(No Model.)

3 Sheets—Sheet 1.

J. A. TILDEN.

STEAM PUMP.

No. 248,834. Patented Oct. 25, 1881.

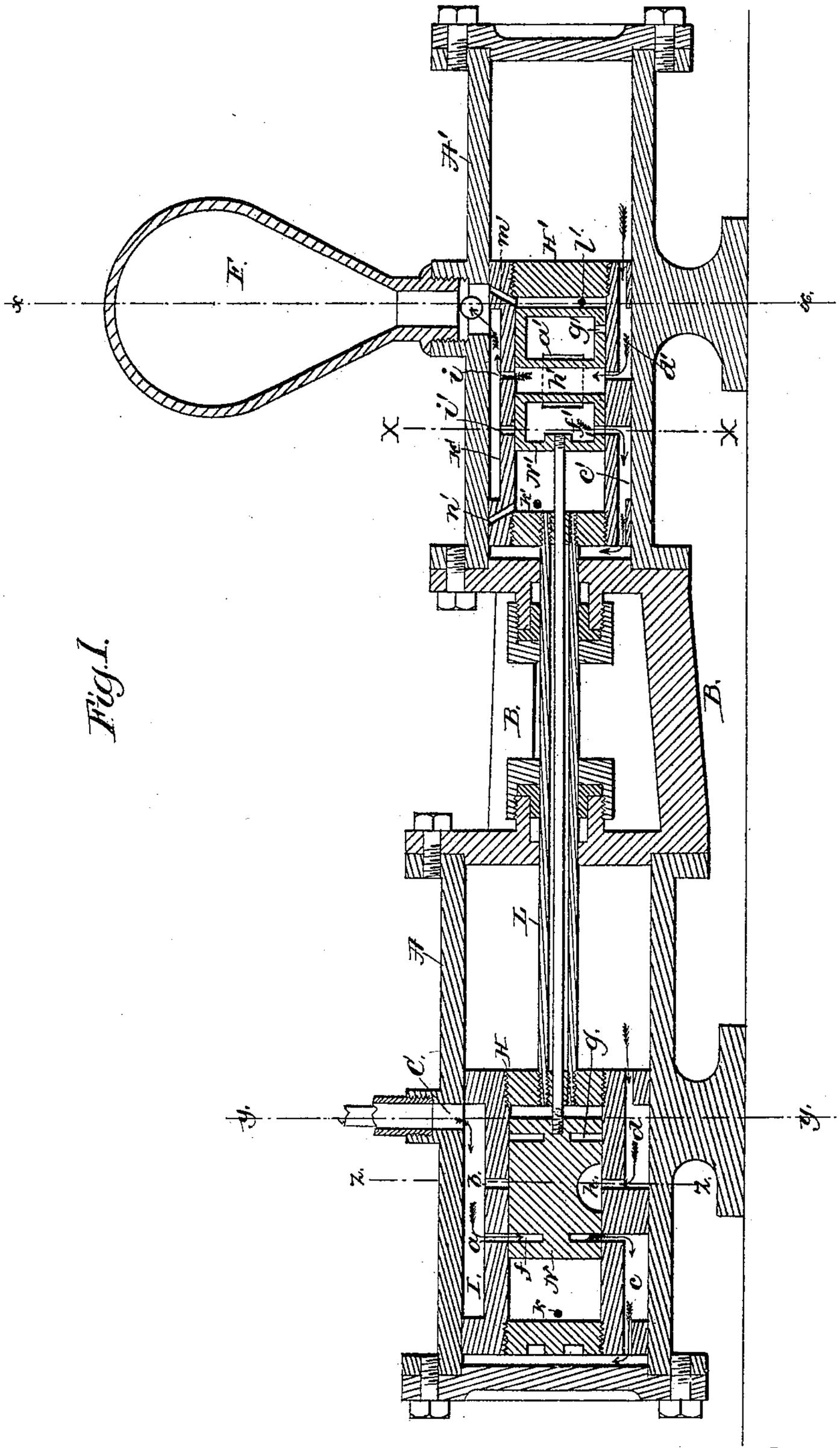

Fig. 1.

Witnesses.
John F. C. Reinkert
L. F. Connor.

