(No Model.) 4 Sheets—Sheet 1.

J. DOOLING.

PISTON WATER METER.

No. 374,241. Patented Dec. 6, 1887.

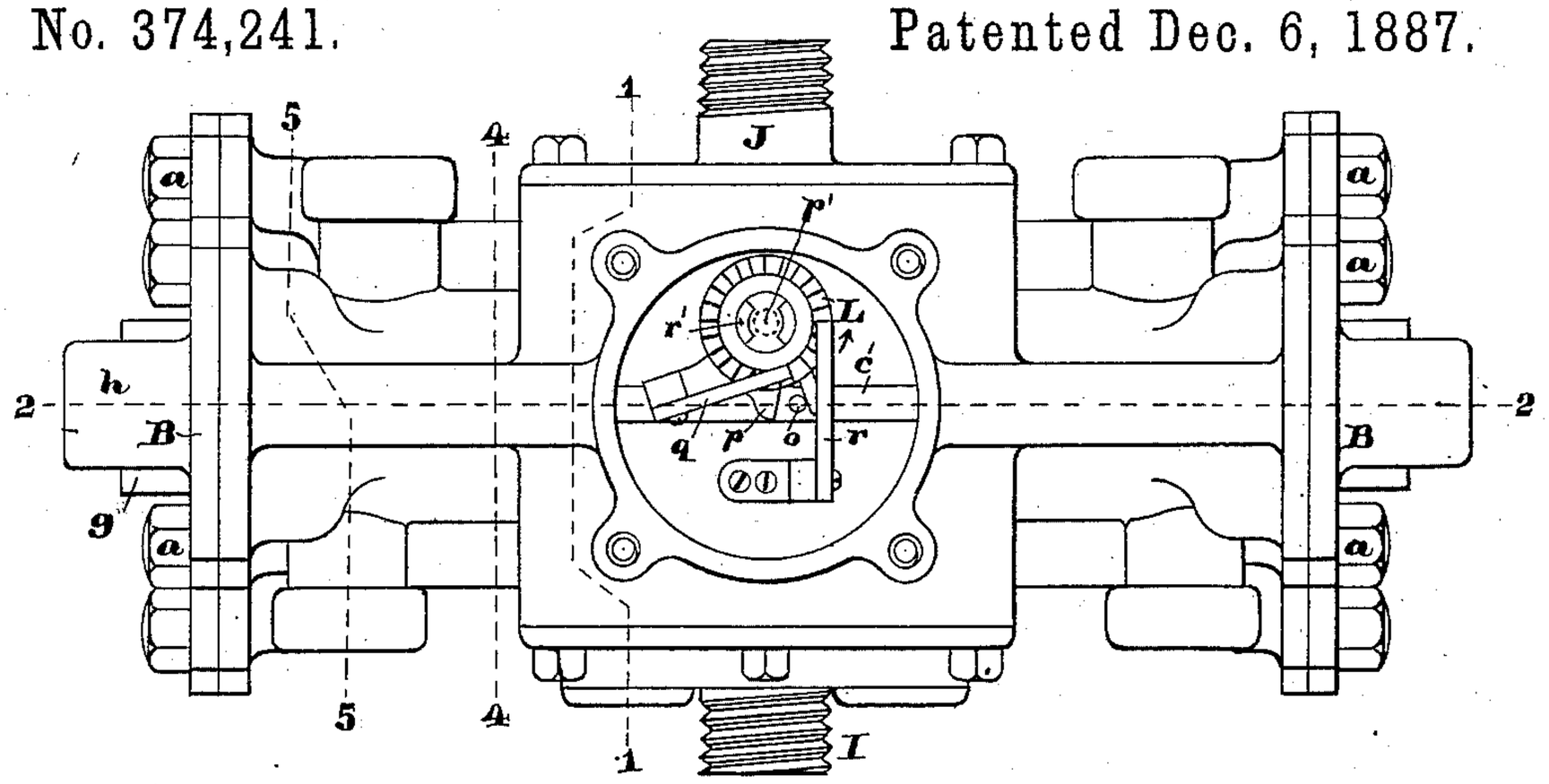

Fig. 1.

