2 Sheets—Sheet 1.

H. CHANDLER.

Piston Water-Meters.

No. 199,352. **Patented Jan. 22, 1878.**

Fig. 1.

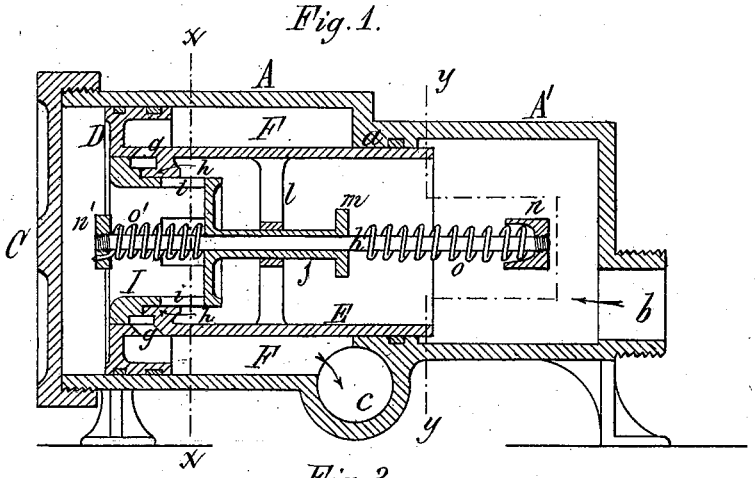


Fig. 2.

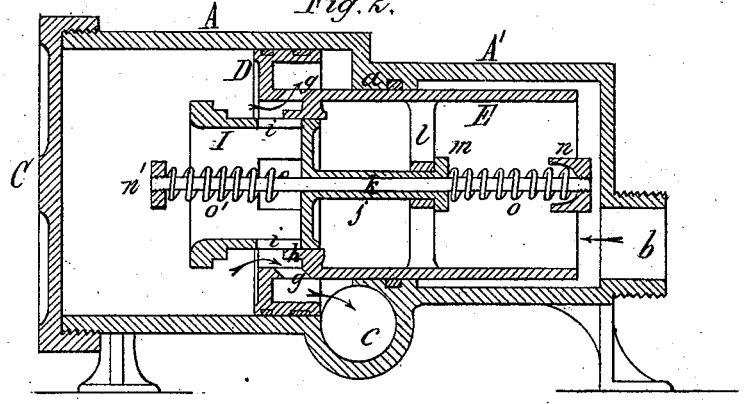


Fig. 3.

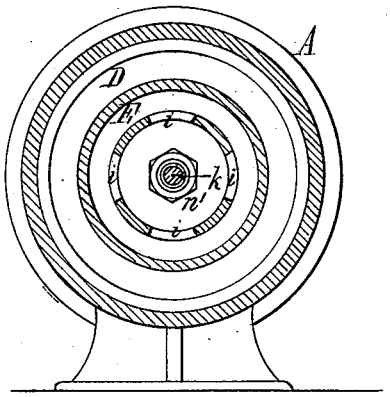
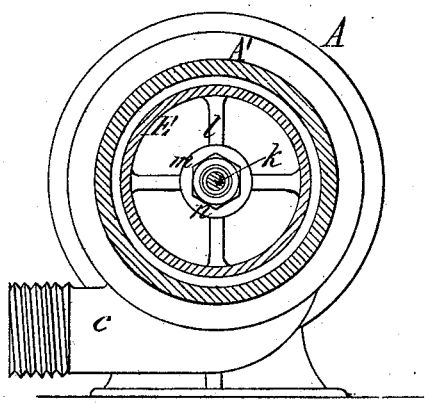


Fig. 4.



