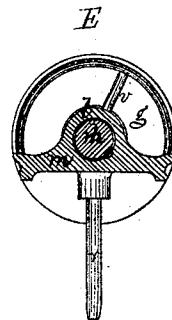
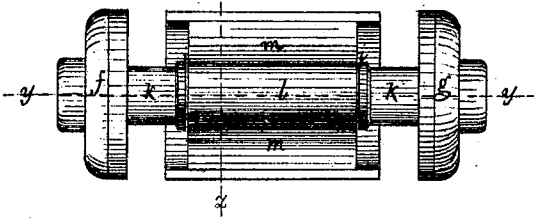
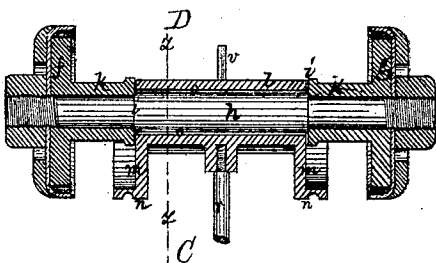
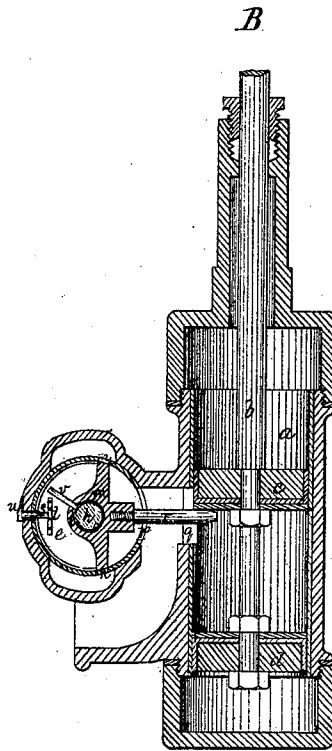
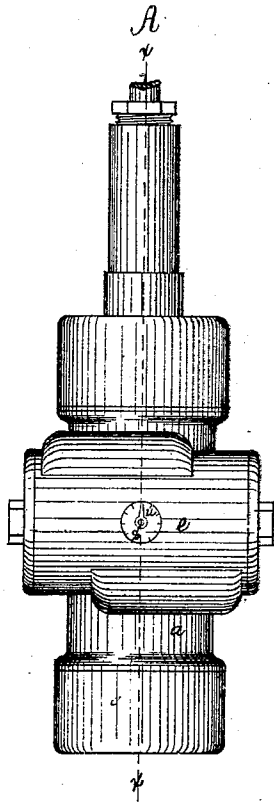


A. D. Laws,
Meter.

No. 112,722.

Patented Mar. 14. 1871.



Albert D. Laws
By his Atty's
Crish, Halsted & Gould

Witnesses { *L. B. Kidder.*
W. M. Frothingham.

UNITED STATES PATENT OFFICE.

ALBERT D. LAWS, OF BRIDGEPORT, CONNECTICUT.

IMPROVEMENT IN METERS.

Specification forming part of Letters Patent No. **112,722**, dated March 14, 1871.

To all whom it may concern:

Be it known that I, ALBERT D. LAWS, of Bridgeport, in the county of Fairfield and State of Connecticut, have invented Improvements in Hydraulic Meters and Motors; and I do hereby declare that the following, taken in connection with the drawing which accompanies and forms part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

United States Letters Patent No. 102,948 were granted to me on the 10th of May, 1870, for an improved hydraulic engine, in which engine there is employed a main cylinder and piston and an auxiliary cylinder and piston-valve, said valve having both a reciprocating or endwise movement in its cylinder and a rotating movement therein, its reciprocating movement being effected by the pressure of the water, and its rotating movement by the movement of the main-cylinder piston, the reciprocating movement of the main-cylinder piston opening and closing its ports, and the rotating movement of the auxiliary-cylinder piston-valve opening and closing its ports.

My present invention particularly relates to certain improvements in the details of arrangement and construction of the mechanism of such motors in reference to their adaptiveness for use as water-meters, and in reference to still further simplification of the organization and method of operation of such engines.

My improvement relates, first, to the construction of the valve of the auxiliary cylinder.

In said patented engine the piston-valve is shown as made with two water-tight or close-fitting pistons having peripheral ports, and connected by a cross-piece or partition, all cast in one piece. In such construction the wear upon the pistons by the reciprocating and rotating movements tends to cause leakages; and in my present improvement I obviate this by making the valve-piston in two parts, the valve proper being not integral with the pistons, but being hung between them and loosely upon the stem or rod connecting them, so that the rotative movement of the valve does not impart a similar movement to the pistons, (which reciprocate, but do not rotatively move,) and so that the wear upon the pistons does not affect the fit of the valve up-

on the valve-seat, the looseness of the valve causing the valve-face to be kept tight against the surface of the cylinder by the pressure of the water, notwithstanding its own wear and the wear of the piston-peripheries. It is in this improved construction of the auxiliary-cylinder piston and valve that the first part of my invention consists.

The next part of the invention relates to the method of effecting the rotating movement of the valve of the auxiliary cylinder by the reciprocations of the main-cylinder piston.

