

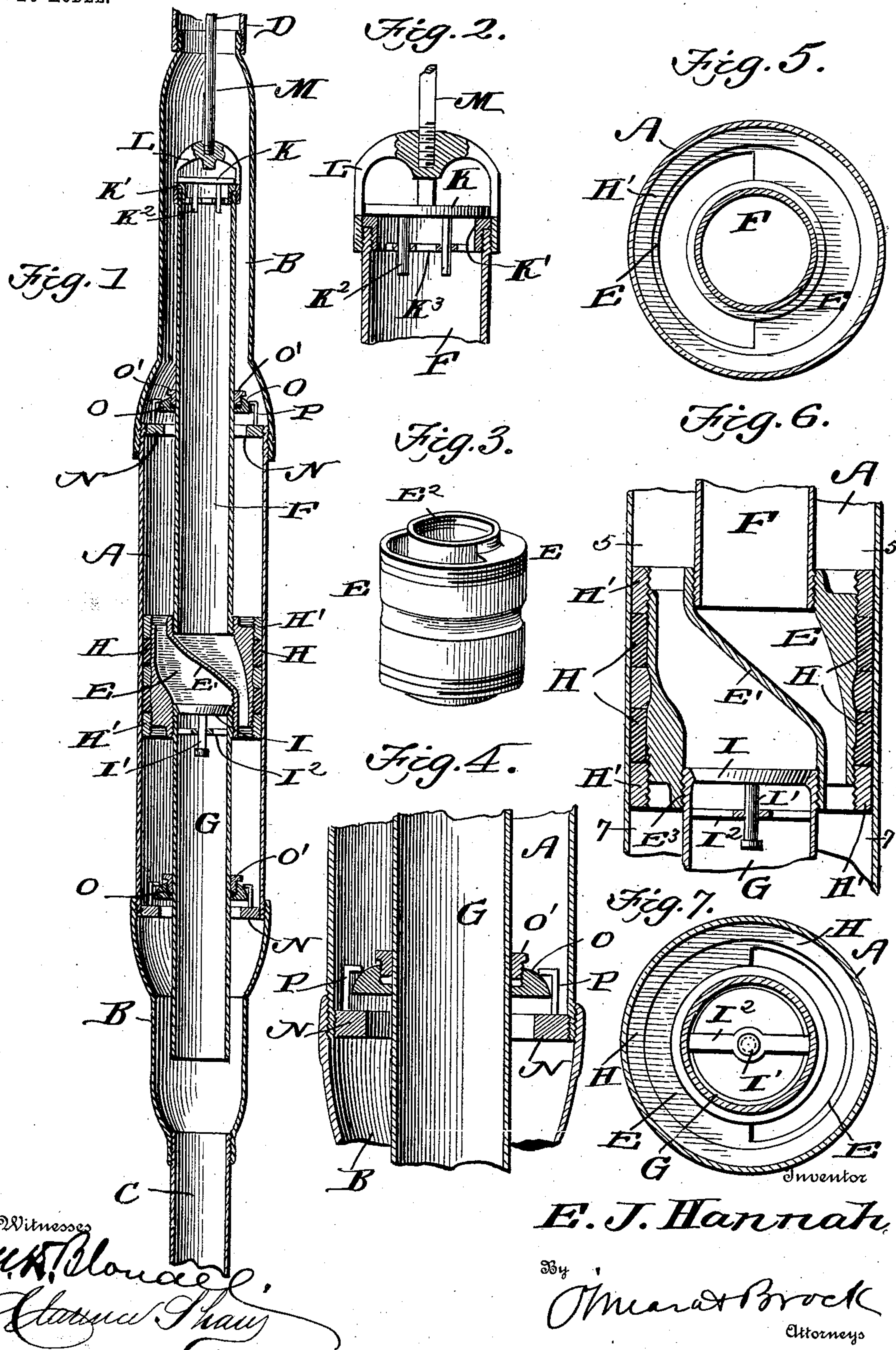
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E. J. HANNAH.
DOUBLE ACTING FORCE PUMP.

APPLICATION FILED JULY 19, 1902.

NO MODEL.



Witnesses
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DOUBLE-ACTING FORCE-PUMP.

SPECIFICATION forming part of Letters Patent No. 756,113, dated March 29, 1904.

Application filed July 19, 1902. Serial No. 116,184. (No model.)

To all whom it may concern:

Be it known that I, EDGAR J. HANNAH, a citizen of the United States, residing at Greencastle, in the county of Sullivan and State of Missouri, have invented a new and useful Double-Acting Force-Pump, of which the following is a specification.

