No. 649,283. Patented May 8, 1900.

W. DUNCAN.

WATER METER.

(Application filed Apr. 27, 1899.)

(No Model.) 3 Sheets—Sheet 1.

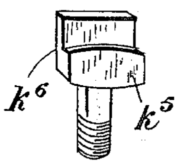

Fig. 5.

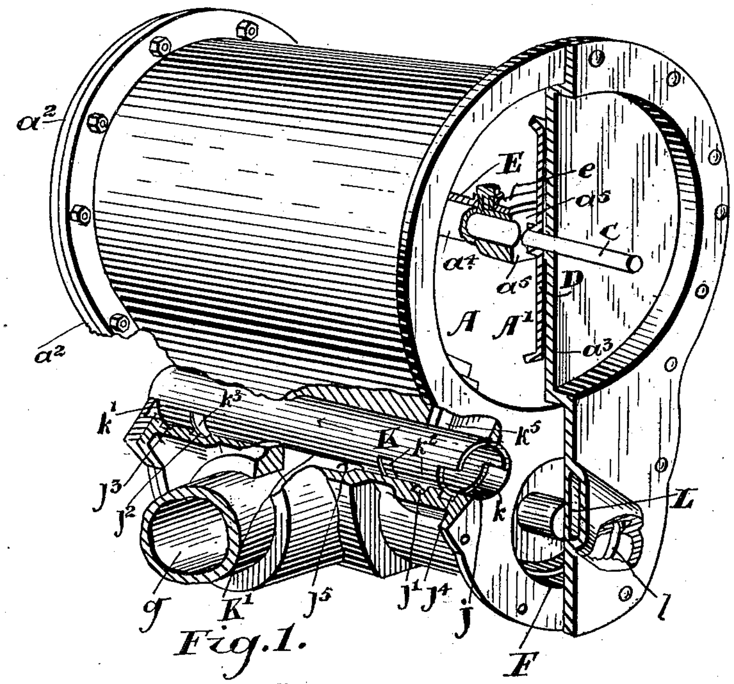

Fig. 1.

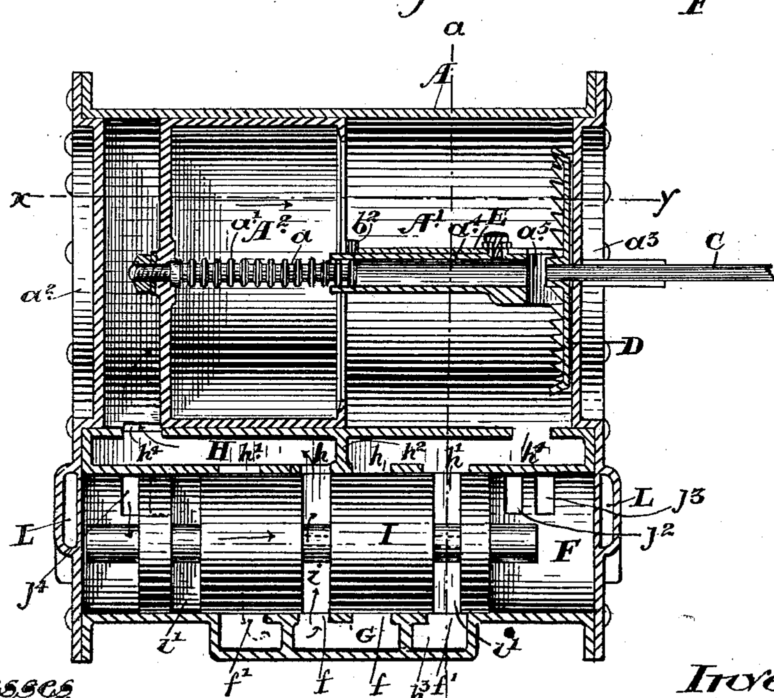

Fig. 2.

Witnesses

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(No Model.) 3 Sheets—Sheet 2.

