(No Model.)

2 Sheets—Sheet 1.

J. THOMSON.

WATER METER.

No. 387,828. Patented Aug. 14, 1888.

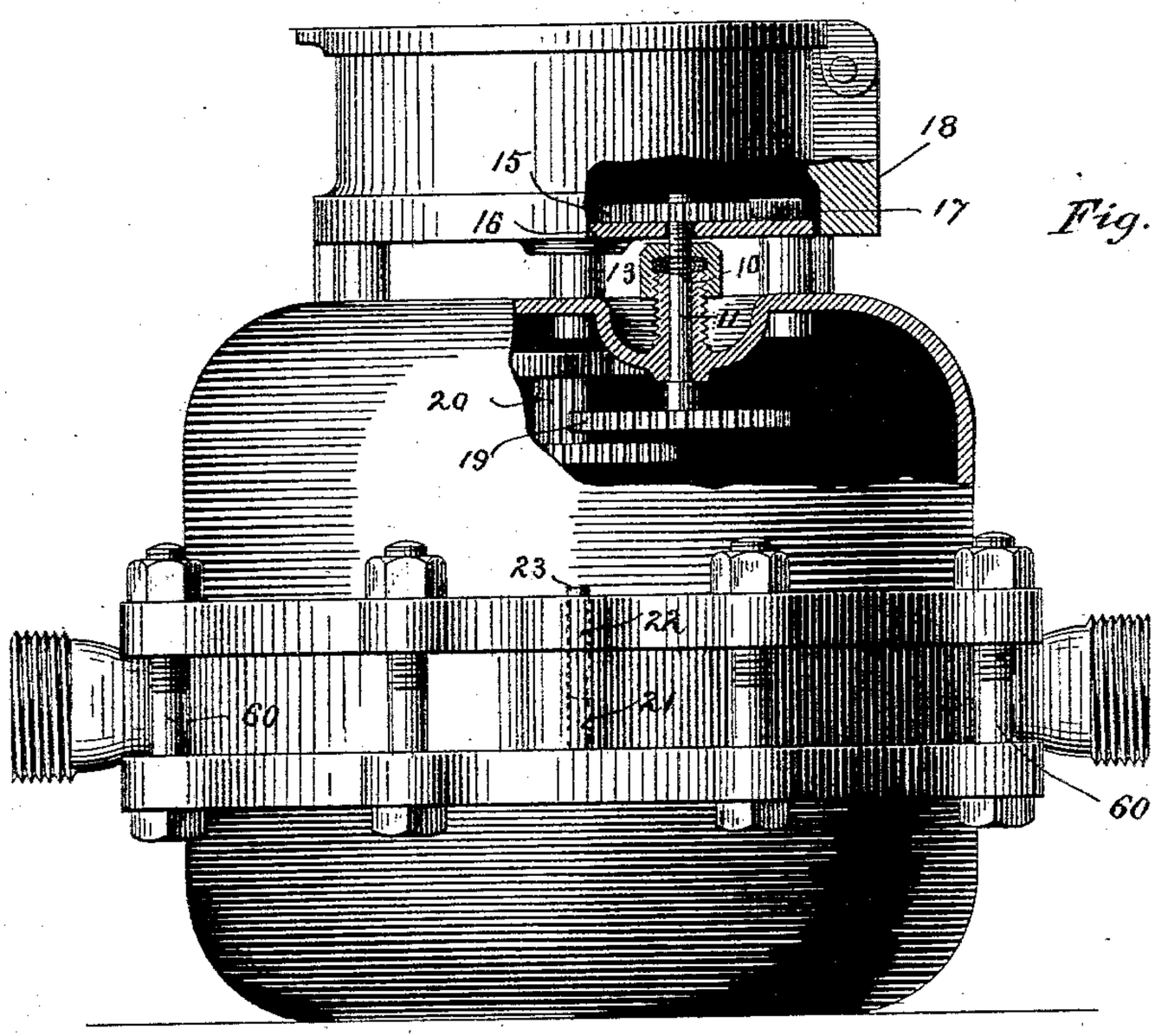


Fig. 1.

Fig. 4.

