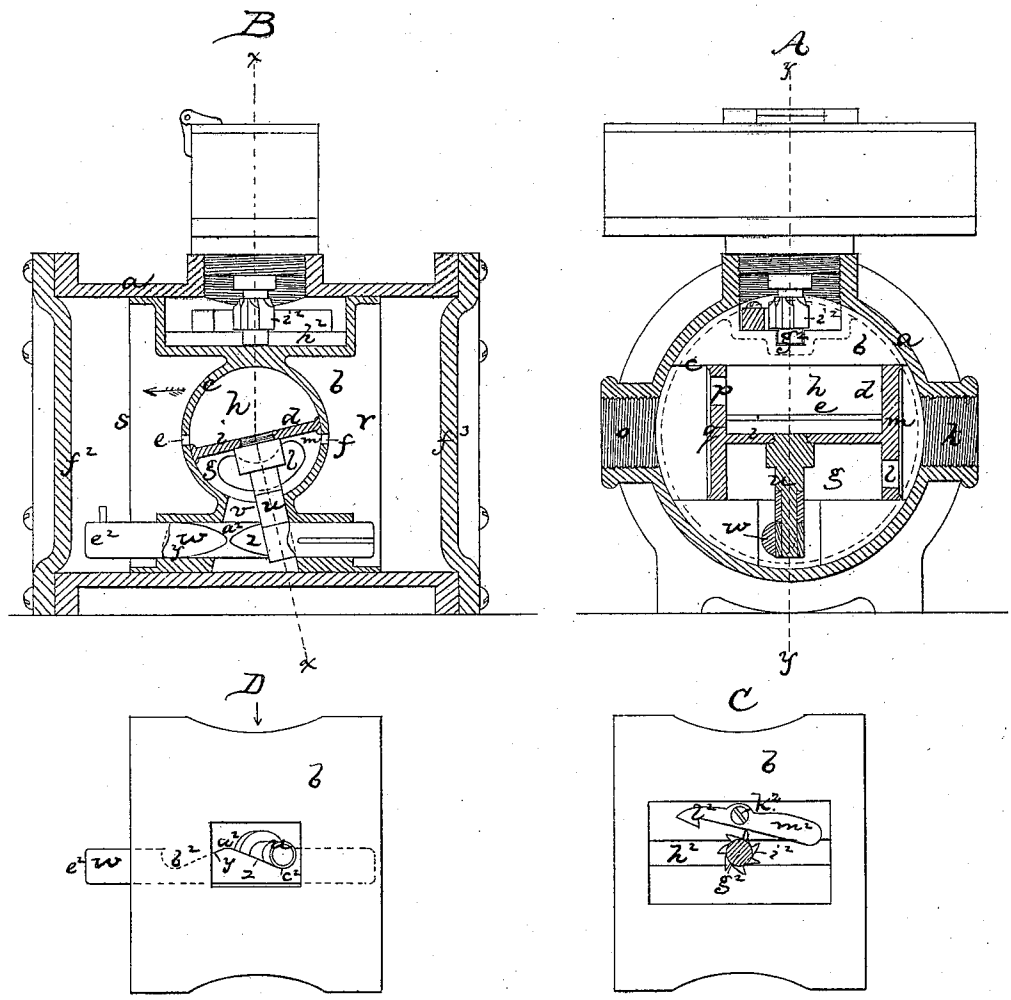
H. F. WHEELER & T. W. LANE.

Water-Meters.

No. 127,942. Patented June 11, 1872.



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UNITED STATES PATENT OFFICE.

HENRY F. WHEELER AND THOMAS W. LANE, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN WATER-METERS.

Specification forming part of Letters Patent No. 127,942, dated June 11, 1872.

To all whom it may concern:

Be it known that we, HENRY F. WHEELER and THOMAS W. LANE, both of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Water Meters and Motors; and we do hereby declare that the following, taken in connection with the drawing which accompanies and forms part of this specification, is a description of our invention sufficient to enable those skilled in the art to practice it.

Our invention relates particularly to the construction or arrangement of mechanism of that class of water meters or motors in which a reciprocating piston is used, said piston having a diametric valve-cylinder, in which is a reciprocating and rotatively-moving piston-valve.