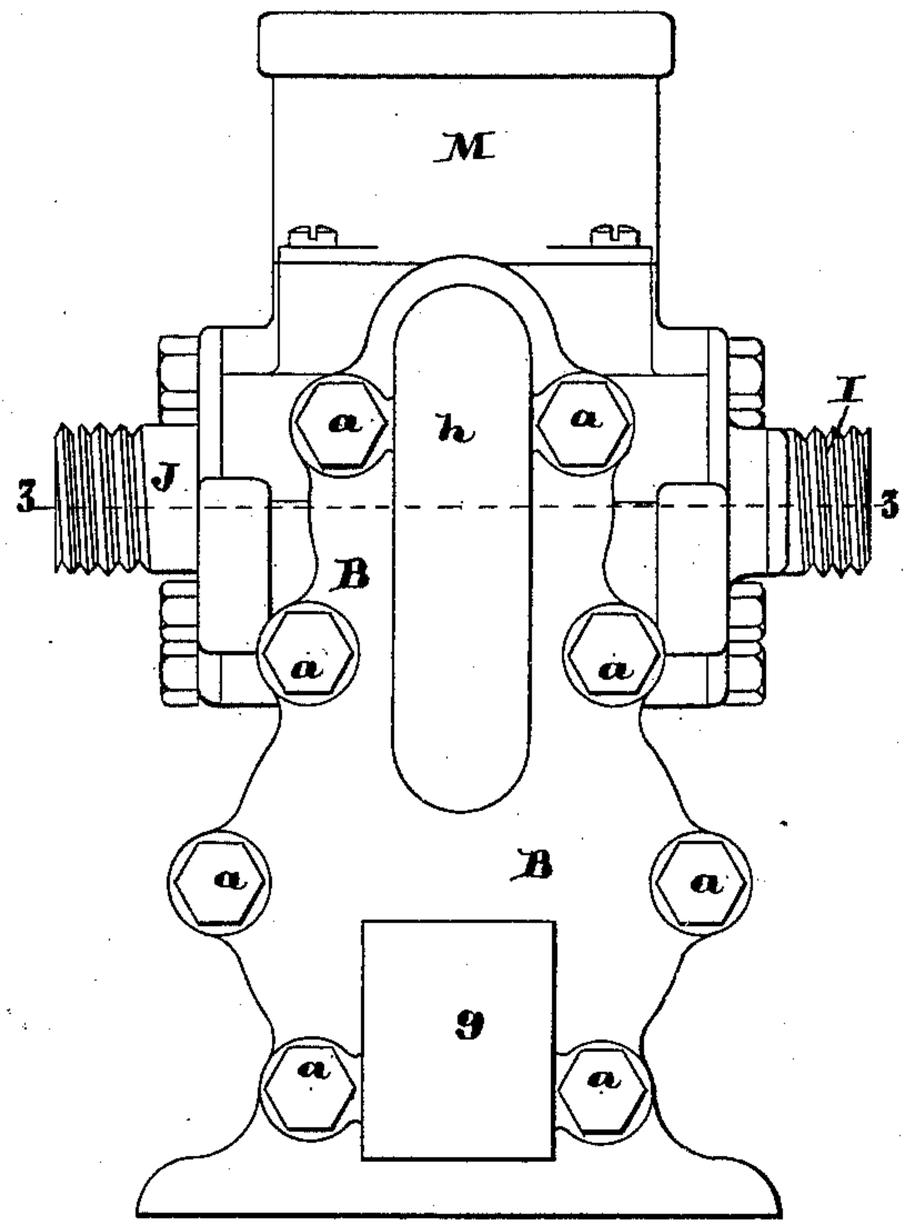

Fig. 2.

