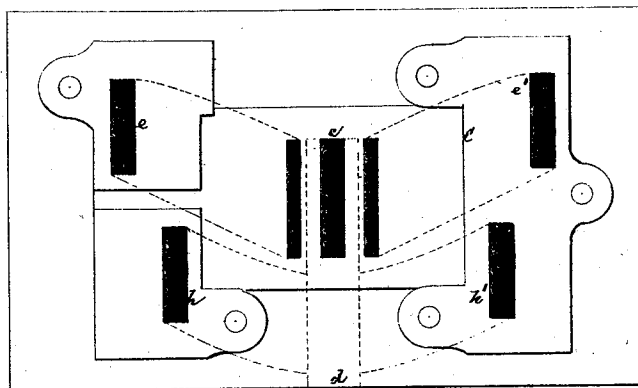
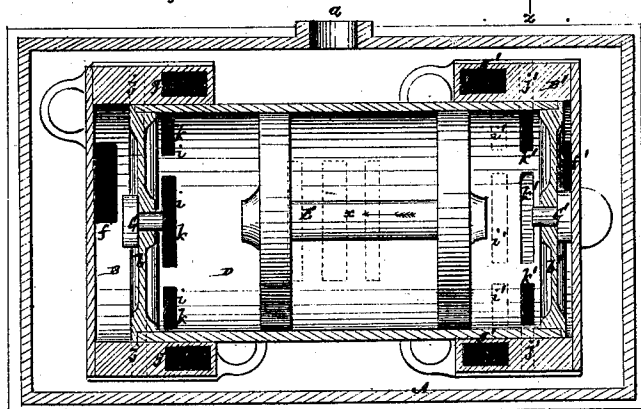
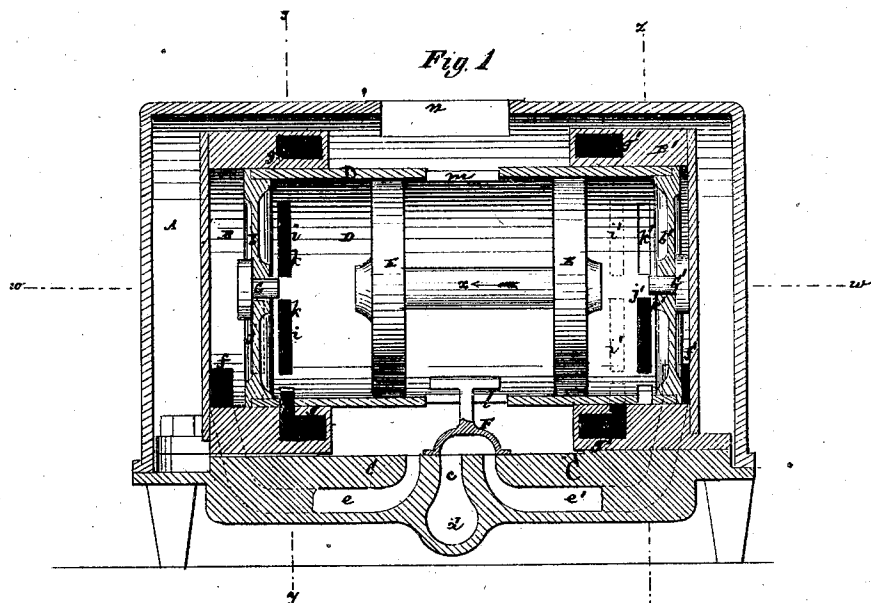


No. 111,268.

PATENTED JAN. 24, 1871.

