(No Model.)

2 Sheets—Sheet 1.

# E. A. MENKING.

## STEAM ACTUATED VALVE.

No. 500,407. Patented June 27, 1893.

Fig: 1.

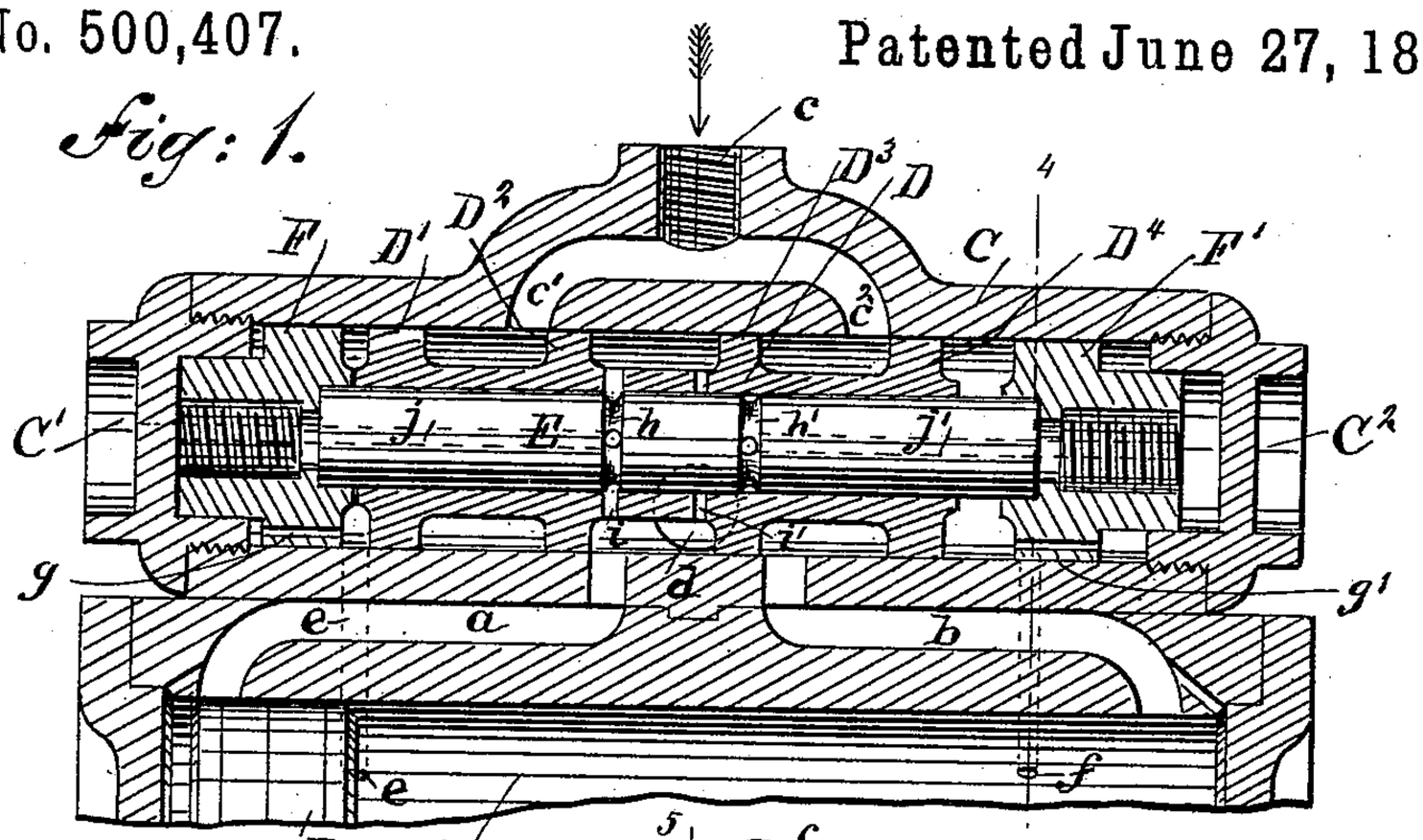



Fig: 2.

