Aug. 21, 1945. J. A. SWINDLE 2,383,226

LIQUID METER

Filed Sept. 20, 1943

Fig. 1.

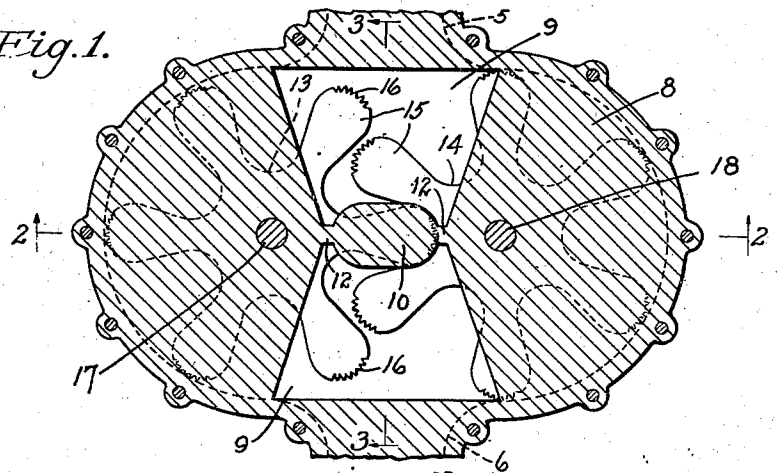


Fig. 2

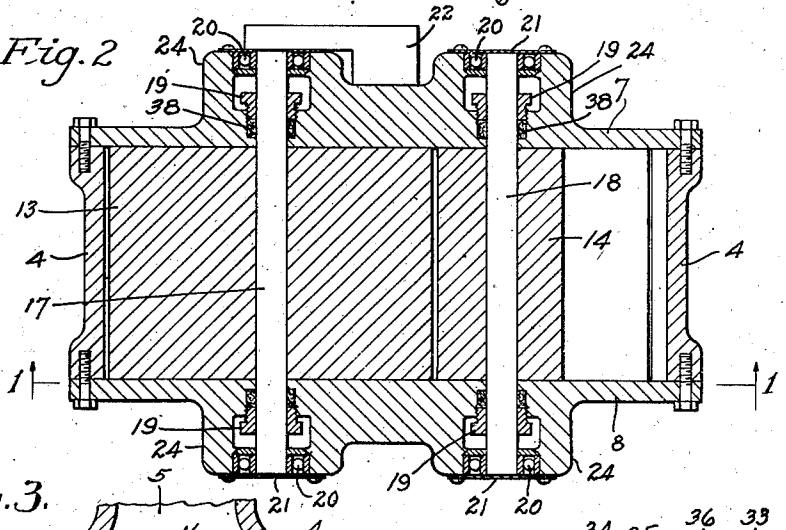


Fig. 3.

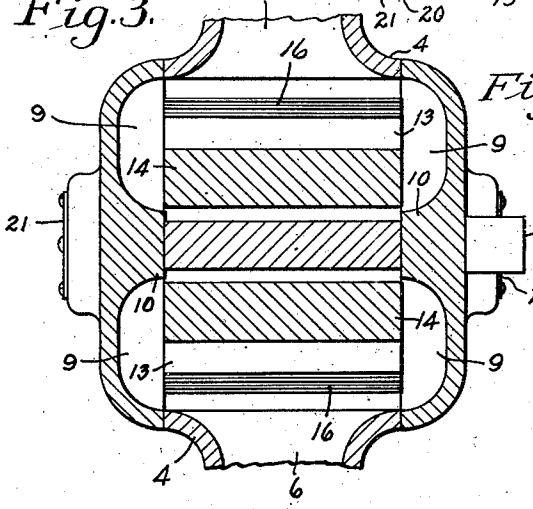
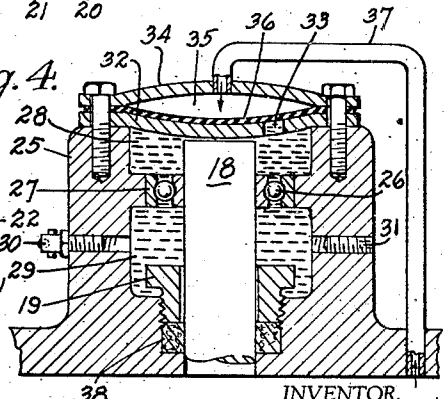


Fig. 4.



INVENTOR.
J. A. Swindle
BY Carlos G. Stratton
ATTORNEY

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LIQUID METER

John A. Swindle, Whittier, Calif.