W. E. SNEDIKER.  
LIQUID METER.

2 SHEETS—SHEET 1.



Witnesses  
Geo. H. Younger  
R. L. Babcock

W. E. Snediker

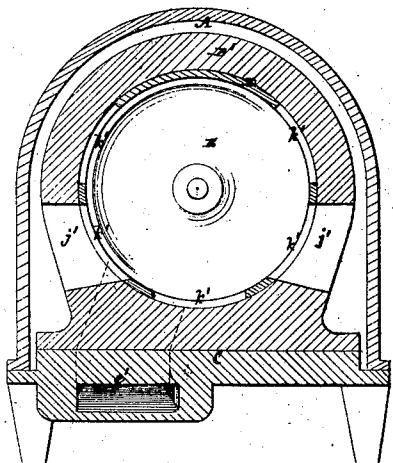
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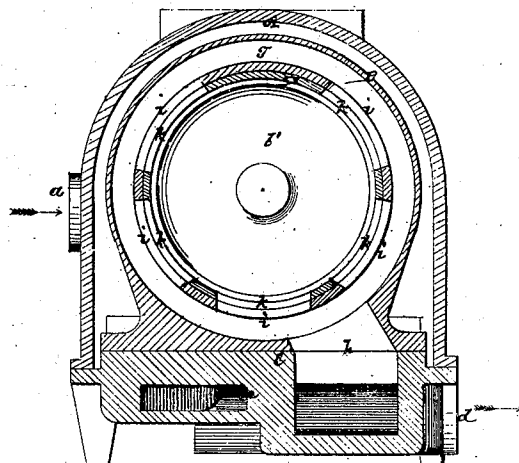
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2 SHEETS—SHEET 2.

*Fig. 5.*



*Fig. 4.*



Witnesses  
*Fred. Haynes*  
*R. Rabeau*

*W. E. Snediker*

# United States Patent Office.

WILLIAM E. SNEDIKER, OF NEW YORK, N. Y., ASSIGNOR TO JOSÉ F. DE NAVARRO, OF SAME PLACE.

Letters Patent No. 111,268, dated January 24, 1871.

## IMPROVEMENT IN LIQUID-METERS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, WILLIAM E. SNEDIKER, of the city, county, and State of New York, have invented a new and useful Improvement in Liquid-Meters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing forming part of this specification, and in which—

Figure 1 represents a central longitudinal sectional elevation of a meter constructed in accordance with my invention.

Figure 2 is a sectional plan of the same through the line *ww* in fig. 1.

Figure 3, a plan of the bed-plate; and

Figures 4 and 5, vertical transverse sections of the meter, taken respectively through the lines *yy* and *zz* in fig. 1.

Similar letters of reference indicate corresponding parts.

My invention has reference to what are termed free piston-meters, that is, meters which are provided with pistons that, controlling in a direct manner the valves which reverse their action, are free of any adjuncts having for their function the tie of the pistons by positive or mechanical connection, to limit and control the stroke of the pistons, and the main object of my invention is to insure a full stroke for the pistons and accurate action of the same under both light and heavy streams, which result it has heretofore been difficult or impossible to obtain in meters of the description specified.

To this end—

The invention comprises a combination of the following elements, namely: a cylinder or pair of cylinders, lying in the same axial line, a tube, operating as a piston within said cylinders, a free or independent piston within the tube, and a valve, operated by the interior piston, together with suitable passages for varying the course of the liquid as regards its action on opposite ends of the tubular piston and independent pistons therein.

In such arrangement or combination of parts, the interior piston, which controls the valve, is fed or supplied with liquid by the tubular piston that, in its turn, is controlled by the valve.

In the operation of these several devices, the interior piston moves alone for a certain distance, or until it brings up against the one head or end of the tube, when it continues to move in the same direction in common with the tube, or the latter with it, until said interior piston is relieved of further advancing pressure, when the outer piston or tube completes alone its stroke in said direction, during which the interior piston travels in a reverse direction, and, in due course, or toward the close of such

stroke, the outer piston or tube along with it, for a repetition of the action already described with reference to the relative movements of the pistons as controlled the one by the other, and by the valve, as hereinbefore mentioned.

Although applicable to measuring liquids of various kinds, my improved meter is mainly designed for measuring water, and, for simplification, will here only be described in accordance with such use.

Referring to the accompanying drawing—

A represents an outer water-case or dome, to which the water to be measured is admitted by an inlet, *a*.

Submerged within this case are two cylinders or half-cylinders, B B', lying in the same axial line, and closed at their outer, but open at their inner ends, or the same may be connected, to form of the two a single cylinder. Said cylinder or cylinders are preferably arranged to occupy a horizontal position, but this is not absolutely necessary.

C is a bed, on which the cylinders B B' are secured, and D the outer piston or tube, arranged to reciprocate within them, and provided with closed ends or heads, *b b'*.

E is the free or independent inner piston, disposed to reciprocate within the outer piston or tube D, and F the valve controlled by it, to regulate the motion of the outer piston or tube, which, in its turn, controls the movement of the inner piston. This valve F is here shown as of an ordinary D-construction, but it may be of any other suitable form.