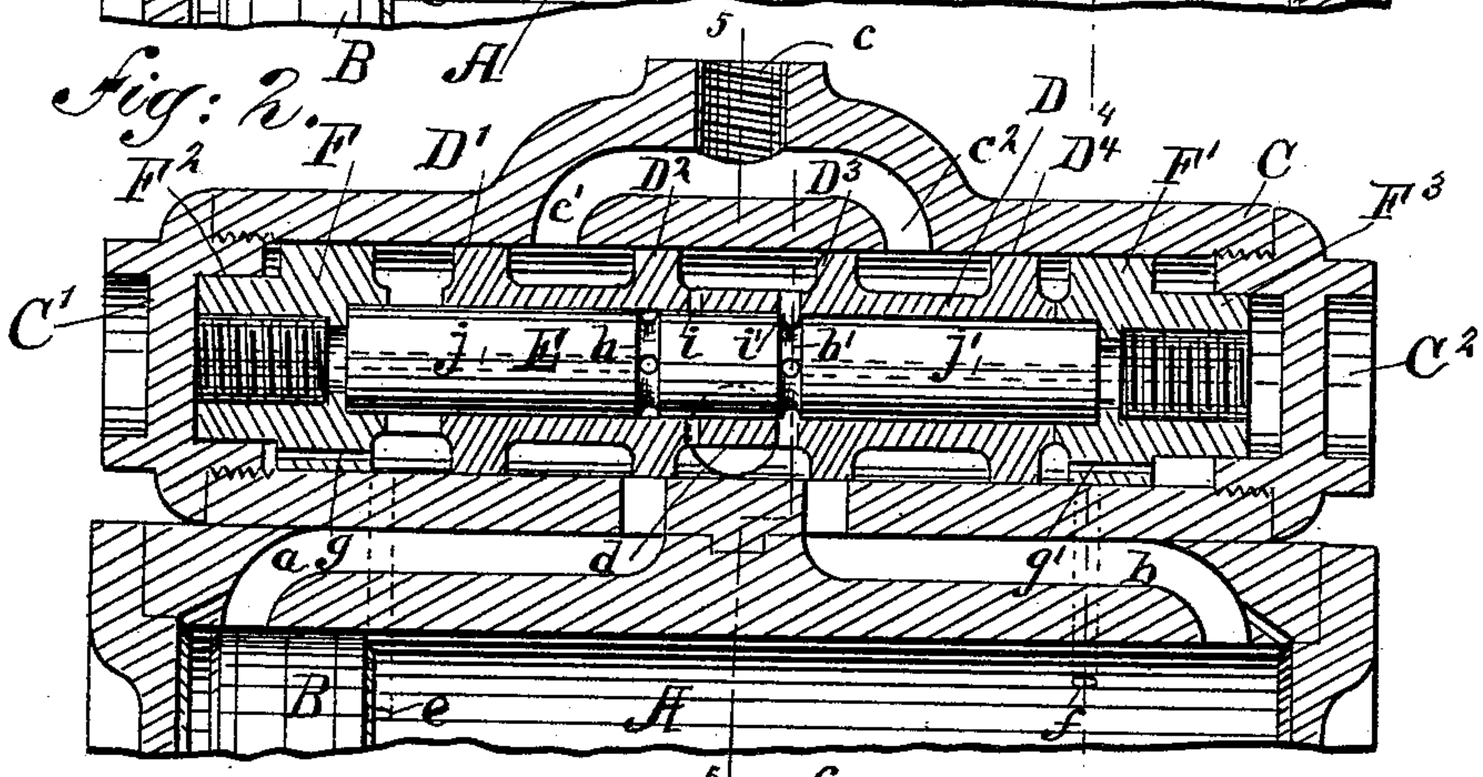
