Dec. 23, 1941. R. E. BRIGGS 2,267,438

SEWAGE TREATING APPARATUS

Filed Jan. 6, 1937 2 Sheets-Sheet 1

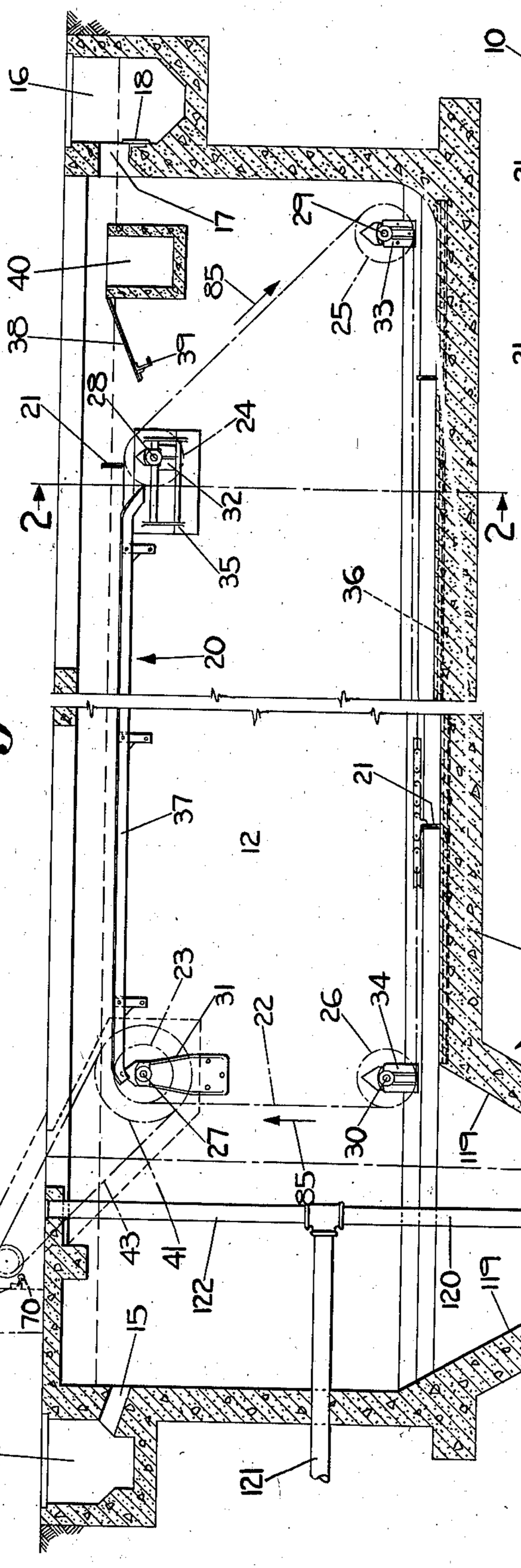

