Sept. 28, 1937. C. H. SCOTT 2,094,552

SEDIMENTATION DEVICE

Filed March 13, 1935 4 Sheets-Sheet 1

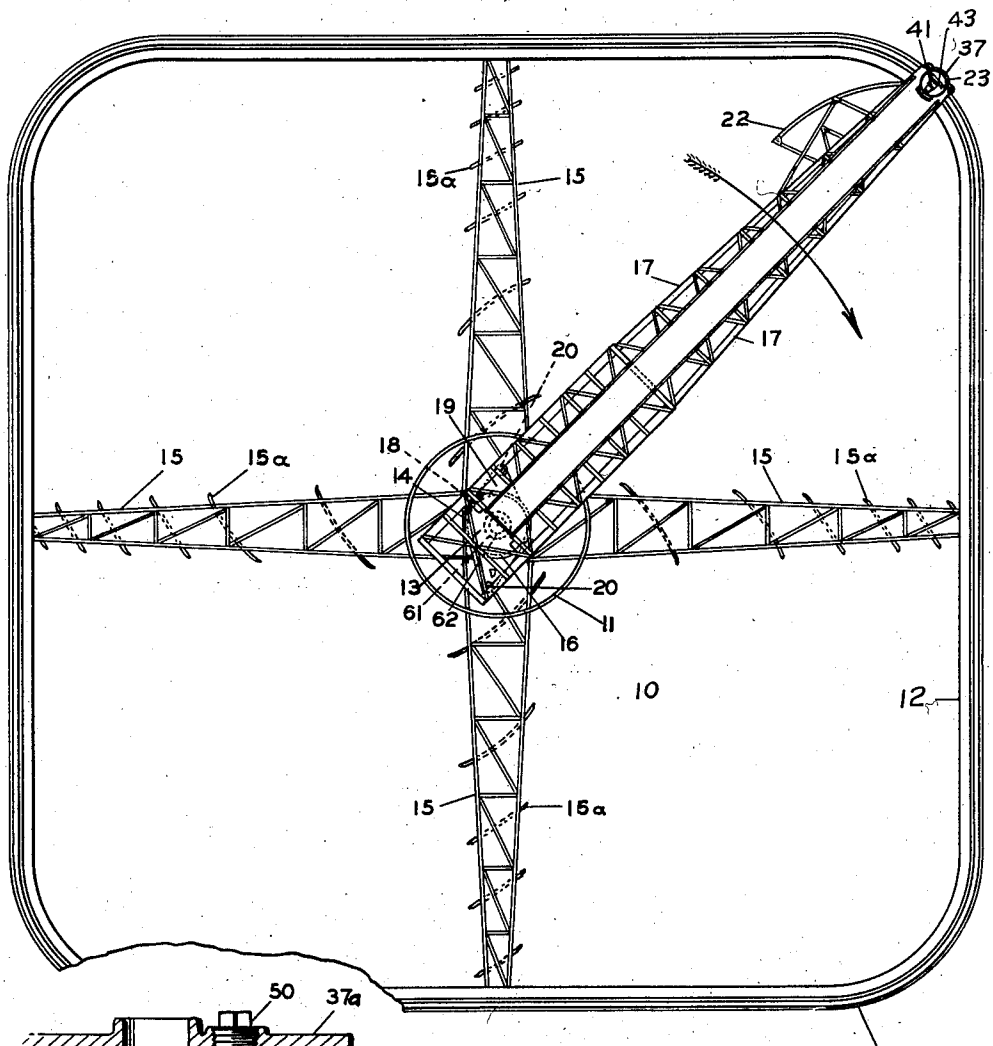

FIG. 1.

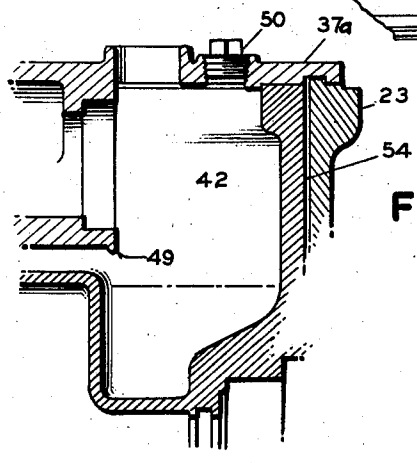

FIG. 5.

