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A. J. TYLER.

DOUBLE ACTING FORCE PUMP.

No. 394,086. Patented Dec. 4, 1888.

Fig. 9.

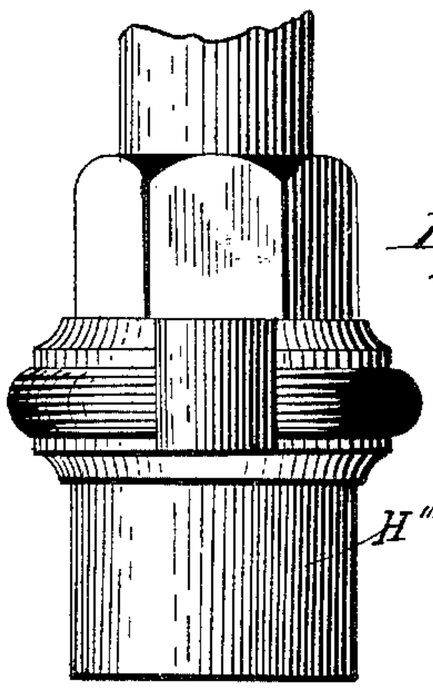


Fig. 10.

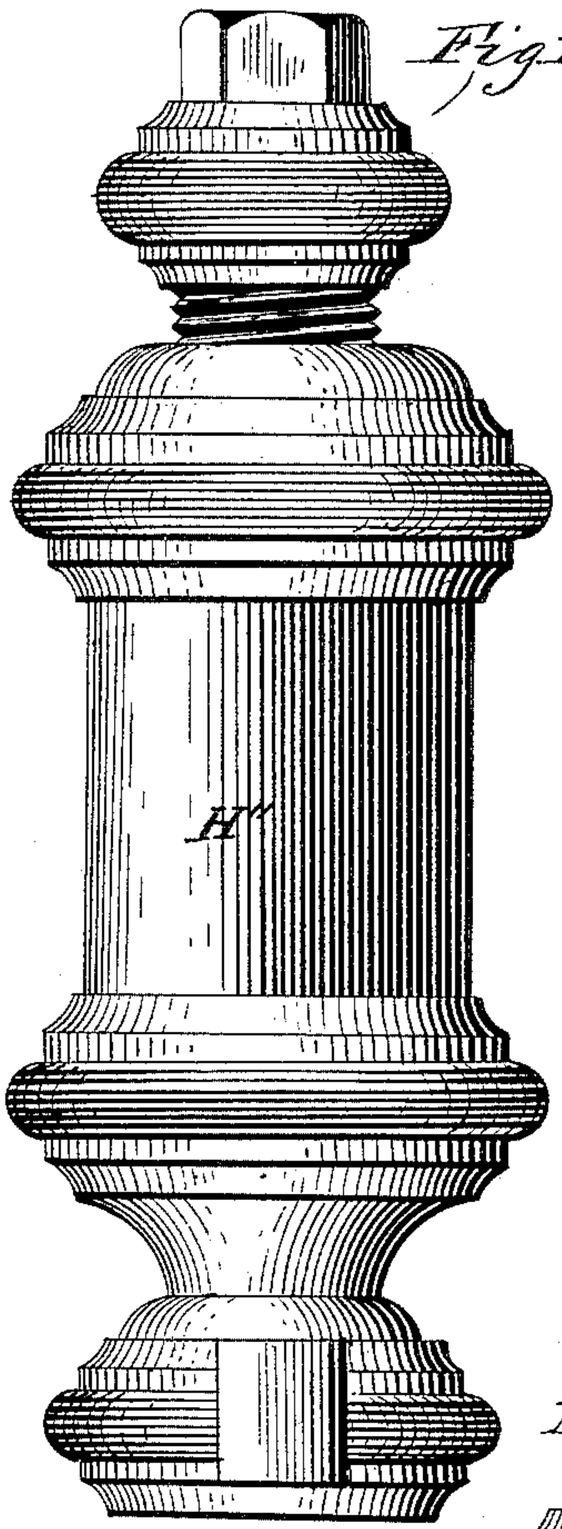
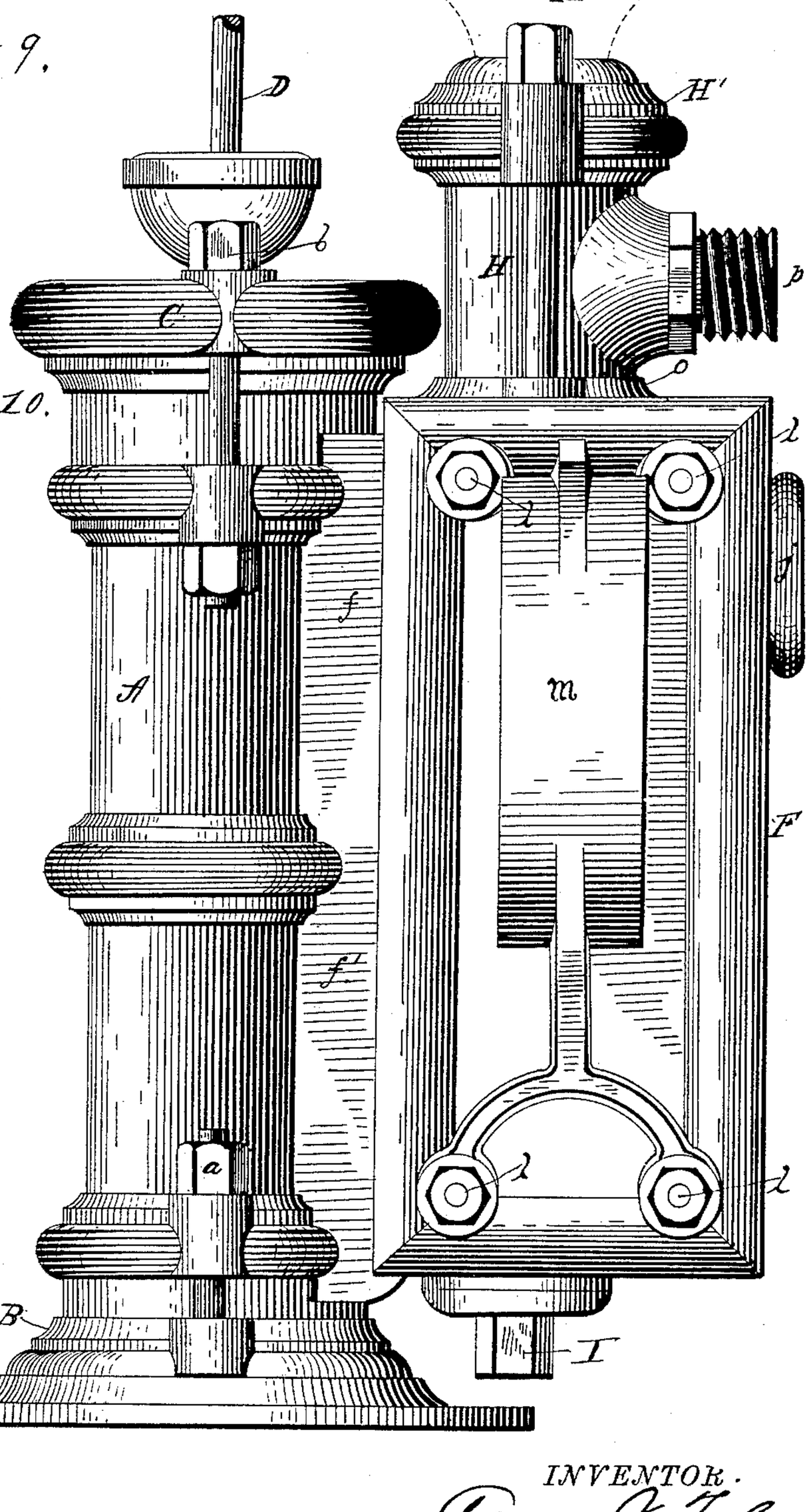


