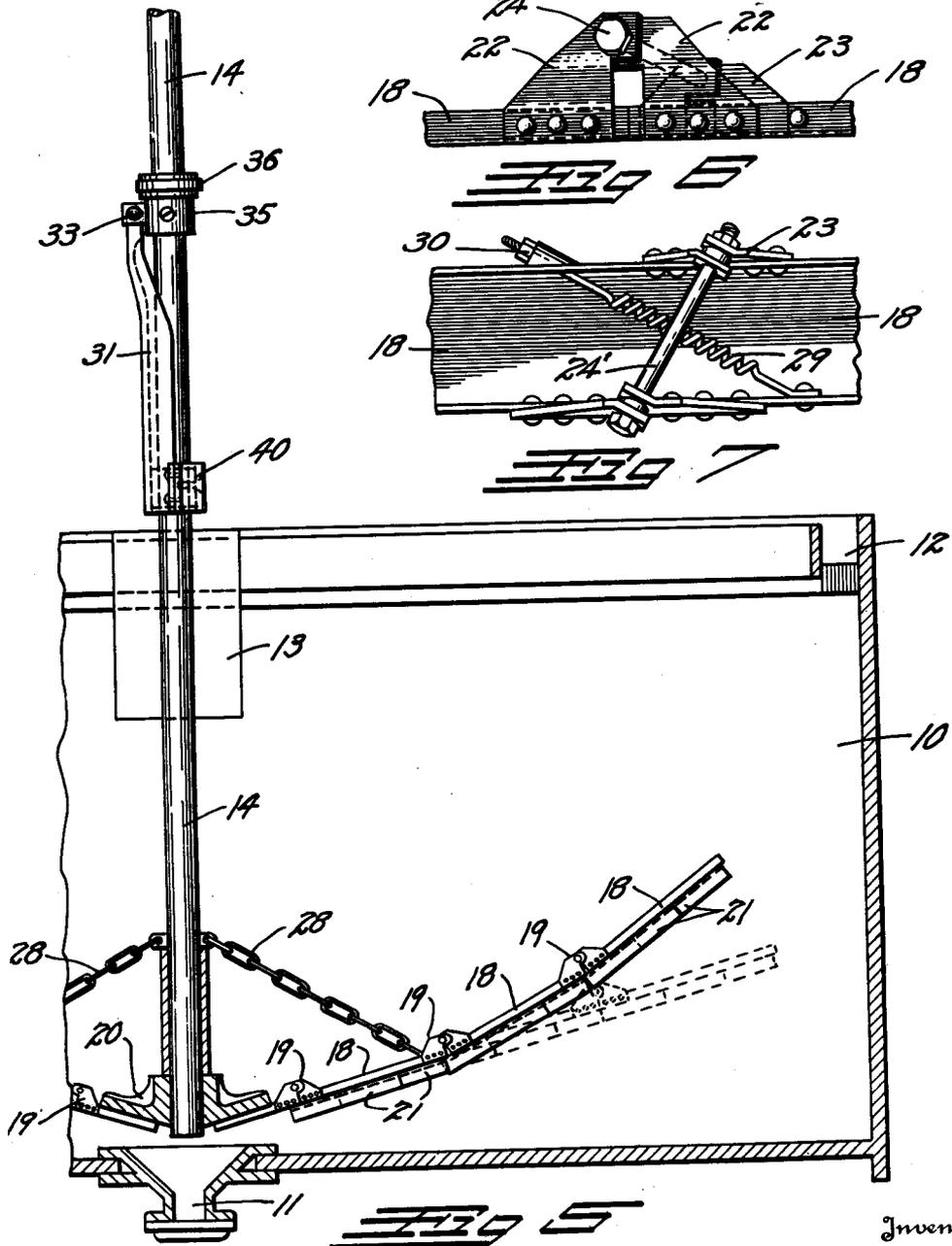
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THICKENER

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UNITED STATES PATENT OFFICE

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THICKENER

Application filed June 25, 1928. Serial No. 288,015.