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SEDIMENTATION DEVICE

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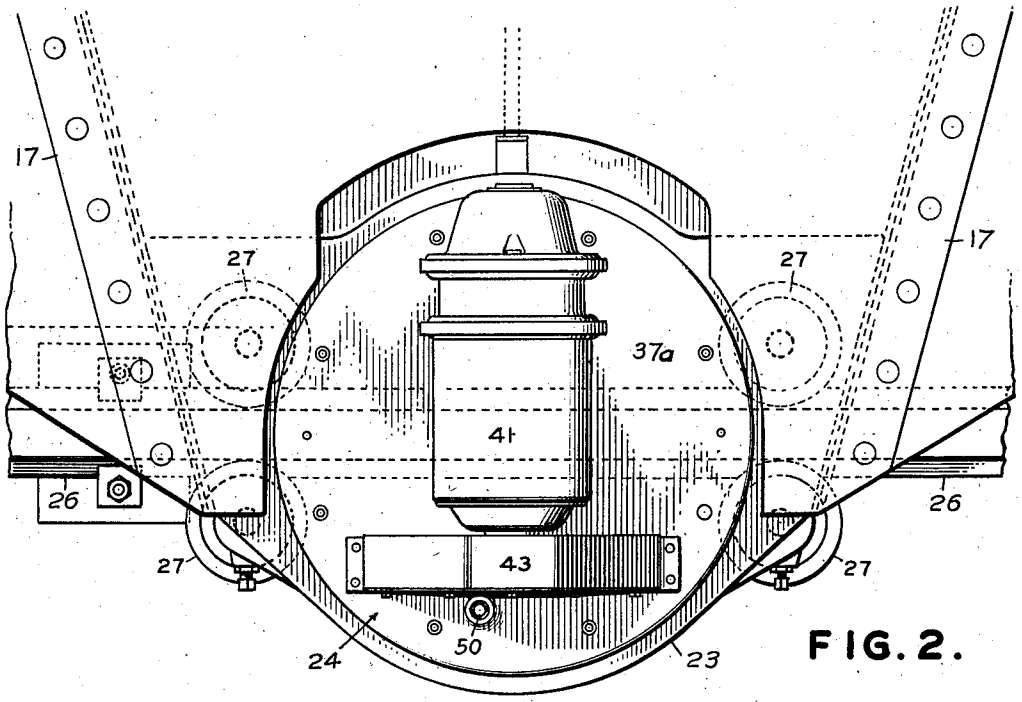

FIG. 2.

FIG. 3.