Fig. 1.



WITNESSES.

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Fig. 5.

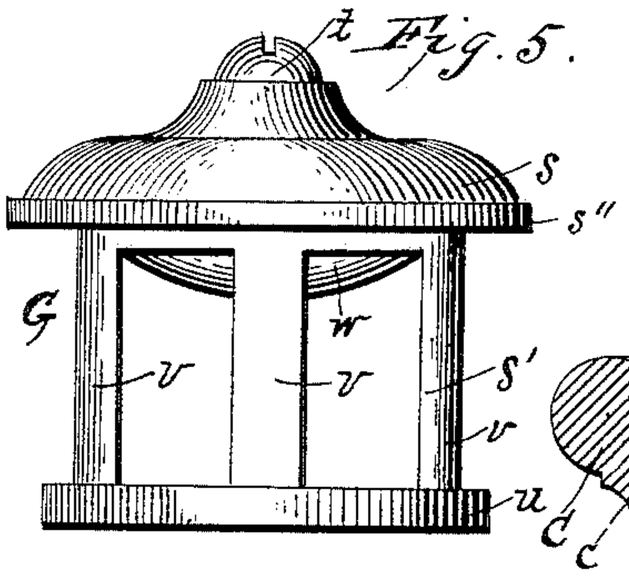


Fig. 6.