Inventor:
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Attys

(No Model.) 3 Sheets—Sheet 2.

J. A. TILDEN.

STEAM PUMP.

No. 248,834. Patented Oct. 25, 1881.

Fig. 3.

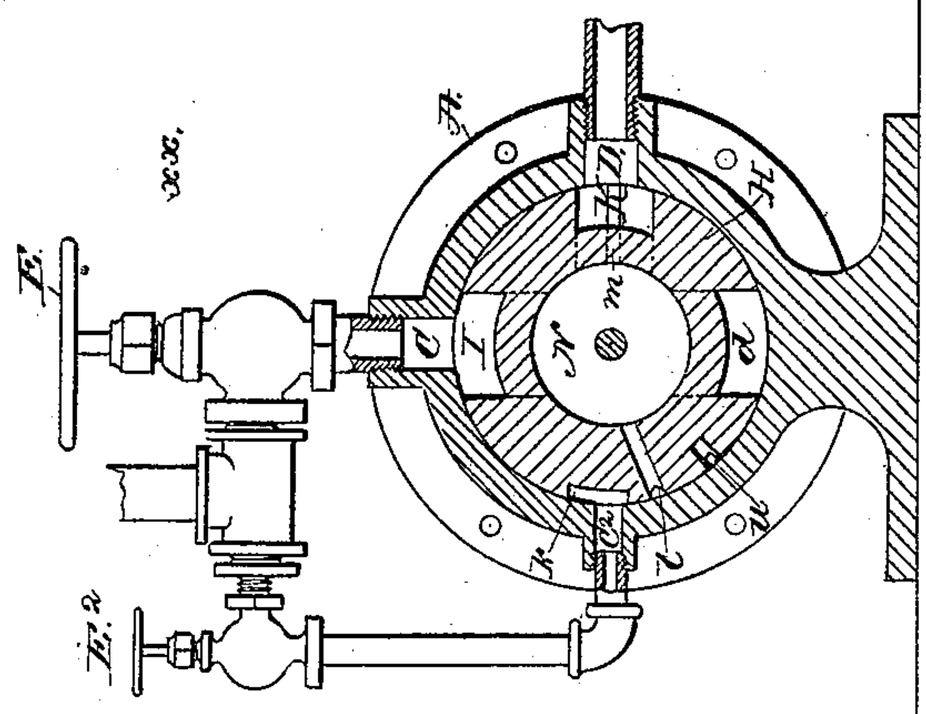
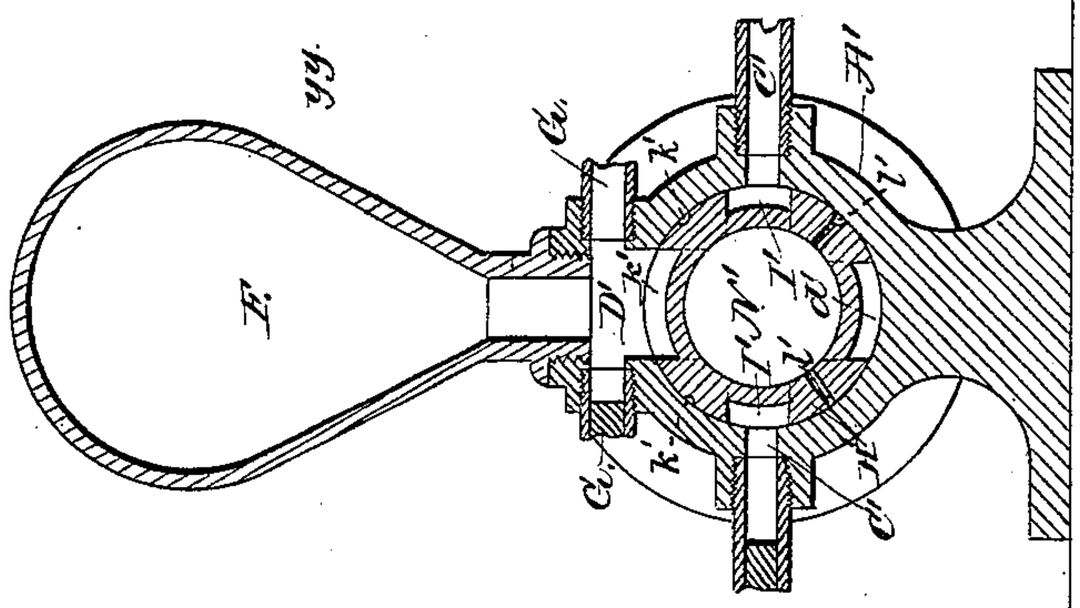


Fig. 2.



