

Sept. 12, 1933.

G. A. STAFFORD ET AL

1,926,316

RATCHET MOTOR

Filed June 25, 1928

3 Sheets-Sheet 1

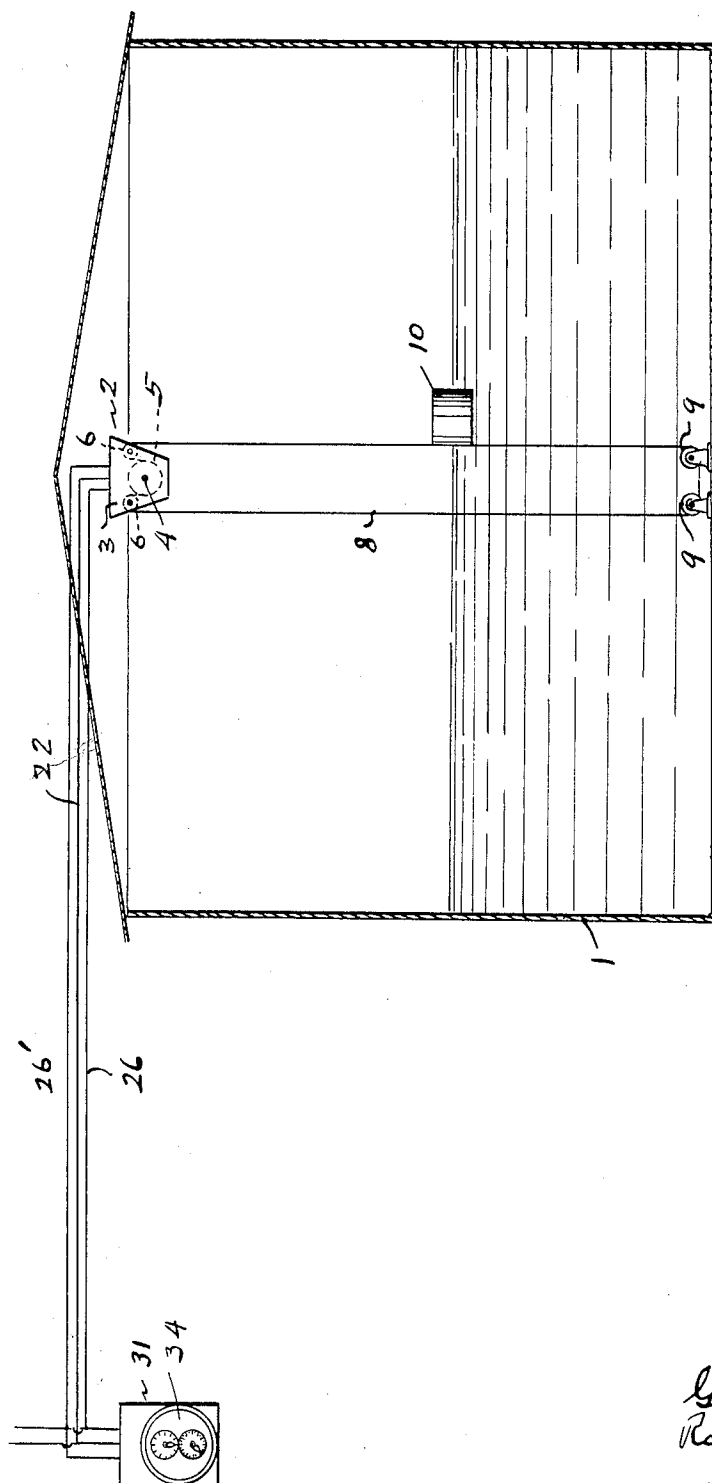


Fig. 1.