The bed-plate C is provided with an exhaust-passage, *c*, in communication with an outlet, *d*, for the water, and is further provided with passages, *e e'* in communication by ports, *ff'*, with the cylinders B B', at or near their outer ends, and which serve as inlet and outlet-passages for the water to and from the backs or outer faces of the ends of the tube D.

The cylinders B B' are, furthermore, provided with an annular or surrounding exhaust-passage, *gg'*, which is in communication, by passages *h h'* in the bed-plate, with the outlet *d*, and connects with the cylinders B B', by a series of ports *i i'*.

Said cylinders B B' have also inlets-ports, *jj'*, arranged between the ports *fi f'i*, and which are in communication with the water-space of the dome A. These several ports *i i'* and *jj'* are disposed at proper distances apart around the cylinders, and are of the requisite area to insure a free passage of the water, even when only partially open, and it is desirable that the exhaust-ports *i i'* exceed in number the inlet ports *jj'*, to effect a free escape, so that there may be no impediment to the free movement of the pistons.

The tube D has, likewise, made in or around and through it, a series of ports, *k k'*, corresponding in

number and area to the exhaust-ports *i i'* over which and the inlet-ports *j j'*, they alternately lie, in or during the reciprocating movement of the tube.

The valve F, which is operated by the piston E, is represented as passing through a slot, *l*, in the outer piston D, and as being operated by the heads of the piston E striking it; but it may be actuated by said inner piston E in any other suitable manner.

An opening, *m*, is also shown as made through the top or opposite side of the tube D, to establish a balance, and to provide for the operation of the registering mechanism by the tube or piston, said registering mechanism being arranged over an opening, *n*, in the outer case. The registering mechanism may be of the ordinary, or any suitable kind.

G G' are sliding-stops or bumpers in the heads or ends of the tube D, to check or limit the movements of the two pistons relatively to each other and the ends of the cylinders, as hereinafter described.

In the operation of the meter, supposing the parts to lie in the position represented in figs. 1 and 2, water is entering by the ports *j* and *k* to drive the piston E in direction of the arrow *x*, the ports *k* being in communication with the ports *i*, which connect with the exhaust. The tube D is then at rest at the extremity of its right-hand stroke, and is held there through the uncovered position of the passage *e* by the valve F, which admits inlet water through the passage *f*, to press upon the left-hand end of the tube, while the opposite end of the tube is relieved of pressure by the communication of the port *f'* and passage *e'* with the exhaust-port or passage *c* under cover of the valve. Upon the piston E, however, arriving at the left-hand end or head *b* of the tube, when it forces outward the bumper G, the valve F has been shifted by the piston E, so as to reverse the ports and passages *f f'* and *e e'* relatively to the inlet and exhaust of the water to and from the outer faces of the ends of the tube. This causes the tube D to travel in common with the piston E to the left till the movement of the tube over the ports *j* causes the inlet of water to be shut off from entering through

the ports *k*, and the ports *k* are open to the inlet-ports *j*, and the ports *k* to the exhaust-ports *i*, which reverses the travel of the piston E, causing it to move to the right, while the tube D continues its movement to the left, where it stops at the end of such stroke till the piston E, acting on the valve F, reverses the supply and egress of water to and from the cylinders B B', and the pistons again move in common to the right, and the piston D subsequently completes its stroke in that direction alone, while the piston moves to the left again by the reversed position of the ports *k k'* relatively to the ports *i i'* and *j j'*.

The sliding-stops or bumpers G G' serve to arrest first the piston E, and, subsequently, the tube D, at the termination of their respective strokes.

What is here claimed, and desired to be secured by Letters Patent, is—

1. The combination with the water-case or dome A of the cylinders B B', the reciprocating tube or outer piston D, the free or independent interior piston E, the valve F, and the several ports or passages under control of said valve and outer piston or tube, substantially as specified, and whereby the interior piston, which throws the valve to reverse the action of the outer piston, is, in its turn, reversed by the action of the outer piston or tube, as herein set forth.

2. The arrangement of the ports *k k'* in the reciprocating outer piston or tube D, relatively to the fixed ports *i i'*, *j j'*, and *f f'*, whereby the inner piston E is caused first to move alone, subsequently by its action on the valve F, to continue its motion in common with the outer piston, and then to be reversed while the outer piston completes its stroke, essentially as shown and described.

3. The combination of the sliding-stops or bumpers G G' with the interior free piston E, exterior piston D, and cylinders B B', substantially as described.

W. E. SNEDIKER.

Witnesses:

FRED. HAYNES,  
R. W. RABEAU.