July 20, 1937. C. H. SCOTT 2,087,725

SEDIMENTATION DEVICE

Filed Dec. 22, 1934 4 Sheets-Sheet 1

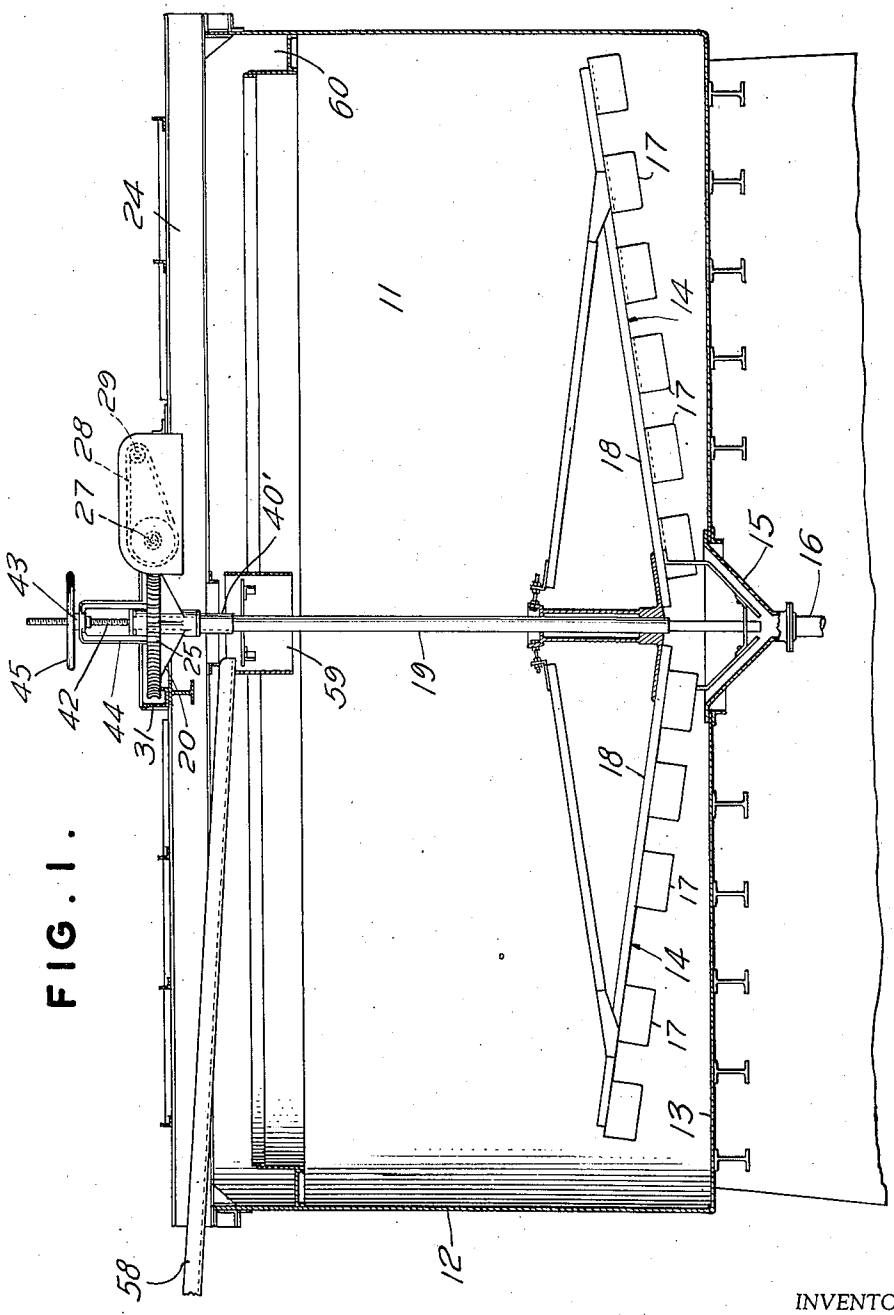


FIG. 1.

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SEDIMENTATION DEVICE

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FIG. 2.