Witnesses.
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(No Model.) 3 Sheets—Sheet 3.

J. A. TILDEN.

STEAM PUMP.

No. 248,834. Patented Oct. 25, 1881.

Fig. 7.

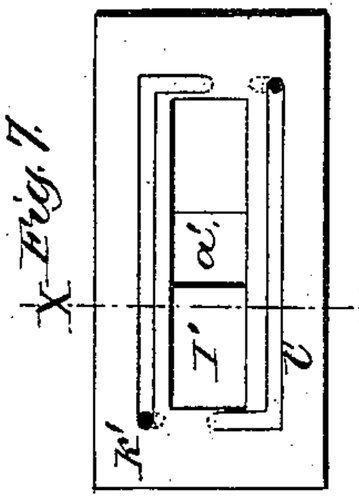


Fig. 8.

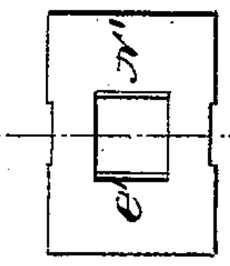


Fig. 9.

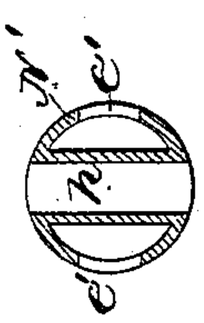


Fig. 10.

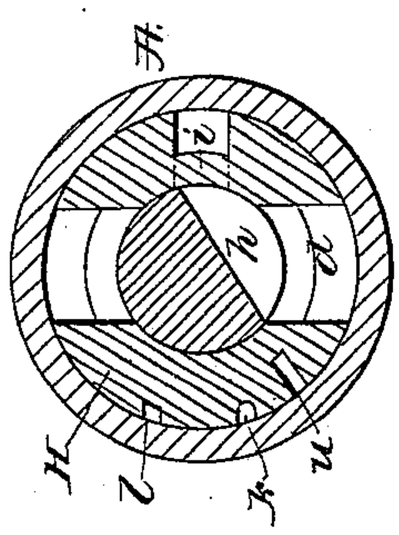


Fig. 11.

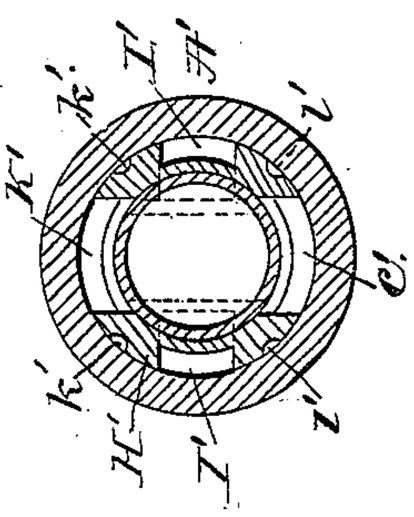


Fig. 4.

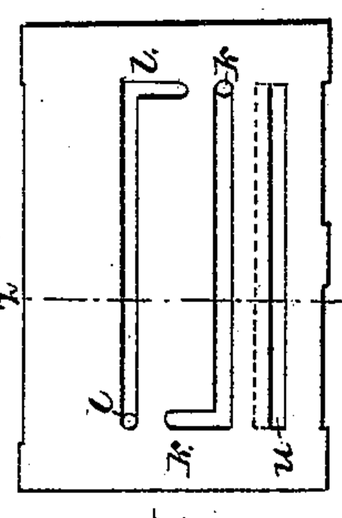


Fig. 5.

