H. S. MAXIM.

Liquid-Meter.

No. 161,624. Patented April 6, 1875.

Fig. 1.

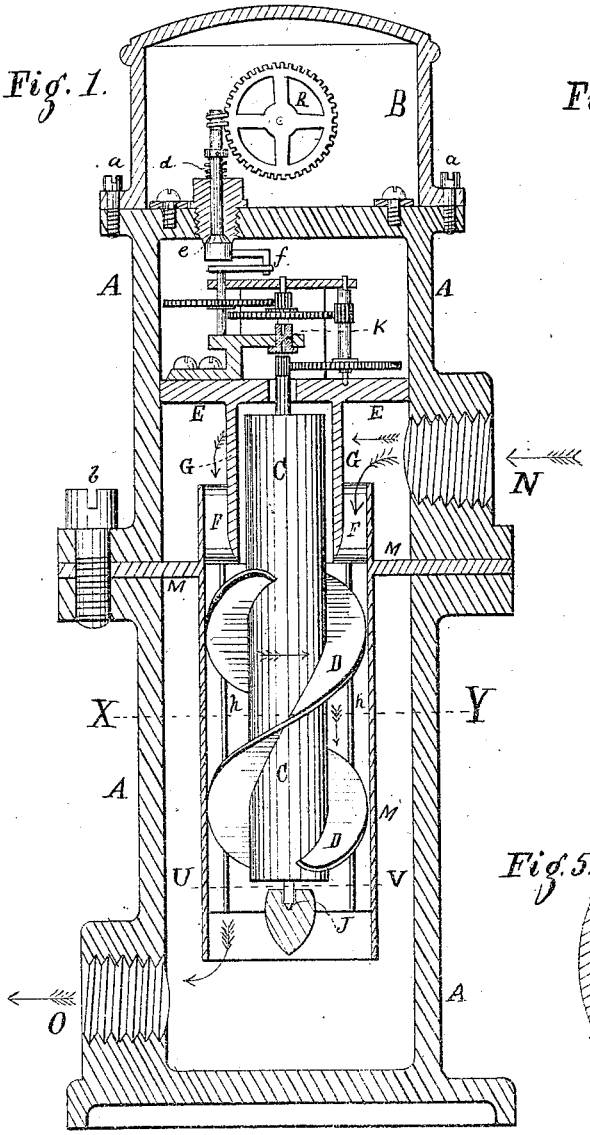


Fig. 2.

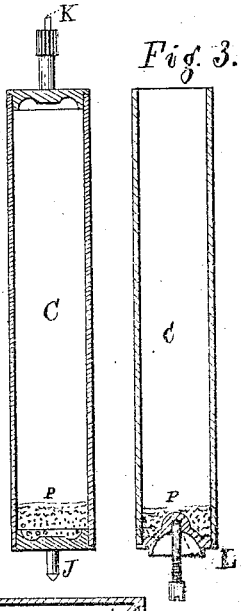


Fig. 3.

Fig. 4.

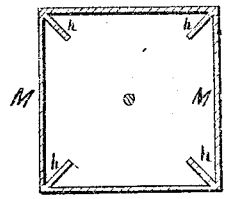
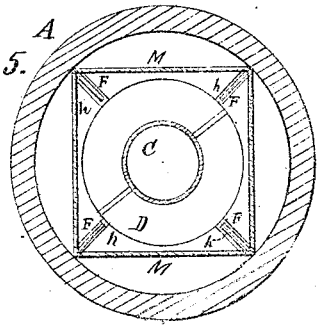


Fig. 5.



Witnesses;
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UNITED STATES PATENT OFFICE.

HIRAM S. MAXIM, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF HIS RIGHT TO ALONZO T. WELCH, OF SAME PLACE.

IMPROVEMENT IN LIQUID-METERS.

Specification forming part of Letters Patent No. **161,621**, dated April 6, 1875; application filed February 10, 1875.

To all whom it may concern:

Be it known that I, HIRAM S. MAXIM, of Brooklyn, Kings county, New York, have invented a Liquid-Meter, of which the following is a specification:

The object of my invention is a cheap and simple water-meter, constructed in such a manner that while its working parts are of brass or composition its outer shell may be made of cast-iron; also, of such a construction as will prevent the water from revolving in the direction of the screw and of a screw-shaft, which is lighter than the water in which it runs.

Figure 1 is a vertical central section embodying the improvements in my invention. Figs. 2 and 3 are sections of the hollow shaft as it is applied in different forms. Fig. 4 is a cross or horizontal section of the square water-trunk through U V. Fig. 5 is a horizontal section through X Y.