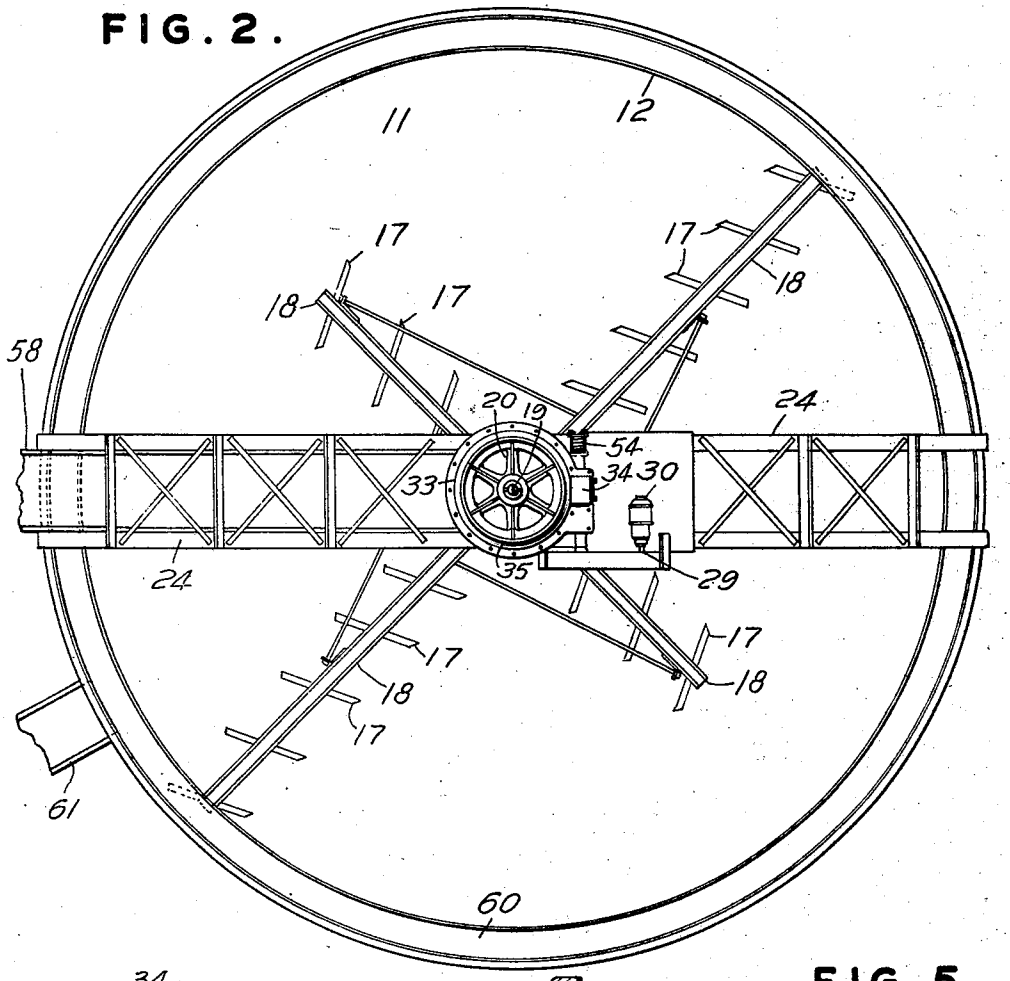
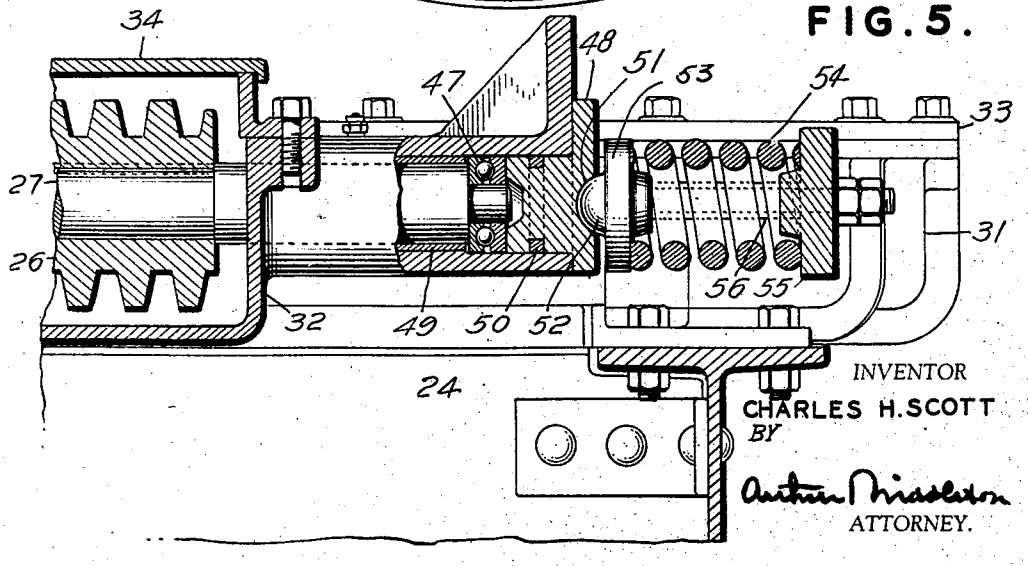


FIG. 5.



