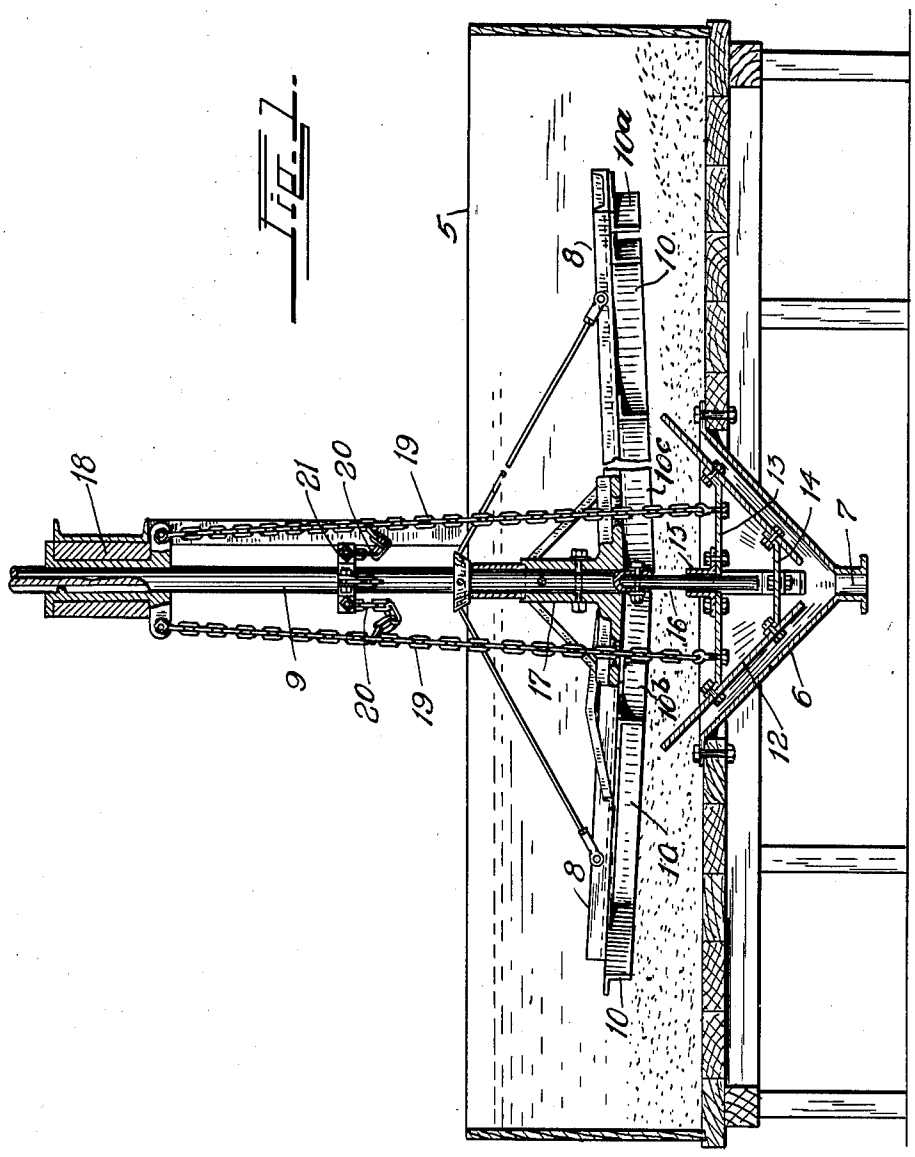
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THICKENER

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Fig. 1.



