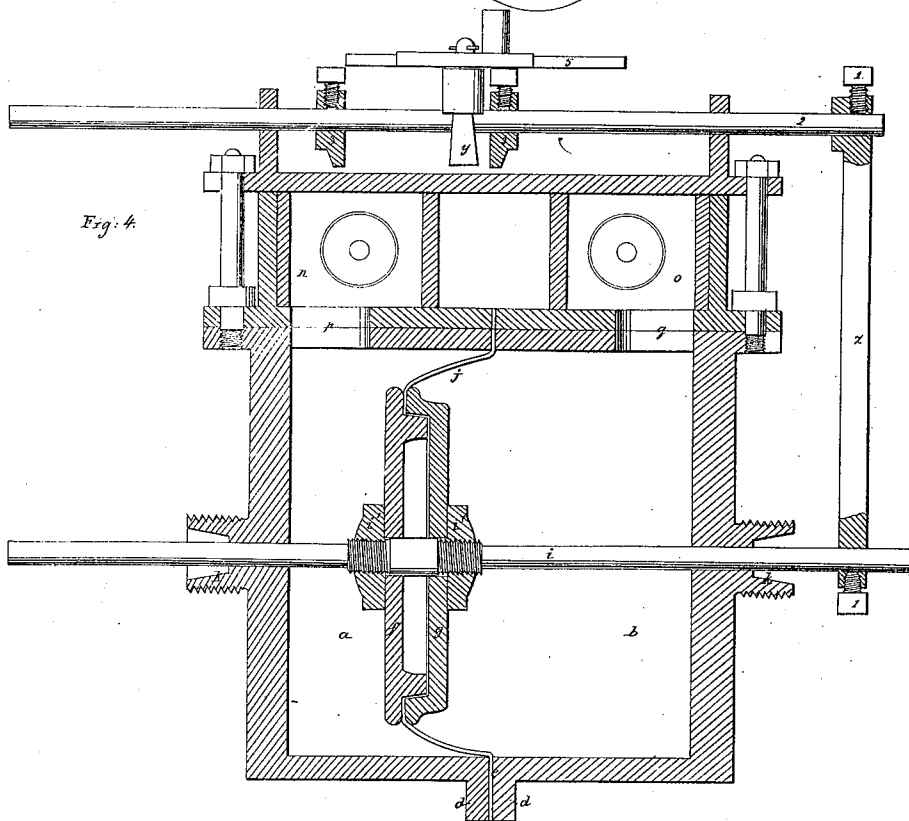
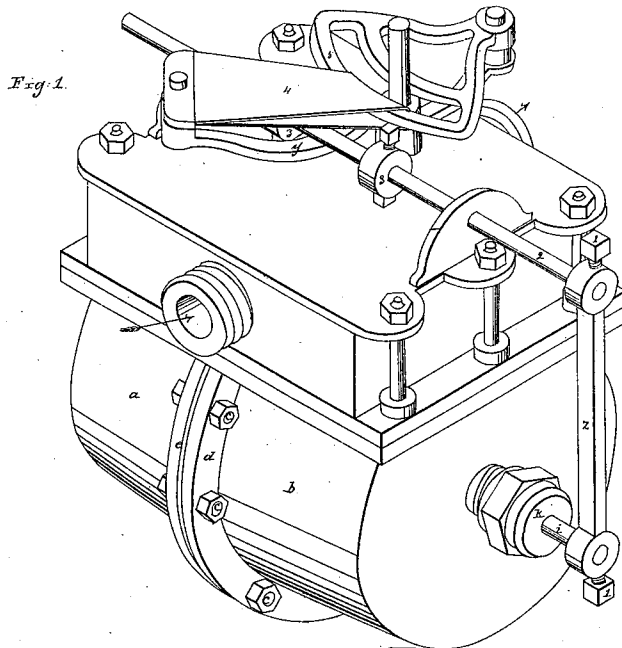


No. 14,921.

PATENTED MAY 20, 1856.