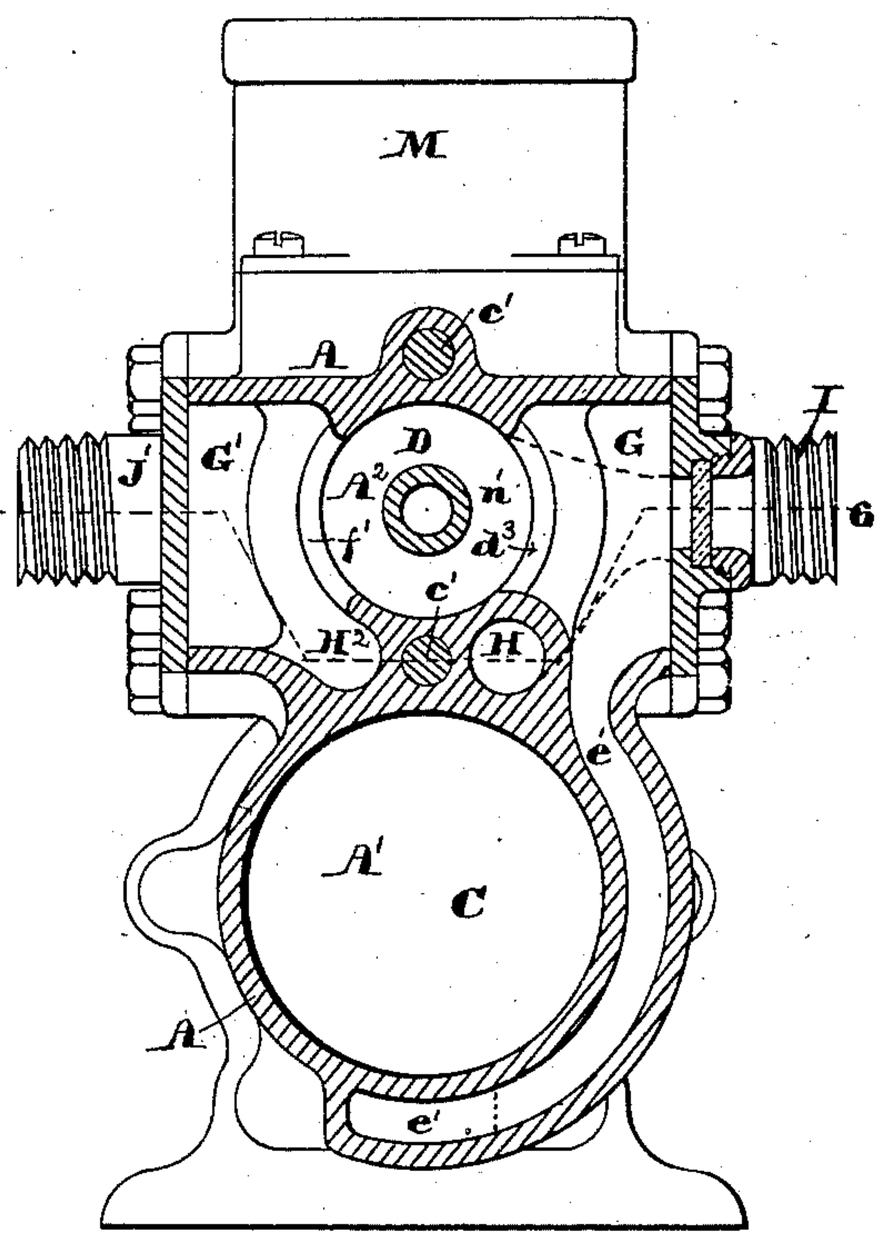

Fig. 3.

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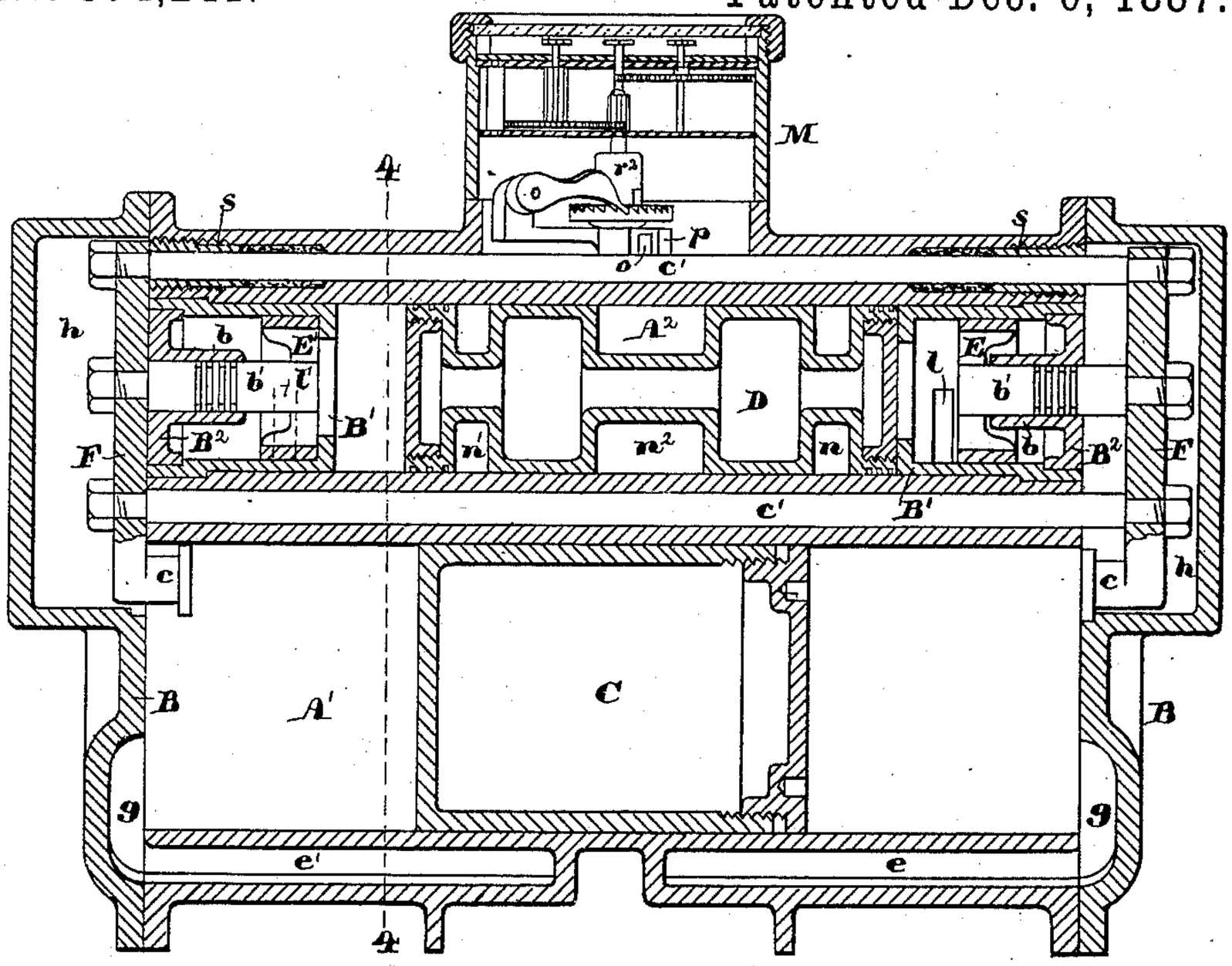

Fig. 4.