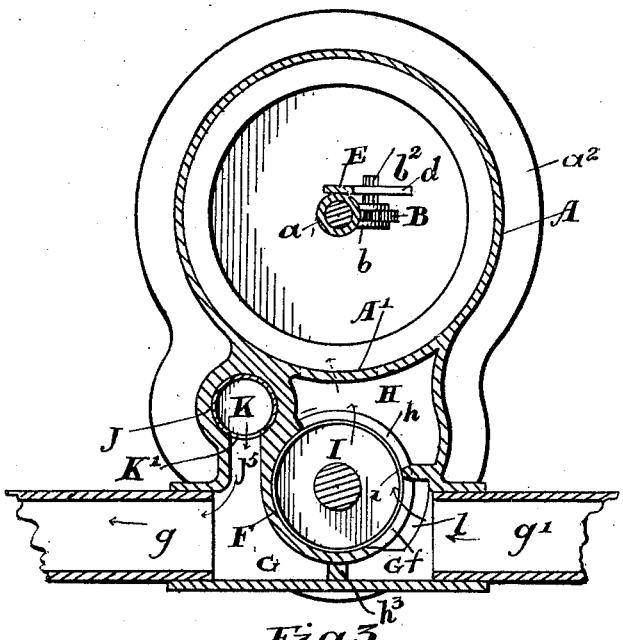

Fig. 3.

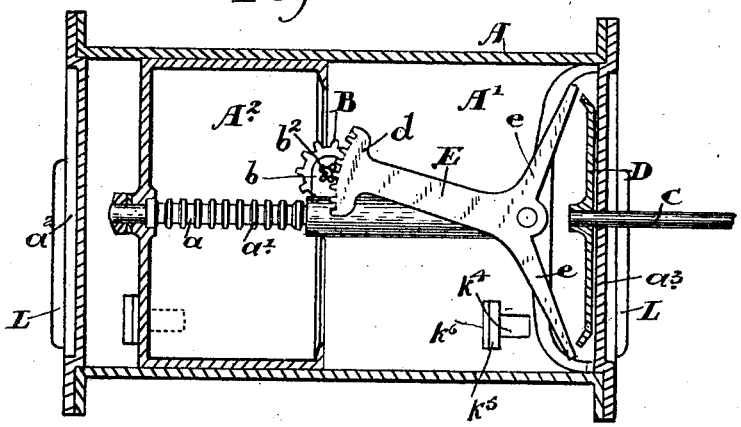

Fig. 4.

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WATER METER.

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(No Model.) 3 Sheets—Sheet 3.

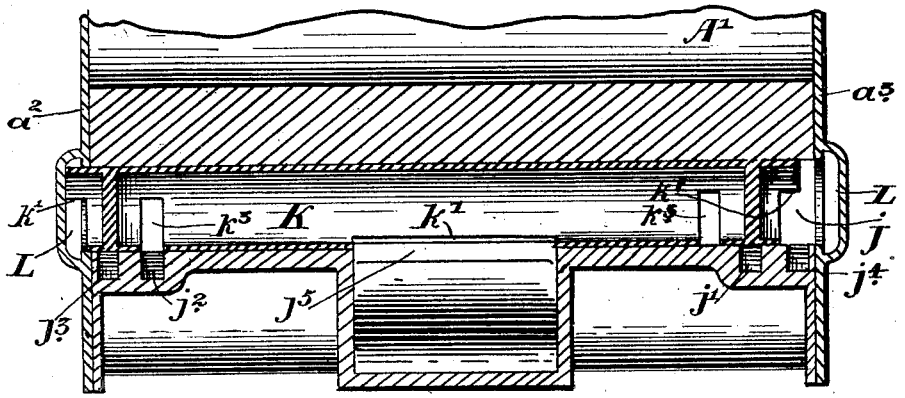

Fig. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM DUNCAN, OF OTTAWA, CANADA.

WATER-METER.

SPECIFICATION forming part of Letters Patent No. 649,283, dated May 8, 1900.

