T. L. WITT.

LIQUID-METER.

No. 174,336. Patented Feb. 29, 1876.

Fig. 1.

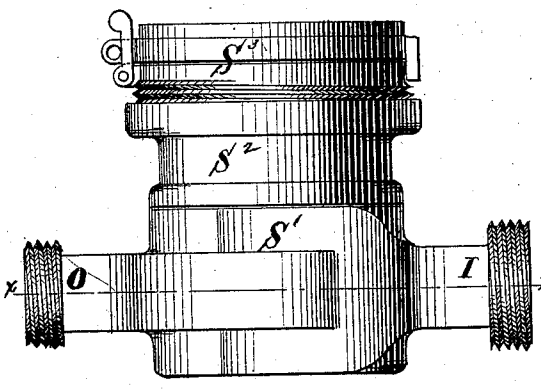


Fig. 3.

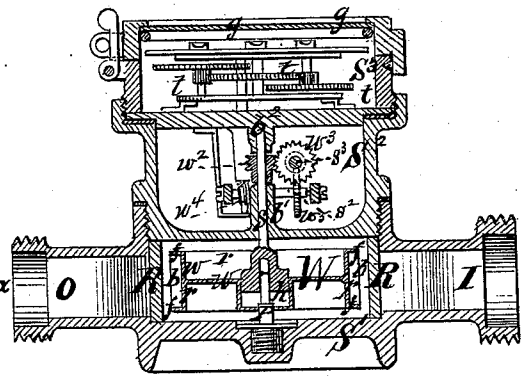


Fig. 2.

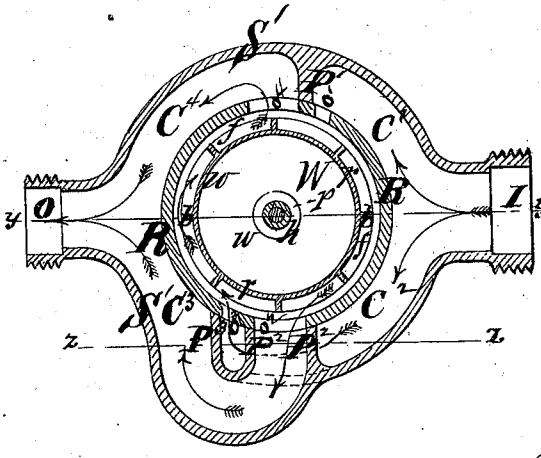
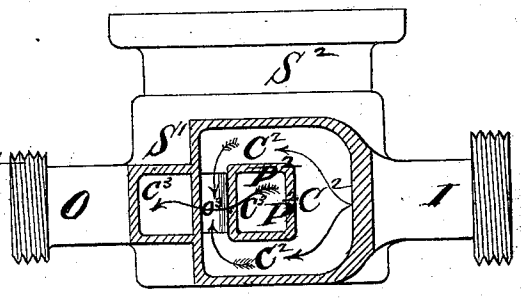


Fig. 4.



Witnesses
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THEODOR LEOPOLD WITT, OF HÖCHST, NEAR FRANKFORT-ON-THE-MAIN, GERMANY.

IMPROVEMENT IN LIQUID-METERS.

Specification forming part of Letters Patent No. **174,336**, dated February 29, 1876; application filed January 31, 1876.

To all whom it may concern:

Be it known that I, THEODOR LEOPOLD WITT, of Höchst, near Frankfort-on-the-Main, in the Empire of Germany, have invented a new and useful Improvement in Liquid-Meters; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing which forms part of this specification.

My invention relates, primarily, to meters for measuring the flow of water through pipes; and it consists in passages and partitions formed in the case of a liquid-meter which direct the water in such a way that it enters in equal quantities through induction-ports in a separately-formed circular partition upon opposite sides of a chamber inclosing a rotating float or bucket wheel, and flows out in equal quantities through eduction-ports formed in said circular partition upon opposite sides to secure an equalization of fluid-pressure upon said float-wheel, and prevent the accumulation of impurities in the meter, and so that the flow of the liquid passing through said passages and ports shall, in part of its course, be in a horizontal circular arc, and during this part of its progress, impinging upon the floats or buckets of said float or bucket wheel, it shall impart rotary motion to said wheel, the central shaft of which imparts motion to a train of registering mechanism.

Figure 1 in the accompanying drawing is a side view of my improved liquid-meter. Fig. 2 is a horizontal section of the same on the line *x x* in Fig. 1. Fig. 3 is a vertical section on the line *y y* in Fig. 2. Fig. 4 is partly a side view of a portion of the meter, and partly a section on the line *z z*.

Similar letters refer to like parts in all the figures.

