P. Ball.

Water-Meter.

No. 73430 Patented Jan. 21, 1868.

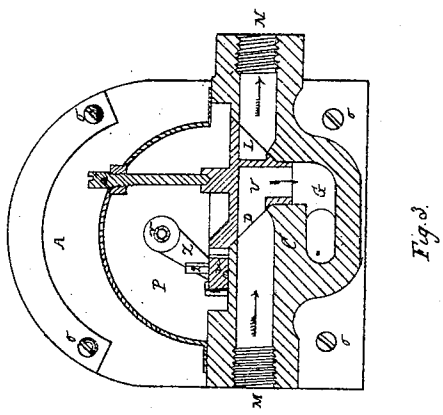

Fig. 3.

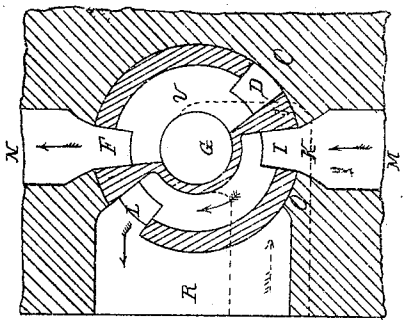

Fig. 5

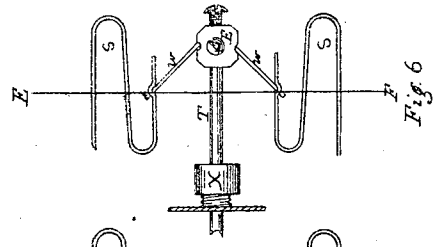

Fig. 6

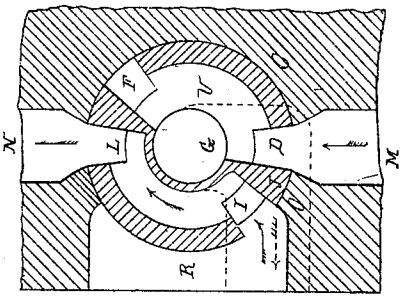

Fig. 4

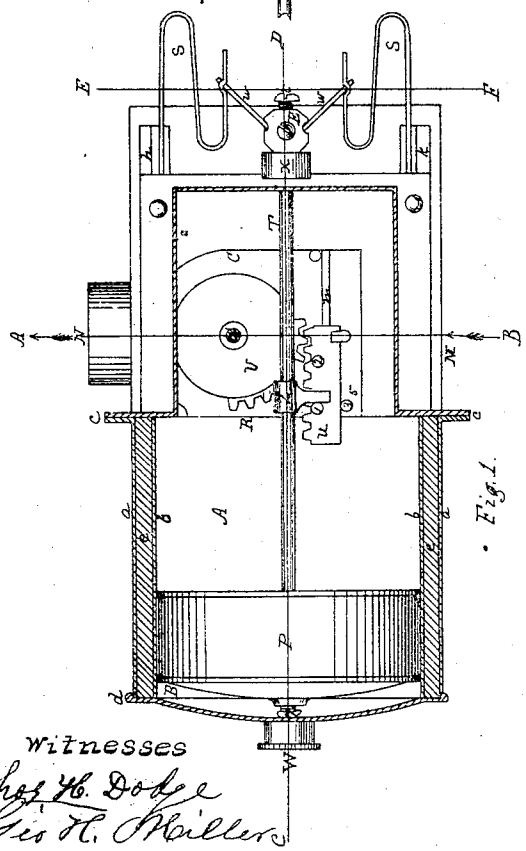

Fig. 1.

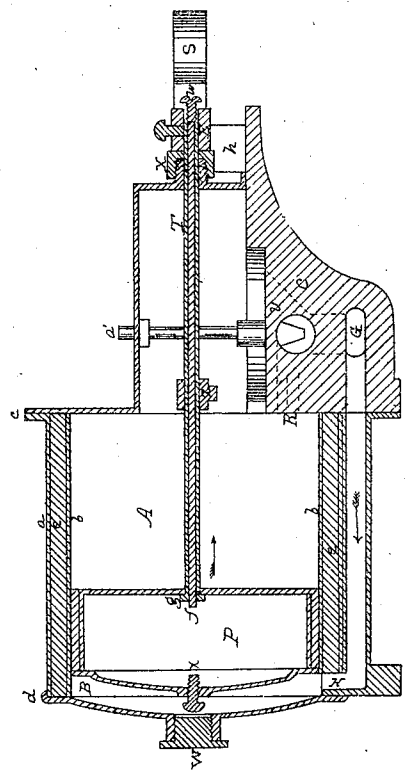

Fig. 2

Witnesses

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Inventor

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PHINEHAS BALL, OF WORCESTER, MASSACHUSETTS.

Letters Patent No. 73,430, *dated January* 21, 1868.

IMPROVEMENT IN WATER-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, PHINEHAS BALL, of the city and county of Worcester, and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Water-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 drawings, forming a part of this specification, in which—

Figure 1 represents a plan view of the meter, with the top of the shell or case removed.

Figure 2 represents a vertical and longitudinal central section.

Figure 3 represents a section on line A B, fig. 1.

Figures 4 and 5 represent horizontal sections of the valve, showing the various positions of the parts and direction of the passing fluid; and

Figure 6 represents a plan view of the springs in a reverse position from that shown in fig. 1.

The peculiarity of my meter consists in its being a single piston or measuring-cylinder meter, the cylinder being constructed without the expensive process of first boring it and then grinding the metal piston in after being accurately turned to near a fit, the water being admitted and reversed from end to end by a single valve, operated partly by the pressure of the water, and partly by springs so arranged as to pass the valve over the centre, when it, the valve, has been so far closed as to shut, or nearly so, the water from the end of the cylinder, which is then receiving the force of the water, and thus produce a change in the flow of the water from end to end of the measuring-cylinder.

