(No Model.)

2 Sheets—Sheet 1.

C. RODENBAUGH.

DOUBLE ACTING PUMP.

No. 523,240. Patented July 17, 1894.

Fig. 2.

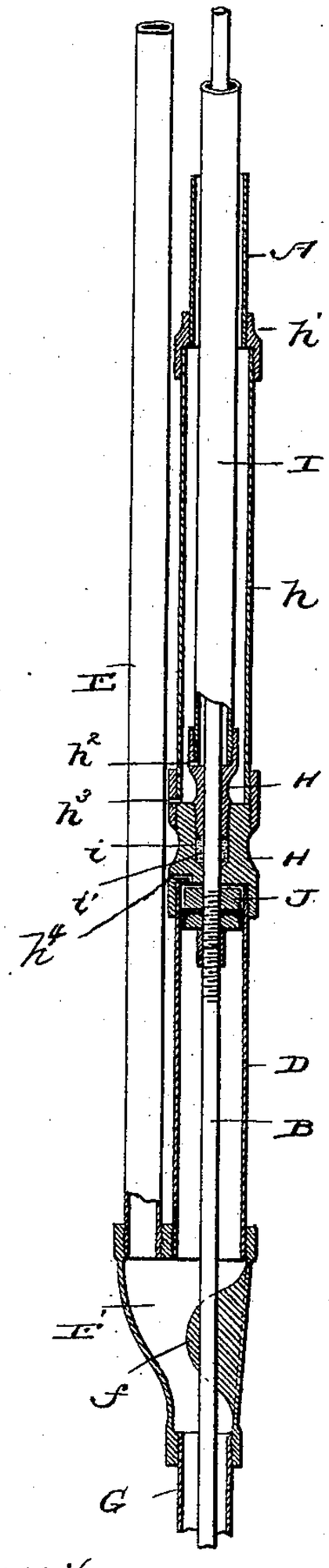
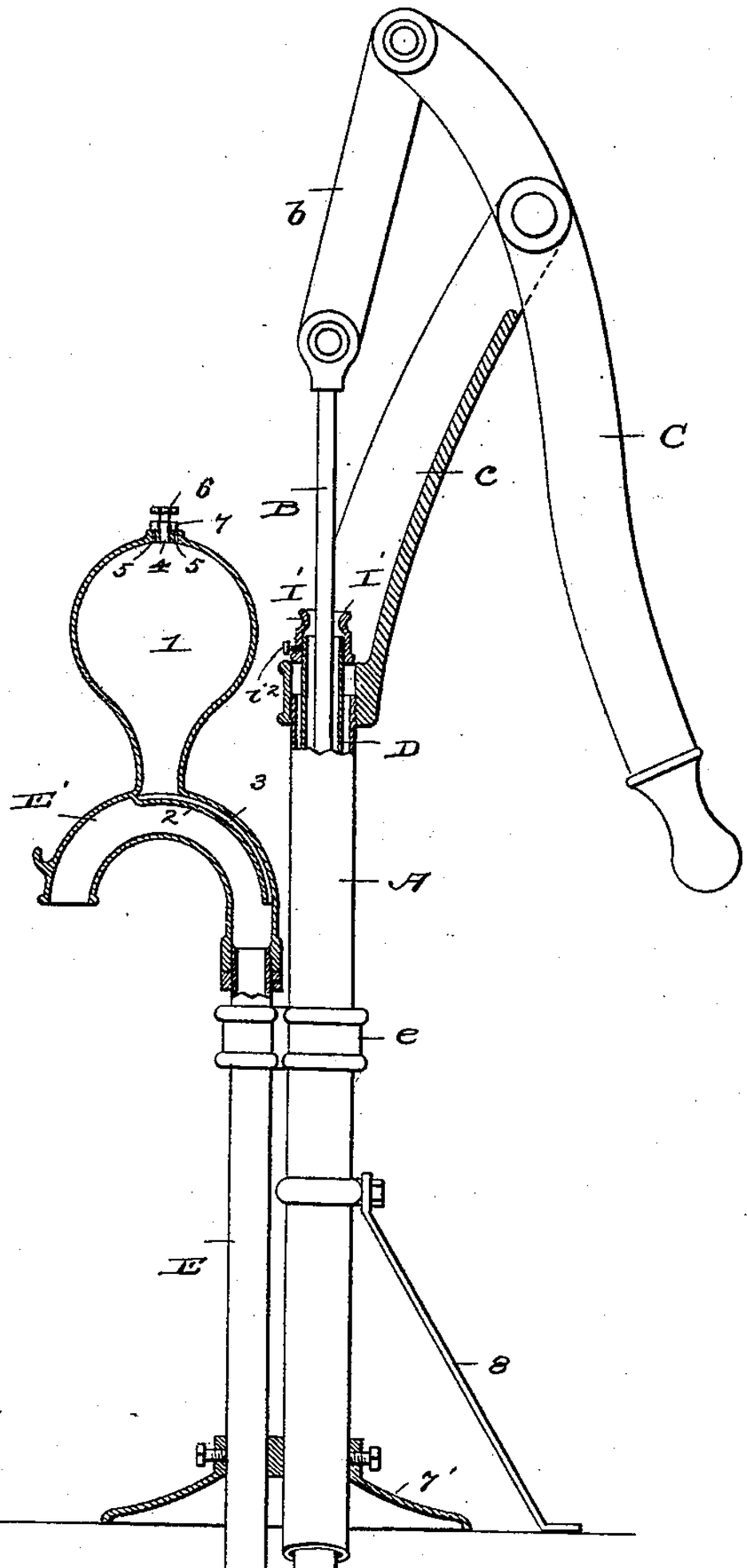


Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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DOUBLE ACTING PUMP.

No. 523,240. Patented July 17, 1894.

Fig. 3.

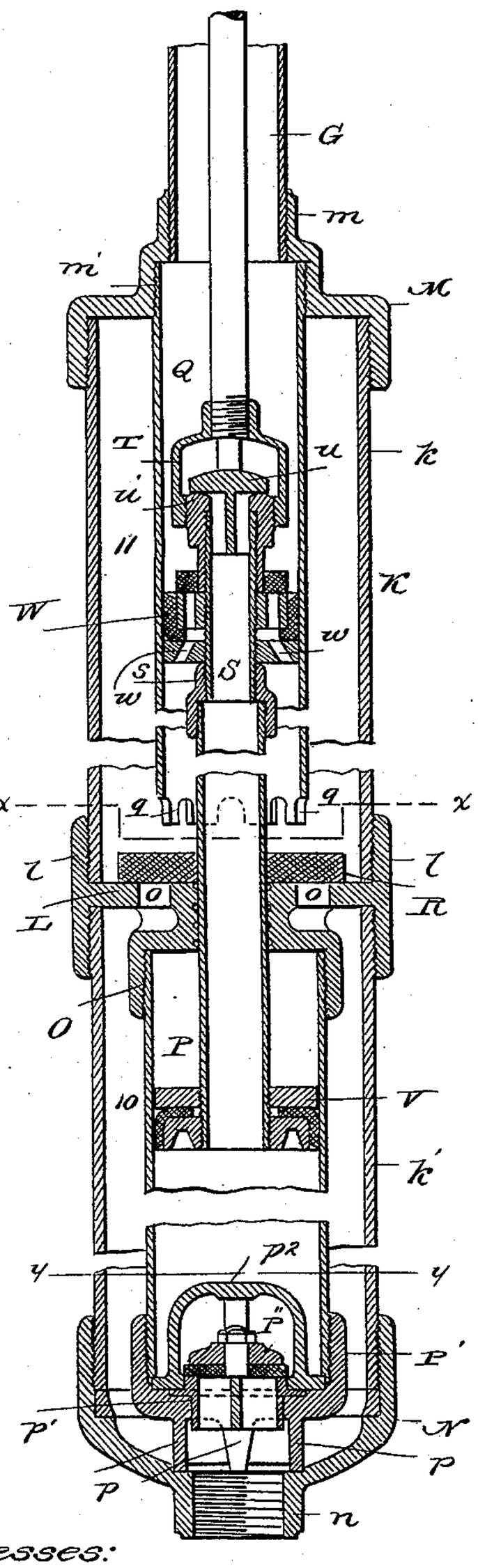


Fig. 4.

