Aug. 14, 1945. J. H. V. FINNEY 2,382,409

THICKENER APPARATUS

Filed Sept. 28, 1942 4 Sheets-Sheet 1

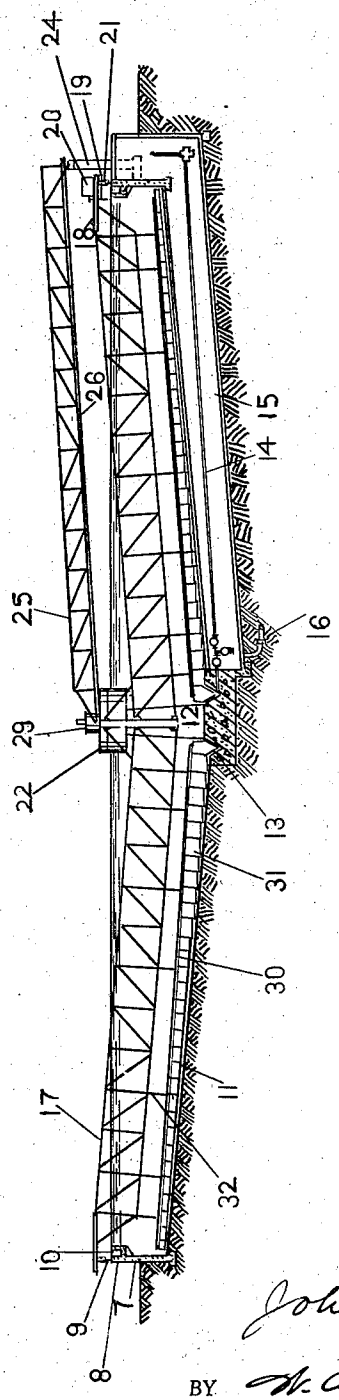


FIG 1

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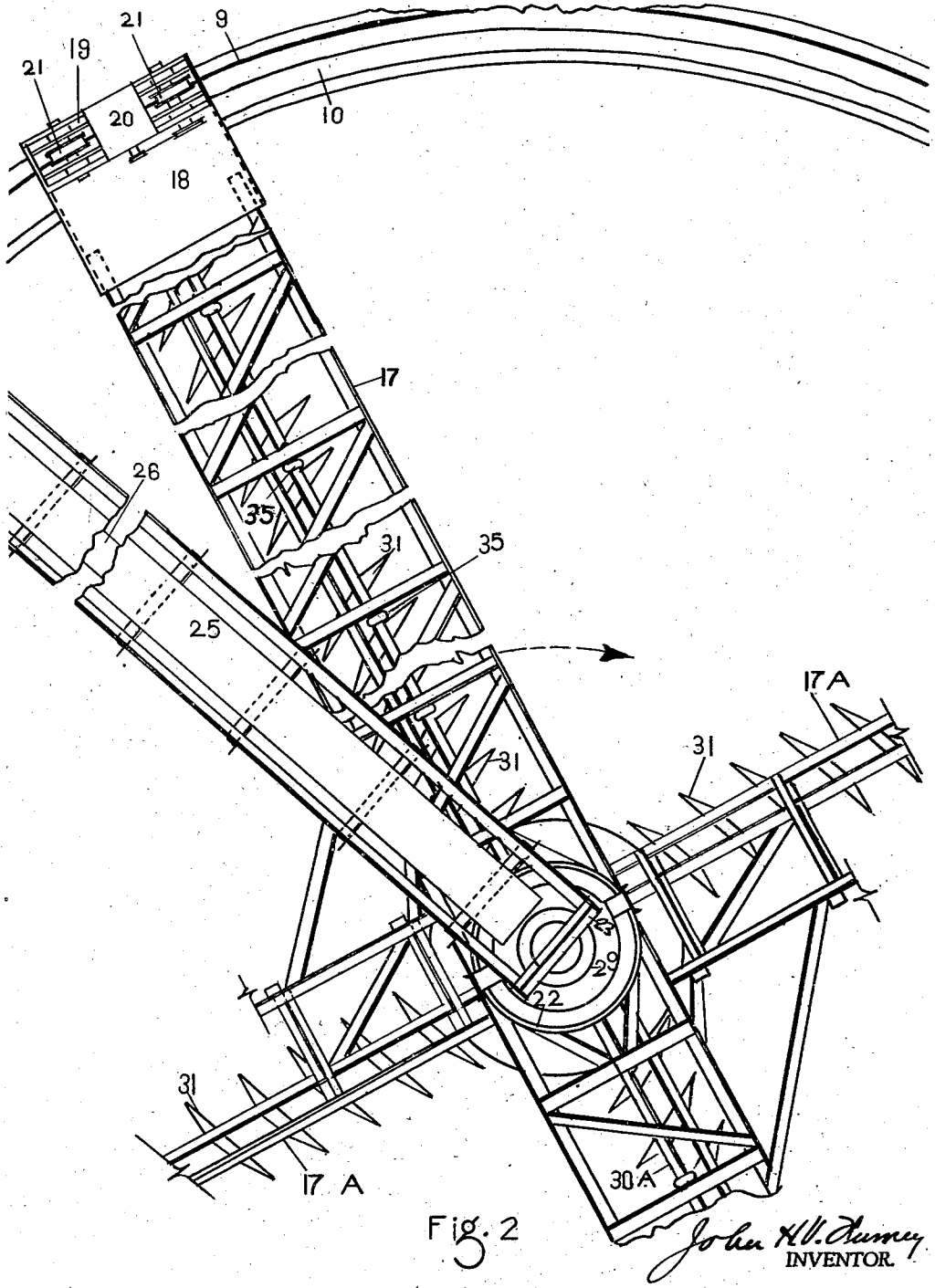