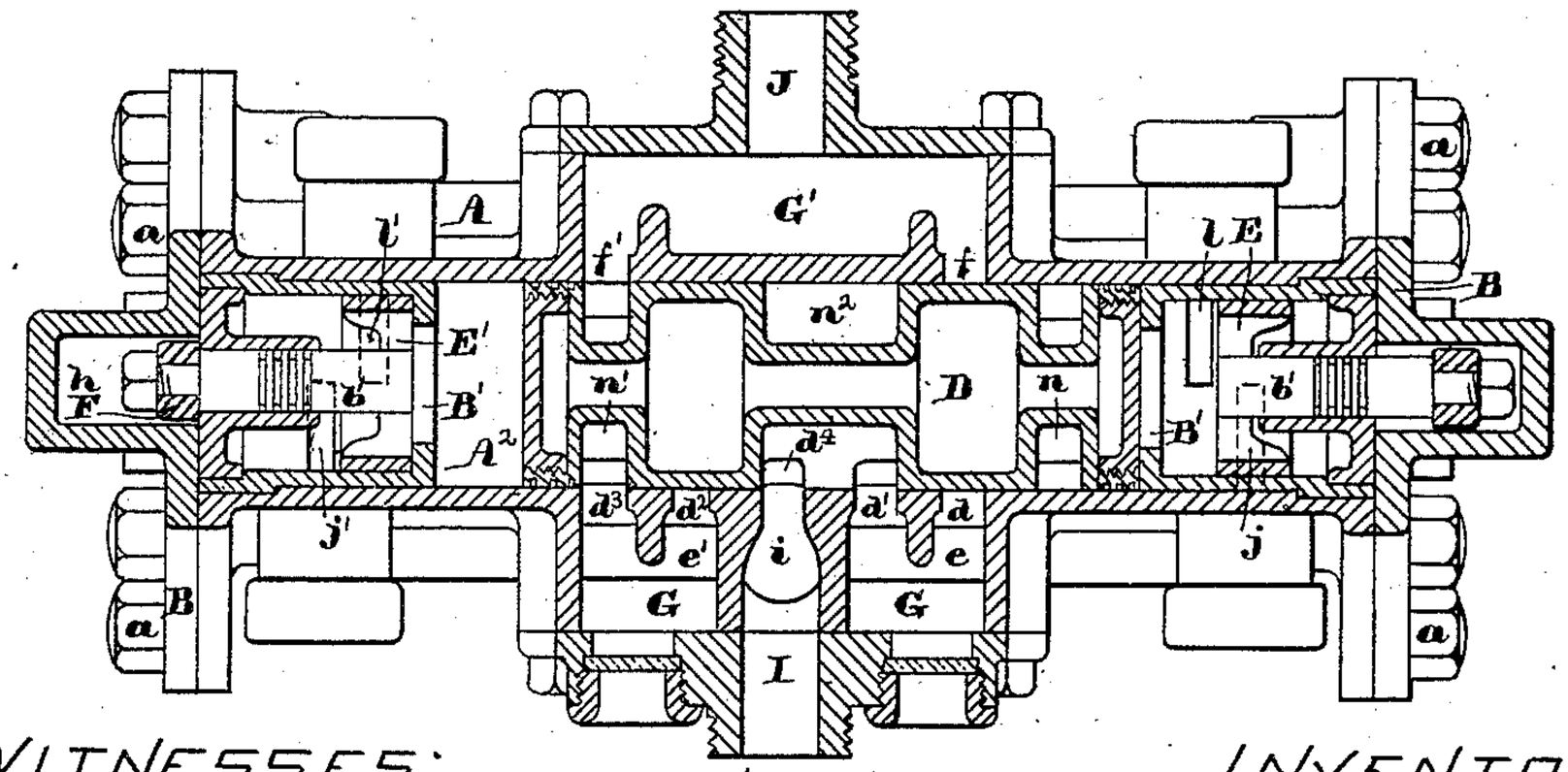

Fig. 5.

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(No Model.) 4 Sheets—Sheet 3.