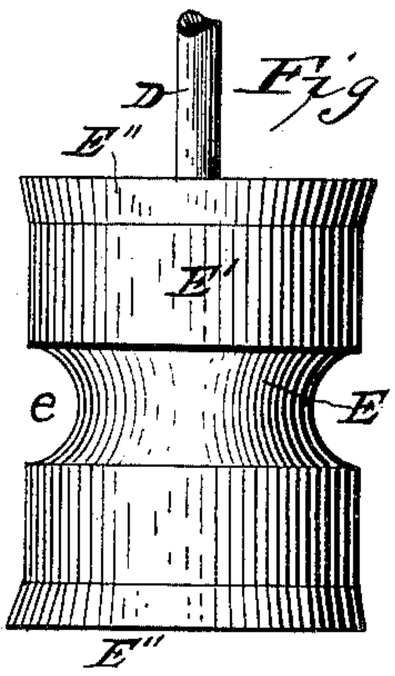


Fig. 7.

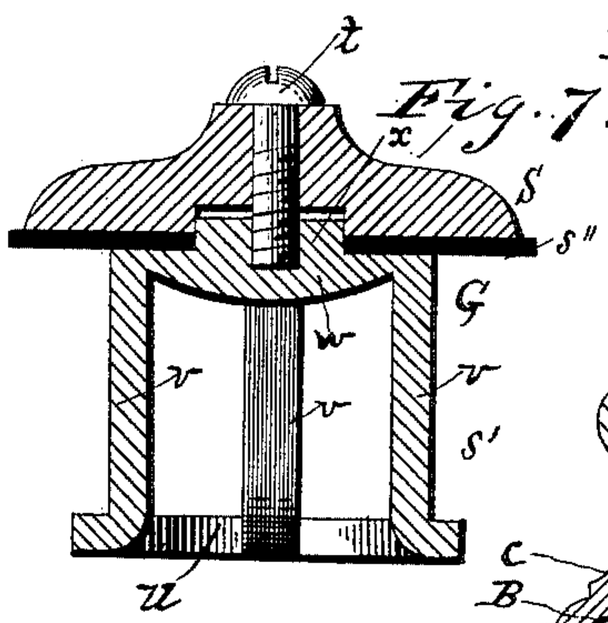
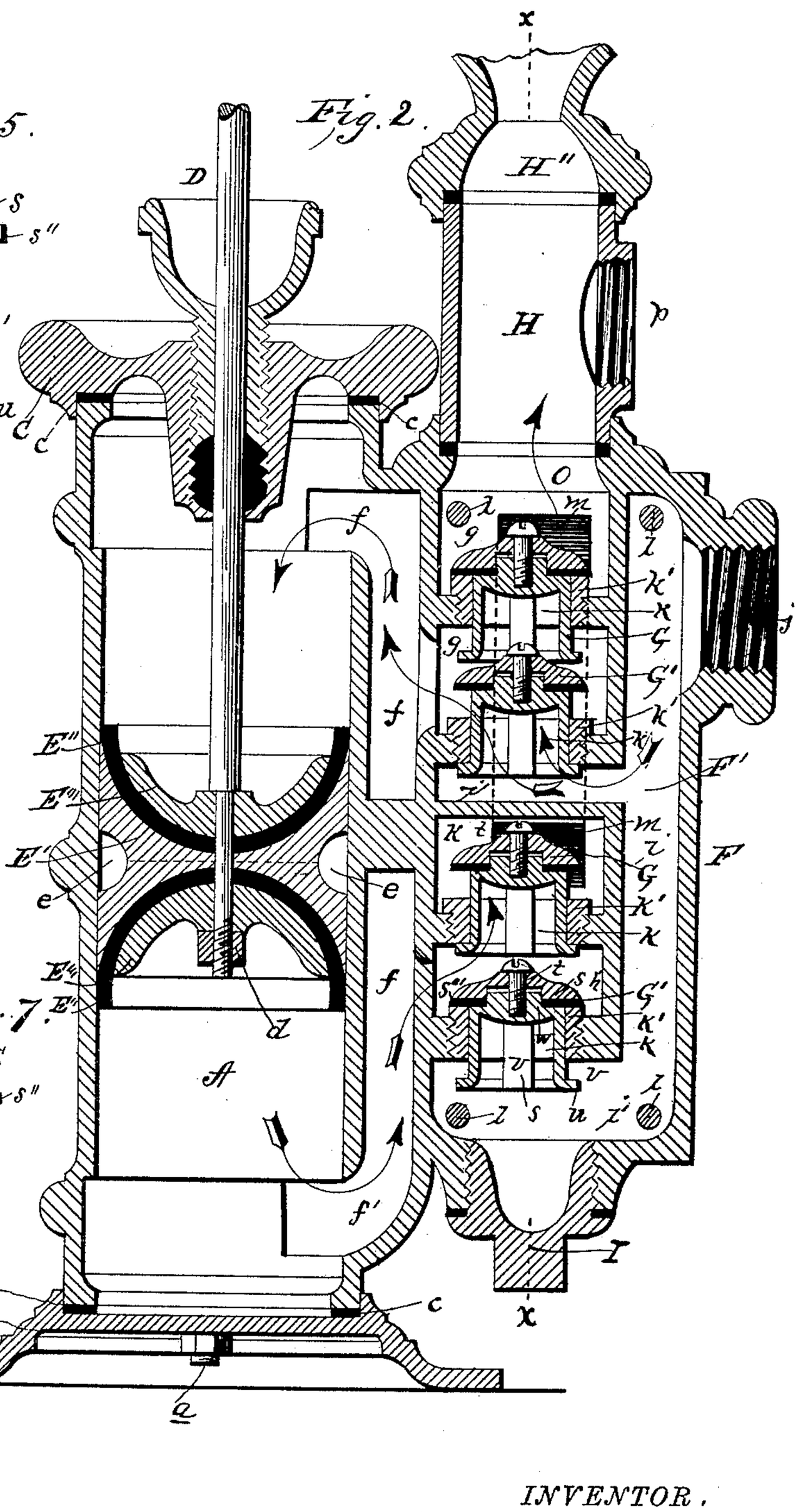