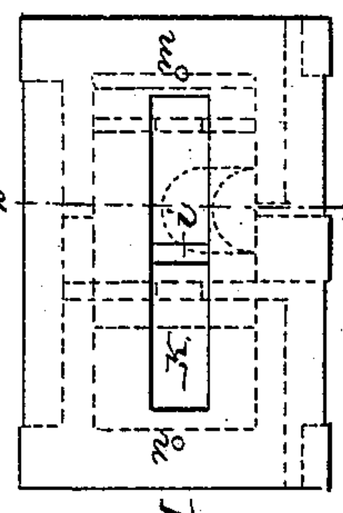
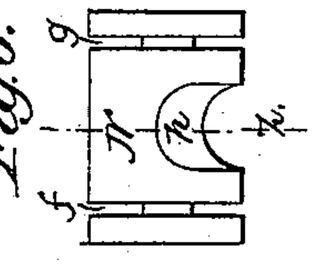


Fig. 6.



Witnesses.
John F. C. Preinkert
L. F. Connor.

Inventor.
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by Crosby Gregory
Attys.

UNITED STATES PATENT OFFICE.

JAMES A. TILDEN, OF HYDE PARK, MASSACHUSETTS.

STEAM-PUMP.

SPECIFICATION forming part of Letters Patent No. 248,634, dated October 25, 1881.

Application filed July 20, 1881. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. TILDEN, of Hyde Park, Norfolk county, State of Massachusetts, have invented Improvements in Steam-Pumps, of which the following description, in connection with the accompanying drawings, is a specification.

My invention relates to steam-pumps; and it consists in a novel construction both of the engine and the pump proper, it being simple and inexpensive, and very certain and positive in action.

The general construction and plan of operation is similar in both parts of the apparatus—namely, engine and pump—each of which consists, in general terms, of a cylinder and a main piston therein, itself made as a cylinder containing the valve, which is made as a piston reciprocating therein, and controls the inlet and exhaust of the fluid by which the main piston is actuated.

In the following description the term "main" will be applied to the various ports and passages by which the movements of the main pistons of the engine and pump are controlled, and the term "secondary" or "valve" will be applied to those which control the "valve" or "secondary" piston, as it may sometimes be called.

The main pistons of both pump and engine cylinders are connected by a main piston-rod, herein shown as hollow, and containing within it the secondary piston-rod connecting the secondary pistons *c*. The liquid being pumped will enter behind the pistons as they travel by atmospheric pressure, and will be forced out in advance of the said pistons.

In the general plan of operation each cylinder is provided with inlet and exhaust passages, entering at about the middle of its sides into longitudinal depressions or channels in the side of the main piston of such length relative to its stroke that they always remain in connection with the said inlet and exhaust passages of the cylinders. The main pistons are provided with main ports leading to the cylinder at either end thereof, acting alternately as inlet and outlet ports, and the valves are provided with main inlet and outlet connecting-passages, the former of which connects one of the said main ports with the inlet depression and passage through the sides of the cylinder, while the latter connects the other main port with the outlet depression and passage. The valve, in making its stroke, reverses the connections of the main ports, which, however, it maintains constant throughout the stroke of the main piston, during which it remains at one end of the said piston stationary relative thereto. The main pistons are provided with secondary inlet and exhaust ports leading from their interior at either end to points on their exterior, so located that when the main piston has completed its stroke the said secondary ports are brought into communication, the inlet one entering one end of the main piston with the inlet-passage of the cylinder, and the outlet one at the other end with outlet-passage of the cylinder to cause the valve to make its stroke, and thereby reverse the connection of the main ports to cause the main piston to make its next or return stroke.

In small pumps where the amount pumped by the secondary piston would be of small consequence, the secondary ports might be dispensed with for simplicity, and the pump-valve loosely fitted to act as a cushion for the engine-valve, and the engine-cylinder is shown as provided with a secondary inlet-passage independent of the main one, so that the amount of steam used to operate the valve may be controlled independently of that used for the main piston.

Figure 1 is a longitudinal section of a pumping-engine embodying my invention; Fig. 2, a transverse section of the pump portion on line *x x*, Fig. 1; Fig. 3, a transverse section of the engine portion on line *y y*, Fig. 1; Figs. 4 and 5, side elevations of the engine-piston from the rear and front sides, respectively, as viewed in Fig. 1; Fig. 6, an elevation of its valve, viewed from the same side as Fig. 5; Figs. 7 and 8, similar side elevations of the pump-piston and its valve, both sides being alike; Fig. 9, a central vertical section of the pump-valve on the dotted line, Fig. 8; Fig. 10, a vertical section of the engine on the dotted line *z z*, Figs. 1, 4, 5, 6; and Fig. 11, a vertical section of the pump on the dotted line X X, Figs. 1 and 7.