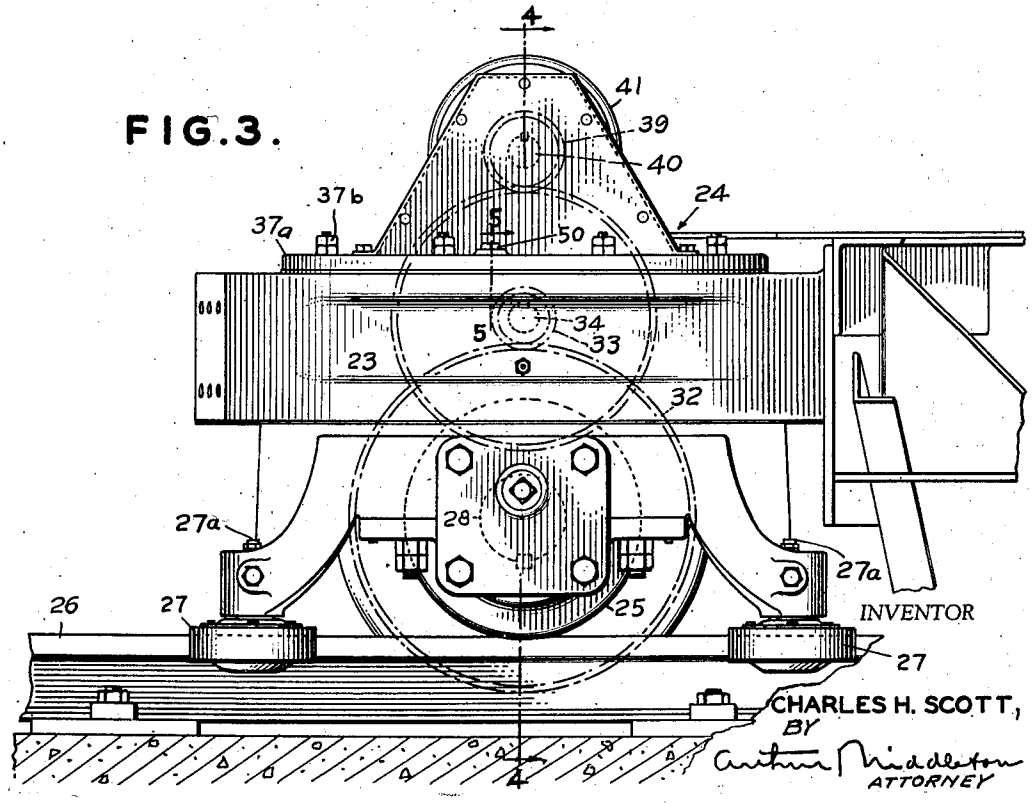

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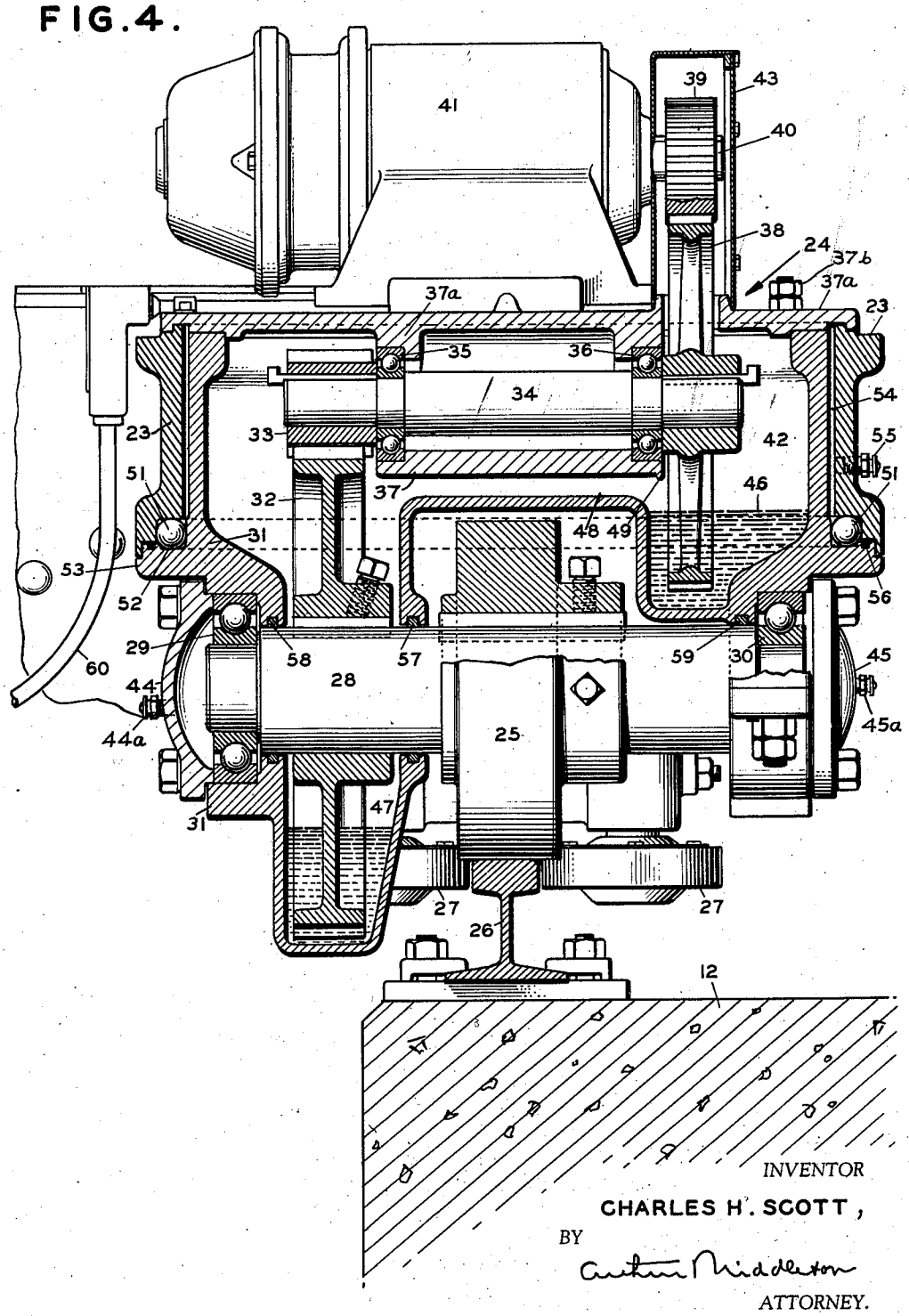
FIG. 4.