N. B. MARSH.
WATER METER.

2 SHEETS—SHEET 1.

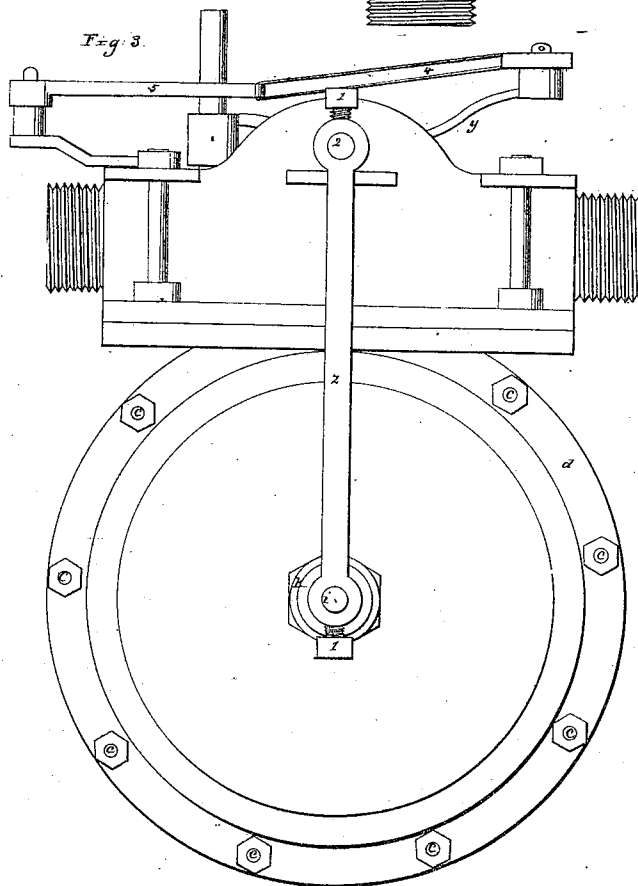
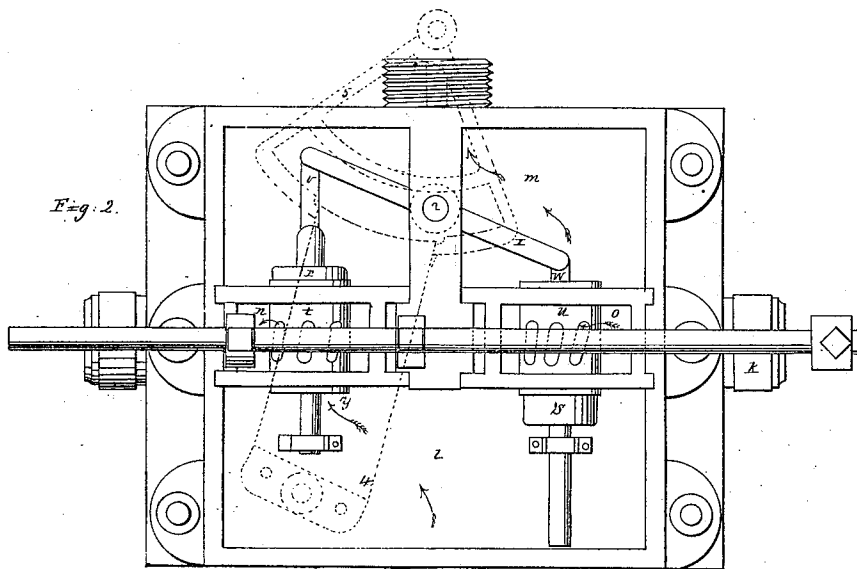


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WATER METER.

2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

NATHAN B. MARSH, OF CINCINNATI, OHIO.

IMPROVED WATER-METER.

Specification forming part of Letters Patent No. 14,921, dated May 20, 1856.

To all whom it may concern:

Be it known that I, NATHAN B. MARSH, of Cincinnati, Hamilton county, Ohio, have invented a new and Improved Water-Meter; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the annexed drawings, making part of this specification.

My improvements consist in devices for the automatic measurement of water or other liquids by the reciprocating movement of a pliant diaphragm or membrane, and of valve mechanism acting with the least possible friction and with certainty and precision, however strong, or however weak or varying the hydraulic head.

In the accompanying drawings, Figure 1 is a perspective view of my meter. Fig. 2 is a top view of the valve-chamber. Fig. 3 is an end view of the meter. Fig. 4 is an axial and vertical section.

ab is a cylindrical or nearly cylindrical shell called by me the "water-chamber," and composed of two similar cylindrical or conical parts, attached to each other by bolts *c* passing through their flanges *d*.

j is a diaphragm of some impervious and pliable fabric, the said diaphragm being formed out of an annular disk by securing the outer margin thereof between the flanges *d*, so as to form a gasket, and stretching the inner margin and clamping it between two disks, *f g*, composing the piston, so as to form a shifting cap-like partition, which isolates from each other the two ends of the water-chamber. This stretching of the inner margin prevents the diaphragm being unduly strained by the throw of the two disks *f g*. This pair of disks *f g* is confined to a motion parallel with their axis, and with that of the cylindrical chamber by means of the nuts *i'* on the screw-threaded central rod, *i*, passing out through stuffing-boxes *k* in the cylinder-heads. Attached to one side of this cylinder is a square box containing a supply-chamber, *l*, and discharge-chamber *m*, and situated between these is a pair of valve-chambers, *n o*, which communicate by passages *p q* with their respective ends of the cylindrical chamber.