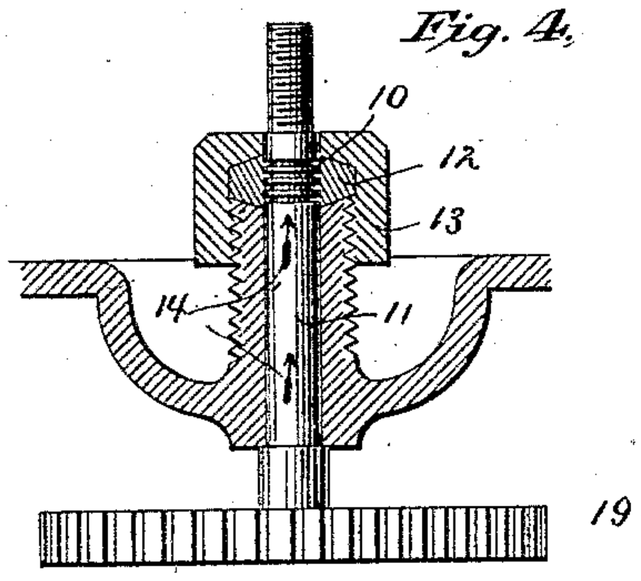
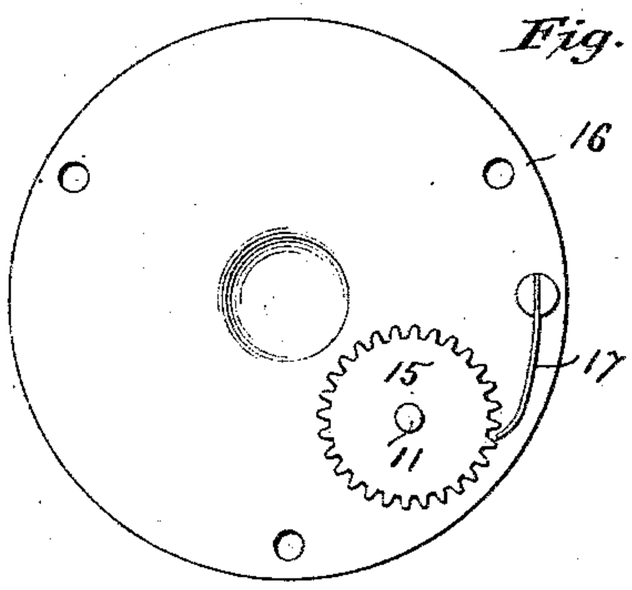


Fig. 5.



Witnesses.
Geo. W. Breck.
Carrie E. Ashley.

Inventor:—
John Thomson.

(No Model.) 2 Sheets—Sheet 2.

J. THOMSON.

WATER METER.

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Fig. 2.