In our invention we make the valve-cylinder with only one port upon each side, each port being alternately an inlet and an outlet port; and in one of the heads of the piston-valve we make an inlet-port, and in the opposite head an outlet-port, the inlet and outlet spaces of the piston being separated by a diametric partition. The piston has two chambers or compartments—an inlet-chamber and an outlet or exhaust chamber—each of which alternately communicates with each port of the valve-cylinder, the inlet-chamber first opening into one of the ports and the outlet into the other, and then the inlet opening into the last port and the outlet into the first, a reciprocating rocking movement of the valve or valve-partition effecting the alternate communications, the operation being as follows: When the main piston (or the piston of the main chamber) is moving in one direction the piston-valve is stationary as respects the valve-cylinder, and the cylinder-port at the side, corresponding to the direction of movement of the main piston, opens into the exhaust-chamber of the piston-valve, the water flowing through these ports and through the exhaust-space of the piston-valve out through one end of the valve-cylinder and through the outlet of the meter, the water escaping by reason of the pressure of the moving piston against it. At the opposite side of the piston-valve the inlet-chamber of the valve opens into the cylinder-port, and water passes into the inlet of the meter-cylinder through the inlet-port in the head of the piston-valve, through the cylinder-port, into the corresponding end of the meter-cylinder, in which, having no outlet, its pressure is exerted to move the piston toward the opposite end of the cylinder. This being the general operation, or the course of the water into one end of the cylinder and out from the other, it remains to shift the movement of the piston, so that the water shall flow continuously into and from the meter, first into one end and from the other, and next from the one and into the other; and it is to the method of producing the change in position of the piston-valve, to effect the change in the direction of the water, that our invention particularly relates.

In all other meters of this kind, or in which an endwise reciprocating and rotatively-reciprocating piston-valve has been used, the change in position of the valve has been gradually effected by independent ports; and such constructions are not reliable, either as motors or as meters, the piston being liable to come to a stop during the rotative movement of the piston-valve.

In our construction the pressure of the water always tends to force the piston-valve in one direction, and the water flows into and from each respective end of the cylinder through the same valve-cylinder port; and to effect the shifting of the valve we employ a slide-pin, passing through the main cylinder in position to connect with a pin extending radially from the center of the piston-valve, this slide-pin having two inclines extending from one point and terminating at their opposite ends in recesses, into either of which fits the pin extending from the piston-valve, or a ring or roll at the end of said pin, the end of the slide-pin toward the head, in the direction of advance movement of the main piston, extending beyond the piston. The pressure of the inlet-water presses the valve-pin at all times against the slide-pin, and as the piston advances the valve and main piston remain relatively immovable by reason of this pressure. When the projecting end of the slide-pin strikes the main cylinder-head the pin stops, and the valve-pin then rides up the incline, against which it lies, reaching and passing the apex just as the cylinder reaches the end of its stroke. This movement of the valve-pin causes the valve to move endwise in the valve-cylinder, but does not change the relative positions of the ports; but

when the valve-pin passes the apex of the inclines the pressure of the water upon the piston-valve throws it down the opposite incline, in and by which movement the valve is turned and the ports shifted, opening communication between the inlet and the end of the cylinder against which the piston is brought, and between the outlet and the end of the cylinder which has been filled.

The drawing represents a meter or motor mechanism embodying the invention.

A shows a transverse section on the line *x x*. B is a section on the line *y y*. C is a top view of the main cylinder-piston. D is a bottom view of it.

a denotes the main cylinder; *b*, the main piston. Said piston is cast with the cylindrical chamber or valve-seat *c* extending diametrically through its center; and in this chamber is placed the piston-valve *d*, said valve being so fitted and arranged that it can move endwise in the valve-chamber, and can also turn rotatively therein. On opposite sides of the valve-chamber or case are two ports, *e f*, opening into opposite ends of the main meter-chamber; and the piston-valve chamber is made in two parts or compartments, *g h*, separated by a valve-partition, *i*, the lower space, *g*, being an inlet-space, into which at all times the inlet-tube *k* of the meter or motor opens through an opening, *l*, in the valve-head *m;* and the opposite compartment, *h*, being an outlet or exhaust space, opening at all times to the outlet *o* through an opening, *p*, in the valve-head *q*. When the valve is in position for the inlet-space *g* of the piston-valve to communicate with the space *r* of the main cylinder through the port *f*, it is also in position to cut off communication between said space *g* and the opposite port *e*, as seen at B, said port *e* opening communication between the outlet-space *h* of the piston-valve and the opposite end space *s* of the main cylinder; and when the position of the valve is reversed by turning it upon its seat the port *f* and the adjacent cylinder-space *r* will communicate with the outlet-space *h* and the outlet *o* of the cylinder, and the port *e* and inlet-space *s* will communicate with the inlet-chamber *g* of the piston-valve.

