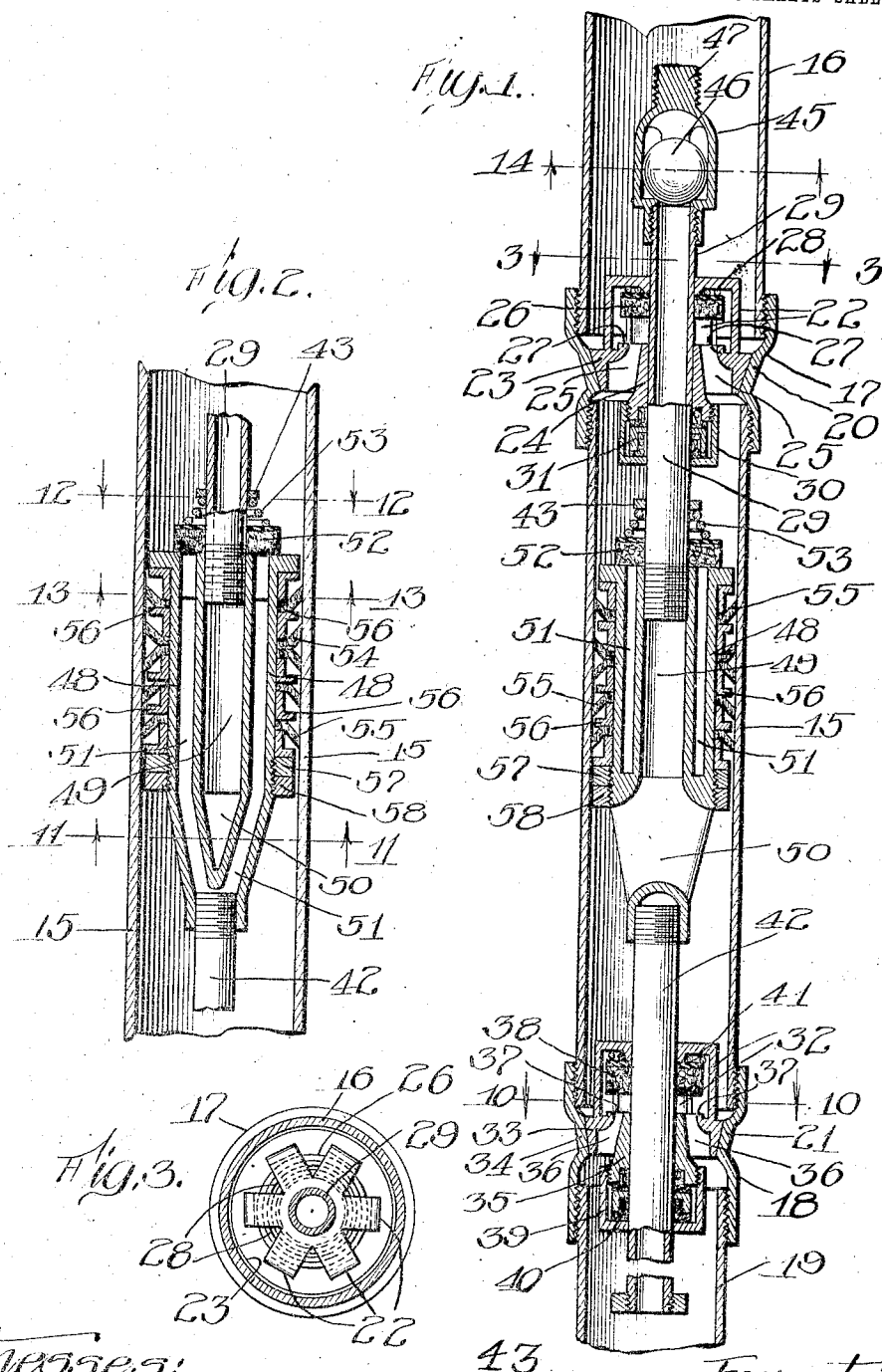


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PUMP.
APPLICATION FILED OCT. 3, 1906.

Patented Apr. 25, 1911.
3 SHEETS—SHEET 1.