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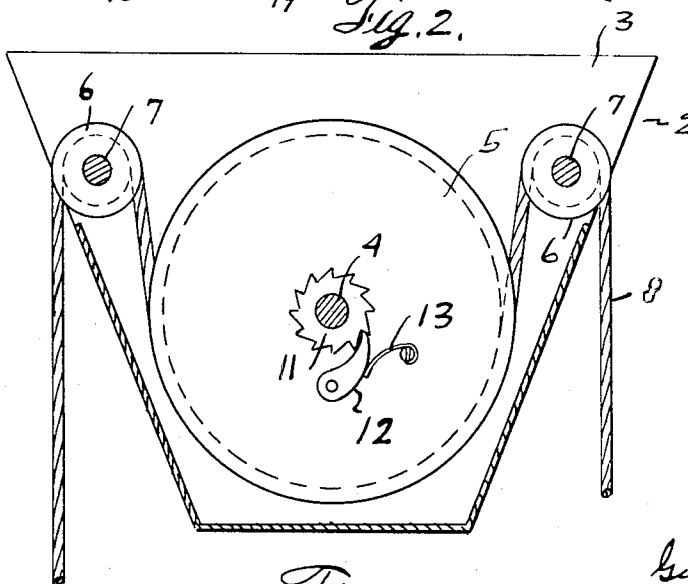
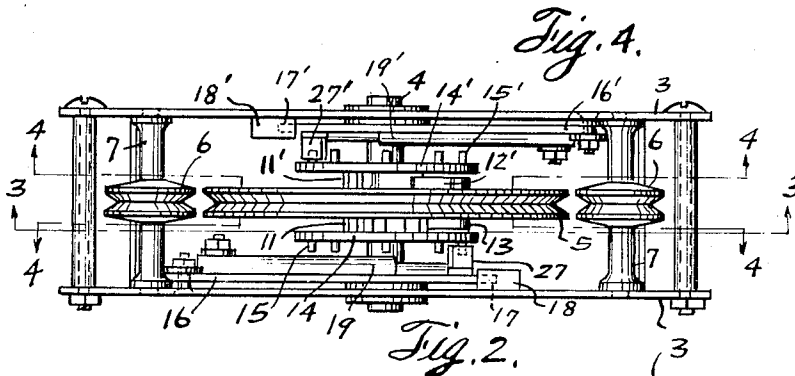
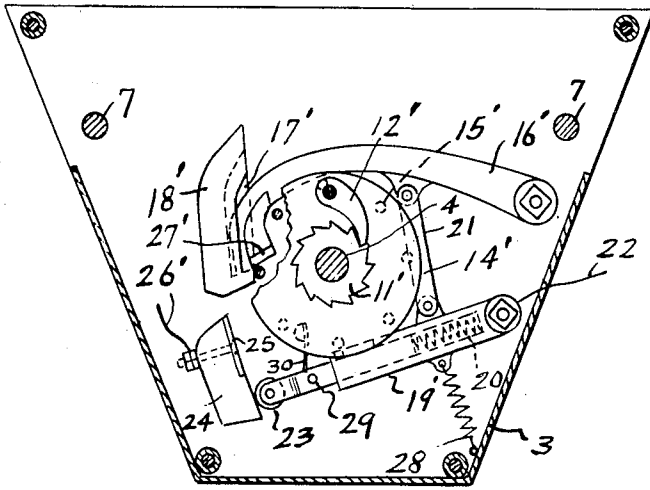
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