Fig. 1

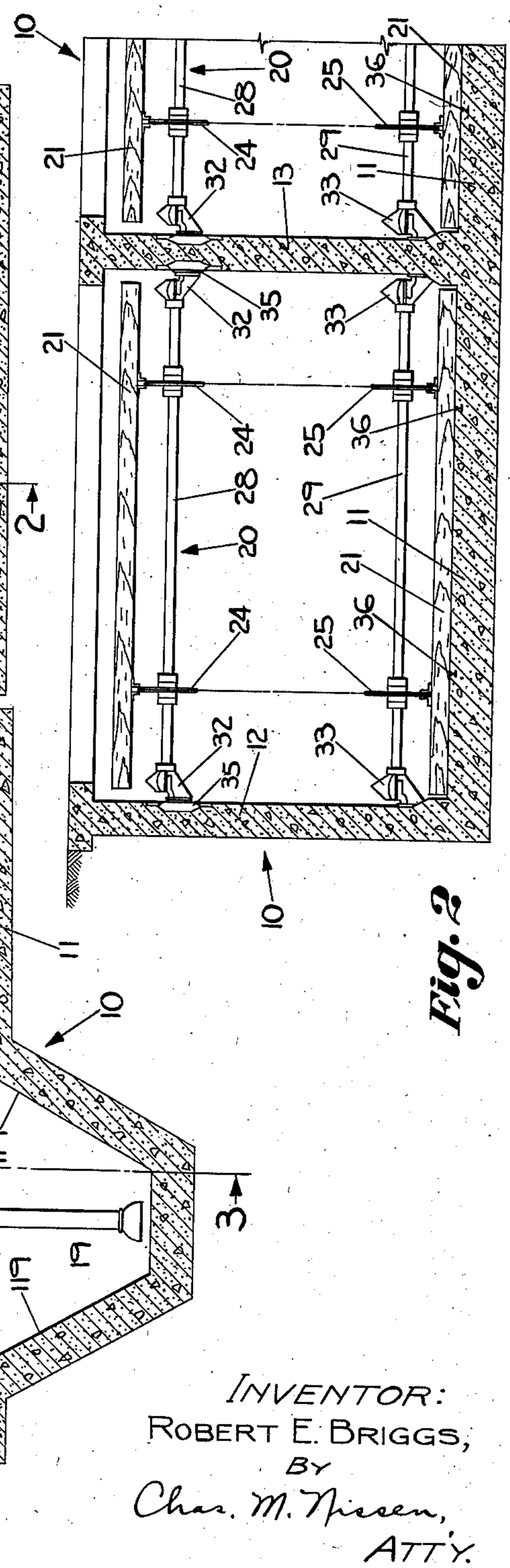

Fig. 2

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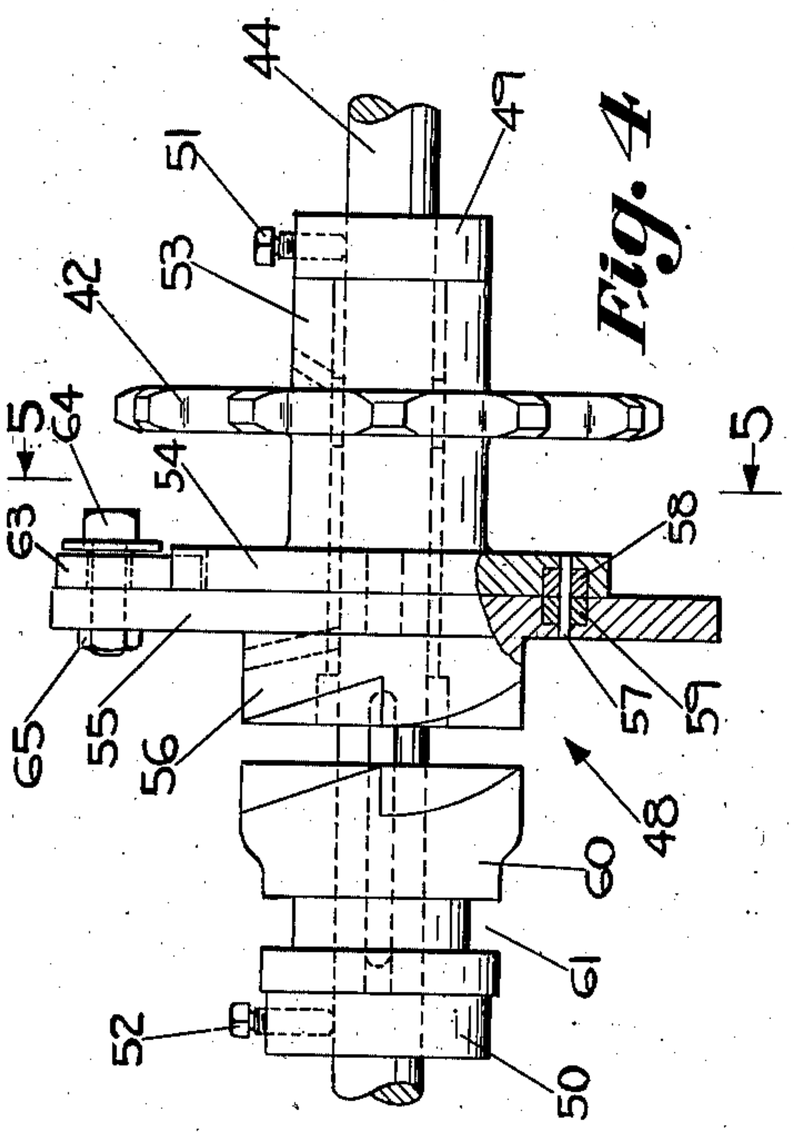