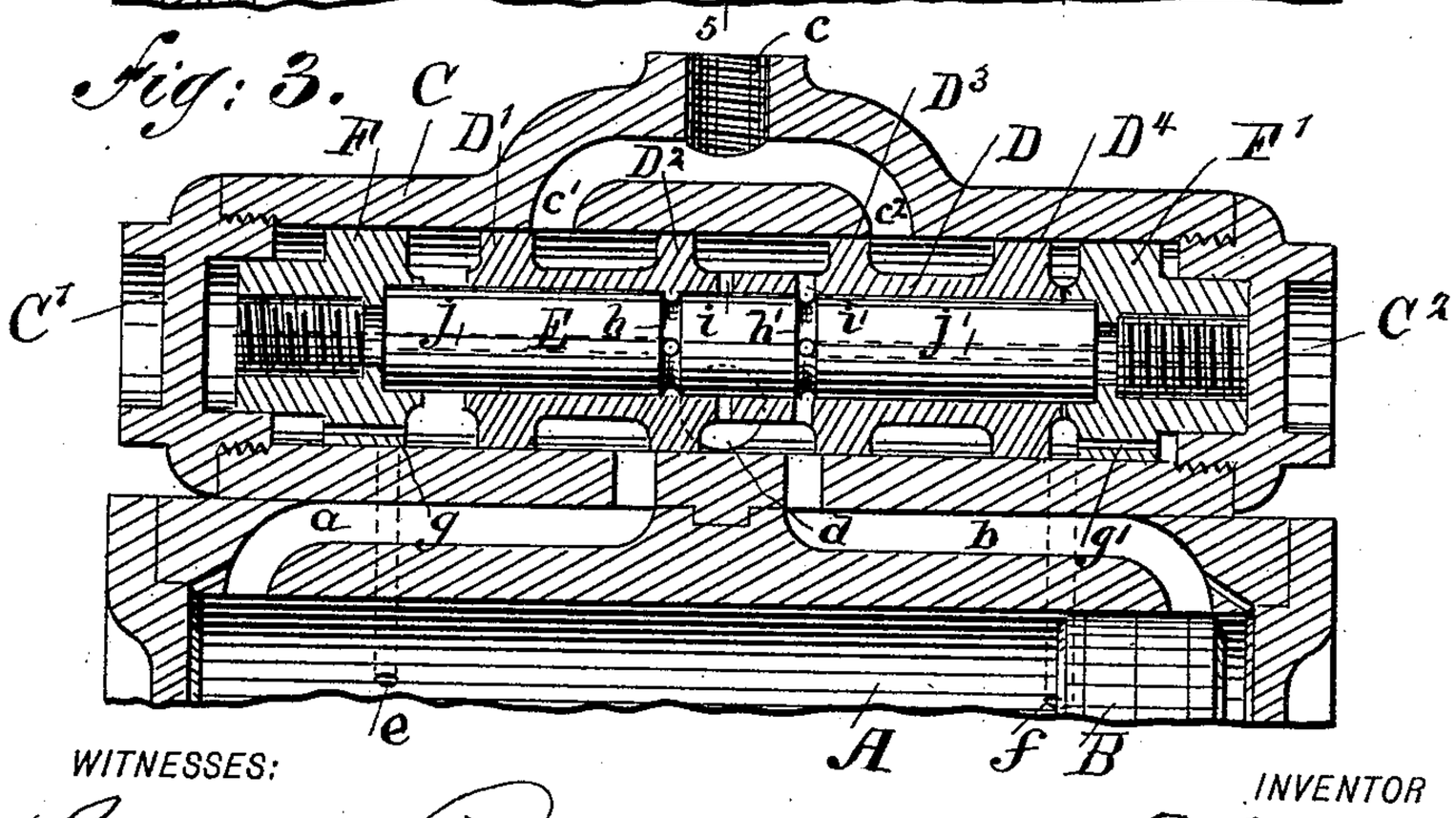