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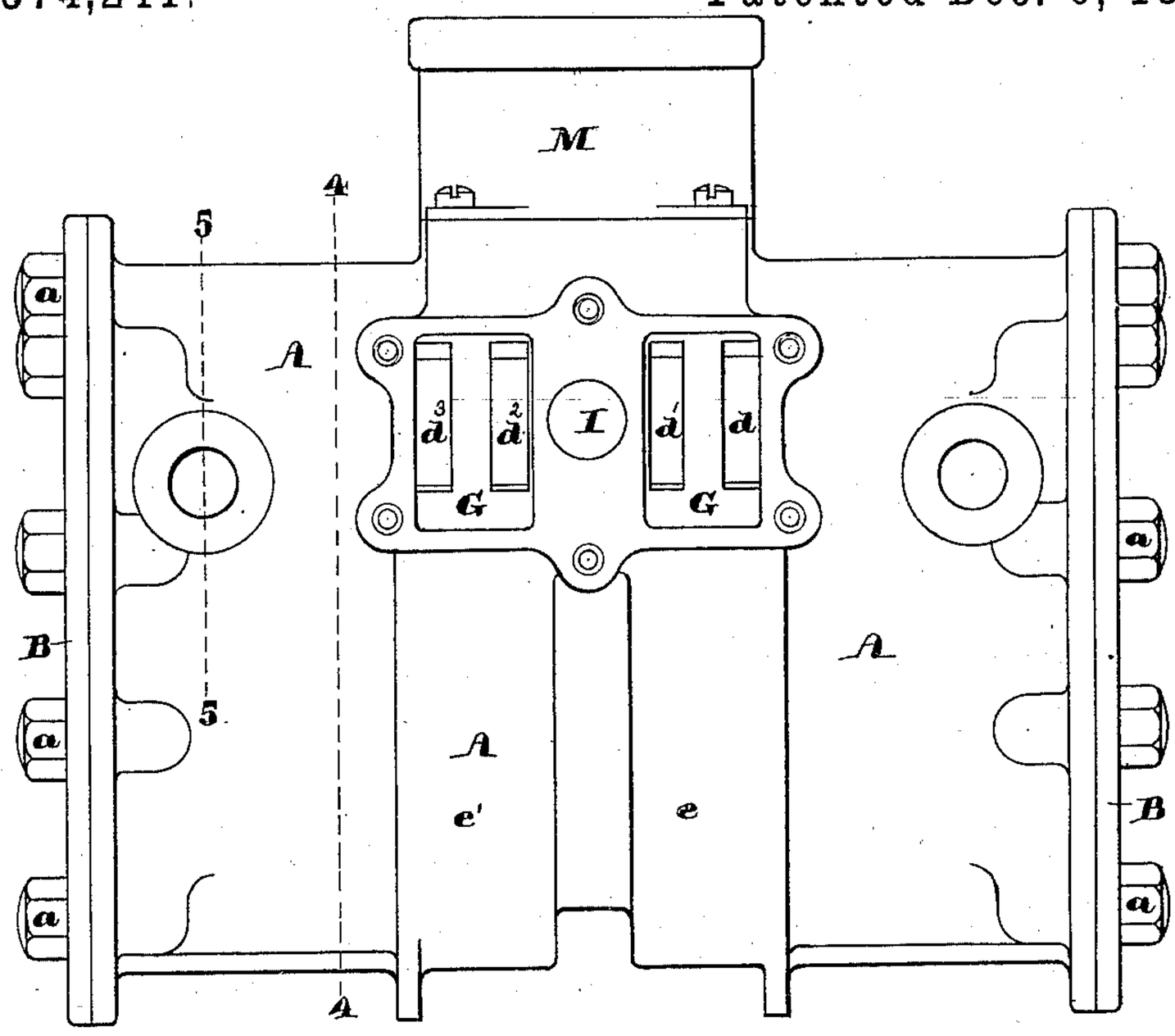

Fig. 6.

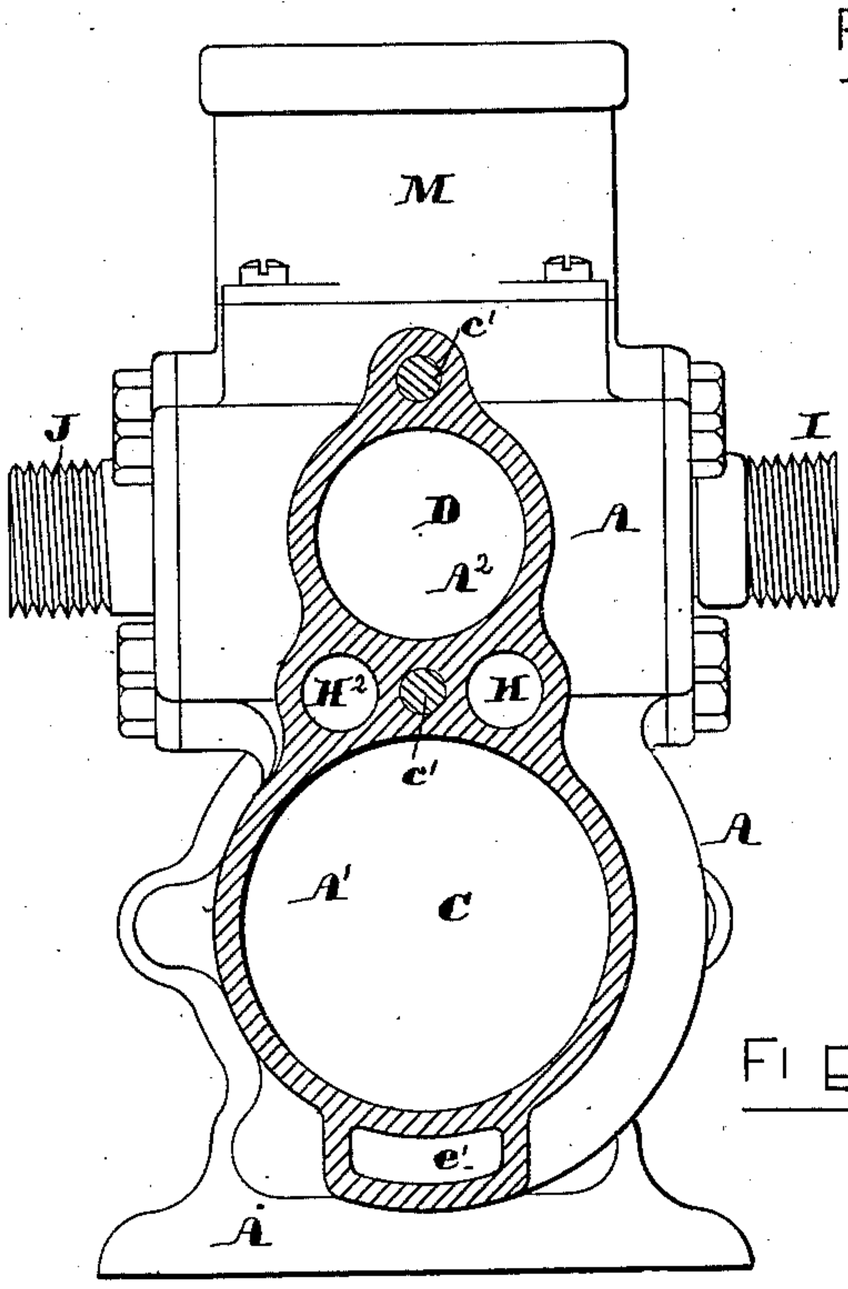

Fig. 7.