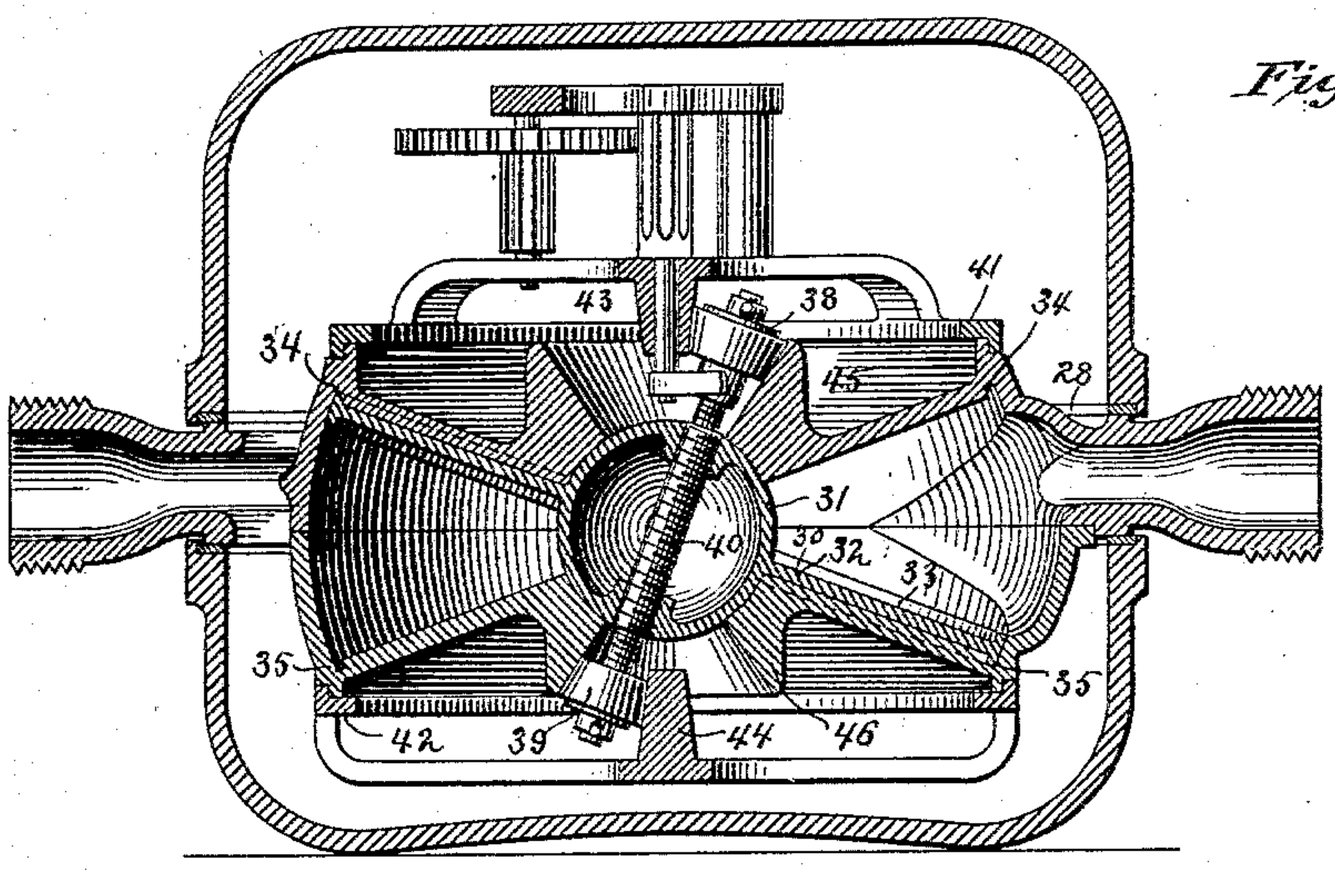

Fig. 7.

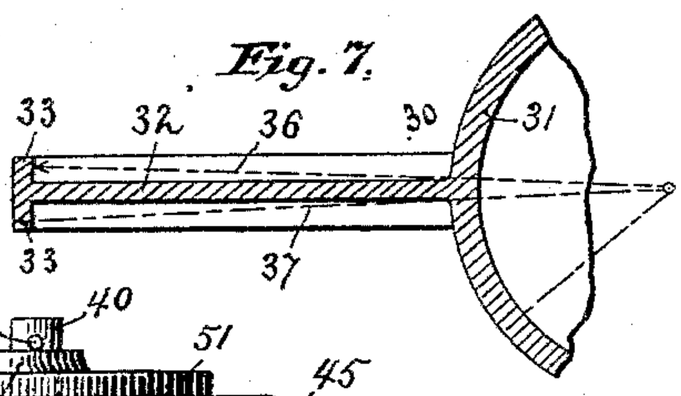

Fig. 6.

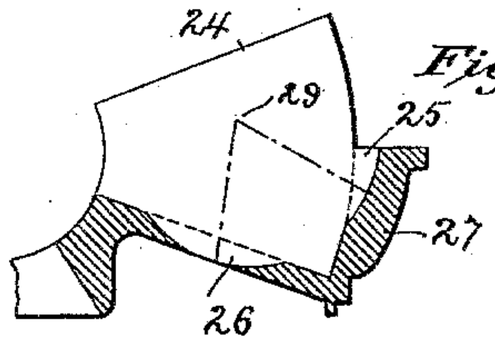

Fig. 8.

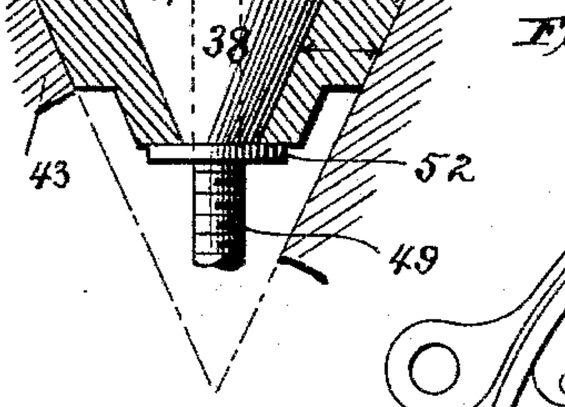

Fig. 3.