Fig: 3.




WITNESSES:

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C. Sedgwick

INVENTOR

E. A. Menking

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ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

# E. A. MENKING.

## STEAM ACTUATED VALVE.

No. 500,407. Patented June 27, 1893.

Fig: 4.

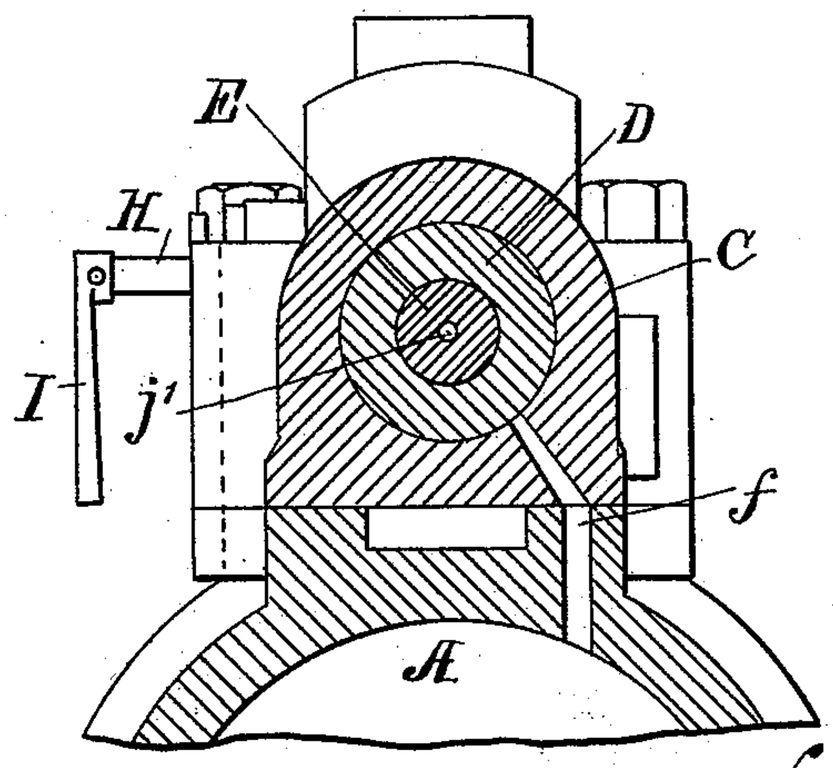



Fig: 5.

