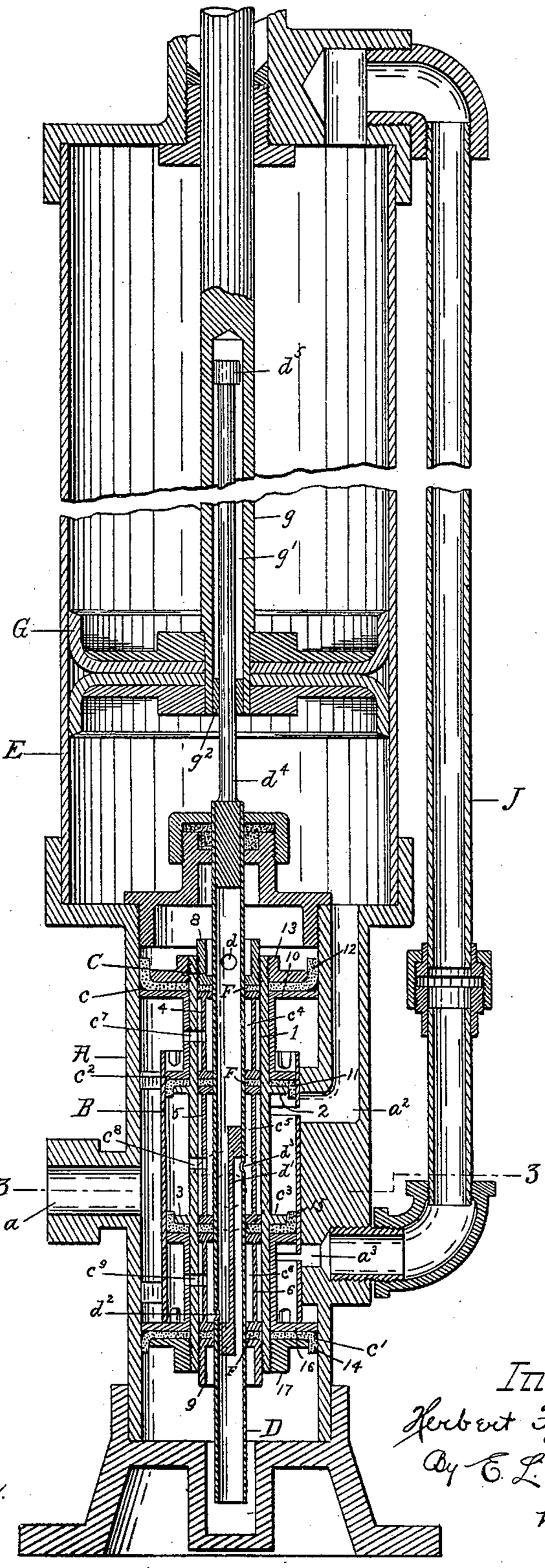
(No Model.) 2 Sheets—Sheet 1.

H. F. COOK.

VALVE MECHANISM.

No. 585,083. Patented June 22, 1897.

Fig. 1.



Witnesses.
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Helen M. Hutchison.

Inventor.
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his attorney

(No Model.) 2 Sheets—Sheet 2.

