F. S. BALDWIN.

Piston Water-Meter.

No. 211,686. Patented Jan. 28, 1879.

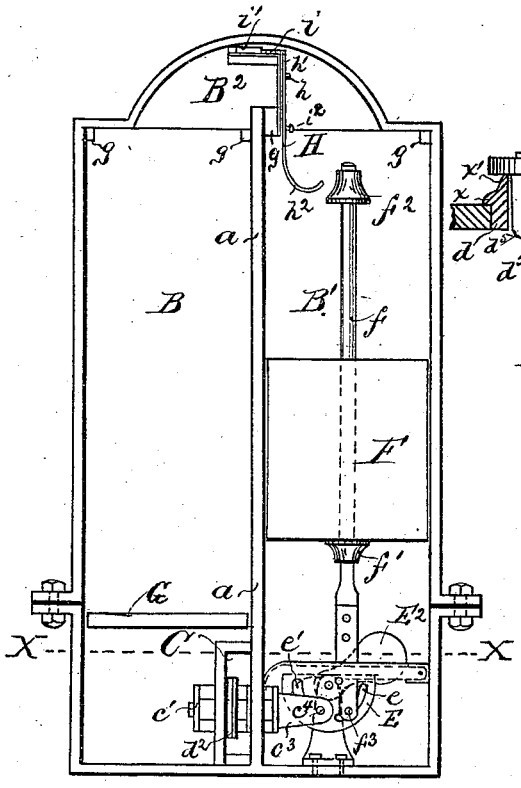

Fig. 1.

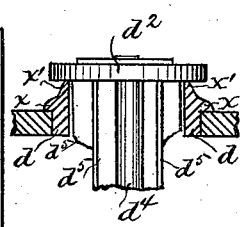

Fig. 4.

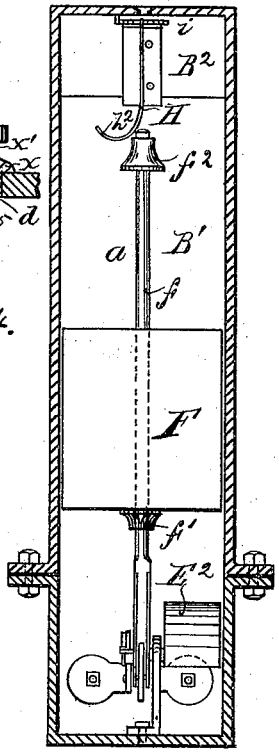

Fig. 2.

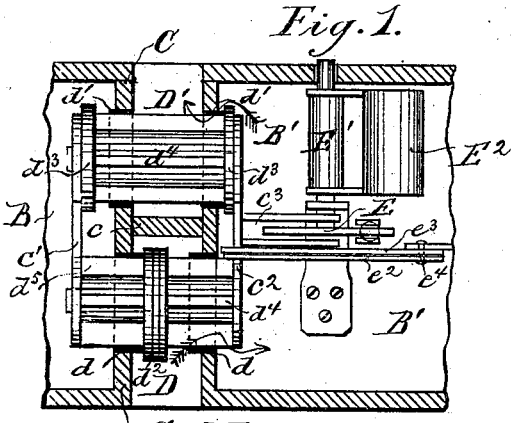

Fig. 3.

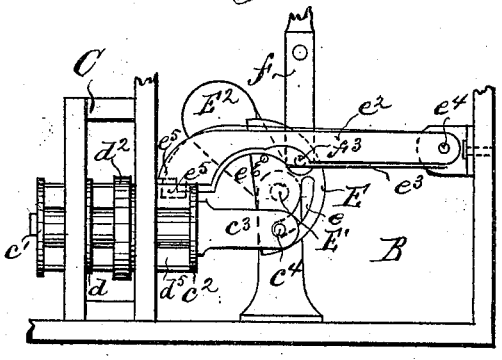

Fig. 5.

Witnesses;
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UNITED STATES PATENT OFFICE.

FRANK S. BALDWIN, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-FOURTH HIS RIGHT TO AMBROSE S. EVERETT, OF SAME PLACE.

IMPROVEMENT IN PISTON WATER-METERS.

Specification forming part of Letters Patent No. **211,686**, dated January 28, 1879; application filed November 6, 1877.

To all whom it may concern:

Be it known that I, FRANK S. BALDWIN, of St. Louis, in the county of St. Louis and State of Missouri, have invented an Improved Water-Meter, of which the following is a specification:

The object of my invention is to produce a water-meter that will measure accurately and record the quantity of water passing through the same under all conditions of varying pressures and different speeds of delivery, and at the same time to avoid the cutting or abrasive action of the sand or grit contained in the water upon the working parts, and also to prevent the clogging of the meter by the settling of the sediment.

