

June 12, 1934.

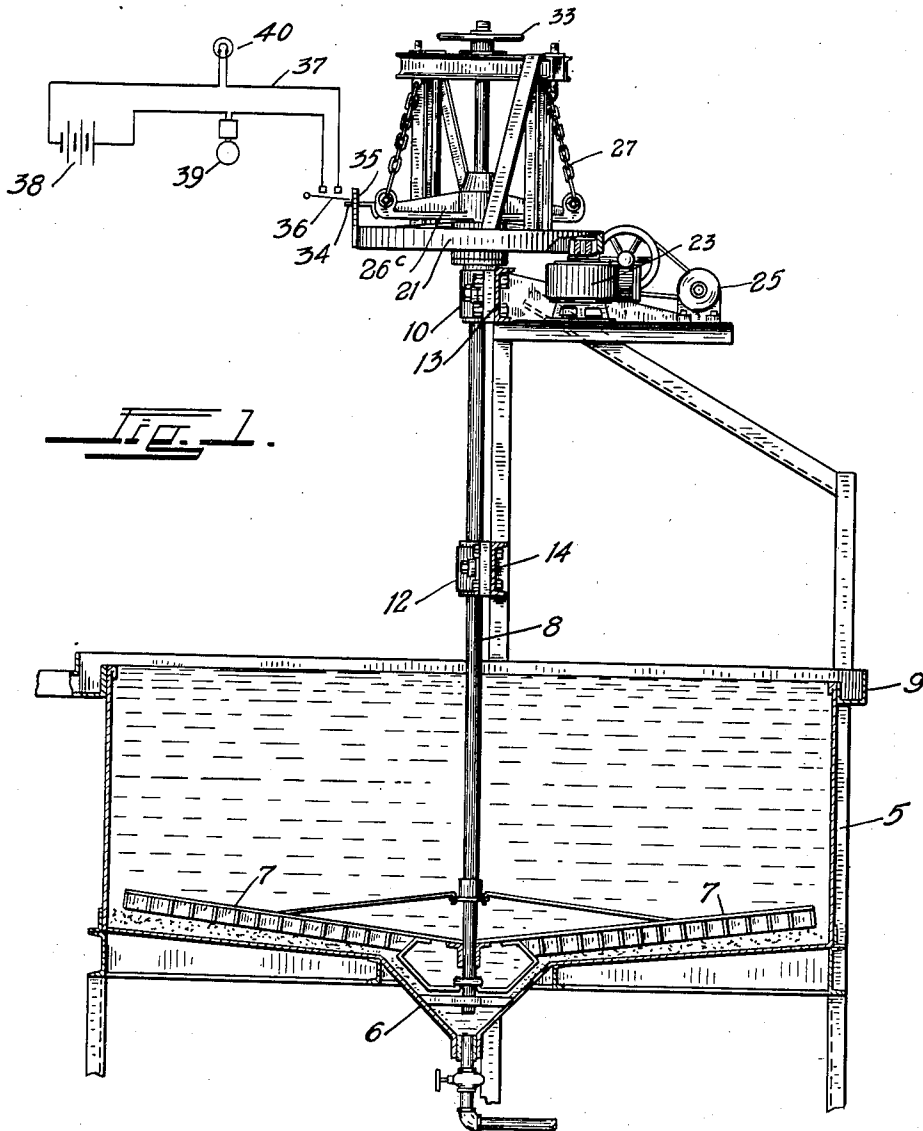
L. H. LOGUE

1,962,646

THICKENER

Filed March 2, 1931

2 Sheets-Sheet 1



INVENTOR.
Leland H. Logue
BY
Rollander & Stratton
ATTORNEYS.