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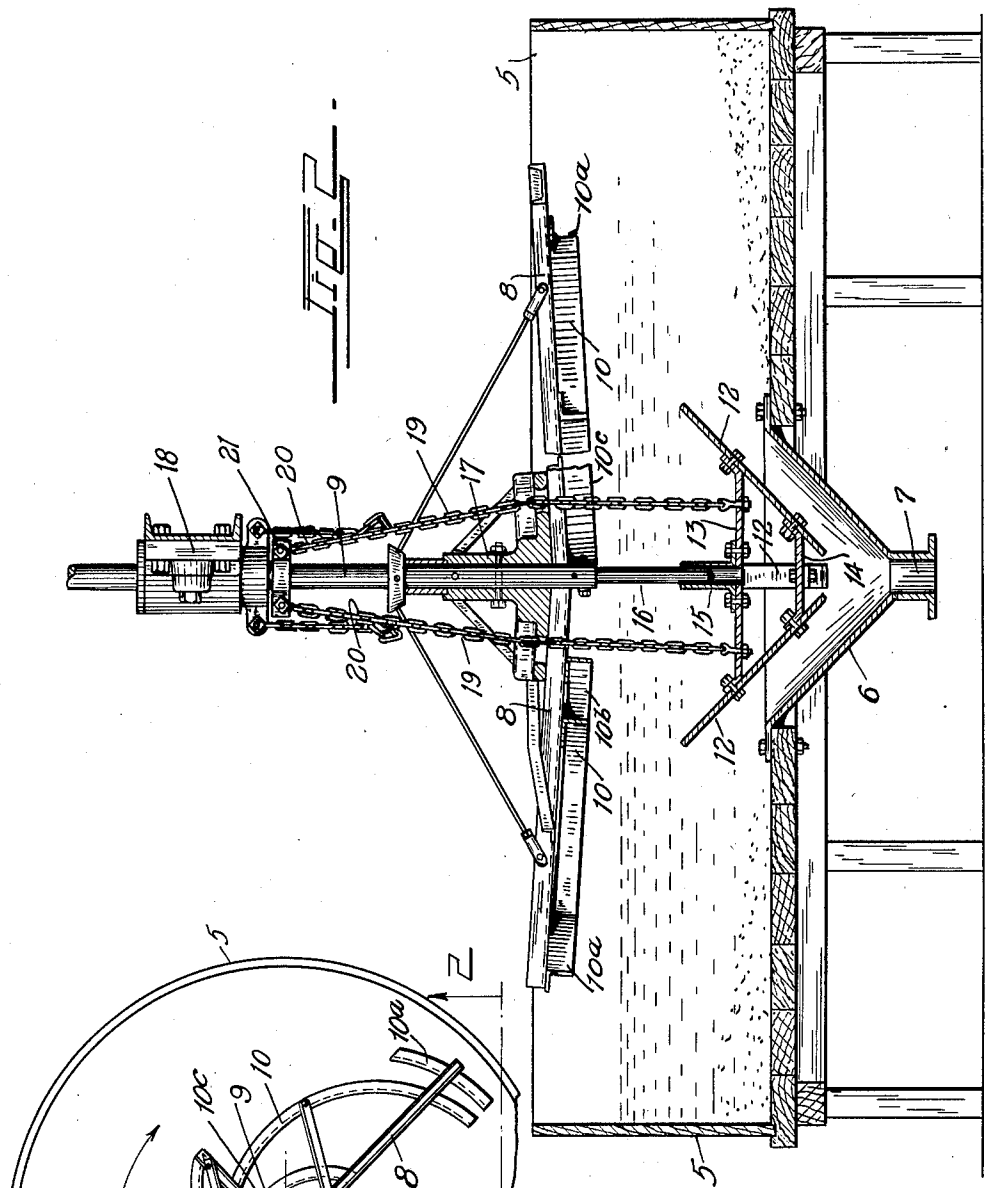


FIG. 2.

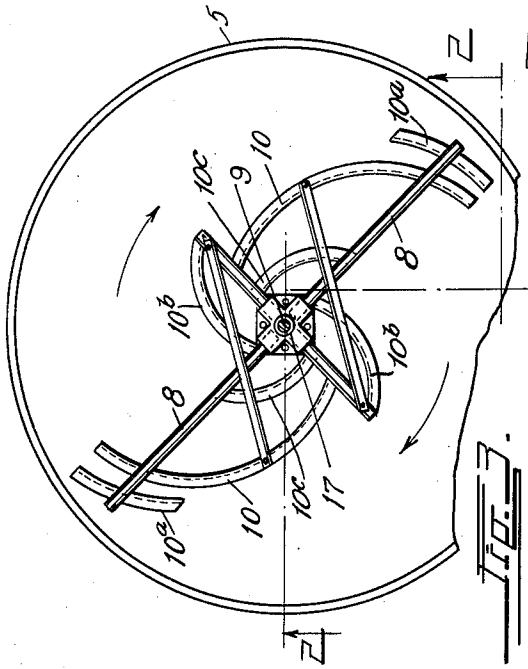


FIG. 3.

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UNITED STATES PATENT OFFICE

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THICKENER

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Application April 20, 1931, Serial No. 531,455

10 Claims. (Cl. 210—55)

This invention relates to settling apparatus of the type commonly known as "thickeners", in which settled solids are forcibly impelled to an outlet in the bottom of a settling tank by the movement of a rotary element. The outlet is usually at the bottom of a well or sump in the form of an inverted cone and it is customary to provide in association with the above mentioned impelling element, a scraper to keep the sump clear of accumulating solids which if allowed to remain, might obstruct the outlet.