This invention relates to thickeners of the type employed for settling out the suspended matter from the solutions in mining and milling operations. Thickeners of this type usually comprise a relatively large settling tank having a central sand discharge at the bottom and a peripheral solution overflow at the top. Arms, carrying scrapers, are rotated in the tank so as to gradually work the settled sands toward the sand discharge. It often happens that the feed of sand is so excessive that the arms and scrapers will become imbedded and the operating shaft and mechanism will be so overloaded as to become damaged. Should the sand become deep enough to stop the arms it is impossible to start them without first cleaning the tank by hand.

The principal object of this invention is to so construct the arms that they will automatically accommodate themselves to the depth of the sand deposit in the bottom of the tank, that is, as the sand becomes deeper and the resistance to the rotation increases, the arms will automatically swing upwardly toward the upper surface of the sand until a position of less resistance is encountered.

Another object of the invention is to arrange the arms so that they will gradually return to their normal position as the sand deposit is decreased.

A further object of the invention is to provide alarm means which will give the operator a warning that the sand deposit is increasing so that he can attend the machine should the automatic arms fail to operate.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention reference is had to the accompanying drawings which form a part hereof. Like numerals refer to like parts in all views of the drawings and throughout the description.

In the drawings:

Fig. 1 is a plan view of a typical thickener tank illustrating the invention in place therein.

Figs. 2 and 3 are detail views illustrating a plan and side elevation respectively, of the novel hinge joint employed between the sections of the thickener arms.

Fig. 4 is a detail view illustrating the contact device for the alarm mechanism.

Fig. 5 is an enlarged fragmentary vertical section through the thickener tank of Fig. 1.

Figs. 6 and 7 are detail views illustrating a side elevation and plan view respectively, of an alternate form of hinge joint for the thickener arms.

In the drawings the usual parts of a thickener are designated by numeral as follows: tank 10; sand discharge 11; solution overflow trough 12; feed box 13; drive shaft 14; shaft supporting frame 15; shaft worm wheel 16; and worm drive 17.

In applying my invention, I provide thickener arms formed of a plurality of sections such as indicated at 18. These sections are hinged together by means of hinges, designated in their entirety by the numeral 19. The first hinge 19 of each arm is preferably carried from an arm casting 20, secured to the shaft 14. Each of the sections 18 carry the usual angularly placed rakes or scrapers 21, for raking the sand toward the sand discharge 11.

The construction of the hinges 19 is novel and results in the advantages claimed for this invention. In the preferred form of hinge, illustrated in Figs. 2 and 3, relatively long hinge plates 22 are secured to one side of the sections 18 and relatively short similar plates 23 are secured to the other side thereof. A hinge pin 24 passes through all of the plates.

The pin 24 is placed at an angle to the surface plane of the sections 18, that is, it will be closer to the sections at the plates 23 than at the plates 22. This placement of the hinge pin causes the outer sections 18 to rise when pressure is brought against their forward surfaces. For instance, assume pressure to be acting against the right-hand

section 18 as indicated by the arrow "A" in Fig. 2. This pressure will act upon the angularly placed hinge pin so as to cause the right hand section to swing rearwardly and upwardly about the pin. Therefore, as the arms encounter resistance, this resistance will cause the arm sections to swing rearwardly as indicated by the broken line position in Fig. 1, and upwardly as indicated by the solid line position in Fig. 5. This causes the scrapers to rise to the top of the sand deposit where they will encounter less resistance and be free to rotate. As they scrape away the sand the arms will follow the lowering surface to their previous normal or aligned position as indicated by broken line in Fig. 5. When in the aligned position the sections butt together, as indicated in Fig. 3, to prevent further downward movement.

Usually the weight of the arms is sufficient to bring them to their normal position as the sand surface lowers. Should a more rapid operation be desired, however, springs 25 can be placed at each of the hinges 19. These springs are stretched between angle clips 26 on the sections 18 and act to maintain the hinges closed and the section extremities against each other in the position of Fig. 3. The tension of the springs can be adjusted by means of tension nuts 27.

Brace chains 28 can be employed so as to assist the first hinge 19 in supporting the weight of the arms. As the arms rise these chains will sag and as the arms lower they will tighten to support the weight thereof.

In Figs. 6 and 7, I have illustrated an alternate form of the hinge. In this form the hinge pin, which is indicated at 24', is placed at a double angle, that is, it is positioned at an angle from the horizontal similarly to the previous hinge pin 24, but is also placed at an angle to the line of travel of the arms. The alternate hinge functions similarly to the first hinge but acts to maintain the scrapers 21 in a more horizontal position when the arms are raised upwardly.

