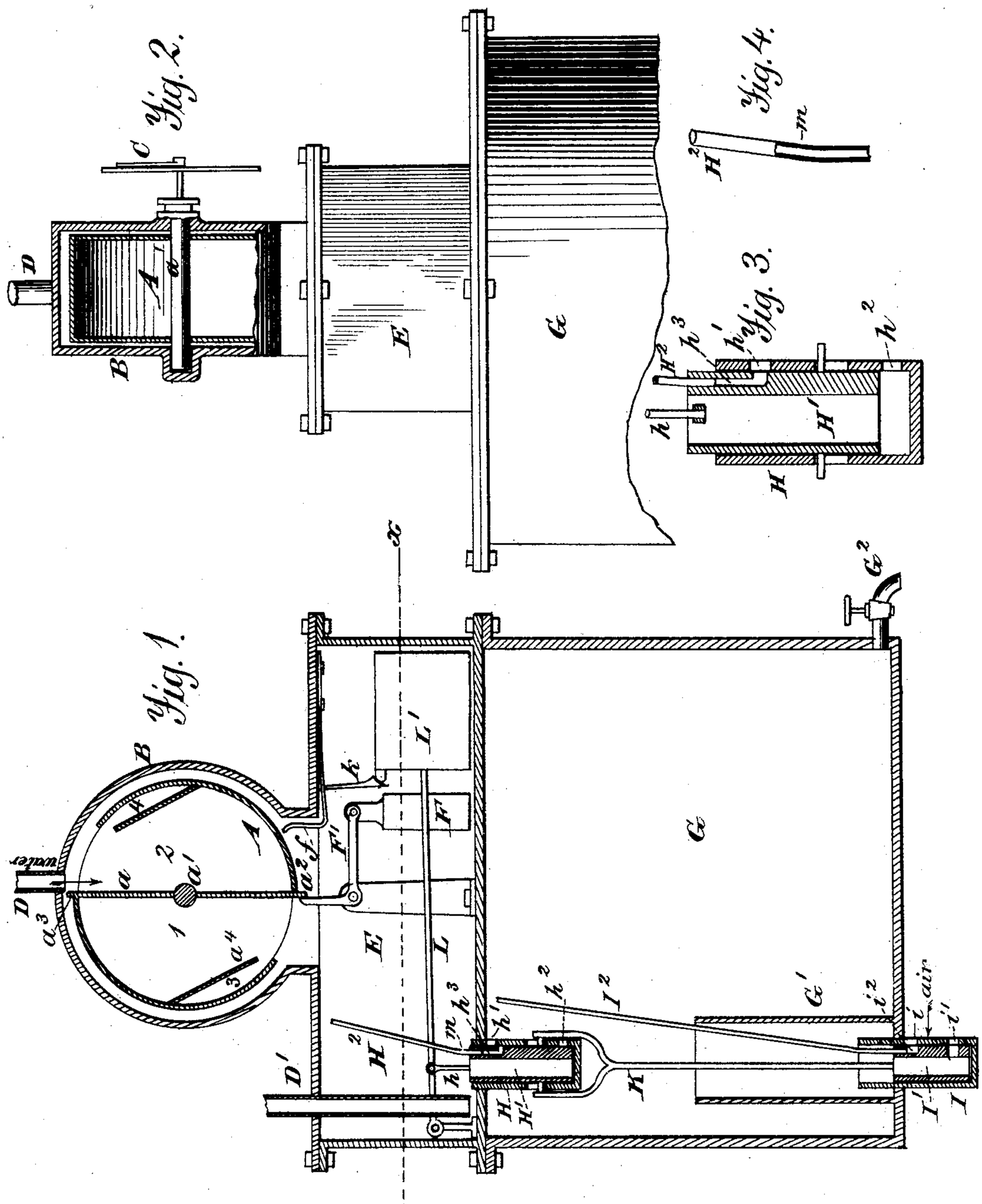
(No Model.)

W. L. HORNE.

Water Meter.

No. 243,561. Patented June 28, 1881.



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WATER-METER.

SPECIFICATION forming part of Letters Patent No. 243,561, dated June 28, 1881.