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SEDIMENTATION DEVICE

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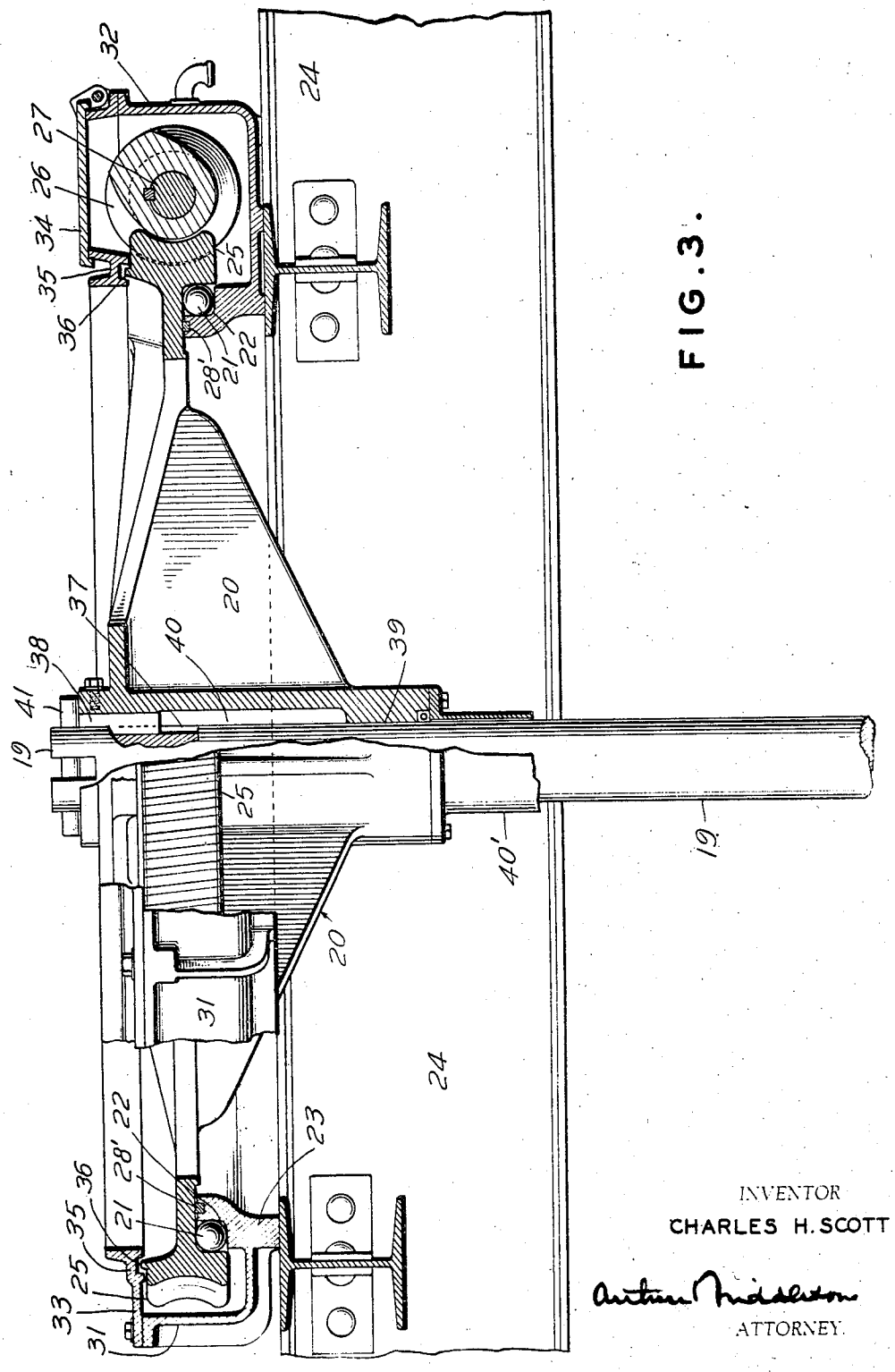


FIG. 3.

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July 20, 1937. C. H. SCOTT 2,087,725

SEDIMENTATION DEVICE

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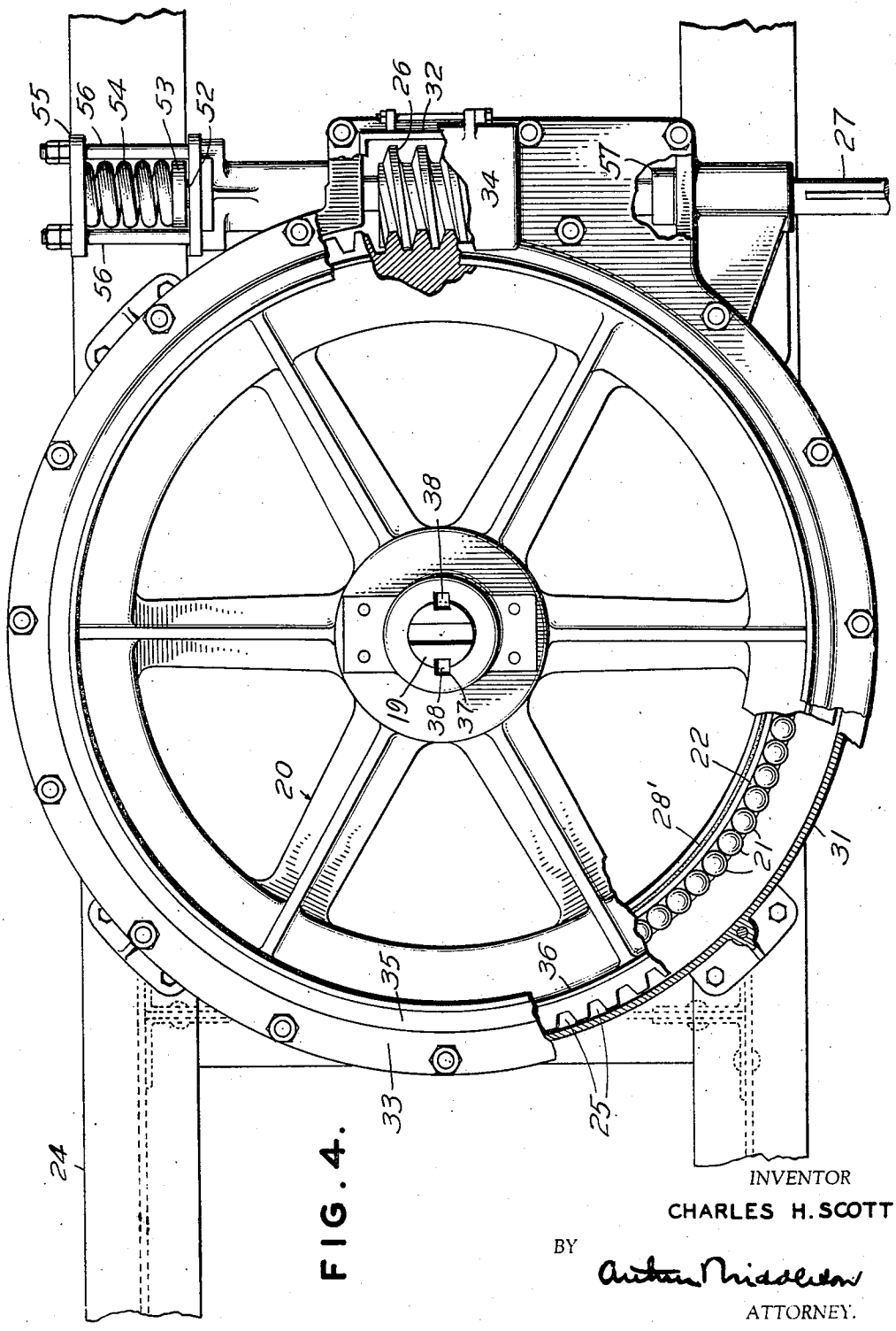


FIG. 4.