Fig. 4

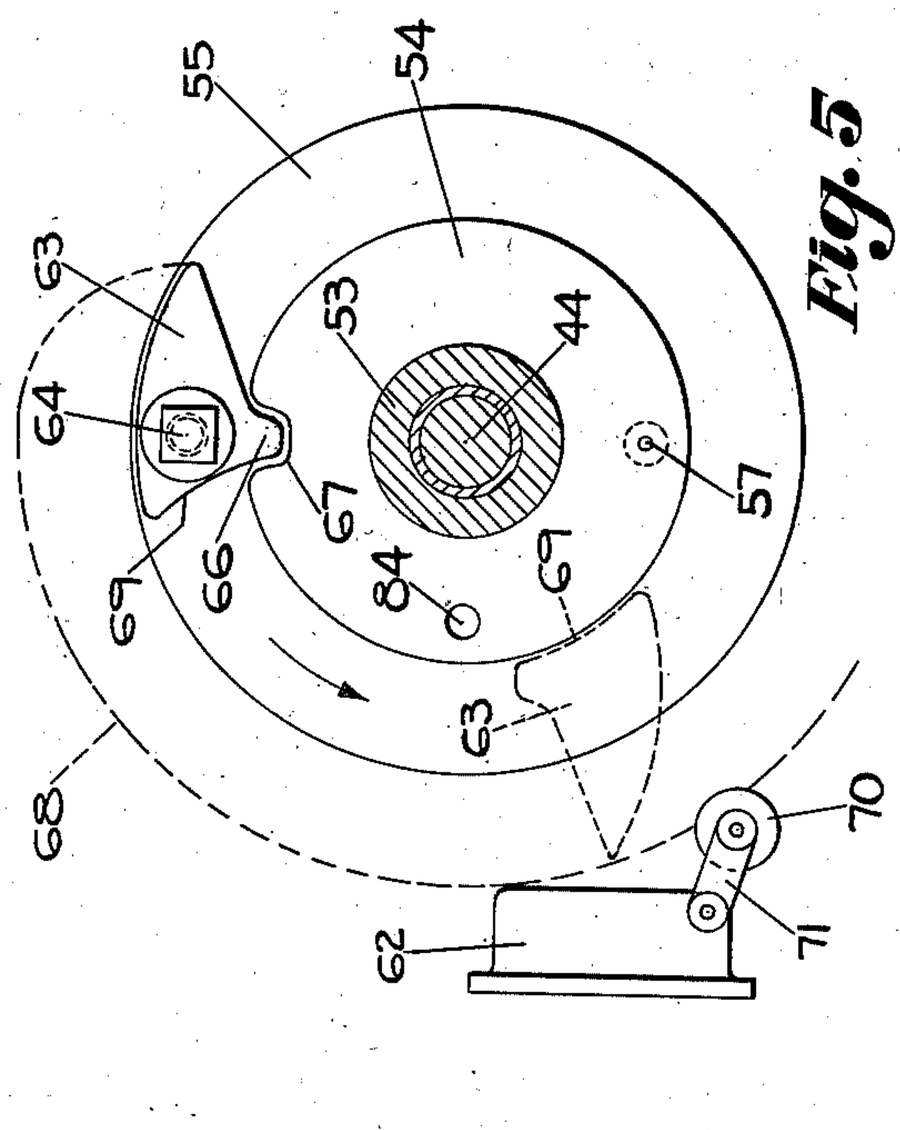

Fig. 5

Fig. 3

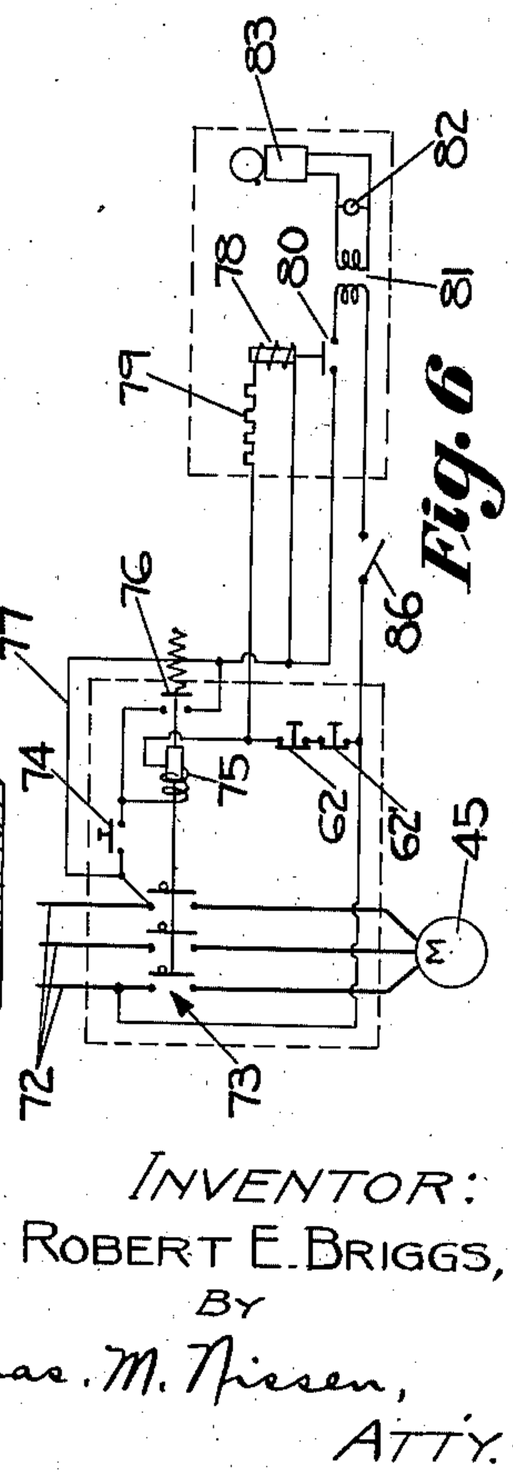

Fig. 6

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2,267,438

SEWAGE TREATING APPARATUS

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Application January 6, 1937, Serial No. 119,307

7 Claims. (Cl. 192—150)

This invention relates to sewage treating apparatus and an object of the invention relates particularly to mechanism for limiting the torque or power applied to a scraper conveyor to relieve the driving motor of any overloaded condition, and to give a signal and to open the motor circuit when said overloaded condition is realized.

Another object of the invention is to provide a shear pin coupling between a drive element and a driven element with means associated with the drive element to give a signal when the driven element becomes stalled and the pin is sheared.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is a longitudinal elevational sectional view of a complete installation comprising my invention;

Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 1 looking in the direction of the arrows;

Fig. 3 is a transverse sectional elevational view taken on the line 3—3 of Fig. 1 looking in the direction of the arrows;

Fig. 4 is an enlarged detail view showing the drive coupling and signal operating means comprising my invention;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4 looking in the direction of the arrows; and

Fig. 6 is a wiring diagram for the apparatus comprising my invention.