In my above-mentioned patented engine the main cylinder has but one piston, and into each end of the cylinder projects a dog, extending from a slide-rod, at the center of which is a shoe, that acts upon a pin extending from the piston-valve of the auxiliary cylinder, each dog being, in turn, struck by the main piston and moving the slide-rod, and thereby turning the valve. A long bearing and guides have to be made for this slide-rod and the dogs, and the latter have to be made attachable to the ends of the rod.

To remedy this somewhat complex construction, or a construction involving the necessity of numerous parts and their fitting, I now make a passage through from one cylinder to the other at the point where the cylinders cross, and extend the pin of the rotatory valve directly through into the main cylinder. Then I make the cylinder with two pistons, between which is the water-space, and these pistons, in their reciprocating movements, alternately strike against the pin, and thereby impart the rotatively-reciprocating movements to the valve. This construction constitutes the second part of my invention.

Lastly, the invention relates to the provision for working an index or meter mechanism by the rotatively-moving valve. Over the valve is a vertical shaft, extending through the meter-case, and on the outside of the case the shaft bears an index-pointer, or is connected by gearing with any suitable registering mechanism, operated by the rotation of the shaft. The lower end of the shaft bears a star or ratchet wheel, which is within the water-space of the auxiliary cylinder.

Projecting up from the top of the rotatory valve, and toward one side thereof, is a stud

or pin, which, when the valve is turned in one direction, moves endwise with the valve without touching the wheel, while, when the valve is turned in the other direction, the pin is carried up between the teeth of the wheel, so that as it moves endwise in the opposite direction it turns the wheel, and thereby imparts rotative movement to the shaft and to the registering mechanism connected therewith, so that by the four motions of the pin the wheel is intermittently and progressively rotated, the pin moving up into connection with the wheel, then forward, carrying the wheel with it, then downward out of connection with the wheel, and then back to its first position, or into position to again move up into connection with the wheel. This constitutes the last part of my invention.

The drawing represents so much of the mechanism of the meter or engine (keeping in view my patent above referred to) as is necessary for a clear understanding of my improvements.

A shows the meter or engine in elevation. B is a section on the line *x x*. C is a plan of the auxiliary-cylinder valve. D is a section of the same on the line *y y*; E, a section on the line *z z*.

a denotes the main cylinder; *b*, the piston-rod, and *c d* the pistons. *e* is the auxiliary cylinder, running at right angles to the main cylinder. *f g* are the two partitions of this cylinder, fixed upon the opposite ends of a connecting-rod, *h*.

On the rod *h* are shoulders *i i*, which may be formed by sleeves *k*, extending from the inner faces of the pistons, and between these shoulders is a tube or sleeve, *l*, through which the rod extends, said sleeve forming part of the valve *m*, the face *n* of which fits to the surface of the cylinder, with a space, *o*, between its sides and ends. The valve is hung upon the rod by means of its sleeve *l*, and the rod is smaller in diameter than the sleeve, as seen at E, to allow radial play of the valve, so that the valve may fit closely against its seat at all times, as before stated, notwithstanding its wear, the valve also turning upon the rod, so that its rotative movement does not affect the pistons *f g*.

The auxiliary cylinder has a slot or hole, *p*, through which and a slot or hole, *q*, made through the main cylinder the valve-pin *r* extends from the valve into the main cylinder, and so that the end of the pin is in the path of reciprocating movement of the main-cylin-

der pistons *c d*, each piston alternately striking the pin and effecting the rotative movement of the valve *m*, there being, as will readily be seen by inspection of the sectional view B, no intervening mechanism between the valve-pin and the pistons which alternately move it.

On the outer side of the valve *m* is a stud or pin, *v*, placed on or inclining to one side of the valve, as seen at B.

Journaled in the auxiliary-cylinder shell is a shaft, *s*, bearing on its inner end, within the cylinder, the star or ratchet-wheel *t*, and on its outer end an index-pointer, *u*, or a gear to mesh into and drive the gearing of a suitable registering or meter mechanism.

Into connection with the teeth of the wheel *t* the pin *v* is carried by the rotative movement of the valve *m* in one direction, and from such connection it is carried by movement in the opposite direction, and while in such connection the end movement of the valve in one direction takes place and turns the wheel and the index-pointer or gearing mechanism connected therewith, after which the rotative movement of the valve in the opposite direction takes place, carrying the pin out of connection with the wheel, so that as the valve then moves back endwise the pin passes free from the wheel and reaches a position to again be brought into connection with the wheel as the valve next moves rotatively.

I claim—

1. The auxiliary-valve pistons *f g*, rod *h*, and reciprocating and rotatory valve *m*, said valve being loosely hung upon the rod, and so as to be capable of radial play and rotative movements with respect to the rod and pistons.

2. In combination with the reciprocating and rotatory valve *m*, auxiliary cylinder *e*, and main cylinder *a*, and main cylinder-pistons *c d*, the valve-pin *r*, extending directly from the auxiliary cylinder into the main cylinder, and into position to be alternately operated by direct contact with the main-cylinder pistons.

3. In combination with the reciprocating and rotatory valve *m*, the meter-wheel *t*, intermittently and progressively rotated, substantially as described.

ALBERT D. LAWS.

Witnesses:

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ROBERT E. DE FOREST.