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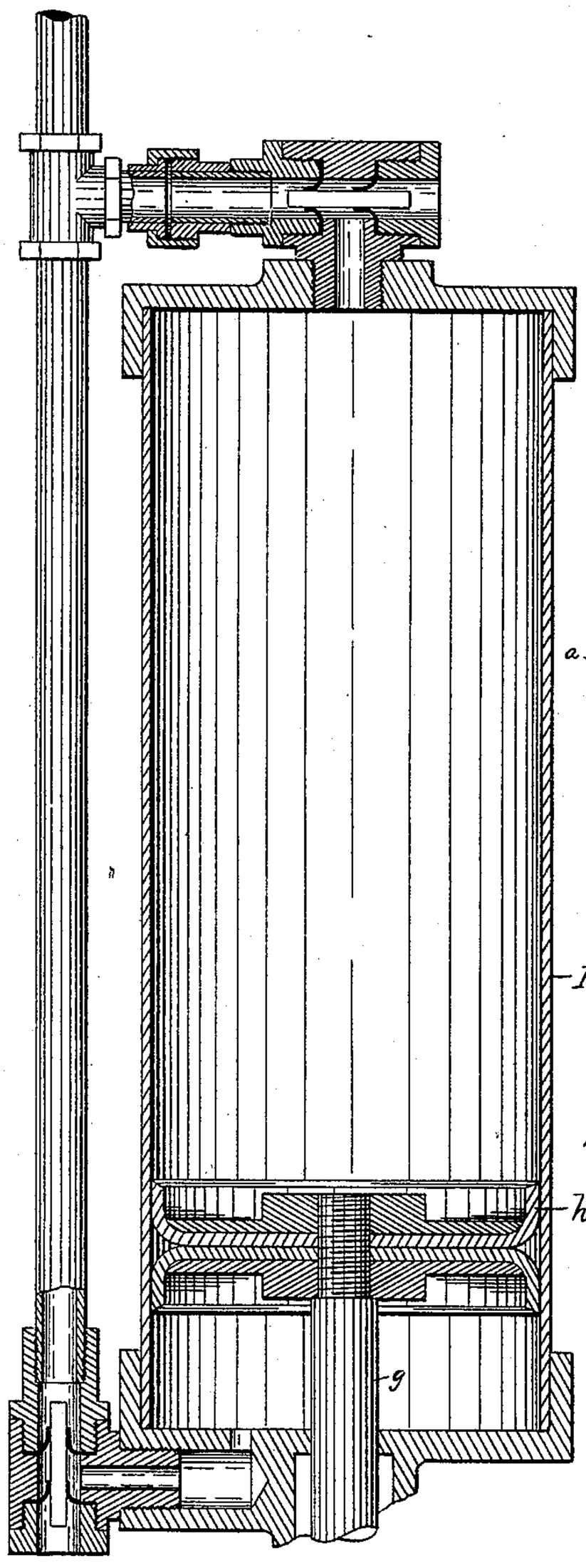