George H. Sykes.
Chas. J. Buchheit. } Witnesses

Henry Chandler. Inventor
by Edward Wilhelm
Attorney.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

2 Sheets—Sheet 2.

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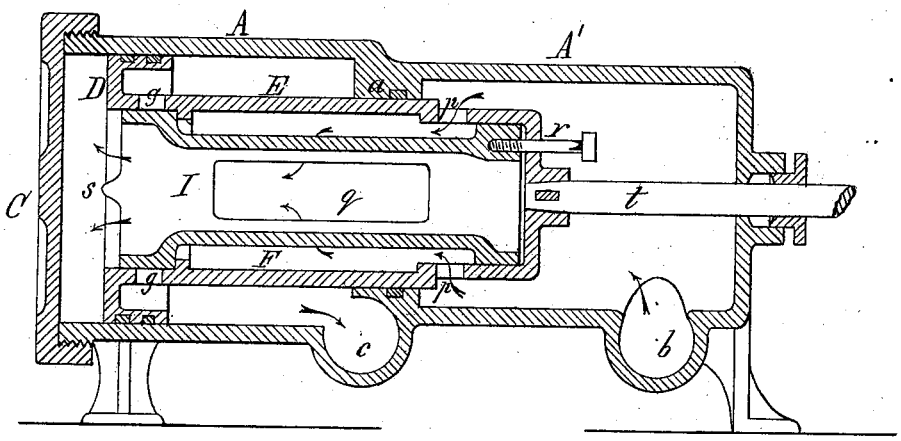
Fig. 5



Witnesses

Chas. J. Buchheit

George H. Sykes

Inventor

Henry Chandler

by Edward Wilhelm

Attorney

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HENRY CHANDLER, OF BUFFALO, NEW YORK, ASSIGNOR TO GEORGE C. STEARNS, OF SAME PLACE.

IMPROVEMENT IN PISTON WATER-METERS.

Specification forming part of Letters Patent No. **199,352**, dated January 22, 1878; application filed May 23, 1877.

To all whom it may concern:

Be it known that I, HENRY CHANDLER, of the city of Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Liquid-Meters, which improvements are fully set forth in the following specification, reference being had to the accompanying drawings.

My invention relates to that class of liquid-meters in which the liquid enters the measuring-cylinder through an induction-pipe connecting with one of the heads of the cylinder, and escapes therefrom through an eduction-spout in the side of the cylinder, and in which the passage of the liquid through the cylinder is regulated by a hollow piston provided with a hollow valve.

The object of this invention is to construct a liquid-meter which shall be very simple in construction, and which shall discharge the liquid in a uniform stream.

The nature of my invention will be fully understood from the following description:

In the accompanying drawings, consisting of two sheets, Figure 1 is a longitudinal section of my improved liquid-meter. Fig. 2 is a similar view with the valve reversed. Figs. 3 and 4 are cross-sections, respectively, in lines *x x* and *y y*, Fig. 1. Fig. 5 is a longitudinal section, showing the apparatus in a modified form, so as to serve as a motor.

Like letters of reference refer to like parts in each of the figures.

A represents the measuring-cylinder, provided with an induction-chamber, A′, separated from the cylinder A by an annular bearing-surface, *a*, and provided with the induction-pipe *b*, arranged in the head of the induction-chamber. C is the cover or bonnet closing the end of the measuring-cylinder A, and *c* the discharge-pipe arranged in the side of the measuring-cylinder A, near the rear end thereof. D represents the hollow piston, fitting snugly in the measuring-cylinder A, and provided with a hollow cylindrical extension, E, fitting in the annular bearing *a*, so as to slide therein. The extension E is made smaller in diameter than the cylinder A, so as to leave an annular space, F, between the latter and the extension E.

In order to obtain a uniform discharge of the liquid the area of cross-section of the extension E should be made one-half of that of the measuring-cylinder A.

The extension E is provided with ports *g*, arranged contiguous to the piston proper, D, and an annular valve-seat, *h*, arranged in the rear of the ports *g*, as clearly shown in Figs. 1 and 2.

I represents a cup-shaped valve, provided with annular ports *i*, and arranged centrally in the piston D, so as to close against the seat *h*. *k* represents the reversing-rod arranged axially in the valve I, and guided in a sleeve, *j*, formed with the latter.

The piston extension E is provided with a bridge-piece, *l*, forming a bearing for the sleeve *j* of the valve, and the latter is provided with an adjustable shoulder, *m*, striking against the bridge-piece *l*, for limiting the forward movement of the valve.