This invention is an improved construction of double-acting force-pump particularly adapted for drilled wells.

The objects of the invention are to provide a pump of this kind in which a continuous suction and discharge will be maintained during operations, one in which water will be discharged by both the upward and downward stroke, and one in which the water will be raised with as little circulation as possible, thereby avoiding all back pressure, which heretofore has been a great drawback in a pump of this kind.

With these objects in view my invention consists, essentially, in the employment of a cylinder or barrel having suction and discharge pipes connected thereto, a piston working in the cylinder or barrel, valves and their seats arranged at the ends of the cylinder or barrel, and the tubes connected to the piston at each end and extending in opposite directions, each tube being provided with a valve and each tube also passing through one of the valves and the seat at the end of the cylinder, the piston being divided by a partition or diaphragm, so that water is passing therethrough during the downstroke, being discharged from bottom of cylinder and filling top of cylinder.

The invention consists also in the novel construction of the piston, in the construction of the valve and seat, and still further in certain novelties of construction and combination, all of which will be fully described hereinafter and pointed out in the claims.

In the drawings forming a part of this specification, Figure 1 is a vertical sectional view of a pump constructed in accordance with my invention. Fig. 2 is an enlarged sectional view, partly in elevation, and illustrating the valves arranged at the upper end of the tube. Fig. 3 is a detail perspective view of the piston. Fig. 4 is an enlarged sectional view taken through the lower end of the cylinder

or barrel and illustrating the ring-valve and its seat at the said lower end. Fig. 5 is a horizontal sectional view on the line 5 5 of Fig. 6. Fig. 6 is an enlarged vertical sectional view of the piston. Fig. 7 is a horizontal sectional view taken on the line 7 7 of Fig. 6 and looking upwardly.

In constructing a pump in accordance with my invention I employ a cylinder or barrel A, which may be of any size desired and which has a suction-pipe C connected thereto at the lower end by means of an elongated tubular head B, and the discharge-pipe D is connected to the upper end of the cylinder or barrel by means of a similarly-shaped head B also, said head being connected to the ends of the cylinder by means of screw-joints. In practice I prefer to make the upper head longer than the lower one; but such construction is not absolutely essential. A hollow cylindrical piston E is arranged within the cylinder or barrel A, said piston being subdivided into two compartments or passages by means of an oblique partition or diaphragm E'. This partition E' terminates in the threaded collar E² at the upper end of the piston and threaded collar E³ at the lower end of the piston. At the upper end of the piston is a curved opening E⁴, arranged at one side of the threaded collar E², and at the opposite side of the collar the end of the piston is closed, as shown at E⁵, and at the lower end a similar-shaped opening E⁶ and closed portion E⁷ are produced, only their positions are reversed, and it will be noted that each end of the piston is constructed alike, so that in placing the piston in the cylinder either end can be arranged uppermost.

A tube F is screwed into the collar E² at the upper end of the piston, and a tube G is screwed into the collar E³ at the lower end of the piston. Packing-rings H of any suitable construction may be arranged upon the exterior of the piston E, if so desired, and held in place by means of threaded rings H'; but this packing is not essential.

A valve I is arranged in the lower tube G, preferably at the upper end thereof, and is adapted to open upwardly upon the downstroke of the piston, said valve having a stem

I', working in a guide I², arranged in the tube G. An upwardly-opening valve K is arranged upon the seat K', arranged in the tube F, preferably at the upper end, said valve
 5 having depending guides K², which work through the transverse guides K³, carried by the tube F. This valve K works within a cage L, attached to and extending over the upper end of the tube F, said cage serving
 10 also as a means for connecting the sucker-rod M to the working parts of the pump.

Rings N are secured within the cylinder A, adjacent the opposite ends, said rings being of such size that the upper and lower tube can
 15 work freely up and down. In fact, the central opening of each ring is considerably greater than the exterior diameter of the tube, so that a free annular space is left between each ring and the tube working therethrough.
 20 These rings N form the seats for the ring-valves O, which surround the tubes F and G, working freely thereon and the tubes working freely therethrough. The valves are held in place and are limited in their upward move-
 25 ments by means of the annular stop-pins P, which are connected to the ring-seats N and are preferably formed integral therewith. Each valve O may be provided with a guiding-ring O', which may be adjustably secured
 30 thereto or integral therewith and which is intended to guide the movement of the valve upon the tubes and also serve to guide the movement of the tubes through the valves. There is a small annular space between the
 35 valve and end of ring O', thereby providing a water packing between the valve and tube.