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Patented July 20, 1937 2,087,725

UNITED STATES PATENT OFFICE

2,087,725

SEDIMENTATION DEVICE

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Application December 22, 1934, Serial No. 758,720

12 Claims. (Cl. 210—55)

This invention relates to sedimentation apparatus of the type exemplified by thickeners and clarifiers, wherein solids suspended in liquid settle to the bottom of a tank by sedimentation to form a sludge which is raked to a sludge discharge. Commonly this discharge is centrally located and the rake blades are arranged to depend from members propelled by a rotatable vertical support.

An object of the invention is the provision of sedimentation apparatus which is simple of construction, which is effective and efficient in operation, and which will have long life. A more specific object is the provision of an improved supporting and driving means for the raking members used in such apparatus. A further object is to provide sedimentation apparatus which will operate with a particularly low power consumption, for which the vertical space requirements will be small, and which will present a sightly appearance. Other objects of the invention will in part be obvious and will in part appear hereafter.

With the foregoing and other ends in view the invention includes among its various features the provision of means whereby the rakes of a thickener, clarifier, or the like, may be firmly and securely supported by compactly arranged means and for intermittent or continuous travel over considerable periods of time without substantial wear on the bearing surfaces and with a maximum of efficiency and effectiveness. In accordance with the invention the rake-supporting means includes a rotatable vertical shaft provided with supporting means disposed horizontally of the shaft and a considerable distance outwardly of the normal center of gravity of the rake members. Such means may include an outwardly-extending member on the upper part of the shaft and means to rotatively support this outwardly extending member adjacent to its periphery so that the points of support may be well spread out. Accordingly normal tendencies of the shaft to tip are counteracted, and at the same time there is provided an effective and shallow support which avoids the necessity of submerged bearings for the shaft or of unsightly and space-consuming elevated braces. As will be apparent, where submerged bearings for the shaft are employed the wear on these bearings and on the shaft is considerable, and a large frictional resistance to the drive is set up with consequent heavy loss of power. Elevated braces, besides being unsightly, increase the fire hazards when made of wood, and require a large amount of head room which prevents the installation of clarifiers, thickeners, and the like, in a variety of otherwise desirable locations. Another feature of the invention is the support of the shaft on bearings which are surrounded by a lubricant-retaining chamber, so that the shaft and its associated mechanism will rotate freely at all times. In its more specific aspects the invention contemplates the inclusion of the drive gearing for the shaft within the lubricant retaining chamber. In devices of the character under consideration moreover, it is of considerable importance that effective resistance be provided for extraordinary tendencies of the shaft to tip when the rakes encounter particularly heavy material at one side of the tank or when other unusual unbalanced conditions occur. To this end, there may be provided in accordance with the invention positive means, in addition to the horizontally spaced support, to maintain the outwardly-extending shaft-supporting member substantially horizontal and the shaft vertical at all times. By the arrangement of such means above a portion of the outwardly-extending means so that it will oppose upward movement of the periphery of the latter at substantially all points thereabout, assurance is had that no substantial tipping movement of the shaft in any direction can occur. The formation of this means as a part of the lubricant-retaining chamber is particularly advantageous, in that, even when the outwardly-extending member contacts with such means, the frictional drag will be small. A further feature of the invention resides in the provision of an overload release mechanism which includes particularly simple and effective centering means for the spring thereof and also includes means to prevent separation of the parts.

While the present invention in various of its aspects is applicable to sedimentation devices of a variety of types, it is exemplified as embodied in a clarifier of a character utilizable in sewage disposal plants. It is particularly noted, however, that the invention is adapted for embodiment in devices having other functions besides that of sedimentation, such for example as sewage digesters and bowl classifiers. In other words, it is obvious that the present invention is applicable to any apparatus for the treatment of liquids or liquid-solids mixtures wherein there is included a tank having a rotatable shaft or support extending downwardly thereinto and carrying suspended weight such as outwardly extending arms serving as raking elements or otherwise. In sedimentation devices it is customary

to provide a tank 11, including a side wall 12 and a bottom 13, for holding the liquid from which solids in suspension are to be removed. Solids settling to the bottom 13 take the form of sludge or of pulp which is raked or impelled by slowly moving rakes 14 toward a central bottom discharge hopper 15 from which the sludge or other thickened product is removed through a discharge pipe 16. The rakes ordinarily comprise blades 17 carried on rake arms 18 which extend more or less radially from a central rotatable support.