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5 Claims. (Cl. 73—261)

My invention relates to a liquid meter and more particularly to a liquid meter having rotors operated by pressure of the liquid.

The principal object of the invention is to provide simple, effective means to prevent trapping of liquid between members of the rotors and thereby avoid locking the meter during operation.

Other objects of the invention are to provide rotors for a liquid meter that are closely interfitting and to provide means on the interfitting members to keep the surfaces of the members clean and to crush relatively small foreign matter.

A further object is to provide means for equalizing pressure on opposite sides of packing employed in the present construction.

My invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. However, the drawing merely shows and the following description merely describes two embodiments of the present invention, which is given by way of illustration or example only.

In the drawing, like reference characters designate similar parts in the several views.

Fig. 1 is a longitudinal section of an embodiment of my invention, looking upward along the line 1—1 of Fig. 2.

Fig. 2 is a longitudinal section taken on the line 2—2 of Fig. 1.

Fig. 3 is a transverse section taken along the line 3—3 of Fig. 1.

Fig. 4 is an enlarged, broken section of a modified construction.

Referring more in detail to the drawing, the reference number 4 generally designates a housing having ports 5 and 6 at opposite sides of the housing. One of the ports is to be used for an inlet and the other for an outlet. The direction of flow is immaterial, since the present meter will operate whether the flow is from the port 5 to the port 6, or vice versa.

Head members 7 and 8 are bolted upon the housing 4 at opposite sides thereof. Each of the head members has pockets or recesses 9 which are substantially isosceles trapezoids in a longitudinal section, as best shown in Fig. 1. The pockets 9 are separated by an elliptical bridge member 10 in the heads. The elliptical members 10 are connected by relatively narrow necks 12 endwise of the elliptical portions, which are narrow portions extending along the line connecting the centers of the interfitting gears. The narrow necks 12 separate the pockets 9 but are restricted in width in order to avoid trapping liquid that would lock the meter.

Gears 13 and 14 have closely interfitting teeth 15 provided with serrated tips 16 that move closely enough to the sides and in between the teeth on the opposite gear so as to keep the opposite gear teeth clean and to crush relatively small matter lodged between the gears, thereby preventing the accumulation of foreign matter, including pipe scale, etc.

It will be noted that all of the surfaces on the gear teeth are arcs or tangents of arcs, and that the gears operate substantially upon the axes of the curves of the inner, end faces of the housing, and the ends of the teeth operate in orbits in close clearance to the curved inner faces of the housing wall 4. Moreover, the tooth ends are so rounded that they conform with the open area between the tooth roots of the opposite, engaged gear. The gears 13 and 14 are keyed to shafts 17 and 18, whereby rotation of the gears is transmitted to the shafts. The shafts 17 and 18 rotate in packing glands 19 at opposite ends of the shafts. Roller bearings 20 journal the ends of the shafts. Cap plates 21 close the bearing races and cover the ends of the shafts.

Any suitable counter mechanism may be employed in the housing 22 for measuring the quantity of liquid passing through the meter, and any suitable dial face may be provided for registering such quantity. Since the counter mechanism and dial per se do not form parts of the present invention, and since suitable constructions of same are known to those skilled in the art, detailed showing and description of same are deemed unnecessary.

In Fig. 4 is illustrated a modified construction for the bosses 24 that house the packing glands 19. These modified bosses 25 house the packing glands 19 and packing 38, as before, but the bearings 26 are preferably spaced inward from the outer end of the boss 25, as shown in Fig. 4. The bearings 26 are mounted in races 27 that permit lubricant to flow therethrough, past the bearings.

Chambers 28 and 29 are provided within each boss 25 at both sides of the bearings 26. The

chamber 29 is connected with a fitting 30 of conventional form known to those skilled in the art that admits grease but automatically prevents its escape therethrough. A screw plug 31 normally closes an air vent for the chamber 29. The plug 31 is removed for the initial filling of the chamber 29 with hard grease, to permit the escape of entrapped air. When the grease fills the chamber 29, the plug 31 is screwed home.

A plate 32 is positioned at the end of chamber 28. The plate 32 is concave and has a passage 33 connecting opposite sides of the plate. A convex end plate 34 forms a pocket 35 with the plate 32. A flexible diaphragm 36 is interposed between the plates 32 and 34. A conduit 37 connects the pocket 35 with the interior of the housing 4.

It is to be understood that each of the bosses 24 may be modified in accordance with the foregoing.