I will first fully describe my invention, how it is constructed, and how it operates, and, lastly, point out the novel features thereof in the claims.

Of the drawings, Figure 1 is an elevation of my improved meter with the front face of the casing removed. Fig. 2 is a side elevation with side of the casing removed. Fig. 3 is an enlarged top sectional plan on line X X. (See Fig. 1.) Fig. 4 is a section of the valve-seat and its valve. Fig. 5 is an enlarged front elevation of the operating parts in Fig. 1 in adjusted position, the parts referred to being contained in the bottom of the casing.

The meter is divided by a stationary partition, *a*, (see Figs. 1, 2,) forming the two air-chambers B B^1, which communicate with each other at the top by the opening B^2. (See Fig. 1.) Further, the meter contains a hollow abutment, C, divided by a partition, *c*, forming the respective receiving and discharge water-chambers D D′, (more clearly shown in Fig. 3,) and which are properly connected, the former with the supply, the latter with the delivery, pipe. Each of the chambers D D′ further communicates, by means of a circular opening, with both air-chambers B B^1, (see Fig. 3,) the said respective openings being controlled by valves so arranged that the pressure of the water holds them firmly to their seats.

I arrange the valve-seats *d d* to face each other inside the receiving-chamber D. (See Fig. 3.) I arrange the like seats d^1 d^1 of the discharge-chamber D′ to be in opposite directions. (See Fig. 3.) By the said arrangement one valve is contained in the receiving-chamber, and two valves operate outside of the discharge-chamber.

d^2 is the valve to control the seats *d d*, and d^3 d^3 are the valves to control the seats d^1 d^1, said valves being mounted on short spindles d^4, which, passing through guide-wings d^5, are secured at their ends to the yokes c^1 c^2. The valves being thus secured are nearly balanced, and move freely together right or left, and, by this arrangement, when pressed against their seats, establish communication for their respective chambers with the opposite air-chambers.

The cutting of the valves and seats being principally caused by the water (carrying the sand or grit) being forced through the narrow aperture existing when the valves are not properly seated, I therefore employ a soft elastic valve and a seat of some hard substance, like glass or porcelain. These latter features are more clearly represented in Fig. 4, in which *d* represents a glass or porcelain seat, and d^2 the soft-rubber valve. At *x* the seat *d* has an annular shoulder bearing against the wall of the abutment C. Further, from the shoulder *x* to the annular edge *x′* the annular face of the seat I form to have the curved bevel shown in Fig. 4, so as to achieve, first, a narrow bearing-edge, *x′*, for the valve to press against; secondly, by means of the bevel feature, to cause the rubber of the valve so impinging its seat to spread or stretch over the bevel surface, preventing the lodgment of any large particles between said valve and its seat. The valve closing on the seat forces the particles of grit, &c, off the seat, and at the same time embeds itself on the seat, thus preventing leakage.

The yoke c^2 has an arm-socket, c^3, which, by pin c^4, connects the valves to a disk, E, which forms part of a rock-shaft, E^1, and which carries the weight E^2. (See Figs. 1, 2, 3.)

The disk is to be operated by the means hereinafter to appear, so as to impart a partial rotation to rock-shaft and weight, lifting the latter to a position so as to drop by gravity and produce a sudden closure of the valves. The slots *e* e^1 in the disk E (see Figs. 1, 5) are

to permit the weight to drop suddenly, as just stated, and press the valves firmly against their seats.

To prevent the movement of the valves while the weighted lever is being lifted during the reverse movement, I employ the keepers e^2 e^3, pivoted to the case at e^4, and each having notches at e^5, which engage the yoke c^2, thus holding the valves stationary. When the weighted lever has passed its center of gravity and is ready to fall, a pin, e^6, on the disk E lifts the keeper (that is in engagement with the yoke) out of engagement. The weight falling, the valves are shifted, and the second keeper engages the yoke, holding the valves firmly until the reverse movement releases it in like manner.

It is obvious that the partial rotation of the shaft E^1 can be accomplished in several ways. The method I employ in this instance is by means of a float, F, in the air-chamber B^1, sliding freely upon an upright rod, *f*, having the stops f^1 f^2, and connected by pivot f^3 (which passes through the slot *e*) to the disk E. (See Figs. 1, 2.)

When the water rises in the air-chamber B^1 the float is carried up until it strikes the stop f^2, and lifting the rod *f* causes the part rotary action of the shaft E^1 to take place, lifting the weight E^2 until its center of gravity is passed, which falling changes the valves.