Application filed June 19, 1880. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. HORNE, a citizen of the United States, residing at West Meriden, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Water-Meters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to meters for measuring liquids under pressure, and more especially to water-meters operating with a measuring-vessel containing two or more buckets of definite capacity, which buckets are successively filled and emptied by the flow of the water.

My improvement consists in mounting the measuring-vessel in a chamber containing a volume of compressed air in that part where said measuring-vessel is suspended, and combining said air-pressure chamber with an air-pump, which is automatically stopped and started for compensating the loss or waste of air from said chamber by fresh supplies of air as fast as needed, so that the measuring-vessel may operate in air at a pressure equal to the pressure or head of the water.

Figure 1 is a transverse vertical section of my improved meter. Fig. 2 is a partial side elevation thereof, showing the measuring-vessel and its casing in axial section. Figs. 3 and 4 are views of some details.

The same letters of reference are used in all the figures in the designation of identical parts.

The measuring-vessel A shown is a wheel containing two buckets, 1 and 2, divided by an axial diaphragm, *a*, and secured to an axle, *a'*, mounted in the front and rear walls of the casing B, through the front wall of which the axle projects to operate through suitable means upon any preferred registering apparatus, C, adapted to record the number of gallons of water measured by the measuring-vessel. The casing B stands upon and has a large opening in its bottom to connect it openly with the top of the chamber E, together with which it constitutes the air-pressure chamber. The supply-pipe D conducts the water from the main to the measuring-vessel. The filling of one bucket of the measuring-vessel causes it to turn a half-revolution, so as to bring the opening of its empty bucket under the supply-pipe at the same time that its filled chamber is discharging its contents through the open bottom of casing B into chamber E. The measuring-vessel is combined with a weight, F, to hold it from turning until the filling-bucket will overbalance the weight, when the vessel escapes from the influence of the weight and makes its half-turn. The weight is suspended from the horizontal arm of an elbow-lever, F', the vertical arm of which is adapted to bear against one or the other of the projections a^2 and a^3 on opposite sides of the measuring-wheel, so as to hold the buckets thereof successively in position for receiving water from the supply-pipe D. In practice the weight is so made and hung as to always remain immersed in the water in chamber E, and so as to have its descent limited, in order that the vertical arm of the elbow-lever F' may always be in position to engage the projections a^2 and a^3.

At the periphery or outer side of the measuring-vessel each bucket thereof is constructed with a partition, a^4, whereby cups 3 and 4 are formed therein. These cups do not begin to receive water until the bucket has about filled and already nearly counterbalances the weight F. The remaining water needed to overbalance the weight flows into the cup, and being thus applied at the periphery serves to make the measuring-vessel sensitive in its action, and to produce the required impact for readily releasing the vessel from the elbow-lever F. For this reason said cups 3 and 4 may be termed "impact-cups." A spring-pawl, *f*, is used to prevent the return motion of the vessel by the emptying bucket beyond a point where the opening in the filling-cup would pass the supply-pipe. The volume of air confined in the air-pressure chamber will be such as to have the chamber E thereof filled with water up to about the dotted line *x x*. The service-pipe D' dips into chamber E to near the bottom thereof, so as to have its lower end constantly immersed in the water in chamber E. The air-pump for maintaining the required amount of air in the air-pressure chamber is, in this in-

stance, an automatic contrivance which is adapted to compress inhaled external air by a column of water supplied from the main through the meter. To this end a box, G, of proper capacity, is connected with the air-pressure chamber of the meter. This box is preferably placed directly under said chamber, as shown in the drawings, although its particular arrangement is of no special moment. Communication from box G to chamber E can only be had through, and is controlled by, a piston-valve composed of the barrel or cylinder H and the hollow piston H′, provided with the air-pipe H^2, for conveying the compressed air into the upper part of chamber E. This is the eduction-valve of the air-pump. A similar piston-valve, composed of the barrel or cylinder I and the hollow piston I′, with air-pipe I^2, is arranged in the bottom of box G, and constitutes the induction-valve of the air-pump. The pistons H′ and I′ are connected for united movements by the connecting-rod K. The piston H′ is connected by a link, *h*, to a lever, L, in chamber E, the long arm of which lever carries a float, L′. The valves are operated by this lever and float, with the latter of which a light spring-catch, *k*, is combined, for a purpose which will be presently explained. The barrel H of the eduction-valve has an air-port, h', and a water-port, h^2, both opening into box G, and controlled by the piston H′, which has an air-passage, h^3, in its wall leading to the air-pipe H^2. The barrel I of the induction-valve has an air-port, *i*, and a water-port, *i*′, both outside of said box G, and controlled by the piston I′, which has an air-passage, i^2, in its wall, leading to the air-pipe I^2, and below it another passage, which registers with an opening in cylinder I, for the purpose of permitting the water to flow out of chamber G while air is entering through passage i^2. The float is so constructed that its buoyancy is a little in excess of its weight.