As seen in Figs. 1, 2 and 3 of the drawings, my invention includes a plurality of settling tanks 10, 10 which are of similar construction and are provided with similar conveying means. It will therefore be understood that a description of one of said tanks and the conveying means associated therewith will be sufficient for an understanding of both. Each of said settling tanks is formed as a monolith of poured concrete and has a substantially horizontal bottom 11, a sidewall 12 and a sidewall 13, the sidewall 13 being common to the two tanks.

An influent channel 14 is provided adjacent the influent end of the tanks 10, 10 and provides a common influent for said tanks 10, 10. Each of said tanks is provided with an influent conduit 15 providing for the flow of sewage from said channel 14 into the tank 10.

At the opposite end of each of the tanks 10, 10 is an effluent channel 16 which is common to both of the tanks 10, 10 into which the effluent flows from said tanks 10, 10 by an effluent conduit 17, of which there will be one for each of said tanks 10, 10. Each effluent conduit 17 is preferably provided with a vertically adjustable gate 18 to adjust and control the liquid level within the tank 10.

Adjacent the influent end of each tank 10 there is provided a sludge sump 19 to receive the heavy particles of sewage as they flow into the tank 10 by way of the influent conduit 15 and to receive the sludge scraped to said sump 19 by the conveyor mechanism designated generally by the character 20.

The conveyor mechanism 20 is of the scraper conveyor type and is formed by a plurality of spaced transversely extending flights 21 carried by a pair of endless chains 22, 22 which, in turn, are carried upon four pairs of sprockets 23, 24, 25 and 26, which sprockets are, in turn, mounted upon transversely extending shafts 27, 28, 29 and 30, respectively, which are supported in journals on pairs of brackets 31, 32, 33 and 34, respectively, supported from the side walls 12 and 13 of each tank 10.

Each of the brackets 32, 32 is supported upon an adjusting mechanism 35 thereby providing take-ups for the chains 22, 22.

Embedded within the bottom 11 is a pair of spaced rails 36, 36 upon which the flights 21 ride during the major portion of their lower run. Extending longitudinally of the tank 10 and adjacent the sidewalls 12 and 13 thereof and supported by said sidewalls are supporting rails 37, 37 which support the upper run of the conveyor 20 so that the flights 21 project upwardly through the surface of the liquid in the tank 10. Said upwardly extending flight 21 conveys any floating material rearwardly where it is received by an upwardly inclined chute 38 or inclined plane which extends completely across tank 10 and is supported upon a transversely extending channel member 39 at its bottom and supported at its top by a transversely extending scum trough 40. The material as it accumulates is pushed toward the chute or inclined plane 38, by the flights 21 and such accumulated material is then conveyed up along the inclined plane by a manually operated rake, or scraper and falls into the scum trough 40 which is connected with the effluent channel 16 by a conduit, not shown in the drawings. The ends of channel member 39 are embedded in and supported by sidewalls 12 and 13.

In operation, the conveyor 20 moves in the direction illustrated by the arrows 85 (Fig. 1), to convey any settled material by a scraping action

along the bottom 11 of the tank 10 and discharges it into the sludge sump 19 having inclined side walls 119. Any floating material is conveyed to the scum trough 40, as aforesaid. Sludge will flow from sump 19 to a sludge well through sludge pipe 120 and branch 121, the upward extension 122 providing a vent to atmosphere.

Associated with each of the shafts 27 of the conveyor mechanisms 20, 20 is a drive sprocket 41 driven from a sprocket 42 by a chain 43. The two drive sprockets 42 are loosely journaled upon a common shaft 44 which is driven from a motor 45 through a speed reducer 46. The shaft 44 is supported at one end by the speed reducer 46 and at the other end by appropriate journal bearing means carried by a standard 47.