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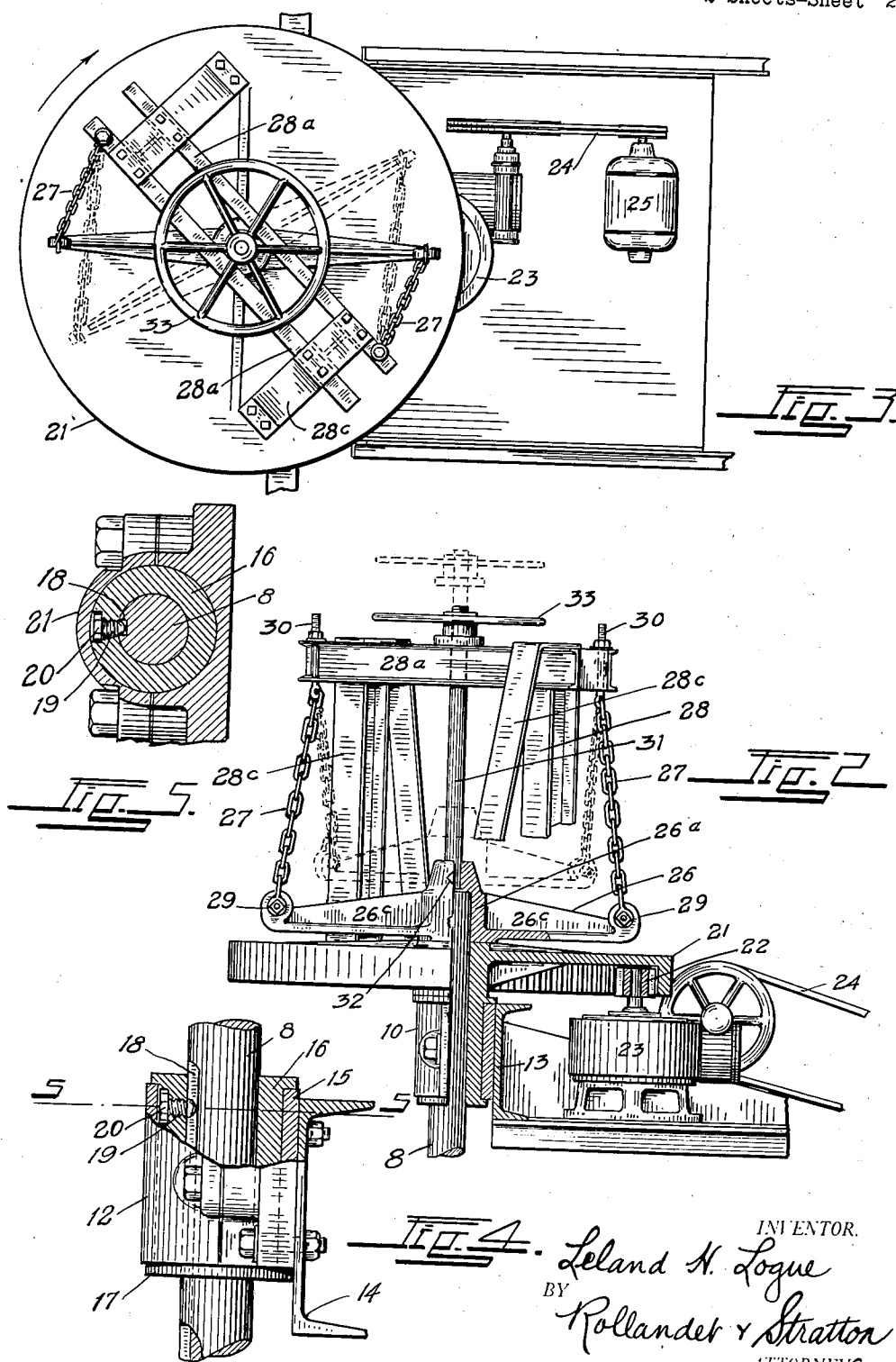
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UNITED STATES PATENT OFFICE

1,962,646

THICKENER

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Application March 2, 1931, Serial No. 519,445

11 Claims. (Cl. 259—108)

This invention relates to settling apparatus of the type commonly known as "thickeners" and its primary object is to provide in association with the rotary rake of a thickener, a driving mechanism in which novelty of construction is combined with practicability and efficiency in use.

Another object resides in providing a driving mechanism inclusive of means for automatically adjusting the position of the rotary rake in ratio to the density of the settled matter upon which it acts.

A further object of the invention is found in the provision of a bearing of novel construction, in which the shaft of the rake is rotatably supported, and still other objects reside in details of construction and in new and advantageous arrangements and combinations of parts as will be fully disclosed in the course of the following description.

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 of the "thickener" type equipped with a driving mechanism in accordance with the present invention,

Figure 2 is a sectional elevation of the driving mechanism, drawn to an enlarged scale,

Figure 3, a plan view of the elements shown in Figure 2,

Figure 4, an enlarged sectional view of one of the bearings of the vertical rake-shaft, and

Figure 5, a section along the line 5—5, Figure 4.

Referring further to the drawings, the settling apparatus comprises a cylindrical tank 5 having in its bottom, a central opening 6 for the discharge of settled solids. A rotary stirring device by which the settled matter is continuously moved toward and into the discharge opening 6 consists of a series of rakes 7 mounted upon a vertical shaft 8. A launder 9 at the periphery of the tank, is provided to receive an overflow of clear liquid rising out of the matter settling toward the bottom of the tank.

All of the elements of the apparatus thus far described are per se, not a part of the present invention. They may be varied in size, form or construction without effect upon the operation of the invention which, as stated hereinbefore, resides principally in the mechanism for driving the rakes, and in therewith associated means for automatic non-rotary adjustment of the same.