Fig. 2

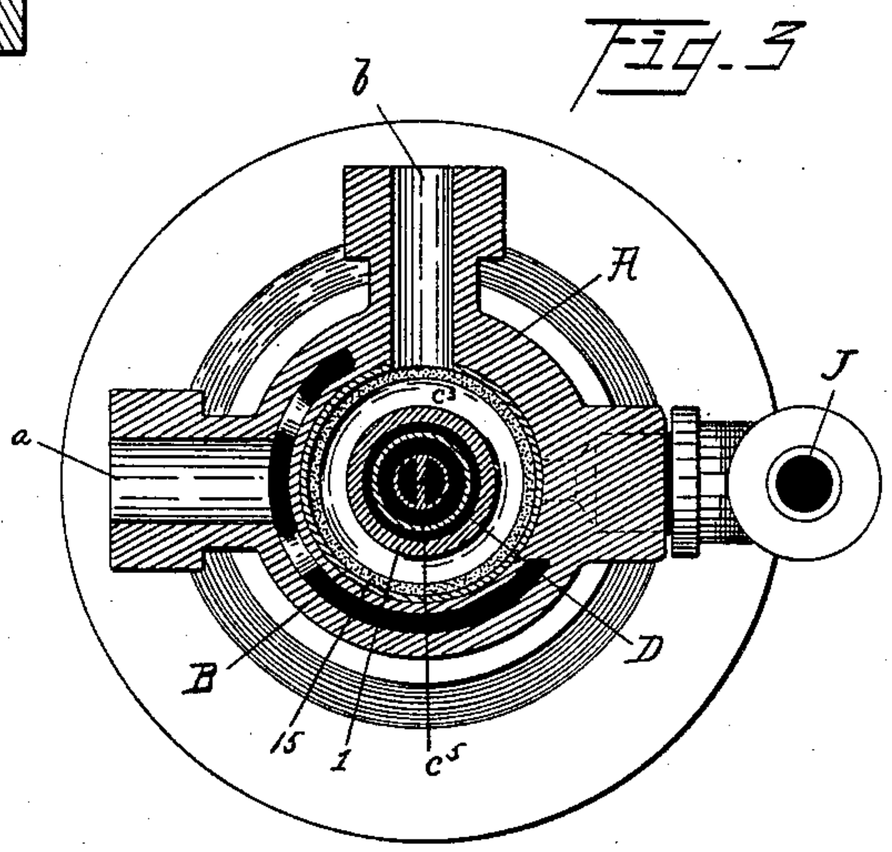

Fig. 3

Witnesses.

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UNITED STATES PATENT OFFICE.

HERBERT F. COOK, OF CLEVELAND, OHIO, ASSIGNOR OF ONE-HALF TO THE OTIS BROTHERS & COMPANY, OF NEW YORK, N. Y.

VALVE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 585,083, dated June 22, 1897.

Application filed January 6, 1896. Serial No. 574,535. (No model.)

To all whom it may concern:

Be it known that I, HERBERT F. COOK, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Valve Mechanism; 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.

The object of my invention is to provide novel valve mechanism for controlling and directing the flow of a fluid under pressure and also to so combine the said valve mechanism with a cylinder and piston therein to be operated by the fluid that the piston will reciprocate in the cylinder automatically so long as the fluid under pressure is admitted to the valve mechanism.

The invention consists in the construction and combination of parts hereinafter described and claimed.

The invention is particularly adapted for use in operating an air-pump to be used to maintain the pressure in a beer-barrel; and I have in the drawings shown the air-pump and an operative connection between it and the piston which is to be operated by the fluid. I do not intend, however, that the invention shall be limited by the claims to this particular use.

In the drawings, Figure 1 is a central longitudinal section of an apparatus embodying my invention. Fig. 2 is a central longitudinal section of the air-pump, which when used is placed upon the part of the apparatus shown in Fig. 1. Fig. 3 is a transverse sectional view on line 3 3 of Fig. 1.

Referring to the parts by letters and figures, A represents a cylindrical valve-casing having the discharge-opening *a*.

B represents a hollow cylinder secured concentrically within the casing, and *b* an inlet-pipe connected with said cyclinder, through which the fluid is admitted to the apparatus.

a^2 and a^3 represent two ports formed in the valve-casing, but opening into the cylinder B, which ports are located, respectively, above and below the inlet-pipe *b*.

C represents a tubular valve which passes concentrically through the cylinder B. It is provided near its ends, respectively, with the pistons *c c'*, which fit and move in the valve-casing. It is also provided with the two pistons c^2 c^3, which fit and move in the cylinder B.

D represents a tubular supplemental valve which passes through the valve C and is independently movable therein. Inside the valve C and around the supplemental valve are four packing-rings F, held in place by suitable means, whereby the space within the valve C around the supplemental valve is divided into three chambers c^4 c^5 c^6. The middle packing-rings are so placed that whatever be the position of the valve the fluid entering the cylinder B from the pipe *b* shall enter the middle chamber c^5 directly through the opening c^8. Openings c^7 c^8 c^9 are formed in the walls of the valve C, leading, respectively, to the said three chambers.

The supplemental valve D has openings in its upper and lower ends within the valve-casing. Preferably the lower end of the valve-tube D is open, and one or more openings *d* are formed at its upper end. The supplemental valve D, or something attached thereto, projects out through a packed joint in the end of the valve-casing, whereby said supplemental valve may be moved by means outside of said casing.