Each of the sprockets 42 is a part of a power or torque limiting coupling 48 of which there are two associated with the shaft 44, one associated with the conveyor mechanism 20 of each of the tanks 10, 10.

The limiting coupling devices 48 are of similar construction, but reversely mounted upon the drive or power shaft 44. Each of said power limiting coupling devices 48 comprises a pair of spaced collars 49 and 50 clamped rigid with the drive shaft 44 by set screws 51 and 52, respectively.

The sprocket 42 is provided with a hub 53 which is loosely journaled upon the shaft 44. The hub 53 is provided with an integral disc 54 which makes face to face contact with a larger disc 55 formed integral with a jaw clutch element 56 and loosely journaled on the shaft 44.

The discs 54 and 55 are connected to rotate together by a steel shear pin 57 adapted to shear under conditions of overload, as hereinafter described in full detail. To prevent damage to the discs 54 and 55 when the pin 57 shears, said discs are provided with hardened steel bushings 58 and 59, respectively. It will be evident that in normal operation the shear pin 57 will insure operation of the clutch element 56 and the sprocket 42 together, but should an overload condition be encountered the pin 57 will shear and relieve this condition.

Slidably carried upon the shaft 44 and keyed thereto is a jaw clutch element 60 which may be shifted along said shaft 44, as clearly illustrated in Fig. 4 of the drawings, to effect driving engagement between the shaft 44 and the clutch element 56. The clutch elements 56 and 60 are preferably provided with opposed tapered jaws whereby the sprocket 42 can be rotated by the shaft 44 only in one direction. The clutch element 60 can be shifted along the shaft 44 to effect either a driving or a non-driving condition by means not shown, associated with the circumferential groove 61.

It is desirable, upon the occurrence of an overload condition on one of the conveyors 20, that the pin 57 of the individual coupling device 48 therefor shear to relieve this condition and, in addition, that the driving motor 45 have its circuit interrupted and a signal or alarm be given to apprise the attendant of the condition which he can take steps to remedy. To this end, I provide limit switches 62 and 62', respectively operated by the individual coupling devices 48 and which are normally closed but which will be selectively opened by means now to be described, upon the occurrence of the overload which produces the shearing of a pin 57.

Said means includes a cam 63 pivotally attached to the disc 55 on a pivot formed by a bolt 64 which threads into the disc 55 and is provided with a lock nut 65, to permit free swinging of the cam 63 about said pivot. The cam 63 is provided with a nose or projection 66 which, in the normal relation of parts, extends into a notch 67 provided in the periphery of the disc 54. Said notch 67 will hold the cam 63 in full line position illustrated in Fig. 5 of the drawings, which is the non-alarm operating position thereof, which condition, of course, is the normal operating condition of the coupling 48.

Upon the occurrence of the overload, as previously described, with the consequent shearing of a shear pin 57, it will be evident that the drive shaft 44 under the driving influence of the motor 45 will continue to drive the disc 55 in a counterclockwise direction, as illustrated by the arrow in Fig. 5. However, due to the overload condition, the disc 54 will be held against rotation. As a consequence, the limits of the notch 67 will operate to swing the cam 63 with its tip following the dotted line 68, under which conditions the arcuate surface 69 of the cam 63 will move into sliding engagement with the periphery of the disc 54 which cooperates therewith to maintain the cam 63 in the dotted line position illustrated in Fig. 5 of the drawings.

When the cam 63 is in said dotted line position and rotation thereof is continued under the influence of the motor 45, said cam will contact the roller 70 carried at the free end of the operating lever 71 of the normally closed limit switch 62 or 62' to open said switch momentarily which will be effective to give a signal and to open the circuit of the motor 45, as hereinafter described in detail in connection with the main electric circuit. Thus the occurrence of an overload condition which is of sufficient severity to shear the pin 57 will shut down the apparatus by turning off the driving motor and severing the driving connection between said motor and the conveyor or conveyors 20; at the same time giving a signal or alarm indicating the condition of affairs.