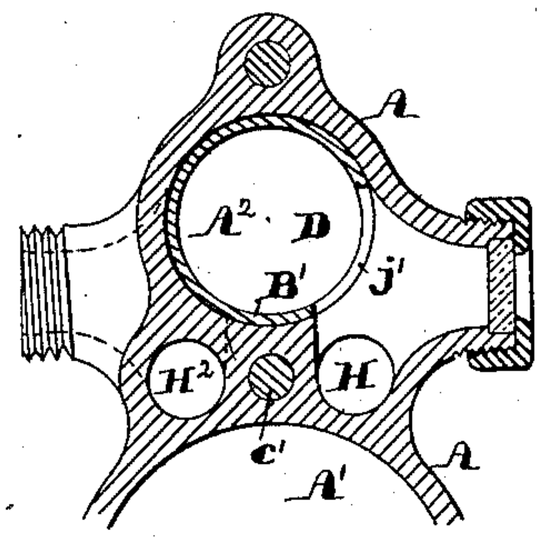

Fig. 8.

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J. DOOLING.

PISTON WATER METER.

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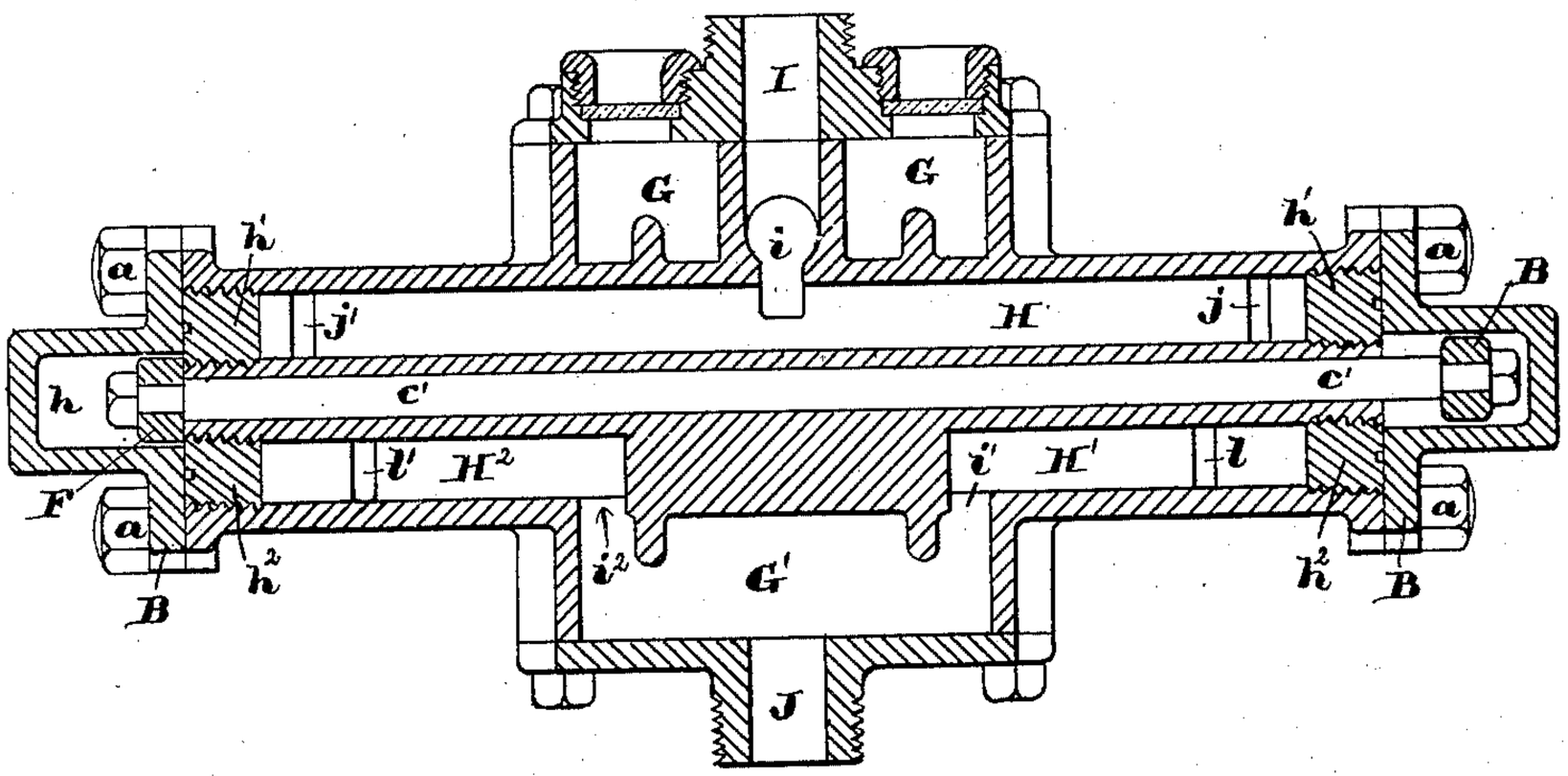

Fig. 9.