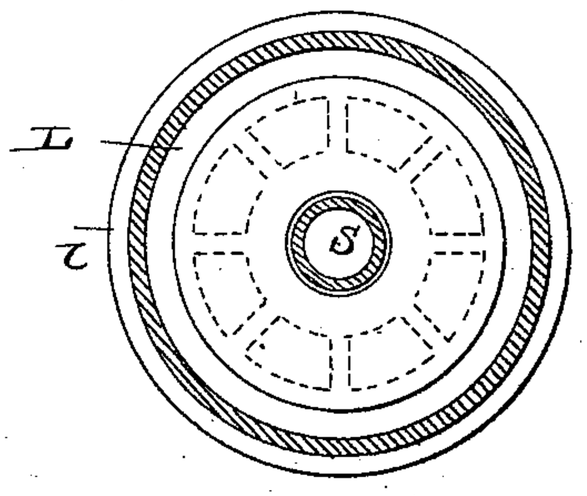
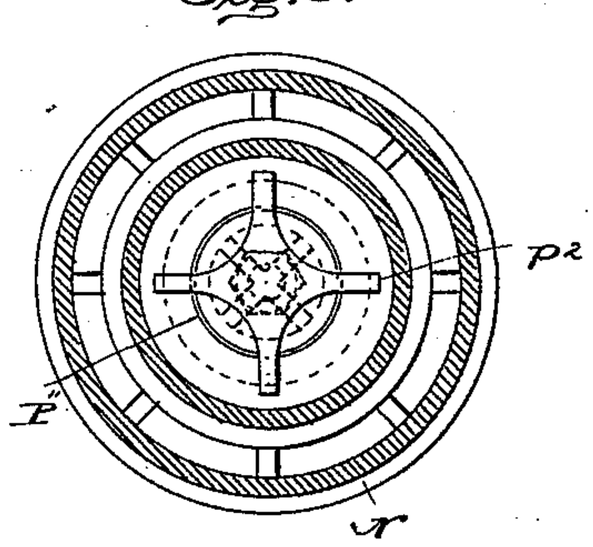


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES RODENBAUGH, OF ALLEGHENY, PENNSYLVANIA.

DOUBLE-ACTING PUMP.

SPECIFICATION forming part of Letters Patent No. 523,240, dated July 17, 1894.

Application filed September 1, 1893. Serial No. 484,584. (No model.)

To all whom it may concern:

Be it known that I, CHARLES RODENBAUGH, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Double-Acting Pumps; 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 nature of my invention is a double-acting pump of that class which employ pistons constructed to lift the water on the upstroke and to force the water on the downstroke; and the objects in view, are, first, to insure a full, free supply of water to both cylinders of the pump without admitting sand or other impurities to the pump-barrels; secondly, to so construct and organize the several parts as to insure simplicity and stability of construction; thirdly, to provide for the free passage of the water through the pump without affording any abrupt turn or angles to increase the friction; fourthly, to enable the stuffing box of the force-cylinder piston to be adjusted and tightened without removing the entire pump from the well, which is particularly advantageous when the pump is used in deep wells; and finally, to increase the efficiency of the pump.

With these and such other ends in view as pertain to my invention, it consists in the combination and organization of devices and novel construction of parts as will be hereinafter fully described and pointed out in the claims.

To enable others to understand my invention, I will now proceed to a detailed description thereof in connection with the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is an elevation, partly in section, of the stand or upper part of the pump. Fig. 2 is a similar view, also partly in section, showing the discharge pipe, the force cylinder, the Y-connection between the pump barrel, the force cylinder and the discharge pipe, and showing the stuffing box for the piston of the force cylinder. Fig. 3 is a vertical longitudinal sectional view through the double pump barrel which is designed to be immersed in the water. Figs. 4 and 5 are horizontal transverse sectional views on the lines *x*—*x* and *y*—*y*, respectively, of Fig. 3.

Like letters and numerals of reference denote corresponding parts in all the figures of the drawings.