The meter will operate as follows: Before water is admitted to it from the main the valves will be in the position shown in Fig. 1, the ports of the induction-valve being open, while the ports of the eduction-valve are closed. The cock in the service-pipe should be closed before turning the water on from the main. The water, having then been turned on, passes through the measuring-vessel—which records the quantity measured by it—into the chamber E, and very soon covers the end of the service-pipe and gradually rises to the line *x x*. As soon as it rises beyond that line the float tends to rise by reason of its buoyancy, but is at first held down by the spring-catch *k*. Very soon, however, it becomes immersed to that extent that its buoyancy overcomes the power of the spring-catch and it flies up, opening the eduction-valve and closing the induction-valve. This establishes a communication, both from the air-space and from the water-space of chamber E, to the box G. An equilibrium of air-pressure is at once established in chamber E and box G, and water flows from chamber E into box G. This flow, which is less than the supply to chamber E from the supply-pipe, continues until the pressure of the air in box G and chamber E equals the pressure or head of the water, and sufficient air at that pressure has passed into chamber E to depress the water therein to the level indicated by line *x x*. As soon as the water sinks to that line the float and lever will close the eduction-valve, so as to shut off communication between chamber E and box G. The induction-valve will be opened at the same time, to allow an escape of water from box G and an influx of air thereto. The measuring-vessel is now suspended in a volume of compressed air, which prevents a flow of water from the supply-pipe so long as the service-pipe remains closed. Whenever the service-pipe is opened water will flow, but the air will remain confined under a pressure maintained by the water itself. There is a constant loss of air occasioned by its absorption by the water. As soon as this loss diminishes the volume of the air so much as to cause a rise of the water beyond the line *x x* in chamber the float will again fly up, and thus start the air-pump, to again increase the volume of air in chamber E to the determined quantity.

In order to prevent escape of air from chamber E to box G (at times when communication between them is shut off) through air-pipe H^2, I form a small hole, *m*, in its lower end, which is immersed in water, so that it may be sealed with water.

To prevent the expenditure of more water by the air-pump than is absolutely necessary, I surround the induction-valve thereof by a pipe, G′, reaching up some distance into the box, so that a portion of the water used for the first charge of air may remain in the box.

If it should at any time become necessary to compress a volume of air, taking the whole box, the reserve water therein may be drawn off through a cock, G^2.

The supply-pipe D should be provided with a check-valve.

Having thus described my invention, what I claim as new is—

1. The combination, substantially as before set forth, of an inclosed measuring-vessel, an air-pressure chamber in which said measuring-vessel is mounted, an air-pump for automatically forcing air into the air-pressure chamber, and automatic means for starting and stopping the air-pump.

2. A measuring device for liquid-meters, consisting of a suspended rotating vessel divided into two equal parts by a diaphragm or partition, each of said measuring-compartments being provided with a passage for the water to and from them, and with a pocket arranged upon the interior surface thereof, for receiving a quantity of liquid when the measuring-compartment is nearly full, for the purpose of aiding in producing the required ro-

tative movement of the vessel, substantially as set forth.

3. The combination, in a liquid-meter, of a float, L′, placed in a chamber, E, containing air and water, a valve, H, for controlling the passage of air from said chamber to a chamber, G, and a valve, I, for controlling the admission of air to, and the discharge of water from, the chamber G, the parts being arranged substantially as set forth, whereby they are made to admit the air to the chambers E and G, and discharge the water therefrom in regulated quantities and at such times only as are required for the operation of the device, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WM. L. HORNE.

Witnesses:
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