Fig. 2.



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DOUBLE ACTING FORCE PUMP.

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Fig. 3.

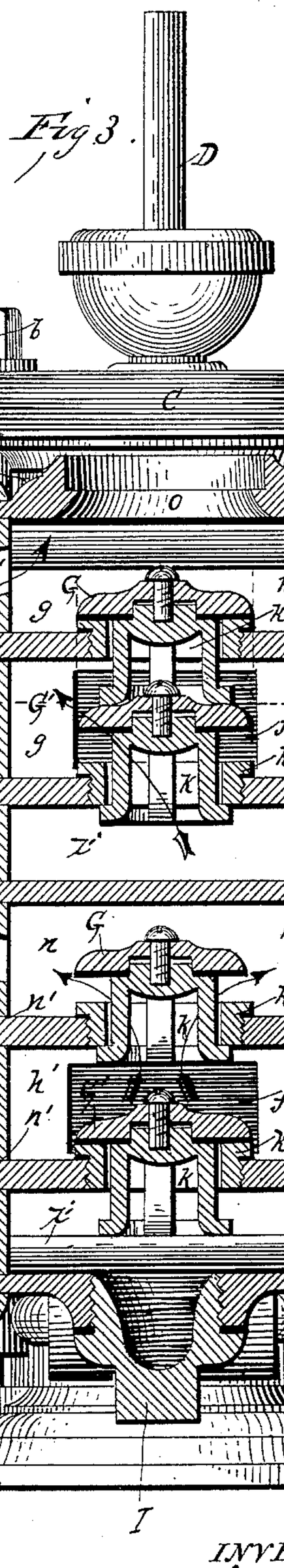
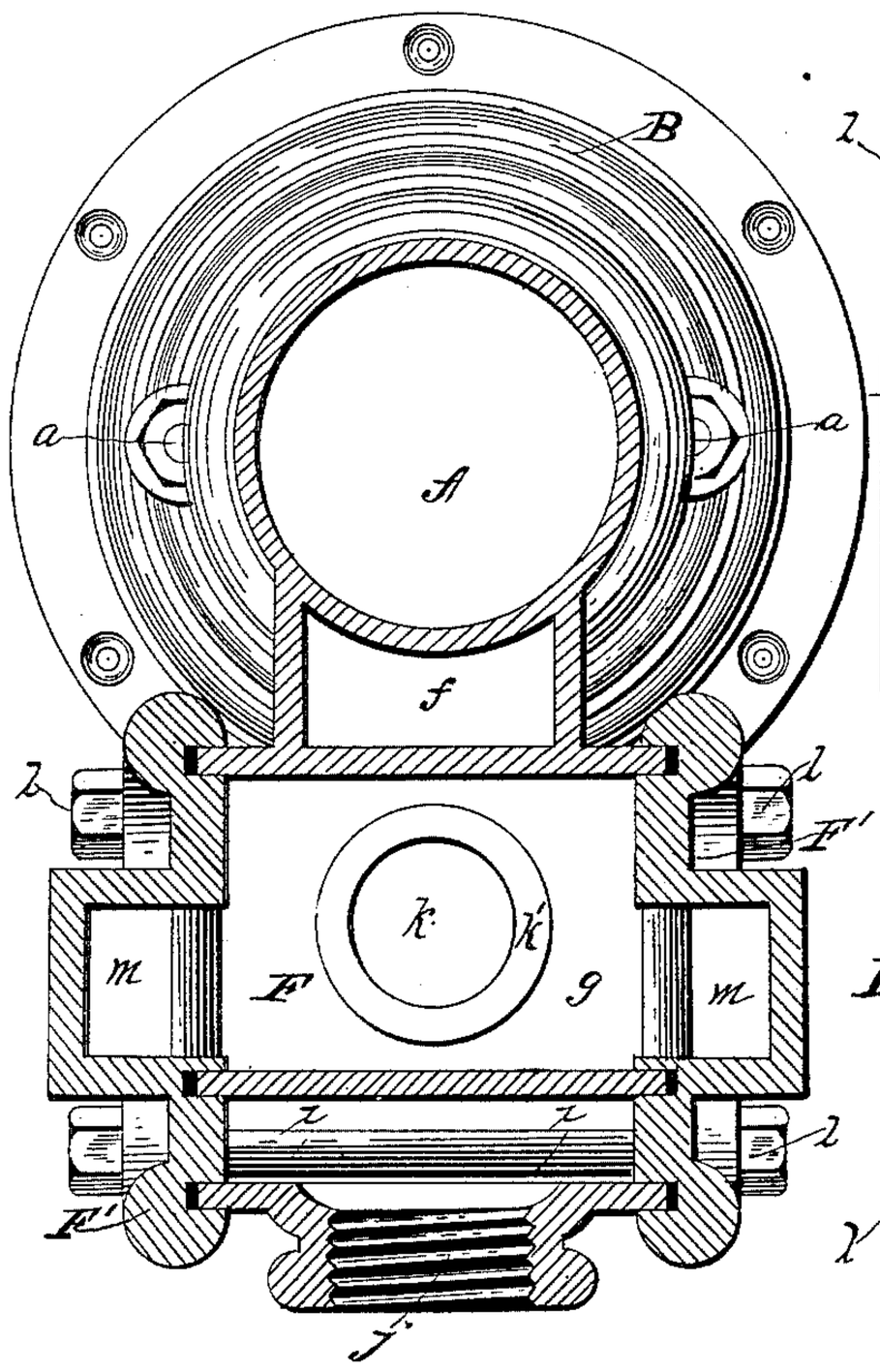