The case or shell of the meter is, preferably, made in three sections, S^1 S^2 S^3, which are, preferably, united by male and female screws, with suitable water-tight packing interposed between the shoulders of the joints; but flanges and screw-bolts may be used to unite the sections. The section S^1 contains the float or bucket wheel W, which is, preferably, made up of the hub *h*, the web *w* extending outward from the hub, the rim *r*, which is formed with upper and lower flanges *f*, and the floats or buckets *b*. The hub *h* is fixed to a vertical shaft, *s*, and said hub has also formed in its under side a socket which fits over the pivot *p*. The shaft *s* passes through a loosely-fitted bearing, b^1, in the bottom of the section S^2, and its upper end is fitted in a loose bearing, b^2, on the under side of the bottom of the section S^3. On that part of the shaft *s* situated within the section S^2 is a worm-wheel, w^2, which meshes into wheel w^3 on the shaft s^3, to which shaft is attached another worm-wheel (not shown) which meshes into the wheel w^5 attached to the shaft s^2 carrying the worm-wheel w^4 which meshes into a wheel, (not shown,) but fixed to a vertical shaft which passes loosely through the bottom of the section S^3, and has on its top a pinion, by which motion is imparted to the first wheel of a train, *t*, of registering mechanism placed in the section S^3, which train, with its dial-plate and appurtenances, is placed beneath a plate of strong glass, *g*, inserted water-tight in the top of the said section S^3. When the sections are screwed together, as shown in Fig. 3, and the meter is placed in position for working, no opening exists in its walls through which leakage can occur, as is the case when the registering apparatus is placed outside and connected with interior mechanism by stuffing-boxes. In the section S^1 are formed an inlet, I, and an outlet, O, for the influx and efflux of the liquid to be measured. Joined to and cast with the section S^1 are the partition-walls P^1 P^2 P^3. The inlet I separates into two (2) water passages or courses, C^1 C^2, shortly after it enters the meter, the inner wall of these passages or courses, and also of the passages C^3 C^4 hereinafter described, being a circular partition, R, fitted tightly into the interior of the section S^1, as shown in Figs. 2 and 3. The said ring R, the bottom of the section S^2, and the bottom of the section S inclose a cylindrical compartment, in which the float-wheel W revolves. The said wheel, however, does not closely fit the walls of said compartment. The said ring R has formed in it ports o^1 o^2 o^3 o^4 for the passage of the liquid as hereinafter described, the induction-ports *o* and o^3 being

opposite each other, and the eduction-ports o^2 and o^4 also being opposite each other.

The passage C^1 is terminated by the partition P^1, as shown in Fig. 2, but communicates through the port *o* with the compartment in which the float-wheel W revolves. The passage C^2 is bifurcated after it reaches the partition P^2, as shown in Figs. 2 and 4, its upper and lower branches passing above and below said partition P^2, said partition being rectangular and inclosing the first part of the eduction-passage C^3. After having passed above and below the rectangular partition P^2, the two branches of the passage C^2 unite, as shown in Figs. 2 and 4, and communicate through the port o^3 with the compartment inclosing the float-wheel W. Joined to the partition P^2 is the curved partition P^3, which completes the separation of the passage C^2 from the passage C^3. The walls of the passage C^3 are thus caused to penetrate through the passage C^2, the separation of the said two passages being effected by the partitions P^2 and P^3, and the passage C^3 communicating directly with the outlet O. The compartment containing the float-wheel communicates also with the inner end of the passage C^4, through the port o^4, which also communicates directly with the outlet O. The direction of the flow of liquid through the meter is indicated by the arrows. The liquid, after entering the inlet I, divides into equal currents, flowing respectively through the passages C^1 and C^2, the ports *o* and o^3 being of equal cross-section, and the opposite passages C^1 C^2 C^3 C^4 also being of equal cross-section. The partitions P^1 and P^3 are placed on lines nearly tangent with the circumference of the float-wheel W, and the liquid is directed by them in such a way that it acts to the greatest advantage upon the buckets *b* of said float-wheel, causing the said wheel to rotate. After passing through the compartment inclosing the float-wheel, the water issues from said compartment in equal quantities, respectively through the ports o^2 and o^4, and thence passes through the passages C^3 and C^4 and the outlet O. The induction and eduction of the liquid equally on opposite sides of the periphery of the float-wheel W balances the pressure on the wheel, and consequently avoids side friction on the pivot *p*. The friction is thus reduced to an amount due only to the bare weight of the float-wheel upon said pivot. Similarly side friction is obviated upon the bearing b^2 of the shaft *s*. The float-wheel may be made of light material, or may be constructed with enough air-chambers to render it practically of the same specific gravity as water, and this would practically reduce the friction of the said wheel W on its bearings to zero. The resistance left for the wheel to overcome would then be merely the *vis inertiæ* of the train of registering mechanism *t*. This resistance will be lessened as the velocity of any part of the said registering-train is lessened, and I therefore interpose the train of worm-gearing w^2 w^3 w^4 w^5 between the shaft *s* of the float-wheel W and the registering-train *t*, which transmits the motion of the said shaft *s*, but at an immediately and greatly reduced velocity. Practical experiments, many times repeated, have demonstrated that the meter constructed as described will, with both large and small quantities of water flowing through it, register the quantities within a very small percentage of the entire volumes passed through the meter. The normal position of the wheel is that which will give it horizontal rotation, and hence the water is maintained on the same level from the time of its entrance into the meter till it reaches the outlet. There is, therefore, no accumulation of dirt in the meter to obstruct its motion, all impurities being swept over a level floor and out by the action of the liquid current.

I claim—

In combination with the circular partition surrounding the float-wheel W, and having the induction-ports o^1 and o^3 placed opposite each other, and eduction-ports o^2 and o^4 placed opposite each other, the section S^1 having the inlet I and the outlet O, the passages C^1 C^2 C^3 C^4, and the partitions P^1 P^2 P^3 to guide the liquid in its influx, and also in its efflux, to opposite sides of the float-wheel W, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand.

THEODOR LEOPOLD WITT.

Witnesses:

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