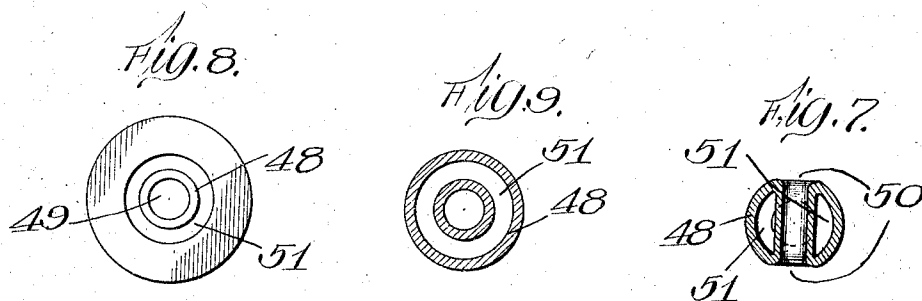
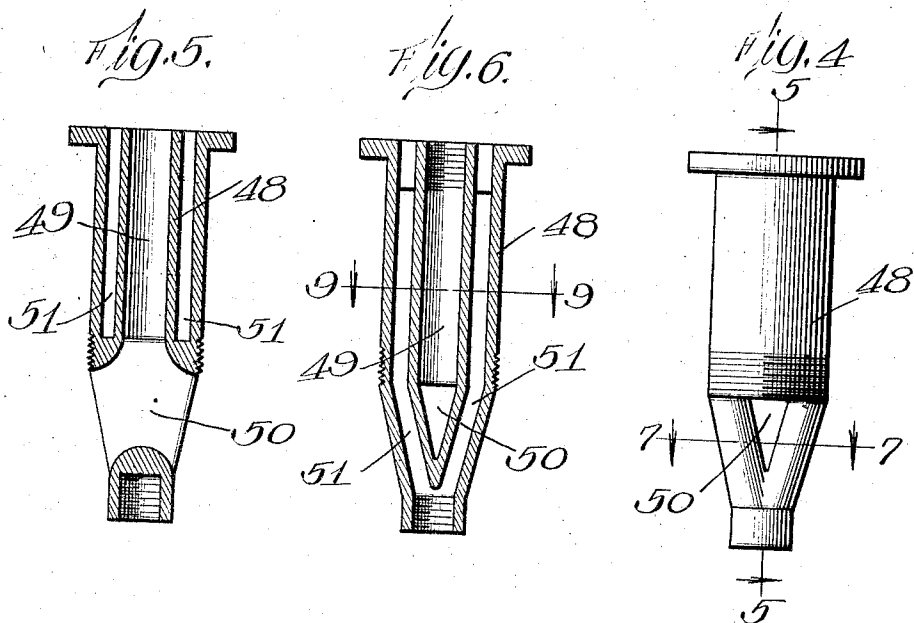
Witnesses:
L. J. Romarup.
Robert H. Wier

Inventor:
Robert E. L. Holmes.
By *Donald Adams P. & J. Jackson*
his Attys.