By means of a pump constructed as herein shown and described I am able to maintain a continuous flow of water from the pump, and
 40 inasmuch as the said pump operates upon both the up and down stroke of the piston it is obvious that a continuous suction and continuous discharge will be had. Upon the down-stroke of the piston the lower valve O will be
 45 closed, the valve I at the upper end of the tube G will open, and water will pass upwardly through the piston into the upper head of cylinder. At the same time the water contained within the cylinder above the
 50 lower valve O is forced upwardly through the opposite side of the piston, out through the upper tube F, and through the valve K into the upper head and discharge-pipe. Upon the upstroke of the piston the valves O are
 55 open and the valves I and K are closed. All the water in the cylinder above the piston will be forced out through the upper valve O into the upper head and discharge-pipe, inasmuch as the valve I is closed, and water will be
 60 taken into bottom of cylinder from suction-pipe, inasmuch as valve K is closed. It will thus be seen that there is a continuous and equal discharge of water at each and every stroke of the piston, and by delivering the
 65 water without any circumlocution all back

pressure is avoided. By means of the peculiar construction and arrangement of the ring-valves and their seats with reference to the upper and lower tubes I am enabled to draw a maximum amount of water through a given
 70 diameter of cylinder, thereby specially adapting this construction of pump to deep-drilled wells.

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

1. In a pump of the kind described, the combination with the suction and discharge pipes, of the cylinder and head for connecting the same to said pipes, the hollow piston arranged
 80 in the cylinder, said piston being divided by a partition, which terminates in a threaded collar at each end, the upper and lower ends of the piston having reversely-arranged open and closed portions, the tubes fitting in the
 85 threaded collars, each tube having a valve arranged therein, a ring-valve arranged upon each tube, a seat for each ring-valve, said seats being arranged in the cylinder, adjacent the opposite ends, stop-pins carried by the
 90 seats, for limiting the upward movements of the ring-valves, the openings in the ring-seats being greater than the exterior diameter of the tubes which work therethrough, whereby water will pass freely around the tubes,
 95 through the seats and pass the ring-valve.

2. In a pump of the kind described, a reversible hollow piston, having a dividing-partition terminating in a threaded collar at each end, each end of the piston having a curved
 100 opening on one side of the collar, the opposite side of the piston end being closed, said open and closed portions being reversely arranged at the opposite ends, substantially as described.
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3. In a pump of the character described employing a single cylinder and having end castings, the combination therewith of means located within the said cylinder and end castings adapted in operation to force substantially a
 110 continuous flow, the said means consisting of fixed valve-seats at the ends of the cylinder, valves in said seats, a plunger constructed with upper and lower openings forming separate passage-ways therethrough a tube lead-
 115 ing from the said upper opening in the plunger, extended loosely, but water-tight, through the said upper valve, a similar tube leading from the lower opening in the plunger and extended
 120 loosely, but water-tight, through the said lower valve, a valve supported by and closing the upper end of the lower tube and a valve closing the upper end of the upper tube, substantially as described.

4. The combination in a pump of the char-
 125 acter described, a single cylinder, castings secured to the upper and lower ends of the cylinder, valve-seats at both ends of the cylinder held in place between the ends thereof, and the inner shoulders on the end castings, ver-
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5 tically-moving valves on the said fixed seats, each having an opening therethrough, a plunger within the said cylinder with means to work it and having upper and lower connected tubes, one tube being extended and working freely through the opening in the valve at the upper end of the cylinder, and the other tube extended down and working freely through the opening in the valve at the lower end of the cylinder, one of the said tubes being adapted to form a closed passage to the cylinder above the plunger from below the lower fixed valve-seat, and the other tube being adapted to form a closed passage from the cylinder below the plunger to the end casting and above the upper fixed valve-seat, a valve supported by and closing the upper end of the said lower tube, and a valve closing the upper end of the said upper tube, substantially as described.

20 5. In a pump of the character described, the combination with a single cylinder having castings on the ends thereof, valves closing the upper and lower ends of the cylinder, a plunger within the cylinder having separate passage-ways through it, upper and lower tubes

fixed to and moving with the plunger, adapted to form closed passage-ways from both sides thereof to and beyond the said upper and lower valves closing the cylinder ends, and valves supported by and closing the upper ends of both the said tubes, substantially as described.

6. The combination in a pump of the character described, of a single cylinder having castings on the ends thereof, and means within the said cylinder adapted, in operation, to force a substantially continuous flow, the said means consisting of a plunger having fixed thereto separate closed water-passages leading from far sides thereof to opposite ends of the pump, fixed valve-seats at the cylinder ends through which the said closed water-passages are adapted to extend, valves in said seats and valves supported by and closing the upper ends of both the said water-passages, substantially as described.

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