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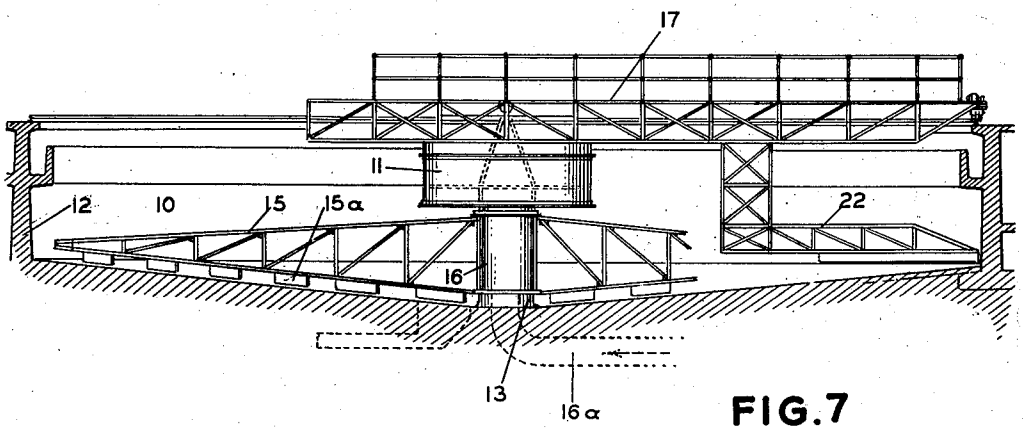

FIG. 7

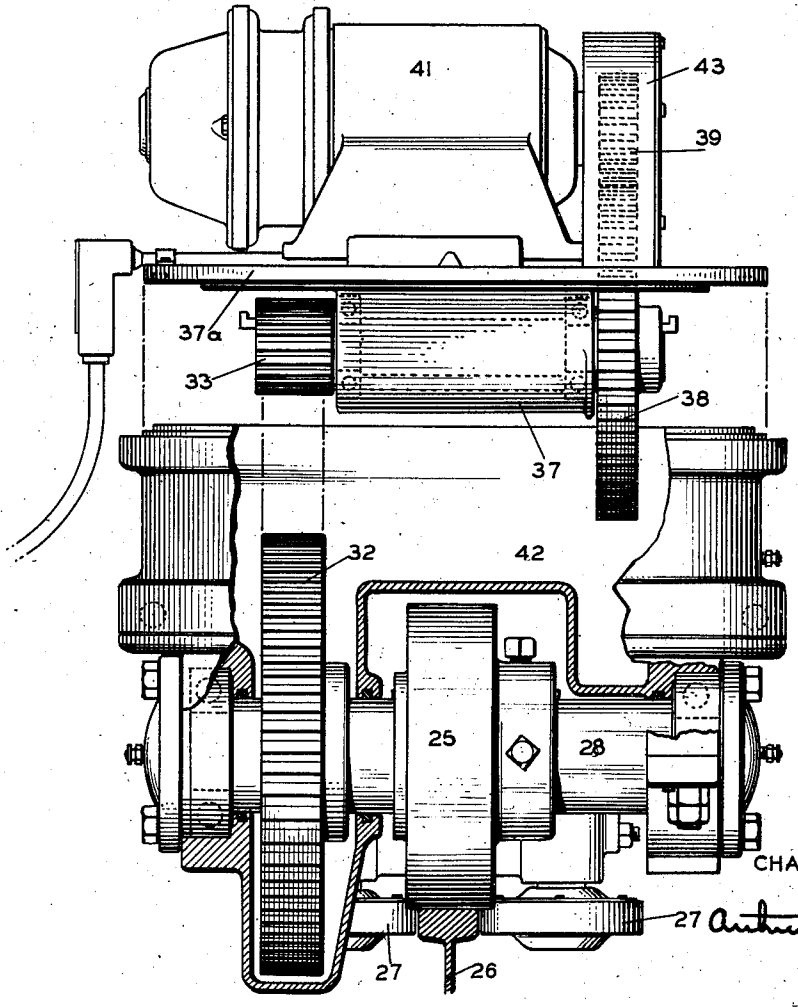

FIG. 6

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Patented Sept. 28, 1937 2,094,552

UNITED STATES PATENT OFFICE

2,094,552

SEDIMENTATION DEVICE

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Application March 13, 1935, Serial No. 10,753

9 Claims. (Cl. 210—55)

This invention relates to sediment collecting mechanism for sedimentation apparatus or tanks such as thickeners, clarifiers or the like, in which settled sludge is slowly raked to a point of discharge.

More specifically this relates to the peripherally driven or so-called traction type of sludge collecting mechanism, and which comprises a rake arm rotatable about a central support and having its free end supported upon and traveling along a path at the top portion of the tank wall.

Ordinarily in the traction type there is provided at the traveling end of a rotary main drive arm a supporting and driving truck unit which has associated therewith a prime mover or electro-motor and a speed-reducing mechanism or gear connection between the motor and the truck wheel.

A special problem in the sweeping of the sludge arises where the sludge collecting mechanism is to be adapted to a tank of non-circular or square shaped configuration, inasmuch as the rake arm must be capable of composite rotary and longitudinally slidable movement, and also because the truck must be movable relative to the drive arm, and in itself be capable of following the non-circular or irregular contour of the tank.