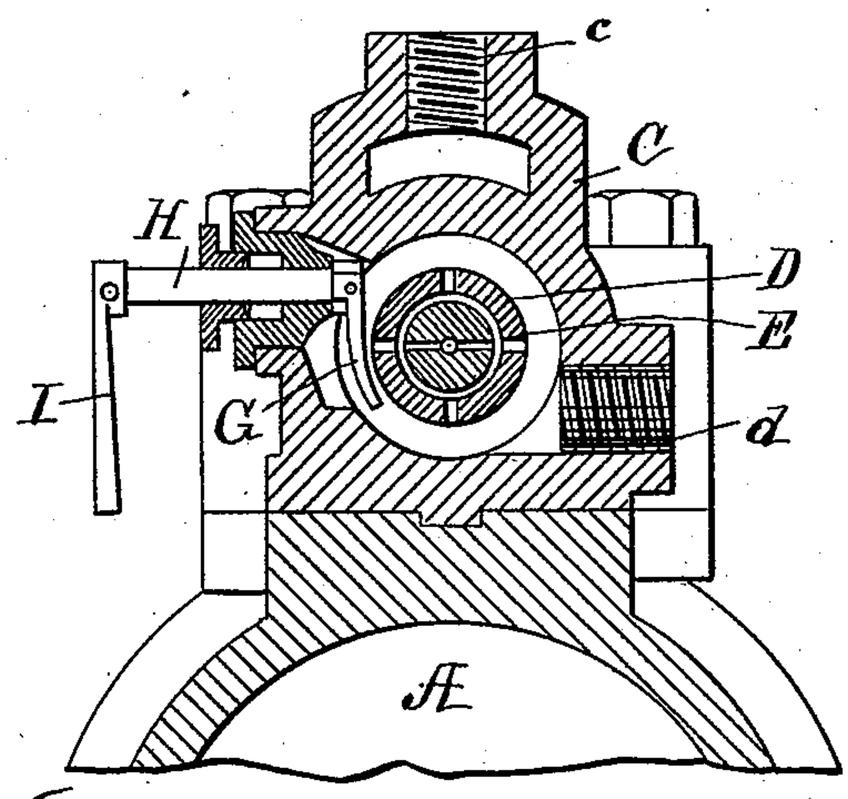



Fig: 6.

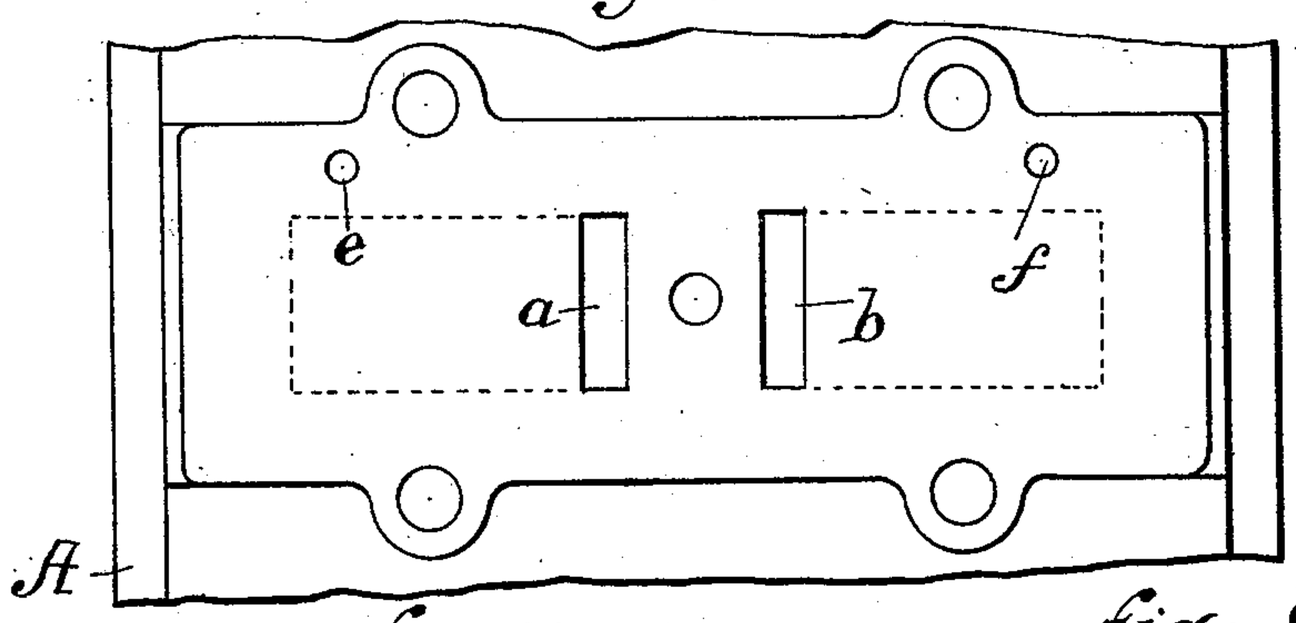



Fig: 7.