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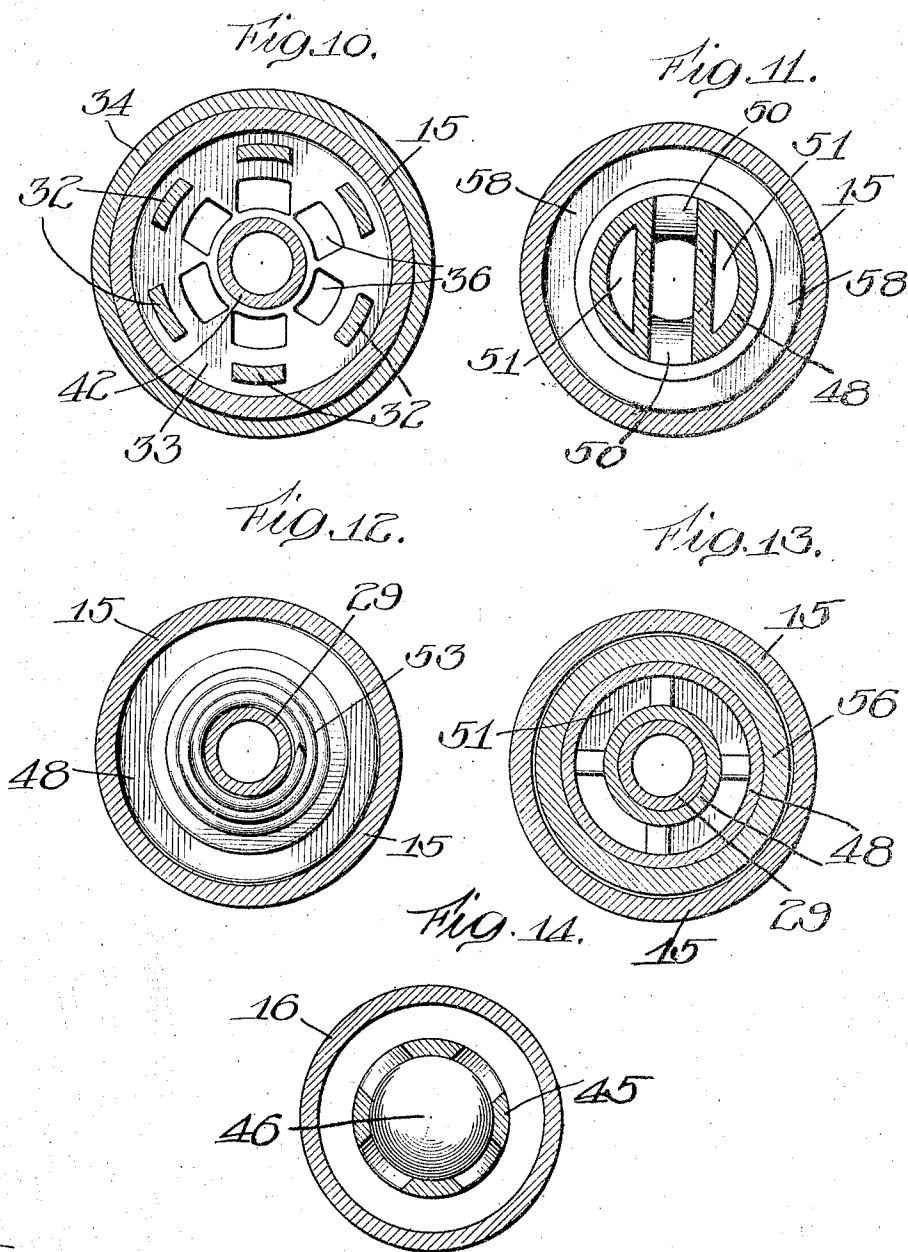
Witnesses:
E. U. Dornan,
Robert H. Wier

Inventor:
Robert E. L. Holmes,
by Andrew Jackson,
his Atty.

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R. E. L. HOLMES.
PUMP.
APPLICATION FILED OCT. 3, 1906.

Patented Apr. 25, 1911.
3 SHEETS—SHEET 3.



Witnesses:
Robert H. Weir
G. V. Donnanus.

Inventor
Robert E. L. Holmes,
by Bond & Smith & Johnson,
his Attys.

UNITED STATES PATENT OFFICE.

ROBERT E. L. HOLMES, OF AURORA, ILLINOIS, ASSIGNOR TO THE AMERICAN WELL WORKS, OF AURORA, ILLINOIS, A CORPORATION OF ILLINOIS.

PUMP.

990,350

Specification of Letters Patent. Patented Apr. 25, 1911.

Application filed October 3, 1906. Serial No. 337,321.

To all whom it may concern:

Be it known that I, ROBERT E. L. HOLMES, a citizen of the United States, residing at Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Pumps, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to pumping apparatus, and particularly to pumps designed for use in raising water from deep wells of small bore where the water does not rise sufficiently near to the surface to be drawn out by means of a suction pump.

It has for its object to provide a new and improved double-acting pump so constructed and operating as to deliver substantially a uniform volume of water on either the up or the down stroke; also to provide a pump adapted to be placed in the bore of the well preferably below the level of the water therein and so constructed that the valves and piston may easily be drawn out of the well for repairs without removing the pump piping and working barrel from the well. I accomplish these objects as illustrated in the drawings and hereinafter described.

What I regard as new is set forth in the claims.