Fig. 4.



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(No Model.) 5 Sheets—Sheet 4.

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DOUBLE ACTING FORCE PUMP.

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Fig. 8.

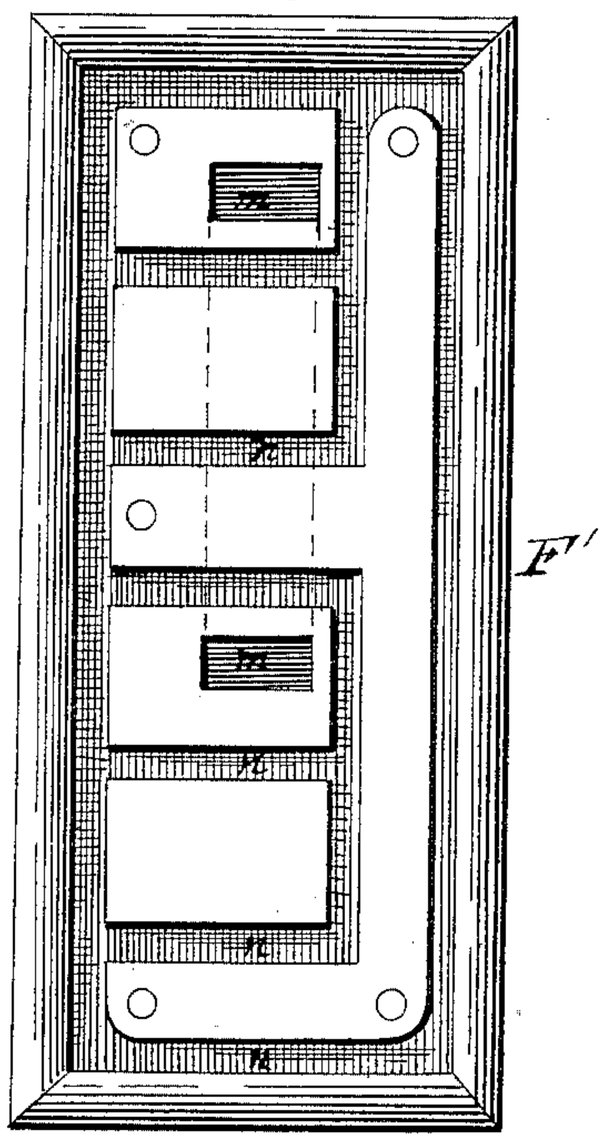
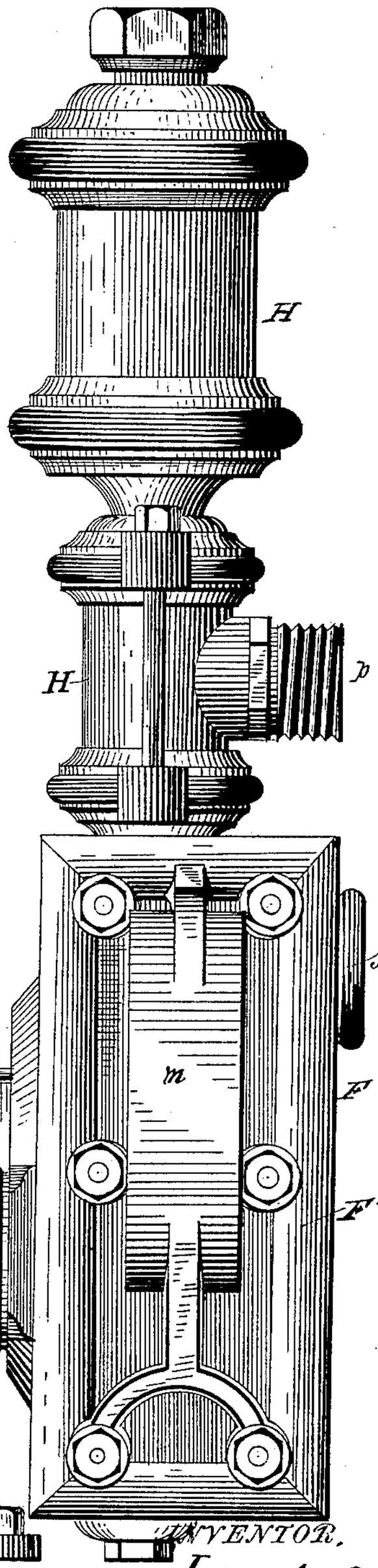