Fig. 2

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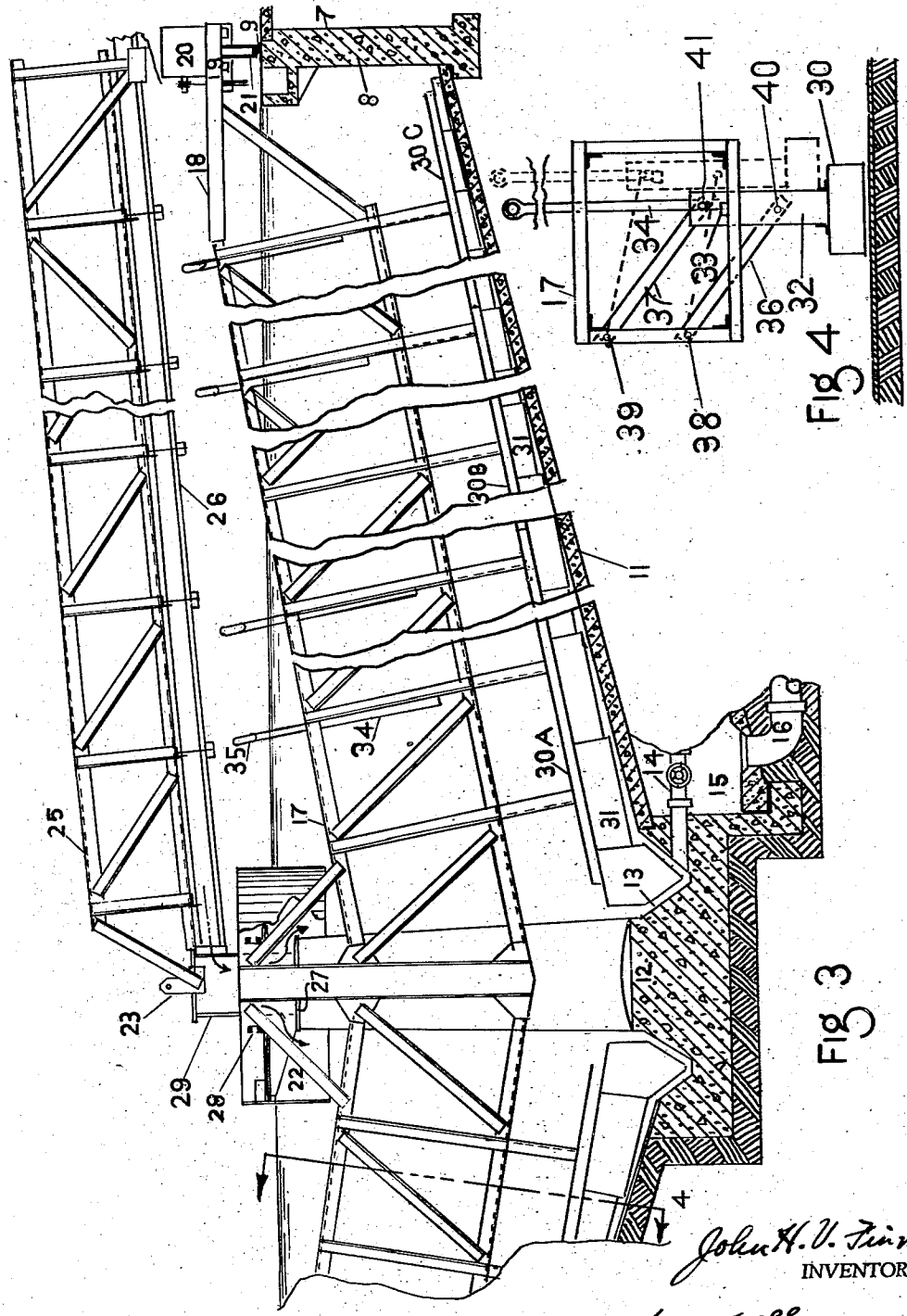