Application filed April 27, 1899. Serial No. 714,702. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM DUNCAN, a subject of the Queen of Great Britain, residing at the city of Ottawa, in the county of Carleton, in the Province of Ontario, Canada, have invented new and useful Improvements in Water-Meters, of which the following is a specification.

My invention relates to improvements in water-meters; and the object of the invention is to provide a simple, cheap, and durable form of meter and one which is also far more sensitive than those now in use and is also absolutely noiseless in its operations; and it consists, essentially, of a main cylinder provided with a piston having its rod connected by suitable mechanism to an ordinary meter-clock, a valve-piston cylinder having inlet and outlet ports, a piston-valve located therein and provided with ports, and a tubular slide-valve provided with suitable ports and having upwardly-extending projections entering the main cylinder through slots, all of which are hereinafter more particularly described.

Figure 1 is a perspective view of my meter partially broken away to exhibit interior constructions. Fig. 2 is a longitudinal section through Fig. 1. Fig. 3 is a vertical cross-sectional view of Fig. 2. Fig. 4 is a sectional plan on line x y, Fig. 2. Fig. 5 is a detail of my slide-valve pin. Fig. 6 is a longitudinal sectional view of a detail.

In the drawings like letters of reference indicate corresponding parts in each figure.

A is the main-cylinder casting.

A′ is the main cylinder. A^2 is the piston located therein and cored out. a is a piston-rod suitably secured within said hollow-cored piston-head.

a' represents annular teeth formed on the piston-rod a.

a^2 a^3 are cylinder-heads.

a^4 is a journal-bearing secured by arms a^5 to the head a^3.

B is a gear-wheel journaled in lugs b, forming part of the journal a^4.

b^2 is a pinion forming part of the gear B.

C is a rod journaled in the center of the head a^3. D is a toothed wheel journaled on said rod C within the cylinder A′. E is a pivoted escapement-lever having arms e operating said rack-wheel D.

d is a toothed quadrant formed on the inner end of the lever E and designed to mesh with the pinion b^2.

F is a cylinder located beneath the main cylinder.

G is a hollow divided core into which are led the outlet and inlet pipes and which is divided longitudinally at h^3.

The core G and cylinder F are connected by inlet-ports f f and outlet-ports f' f'.

H is a hollow chest located above the cylinder F and connected thereto by inlet-ports h h.

h^2 is a cross-partition dividing the core H into two equal parts.

I is a piston-valve provided with annular port or passage i, connecting the inlet-ports f f and outlet-ports h h.

i' represents annular ports or passages connecting the inlet-ports h' h' with the outlet-ports f' f'.

J is a cylindrical bore in which is held the slide-valve K. The bore J is provided with outlet-ports j' j^2 and inlet-ports j^3 j^4 and a longitudinal exhaust-port j^5, connecting the bore J with the pipe g. The slide-valve K has inlet-ports k k' cut in the ends and outlet-ports k^2 k^3.

K′ is a longitudinal exhaust-port registering with exhaust-port j^5 in the bore J.

k^4 represents slots connecting the bore J with the main cylinder A′.

k^5 represents pins secured in the slide-valve K and having heads provided with broad flat inner faces k^6, against which the piston is designed to operate.

h^4 represents openings connecting the main cylinder A′ and cylinder F.

L represents passages formed in the cylinder-heads connecting the end of the slide-valve bore J with the passage-way l leading to the inlet-pipe g.

Having now described the principal parts involved in my invention, I shall briefly describe the operations of the same.