In the following description the same letters

will be used for corresponding parts in the engine and pump, the latter being distinguished by a dash or accent-mark, (′,) and a separate description will be given only for those parts that differ materially in form.

The cylinders A A′ of the engine and pump, respectively, are connected by bars B, formed as a part of the same casting with the opposite heads of the said cylinders, which are provided with inlet-passages C C′ and outlet-passages D D′, passing through the sides of the cylinders about midway between their ends. In the engine-cylinder the inlet-passage is divided into two parts, a separate passage, C^2, supplying the motive power for the valve, the said passages being connected with branches of the steam-pipe and controlled by separate valves E E^2, (see Fig. 3,) to enable the operation of the valve to be regulated independently of that of the engine-piston. In the pump-cylinder inlet-passages C′ are provided on each side of the cylinder for convenience of connection in setting up, one being usually closed by a cap or plug; and the outlet-port D′ enters the usual air-chamber, F, and is provided with means for connection with a force-pipe on either side of the engine, as shown at G.

The main pistons H H′, connected by the hollow piston-rod L, are provided with longitudinal inlet-channels I I′ and outlet-channels K K′, of proper length to remain in communication with the inlet-passages C C′ and outlet-passages D D′, respectively, throughout the stroke.

The engine-cylinder is provided with main inlet-ports *a b*, and the pump-cylinder with a main inlet-port, *a′*, leading from the inlet-channels I and I′ to the interior of the main pistons, which are made as cylinders to contain the valves N N′, or secondary pistons, connected by the rod P, passing through the main piston-rod L, provided with suitable bushings at its ends, the space between the piston-rods being filled with suitable packing material.

The main pistons H H′ are provided with main ports *c c′* and *d d′*, leading from their interior to either end, where they open into the cylinders A A′, and the engine-valve is provided with two inlet connecting ports or channels, *f g*, (shown as cut in entirely around the said valves,) the one *f* being adapted to connect the ports *a* and *c*, when the piston is in the position shown in Fig. 1, to admit steam to one end of the cylinder, and the one *g* being adapted, when the valve is at the other end of its stroke, to connect the ports *b d*, to admit steam to the other end of the cylinder. The ports *c d* are cut away to the side of the cylinder A, as shown, in order to balance the pressure in the inlet-channel I′.

The pump-piston is hollow and provided with an inlet-passage, *e′*, and connecting-ports *f′ g′*, operating, the former to connect the inlet C′ with the port *c′*, and one end of the cylinder when in the position shown in Fig. 1, and the latter, *g′*, to connect the said inlet with the port *d′* and other end of the cylinder when the valve N′ is at the other end of its stroke. The valves are also provided with connecting exhaust or outlet passages *h h′*, which operate to connect one of the main ports *d d′* or *c c′* with the outlet-channel K K′ and passage D D′ when the other of the said ports is connected, as just described, with the inlet-passage, the said outlet-channels K K′ being connected by ports *i i′* with the interior of the main piston opposite the said exhaust-passages *h h′*. The exhaust-passage *h′* of the pump is made as a tube separate from the interior of the valve N′, and two openings, *i′*, are shown corresponding in position to the openings of the main ports *c′ d′*; but it is obvious that a single opening, *l′*, of sufficient width to remain in connection with the channel *h′* throughout the stroke might be used as in the engine-cylinder, and that similarly the entire space between the inlet-openings *a b* of the engine-cylinder might be removed, forming a single passage, as at *a′*, in the pump, for in both cases the flow of fluid is controlled by the coincidence of the openings of the main ports *c d c′ d′* with the proper channels or passages in the valves.

The inlet and outlet of fluid to the interior of the main piston for the proper operation of the valves N N′ is controlled as follows: The stroke of the valve is made at the end of the stroke of the main piston, and is, in the arrangement shown, made from the end of the said piston nearest the cylinder-head toward the middle of the cylinder.