Fig. 11.



WITNESSES.

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(No Model.)

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DOUBLE ACTING FORCE PUMP.

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Fig. 13.

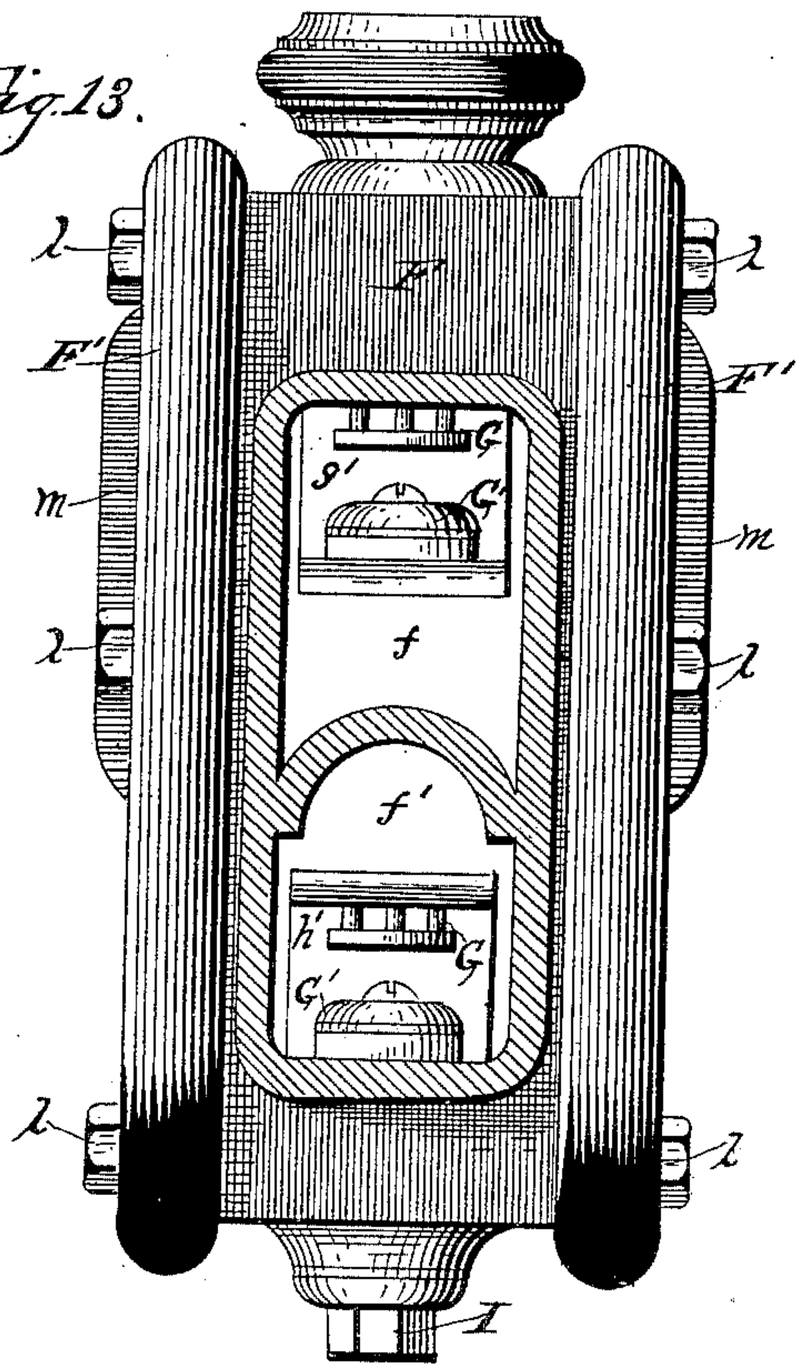

Fig. 12.

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UNITED STATES PATENT OFFICE.