In a narrower sense then, however without in any way restricting its broader features, the characteristics of design according to this invention will be more clearly understood by reference to the non-circular tank and associated sludge collecting mechanism as disclosed in the U. S. Patent to S. I. Bousman No. 1,741,498 issued December 31, 1929. In this patent, specifically, since the drive relies upon rail-friction, the supporting and driving truck is equipped with a single supporting roller which should normally have concentrated thereon sufficient weight of the drive arm to insure adequate operating friction between the roller and an operating track. While an annular bearing provides the desired articulation between the main drive arm and the truck, guide rollers fore and aft hold the truck in operative relation to the path or track. Motor means in the way of an electro-motor and reduction gearing must be provided to drive the truck at a suitable speed for sludge raking. Furthermore, in the patented design the motor finds its place upon the outer end portion of the main drive arm where it is mounted reasonably close to the otherwise compact one-roller type truck to obtain a desirable weight concentration thereon. This structural set-up, however, makes necessary the provision of a flexible or relatively movable connection somewhere in the train of speed-reducing mechanism between the motor and the truck wheel, as by the use of bevel gears arranged and capable by their relative bodily movement of absorbing certain differentials of motion.

In a narrower sense then the invention can be said to contemplate the realization of an improvement over the patented motor-gear truck driving arrangement, the objects being to simplify and coordinate more closely the driving connections, to produce an altogether more compact, more unitary or self-contained, and otherwise more efficient driving or truck unit for the main driving arm, and one whose elements are well protected and readily maintained in good operating order, and yet readily accessible for inspection.

To this end the invention contemplates the placing of the driving motor onto the truck and into fixed driving relationship with the gear and the supporting truck roller.

According to one feature the frame of the truck itself is formed to constitute the casing for the reduction gear. This novel combined gear-casing and truck-frame is also formed with a circumferential annular bearing to establish the necessary articulated connection between the main driving arm and the truck.

According to another feature the gear casing has a removable platform or coverplate to serve for the mounting thereon of the driving motor and gearing thereof to the speed-reducing or gear mechanism inside the casing below the platform.

Another feature provides that some elements of the speed-reduction mechanism or gearing are mounted upon and depending from the lower side of the plate or platform which covers the open top of the gear casing. As a consequence it is a characteristic of the assembly that the removal of the cover will also remove the parts of the gearing associated therewith, thereby exposing or making accessible the subadjacent parts located further below in the casing, whereas the very act of replacing the cover upon the casing will bring the respective elements or gears into cooperative or meshing relationship.

According to still another feature the articulation between the main driving arm and the supporting truck is realized in a novel manner by forming the gear casing substantially with a vertical cylindrical top portion and having the

same surrounded by a substantially corresponding cylindrical or eye-portion of the incumbent main driving arm, and by securing the two respective rotary portions in proper operative or guiding relationship to each other.

In a preferred embodiment a unique though simple arrangement and bodily coordination of parts provides a combination of advantages which consist in compactness, mechanical stability, accessibility of parts, and improved mechanical and operative efficiency and maintenance.

More specifically, in a compact unitary motor truck arrangement, preferably of the single supporting roller type, a set of gears such as spur gears transmits reduced speed from the motor to the roller axle, with intermediate gear-portions cooperatively interconnecting a motor pinion with a gear that rotates co-axially with the roller. The truck frame or gear casing being provided with suitable oil pockets provides directly or indirectly constant lubrication for all gears.

Further, a plate member to cover the open top of the gear casing coincidentally serves a multiple purpose. That is to say, as an operating platform it carries mounted thereon the prime mover or motor. For mechanical stabilization and security of the articulated connection between the casing and the driving arm, a marginal portion of the plate member is extended to embrace the adjacent surrounding annular portion or eye of the associated driving arm. Moreover, this marginal extension of the plate member also serves as a top closure for a clearance left between the gear casing and the surrounding annular portion or eye of the driving arm, thus forming a confined space to serve as a grease distributing chamber for the articulation. And finally, the platform or cover is utilized to carry depending from its lower side a portion of the gear, so that the dismounting of the cover in itself will make all interior parts readily accessible.

The invention possesses other objects and features of advantage, some of which with the foregoing will be set forth in the following description. In the following description and in the claims, parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit. In the accompanying drawings there has been illustrated the best embodiment of the invention known to me, but such embodiment is to be regarded as typical only of many possible embodiments, and the invention is not to be limited thereto.

The novel features that I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawings in which

Fig. 1 is a diagrammatic plan view of a square traction type sedimentation tank.

Fig. 2 is a top view upon the motor truck driving arrangement for the main driving arm of the sludge collecting mechanism.

Fig. 3 is a view upon the outer end of the driving mechanism shown in Fig. 2.