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UNITED STATES PATENT OFFICE.

JOHN THOMSON, OF BROOKLYN, NEW YORK.

WATER-METER.

SPECIFICATION forming part of Letters Patent No. 387,828, dated August 14, 1888.

Application filed January 30, 1888. Serial No. 262,328. (No model.)

To all whom it may concern:

Be it known that I, JOHN THOMSON, a citizen of the United States, residing in the city of Brooklyn, Kings county, and State of New York, have made certain new and useful Improvements in Water-Meters, of which the following is a specification.

This invention relates to improvements in oscillating-disk water-meters.

In the drawings, Figure 1 is a side elevation in which a portion of the upper cap and register-box is broken away to disclose portions of the internal mechanism. Fig. 2 is a vertical longitudinal section through the meter. Fig. 3 is a top plan view of the disk-chamber, the upper cap with gear-train and plate being removed. Fig. 4 is an enlarged sectional view, detached, of stuffing-box and spindle. Fig. 5 is a top plan view of the register-inclosing plate with gear and disconnecting-pawl. Fig. 6 is a detail view of diaphragm to show method of securing the same to the disk chamber. Fig. 7 is an enlarged transverse section through disk, and Fig. 8 is an enlarged sectional detail of conical roller and bearing.

The several objects of my invention and the manner of reaching the same will be severally pointed out in the order of illustration.

In the stuffing-box it is desirable to obtain a perfectly tight and durable joint with the least possible friction against the rotation of the spindle. This I obtain by forming, preferably, a plurality of grooves, as 10, either square or V-shaped in cross-section, extending circumferentially around the spindle 11, each groove being distinct and separate from each other. Thus when the packing material 12 is compressed by the nut 13 it is forced into the grooves and each channel offers a distinct and separate obstruction to the escape of the water. In fact, the greater the pressure, as indicated by the arrows 14, the more perfect will be the seal, owing to the packing material being forced upward against the sides of the channels. This construction also offers increased durability, in that greater surface is presented at the packing. In this type of meter the water may pass in either direction, (though not with equal durability;) and this fact may be taken advantage of by unscrupulous users, the meter being operated in one direction until a certain volume is registered, and then, by reversing the meter, the hands of the register are carried backward. To detect such practice, the driving gear or pinion 15 is screwed to the spindle, and to the plate 16 is attached a light spring-pawl, 17, the arrangement being such that when the meter is being properly operated the pawl will ride freely over the teeth of the gear and permit its free rotation, but upon reversing the motion of the meter the pawl will engage the gear and cause it to unscrew from the spindle. The register is thus rendered inoperative, and the cause is beyond dispute, as it will furthermore be observed that the gear is within the register-box 18 and can only be reached for readjustment by breaking the seal and removing the box.

It is desirable to make a direct gear-connection between the internal spindle-gear, 19, and the final pinion 20 of the internal gear-train. To this end, the said gear 19 is fixedly secured to the spindle 11, and is then brought into proper mesh with the pinion 20 by sense of touch, the projecting end of the spindle being slid back and forth before the packing-nut 13 and the register-box are put in place. When the correct engagement is obtained, two or more of the flange-bolts 60 are tightened to temporarily secure the adjustment, and the projections 21 22 of the disk-chamber and upper cap are drilled and the steady-pin 23 inserted. In this wise the mesh of the gears are not only made permanent, but the meter may be disconnected and reassembled without skillful adjustment.

It is desirable to effect a permanent, convenient, and very rigid attachment of the diaphragm 24, which separates the inlet-port from the outlet-port and also prevents the differential rotation of the disk. This is reached by forming upon the diaphragm two projecting lips, 25 26, which fit snugly in the recesses shown in one of the sections 27 of the disk-chamber 28. These recesses are readily formed by a milling-cutter whose center is at 29. In this wise the disk-chamber may be readily taken apart, the diaphragm remaining in its section.

When the disk 30 is of metal, it is of the first importance to secure the lightest and most rigid construction. This I obtain in the highest degree, first, by forming the ball-bearing 31 hollow, and, second, by forming upon the periphery of the disk portion 32 an annular flange, 33, projecting equally beyond each

of the surfaces of the disk. This necessitates the two annular recesses 34 35, formed at the intersection of the spherical and conical surfaces of the disk-chamber. The correct form of both the inside and outside surfaces of the said recesses and the flange is the section of a sphere, the centers of which are common with that of the ball, as shown by the lines 36 37, Fig. 7. This construction obtains the greatest area of bearing-surface in the ball and socket, and the flanged periphery of the disk acts as a stiffening-rib, permitting the use of very thin metal and consequently a light structure.