The valves, by means of which the two compartments of the cylindrical chamber are successively and alternately brought into com-

munication with the supply and with the discharge, are made to combine the promptness of the puppet-valve with the freedom of the slide-valve—two great desiderata in a meter, and consist as follows:

r s are two solid cylindrical pistons ground to fit and play easily within two cylindrical tubes, *t u*, open at their ends into the supply and discharge chambers respectively, and also perforated at their sides, so that when not closed by their pistons there is free communication through the tube *t* or *u* into its respective chamber *n* or *o*, and thence with the respective compartments of the cylindrical chamber *a b*. The piston-valves *r s* connect by rods *v w* with the opposite ends of a beam, *x*, pivoted at its mid-length to the case.

y is an arm projecting rectangularly from the beam and in the plane of its vibration.

One end of the main or diaphragm rod *i* is by means of a bar, *z*, and set-screws 1, placed in rigid connection with a valve-rod, 2, having attached at suitable distances upon it, according to the length desired, a pair of tappets, 3, which at the successive strokes of the piston move the arm *y* alternately to and fro, and with it the valves.

In order that there may be no perceptible cessation of the flow of water, or regurgitation, the last part of the valve motion is made almost instantaneous by the retracting force of a spring, 4, composed of an india-rubber thong attached at one end to the outside of the arm and at the other end to a stirrup, 5, capable of vibrating around a pivot placed eccentrically with that of the arm *y*, so that the thong, being drawn out at the middle of the stroke, tends, by its contractile force, to instantly throw or shoot the arm to whichever extremity of its sweep it is for the time being nearest. These valves and their perforated sockets are so arranged that at no part of their motion can they both communicate with the supply and the discharge at the same time. They open and close at the same instant, and, being perfectly balanced, are not subject to any unequal water-pressure. Their instantaneous action prevents any cessation of the flow of water, which escapes, consequently, in a uniform stream, as if flowing through an open pipe.

The main piston or disk *f g*, fitting loosely

within the cylinder, and being simply connected with the outer walls by a pliant disk, (made to assume the cap form by the means before described,) does not oppose any friction to the passage of the water—a matter of great importance in such an apparatus where the hydraulic force, which is available as the motor, is in many cases very feeble, and the same pliability of the diaphragm is, together with the absence of any appreciable resisting force, a safeguard against any bursting of the inclosing-walls by a sudden variation of pressure; hence such a diaphragm (although ill adapted to pumps where a strong force is to be overcome, and where sufficient pliability of rubber involves an insufficiency of strength) is particularly applicable to the more delicate and yielding operation of a meter.

The above-described apparatus (although intended as an illustration of my invention and preferred by me for that purpose, because my earliest and successful embodiment of the plan) may be variously modified to suit different circumstances—as, for example, the piston-rod may be placed to one side of the center of the cylinder and disk and nearer to the valve movement, so as to shorten the connection, or the connection may be made by a vibrating-arm; or the piston may only emerge at one head, so as to involve but one stuffing-box; or the valve may be thrown by two pistons communicating directly with the respective ends of the water-chamber. The diaphragm may be made of stout canvas or other woven

or matted fabric saturated with caoutchouc or other varnish or paint. Registering or indicating dials of any approved construction may derive motion from the valve-rod by means of a pawl and ratchet or otherwise.

Having thus fully described the nature of my invention, I would state that I am aware that elastic diaphragms have been used for various purposes. This therefore I do not claim; but

What I do claim as new, and desire to secure by Letters Patent, is—

1. The manner of pinching the diaphragm between the plates *f g*, so as to perfectly and at all times back the joint between the chambers which it divides—viz., by means of the projecting flanges on each lapping past each other, and the nuts to hold them together, as represented.

2. The double reversing-valve movement, as described—namely, the two solid cylindrical valves *r s*, having their spindles connected by a rocking beam, *a*, and playing within tubes *t u*, communicating at their ends with the supply and discharge respectively, and with the respective compartments of the measuring-cylinder, by means of apertures in their sides.

In testimony whereof I hereunto set my hand before two subscribing witnesses.

NATHAN B. MARSH.

Witnesses:

GEO. H. KNIGHT,

J. B. BENNETT.