It has been found that if the angle of the hinge pin 28, from a line normal to the axis of the arm, equals the angle of the pin from a horizontal plane the scrapers 21 will maintain themselves substantially horizontal at any position of the arms. The alternate form of hinge can also be provided with a spring 29 extending at right angles to the hinge pin and provided with an adjusting nut 30.

Ordinarily the hinged arm sections 18 will automatically accommodate themselves to the sand volume in the tank 10 but should they fail to do so an alarm mechanism, indicated in Figs. 4 and 5, is provided.

The alarm mechanism comprises a relatively long contact blade 31 firmly fixed to the shaft 14 by means of a clamp collar 40

and a set screw 33. The extremity of the arm 31 is provided with an electrical contact screw 32 which makes contact with a second similar screw 33. The screw 33 is carried in an insulated bushing 34 supported from a collar 35 on the shaft 14. The collar 35 also carries a collecting ring 36 to which current is carried by means of any suitable brush mechanism 37. The ring 36 is electrically connected to the screw 33. The brush 37 and the shaft 14 are connected in circuit with an indicating bell 38 and battery 39. The bell 38 and the shaft 14 are grounded.

In operation, increased resistance to the swing of the arms in the thickener tank 10 will cause the shaft 14 to twist slightly. The twist of the shaft between the collars 40 and 35 will cause the arm 31 to bring the two contact screws 32 and 33 together. This will close the electric circuit to the bell 38 and give an audible alarm that the shaft 14 is overloaded.

The specific form of hinges illustrated in Figs. 2, 3, 6, and 7 are simply illustrative. Other means could be employed than the hinge plates 22 and 23 and the hinge pin 24 could be replaced by separate pivots at each side of the arms. These changes are simply details of construction and are within the spirit of the invention so long as the axis of the hinge is at an angle to either or both the plane of the arms 18 or the axis thereof.

The invention has been described as pertaining to a thickener. It can be readily comprehended, however, that its advantages are not limited to a thickener but will be equally useful in any type of mechanism having arms which rake material toward a discharge, such as a classifier, a settling tank, or conveyor feeding mechanism such as employed in grain elevators and the like. It is, therefore, to be understood that the word "thickener" as appearing throughout this specification and in the following claims, includes all such mechanisms.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what I claim and desire secured by Letters Patent is:—

1. An arm adapted to rake material toward a discharge for thickeners comprising a series of sections hinged together; means for stopping the rotation about said hinges in one direction when said arm sections are substantially in alignment; and spring means for drawing said arm sections into alignment, one extremity of said arm being free to rise above the other extremity.

2. In a mechanism having a vertical shaft

adapted to rotate within a tank, and arranged to operate rakes for raking material toward a discharge in said tank: an arm section hinged to said shaft so as to swing
5 upwardly; a flexible medium connecting said arm section to said shaft so as to limit its downward movement; and a series of arm sections hinged to said first section.

3. In a mechanism having a vertical shaft
10 adapted to operate rakes for raking material toward a discharge: an arm section hinged to said shaft so as to swing upwardly; a flexible medium connecting said arm section to said shaft so as to limit its down-
15 ward movement; a series of arm sections hinged to said first section; and means for preventing said series of sections from swinging below a position of alignment.

4. In a mechanism having a vertical shaft
20 adapted to rotate within a tank and operate rakes for raking material toward a discharge means for carrying said rakes comprising: an arm section hingedly supported by said shaft so as to swing upwardly; a
25 flexible medium connecting said arm section to said shaft so as to limit its downward movement; a series of arm sections hinged to said first section; and means for causing said hinges to swing said sections upwardly
30 when they encounter a resistance.

5. In a mechanism having a vertical shaft adapted to rotate within a tank and operate rakes for raking material toward a discharge means for carrying said rakes com-
35 prising: an arm section hinged to said shaft so as to swing upwardly; a flexible medium connecting said arm section to said shaft so as to limit its downward movement; a series of arm sections hinged to said first section; and means for causing said hinges to
40 swing said sections upwardly when they encounter a predetermined resistance, said means comprising the positioning of the hinge axis at an angle to the horizontal.

45 In testimony whereof, I affix my signature.

ARTHUR C. DAMAN.

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