It is to be particularly noted that there are two conveyor mechanisms 20, one for each tank, each of which is provided with an individual limiting coupling device 48, and that said devices 48 are driven from the same motor 45 through common shaft 44. It is therefore evident that should the shear pin 57 of either coupling device 48 shear due to an overload, the motor 45 will be stopped with a consequent stopping of both of the conveyor mechanisms 20. The sounding of the alarm will inform the attendant that one of the pins 57 has sheared and an inspection of the coupling devices 48 will reveal immediately which one has sheared.

It is particularly important to provide the alarm, and motor shut down, for otherwise a pin may shear due to an overload and not be detected even for days, due particularly to the fact that the motor would continue to run and the main conveyor 20 is largely under water and not readily visible.

In Fig. 6 of the drawings I have illustrated the electrical connections for carrying out the operations above described. Leading to the motor 45 are three power mains 72 which are controlled by a switch 73. It will be evident that whenever the switch 73 is closed the motor 45 will operate, and when it is open said motor 45 will not operate. To effect the closing of the switch 73 the operator will push the normally open push-button switch 74 which will close the circuit from one of the power mains 72 through the switch 74, sole-

noid 75, limit switches 62 and 62' to another of the power lines 72. This will cause the energization of the solenoid 75 which will produce the closing of the switch 73.

The switch 73 is provided with a pilot contact 76 which closes and opens with the switch 73, and when said switch 73 is closed, as aforesaid, provides a holding circuit for the solenoid of the electro-magnet 75 from the right hand power main 72, shunt line 77, pilot contact 76, solenoid 75, limit switch 62 to the left hand power main 72. Thus only a monetary closing of the push-button switch 74 is required to close the motor circuit which is thereafter automatically held closed by the holding circuit 77, 76, 75, 72, so long as the limit switches 62 and 62' are closed. Upon the opening of the limit switch 62 or 62', as previously described, in response to an overload condition and the consequent shearing of the pin 57, the above traced holding circuit for the solenoid of electro-magnet 75 will be broken with the consequent opening of the circuit for the motor 45 by the opening of the main line switch 73.

Under normal conditions, with limit switches 62 and 62' closed, signal relay 78 is also energized over a circuit including the right hand power main 72, shunt line 77, the winding of signal relay 78, limit resistor 79, limit switches 62 and 62' and the left hand power main 72.

The signal relay 78 is provided with a switch 80 which it controls, said switch 80 being closed when relay 78 is de-energized, and open when said relay is energized. Said switch 80 controls the primary circuit of a transformer 81 which is connected directly across two of the power mains 72. The secondary of the transformer 81 is connected to a signal light 82 and a bell 83. It will thus be evident that whenever the switch 80 is closed the bell 83 and the light 82 will be energized.

I also preferably provide a knife switch 86 in one of the lines leading to the primary of the transformer 81 so that the alarm may be shut off by the attendant after it has been set into operation in response to an overload condition.

In the operation of the device comprising my invention the motor 45 drives one or both of the conveyor mechanisms 20 in the direction of the arrows 85 seen in Fig. 1, as determined by the condition of the driving clutches including the elements 60 associated with the conveyors 20, 20. Said conveyors 20, 20 will operate in the direction of the arrows 85 illustrated in Fig. 1, to convey settled sludge to the sludge sump 19 and to convey floating scum to the scum trough 40; all the while sewage is flowing into the tank or tanks 10 from the influent channel 14 and out of said tank or tanks by way of the effluent channel 16.