In accordance with an embodiment of the present invention the support is in the form of a vertical shaft 19 which is in turn supported adjacent to its upper end by an outwardly extending member in the form of a spider 20. The spider rides on suitable bearings such as ball bearings 21 carried on a horizontally disposed bearing race 22 at points spaced outwardly a sufficient amount so that ordinary variations in the weight of the sludge at different sides of the tank will not tip the shaft to lift the spider off its support at one side. The race 22 is provided with an annulus 23 supported by a framework 24 which extends across the top of the tank. As exemplified, the spider is formed with peripheral teeth providing an external gear 25 which meshes with a worm 26 carried on a countershaft 27. The countershaft is driven by means of a chain 28 from a shaft 29, which in turn is driven by an electric motor 30 supported in proximity to the spider on the framework 24.

The vertical shaft 19 is entirely carried from, turnably supported by and maintained in proper aligned position solely through the medium of an outwardly extending spider member 20 which is mounted so as to turn about a vertically extending axis which is the maintained vertical axis of the shaft. In other words, all guiding and supporting of the shaft is through the medium of the outwardly extending spider. This spider provides or constitutes a part of the construction which is sometimes referred to as the horizontally-turnable upper main bearing member.

An underlying construction constitutes a carrying means for rotatably supporting the outwardly extending spider member. Said carrying means comprises a member or part that provides the horizontally-disposed bearing race 22 and provides that which is sometimes referred to as a stationary lower main bearing member. This lower bearing member provides a horizontally-extending annular supporting-bearing surface portion constituting a lower carrying section which is the horizontally-disposed section that is referred to as the bearing race 22.

The spider member 20 has at the underside thereof an annular supported-bearing surface portion sometimes referred to as an upper carried section that corresponds to and overlies the annular supporting-bearing surface portion of the lower main bearing member.

From that which has preceded, it will be seen that the spider is turnably supported in respect to the lower bearing member through the medium of a series of rollable members or elements in the form of balls. This series of balls may be viewed as collectively constituting an annular intermediate-bearing means of a type to lessen friction and to avoid excessive wear as between the supporting and supported bearing surface portions. This intermediate bearing element is disposed between and along the annular sections respectively constituting said lower carrying and upper carried main-bearing surface portions and therefore the spider derives support from several horizontally-disposed sections whereby as the spider is caused to turn about its vertically extending axis it is at all times properly positioned for effecting the desired turning movement of the shaft about its vertical axis.

In order to ensure the preventing or avoiding of any objectionable tilting of the spider and therefore avoid any objectionable tilting of the shaft from its vertical alignment and whereby the parts carried by the shaft will at all times be properly positioned in respect to the rest of the tank structure an annular cover member 33 hereinafter referred to has been provided as an important part of a tilt-restraining construction which may be viewed as embodied in the bearing structure as a whole. The lower bearing member that provides the raceway 22 and the series of balls constituting the intermediate bearing element may be collectively viewed as providing the carrying means for rotatably supporting the outwardly extending spider member 22. This carrying means is supported from a stationary means which has fixed relationship in respect to the tank and which is provided by the fixed structural framework 24.

To insure that the spider will rotate with a minimum of friction there is provided a flange 31 extending outwardly from the member 23 and upwardly beyond the bearing race so as to provide a chamber for the retention of lubricant adjacent to the bearings. The bearings accordingly run in lubricant at all times so that friction and the unit pressure on any moving surface are reduced. In order to assure the retention of the lubricant, a packing 28' is provided to seal the space between the spider 20 and the annular member 23. In the present instance a portion 32 of the flange 31 extends above the worm 18 so as to retain the lubricant adjacent to the gear and worm. An annular cover member 33 is provided to close the lubricant chamber, a supplementary cover 34 being provided above the worm. There is thus provided a simply constructed lubricant chamber whereby assurance is had that the bearings and gearing will perform their heavy work with a minimum of friction and consequent wear. The shaft hangs freely from the spider and has no contact with any stationary member, thus preserving the shaft from wear.

As will be observed, the bearings provide a support for the shaft which is well spaced outwardly thereof so that tendencies of the shaft to tip when the rakes encounter particularly heavy materials on one side of the shaft will be minimized. In order however to insure against tipping of the shaft regardless of the conditions of operation, the cover member 33 is provided with an annular portion 35 extending in close proximity to the annular rim or bead 36 extended above the upper surface of the rim of the spider, so that the spider is held down on any side at which it would tend to rise under unbalanced conditions, and the shaft is maintained in a vertical position. As will be apparent, the lubricant in the lubricant retaining chamber will work its way between the portions 35 and 36, so that even when the surface 36 bears against the surface 35 there will be no large frictional drag.

In the present instance the shaft 19 is mounted on the spider for longitudinal movement to permit the adjustment of the height of the rakes.

As exemplified the shaft is formed with a keyway 37 into which a key 38 in the spider fits, and the shaft extends through a bore 39 in the spider. The bore is provided with a grease chamber 40. Normally the downward movement of the shaft is positively limited by a pin 41 extending through the shaft and above the central portion of the spider. The shaft carries a threaded upright 42 which runs through an interiorly threaded sleeve 43, rotatably carried on bracket 44 extending upwardly from the spider. The sleeve 43 is provided with a hand wheel 45. By operation of the hand wheel the shaft may be lifted through the bore to lift the rakes 14 when desired. In order to insure against splash working into the bore 39 the spider carries a depending sleeve 40' which surrounds the upper portion of the shaft.