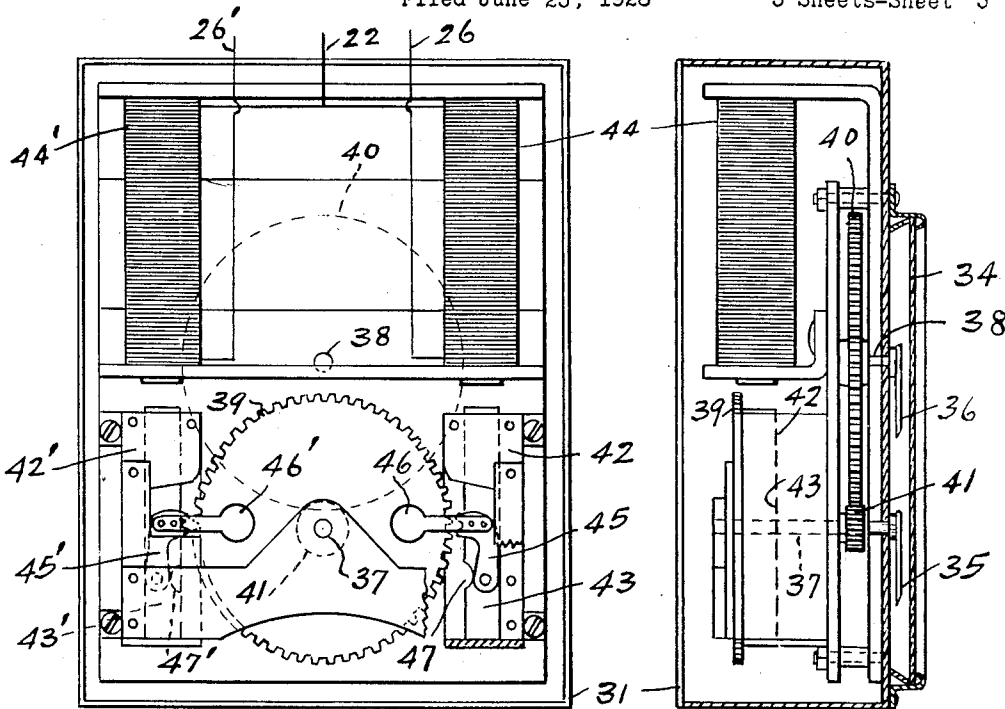


Fig. 6.

Fig. 7.

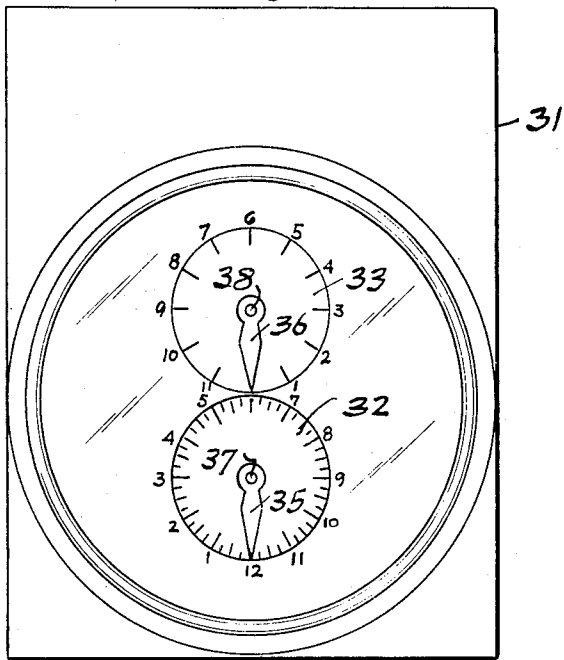


Fig. 5.

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UNITED STATES PATENT OFFICE

1,926,316

RATCHET MOTOR

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Application June 25, 1928. Serial No. 288,145

5 Claims. (Cl. 172-126)

This invention relates to new and useful improvements in a tank gauge.

One object of the invention is to provide a mechanism of the character described whereby the amount of fluid in a tank may be registered at a distance from the tank.

Another object of the invention is to provide, in combination with a fluid containing tank, an electrically operable register and an automatic circuit maker and breaker, operable through means controlled by the rising or falling of the fluid level in the tank and effective to intermittently complete and break electrical circuits to said register, whereby said register is caused to operate to indicate the amount of fluid in the tank.

With the above and other objects in view this invention has particular relation to certain novel features of construction, operation and arrangement of parts an example of which is given in this specification and illustrated in the accompanying drawings, wherein:—

Figure 1 shows a diagrammatic view of the complete apparatus shown associated with an oil tank.

Figure 2 shows a plan view of the circuit maker and breaker.

Figure 3 shows a sectional view thereof taken on the line 3—3 of Figure 2.

Figure 4 shows a sectional view thereof as taken on either of the lines 4—4 of Figure 2.

Figure 5 shows a front elevation of the register.

Figure 6 shows a rear elevation thereof, with the rear wall removed, and shown partly in section, and

Figure 7 shows a transverse vertical sectional view thereof.

Referring now more particularly to the drawings, wherein like numerals of reference designate similar parts in each of the figures the numeral 1 designates an oil tank, of any conventional construction. Mounted in said tank, adjacent the top thereof, there is a casing 2 formed fluid tight and having the spaced side walls 3, 3. Rotatably mounted in suitable aligned bearings in the side walls 3 there is a shaft 4 on which the grooved pulley 5 is fixed and on opposite sides of the pulley 5 are the grooved sheaves 6, 6 which are fixed on the respective shafts 7, 7 which rotate in suitable transversely aligned bearings in the side walls 3. There is an endless cable 8 which works underneath the pulley 5 and over the sheaves 6 and which also works around the sheaves 9, 9, secured to the bottom of the tank 1. One side of the cable 8 has a float

10 attached thereto and which rides on the surface of the fluid in said tank. Loosely mounted on the shaft 4, on opposite sides of the pulley 5 are the reversely arranged ratchet wheels 11, 11' and pivoted to opposite sides of said pulley are the dogs 12, 12' adapted to engage the corresponding ratchet wheels 11, 11'. The dog 12 is held in engagement with its ratchet wheel by the flat spring 13, but the dog 12' is held in engagement with its ratchet wheel by gravity.