In the operation of the apparatus, the impelling element is occasionally lifted out of the settled mass in the bottom of the tank, either automatically or by mechanically or manually controlled means and heretofore, the sump-scraper owing to its rigid connection with the impeller, has been compelled to follow the upward movement of the same. As a result it frequently occurs that in the absence of a cleaning action the sump fills with solids during the period the impeller and the scraper are elevated from their normal operative position and that in consequence, the outlet at the bottom of the sump will clog with accumulated matter, thereby interfering with the operation of the apparatus and obstructing the return movement of the scraper to its original position.

In order to avoid an occurrence of this kind, the present invention consists in providing a driving connection between the impelling element and the sump-scraper which permits of a limited separate upward movement of the latter, thereby maintaining the scraper in its operative position.

An additional feature of the invention resides in providing means which at a determined point in the upward movement of the impelling element, causes the sump-scraper to follow said movement, so that both elements may be lifted for repairs, cleaning or other purposes.

A further object of the invention resides in providing an impelling element of novel, simple and very efficient construction.

In the accompanying drawings in the several views of which like parts are similarly designated,

Figure 1 represents a sectional elevation of a settling apparatus, inclusive of an embodiment of the present invention,

Figure 2, a similar view showing the impelling and scraper elements in an elevation position, and

Figure 3, a plan-view of the impelling element drawn to a reduced scale.

The tank 5 of the apparatus has in its bottom a central opening occupied by a downwardly extending sump 6 of inverted cone-shape, which at its lower end has an outlet 7. In the operation of the apparatus, settling solids accumulating on the bottom of the tank are continuously moved toward and into the central sump by the action of a rotary impelling element, which in its preferred form consists of a spider 8 fastened at an end of an upright shaft 9, and scraper blades 10, 10^a, 10^b and 10^c fastened on the spider. The blades 10 contact particles near the periphery of the tank and move same in less than one-half a revolution to a position adjacent the center of the tank. The particles so moved are next engaged by the blades 10^b which terminate at the outlet of the tank and which intersect the imaginary extension of the blades 10. The blades 10^b cause the particles to move rapidly to and into the outlet. Thus, upon completion of one-half revolution of the impeller, the material has been moved from a point near the periphery of the tank into the outlet. The blades 10^c extending inside the arc of the blades 10, and terminating in closer adjacency to the outlet, take up any surplus and move it to the outlet in a manner similar to the action of the blades 10^b. The blades 10^a positioned adjacent the ends of the spider outside the arcs of the blades 10^a engage the particles not brought within the sphere of operation of the blades 10. Under normal conditions, the angle of repose will cause the particles to be deposited well within the sphere of operation of the blades 10, but when there is no repose and material is outside the aforementioned sphere, the blades 10^a perform the auxiliary function of disturbing material adjacent the circumference and causing it to move into the path of the blades 10.

The scraper blades are each of true arcuate form and are mounted on the spider at different distances from its axis of rotation. The blades are longer and placed closer together nearer the axis to provide for an even removal of the solids to the outlet, over the entire area of the bed of settled matter. It is, as stated before, a distinctive feature of the construction of the impelling element that all the scraper blades are in form, true arcs of circles, the centers of which are arranged as may be found to be of best advantage.

The scraper for keeping the sump or well clean of accumulating solids, consists of a plurality of blades 12 convergingly assembled by means of spiders 13 and 14. The blades thus arranged, are substantially parallel to the conical wall of the sump.

One of the spiders 13 has a central hub 15 pro-

vided with a central hole of angular section to receive a correspondingly formed stem 16 suspended from the hub 17 of the spider 8 of the impelling element. The stem is the medium by which the rotary motion of the element is transmitted to the scraper and its sliding relation to the hub of the scraper permits of a separate up and downward movement of the element.

The shaft 9 of the impelling element is mounted for rotation in bearings, one of which has been shown at 18. A sleeve 25 is interposed between the shaft 9 and the bearings. A key 26 between the sleeve and the shaft effects conjunctive rotation of the two, but permits longitudinal movement of the shaft relative to the sleeve. The sleeve has a flange 27 resting on the upper end of the bearing 18. The lower end of the sleeve carries a collar 28, which is integral with the sleeve. The scraper is suspended by chains 19 that are connected with the collar 28. By this arrangement, the weight of the chains and the scraper is supported by the flange 27 that rotates on the bearing 18.

It is sometimes desired to lift both the impeller and the scraper for cleaning and/or repairs. To this end, a connection is provided between the two elements by means of two normally slack chains 20, fastened to a collar 21 mounted on the shaft and to links of the suspension chains 19. When the impeller and shaft are raised, the scraper remains in its operative position in the sump or well 6, until all of the slack is taken out of the chains 20. Continued upward movement of the shaft will raise both the impeller and the scraper.