A designates the stand pipe and B is the piston-rod. This piston rod extends practically throughout the length of the pump, and its upper end is connected by a link *b* to an operating lever C which is fulcrumed on a bracket *c* rigidly fastened to the upper end of the stand-pipe A.

D is the forcing cylinder, E is the discharge pipe, F the Y-connection, or three way coupling, and G is the pipe that leads from the pump-barrel to the Y-connection. This discharge pipe E extends parallel to the stand-pipe A, and near its upper end it is fastened to and braced by a coupling collar *e* which is clamped to the stand pipe and the discharge pipe. Said discharge E carries a goose-neck discharge nozzle E′ which is constructed with the air chamber 1 and with an internal curved plate 2 arranged concentric within the curved upper side of the goose-neck nozzle E′ to provide the air-passage 3 which leads from the air chamber to the upper part of the discharge nozzle. At its top this air chamber is provided with an internally threaded hole 4, and with two air vents 5, 5, situated on opposite sides of the tapped hole.

A headed top-bolt 6 is screwed into the threaded hole 4, and on the threaded shank is fitted a nut 7 which can be screwed down upon the top of the air chamber to close the air inlet ports 5 to said chamber.

The stand pipe and discharge pipe pass through a base plate 7′ and are fastened thereto by set screws, and they are stayed by a brace 8, as shown by Fig. 1.

The force cylinder D is arranged in line with the stand pipe, alongside of the discharge pipe, and above the Y-connection F, and the lower ends of this force cylinder and the discharge pipe are screwed into or otherwise suitably fastened to the upper end of the Y-connection F as indicated by Fig. 2 of the drawings.

To the upper end of the force cylinder is securely fastened the stuffing box H which is made or cast in a single piece of metal. The

stuffing box H is interiorly screw-threaded to receive the upper end of the force cylinder, and its upper end is exteriorly screw threaded to adapt a tube *h* to be screwed thereon, said tube *h* forming a continuation of the stand pipe A and fastened at its upper end thereto by a collar *h'*. Through this stand pipe and the tube *h* extends another tube I which forms a guide for the upper part of the piston rod B, and through which said piston rod plays freely, and this guide tube serves the further purpose as a means for adjusting the gland H' of the stuffing box. The upper end of this gland is screw threaded to enable the lower end of the tube to be screwed thereon and form a support for its lower end, and this stuffing box is provided with a central chamber *i* which receives the packing *i'* and which has its upper part internally threaded to receive the lower end of the gland H' which can be screwed therein, by rotating the tube I, so as to compress and tighten the packing *i'* in the stuffing box. To the upper end of this tube I, which extends above the stand pipe A somewhat, is fitted a collar I', clamped to said tube by a set screw i^2, and supported on the collar by which the bracket support *c* is fastened to the stand pipe A.

The lower end of the force cylinder communicates with the chamber of the Y-connection F, so that the water supplied to the connection by the pipe G, will enter said cylinder D, and a piston head J operates in this cylinder to force the water therein, on the downstroke, up into the discharge pipe E, said piston head being suitably fastened to the piston rod B and provided with a packing, see Fig. 2.

In the lower end of the tube or pipe I is formed a drain hole h^2 which serves to drain any water in the pipe I into the tube *h;* and said tube *h*, is provided with a similar drain hole h^3 by which water can be drained from the interior of the tube *h* to the outside thereof. In the lower part of the stuffing box, is provided an air vent h^4, see Fig. 1, which opens into the upper end of the cylinder D and which permits the air to escape freely on the ascent of the piston J. This connection F has an offset *f* formed therein which bulges in a curved line laterally beyond a line drawn through the force cylinder, so that it will not afford any material obstruction to the free passage of water through the connection; and a vertical passage is formed in the offset to accommodate the piston rod and form a guide therefor as it plays vertically when operated by the pump handle.