In order to prevent excessive load from harming the mechanism, the worm 26 is slidably mounted so that in case of overload it may move forwardly against the pressure of a spring, instead of rotating the spider. At the end of the countershaft 27 remote from the driving chain 28 there is provided a thrust bearing 47 and a bracket head 48. The countershaft rotates within a sleeve 49, and the space between this sleeve and the bracket head is sealed by means of the packing 50 so as to retain a lubricant. The bracket head is formed with a recess 51 into which a semi-spherical nub 52 on a spring head 53 closely fits, the recess being conformed to the surface of the nub. A coil spring 54 bears against the head and against a stationary head 55 on the other side. A pair of rods 56 extend from the head 55 into the head 53. When the load on the rakes becomes excessive, the worm moves forwardly through the sleeve 49 and compresses the spring, the portions 51 and 52 serving to keep the spring pressure centered. A suitable alarm device may be provided if desired. A collar 57 on the countershaft 27 prevents the countershaft from slipping rearwardly, so as to assure that the thrust bearing 47 will not slip out of place even when there is no load on the mechanism.

Liquid to be treated by the device may be introduced into the tank through a launder 58 and feedwell 59 and liquid from which suspended solids have settled passes out through an effluent launder 60 and outlet 61.

Operation

The motor drives the countershaft through the medium of the shaft 29 and the chain 28. The worm on the countershaft rotates the spider and shaft 19 and causes the rakes to move slowly about the lower portion of the tank so as to cause the settled solids in the form of pulp or sludge to be moved toward the discharge hopper 15. The provision of the horizontally disposed support for the shaft mounts the shaft steadily without submerged or elevated bearing members. The spider rotates smoothly on its lubricated bearings and smoothly carries the heavy weight of the rakes. If a tendency of the heavy sediment on one side of the tank to tip the shaft is sufficiently great to lift the spider off the bearings at one side, the rim of the spider will bear against the cover 33, with the result that no substantial tipping of the shaft can even then occur. Since the rim of the spider is lubricated there will be no large added frictional drag. If there is an excessive load on the rakes, the spring 54 serves to provide a release without throwing the countershaft off-center, or causing an off-center thrust on the thrust bearing 47. This bearing, moreover, will never be released, even if the worm is rotated backwards, due to the provision of the collar 57.

The following paragraph is herewith included by way of broad illustration and not by way of specific limitation whereby the purport of the language as employed in certain of the claims will be rendered more clear and definte.

It will be manifest that reversal of parts or substitution of mechanical equivalents can be employed and still be comprehended within and by the spirit and scope of the invention and that the language as employed in the claims is to be broadly construed in the absence of art indicating that a limited construction of claims should be followed.

The apparatus as a whole may be referred to as a sedimentation apparatus and it essentially employs a sedimentation tank or basin.

The stationary bearing member 23 heretofore referred to is of such construction that it provides an annular raceway. In cross section the peripheral portion of the bearing member 23 is U-shaped whereby there results an oil holding or receiving pocket which can be relied upon for holding a lubricating medium for maintaining constant lubrication of the gear and the anti-friction balls 21 constituting one form of rollable members. The rotation of the balls consequently effects lubrication of the parts engaged thereby.

The stationary bearing member 23 is carried by a structure which may be referred to as a bearing supporting structure or bearing supporting construction which is fixed in relation to the sedimentation tank or basin.

An upper member which extends to and over the stationary bearing member is embodied by a spider shaped member 20 provided at the underside thereof with an annular raceway or race defining portion that is operatively positioned on and in engagement with the anti-friction balls or rollable members 21. The member which provides this spider 20 is herein referred to as the horizontally turnable bearing member and it embodies or has at the periphery thereof a driven annular gear in the form of an external worm driven gear 25. This gear 25 dips into the oil or as otherwise expressed, into the oil receiving pocket of the stationary bearing member. The stationary bearing member has or is provided with bearings for receiving a shaft 27 that in turn carries and drives a power transmission gear in the form of a worm 26 which has driving engagement with the annular gear 25. This worm gear 26 may be viewed as a power transmission gear constituting part of a speed reducing and power transmission mechanism and it is preferably arranged so as to dip or extend into the lubricant receiving section or oil pocket of the stationary bearing member 23 with the result that as the worm 26 operates there is effected a continuous lubrication of itself and also of the annular gear 25 driven thereby. The horizontally turnable bearing member just referred to carries and actuates, incident to the turning thereof, a depending rake carrying structure provided with or having raking elements which function to effect the impelling and transferring of sedimented solids from diverse sections of the tank bottom to a settled solids discharge provided by a central bottom discharge hopper 15 and the discharge pipe 16 leading therefrom.

A unit embodying the present invention has as an important function the sedimentation or settling of solids from the liquid solids mixture

whereby there is required the raking of the sedimented solids to effect disposal thereof from the bottom of the tank or basin while at the same time there is generally carried out a withdrawal of supernatant liquid from the upper interior portion thereof as through the medium of an effluent peripheral launder provided at 60 and which is sometimes referred to as a part of the supernatant liquid withdrawal means.

The rake carrying structure is normally turned so as to rotate in horizontal paths about a vertical axis common to the raceways of the stationary and turnable bearing members and it is important in certain installations to maintain this depending structure against tilting. To that end as has been indicated above, there is provided an anti-tilting device extending from one of said bearing members towards and in overlapping relationship in respect to the other bearing member. In the embodiment shown this anti-tilting member is provided by an annular cover plate which is secured to the upper end of the outer leg of the U-shaped section. The cover plate extends inwardly over the oil pocket or oil holding portion and ultimately to and over and in overlapping relationship with respect to the turnable bearing member whereby the latter is prevented from tilting, or as otherwise expressed, from upward displacement to any substantial extent with respect to the stationary bearing member with which it is associated. This cover member functions not merely as an anti-tilting element, but it extends over the oil pocket; it serves as a cover protecting the oil pocket against entrance of dirt, water, or other foreign substances and it also provides a protective zone within which the driven annular gear and the worm or power transmission gear driving it functions under encased and protective conditions. Due to the U-shaped section an annular oil receiving section or pocket has been provided within which the ball raceways are located at an elevation below that of any oil overflow limit as determined by any upper edge of the upstanding legs of the U-shaped portion. The annular worm driven gear and the power transmission gear or worm extend into the oil receiving or pocket section. It will therefore be borne in mind that the anti-friction balls and the raceway portions engaged thereby, as well as any and all gear elements that extend into the oil receiving portion are constantly lubricated as the apparatus functions.