When the float 10 rises the pulley will be turned in such direction that the dog 12 will ride idly over the ratchet wheel 11 without turning the same, but the dog 12' will engage its ratchet and turn the same. When the float falls the cable and pulley 5 will be operated in the opposite direction and the ratchet wheel 11 will be correspondingly rotated while, the ratchet wheel 11' will remain idle.

Fixed to the outer side of the ratchet wheels are the respective discs 14, 14' having the annular rows of outwardly extending studs 15, 15'. Pivoted to the inner sides of the respective side plates 3 are the lift levers 16, 16', arcuate in general contour, which work above the discs 14, 14' and whose free ends are downwardly curved and work in the guideways 17, 17' of the guides 18, 18' which are fastened to the inner sides of the respective plates 3, 3. Opposite the lift levers and pivoted, at one end, to the inside of the plates 3, 3 are the sectional arms 19, 19'. The outer end sections of the arms telescope within the inner, or pivoted, sections thereof and are seated against the coil springs 20, therein.

The lever 16 and arm 19 as well as the lever 16' and arm 19' are connected, respectively, by the links 21, said links being pivoted to the parts connected by them.

A current conducting wire 22 is connected to the respective arms 19, 19'.

The free end of each arm 19, 19' carries a contact roller, 23, which ride against the opposing tracks, 24, formed of insulating material, and secured to the inner sides of the respective side plates 3, 3. Each track carries a contact plate, 25, to which the respective wires 26, 26' are connected. The free ends of the lift levers 16, 16' have the inwardly turned lugs 27, 27' whose outer faces are disposed at an inclined angle to the path of travel of the studs 15, 15' contacting therewith, as hereinafter explained.

Assuming that the float 10 is moved by changing level of the fluid in the tank 1 so as to turn the pulley 5 in a direction to engage the dog 12' with the corresponding ratchet wheel 11' and

turn the latter, the studs 15' will successively engage the lug 27' and lift the lever 16'. As said lever is lifted its free end will move outwardly and the engaging stud will move inwardly relative to the sloping face of the lug with which it is in engagement, until said stud clears said lug. As the lift lever is lifted, the corresponding coil spring, 28', will be placed under tension. This spring is attached, at its outer end, to the corresponding plate 3 and at its other end to the corresponding arm. When a stud 15' passes the lug 27' the lift lever will drop by gravity, assisted by the corresponding spring 28, to original position and in readiness to be again lifted by the next succeeding stud 15'.

As the lift lever 16' is lifted the corresponding arm 19' will be lifted with it and when said lever is released the arm is pulled back downwardly by its spring 28. The outer section of each arm 19, 19' carries an outwardly extending stud 29, and the inner sides of the plates 3 carry the guides, 30. As the arm 19' is lifted its stud 29 engages behind the corresponding guide 30 and the outer end section of the arm is forced back, placing the corresponding spring 20 under compression until the stud 29 clears the upper end of the guide 30 and thereupon said spring 20 will suddenly force the roller into contact with the opposing plate 25 and a circuit will be completed through the wiring 22, 26'. When such contact is made the lug 27' being released, the arm 19' will immediately drop down and carry the roller 23 out of contact with the plate 25 and the circuit will be broken.

The parts, of course, are suitably insulated, and the casing 2 is filled with a suitable non-conducting oil, as a vegetable oil, to prevent short circuiting.

When the liquid level in the tank 1 varies to move the float 10 in the other direction to reverse the direction of rotation of the pulley 5 the ratchet wheel 11 will be turned to rotate the disc 14 and an electrical circuit will be successively completed and broken through the wiring 22, 26, in the manner above explained. It may be here stated that the mechanism, carried by one plate 3, for completing and breaking the circuit through the wiring 22, 26 is identical with the apparatus carried by the other plate 3 for completing and breaking the circuit through the wiring 22, 26' but reversely arranged.

There is a registering device which may be located at any desired place, distant from the tank, as at a central office, and which will now be described.

The numeral 31 designates a box like casing having the dials 32, 33 on the front wall thereof, enclosed by the transparent pane 34. Associated with the respective dials are the respective pointers 35, 36 which are fixed to the forward ends of the corresponding shafts 37 and 38. The shafts are mounted to rotate in suitable bearings in the casing 31. Fixed on the inner ends of the respective shafts 37, 38 are the spur gears 39, 40, the latter of which is in mesh with, and driven by a spur pinion 41 fixed on the shaft 37.