In the supplemental valve is a transverse partition *d'*, which prevents direct communication between the upper and lower ends thereof. An opening d^2 is formed in said valve above the partition, and another opening d^3 is formed therein below the partition. In order to be able to most conveniently connect the upper port a^2 with the lower end of the cylinder E and the lower port a^3 with the upper end of said cylinder—obviously the cheapest construction—it is necessary to have the opening d^3 above the opening d^2. The partition *d'* is therefore constructed so that its general direction is oblique to the axis of the tube and to a horizontal plane across it. In the exact construction shown the partition extends transversely half the distance, then vertically as far as necessary, and then transversely the other half of the distance across the tube.

The packing-rings F and the openings d^2 d^3 are so placed that when the supplemental

valve is moved so that one of the said openings is in the middle chamber c^5 the other one is in one or the other of the chambers c^4 c^6, and that these conditions will remain unchanged after the resulting movement of the valve.

The ports a^2 a^3 are so placed that when the valve is up the port a^2 is between the two piston-heads c^2 c^3, and the other port a^3 is below the piston c^3; but when the valve is down the port a^3 is between the said piston, while the port a^2 is above the piston c^2.

E represents a cylinder secured above and concentric with the valve-casing, and G a piston movable therein. A rod d^4, which is secured to the supplemental valve D, projects into the cylinder E, and there is a telescoping connection between it and the piston, whereby the latter may move independently of said rod. Shoulders are provided upon said parts which at certain points in the movement of the piston engage with each other, whereby both move together. This construction results in the automatic movement of the supplemental valve at the proper time to cause the valve C to be moved so as to change the direction of the fluid. In the specific construction shown the piston-rod g, which projects out of the upper end of the cylinder, is provided at its lower end with an axial opening g', into which the rod d^4 projects. On the upper end of the rod is an enlargement or head d^5, which will be engaged by a plug g^2 in the lower end of the opening g, and the opening g is of such length that at the proper time the end of the rod will be struck by the end of the opening.

H represents the cylinder of an air-pump of any suitable construction, and h its piston, which is attached to the upper end of the piston-rod g. It is not essential that an air-pump be used, nor is it material that the movement of the piston-rod shall operate the piston of any other pump. It may be connected with or communicate motion to any sort of a device adapted to receive motion therefrom.

The valve C, as shown, is constructed of a novel combination of parts which while not essential to the invention as broadly claimed is nevertheless new and particularly well adapted to produce the result sought. In the construction shown the valve includes a tube 1, having thereon the annular flanges 2 and 3. Inside of this tube are placed the sleeves 4, 5, and 6, each of which must be flanged internally and may be flanged externally at both ends. The packing-disks F are placed between the ends of the tubes 4, 5, and 6. The glands 8 and 9 screw into the ends of the tube 1 against packing-disks F, placed between said glands and the ends of the sleeves. The edges of these packing-disks bear against the inside of tube 1 and the outside of the supplemental valve, thereby separating the chambers c^4 c^5 c^6 from each other. A sleeve 10, having external annular flanges at its ends, is placed outside of the tube 1. A packing-disk 11 is placed between the lower flange thereon and the flange 2 on tube 1. Another packing-disk 12 is placed around the tube 1 above the sleeve, and a flanged collar 13, which is screwed onto the upper end of tube 1, holds the parts in the described relation to each other. Similar disks 14 and 15, a similar sleeve 16, and a flanged collar 17 are in like manner secured upon the lower end of tube 1.