I have shown the pump-barrel, the cylinders and valves in Figs. 3 and 5 inclusive, and referring more particularly to Fig. 3 it will be seen that the barrel K is constructed of two sections *k*, *k'*, placed vertically one above the other and in axial alignment with each other. This pump barrel is divided transversely into upper and lower chambers 10, 11, by means of the disk like diaphragm or plate L which is also constructed to afford a coupling whereby the approximate ends of the barrel sections *k*, *k'*, may be fastened together. This diaphragm or plate is provided at its edge with annular flanges *l* which project above and below the diaphragm, and in these flanges are screwed the approximate ends of the barrel sections. At its top, the barrel K is provided with a cap M which is screwed upon the barrel, and this cap is provided with a threaded nipple *m* to accommodate the lower end of the pipe G that leads to the Y-connection F, said upper cap being further provided with an interior threaded part *m'* by which the inner upper cylinder, presently described, is fastened to said upper cap in a manner to suspend said upper internal cylinder in a fixed position within the upper part of the pump barrel. At the bottom of the pump barrel is provided the lower cap N which is interiorly threaded to receive the lower end of the barrel, and this cap is constructed with a suction nozzle *n* which can be covered with a sieve to prevent the entrance of sand, &c., into the pump barrel.

The diaphragm L is further provided with a depending neck O which is integral therewith, and with ports *o* through which the water can pass from the lower chamber 10 into the upper chamber 11 of the pump-barrel when the ports are opened on the ascent of the automatic check valve R, said ports being arranged in series around the depending neck O of said diaphragm.

P is the internal lower cylinder and Q is the internal upper cylinder which are arranged within the lower and upper chambers 10, 11, respectively of the pump barrel, said cylinders being disposed concentric with the pump barrel so as to leave spaces between the cylinders and barrel, to which spaces water is constantly supplied to maintain a full supply of water for the cylinders.

The lower cylinder P has its upper end rigidly fastened to the depending neck O of the diaphragm and the lower end of said cylinder P is likewise fastened to a seat P' which has depending feet *p* which are fastened to the bottom cap N and which feet *p* are spaced to provide passages or openings through which the water from the suction nozzle *n'* can pass freely to the lower chamber 10 between the pump barrel and the cylinder P. This seat P' is furnished with a valve-seat *p'* within the bottom end of the lower cylinder and with a bridge p^2 to limit the upward play of an automatic check valve P'' which is confined within the bridge and is arranged to rest on the valve seat when the piston of the cylinder P descends.

The upper cylinder Q is fastened to the cap M in the manner described so as to be suspended within the upper part of the pump barrel, and the lower end of this upper cylinder Q terminates a suitable distance above the diaphragm L and is furnished with a series of notches forming a series of spaced lugs *q* against which the valve R is adapted

to bear when it is lifted, whereby this valve is not adapted to close the lower open end of the cylinder Q as the water from the chamber 11 is free to pass through the openings, provided by the notches, into the lower end of the cylinder Q as will be readily understood.

S is the hollow piston rod constructed of two communicating sections which are coupled together by the sleeve *s*, the upper section being somewhat smaller in diameter than the lower section, so that the sections of the piston rod are adapted to the sizes of the cylinders and pistons; and this hollow piston rod is coupled at its upper end to the lower end of the piston rod B by means of the coupling T which also affords a support for the check valve U at the upper extremity of the piston rod, said check valve being confined within the bridge *u* on the coupling T and resting against a seat *u'* on the upstroke of the piston rods.

The lower larger section of the hollow piston rod S passes freely through the diaphragm and its nozzle O, and to the lower end of the hollow piston rod is fastened a solid piston head V which has a suitable packing and is arranged to permit the lower end of the hollow piston rod S to open through the same, so that, on the downstroke of the piston, the water in the cylinder P is forced into and through the hollow piston rod as the check valve P^2 is closed on the downstroke.

A valved piston head W is fastened at a suitable point to the upper section of the hollow piston rod so as to operate in the upper cylinder Q within the pump barrel. This valved piston head is suitably fastened to the piston rod S so as to move therewith, and it is furnished with ports *w* which are designed to be closed on the upstroke by means of an automatic valve W' fitted to slide freely on the hollow piston rod and confined in its movement in one direction by the piston head W and in the other direction by the ledge or shoulder W'' provided by the coupling T between the solid and hollow piston rods B, S. The valve R is fitted to play freely on the lower larger section of the hollow piston rod S, and it is designed to bear against the perforated diaphragm L when it is lowered so as to close the ports therein while the upward play of this valve R is limited by the valve coming in contact with the depending lugs *q* of the cylinder Q.