Fig. 4 is an enlarged longitudinal section through the motor truck or driving unit, showing the interior arrangement of the encased reduction gearing.

Fig. 5 is a sectional detail view showing characteristic parts of the gear casing and cover.

Fig. 6 is a part cross-sectional view similar to Fig. 4 showing the cover plate with associated parts of the reducing gear lifted off the casing.

Fig. 7 is a diagrammatic longitudinal section taken upon the sedimentation tank of Fig. 1.

In the exemplified construction there is shown a clarification tank **10** having a central influent well **11** and an outer wall **12** in which effluent discharge openings of any well-known or suitable type are provided. In the central portion of the bottom of the tank there is provided a sludge discharge which may be of the character described in the patent to S. I. Bousman, No. 1,741,498, issued December 31, 1929. From within this discharge portion a supporting pedestal **13** or pier rises to the top of the tank as shown in detail in said patent to Bousman. On this pedestal a turntable **14** is rotatably supported. Rake arms **15**, carrying blades **15***a* extend generally radially along the bottom of the tank from a drum **16** extending from the turntable and surrounding the pier. A feed conduit **16***a* rises through the pier. By the slow movement of these rake arms over the bottom of the tank the settled solids in the form of sludge are worked inwardly toward the discharge.

The turntable slidably supports the inner end of a drive arm **17**, the outer end of which follows the periphery of the tank. This sliding support is provided by vertical rollers **18** on the turntable. The turntable is formed with lateral extensions **19** carrying at their outer ends horizontal rollers **20** which bear against depending flanges **21** on the sliding arm **17** so that angular movement of the sliding arm will rotate the turntable and thereby the rake arms. The sliding arm may be provided near its outer end with a depending rake or explorer portion **22** whereby sludge in the corners of the tank may be readily moved inwardly within the range of the rake arms **15**.

The outer end of the sliding arm **17** has an annular bracket or bearing portion **23** (see Fig. 4) which is rotatably supported on a self-contained driving unit **24** in order to permit pivotal movement of the unit with respect to the arm and corresponding to the composite sliding and angular movement of the drive arm. The driving unit **24** includes a roller **25** which operates upon a track **26** extending along the top of the wall **12**. The track may be in the form of an ordinary railroad rail and it may be associated by frictional contact with a steel roller having a chilled bearing surface. For directional guidance along the operating path the roller **25** has cooperatively associated therewith four guide rollers **27** included in the driving unit and disposed pairwise at opposite sides of the track. These rollers **27** have sufficient clearance from the track to prevent binding on the curved portions thereof, and they have greasing connections **27***a* (see Fig. 3). The roller **25** is secured to a horizontal shaft **28** which runs on ball bearings **29** and **30**, carried by a casing portion **31**. The shaft **28** carries a large spur gear **32** which meshes with a pinion **33** on one end of a horizontal shaft **34** which runs on ball bearings **35** and **36**, carried in a journal or bearing portion **37** which forms a depending portion of a plate member or casing cover **37***a*. Studs and nuts **37***b* may secure the cover upon the casing. The shaft **34** also carries a large spur gear **38** to mesh with a pinion **39** on a shaft **40** which is the armature shaft of an electric motor **41**. The motor is supported above

the roller 25 as a part of the driving unit. The gears 32, 33, 38, and 39 are enclosed within a chamber 42, the walls of which are provided by the casing portions 31 and 37 and an auxiliary casing or protective cover portion 43. Additional casing portions 44 and 45 provide, respectively, lubricant containing chambers for the bearings 29 and 30, and they have greasing connections 44a and 45a respectively. The casing portion 31 is formed to provide an oil well 46 into which the gear 38 dips, and an oil well 47 into which the gear 32 dips. The casing 31 forms a recess in the bottom in which the roller 25 lodges between the wells 46 and 47, and by its very nature it also provides an oil dam 48 between the oil wells 46 and 47. As will be observed, the portion 37 of the casing cover which carries the bearings 35 and 36, is formed with a drip point 49 above the oil well 46. A removable fitting 50 (see detail Fig. 5) is provided in the casing cover 37a to permit oil to be introduced into the chamber 42.

It will thus be seen that the cover plate 37a and associated motor 41 and train of gearing 33, 38, and 39, which may be referred to as a primary gearing section, may be readily removed to give access to the interior of the casing and may be replaced so that the primary gearing section will readily assume operative engagement with the spur gear 32 which may be termed a secondary gearing section.