Extending centrally from the piston-valve is the radial pin *u*, which passes through an opening, *v*, that permits it to oscillate, the end part of the pin extending down by a slide-pin, *w*, that slides in a suitable guide-passage made in the main cylinder. Stops may be used to limit the extent of movement of the slide in either direction, and a feather-and-spline connection may keep the slide from rotating. This slide is made with two inclines, *y z*, as seen at D, meeting at a^2 and terminating in the two recesses b^2 c^2; and as the pressure of the water is always upon the valve in the direction of the arrow, seen at D, it will be obvious that whenever the pin *u* is beyond the point a^2, in either direction, the pressure will carry the pin to the bottom of the corresponding incline and into the recess at the foot thereof, by which movement the valve will be turned either to the position as seen at B or to a reverse position, as the case may be.

The parts being in the position shown at B, the piston *b* will be moving in the direction of the arrow, as seen at B, water flowing into the cylinder-space *r* through the inlet *k*, opening *l*, valve-compartment *g*, and port *f*, and escaping from the opposite cylinder-space *s* through port *e*, exhaust-space *h*, exhaust-opening *p*, and outlet-tube *o*. The piston *b*, piston-valve *d*, ports *e f*, pin *u*, and slide *w* remain in relative position, as seen at B, until the end e^2 of the slide *w* strikes the head f^2 of the main cylinder; and when the slide *w* (by the movement of the piston *b*) does strike the head f^2 the slide stops, and the continued movement of the piston *b* causes the valve-pin *u* to be pressed forward by the incline *y* advancing against it. This forward movement of the pin extends to the piston-valve *d*, which moves in the valve-cylinder against the pressure of the water, but does not turn, the position of the valve and ports remaining the same until, by the completion of the stroke of the piston *b*, the apex a^2 of the inclines on the slide *w* is carried to and just beyond the line of the axis of valve-pin *u*. Then the pressure of the water will force the pin down the opposite incline *z* to the recess at the foot thereof, and in accomplishing this the valve will be turned, reversing the communications of the ports *e f* and inlet and outlet spaces *g h*, so that the port *e* is in communication with the inlet-space *g* and becomes an inlet-port, and the port *f* is in communication with the space *h* and becomes an exhaust-port; the movement of the piston *b* being then reversed and the opposite end of the slide *w* projecting beyond the piston, so that it in turn will strike the head f^3 and effect the change in position of the ports.

It will thus be observed that no change of the valves with relation to the ports takes place until the completion of the movement of the main piston, and that the change is then positively effected by the pressure of the water, consequently the parts cannot come into a position where both ports *e f* are closed or where both are open to one space, or each open to both spaces; and no stop in the reciprocation of the piston can take place so long as there is any supply of water to the meter through the inlet *k*.

It will also be observed that no intermission or irregularity in the flow of water from the outlet can take place, for when the valve is changing the exhaust-water is being pressed from the meter by the return end movement of the piston-valve.

The parts of the engine are very few in number, and cannot be disarranged or become inoperative, and the construction is exceedingly simple and inexpensive.

To limit the rotative movement of the piston-valve in either direction, stop-pins may be employed.

When used as a meter a suitable registering

mechanism is employed, and to the main shaft g^2 of such mechanism the cylinder-piston imparts movement, as follows: Said shaft extends down into a space, h^2, in the upper side of the piston b, and bears a ratchet-wheel, i^2, fast upon the shaft. Pivoted to the cylinder by a pin, k^2, is a drag-pawl, l^2. When the pawl-hook is swung in, as seen at C, the piston is moving in a direction to bring said hook against the ratchet-wheel, striking which the hook moves said ratchet a fixed distance, and as the ratchet passes the tooth the latter presses it back to the position shown at C, so that when the piston returns the hook will not act upon the ratchet; but as the ratchet passes the tail-piece m^2 of the pawl it presses said tail-piece back, and this again presses the pawl-tooth forward into position to again engage with the ratchet, the pawl remaining in its respective positions by friction, except when so actuated by the ratchet.

We do not herein claim anything shown in H. F. Wheeler's patent, No. 123,530, February 6, 1872.

We claim—

1. In combination with the main piston b and the diametric valve-chamber or cylinder c and its ports $e\,f$, the rocking piston-valve d, with its inlet and exhaust chambers $g\,h$, said valve having the pin u, actuated by the inclines of the slide w to shift the valve, all substantially as shown and described.

2. In combination with the registering mechanism and the ratchet-shaft g^2 and its ratchet i^2, the drag-pawl l^2, having a tail-piece, m^2, the hook of the pawl turning the ratchet and being then thrown above the line of the ratchet for return movement (by the ratchet) as the main piston advances in one direction, and being thrown into position to again engage with the pawl in its next advance movement by contact of the ratchet with the tail-piece in the return movement of the cylinder, substantially as shown and described.

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