When the water falls in the air-chamber B^1 the float falls down the rod until it strikes the lower stop, f^1, when by its own gravity the float causes the rod to be pressed downward, which action rotates the weighted lever in the opposite direction in the like manner.

My meter being so far constructed and arranged, the more complete operation of the device is as follows: The stop-cock of the delivery-pipe is closed to prevent the air from escaping in starting. The weight of the float resting upon the lower stop of the rod has thrown the valves in the position shown in Figs. 1, 3, the air-chamber B^1 being in communication with the receiving-chamber D, but closed from the chamber B. If, now, the supply-cock be opened the water will flow through the receiving-chamber D into the air-chamber B^1, and as the water rises in this chamber it lifts the float and drives the air over into the chamber B, compressing said air to one-half its former volume. When the float reaches the highest stop the valves are simultaneously shifted, so as to close the communication between the receiving-chamber with the chamber B^1, but open said receiving-chamber to the chamber B. (See Fig. 5.) The water will then rise in B, still further compressing the air until its elastic force is equal to the pressure of the water, when the water will cease to flow, and the meter is ready for operation.

If, now, the stop-cock of the delivery-pipe be opened the water in the chamber B^1 will flow out through the discharge-chamber D′ into the delivery-pipe, while the water at same time from the supply flows into the chamber B, and, driving the compressed air over into B^1, thus forces the water out of same. The discharge of the water from B^1 takes place until the float has reached the stop f^1, when the valves are changed to original position, and the water again flows into B^1, forcing the water out of B in like manner.

It will be observed that while the volume of air contained in the chambers B B^1 will vary with the pressure of the water, the quantity of water discharged is governed entirely by the distance the float travels in the chamber B^1, thus insuring an accurate measurement under all pressures or velocities of delivery. The chambers B B^1, at their upper ends, are provided with shoulder-bearings *g*, (see Fig. 1,) and the air-chamber B with a smaller float, G. The just-mentioned parts are precautionary means to prevent the water from flowing over the partition *a* in case the air-column intervening between the water-discharge and inlet-column is not sufficient to act as the intermediate body in the manner before described. Thus in case the water in B rises higher and higher, and the air contained should be insufficient to allow the float F to travel its full distance, then the water rising in B will buoy the float G to the top, abutting against the bearings *g*, and check the passage of the water from passing over the partition *a*. In like manner the float F serves the same function in the chamber B^1. Hence, if from any cause the air-column becomes rarefied or insufficient to permit the float F to travel its full distance, or if the valves should become disarranged, the floats in the respective chambers will act as check-valves, giving warning that the meter is out of order.

The registering device can be either operated from the rock-shaft or, as here shown, by means of a lever-rod, H, operated by the float F. (See Figs. 1, 2.) The lever-rod H has its fulcrum at *h*, its short arm, h^1, engaging the gearing of the registering device, while its long arm, h^2, terminates with a hook projecting to one side of its vertical part. (See Figs. 1, 2.)

I have here only shown that part of the registering device operated by the lever H. It is a gear, *i*, in the teeth of which the short arm of the lever engages, a pawl, i^1, holding the gear after every action of the lever. The float F strikes the hook-shaped arm of the lever H, raising it sufficiently to cause its short arm, h^1, to turn the gear *i* the distance of a tooth, and when said lever is released it drops to original position against a stop at i^2. Any well-known registering device ordinarly used for this class of devices can be applied.

What I claim is—

1. The disk E, having slots *e* e^1, as and for the purpose set forth.

2. The combination of the disk E, rock-shaft E^1, its weight E^2, with the rod *f*, having stops, and the float, to operate said weight in the manner and for the purpose set forth.

3. The combination of the keepers e^2 e^3 with

a yoke, c^2, to operate as and for the purpose set forth.

4. The combination of the keepers e^2 e^3, the yoke c^2, the disk E, having pin e^6, the rock-shaft E^1, and its weight E^2, by means whereof said keepers are operated in the manner set forth.

5. The bearings g, provided in the air-chambers B B^1, having the open passage B^2, in combination with one or both the floats F G, to operate as check-valves.

6. The lever-rod H, having hook-shaped arm h^2, short arm h^1, in combination with the gear i, pawl i^2, as and for the purpose set forth.

7. The gear i, pawl i^2, the lever-rod H, in combination with the float F, contained in a water-meter, to operate as and for the purpose set forth.

In testimony of said invention I have hereunto set my hand.

FRANK S. BALDWIN.

Witnesses:

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JOHN W. HERTHEL.