The operation of so much of the apparatus as involves my invention, as embraced in the claims, is as follows: When the parts are in the relative positions shown, the fluid enters from pipe b into the cylinder B between the pistons c^2 c^3. Some of it passes through the opening c^8 into chamber c^5, thence through opening d^3 into the supplemental valve-tube below partition d', and thence into the valve-casing below the piston c', whereby the valve C is moved up and is held up. Another part of the fluid in cylinder B between the pistons c^2 c^3 enters port a^2 and passes thence into the cylinder E below the piston G, whereupon the piston begins and continues its upward movement. The fluid which was in the valve-casing above the piston c entered the opening d in the supplemental valve, passed through the opening d^2 into chamber c^6, out through opening c^9 into the cylinder B, under the lower end thereof into the valve-casing between pistons c c', and out of the exhaust-opening a. The fluid from the top of the cylinder E passes through pipe J and port a^3 to the lower part of cylinder B below piston c^3 and thence out to exhaust-opening a, as just described. When the piston G has about reached its highest position, the plug g^2 engages with the head d^5 and draws the supplemental valve up, so that the opening d^2 is in the chamber c^5 and the opening d^3 is in the chamber c^4. The fluid from chamber c^5 enters the supplemental valve above the partition d' and passes out through the opening d into the valve-casing above valve C, which thereupon moves down, the fluid below said valve D passing thence into chamber c^4 and into valve-casing between the pistone c c' through the opening c^7. The downward movement of the valve carries the pistons c^2 c^3 down past the ports a^2 a^3, respectively, whereupon the fluid between said pistons enters port a^3, passing thence through pipe J to the cylinder E above the piston G, while the fluid below said piston enters port a^2, passing thence into valve-casing and to the exhaust. When the piston G nearly reaches its lowest point, the supplemental valve is moved down, making the connection first explained, whereupon the valve C moves to the position shown.

The apparatus in its entirety, as shown, is intended for use as a beer-pump, but the air-pump might be omitted and any other device suitable to receive its motion from the piston G might be substituted.

It is intended to connect the apparatus, as shown, with a pipe for delivering the water under pressure—in other words, to use water as the operating fluid; but steam or any other suitable fluid might be used with the apparatus, as shown, or when only slightly modified in merely mechanical features.

The movement of the valve in the apparatus shown directs water to either the upper or lower end of the cylinder E, and the movement of the piston automatically moves the supplemental valve; but the supplemental valve might be operated in any other suitable manner, and the water entering the ports a^2 a^3 might be carried to any desired point or suitable apparatus.

Having described my invention, I claim—

1. The combination of a valve-casing A having an exhaust-opening, a tubular cylinder B secured within said casing and having two ports a^2 a^3, a supply-pipe connected with said cylinder between said ports, a tubular valve C having, first, two pistons near its ends which are fitted to and movable in the valve-casing, and, second, two other pistons which are fitted to and movable in the cylinder B, a tubular supplemental valve D independently movable in the valve C, and having, first, openings near its ends into the valve-casing, second, a transverse partition, and, third, two openings respectively above and below said partition, four packing-rings secured to the valve C around the supplemental valve D, thereby dividing the space into three chambers which have the openings c^7 c^8 c^9, and mechanism for moving the supplemental valve, substantially as and for the purpose specified.

2. The combination of a valve-casing A having an exhaust-opening, a tubular cylinder B secured within said casing and having two ports a^2 a^3, a supply-pipe connected with said cylinder between said ports, a tubular valve C having, first, two pistons near its ends which are fitted to and movable in the valve-casing, and, second, two other pistons which are fitted to and movable in the cylinder B, a tubular supplemental valve D independently movable in the valve C, and having, first, openings near its ends into the valve-casing, second, an oblique transverse partition, and, third, two openings respectively above and below said partition, four packing-rings secured to the valve C around the supplemental valve D, thereby dividing the space into three chambers which have the openings c^7 c^8 c^9, a cylinder E which is connected at its lower and upper ends respectively with the ports a^2 a^3, a piston G movable in said cylinder, its piston-rod, a rod d^4 secured to the supplemental valve, entering a hole in the piston-rod, and shoulders on said two rods, substantially as and for the purpose specified.

3. A valve consisting of the tubular cylinder 1 having the external flanges 2 and 3, three internally-placed sleeves 4, 5 and 6, having at their ends internal annular flanges, the glands 8 and 9, and the packing-rings F, the two external sleeves 10, 16 having annular flanges at their outer ends, the flanged collars 13 and 17, and the packing-rings 11, 12, 14 and 15, the said cylinders and sleeves having the holes c^7 c^8 c^9, substantially as and for the purpose specified.

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

HERBERT F. COOK.

Witnesses:
E. L. THURSTON,
L. L. GRISWOLD.