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UNITED STATES PATENT OFFICE.

JAMES DOOLING, OF BOSTON, MASSACHUSETTS.

PISTON WATER-METER.

SPECIFICATION forming part of Letters Patent No. 374,241, dated December 6, 1887.

Application filed July 7, 1887. Serial No. 243,611. (No model.)

To all whom it may concern:

Be it known that I, JAMES DOOLING, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Water-Meters, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to fluid-meters, and to that particular class of such meters which are usually termed "piston-meters;" and it consists in certain novel features of construction, arrangement, and combination of parts, which will be readily understood by reference to the description of the drawings, and to the claims to be hereinafter given.

Figure 1 of the drawings is a plan of a meter embodying my invention, with the registering mechanism and its casing removed. Fig. 2 is an end elevation. Fig. 3 is a vertical transverse section on line 1 1 on Fig. 1. Fig. 4 is a vertical longitudinal section on line 2 2 on Fig. 1, with the registering mechanism and its casing in position. Fig. 5 is a horizontal section on line 3 3 on Fig. 2. Fig. 6 is a side elevation of the same with the cover of the inlet-passages removed. Fig. 7 is a vertical transverse section on line 4 4 on Figs. 1, 4, and 6. Fig. 8 is a partial vertical transverse section on line 5 5 on Figs. 1 and 2. Fig. 9 is a longitudinal section on line 6 6 on Fig. 3, looking upward.

In the drawings, A is the main casting, in which are formed the measuring-cylinder A′ and the valve-cylinder A^2, the axes of which are parallel to each other, and B B are the cylinder-heads secured to the ends of the main casting by the bolts *a a*, as shown.

C is the working-piston, D the main piston-valve, and E and E′ the auxiliary valves, which control the action of the main valve D, as will be hereinafter described.

In each end of the cylinder A^2 is fitted a bushing, B′, the inner ends of which serve as stops to limit the movement of the main piston-valve D, and the outer ends of which are closed by the heads B^2, each provided with an inwardly-projecting hub, *b*, in which is formed a bearing for the passage of the stem *b′* of the ring-valve E or E′, which is fitted to and reciprocates in the bushing B′, as shown in Figs. 4 and 5.

The stems *b′* of the valves E and E′ are secured at their outer ends to the bars F, each provided with an inwardly-projecting arm, *c*, and firmly secured to the ends of the rods *c′ c′*, fitted to bearings in the main casting A, one above and the other below the valve-cylinder, the distance between the two bars F being in excess of the length of said main casting a distance equal to the desired movement of the auxiliary ring-valves E and E′, all as shown in Fig. 4.

The central part of the upper portion of the main casting is enlarged or expanded upon the opposite sides of the valve-cylinder A^2 to form chambers G and G′, from the former of which the ports *d*, *d′*, d^2, and d^3 open into the valve-cylinder A^2, and the passages *e* and *e′* extend downward to the under side of the working-cylinder A′, and, respectively, to the right and left hand ends of said cylinder, as shown in Figs. 3 and 4, and from the latter of said chambers the ports *f* and *f′* open into the valve-cylinder A^2, as shown in Figs. 3 and 5.

The cylinder-heads B are each provided with a recess, *g*, through which the fluid flowing through the passages *e* and *e′* enters the opposite ends of the cylinder A′. The heads B B are also provided with the rectangular recesses *h h*, in which the bars F are inclosed and reciprocate.

H is a cylindrical passage extending longitudinally through the main casting A between the cylinders A′ and A^2, but having its ends closed by the screw-plugs *h′ h′*, and communicating by the passage *i* with the fluid-supply pipe I, and by the ports *j* and *j′* with the valve-cylinder A^2, at the right and left hand, respectively, of the main valve D, the bushings B′ being provided with corresponding ports, one of which is shown in dotted lines at *j* and the other in full lines at *j′* in Fig. 5.

H′ and H^2 are two shorter cylindrical passages extending inward from opposite ends of the casting A parallel to the passage H, and having their outer ends closed by screw-plugs h^2 h^2, and communicating at their inner ends through the ports *i′* and i^2, respectively, with

chamber G′, and through the ports *l* and *l′* with the valve-cylinder A² at the right and left hand, respectively, of the main valve D, the bushings B′ being provided with coinciding ports, one of which is shown in full lines at *l* and the other in dotted lines at *l′* in Figs. 4 and 5.

The main valve D has formed in its periphery two circumferential grooves, *n n′*, one near each end thereof, said grooves having a width corresponding to the widths of the ports *d*, *d′*, *d²*, *d³*, *f*, or *f′*, and also with a third circumferential groove, *n²*, of a width equal to the aggregate width of two of said ports and the width of the bar of metal between them, as shown in Fig. 5.

I is the inlet-nozzle, to which the supply-pipe is coupled and through which the fluid enters the meter, and *d⁴* is the port through which it first enters the valve-cylinder within the groove *n²*.

J is the discharge-nozzle, to which may be coupled a pipe leading to the place where the fluid is to be used.