The reversing-rod *k* is provided at each end with an adjustable piece, *n n′*, each provided with a suitable spring, *o o′*, for reversing the valve at the end of each stroke.

The parts being in the position shown in Fig. 1, the liquid, entering the induction-chamber A′ through the pipe *b*, passes into the extension E, and thence through the ports *i* into the hollow valve I, filling the space between the piston D and the cover C of the measuring-cylinder, and forcing the piston and connecting parts backward toward the induction end of the cylinder.

The ports *g* of the piston being closed, the liquid contained in the annular space F back of the piston is expelled through the discharge-spout *c*. As the piston approaches the rear end of the measuring-cylinder, the end piece *n* of the reversing-rod *k* strikes the head of the induction-chamber A′, thereby arresting the movement of the reversing-rod. As the piston and valve continue in their backward movement, the spring *o*, attached to the end piece *n* of the reversing-rod, comes in contact with the end of the sleeve *j* of the valve I, arresting the movement of the valve.

The piston D continues its movement, whereby the ports *g* of the piston are caused to coincide with the ports *i* of the valve, and the

latter raised from its seat, as shown in Fig. 2, when the liquid in the induction-chamber is excluded from the measuring-cylinder A, and, pressing upon the valve I and extension E, forces the piston and connecting parts forward. The liquid contained in the measuring-cylinder A, forward of the piston, is, by this movement of the piston, forced into the annular space F, and thence out through the escape-pipe *c*. As the piston approaches the cover C of the measuring-cylinder the reversing-rod strikes the cover, thereby reversing the relative position of the valve and piston in an obvious manner.

It is evident from the foregoing that when the area of the cross-section of the piston extension is made one-half of that of the measuring-cylinder a uniform quantity of liquid, equal to that contained in the annular space F, is discharged at every stroke, thus insuring a steady flow of the liquid from the measuring apparatus.

The number of strokes of the piston D may be recorded by any suitable registering mechanism, connected with the piston by a spring-bar passing through a stuffing-box in the cylinder-head, or in any other suitable manner.

In the modification shown in Fig. 5 the hollow extension E of the piston is closed at the rear end and provided with ports *p*, so as to admit the liquid through the side instead of through the end of the extension E. The valve I is open at both ends, and constructed with openings *q* in its side to admit the water from the space between the cylinder extension E and valve I to the interior of the latter. The valve I is provided with a reversing-rod, *r*, at its rear end, and a projection, *s*, serving the purpose of a reversing-rod at its front end.

By this construction of the parts the valve is relieved from all pressure by the liquid, and consequently reversed with great ease.

t represents the piston-rod secured to the end of the piston extension E, and working through a stuffing-box in the head of the induction-chamber.

It is obvious that water, steam, or air pressure may be used to actuate the apparatus when employed as a motor.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with the cylinder A and induction-chamber A′, of the piston D, provided with hollow extension E and hollow valve I, substantially as and for the purpose hereinbefore set forth.

2. The combination, with the measuring-cylinder A and induction-chamber A′, separated by the annular bearing *a*, and induction-pipe *b* and discharge-pipe *c*, of the piston D, provided with hollow extension E, having ports *g*, and hollow valve I, provided with ports *i*, substantially as and for the purpose hereinbefore set forth.

3. The combination, with the measuring-cylinder A and induction-chamber A′, of the piston D, provided with hollow extension E, and hollow valve I, provided with reversing-rod *k*, arranged axially in the valve and piston, and projecting through both ends thereof, substantially as hereinbefore set forth.

4. The combination, with the measuring-cylinder A and induction-chamber A′, of the piston D, provided with hollow extension E, having an area of cross-section equal to one-half of the area of the cross-section of the measuring-cylinder, for insuring a uniform flow of liquid from the meter, substantially as and for the purpose hereinbefore set forth.

HENRY CHANDLER.

Witnesses:

EDWARD WILHELM,

GEORGE H. SYKES.