This being the construction of my pump, the operation may be described as follows:—The pump barrel is immersed in the water of a well, which passes between the feet *p* and fills the chamber 10 between the cylinder P and pump barrel. On the downstroke of the piston, the check valve P'' is closed and any water in the cylinder P is forced by the piston V into the hollow piston rod S to and past the valve U above the upper piston W, and any water in the cylinder Q passes through the ports *w* in the piston W as the valve W' opens upward. On the upstroke of the piston, the valves P'' and R are opened and the valves U and W are closed so that water is drawn in, by suction, into the lower cylinder P, the upper chamber 11 and the cylinder Q as the water is free to pass through the ports in the diaphragm L and through the openings formed by the notches in the lower end of the cylinder Q. On the next downstroke, the valves P'' and R are closed and the valves U and W opened to permit the water from the cylinders P, Q, to pass through the hollow piston rod and the ports in the piston W to pass above said piston into the upper part of the cylinder Q, from whence the water is lifted, on the next upstroke of the piston, through the pipe G into the Y-connection. The water is thus lifted to the Y-connection and forcing-cylinder, and as the piston J therein descends, the water is forced into and through the discharge pipe and thus to the goose-neck nozzle *e*.

I am aware that changes in the form and proportion of parts and details of construction of the devices herein shown and described as an embodiment of my invention can be made without departing from the spirit or sacrificing the advantages thereof, and I therefore reserve the right to make such changes and alterations as fairly fall within the scope of the same.

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

1. In a double acting pump, the barrel divided transversely into two chambers by a valved diaphragm, the upper and lower cylinders fixed within the respective chambers of the barrel, said upper cylinder having its lower end open for the free ingress of water and the lower cylinder provided with an automatic check-valve, and the hollow piston rod carrying the solid and valved piston heads operating in the lower and upper cylinders respectively and provided with a check valve above said upper piston head, combined with a coupling F having the pump barrel connected therewith, the discharge pipe, the forcing cylinder communicating with said connection F and the piston rod coupled to the hollow piston rod and carrying a piston head which operates in the forcing cylinder, substantially as and for the purpose described.

2. In a double acting pump, the combination of the connection F having the bulged guide *f* which extends laterally from one side of said connection, the forcing cylinder D and discharge pipe E coupled to the upper end of said connection F, the pump-barrel having the divided chamber, valves and piston-heads, the connecting pipe G coupled to the lower end of the connection F and to the upper end of the pump-barrel, the solid piston rod B extending through the forcing cylinder, the guide *f* in the connection F and the pipe G and carrying a piston head J, and the hollow piston rod in the pump-barrel and connected

to the rod B, substantially as and for the purposes described.

3. In a double acting pump, the pump barrel constructed in sections which are coupled together by a diaphragm L provided with transverse ports and a depending neck O, the seat P′ fixed within the lower end of said barrel and having the feet arranged to provide passages for the free ingress of water to the lower chamber of the barrel, the lower cylinder P fixed to the neck O and to the bridge P′ and provided with the check valve, the upper cylinder Q suspended within the upper chamber of the barrel and terminating above the diaphragm, the hollow piston rod provided with a valve at its upper end and carrying the solid and valved piston heads which operate in the upper and lower cylinders, respectively, and the valve R fitted on the hollow piston rod to close the ports in the diaphragm L and limited in its upward movement by the cylinder Q, substantially as and for the purposes described.

4. In a double acting pump, the combination with a connection F and the discharge pipe, of the forcing cylinder connected to the connection F and provided with a piston head which is carried by the piston rod B, the stand pipe, the stuffing box fastened to the stand pipe and the forcing cylinder and provided with the packing chamber and the gland, and the tube I fastened to the gland and having a collar at its upper end which is sustained by the stand pipe, substantially as described.

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

CHARLES RODENBAUGH.

Witnesses:

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A. E. RODENBAUGH.