The water is lead by the passage-way l to and through the passage-ways L in the cylinder-heads into contact with the end of the slide-valve K, where it is held by such valve. At the same time water is allowed to flow

through the inner pipe into the core or chamber G, when it passes through the inlet-port *f* and by means of the annular port *i* is conducted to and through the outlet-port into the chest H, whence it passes by means of the opening h^4 into the main cylinder A', where it comes into operating contact with piston-head A^2, driving it in the direction indicated by arrow. The piston A' in passing to the opposite end of the cylinder comes in contact with the face-plate on the end of the pin k^5, moving the valve in the direction indicated by arrow, so as to bring the port *k* into registering position with the port j^4 and the port k^3 into registering position with the port j^2, and water passes from the end of the valve K into the cylinder F, where it comes in contact with the end of the piston-valve I, driving it in the direction indicated by arrow. By this means the ports *h* and *f* are closed and the inlet-ports *h' f'* open by the annular port *i*, registering with these ports. Water now passes through these ports into the core G and out by the take-off pipe. The machine is now reversed and the same operation takes place at the reverse end, both sides of the machine being identical. While the reverse action takes place the water is driven through the ports $j' j^2$ by the return of the piston-valve I, these ports being caused to register by the return of the main piston A^2. The water then escapes through the exhaust-ports K' j^5 out into the take-off pipe. As the piston H moves backward and forward it oscillates the lever E through the rack *a'*, gear B, pinion b^2, and quadrant *d*, so as to bring its arms *e* into operating contact with slanting teeth on the wheel D on the shaft C, such shaft being connected to a meter-clock.

It will be seen from this description that my meter is very simple in construction and can be manufactured at a minimum expenditure of time and labor and at comparatively small cost. Another advantage which I derive from my construction is that my machine is absolutely noiseless, the piston and piston-valve being cushioned by the exhaust-water as it is forced out of the machine.

My form of meter is very sensitive and no water can possibly be lost in passing through the same.

What I claim as my invention is—

1. In a machine of the class described, the combination with the main cylinder, a piston operating therein having its piston-rod connected to a meter-clock mechanism, of a second cylinder located immediately beneath and directly connected by ports with the main cylinder, ports in said second cylinder arranged in pairs, a plurality of valves in said cylinder, the outer ports of each pair admitting water to act as a cushion for said sliding valves, substantially as described.

2. In combination with the main cylinder, a piston operating therein having its rod connected to a meter-clock mechanism, a cylinder provided with slide-valves located immediately beneath the main cylinder and having direct connection therewith by means of ports, a subsidiary cylinder located to one side and against the main and lower cylinders, a tubular slide-valve therein having inlet and outlet ports, means for operating said valve from the main cylinder whereby the slide-valve in lower cylinder is operated by the influx and reflux of the water and the ends of the lower cylinder provided with dead-water to serve as a cushion, substantially as described.

3. In combination the main cylinder and piston located therein, the piston-valve cylinder and piston-valve ports connecting the inlet-pipe and main cylinder through said piston-valve cylinder, a tubular slide-valve working in the suitable bore outlet and inlet ports therein designed to register alternately with outlet and inlet ports connecting said bore with main cylinder, slots cut between main cylinder and cylinder-bore pins secured in said slide-valve and projecting through said slots to form contact with the piston in its reciprocating motion as and for the purpose specified.

4. In combination the main cylinder and piston located therein, the piston-valve cylinder and piston-valve I inlet-ports *f f* and outlet-ports *h h* and annular connecting-port *i*, exhaust-ports *h'* and *f'* and annular connecting-port *i'*, a cylindrical valve-bore a tubular valve located therein inlet and outlet ports $j' j^2 j^3 j^4$ and ports $k' k^2 k^3 k^4$ designed to alternately register in pairs, pins secured in the slide-valve projecting through slots into the cylinder and having heads with broad flat inner faces designed to form contact with the cylinder as and for the purpose specified.

5. The combination with the main cylinder and piston of a piston-rod secured to said piston an annular toothed rack formed thereon, a journaled box secured to one of the end plates of the cylinder, a rod journaled centrally of the plate a rack-wheel secured thereon, a rocking detent pivoted to said journal-box and designed to operate said rack-wheel and a toothed quadrant at its inner end suitably connected by gears to said annular rack as and for the purpose specified.

Ottawa, Canada, April 15, 1899.

WILLIAM DUNCAN.

Witnesses:

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OSCAR GROULX.