Fig 4

Fig 3

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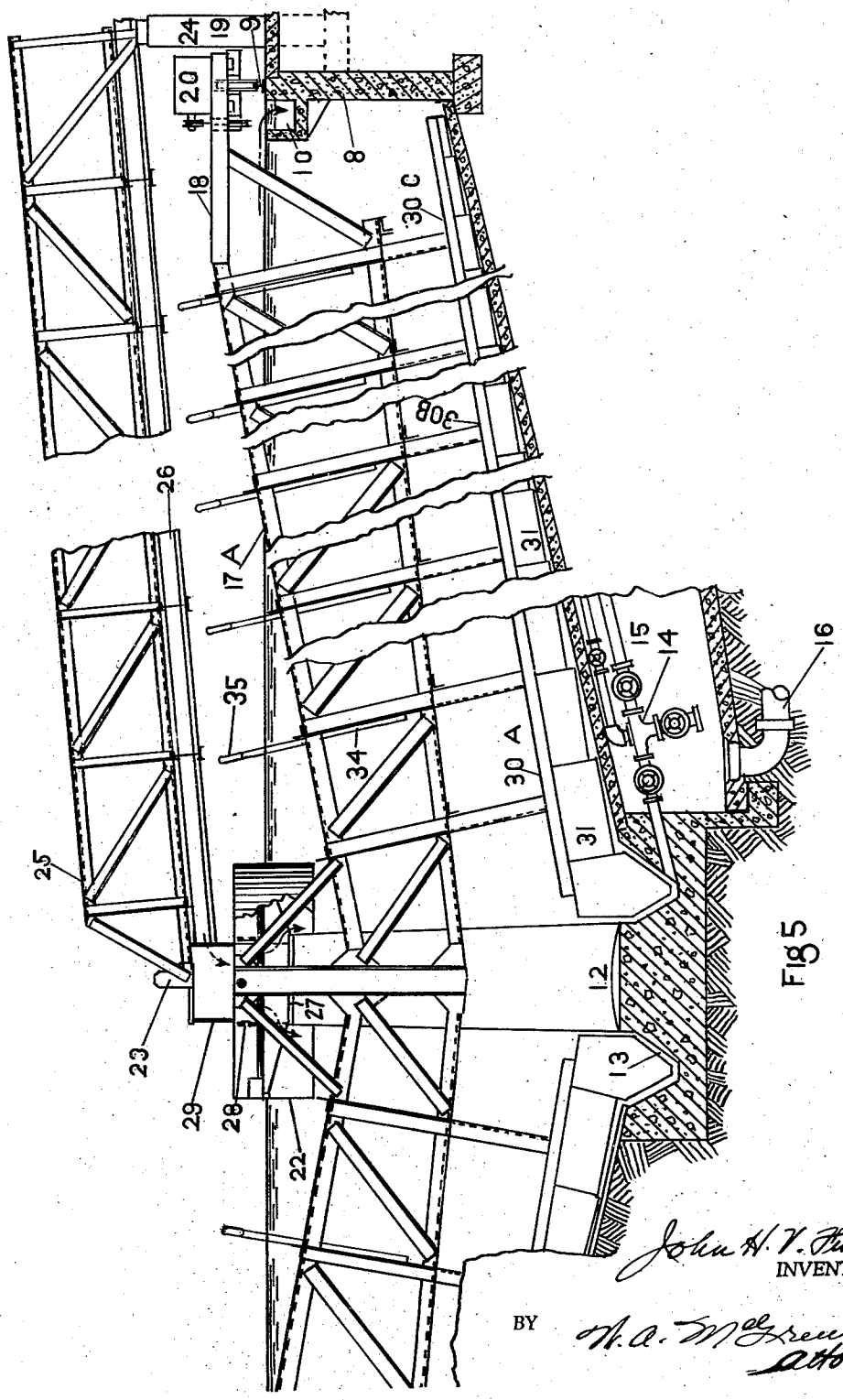