The mode of its construction is as follows: The measuring-cylinder *c d*, figs. 1 and 2, is made of a cast-iron shell, lined with drawn brass or copper tubing, *b b*. This lining is held in the iron case by being packed in the joint *e e*, figs. 1 and 2, with Roman cement, asphaltum, lead, or type-metal, or similar materials, and is still further confined in position by the head resting upon the end of it when bolted to the cylinder-case by the bolts *o o*, fig. 3, at the packed joint *c c*, figs. 1 and 2. The port G, figs. 1, 2, and 3, which communicates with the valve V and the end of the cylinder B, is formed in the cast-iron cylinder case, when it is made passing beyond the end of the brass lining by a projection on the end, as seen at H. The piston P is made of cast iron, or other metal, is cast hollow to admit the valve-rod T to pass up to the striking-pin *x*, by which means the length of the stroke of the piston is obtained, the valve-rod T not being attached to the piston P, the length of the stroke of the piston being limited to the distance between the end of the valve-rod T and the end of the screw-pin *x*, increased by the travel of the valve-rod T, which is required to throw the valve V. The travel of the piston may be adjusted by the screw-pin *x*, which can be reached for adjustment by simply withdrawing the nut W′, or by the rod *f*, which passes through the valve-rod T, and can be regulated by the screw *i* in the end of the valve-rod T. The piston P is, otherwise than above described, constructed and packed like common pump, air, or air and steam-engine pistons. The valve V is an angular valve, ground and fitted water-tight on the seat. The ports in the valve and seat are shown in figs. 4 and 5. The passage M is the inlet, and the passage N the outlet of the water. In fig. 4, the water is entering by the port D, and passing out of the port G, and filling the end of the cylinder B, while the water in the end of the cylinder A is being discharged by the ports I and L through the outlet N. In this position of the valve, the port F is covered and closed on the valve-seat C. When the valve is changed to the position shown in fig. 5, the water is entering the end of the cylinder A by the ports I and L, and is being discharged from the end, B, by the port and passage G and the port F, the port D being closed on the seat. The water enters and discharges from this valve in such manner as to balance it quite accurately; and when the port I is carried over the blank space O, and the water is entirely shut off, the blank part, J, of the valve, between the ports D and I, always receives the force of the water from the inlet-tube at the point K, and has an equal pressure in each motion of the valve, whether from left to right, or the reverse, and at the moment when it is being reversed by the power of the springs S S. The motion of the valve in reversing the course of the water is produced by the combined action of the water acting upon the piston P, and the springs S S and levers W W. The levers W W are attached by flexible joints to springs S S, and also to the hub E, fastened on the end of rod T, after it has passed through the packing-box X. The piston being in position, as seen in fig. 2, the valve is so set as to carry the water through the port G to the end B, and at the same time is emptying the end, A. When the screw *x* in the piston P reaches the end

of rod *f* in the valve-rod T, it then drives the valve-rod forward, moving the actor Z, which is fastened to the rod, over the space on the rack *w* from the pin 1 to pin 2, during which motion the valve-rod has compressed the springs S S, by means of the levers W W, about three-quarters of the distance between the point of rest and the line E F of the central equipoise, and during the remainder of the distance the actor Z, communicating the power of the water acting upon the piston to the valve V, through the geared rack *u*, to the geared edge of the valve V, commences the operation of reversing the ports of the valve, and when the levers W W have passed the central line of equipoise E F, the springs S S, having received their greatest compression communicated to them from the moving piston P through the valve-rod T, expand and complete the operation of reversing the valve V, the rod T and levers W W being moved into the position shown in fig. 6 by the power of the springs S S, in which position the travel of the piston P is reversed, and when it reaches collar 8 on the valve-rod T, the operation just described is repeated in a reversed order, and the levers are brought back to the position in fig. 2, and the entire operation of action and reaction in the working of the piston is completed. The valve-rod is packed and made water-tight by the packing in the stuffing-box X. Springs of different form from those shown in the drawings may be employed to throw the rod T to operate the valve and change the direction of the water.

Some of the advantages of my mode of constructing and operating water-meters are as follows: They can be constructed more economically, as regards material and labor; the important and delicate working-parts being upon the outside, they are readily cared for and changed, even without disturbance of the body of the meter; the facility with which the length of the measuring-stroke of the piston can be controlled, and thus adjusted to the count of the registering-apparatus which is to be attached to the projecting end of rod T in any desirable and proper manner. The small surface of the valve, which reduces the liability and amount of leakage, is also of considerable importance.

Having described my improved water-meter, what I claim therein as new, and of my invention, and desire to secure by Letters Patent, is—

1. The hollow piston P, in combination with the valve, bar, or rod T, arranged to slide within said piston, substantially as and for the purposes set forth.

2. The springs S S, or other equivalent device, compressed by the power acting upon the piston within the cylinder, so that when they reach the central line of equipoise, they react and release the valve, substantially as set forth.

3. The combination of the springs and valve, bar, or rod with the valve and gearing, or racks for actuating the same, under such an arrangement that the compression of said springs shall take place partially or wholly during the time the valve remains at rest, substantially as set forth.

4. The arrangement of the adjusting-rod *f* within the valve, bar, or rod T, whereby the length of the stroke of the piston is readily adjusted, substantially as set forth.

5. The combination of the angular valve V and ports formed in the cylinder-case, as described, of the piston, valve-rod, springs, and gearing for actuating said valve, substantially as and for the purposes set forth.

PHINEHAS BALL.

Witnesses:

THOS. H. DODGE,

GEO. H. MILLER.