The vertical shaft 8 is rotatably mounted in upper and lower bearings 10 and 12 secured in vertical alinement upon channel bars 13 and 14

of a suitable supporting frame. Only parts of the frame have been shown in the drawings since its form and construction are immaterial and subject to variations in accordance with differing conditions.

In order to provide for the automatic non-rotary adjustment of the stirring device, it is necessary that the shaft be capable of sliding lengthwise in its bearings and at least one of the bearings is specially constructed to eliminate friction and to prevent dirt and muck from being carried into the bearing by the longitudinal movement of the shaft.

The bearing 12 shown on a larger scale in Figures 4 and 5, comprises a sectional housing 15 which is fastened to the respective channel-beam 14 of the frame, and a bushing 16 which rotates inside the housing and is flanged as at 17 to prevent endwise displacement.

The shaft has a longitudinal key-way 18 and a key 19 in the bushing projects loosely into this key-way, to effect the rotative continuity of the bushing and the shaft while allowing of a relative lengthwise movement of the latter.

It is desirable that the key gives as little friction as possible and it is to this end composed of a screw-plug having a rounded end projecting into the key-way and held in place by a nut 20 screwed upon its opposite end. It will be observed that the bearing-surfaces in the rotary motion of the shaft are between the bushing and the housing while the shaft slides freely in the bushing. Dirt and muck adhering to the shaft and carried upwardly or downwardly during its longitudinal motion, cannot reach the bearing-surfaces and the rotary movement of the shaft does not interfere with its up or downward motion.

The driving mechanism for the shaft consists of an internal gear wheel 21 loosely mounted on the shaft, and supported for independent rotation upon the bearing 10. A pinion 22 meshing with the gear, is fixed on the shaft of a reducer 23 and the shaft of the reducer is by a suitable transmission gear, indicated at 24, connected with the rotor of a conveniently positioned motor 25. It will be understood that the motor drives the internal gear at a uniform velocity.

Fixed at the upper end of the shaft, above the gear-wheel is a drag yoke 26 which by means of chains 27 or other flexible devices, is connected with a superstructure 28 on the gear-wheel 21.

The yoke is composed of a hub 26a and oppositely projecting horizontal arms 26c and the superstructure 28 includes oppositely projecting arms provided by parallel channel bars 28a which

are rigidly supported upon the gear-wheel by legs 28c.

The arms of the superstructure extend at an angle to those of the drag yoke and forwardly thereof with relation to the direction of rotation of the gear-wheel, and the arms of the two elements are connected at their extremities by the beforementioned chains 27. The chains may be fastened by any suitable means such as bolts 29 on the drag yoke and eye bolts 30 on the transverse top-portion of the superstructure of the gear-wheel, and it will be apparent that the chains must slant from the drag yoke forwardly with reference to the direction of rotation.

In order to provide for the manual up and downward adjustment of the shaft, a screw 31 fastened to the hub of the drag yoke by a set bolt 32, extends through a central opening of the superstructure 28, and a hand wheel 33, bearing upon the superstructure has an integral nut in cooperative engagement with the screw.

In the operation of the settling apparatus, the constant rotary movement of the gear wheel 21 is imparted to the rake shaft through the medium of the superstructure, the drag yoke and the chains.

Solids in material fed into the tank, settle to the bottom and are continuously moved toward the central discharge opening by the rakes at the lower end of the shaft.

It will be observed that the chains being fastened to the superstructure forwardly of the ends of the drag yoke, compel the shaft to which the yoke is fixed, to rotate in conjunction with the gear wheel. When, as frequently occurs, the resistance offered by the settled matter in the tank, to the motion of the rakes, increases beyond a predetermined maximum, the consequent stress imposed upon the chains will cause the drag-yoke to move upwardly with the result that the shaft is moved lengthwise through its bearings, it being understood that, as stated before, the gear and its superstructure to which the chains are fastened rotates at a constant velocity.

The upward movement of the shaft withdraws the rakes from the resistant mass until the density thereof is restored to normal when the rakes are returned to their original position by downward movement of the shaft. The driving mechanism is therefore released of stresses due to varying resistances to the movement of the driven parts, and breakage and abnormal wear are thus effectively avoided.

It will be understood that if so desired, an indicatory appliance may be associated with the mechanism hereinabove described, to give visible or audible warning of an increase in resistance to the movement of the rake or to visibly measure the degree of said resistance. A simple means for accomplishing these results has been shown, in outline, in Figure 1 of the drawings.

A pointer 34 on the drag yoke, cooperates with a graduated scale 35 on the gear-wheel, to indicate the degree of resistance to the movement of the rakes, by the upward displacement of the shaft, and when the shaft has lifted the pointer to a given point, it closes a switch 36 of an electric circuit 37, including a source of electricity 38 and either an electric alarm 39 or an electric lamp 40 or both.