AARON J. TYLER, OF ALBION, NEW YORK.

DOUBLE-ACTING FORCE-PUMP.

SPECIFICATION forming part of Letters Patent No. 394,086, dated December 4, 1888.

Application filed May 14, 1888. Serial No. 273,887. (No model.)

To all whom it may concern:

Be it known that I, AARON J. TYLER, a citizen of the United States, residing at Albion, in the county of Orleans and State of New York, have invented certain new and useful Improvements in Double-Acting Force-Pumps, of which the following is a specification, reference being had therein to the accompanying drawings, in which—

Figure 1 represents a side elevation of my improved double-acting force-pump; Fig. 2, a vertical sectional view of the same; Fig. 3, a similar view taken through the valve-chest on the line *x x* of Fig. 2; Fig. 4, a transverse sectional view taken on the line *x' x'* of Fig. 3; Fig. 5, a side elevation of one of the valves used in the pump; Fig. 6, a side elevation of the plunger used; Fig. 7, a sectional view of the valve shown in Fig. 5; Fig. 8, an elevation of one of the removable sides of the valve-chest, showing its inner face; Fig. 9, a detail view of a pipe that may be attached to outlet, in lieu of water-chamber H, when it is desired to carry the water up to a higher point than where the pump itself is located; Fig. 10, a side elevation of air-chamber; Fig. 11, a side elevation of a slight modification of my invention; Fig. 12, a vertical sectional view of the modification, and Fig. 13 a sectional view taken on the line *x'' x''* of Fig. 12.

This invention has for its objects, essentially, to provide an improved piston or plunger that may be readily put together and repaired, and which will preserve its efficiency for a comparatively long time; to provide a very simple and durable valve that may be easily inserted in its seat and put together and at the same time not appreciably obstruct the passage of the water, and to improve and simplify the construction of the pump generally, whereby the valves may at any time be taken out for repairs and a continuous and full flow of water is obtained, as will be more fully hereinafter set forth.

The invention consists in certain novel features of construction that will be fully hereinafter set forth, and particularly pointed out in the claims.

Referring to the annexed drawings by letter, A designates the pump-cylinder, bolted to a base, B, by means of bolts *a a*, and provided with a cap or head, C, secured over the upper end by means of bolts *b b*, packing-rings *c c* being interposed between the said base and cap and the ends of the cylinder.

Passing through a suitable adjustable stuffing-box and oil-cup in the center of the head C is the piston-rod D, to which is attached the piston or plunger E, this piston being removably attached to the lower end of the rod by means of a nut, *d*. This piston is constructed of a central body portion, E', adapted to fit closely the bore of the cylinder, this central portion being provided with a circumferential water-packing groove, *e*. The upper and lower faces of this central portion are concaved or formed cup-shaped, the curvature of these depressions being that of a true circle the diameter of which is approximately equal to that of the pump-cylinder A. Formed so as to closely fit these depressions in the central portion are the leather or other flexible packings E'', these packings being first preferably formed by suitable dies, so that there will be no wrinkles or creases at their edges to cause leaking. Adapted to retain these packings in their respective depressions are the cap-shaped plates E''', centrally perforated for the passage of the piston-rod, the convex surfaces of these plates being so formed as to fit closely the concave surfaces of the packings. The nut *d* secures the piston on the rod and binds all the parts together, as is evident. I may desire to cast the central portion, E', in two sections, as shown by dotted lines in Fig. 2, and therefore I do not wish to confine myself to casting it in a single piece. By forming and curving the packings as described they may be made to fit closely the bore of the cylinder and effectually prevent leaking.

Cast preferably integral with the cylinder, on one side thereof, is the valve-chest F, which is provided with two upper valve-chambers, *g g'*, and two lower valve-chambers, *h h'*, as clearly shown in Fig. 2. The lower one, *g'*, of the upper pair of these chambers and the lower one, *h'*, of the lower pair communicate, respectively, with the upper and lower ends of the cylinder A by means of independent passages *f f'*. Between these valve-chambers and the front wall of the valve-chest is the main inlet-passage *i*, provided with two horizontal branches, *i' i'*, which extend, re-

spectively, under the valve-chambers g' and h'. The upper valve-chamber, g, connects with the chamber g', the latter chamber with the upper one of the branches i' of the inlet-passage, the chamber h with the chamber h', and the latter with the lower branch, i', of the inlet-passage by means of openings k, and into the openings are tapped removable valve-seats k'.

The letter j designates the water-inlet, which preferably communicates with the upper end of the inlet-passage i, as shown in Fig. 2. Working in the communicating openings k and adapted to close on the valve-seats k' are the valves G G G′ G′, the former two of which act as discharge or force valves, and the latter as suction-valves. In order that the valves and valve-seats may be removed, the sides F′ of the valve-chest are made removable, being connected to the valve-chest by means of suitable bolts, l. Formed in one of the sides F′ of the valve-chest is a side passage, m, which connects the discharge-valve chambers g h, as shown in Fig. 3. Should it be desired or advisable, for the sake of symmetry, or for other reasons, to form one passage in each side, as shown in Fig. 3, this may be done without departing in the least from my invention. The inner faces of these sides F′ are provided with grooves n for the reception of the walls of the valve-chest and valve-chambers, packing-strips n' being interposed between the said walls and sides to insure a water-tight joint.