It will thus be seen that there is provided a simple, strong, smooth running, and sightly construction, which combines efficiency and effectiveness with long life.

Since certain changes may be made in the above construction and different embodiments could be made without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. Sedimentation apparatus comprising a tank having a centrally located settled-solids discharge portion in its bottom, a shaft extending downwardly into the tank, travelling rakes deriving their support from said shaft and adapted to move settled solids toward said discharge portion, an outwardly extending member connected with said shaft adjacent to its upper end and serving to support the same, a bearing race, bearings in said race for rotatively supporting said outwardly extending member at outwardly spaced points whereby a horizontally extended support for the shaft and rakes is provided, means to support said race, and means extending above and engaging with an outwardly disposed portion of said outwardly extending member positively to prevent substantial tipping of the shaft, said shaft being unconfined at all points beneath said outwardly extending member.

2. Sedimentation apparatus comprising a tank having a settled-solids discharge portion, a shaft extending downwardly into the tank, travelling rakes deriving their support from said shaft and adapted to move settled solids toward said discharge portion, an outwardly extending member connected with said shaft adjacent to its upper end and serving to support the same, said outwardly extending member being formed to provide an external gear, a worm meshing with said gear, means to drive said worm, a bearing race, bearings in said race adapted to support said outwardly extending member at horizontally disposed points, means disposed interiorly of said bearings providing an annular packing adjacent to said outwardly extending member, a wall extending outwardly and upwardly from said bearing race and about said gear and worm, and cover means extending from said wall over said gear and in proximity to an upper annular portion of the outwardly extending member to prevent said shaft from tipping when there are unbalanced conditions in said tank and to provide with said wall a lubricant retaining chamber enclosing said bearings and said gear and worm.

3. Sedimentation apparatus comprising a tank having a settled solids discharge portion, a shaft extending downwardly into the tank, travelling rakes deriving their support from said shaft and adapted to move settled solids towards said discharge portion, an outwardly extending member connected with said shaft adjacent to its upper end and serving to support the same, a bearing race, bearings in said race for rotatively supporting said outwardly extending member at outwardly spaced points whereby a horizontally extended support for the shaft and rakes is provided, and means extending outwardly and upwardly from said bearing race and inwardly above the periphery of said outwardly extending member and completely enclosing the periphery of the same, said means being in sealed relationship with said outwardly extending member and constituting an annular chamber for retaining a lubricant.

4. A sedimentation unit comprising a tank provided with supernatant liquid and settled solids discharge outlets respectively leading from the upper and lower portions of the tank; a bearing support construction fixedly positioned in respect to the tank; a stationary bearing member having a horizontally extending annular raceway carried by said support construction; a turnable bearing member having an annular raceway operatively disposed above and in respect to the raceway of the stationary bearing member; a series of anti-friction rollable elements operatively disposed between said raceways and serving as means by which the turnable bearing member derives support from the stationary bearing member; sedimented solids raking elements disposed over the bottom of the tank and functioning incident to the turning of the same about the vertically extending axis that is common to the raceways to effect an impelling and transferring of sedimented solids from the diverse sections

of the tank bottom toward and ultimately to said settled solids discharge outlet; a rake carrying structure depending from said turnable bearing member and in turn carrying said raking elements; means for imparting horizontal rotary movement to the turnable bearing member and associated members carried thereby; and a tilt-restraining means comprising a rigid construction secured to one of said bearing members and in overlapping relationship with respect to the other of said bearing members on the opposite side of the raceway from the side to which it is fixed so as to prevent any substantial movement of the turnable bearing member from its normal operative relationship in respect to the stationary bearing member.

5. A sedimentation unit as defined in and by claim 4 in which the turnable bearing member is provided with an annular driven gear at the periphery thereof and in which the tilt-restraining means includes a flange extending outwardly and upwardly from the stationary bearing and an annular cover connected to said flange and extending inwardly therefrom to and in overlapping relationship with respect to the turnable bearing member closely adjacent thereto.

6. A sedimentation apparatus having a tank for receiving liquid to be subjected to sedimentation provided with supernatant liquid withdrawal means leading from the upper portion of the tank and a settled solids discharge outlet leading from the lower portion of the tank; a bearing support construction fixedly positioned in respect to the tank; a stationary bearing member having a horizontally extending annular raceway carried by and affixed to said support construction; a turnable bearing member having an annular raceway that is operatively disposed above and in respect to the raceway of the stationary bearing member; a series of anti-friction rollable elements operatively disposed between said raceways and serving as a means by which the turnable bearing member derives support from the stationary bearing member; sedimented solids raking elements operatively disposed over and in relation to the bottom of the tank and functioning incident to the turning of the same about a vertically extending axis that is common to the raceways to effect an impelling and transferring of sedimented solids from diverse sections of the tank bottom toward and ultimately to said settled solids discharge outlet; a rake carrying structure depending from said turnable bearing member and in turn carrying said raking elements and means for imparting rotary movement to the turnable bearing member and associated members carried thereby; which apparatus is characterized in that the stationary bearing member has an annular portion which is U-shaped in cross section to provide an annular oil pocket, in that the raceway of said stationary bearing member is at an elevation below that of any oil overflow limit as determined by any upper edge of the upstanding legs of the U-shaped annular portion, in that the anti-friction rollable elements essentially extend into and operate along the oil holding section of said pocket, and in that there is provided tilt-restraining means secured to one of the legs of the stationary bearing member, extending over the oil pocket and to a location in which a portion thereof overlies a portion of the rotatable bearing member.