An additional distinctive feature of the invention resides in providing a thickener, a driving-mechanism inclusive of a horizontal internal gear-wheel closed at its upper side to exclude dirt, dust and obstructive objects from its teeth.

Heretofore, thickeners have been driven by means of a worm and worm-wheel, and the provision of a closed internal gear wheel and a pinion, in substitution for the worm wheel and the worm, is a valuable improvement in apparatus of this type.

Changes in the construction or in the arrangement of the elements and parts comprised in the embodiment of my invention herein described, may be resorted to without departing from the spirit or scope of the same as defined in the hereunto appended claims.

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

1. The combination with a rotary stirring device of a thickener capable of non-rotary displacement within the fluid body, of automatic means to effect non-rotary displacement of the device by varying resistance to its rotary motion, and means outside the fluid body to effect said displacement manually separate and independent of the automatic means.

2. The combination of a settling tank, a rotary stirring device therein, including a shaft mounted for lengthwise movement, a rotary driving-element, including a wheel, a superstructure thereon, and a drag-yoke on the shaft, movably connected with the superstructure, said rotary driving-element including the superstructure and drag-yoke being outside the tank and above the material contained therein.

3. The combination of a settling tank, a rotary stirring device therein, including a shaft mounted for lengthwise movement, a rotary driving-element, including a wheel, a superstructure thereon, a drag-yoke on the shaft, and movable connections between the yoke and the superstructure, said rotary driving-element including the superstructure and drag-yoke being outside the tank and above the material contained therein.

4. The combination of a settling tank, a rotary stirring device therein, including a shaft mounted for lengthwise movement, a rotary driving-element, including a wheel, a superstructure thereon, a drag-yoke on the shaft, and movable connections between the yoke and the superstructure, slanting upwardly and forwardly with relation to the direction of rotation of the wheel, said rotary driving-element including the superstructure and drag-yoke being outside the tank and above the material contained therein.

5. The combination of a settling tank, a rotary stirring device therein, including a shaft mounted for lengthwise movement, a rotary driving-element, including a wheel, a superstructure thereon, a drag-yoke on the shaft, movably connected with the superstructure, and means on the superstructure for manual lengthwise adjustment of the shaft, said rotary driving-element including the superstructure and drag-yoke being outside the tank and above the material contained therein.

6. The combination of a rotary stirring device, including a shaft mounted for lengthwise movement, a rotary driving-element, including a wheel, a superstructure thereon, a drag yoke on the shaft, movably connected with the superstructure, a screw on the shaft, and a nut on the screw in association with the superstructure, said rotary driving-element including the superstructure and drag-yoke being outside the tank and above the material contained therein.

7. The combination of a settling tank, a rotary stirring device including a shaft mounted for

lengthwise movement, of an internal gear-wheel, a pinion in driving engagement therewith, a superstructure on the gear-wheel, and a drag yoke on the shaft, movably connected with the superstructure, said rotary driving-element including the superstructure and drag-yoke being outside the tank and above the material contained therein.

8. The combination of a rotary stirring device, including a shaft mounted for lengthwise movement, a rotary driving wheel loose on the shaft, arms supported on the driving wheel in superposed relation thereto, arms on the shaft, and connections between the arms of the two elements in movable relation to the same and adapted to automatically permit of upward movement of the arms on the shaft, toward those on the gear wheel by an excess resistance to the movement of the stirring device.

9. The combination of a rotary stirring device, including a shaft mounted for lengthwise movement, a rotary driving wheel loose on the shaft, a transverse member fixed to and in superposed relation to the driving wheel, a yoke on the shaft, and connections between the transverse member and the yoke, in movable connection with the same, to permit of automatic upward movement of the yoke toward the transverse member by excess resistance to the movement of the stirring device.

10. The combination of a settling tank, a rotary stirring device therein, including a shaft mounted for lengthwise movement, a rotary driving-element, a drag-yoke on the shaft, connections between the yoke and the element, slanting in the direction of rotation of the same, said rotary-element and drag-yoke being outside the tank and above the material contained therein, automatic means to effect lengthwise movement of the shaft by varying resistance to the rotary motion of the device, and means to manually effect lengthwise movement of the shaft, separate and independent of the actions of the above-stated elements for producing the same results.

11. The combination of a settling tank, a rotary stirring device therein, including a shaft mounted for lengthwise movement, a driving element in connection with the shaft, automatic means to effect lengthwise movement of the shaft by varying resistance to the rotary motion of the device, and mechanical indicatory means recording density variations in material in the tank and actuated by the lengthwise movement of the shaft, said indicatory means including a pointer mounted for movement with the shaft, and a relatively stationary scale cooperating with the pointer.

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