Fig 5

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UNITED STATES PATENT OFFICE

2,382,409

THICKENER APPARATUS

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Application September 28, 1942, Serial No. 459,909

12 Claims. (Cl. 210—55)

This invention relates to settling apparatus for the treatment of solids in liquids and more particularly relates to traction-type thickeners.

Such apparatus provides a quiescent pool in which solids settle freely through the liquid and deposit onto a bottom, usually conical, above and in proximity to which, rotary scrapers move at slow speed to direct the settled solids to a discharge outlet centrally of the bottom.

Industrial demands necessitate the production of such apparatus in a wide variety of sizes. Where the diameter of the tank is forty feet or less, it usually is expedient to drive the scraper assembly through the intermediary of a central shaft suitably connected with a prime mover.

However, when larger sized tanks are specified, and particularly those of a diameter of one hundred feet or larger, traction drive mechanism is employed to avoid subjecting the central shaft to undue stresses. In such a structure, a supporting truss member is pivotally mounted on a central column in the tank, and has one or more of its ends mounted on a wheel-supported carriage traveling on an endless track on the rim of the tank.

These carriages constitute the driving members of the assembly and carry motors for driving the wheels. The scrapers are suspended from the truss structure for conjoint rotation therewith and rotate at a fixed distance above the bottom.

All of the devices hereinbefore described are subjected to occasional or intermittent shutdowns due to power failure or other causes, and when the stoppage is of any considerable duration, the settled solids form a very compact and inert mass all around the scrapers.

In the central drive shaft designs, the deleterious effects of the resistance of such a mass are avoided through the provision of lifting mechanism by which the rakes can be elevated to approximately the top of the settled body, and then after they are rotating they are allowed to descend gradually to their normal operating positions. As a consequence, undue stresses on the driving mechanism are avoided.

Unlike the central shaft type, the traction type mechanism has been so designed heretofore that no means for elevating the rakes during operation or after shutdowns has been feasible. This condition has another disadvantage in that obstructions sometimes develop during normal operation, due to the presence of rocks, tramp iron and the like which occasionally enter the tank. If the rakes were self-elevating, they could ride up over such obstructions and thus avoid damage to the mechanism.

While such an arrangement has been incorporated into central drive shaft thickener mechanism, the design of the traction type mechanism has not been adapted to utilization of these lifting features.

It is an object of the present invention to provide traction-type actuating mechanism for thickeners having simple, efficient and economical means for elevating the associated scraper members as required.

Another object of the invention is to provide traction-type actuating mechanism for thickeners, inclusive of self-elevating scraper members.

A further object of the invention is to provide traction-type actuating mechanism in which the associated scraper members may be selectively and/or differentially spaced from the bottom of the tank in which they are positioned at different distances from the axis of rotation.

Other objects reside in novel combinations and arrangements of parts and in novel details of construction, all of which will be described in the course of the following description.