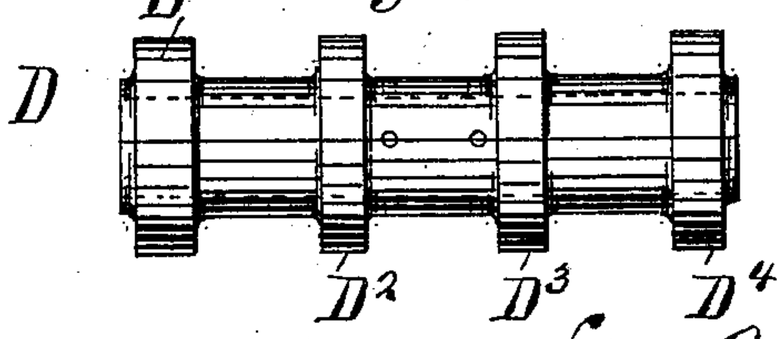



Fig: 8.

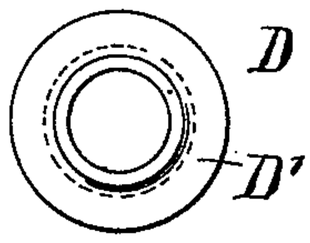
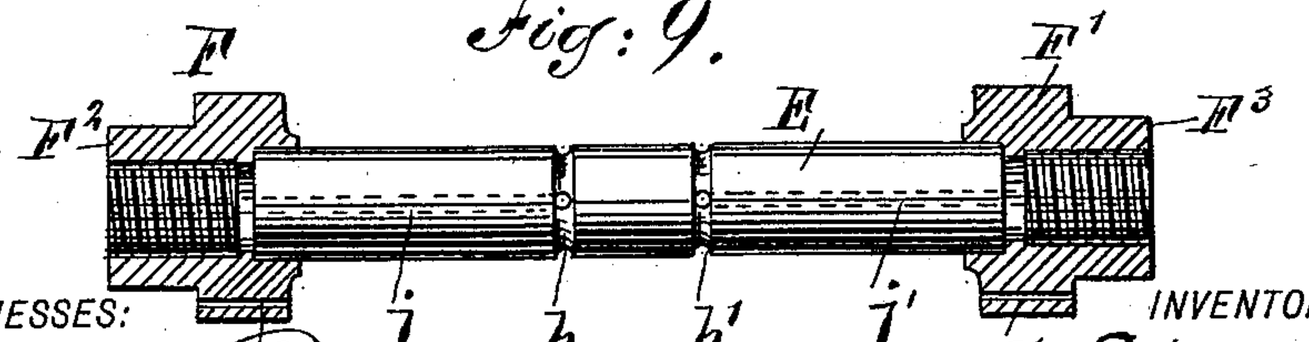



Fig: 9.

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# UNITED STATES PATENT OFFICE.

ERNEST A. MENKING, OF PITTSBURG, PENNSYLVANIA.

## STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 500,407, dated June 27, 1893.

Application filed November 14, 1892. Serial No. 451,929. (No model.)

*To all whom it may concern:*

Be it known that I, ERNEST A. MENKING, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and Improved Steam-Actuated Valve, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved steam-actuated valve, which is simple and durable in construction, very effective in operation, and arranged to prevent undue wear, and requiring but little power to shift the valves, as they are perfectly balanced.

The invention consists of certain parts and details, and combinations of the same, as will be hereinafter described and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement. Fig. 2 is a like view of the same in a different position. Fig. 3 is a similar view of the same in still another position. Fig. 4 is a transverse section of the same on the line 4—4 of Fig. 1. Fig. 5 is a similar view of the same on the line 5—5 of Fig. 2. Fig. 6 is a plan view of the cylinder. Fig. 7 is a side elevation of the main piston valve. Fig. 8 is an end view of the same; and Fig. 9 is a sectional side elevation of the auxiliary valves.

The cylinder A, is provided with the usual piston B, and the main inlet ports *a* and *b*, connecting the ends of the cylinder with the interior of the cylindrical steam chest C, fastened to the top of the cylinder A in the usual manner. In the cylindrical steam chest C is mounted to slide a main piston valve D, formed with pistons D′, D², D³ and D⁴, in frictional contact with the interior surface of the cylindrical steam chest C and arranged to form annular spaces in the main piston, as plainly illustrated in the drawings.