What we claim and desire to secure by Letters Patent is:

1. In settling apparatus, a tank having an outlet-sump, a rotary impeller for moving settled matter to the sump, a separate scraper for the sump, means for transmitting rotary movement of the impeller to the scraper, said means being adapted to permit of separate upward movement of the impeller with the scraper in its operative position with relation to the sump, and means for transmitting upward movement of the impeller to the scraper at a determinate point in said movement.

2. In settling apparatus, a tank having an outlet-sump, a rotary impeller for moving settled matter to the sump, a separate scraper for the sump having an angular opening and a correspondingly formed stem on the impeller, slidable in the opening, for transmitting rotary movement of the impeller to the scraper, while permitting of separate upward movement of the impeller.

3. In settling apparatus, a tank having an outlet-sump, a rotary impeller for moving settled matter to the sump, a separate scraper for the sump suspended independent of the impeller, and having an angular opening, and a correspondingly formed stem on the impeller, slidable in the opening, for transmitting rotary movement of the impeller to the scraper, while permitting of separate upward movement of the impeller.

4. In settling apparatus, a tank having an outlet-sump, a shaft, a rotary impeller on the shaft for moving settled matter to the sump, a separate scraper for the sump, means for suspending the scraper, independent of the impeller, normally slack flexible connections between the shaft and the suspension means, and means for transmitting rotary movement of the impeller to the scraper, said means being adapted to permit of separate upward movement of the impeller with the scraper in its operative position with relation to the sump.

5. In settling apparatus, a tank having an outlet and a rotary impeller for moving settled matter to the outlet, comprising a plurality of arcuate scrapers for the continuous movement of settled material to the outlet, the scrapers comprising a relatively long member disposed to move material from a point adjacent the circumference of the tank to a point adjacent the outlet in less than one-half a revolution of the impeller, and a relatively short member extending to the outlet and intersecting an imaginary extension of the arc of the first member and cooperating with said first member to move the material passing from the first member to the outlet prior to the completion of the one-half revolution.

6. In settling apparatus, a tank having an outlet and a rotary impeller for moving settled matter to the outlet, comprising a plurality of scrapers for the continuous movement of settled material to the outlet, the scrapers comprising a member extending curvilinearly from a point adjacent the circumference of the tank to a point adjacent the outlet of same, and a second member extending to the outlet and intersecting an imaginary extension of the curvature of the first member and cooperating with said member to move the material passing from the first member to the outlet prior to the completion of the one-half revolution.

7. In settling apparatus, a tank having an outlet and a rotary impeller for moving settled matter to the outlet, comprising a plurality of scrapers for the continuous movement of settled material to the outlet, the scrapers comprising a member extending curvilinearly from a point adjacent the circumference of the tank to a point adjacent the outlet of same, a second member extending to the outlet and intersecting an imaginary extension of the curvature of the first member and cooperating with said member to move the material passing from the first member to the outlet prior to the completion of the one-half revolution, and a third member extending within the curvature of the first-mentioned member and terminating in closer adjacency to the outlet.

8. In settling apparatus, a tank having an outlet and a rotary impeller for moving settled matter to the outlet, comprising a plurality of scrapers for the continuous movement of settled material to the outlet, the scrapers comprising a member extending curvilinearly from a point adjacent the circumference of the tank to a point adjacent the outlet of same, a second member extending to the outlet and intersecting an imaginary extension of the curvature of the first member and cooperating with said member to move the material passing from the first member to the outlet prior to the completion of the one-half revolution, a third member extending within the curvature of the first-mentioned member and terminating in closer adjacency to the outlet, and a forth member exteriorly of the curvature of the first-mentioned member for the disturbance of material adjacent the circumference of the tank.

9. In settling apparatus, a tank having an outlet and a rotary impeller for moving settled matter to the outlet, comprising a plurality of scrapers for the continuous movement of settled material to the outlet, the scrapers comprising a member extending curvilinearly from a point adjacent the circumference of the tank to a point

adjacent the outlet of same, a second member extending to the outlet and intersecting an imaginary extension of the curvature of the first member and cooperating with said member to move the material passing from the first member to the outlet prior to the completion of the one-half revolution, and a third member exteriorly of the curvature of the first-mentioned member for the disturbance of material adjacent the circumference of the tank.

10. In settling apparatus, a tank having an outlet-sump, a shaft, a rotary impeller on the shaft for moving settled matter to the sump, a separate scraper for the sump, and a flexible suspension element suspending the scraper from the shaft, independent of the impeller.

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