To afford a better understanding of the invention reference will be made to the accompanying drawings illustrating typical embodiments of the invention. In the drawings in the several views of which like parts have been designated similarly,

Figure 1 is a vertical central section through a thickener tank including mechanism embodying features of the present invention;

Figure 2 is a fragmentary top plan view of one embodiment of the mechanism of the present invention, partially broken to show concealed parts and drawn to an enlarged scale;

Figure 3 is a fragmentary side elevation partially in section and corresponding to the apparatus of Figure 2;

Figure 4 is a section taken along the line 4—4, Figure 3; and

Figure 5 is another fragmentary side elevation partially in section of another embodiment of the mechanism of the present invention, also drawn to an enlarged scale.

Referring first to Figure 1, the thickener comprises a tank 7 having an upright peripheral wall 8, supporting at its top an endless track 9 and provided with an overflow launder 10 extending along the top of the inner surface of wall 8.

The bottom 11 of tank 7 is conical and supports a column 12 at its center about which an annular sump 13 is provided to collect the solids

descending along the conical bottom. Solids collecting in sump 13 are drawn off through a suitable valve-controlled conduit 14 by the action of a pump (not shown).

Preferably, the conduit 14 and its associated valves are located in a tunnel 15 beneath the bottom 11 of the tank, which permits access for repairs whenever required. A drain 16 is provided in the bottom of the tunnel for removal of any solids or moisture deposited in the tunnel through leakage.

The operating mechanism of the thickener comprises a main truss 17, employing any suitable arrangement of structural members, here shown as consisting of four radial members disposed at 90° intervals. Two of these members positioned in lengthwise alinement are relatively short as indicated at 17a in Figure 2, while the other two coact to form a tank spanning member, one or more of the outer ends of which are suitably connected as shown at 18, to a wheel-supported carriage 19 mounted on track 9. Each carriage has a motor 20 in driving connection with its wheels 21 and it will be understood that suitable speed reduction mechanism may be included in the motor transmission system to rotate the truss at the desired speed.

The center of the truss is journaled on a suitable bearing 27 mounted on the top of the column or pier 12 and the upper portion of this pier is enclosed by a feed well 22. The truss 17 comprises a rectangular framework suitably braced in a manner well known in the art.

In order to provide access to the bearing 27 and feed well 22, as well as the main truss sections 17, a walkway truss 25 is suspended above the movable truss by attachment to the central column 12 as indicated at 23, and a second support 24 located beyond the periphery of the tank. Feed to the well 22 is supplied by a conduit 26 supported beneath walkway truss 25 which discharges into the feed well through a hollow cylinder 29 having openings into the feed well. Adjacent to the feed, a series of slip rings 28 are provided which carry electric current stationary power lines (not shown) to rotating lines on the truss which are connected to the motor 20.

Scraper members 30 are supported in depending relation from truss 17 for conjoint rotation therewith and carry a plurality of blades 31 positioned at an inclination to their paths of movement and in close proximity to the bottom 11 to push settled solids thereon toward and into sump 13. These scrapers are made in separate sections designated 30A, 30B and 30C in Figure 3, but it will be understood that any desired number of such sections may be employed and this number usually will be varied as the size of the tank varies.

The scrapers 30A, 30B etc. are supported from truss 17 by upright I-beams 32 guided for angular movement on the truss and carrying a projection or stud 33 acting as a stop to limit downward movement of the scrapers, thus determining their normal operating position.

A rod 34 is fixed on each of the beams 32, usually by welding and extends through the truss, terminating above the liquid level in an eyelet 35. The beams 32 also are held by two parallel braces 36 and 37 pivoted on a side bar of truss 17 as indicated at 38 and 39 respectively in Figure 4 and pivotally connected with the beam as indicated at 40 and 41.

By this arrangement, the upright or vertical position of the beam 32 remains unchanged throughout the range of its angular movement, which is an arcuate path substantially at right angles to the lengthwise axis of the truss, as is clearly shown in Fig. 4, and this is true whether the elevating component is initiated by fastening a chain or the like into eyelet 35 and manually raising the scraper section, or when extraordinary opposition is encountered in the rotary movement inducing a self-elevating action by the scraper.

This feature is of particular importance when extraordinary opposition occurs to the rotary movement of the scrapers during normal operation. Due to the inclination of the blades 31 and the manner of suspending scrapers 30 through the intermediary of beams 32, such opposition to forward movement induces a self-elevating component into the scraper assembly with the results that the blades 31 encountering the obstruction rise above the obstruction whereupon they are free to settle again to normal operating position determined by the location of stops 33.