The steam chest C is provided with a steam inlet port *c*, from which extend the branch inlet ports *c′* and *c²*, in communication at all times with the annular space formed between the pistons D′, D² and the pistons D³, D⁴, respectively, of the main piston valve D. In the steam chest C is arranged an exhaust port *d* in communication at all times with the annular space formed between the pistons D² and D³ of the main piston valve D. The port *a* is adapted to connect alternately with the annular space formed between the pistons D², D³ and the pistons D² D′, and in a like manner, the port *b* is adapted to be alternately connected with the space between the pistons D² D³ and D³ D⁴ respectively.

From the cylinder A and near the ends of the same lead the ports *e* and *f* to the interior of the cylindrical steam chest C, the said ports serving to admit live steam on the forward and return stroke of the main piston B which passes into the steam chest for the purpose hereinafter more fully described.

The main piston valve D is provided with a central aperture extending longitudinally and through which passes loosely the stem E of the two auxiliary piston valves F and F′, secured on the ends of the said stem E. The auxiliary piston valves F and F′ have reduced ends F² and F³ respectively, fitted into the caps C′ and C² respectively, closing the ends of the cylindrical steam chest C. In the auxiliary piston valves F and F′ are arranged longitudinally-extending ports *g* and *g′* serving to conduct live steam to the rear ends of the said piston valves for the purpose hereinafter more fully described.

In the valve stem E are arranged annular grooves *h* and *h′* respectively, adapted to connect alternately with ports *i* and *i′* respectively, formed in the main piston valve D between its pistons D² and D³. From the annular grooves *h* and *h′* lead ports *j* and *j′* respectively, through the center of the stem E to the reduced ends F² and F³ of the auxiliary piston valves F and F′, respectively.

The operation is as follows: When the several parts are in the position illustrated in Fig. 1, the live steam entering the inlet port *c* passes into the branch inlet port *c²* around the space between the pistons D³ and D⁴ of the main piston valve D to the inlet port *b* and to the right hand end of the cylinder A, to force the piston B to the left on the outward stroke. When the piston B nears the end of its stroke, as shown in said Fig. 1, it it uncovers the port *e*, so that the live steam in the cylinder A can pass through the said

port *e* into the steam chest C, between the auxiliary piston F and the piston D′ of the main piston valve D. The force of the steam thus passing into the steam chest C forces the main piston valve D to the right, so that the main inlet port *b* is cut off from the live steam, and the other inlet port *a* is connected with the live steam by the space between the pistons D′, D² of the main piston valve D and the branch inlet port *c*′, as will be readily understood by reference to Fig. 2. The main piston valve D moves to the right until it strikes with its piston D⁴, the auxiliary piston F′ and as now the steam enters the left hand end of the cylinder A, the main piston B is forced to the right, so that the port *e* is first covered up by the main piston B, and then uncovered to permit the live steam to again pass through the said port *e* to the space between the auxiliary piston F and the piston D′ of the main piston valve D. The steam passes through the small port *g* in the auxiliary valve F to the rear of the latter, so that the said auxiliary piston valve is now forced to the right to move the other auxiliary piston valve F′ to the right onto its seat in the cap C²; see Fig. 3.