The upper rod, *c′*, has set therein at, or near the middle of its length, the pin *o*, which projects upward therefrom and engages with the forked end of the lever *p*, mounted loosely upon the stud *p′*, set in the casting A, said stud also having mounted thereon the ratchet-wheel L, with the teeth of which the pawl *q*, pivoted to an arm of said lever *p*, engages in such a manner that when the rod *c′* is moved in one direction the ratchet-wheel will be moved about its axis in the direction indicated by the arrow on Fig. 1, and when the rod is moved in the opposite direction the pawl *q* will be moved back to engage with another tooth, said wheel being prevented from turning by the stop-pawl *r* in a well-known manner.

The hub of the ratchet-wheel L has formed on its upper end one half, *r′*, of a coupling, which engages with a corresponding half-coupling, *r²*, secured to the lower end of the driving-shaft of the registering mechanism inclosed in the cylindrical casing M, as shown in Fig. 4.

The operation of my invention is as follows: The several parts being in the position shown in the drawings, if the faucet be opened to draw the fluid, the fluid will flow into the meter through nozzle I and port *d⁴*, then, through port *d′* and passage *e*, into the cylinder A′ at the right of the working-piston C, as shown in Fig. 4, and move said piston toward the left-hand end of Fig. 4, the fluid in front of said piston flowing through passage *e′*, port *d³*, groove *n′* in the main valve, and port *f′* into the chamber G′, and thence through the nozzle J and the pipe connected therewith to the faucet. (Not shown.) As the piston C approaches the left-hand end of the cylinder A′, it comes in contact with the projecting arm *c* of the bar F at the left end of Fig. 4 and moves said bar, the rods *c′ c′*, the bar F at the right of Fig. 4, and the auxiliary valves E and E′ toward the left, so as to simultaneously cover the induction-port *j′* and the eduction-port *l*, and by a further movement after said ports are closed to simultaneously uncover the eduction-port *l′* and the induction-port *j*, thus allowing the pressure of the inlet-fluid, which flows through passages *i* and H and port *j* to the interior of the valve-cylinder, to be exerted upon the right-hand end of the main valve D and move it toward the left of Fig. 4, and the fluid in said valve-cylinder at the left of said main valve to be forced through the port *l′* into the passage H², and thence through the passage *i²* into the chamber G′, and thence through the nozzle J to the faucet. When the valve D has reached the limit of its movement toward the left, the ports *d′*, *d³*, and *f′* are closed, and the ports *d*, *d²*, and *f* are uncovered, and the fluid, entering through nozzle I, flows through ports *d⁴* and *d²* and passage *e′* into the cylinder A′ at the left of the piston C and moves it toward the right-hand end of Fig. 4. By the movement of the piston C to the left the arm *c* of the bar F, at the right of Fig. 4, is projected into the cylinder A′, and as the piston C again approaches the end of its movement toward the right it comes in contact with said arm *c*, and as it continues its movement the bars F F, rods *c′ c′*, and valves E and E′ are moved toward the right, thereby simultaneously covering the induction-port *j* and the eduction-port *l′*, and by a further movement thereof simultaneously uncovering the induction-port *j′* and the eduction-port *l*, thus allowing the pressure of the inlet-fluid, which flows through the passages *i* and H and the port *j′* to the interior of the cylinder A², to be exerted upon the left-hand end of the main valve D and move it toward the right, thereby forcing the fluid at the right of said valve through the port *l*, the passage H′ at the right-hand end of the machine, through the port *f* into the chamber G′, and thence through the nozzle J to the faucet.

The upper rod *c′* passes, at each end of the main casting, through a stuffing-box, *s*, to prevent leakage of the fluid into the register-chamber, and the lower rod *c′* may be similarly supplied, if desired.

The working-piston C may be provided with a series of circumferential grooves (not shown) to serve as a means of packing said piston by being filled with the fluid being measured in a well-known manner.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a fluid-meter, the combination of a measuring-cylinder, a free piston fitted to said cylinder and movable in either direction therein by the pressure of the fluid admitted to said cylinder, a valve-chamber connected with the inlet and discharge nozzles and with the measuring-cylinder by suitable ports and passages, a free valve constructed and arranged to be alternately moved in opposite directions in said chamber by the pressure of the fluid thereon, and two auxiliary valves constructed and arranged to be moved by said piston and to control the flow of the fluid into

and from said valve-chamber at opposite ends of said free valve, thereby causing said valve to be moved alternately in opposite directions, and thus change the direction of the flow of the fluid in the measuring-cylinder.

2. The combination of the cylinder A′, the free piston C, the valve-chamber A^2, the ports d, d', d^2, d^3, d^4, f, f', j, j', l, and l', the chambers G G′, the passages e, e', H, and H′, the bars F F, provided with the arms c c, the rods c' c', the auxiliary valves E and E′, connected to and movable with the bars F F, and the free valve D, provided with the circumferential grooves n, n', and n^2, all arranged and adapted to operate substantially as described.

3. The combination of the measuring-cylinder, its piston, the valve cylinder, the free piston-valve, the auxiliary valves, the bars F F, the rods c' c', the pin o, and the registering mechanism, all constructed, arranged, and adapted to operate substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 2d day of July, A. D. 1887.

JAMES DOOLING.

Witnesses:
N. C. LOMBARD,
WALTER E. LOMBARD.