A A A is a cast-iron shell, secured together with the screws *b*, and divided into two compartments by the partition or diaphragm M M. B represents a bonnet or cap, which incloses suitable dials and the accompanying train of gears, which may be made in any convenient form, and to register either large or small quantities, as their use or adaptation may require. The bonnet B is secured to the body of the meter by the screws *a a*. C C C (shown in elevation, Fig. 1, and in section, Figs. 2, 3, and 5) is a hollow shaft or cylinder, made air-tight, of thin brass or like metal, having a head in each end, provided with suitable pivots, and with a small pinion, for communicating motion through the train of gears to the registering-indexes. It has also in its lower end, marked P, a small quantity of bicarbonate of soda or supercarbonate of soda, together with dry tartaric acid, which, when dry, have no effect on each other, (they may be separated by paper), but when in connection with water will evolve carbonic-acid gas until the pressure within is equal to the pressure without, when no more water could sweat in. The object of this is to prevent the water from filling the hollow shaft by sweating through the pores of the metal, thus destroying its buoyancy. The main specific gravity of this shaft and its screw-blades D D I prefer to be about ninety-five degrees, or a little less than the liquid in which it turns, so that when the liquid is flowing slowly in the direction of the arrows it shall turn on a very fine point, (shown at K K,) while, when a larger quantity passes and the movement is much quicker, it will drop down with the passing current, and rest on the lower and larger pivot. Thus a sharp and delicate point is always preserved, to be used only when a very small quantity of liquid is passing, and as the shaft is only a trifle lighter than the liquid the resistance on such a point is reduced to its minimum. The train of gears being very light and reducing one thousand times or more before reaching the air-tight joint *e*, it will be obvious that a very slight movement of liquid will turn the screw-shaft C. E E E is a brass or composition casting, embracing three separate parts, and performing three different functions. It constitutes the plate E E, on which the train of gear is secured, and protects them from the impurities of the liquid by dividing off a portion of the top from the rest of the water-chamber. It forms the cylinder G G, in which the shaft C revolves, and protects it from being thrown to one side by the force of the incoming liquid at N, and its lower end terminates in four arms, F F F F, which give direction to the current of liquid, and also holds the ends of the four vertical internal webs *h h h h*. M M is a square passage-way or trunk, through which the liquid flows, being provided with a disk, which divides the upper and lower portion of the shell A A into two parts, and forms the air-tight packing between the two castings of which the shell A is made.

My object in making this trunk square, placing the four webs *h h h h* in the corners, is to prevent the liquid from revolving in the direction of the angle of the blades of the screw, as it does when a cylindrical passage is used, thus rendering all meters heretofore made on this principle unreliable and useless, especially when a small stream of liquid is passing. By the use of this square trunk or passage I am enabled to prevent the liquid from revolving, even in minute quantities, and when used

in connection with the light and easy-running screw, it constitutes a water-meter which is simple, accurate, durable, and cheap.

By the foregoing description it will be seen that only a very small portion of the meter has to be made of an expensive metal. The outer shell, which requires no boring out, can be of cast-iron, and as the force of the water is alike on all sides of the light inside partitions and passage-ways, they can be made quite light.

The liquid to be measured flows in at N, Fig. 1, and is received into the chamber above the partition M M, where, after expending its force against the cylinder G, it passes downward, as shown by the arrows, turns the screw-shaft D, and passes out at O.

The water is prevented from entering the bonnet B by the air-tight joint *e*, which is a ground joint, turning freely, and held in its seat by the action of the spiral spring *d*. *f* is a crank and arm connection, which communicates motion between the train of gears on the plate E E, and those in the dry bonnet B. I use this peculiar construction to insure perfect ease in running. It does not require the upper and lower shafts to be in line, and therefore requires less accurate workmanship.

I have shown at L, Fig. 3, an inverted cup in place of the pivot J—an arrangement which I prefer to use only when very muddy or dirty water is to be measured, as this surrounds the pivot, and no dirt can get into the pivot-hole.

Having thus described my improvement, what I desire to claim as my invention, and have Letters Patent issued to me for, is—

1. In liquid-meters, a hollow shaft made lighter than the surrounding liquid, when protected from filling with water, in the manner hereinbefore set forth.

2. In liquid-meters, a hollow shaft made lighter than the surrounding liquid, and provided with two pivots, one on which it runs when a large volume of liquid is passing, and another and smaller one, onto which it changes when only a small volume is passing, in combination with the acid and carbonate of soda, when operating in the manner and for the purpose hereinbefore specified and set forth.

3. The combination of the plate E E, cylinder G G, and radial arms F F, as set forth, and for the purpose specified.

4. The square trunk M, having the internal vertical webs *h h h h*, for the purpose herein described and set forth.

5. The combination of the air-tight ground joint *e*, crank *f*, and spiral spring, when used for the purpose specified, and in the manner set forth.

6. The combination of the hollow shaft C, screw-blades D D, square trunk M, vertical webs *h h h h*, plate E E, cylinder G G, and arm F F, all operating in the manner herein described, and for the purpose set forth.

HIRAM S. MAXIM.

Witnesses:
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