The main pistons H H′ are provided with secondary inlet-ports *k k′* and *l l′*, passing from the interior of the piston at one end along its exterior or through its walls, and having an opening in the exterior of the cylinder in line with the inlet-openings C^2 C′, so that just at the end of the stroke of the main piston the said inlet-openings are connected with the remote end of the interior of the main pistons, which are also provided with secondary outlet-ports *m m′* and *n n′*, leading directly from each end thereof, and brought at the end of the stroke into connection with the outlet-passages D D′ of the cylinders.

The parts are shown in the position assumed after the valves have just completed their stroke and placed the ports in position for the main pistons to make a stroke. In making this stroke of the valves steam entered through the passage C^2 and port *k* and exhausted through the port *m* and passage D, and the liquid entered through the passage C′ and port *k′*, and was discharged through the port *m′* and passage D′. When in this position steam enters at C and I and passes through the ports *a*, *f*, and *c* into one end of the cylinder, and exhausts from the other end through the port *d*, channel *h*, and passage D, and the liquid at the same time enters one end of the cylinder A through the passage C′, channel I′, port *a′*, passing through the interior of the valve N′ and ports *f′* and *c′*, and the liquid is forced

out from the other end of the cylinder through the port *d'*, passage *h'*, port *i'*, channel K', and passage D'. At the end of the stroke the secondary ports are brought in position to cause the valve to make its return-stroke, and the operation is continuous, there being no dead-points.

It is obvious that an engine of this kind may be employed to operate a pump of any ordinary construction, the engine main piston, for example, being connected with an ordinary plunger and the secondary piston-rod wholly dispensed with, or connected with a secondary plunger working in the main plunger as a cylinder. The pump, also, may be employed with an engine of different construction from that shown, but adapted to operate the valve at the proper time relative to the stroke of the main pump-piston, and various other modifications in construction may be made in which portions of the devices constituting this invention may be employed while the rest is differently constructed.

The engine-cylinder might be provided with a small channel or depression, *t*, running along its side, shown as crossing the secondary opening C^2, and of proper length to have one of its ends just uncovered when the main piston arrives at the end of its stroke, so that the steam will first exhaust from that end of the main cylinder into the secondary inlet-port leading to the other end of the main piston, to thereby operate the secondary piston or valve by the exhaust of the main cylinder. In this case the secondary inlet-passage C^2 might be dispensed with; but it will preferably be retained to insure the certainty of operation, especially when starting the engine, its controlling-valve F being closed when the engine is fully in operation, and the valve being then actuated wholly by the exhaust from the cylinder. This arrangement would be especially desirable in case the engine was running with a pump of different construction—for example, a plunger-pump—and the secondary engine piston or valve performing no work, being moved merely to control the main piston-ports. Suitable guides are provided to prevent the rotation of the pistons in the cylinders, that of the main engine-piston being shown at *u*.

I claim—

1. In a steam-pump, the main engine and pump cylinders provided with inlet-passages and connected main pistons therein, made as cylinders, and provided with main ports leading to either end thereof and with inlet channels or chambers communicating with the said inlet-passages, combined with connected valves operated as pistons within the said main pistons and provided with inlet connecting-passages to connect the inlet-chambers with the main ports leading to either end of the cylinder alternately, substantially as described.

2. In a steam-pump, the engine and pump cylinders provided with outlet-passages, and the main pistons therein provided with main ports leading to either end thereof, and with outlet channels or chambers communicating with the said outlet-passages, combined with valves provided with exhaust connecting-passages to connect the said main ports alternately with the said outlet-chamber, substantially as described.

3. The combination, with the main cylinder, provided with independent main and secondary inlet-passages, and separate valves to control them, of the main piston therein, made as a cylinder and provided with secondary inlet-ports, and the valve operated by the co-operation of the said secondary inlet passage and ports of the main cylinder and piston, to control the admission and exhaust of the main cylinder, substantially as and for the purpose set forth.

4. The combination, with the main piston, made as a cylinder, provided with an inlet-passage and main ports leading to its ends, of the piston-valve therein, provided with annular channels or depressions to connect the said inlet-passage with the said main ports, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES A. TILDEN.

Witnesses:
JOS. P. LIVERMORE,
L. F. CONNOR.