Bolted in the flanged outlet o, formed in the upper end of the valve-chest, is the water-chamber H, provided with a lateral outlet or nozzle, p. This water-chamber may be closed at its top by a cap, H′, as shown in Fig. 1, or it may be left open and have bolted to it an ordinary air-chamber, H″, (shown in Figs. 2 and 9,) as the exigencies of the case may require. Should it be desired to carry the water straight up to a point above the pump, as when the pump is located down in mines, the lower end of a pipe, H‴, may be bolted over the outlet o instead of the water-chamber.

The letter I designates a removable plug tapped into an opening in the bottom of the valve-chest. Should it be desired, for convenience or necessity, to let the water into the valve-chest at the bottom, this plug may be removed and the suction-pipe applied to the opening instead of carrying it up to the inlet j. It is preferable, however, to let the water into the chest at the upper inlet, j, inasmuch as the valves will always remain submerged, whether the pump be in operation or not, keeping the valves in a prime condition.

The valves G G′ are all constructed alike, and consist each, essentially, of two parts, s s', connected together by means of a screw, t, as fully shown in Figs. 5 and 7. The lower part, s', consists of a ring, u, the inner diameter of which is approximately equal to that of the openings through the valve-seat k, this ring having formed integral with it vertical arms v, which are connected together at their upper ends by means of an integral disk, w, provided with a central boss, x, upon its upper side. The upper portion, s, of this valve is a circular cap provided in its under side with a central recess for the reception of the boss x, and a central opening for the passage of the securing-screw t, this screw being tapped into the said boss. A packing-ring, s'', may or may not be clamped between the two portions s s' of the valve. By thus constructing the valve it may be readily inserted and removed, and also will not impede the passage of the water, as the ring u does not project over and obstruct the opening in the valve-seat.

It is evident that I may bevel the valves and valve-seats, should I so desire, without departing from my invention.

In Figs. 11, 12, and 13 I have shown the pump-cylinder A set horizontally, instead of vertically, as in the other figures, this form being preferable where great power is required. When the cylinder is thus set at right angles to the valve-chest, it is supported upon a suitable base or standard, B′, and the upper independent passage, f, is extended along the upper side of the cylinder, the lower passage, f', connecting directly with the opening at the bottom of the cylinder, as shown most clearly in Fig. 12.

The operation of the pump will be readily understood, and is as follows: When the piston is moved in a downward direction, the water will be drawn in the inlet j through the passage i and upper branch, i', up past the upper suction-valve, G′, and through the upper passage, f, into the pump-cylinder above the piston, the water below the piston being forced out through the lower passage, f', into the lower valve-chamber, h', and up past the lower discharge-valve, G, into the valve-chamber h, up around the passage or passages m in the side or sides, and into the upper valve-chamber, g, and out through the outlet o, as clearly indicated by the arrows on Figs. 2 and 3. When the movement of the piston is reversed, the flow of water through the pump will be reversed, as is usual in this class of pumps.

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

1. The combination, with a valve-seat, k', of a valve consisting of a centrally-perforated cap$s$, provided with a central depression in its under side, and the lower portion, s', comprising the disk w, provided upon its upper side with a central boss, x, arms v, depending from the edge of the said disk w, and a ring, u, connected and formed integral with the lower ends of the arms v, this ring u being larger in diameter than the passage through the valve-seat, and a screw, t, passing through the central aperture in the cap s and tapped into the said boss x, substantially as herein set forth.

2. In a double-acting force-pump, the combination, with the cylinder and piston, of a valve-chest provided with a water inlet and outlet, the two pairs of valve-chambers *g g'* and *h h'*, forming the passages *i' i'*, each pair of the said chambers communicating with each other and the inlet-passages, and the chamber *g* communicating with the outlet-passage of the valve-chest, the lower one of each pair of valve-chambers communicating with the respective ends of the cylinder by means of independent passages *f f'*, discharge and suction valves, removable sides F', bolted to the valve-chest, and a side passage or passages, *m*, connecting the valve-chambers *g* and *h*, this passage being formed in one of the said removable sides, substantially as herein shown and described.

3. The combination of the valve-chest provided with removable sides F', the inner faces of these said sides being provided with grooves *n* for the reception of the ends of the walls of the valve-chest, packing-strips *n'*, inserted in these grooves, and bolts for removably attaching the said sides to the valve-chest, substantially as described.

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

AARON J. TYLER.

Witnesses:
CHAS. D. DAVIS,
CHAS. D. JOST.