The annular bracket 23 runs on ball bearings 51 which are carried on a bearing race 52 formed in a flange 53 surrounding the casing portion 31. In this manner the bracket is so mounted as to avoid frictional drag during relative movement of the driving unit and the end of the drive arm due to the variations of the track from a true arc. The bracket 23 has annular clearance between it and the corresponding cylindrical portion 31 to provide a chamber 54 communicating with the bearings 51, to serve as a grease chamber. A marginal extension of the plate member or casing cover 37a bridges the clearance or grease chamber 54 and embraces the top of the bracket portion 23. Grease may be introduced at 55 into the annular clearance or grease chamber 54. An annular packing or gasket 56 closes the bottom of the bracket 23 against the flange 53 to assure the retention of lubricant in the ball bearings 51, 52. In practice, grease is retained in the bearing race 52 over long periods of time. Packing is also provided about the shaft 28 as indicated at 57 to close the chamber 47, and as indicated at 58 and 59 to close the lubricant chambers for the bearings 29 and 30. The motor is supplied with electric current through a flexible cable 60 and connected by suitable means including slip rings 61 and 62 to suitable leads in the pedestal 13.

The motor is mounted so that its weight is centered on the roller 25. Moreover, the roller is driven with a minimum of loss of power so as to permit the use of a motor of much less horsepower than was formerly possible. By supporting the outer end of the reciprocating arm on the free-running lubricated bearings frictional drag, as the angularity of this arm and the driving unit shifts, is avoided. Power consumption and horse power requirements are relatively reduced. There is accordingly provided highly improved traction means for driving the rake arms in clarifiers for sewage and other liquids, for sewage digesters, and for thickeners such as utilized in recovering a variety of solids from liquids, and in general for driving sweeping means from a non-circular periphery of a zone to be swept.

I claim:

1. In a sedimentation apparatus having a settling tank and a sediment collecting angularly moving raking member with its free end adapted to travel along the circumference of the tank, a supporting and driving apparatus associated with the travelling end of said member, which apparatus comprises supporting roller means adapted to travel along a trackway substantially paralleling the circumference of said tank, a prime mover associated with said roller means for actuating the same, power transmitting mechanism operatively interconnecting said prime mover and said roller means for propelling the raking arm, a mounting for said roller means in the form of a hollow frame adapted to substantially encase therein said power transmitting mechanism, annular bearing means surrounding said hollow frame in a horizontal plane and adapted to support thereon the travelling end of the said raking member, said hollow frame being in the form of a casing having an open top and having a portion rising above the horizontal operating plane of the annular bearing means, the travelling end of the said raking member forming a similar rising portion surrounding the first portion and operative upon said annular bearing means, and a cover attachable to said open top of the casing, which cover has a marginal overhang adapted to substantially embrace the upper edge of the rising portion of said raking arm.

2. In a sedimentation apparatus having a settling tank and a sediment collecting angularly moving raking member with its free end adapted to travel along the circumference of the tank, a supporting and driving apparatus associated with the travelling end of said member, which apparatus comprises supporting roller means adapted to travel along a trackway substantially paralleling the circumference of said tank, a prime mover associated with said roller means for actuating the same, power transmitting mechanism operatively interconnecting said prime mover and said roller means for propelling the raking arm, a mounting for said roller means in the form of a hollow frame adapted to substantially encase therein said power transmitting mechanism, annular bearing means surrounding said hollow frame in a horizontal plane and adapted to support thereon the travelling end of the said raking member, said hollow frame forming the casing having an open top, and a cover plate member attachable thereto, said member adapted to have bodily mounted thereon said prime mover, and to have extending therethrough a power transmitting connection from the prime mover to the exterior of the casing.

3. In a sedimentation apparatus having a settling tank and a sediment collecting angularly moving raking member with its free end adapted to travel along the circumference of the tank, a supporting and driving apparatus associated with the travelling end of said member, which apparatus comprises supporting roller means adapted to travel along a trackway substantially paralleling the circumference of said tank, a prime mover associated with said roller means for actuating the same, power transmitting mechanism operatively interconnecting said prime mover and said roller means for propelling the raking arm, a mounting for said roller means in the form of a hollow frame adapted to substan-

tially encase therein said power transmitting mechanism, annular bearing means surrounding said hollow frame in a horizontal plane and adapted to support thereon the travelling end of the said raking member, said power transmitting mechanism comprising primary and secondary gearing sections, said hollow frame forming the casing having an open top, and a cover plate member attachable thereto and adapted to support from the lower side thereof the primary gearing section and positionable to enable the primary gearing section to assume operative engagement with the secondary gearing section.