Likewise, after shutdowns, this feature permits an operator to stand on walkway truss 25 and hook onto an eyelet 35 with suitable lifting mechanism such as a block and tackle assembly for example, and thus manually raise the scrapers above or onto the top of the bed of settled solids on the bottom of the tank.

In these operations, the individual scrapers 30A, 30B, and 30C are or may be differentially spaced from the bottom 11 of the tank, and are individually movable in a substantially vertical direction to provide the necessary clearance for moving over obstructions or for positioning the scrapers above or on top of a bed of settled solids, when required.

The form of the invention illustrated in Figure 5 attains the same objects of the invention, but differs somewhat in certain particulars, described hereinafter. The principal difference resides in the construction of the main truss and the suspension system for scrapers 30.

In this form, the section of the main truss tapers from its outer end toward its center support, and as a consequence, the under surface of the truss is spaced a substantial distance from bottom 11, particularly adjacent central pier 12 and thereby provide a relatively wide range of movement for beams 32 and associated scrapers 31.

In the various forms illustrated, it usually will be unnecessary to provide more than one driving carriage 19 for the main truss member 17, but it will be understood that when desired a plurality of such driving carriages may be mounted at the ends of the truss sections.

The sectional scraper assembly is common to the various forms illustrated, but is will be understood that the number of such sections may be two or more as required to meet manufacturing, assembling and operational requirements.

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

1. In a thickener of the traction-drive type, inclusive of a tank having an overflow determining a liquid level in the tank, and a truss mounted for rotary movement in the tank, the improvement which comprises a plurality of submerged scraper members carried in a depending position on said truss between its center and outer extremity, each said scraper member being pivotally mounted on said truss for angular up and down movement in an arcuate course transverse to the lengthwise axis of the truss and being positioned normally in proximity to the bottom of the tank to urge solids settling thereon centrally

of the tank, and lifting means connected with each said scraper member and extending above the liquid level in the tank for selective elevation of said scraper members.

2. In a thickener of the traction-drive type, inclusive of a tank having an overflow determining a liquid level in the tank, and a truss mounted for rotary movement in the tank, the improvement which comprises a plurality of submerged scraper members carried in a depending position on said truss between its center and outer extremity, each said scraper member being pivotally mounted on said truss for angular self-elevating movement in an arcuate course transverse to the lengthwise axis of the truss whenever an obstruction to its circumferential movement is encountered, each said scraper being positioned normally in proximity to the bottom of the tank to urge solids settling thereon centrally of the tank, and lifting means connected with each said scraper member and extending above the liquid level in the tank for selective elevation of said scraper members independently of said self-elevating action.

3. In a thickener of the traction-drive type, inclusive of a tank having an overflow determining a liquid level in the tank, and a truss mounted for rotary movement in the tank, the improvement which comprises a plurality of submerged scraper members carried in a depending position on said truss between its center and outer extremity, each said scraper member being pivotally mounted on said truss for angular up and down movement in an arcuate course transverse to the lengthwise axis of the truss and being positioned normally in proximity to the bottom of the tank to urge solids settling thereon centrally of the tank, and means including an eyelet connected with each said scraper member and extending above the liquid level in the tank for selective manual elevation of said scraper members.

4. In a thickener of the traction-drive type, inclusive of a tank and a truss mounted for rotary movement in the tank, the improvement which comprises a plurality of scraper members carried in a depending position on said truss between its center and outer extremity, and means for holding each said scraper in said depending position, including a pair of parallel supports pivoted on the truss and movable through an elevating arc in a path transverse to the lengthwise axis of the truss, whenever an obstruction to the circumferential movement of the scrapers is encountered.

5. In a thickener of the traction-drive type, inclusive of a tank and a truss mounted for rotary movement in the tank, the improvement which comprises a plurality of scraper members carried in a depending position on said truss between its center and outer extremity, and means for holding each said scraper in said depending position, including a pair of parallel supports pivoted on the truss and movable through an elevating arc in a path transverse to the lengthwise axis of the truss, whenever an obstruction to the circumferential movement of the scrapers is encountered, the supports adjacent the center of the tank being mounted for movement through a longer arc than the supports nearer the periphery of the tank whereby a greater degree of elevation is imparted to the associated scraper member.