It is understood that the main piston valve D moves with the auxiliary valves to the right owing to the pressure of steam on the piston D′ of the said main piston valve D. The auxiliary valve F finally cuts off the port *e* and when the valves are finally seated as shown in Fig. 3, the other port *f* opens between the auxiliary piston valve F′ and the piston D⁴ of the main piston valve D. When the main piston valve D first moves to the right, as above described and shown in Fig. 2, the port *i*′ of the said piston valve moves into register with the annular groove *h*′ so that the exhaust steam can pass from the middle of the steam chest C through the port *i*′ to the annular groove *h*′, and from the latter through the port *j*′, to the back or reduced end F³ of the auxiliary valve F′ to cushion the latter at the time the said auxiliary piston valve F is finally seated. When the main piston B moves to the left, the above described operation is repeated in reverse order, that is to say, the main piston B first uncovers the port *f* to permit the live steam to pass from the cylinder through the said port *f* between the piston D⁴ and the auxiliary piston valve F′ to force the main piston valve D to the left, so that live steam is again permitted to pass to the right hand end of the cylinder A. On the return stroke of the main piston B the port *f* is again uncovered to permit live steam to pass again between the piston D⁴ and auxiliary valve F′ and through the port *g*′ to the rear end of the said auxiliary piston valve F′, to shift the latter to the left so as to seat the other auxiliary piston valve F in the cap C′. The auxiliary piston valve F is cushioned by the exhaust steam passing from the exhaust space through the port *i* to the annular groove *h* and from the latter through the central port *j* to the reduced end F² in the cap C′ to cushion the auxiliary piston valve F.

In order to shift the main piston valve D from the outside by hand I provide an arm G extending into the steam chest C between the pistons D² and D³ of the main piston valve D, see Fig. 5. This arm G is held on the inner end of a shaft H extending transversely and mounted to turn in suitable bearings formed in the rear side of the steam chest C. On the outer end of this shaft H is held a hand lever I adapted to be taken hold of by the operator to turn the shaft H so as to move the arm G alternately in contact with the pistons D² and D³ to cause the piston valve D to slide longitudinally. This is usually used only to relieve the steam chest of condensed steam in case the pump engine is cold and it is necessary to start the same in a great hurry. When the engine is running, the lever remains stationary as the main piston valve does not touch it. It will be seen that by this arrangement no long double piston with steam reservoir in the center is necessary in order to move the steam valve, so that the steam chest and the parts contained therein can be comparatively short and the friction is reduced to a minimum. It will further be seen that the main piston valve is completely balanced, so that it requires but a small amount of live steam to actuate the valve in the manner above described.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination with the cylindrical steam chest having inlet and exhaust ports, *a b* leading to the ends of the cylinder intermediate exhaust port *d* and ports *e f*, connecting the steam chest and cylinder near their ends said ports *e f* being uncovered when the main piston reaches the ends of its stroke, of the main piston valve sliding in the said chest and having three annular grooves, the auxiliary pistons at the ends of the main valve and of the same diameter therewith and controlling the ports *e f* within the chest, and the rod sliding within the main piston valve and connecting the said auxiliary valves; the auxiliary valves being provided with ports to admit steam behind their outer faces, substantially as set forth.

2. The combination with cylinder A, and cylindrical chest C having inlet port *c c*′ *c*², exhaust port *d*, and ports *f e* leading from near the cylinder ends into the chest near its ends, of the tubular piston valve D having three annular recesses between its several pistons D′ D² D³ D⁴, and ports *i i*′ leading from its interior into the middle groove, the auxiliary piston valves F F′ in the ends of the chest, of the same diameter as the valve D controlling ports *e f* and provided with longitudinal ports *g g*′ respectively, and the rod E sliding through the valve D, connected at its ends to valves F F′, and provided with annular grooves *h h*′ operating in connection with ports *i i*′ and

communicating with longitudinal passages *j j'* leading to the ends of the said rod, substantially as set forth.

3. The combination with the cylinder, the cylindrical steam chest having inlet and exhaust ports, ports *a b* leading to the ends of the cylinder, ports *e f* leading from the cylinder near its ends into the chest near its ends, of the annularly grooved main piston valve D, the rod sliding through said valve and provided at its ends with auxiliary steam controlled piston valves of the same diameter as the main valve and controlling the ports *e f*, the shaft H extending through a gland in the chest, and provided at its inner end with an arm G working in the middle groove of the main valve and means for operating said shaft, substantially as set forth.

ERNEST A. MENKING.

Witnesses:
J. H. SORG,
JOHN HARTUNG.