On opposite sides of the gear wheel 39 are the guides 42, 42' slidably mounted in which are the respective armatures 43, 43'. Above the armatures are the respective electro-magnets 44, 44', connected into the respective circuits 22, 26, and 22, 26' respectively. When the magnet 44 is energized by completing the circuit 22, 26, as hereinbefore explained, the armature 43 will be elevated and when said circuit is broken the end

of said dog to move said dog toward said armature 43 will descend; and correspondingly when the circuit 22, 26' is completed, as explained, the magnet 44' will be energized and the armature 43' lifted, but upon the breaking of said circuit said armature 43' will descend. The electrical circuits are connected to any source of electrical energy.

Pivoted to the armatures are the respective dogs 45, 45' whose upper free ends are inwardly turned and toothed and thus adapted to engage the opposing teeth of the gear wheel 39. Attached to said inwardly turned ends are the respective weights 46, 46' which tend to hold the dogs in engagement with said teeth. The guides 42, 42' have the stops 47, 47' which normally engage the inner side of the dogs 45, 45' and hold them in non-engaging position. When the electro-magnet is energized, as above explained, it will elevate the corresponding stop and said dog will fall inwardly, through its weight, into engagement with the gear wheel 39 and will turn said wheel and move the corresponding pointer 35 around its dial, each rotation of the shaft 37, will effect a partial rotation of the shaft 38, and pointer 36, through the pinion 41 and gear 40. The dials 32, 33 are suitably gauged, so that the movements and relative locations of the pointers 35, 36, will accurately indicate the amount of fluid in the tank 1 and the variations in the level thereof.

When the circuit through a magnet is broken the corresponding armature will fall and its dog will disengage the teeth of the gear 39 and the corresponding stop will throw the dog outwardly to hold it out of such engagement.

It is obvious that as the float 10 rises the magnet 44' will be successively energized and the gear 39 and pointer 35 turned in a clockwise direction, and the pointer 36 moved in an anticlockwise direction to indicate the filling of the tank 1, and as the float falls the magnet 44 will be successively energized and the gear 39 and pointer 35 moved in an anticlockwise direction and the pointer 36 moved in a clockwise direction to indicate that the tank is being emptied.

While we have shown what we now consider the preferred form of the invention it is obvious that mechanical changes may be made therein and equivalents substituted for the parts shown and we reserve the right to make such mechanical changes and substitutions as may be found desirable within the scope of the appended claims.

What we claim is:—

1. In a device of the character described, a shaft, a gear thereon, an electro-magnet, an armature actuated by said magnet, a dog on said armature pivoted to swing into and out of engagement with said gear, stationary means to contact with and move said dog from engagement with said gear when said armature is released from said magnet and means to move said dog to engage said gear when said armature is raised by said magnet.

2. In a device of the character described, a shaft, a gear thereon, an electro-magnet, an armature actuated by said magnet but normally held by gravity away therefrom, a dog on said armature pivoted to swing into and out of engagement with said gear, stationary means engaged by said dog to move said dog from engagement with said gear when said armature is released from said magnet and a weight on the forward end of said dog to move said dog toward said

gear to engage the same when said armature is moved by said magnet.

3. In a device of the character described, a rotatable gear, a guide adjacent thereto, an armature adjacent said gear and slidable in said guide, a dog pivoted to said armature and movable to engage said gear, a cam adjacent said armature to hold said dog normally out of engagement, a magnet above said armature to lift the same, and a weight on said dog to move said dog into engagement with said gear to operate the same when said armature is moved upwardly by said magnet.

4. In a device of the character described, a rotatable gear wheel, a vertically positioned guide-way adjacent said wheel, an armature slidable in said guide-way, electromagnetic means to raise said armature, a dog on said armature,

means to normally hold said dog to engage said gear, a cam on said guideway to engage and move said dog away from said gear when said armature is moved by gravity away from said electromagnetic means.

5. In a device of the character described, a rotatable gear wheel, a vertically positioned guide-way adjacent said wheel, an armature slidable in said guideway, electromagnetic means to raise said armature, a dog on said armature, a weight at the upper end of said dog to hold said dog to engage said gear, a cam on said guideway to engage and move said dog away from said gear when said armature is moved by gravity away from said electromagnetic means.

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