In the operation of my present invention, it is believed clear that there is positive displacement, so that there is an actual measure of fluid passing through my present meter.

Liquid coming into the housing flows against the side of the gear teeth 15 and fills the pockets 9 at the incoming side of the housing. Further introduction of liquid into the housing effects rotation of the gear teeth, since there is more surface tending to rotate the gears in the desired direction than tending to resist it. In the proportions shown in the drawing, there is approximately twice as much pressure tending to rotate, as there is to resist rotation. Liquid trapped by the gear teeth is carried around with the teeth. After the liquid passes the center and fills the other side of the housing, it fills the pockets 9 on the outlet side, and continued pressure on the inlet side produces a measured discharge on the outlet side. The amount of liquid passing through the meter will be indicated by the dial operated by the counter mechanism.

The pockets 9 together with the narrow necks 12 prevent my meter from trapping liquid that will lock the gear teeth in position, since liquid caught in the curves between the gear teeth is effectively pushed into the pockets 9.

Normally at the start of operation, the diaphragm 36 is against the end plate 34, with the pocket 35, between the diaphragm and the dished plate 32, full of grease. Of course, pressure on the inside of the housing 4 bears against the inside of the packing 38, but the same pressure passes through the conduit 37, which causes the diaphragm to exert a similar pressure upon the grease between the diaphragm and the plate 32 and in the chambers 28 and 29, thus equalizing the pressure on opposite sides of the packing. This combination of parts thereby materially lengthens the effective life of the packing.

While I have illustrated and described what I now regard as the preferred embodiment of my invention, the construction is, of course, subject to modifications without departing from the spirit and scope of my invention. I, therefore, do not wish to restrict myself to the particular form of construction illustrated and described, but desire to avail myself of all modifications that may fall within the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a liquid meter, close, interfitting gears having enlarged, curved tooth ends provided with reduced connections with the bodies of the gears, and having curved surfaces between the gear teeth closely interfitting the enlarged tooth ends of the opposite gear teeth, the gears having particle crushing serrations at their tips arranged to move in orbits in close proximity to the sides of teeth on the opposite gear and a housing for the gears having inlet and outlet ports.

2. In a liquid meter for operating counting mechanism, close, interfitting gears having enlarged tooth tips, the engaging and close, interfitting surfaces of the gears being arcs and tangents of arcs and the sides and enlarged tips of the teeth of each gear closely interfitting with the sides and roots of the teeth on the other gear, the enlarged portion of the teeth of said gears provided with obstruction removing means, a housing for the gears having inlet and outlet ports, closure plates for said housing having chambers recessed therein, and means operatively connected with the gears to drive mechanism counting the revolutions of the gears.

3. Sealing means for a liquid meter for operating counting mechanism having, a housing, meshing gears rotatably mounted within the housing and means connected with the gears to drive mechanism counting the revolutions of the gears, and shafts for the gears, comprising packing for each shaft, and means to equalize the pressure on opposite sides of the packing, comprising a chamber outside of but connected with the packing for holding a supply of grease by which to apply outside pressure to the packing, spaced bearings in the chamber journaling the shaft but spaced to permit grease to pass therebetween, concavo-convex plates closing the outer end of the chamber, the concave faces of the plates facing each other to provide a pocket, the inner plate having a passage connecting the pocket with said chamber, a flexible diaphragm in the pocket movable to apply pressure upon grease in the pocket, and conduit means connected with the interior of the housing and with the pocket at the outer face of the diaphragm.

4. Sealing means for a liquid meter for operating counting mechanism having a housing, meshing gears rotatably mounted within the housing, and means associated with said gears to drive mechanism counting the revolutions of said gears and shafts for the gears, comprising packing for each shaft, and means to equalize the pressure on opposite sides of the packing, comprising a chamber outside of but connected with and housing the packing for holding a supply of grease by which to apply outside pressure to the packing, bearings in said chamber journaling said shaft, a chamber closing the end of said first-named chamber and having communication with said chamber, a flexible diaphragm in said second chamber movable to apply pressure upon grease in the chamber, and conduit means connected with the interior of the housing and connected to apply pressure to the outer face of the diaphragm.

5. In a liquid meter, a housing, close interfitting gears therein having enlarged curved tooth ends and curved surfaces between the gear teeth closely interfitting the enlarged tooth ends of opposite gear teeth, the gears having serrations arranged to move in close proximity to the sides of the teeth on the opposite gear, said housing having an inlet and an outlet, and spaced chambers communicating with the inlet and outlet.

JOHN A. SWINDLE.