7. A sedimentation apparatus as defined in and by claim 6 further characterized in that it includes a driven gear wheel provided on and as a part of the turnable bearing member and a power transmitting and speed reducing gear mechanism that comprehends a power transmission gear element supported in bearings provided on and by the stationary bearing member and which is in driving engagement with said driven gear wheel for imparting rotary movement to the latter and therethrough to the turnable bearing member and the parts carried thereby, and in that there is included as a part of the tilt-restraining means an annular cover member which extends over said power transmission gear element to and past the toothed section of said driven gear wheel.

8. Apparatus for treating liquids and liquid-solids mixtures comprising a tank having an inlet for the material to be treated and an outlet for the discharge of treated material, a shaft extending downwardly into the tank, travelling arms deriving their support from said shaft and extending outwardly therefrom, an outwardly extending member connected with said shaft adjacent to its upper end and serving to support the same, a bearing race, bearings in said race for rotatably supporting said outwardly extending member at outwardly spaced points whereby a horizontally extended support for the shaft and arms is provided, means fixed in relation to the tank to rigidly support said race, and means extending above and engaging with an outwardly disposed portion of said outwardly extending member and rigidly fixed with respect to the means to support the bearing race positively to prevent substantial tipping of the shaft.

9. Apparatus for treating liquids and liquid-solids mixtures comprising a tank having an inlet for material to be treated and an outlet for the discharge of treated material, a shaft extending downwardly into the tank, travelling arms deriving their support from said shaft and extending outwardly therefrom, an outwardly extending member connected with said shaft adjacent to its upper end and serving to support the same, said outwardly extending member being formed to provide an external gear, a worm meshing with said gear, means to drive said worm, a bearing race, bearings in said race adapted to support said outwardly extending member at horizontally disposed points, means fixed in relation to the tank to rigidly support said race, means disposed interiorly of said bearings providing an annular packing adjacent to said outwardly extending member, a wall extending outwardly and upwardly from said bearing race and about said gear and worm, and cover means extending from said wall over said gear and in proximity to an upper annular portion of the outwardly extending member to prevent said shaft from tipping when there are unbalanced conditions in said tank and to provide with said wall a lubricant retaining chamber enclosing said bearings and said gear and worm.

10. Apparatus for treating liquids and liquid-solids mixtures comprising a tank having an inlet for material to be treated and an outlet for the discharge of treated material, a shaft extending downwardly into the tank, travelling arms deriving their support from said shaft and extending outwardly therefrom, an outwardly extending member connected with said shaft adjacent to its upper end and serving to support the same, a bearing race, bearings in said race for rotatably supporting said outwardly extending member at outwardly spaced points whereby a horizontally

extended support for the shaft and arms is provided, and means extending outwardly and upwardly from said bearing race and inwardly above the periphery of said outwardly extending member and completely enclosing the periphery of the same, the inwardly-extending portion of said means being in closely spaced relationship with said outwardly extending member and constituting an annular chamber for retaining a lubricant.

11. Apparatus for treating liquids and liquid-solids mixtures comprising a tank having an inlet for the material to be treated and an outlet for the discharge of treated material, a shaft extending downwardly into the tank, travelling arms deriving their support from said shaft and extending outwardly therefrom, an outwardly-extending member connected with said shaft adjacent its upper end and serving to support the said shaft, carrying means engaging the under surface of said outwardly extending member adjacent its periphery for rotatably supporting said outwardly-extending member substantially at the circumferential portion thereof whereby a horizontal support is provided for the outwardly-extending member and for the shaft and arms supported therefrom, stationary means by which said carrying means is rigidly supported with respect to the tank, and tilt-restraining means fixed against vertical movement with respect to the tank and extending above and engaging with a portion of said outwardly-extending member positively to prevent substantial tipping of the shaft.

12. Apparatus for treating liquids and liquid-solids mixtures, comprising a tank having an inlet for material to be treated and an outlet for the discharge of treated material; a bearing support construction fixedly positioned in respect to the tank; a stationary bearing member carried by said support construction and having a horizontally-extending annular supporting surface portion; a turnable bearing member having an annular supported surface portion operatively disposed above and in respect to the annular supporting surface portion of the stationary bearing member; an intermediate bearing element disposed between and along said annular supporting and said annular supported surface portions; an outwardly-extending arm functioning within the tank incident to the turning of the arms about a vertically-extending axis that is common to the aforesaid annular surface portions; an arm-carrying structure depending and deriving support from the turnable bearing member and in turn carrying said outwardly-extending arm; means for imparting horizontal rotary movement to the turnable bearing member and associated members carried thereby; and a tilt-restraining means comprising a rigid construction secured to one of said bearing members and extending therefrom into overlapping relationship with respect to and adjacent the other of said bearing members so as to prevent any substantial movement of the turnable bearing member from its normal operating relationship in respect to the stationary bearing member.

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