6. Traction-type thickener apparatus, comprising a cylindrical tank having an endless track on its rim, a peripheral overflow adjacent thereto and a feed inlet, said overflow determining a liquid level in the tank, a central pier in the tank extending above the liquid level, a tank-spanning truss journaled for rotation at the upper end of the pier and supported on at least one of its ends by a carriage having wheels travelling on said track, means on said carriage for driving said wheels to rotate the truss, there being a central bottom discharge from the tank adjacent the pier, and sectional scraper members depending from the truss in proximity to the tank bottom to urge settled solids toward said discharge, each said scraper member being mounted for limited up and down movement relative to the truss in an arcuate path transverse to the lengthwise axis of the truss, and means connected with each said scraper member and extending above the liquid level determined by said overflow for selective up and down movement of said scraper members.

7. Traction-type thickener apparatus, comprising a cylindrical tank having an endless track on its rim, a peripheral overflow adjacent thereto and a feed inlet, said overflow determining a liquid level in the tank, a central pier in the tank extending above the liquid level, a tank-spanning truss journaled for rotation at the upper end of the pier and supported on at least one of its ends by a carriage having wheels travelling on said track, means on said carriage for driving said wheels to rotate the truss, there being a central bottom discharge from the tank adjacent the pier, sectional scraper members depending from the truss in proximity to the tank bottom to urge settled solids toward said discharge, the respective sections of said scraper members being mounted for limited up and down movement relative to the truss in an arcuate path transverse to the lengthwise axis of the truss, and means including an eyelet supported from the truss above the liquid level in the tank for moving said sections up and down.

8. In a thickener, inclusive of a tank and a truss mounted for rotary movement in the tank, the improvement which comprises a plurality of scraper members carried in a depending position on said truss between its center and outer extremity for conjoint rotation therewith, said scrapers being mounted for differential spacing from the bottom of the tank and in proximity thereto to urge solids settling thereon centrally of the tank, the scraper member nearest the center of the tank being positioned at a greater distance from the bottom of the tank than the scraper members distant from the center of the tank, and having blades of greater width than the other said scrapers providing a greater impelling surface in said movement of the solids.

9. In a thickener, a tank, a truss mounted for rotation therein, a plurality of scrapers suspended from the truss for conjoint rotation therewith, and means for supporting each such scraper for individual up and down movement comprising a beam extending through the truss in supporting relation to a depending scraper, means on the truss including at least two arms pivotally mounted to elevate the scraper angularly in an arcuate path transverse to the lengthwise axis of the truss, and means on the beam coacting with the truss for limiting the extent of downward movement of the beam.

10. In a thickener, a tank, a truss mounted for rotation therein, a plurality of scrapers suspended from the truss for conjoint rotation therewith, and means for supporting each such scraper for individual up and down movement compris-

ing a beam extending through the truss in supporting relation to a depending scraper, means on the truss including two arms pivotally mounted to elevate the scraper angularly through an arc transverse to the lengthwise axis of the truss, and coacting means on the beam and the truss for limiting the extent of up and down movement of the beam.

11. In a thickener, a tank, a truss mounted for rotation therein, a plurality of scrapers suspended from the truss for conjoint rotation therewith, and means for supporting each such scraper for individual up and down movement comprising a beam extending through the truss in supporting relation to a depending scraper, means on the truss including two arms pivotally mounted to elevate the scraper angularly through an arc transverse to the lengthwise axis of the truss, and a stop member on the beam coacting with the truss for limiting the extent of downward movement of the beam.

12. In a thickener, a tank, a truss mounted for rotation therein, a plurality of scrapers suspended from the truss for conjoint rotation therewith, and means for supporting each such scraper for individual up and down movement comprising a beam extending through the truss in supporting relation to a depending scraper, means on the truss including two arms pivotally mounted to elevate the scraper angularly in an arcuate path transverse to the lengthwise axis of the truss, means on the beam coacting with the truss for limiting the extent of downward movement of the beam, and means attached to the beam extending upwardy out of the tank and adapted for connecting with mechanism to raise the scraper in the tank.

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