It is necessary to the proper action of the disk that it be maintained in uniform relation with respect to the cone-frusta, and it is of the first importance that this relation be maintained with the lowest expenditure of power. As a matter of fact, for each complete oscillation of the disk there are two distinct but separate efforts, one gradually merging into the other, and vice versa--namely, a tendency in one instance to carry the disk away from the cone-frusta and a tendency in the other instance to force the disk toward the cone-frusta. To entirely relieve the ball and surfaces of the disk from the described strains, I mount two conical rollers, 38 39, upon opposite ends of the disk-shaft 40. Upon the sides of the disk-chamber are secured two frames, 41 42, from each of which project inward toward the center of the ball two central conical bearings, 43 44; also, upon both the outer surfaces of the upper and lower sides of the disk-chamber are formed two conical flanges, 45 46. The theoretically-correct form of the outer surfaces of the bearings 43 44 and the rollers 38 39 and the inside surfaces of the conical flanges 45 46 are shown in Figs. 2 and 8—namely, in which all converge to the center of the ball. The conditions necessary to correct operation are, that the spaces between the outer and inner surfaces of the central bearings, 43 44, and the conical flanges 45 46 shall be equal to each other, and that the conical rollers shall just operate freely within these said spaces. The rollers will therefore operate with rolling contact at all sections of their diameters, and will also resist any tendency to thrust the disk either toward or away from the cone-frusta.

It is of course self-evident that a single roller, center-bearing, and conical flange, as the combination of parts 43 38 45, would also so act; but the arrangement just described and here shown is selected, in that it is the most correct. It next follows that the controlling action should not set up false strains. This I obviate by mounting the rollers upon conical bearing-sleeves 47, Fig. 8, the taper of whose sides is such as to obtain an equal thickness of material in the roller between the opposite contacting surfaces of the central bearing and flange, as indicated by the arrows 48. Were the roller to operate on a cylindrical bearing, it will be seen that a wedge action would result, tending to force the roller up, producing friction against its proper rotation. The roller is screwed upon the shaft, as at 49, and in this manner affords ready adjustment either in the primary assembling of the meter or for wear of the parts. Accidental unscrewing of the conical bearing is prevented by the pin 50. The conical bearing is also provided with upper and lower flanges, 51 52—in the one case to prevent the roller from being thrown upward by centrifugal action and binding upon the coned bearing, and in the other case to prevent it from dropping and wedging between the bearings.

I claim—

1. The combination, in a water-meter capable of operation in either direction of flow, of the register driving-gear, as 15, screwed to the spindle, and an engaging-pawl, as 17, the arrangement of the screw and the pawl being such that the pawl will ride freely over the gear when the meter is properly operated, but when improperly operated the said pawl will engage the gear and cause it to unscrew from the spindle, substantially as described.

2. The combination of the internal gear-wheel, 19, fast to the stuffing-box spindle, the final pinion, 20, of the internal gear-train, the said gear being mounted in the upper cap and the said pinion being mounted upon the disk-chamber, and the steady-pin 23, inserted on the outside through the flanges of the cap and disk-chamber, all as shown and described, and for the purpose specified.

3. The combination, with the disk and disk-chamber, of the conical flanges, the central conical bearings, and the conical rollers mounted upon opposite ends of the disk-shaft and adapted to roll within the space formed between the said center bearings and the conical flanges, whereby the rollers act to receive the thrust of the disk to and from the cone-frusta, substantially as specified.

4. The combination, with the disk-chamber, disk, and disk-shaft, of the conical bearing-sleeve, conical roller, and external bearing upon which the said roller shall act, substantially as and for the purpose described.

5. The combination, with the disk-chamber, disk, disk-shaft, conical roller, and external bearing, of the conical bearing-sleeve capable of being adjusted back and forth upon the disk-shaft, for the purpose of determining the proper position of the said conical roller, substantially as specified.

6. The combination, with the conical roller and disk-shaft, of the conical bearing-sleeve having an upper and a lower flange, as 51 52, for the purpose of maintaining the said conical roller in proper relation with the said bearing-sleeve, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN THOMSON.

Witnesses:

WM. THOMSON,

THOS. C. BYRNES.