Should an overload condition be realized in either of the tanks 10, which might occur if one of the conveyor flights 21 caught on some unusually heavy material, the shear pin 57 of the limiting coupling 48 associated with the particular overload conveyor 20, will shear. Under such conditions the disc 55 will rotate with respect to the disc 54 where they otherwise rotate together, in consequence of which, cam 63 will move from the full line position illustrated in Fig. 5 to the dotted line position illustrated in said Fig. 5 and rotate along path 68 with disc 55. Said cam 63 will therefore operate the limit switch 62 or 62' to open said limit switch and give the signal or alarm, at the same time opening the circuit to motor 45, as previously described.

After the overload condition has been remedied, the shearing pin 57 may be driven out by the alignment of a hole 84 in the disc 54 with that portion of the pin 57 carried by the disc 55. The disc 55 is also provided with a hole similar to the hole 84 whereby the portion of the pin 57 carried by the disc 54 may be driven out. After the two halves of the sheared pin 57 have been thus removed and the apertures which carried the bushings 58 and 59 are again aligned a new shear pin may be inserted.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I therefore wish not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. In a device of the class described, the combination with a rotary drive member having a disc, of a rotary driven member having a disc, power limiting means connecting said members to rotate together unless overloaded whereupon there is relative rotation between them, a swingable operating cam carried by the disc of said drive member, said driven member disc having means constructed and arranged to hold said cam in non-operating position when said discs rotate together and to move and hold said cam into operating position responsive to relative rotation between said discs.

2. A drive mechanism alarm comprising a drive member, a driven member, power limiting means connecting said members whereby they normally rotate together but upon an overload the drive member rotates relative to said driven member, a pivotal operating member carried by said drive member and having an operating nose and an arcuate surface, a disc carried by said driven member having a notch normally receiving said nose and holding said operating member in non-operating position, said disc operating upon relative movement between said members as aforesaid to swing said operating member to operating position and to hold it in said position by cooperation between the peripheral surface thereof and the arcuate surface of said operating member.

3. In mechanism of the class described, a power transmitting coupling including driving and driven elements and a shear pin normally connecting said elements, a control means adjacent said coupling, an actuating member for said control means movably carried by said driving element independently of the shear pin, having a portion arranged to be moved to and from a position in which it may coact with said control means, and means carried by said driven element arranged through relative movement between said elements upon rupture of the shear pin to move said actuating member to actuating position.

4. In mechanism of the class described, a power transmitting coupling including driving and driven elements and a shear pin normally connecting said elements, a control means adjacent said coupling, a member movably carried by said driving element independently of the shear pin having a portion adapted to engage with and actuate said control means, said portion however being disposed in a non-actuating position when said shear pin is intact, and means carried by said driven element arranged to move the actu-

ating portion of said member to an actuating position relative to said control means when the shear pin ruptures.

5. In mechanism of the class described, a power transmitting coupling including driving and driven elements and a shear pin normally connecting said elements, a control means adjacent said coupling, a member pivotally carried by said driving element having a portion adapted to engage with and actuate said control means, said portion however being disposed out of line with said means when said shear pin is intact, and means carried by said driven element arranged to swing the actuating portion of said member into line with said control means when the shear pin ruptures.

6. In mechanism of the class described, a rotatable power transmitting coupling including driving and driven members and a shear pin normally connecting said members, a stationary control means disposed adjacent the path of travel of said members, and a member pivotally mounted on the end of said driving member, having a portion adapted to engage with and actuate said control means, said portion however being disposed out of line with said means when the shear pin is intact, a portion of said driven member being arranged to engage with said member and swing its actuating portion into line with said control means upon rupture of the shear pin.

7. In mechanism of the class described, a rotatable power transmitting coupling including complementary driving and driven members and a shear pin normally connecting said members, a stationary control means disposed adjacent the path of travel of said members, a member pivotally mounted on the end of said driving member having a portion adapted to engage with and actuate said control means, said portion being disposed out of line with said means when the shear pin is intact, and an abutment on said driven member arranged through relative movement between the members when the shear pin ruptures to engage said actuating member and swing its actuating portion into line with said control means.

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