4. In a sedimentation apparatus having a settling tank and a sediment collecting angularly moving raking member with its free end adapted to travel along the circumference of the tank, a supporting and driving apparatus associated with the travelling end of said member, which apparatus comprises supporting roller means adapted to travel along a trackway substantially paralleling the circumference of said tank, a prime mover associated with said roller means for actuating the same, power transmitting mechanism operatively interconnecting said prime mover and said roller means for propelling the raking arm, a mounting for said roller means in the form of a hollow frame adapted to substantially encase therein said power transmitting mechanism, annular bearing means surrounding said hollow frame in a horizontal plane and adapted to support thereon the travelling end of the said raking member, said hollow frame having an open top, a cover plate member attachable thereto and adapted to carry mounted thereon the prime mover, said power transmitting mechanism comprising gear elements and a horizontally arranged gear countershaft intermediate the prime mover and the driven roller means, said countershaft being operatively supported from said cover plate member.

5. In a sedimentation apparatus having a settling tank and a sediment collecting angularly moving raking member with its free end adapted to travel along the circumference of the tank, said raking member having an annular bearing portion at its free end, a supporting and driving apparatus associated with the travelling end of said member, which apparatus comprises a self-contained unit including supporting roller means, a mounting in the form of a hollow frame for said roller means and constituting a casing adapted to house a power-transmitting mechanism hereinafter mentioned, a prime mover supported upon said casing, power-transmitting mechanism within said casing between said prime mover and said roller means, and an annular vertical thrust bearing surrounding the casing and supporting said annular bearing portion at the free end of said raking member.

6. In a sedimentation apparatus having a settling tank and a sediment-collecting angularly-moving raking member with its free end adapted to travel along the circumference of the tank, a self-contained supporting and driving unit associated with the travelling end of said member, which unit comprises supporting roller means adapted to travel along a track substantially paralleling the circumference of said tank, a prime mover, power - transmitting, speed - reducing mechanism operatively interconnecting said prime mover and said roller means for propelling the raking arm, a mounting for said roller means in the form of a casing having an open top and adapted to substantially encase therein said power-transmitting mechanism for said roller means, a cover plate attachable to said casing and having a perforation for the extension therethrough of the power-transmitting means, annular bearing means surrounding said casing in a horizontal plane and adapted to support thereon the travelling end of the raking member and to permit rotation about a vertical axis of said casing relative to the travelling end of said raking member, and means for guiding said roller means along said track.

7. Apparatus according to claim 6, in which the casing has a portion rising above the horizontal operating plane of the annular bearing means, in which the travelling end of the raking member forms a similar portion surrounding the first portion and is operative upon said annular bearing means, and in which the cover plate has a marginal portion adapted to extend substantially into guiding relationship with said surrounding portion of the raking member.

8. In a sedimentation apparatus having a settling tank and a sediment-collecting angularly-moving raking member with its free end adapted to travel along the circumference of the tank, a self-contained supporting and driving unit associated with the travelling end of said member, which unit comprises supporting roller means adapted to travel along a track substantially paralleling the circumference of said tank, a prime mover, power-transmitting speed-reducing mechanism, operatively interconnecting said prime mover and said roller means for propelling the raking arm, a mounting for said roller means in the form of a hollow frame adapted to substantially encase therein said power-transmitting mechanism for said roller means, said hollow frame forming a receptacle for containing a lubricant for the power-transmitting mechanism encased therein, annular bearing means surrounding said hollow frame in a horizontal plane and adapted to support thereon the travelling end of the raking member and to permit rotation about a vertical axis of said hollow frame relative to the travelling end of said raking member, and means for guiding said roller means along said track.

9. In a sedimentation apparatus having a settling tank and a sediment-collecting angularly-moving raking member with its free end adapted to travel along the circumference of the tank, a self-contained supporting and driving unit associated with the travelling end of said member, which unit comprises supporting roller means adapted to travel along a track substantially paralleling the circumference of said tank, a driving axle for said roller means, a prime mover, power-transmitting speed-reducing mechanism operatively interconnecting said prime mover and said roller means for propelling the raking arm, a mounting for said roller means in the form of a hollow frame adapted to substantially encase therein said power-transmitting mechanism for said roller means, said hollow frame forming a pocketed receptacle having a deeper and shallower pocket, one end of said axle extending across and through the walls of said deeper pocket and journalled in one of the walls thereof, the opposite end of the axle extending below the shallower pocket and having a journal supported from the outside of said shallower pocket, said power-transmitting mechanism comprising a spur gear rotatable with said axle and fixed at a portion thereof where it lodges in said deeper pocket, a gear countershaft operatively supported in the

upper portion of the receptacle and carrying at one end a relatively smaller spur gear meshing with said first spur gear, a relatively larger gear at the opposite end of said countershaft and adapted to lodge in the said shallower pocket, driving means between said last-mentioned relatively larger gear and the prime mover, annular bearing means surrounding said hollow frame in a horizontal plane and adapted to support thereon the travelling end of the raking member and to permit rotation about a vertical axis of said hollow frame relative to the travelling end of said raking member, and means for guiding said roller means along said track.

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