In the accompanying drawings,—Figure 1 is a sectional view illustrating my improvements; Fig. 2 is a sectional view of a part of the working barrel, showing a section of the plunger and adjacent parts taken at right angles to that illustrated in Fig. 1; Fig. 3 is a horizontal section on line 3—3 of Fig. 1; Fig. 4 is an elevation of the exterior of the piston, the packing being removed; Fig. 5 is a vertical section on line 5—5 of Fig. 4; Fig. 6 is a vertical section of the piston taken at right angles to the section shown in Fig. 5; Fig. 7 is a cross-section on line 7—7 of Fig. 4; Fig. 8 is a top or plan view of the piston; Fig. 9 is a horizontal section on line 9—9 of Fig. 6; Fig. 10 is a cross-section on line 10—10 of Fig. 1; Fig. 11 is a cross-section on line 11—11 of Fig. 2; Fig. 12 is a cross-section on line 12—12 of Fig. 2; Fig. 13 is a cross-section on line 13—13 of Fig. 2; and Fig. 14 is a cross-section on line 14—14 of Fig. 1.

Referring to the drawings,—15 indicates the working barrel or cylinder of the pump,

in which the piston reciprocates, as will be hereinafter explained.

16 indicates a discharge pipe, which extends up from the cylinder 15 to the top of the well, being of somewhat greater diameter than the cylinder and being connected to the cylinder by a coupling 17, as shown in Fig. 1. In like manner a coupling 18 is provided at the lower end of the cylinder 15 to provide for attaching thereto a supply pipe 19 which is of somewhat less diameter than the cylinder and extends down farther into the well. As shown in Fig. 1, the couplings 17 and 18 are screw-threaded at their ends so that the pipes 16 and 19 and the cylinder may be readily connected therewith. The upper coupling 17 is provided intermediately with a taper-seat 20, the greatest diameter of which is at its upper end, and in like manner the lower coupling 18 is provided with a similar taper-seat 21.

22 indicates an upper valve-cage fitted in the upper coupling 17 and having a taper bearing-block 23, which is seated on the seat 20. Said cage is provided with a central sleeve 24 and with passages 25 between said sleeve and taper bearing. The valve-cage 22 carries a disk-valve 26, which is adapted to rest on an annular seat 27, so as to normally close the passages 25 against downward flow of water from above said valve-cage. A spring 28 is provided between the valve 26 and the top of the valve cage to assist in holding said valve upon its seat. 29 indicates a hollow piston-rod or tube, which extends through the valve-cage 22 and sleeve 24 thereof and is connected with the piston, as hereinafter described. 30 indicates a packing-box or gland mounted on the piston-rod below the sleeve 24 and secured to the said sleeve. Said box is provided with suitable packing 31 so as to prevent the passage of water between said piston-rod and the sleeve 24. In like manner 32 indicates a lower valve-cage, which is substantially the same as the valve-cage 22 and is provided with the same parts,—33 indicating the taper bearing-block of said valve-cage which is seated in a taper-seat provided in the coupling 21, 35 indicating the sleeve, 36 the water passages, 37 the valve-seat for the disk-valve 38, 39 the packing-box or gland, 40 the packing therein, and 41 the spring above the valve-disk 38.

42 indicates a hollow piston-rod, which extends down from the lower side of the piston through the valve-cage 32 and the sleeve 35.

43 indicates a collar fixedly secured on the piston-rod 29 below the packing-box 31, and 44 indicates a similar collar secured on the lower piston-rod 42 below the packing-box 39. The object of providing the taper valves and valve seats, above described, and providing the piston rods with the collars 43 and 44 is to permit the ready removal of the piston rods, piston and valve cages. Obviously, when the piston rods are raised the collars 43 and 44 will strike the packing boxes 31 and 39 from below, thereby lifting the valve cages from their seats and enabling the parts to be withdrawn from the well. They may also be readily replaced and will automatically seat themselves properly when lowered into proper position.

45 indicates a valve-cage at the upper end of the piston-rod 29 and preferably secured thereto by being screwed thereupon. Said valve-cage carries a ball-valve 46 seated at the upper end of the piston rod 29 and acting as a check-valve to prevent the down-flow of water therethrough. As shown in Fig. 1, the upper end of the valve-cage 45 is provided with a screw-threaded boss 47 for the convenient attachment thereto of the rod used in withdrawing the piston from the well.

48 indicates the piston, which is fitted in the cylinder 15 and is connected at its upper and lower ends, respectively, with the piston rods 29 and 42 in the manner hereinafter described. As best shown in Figs. 1 and 2, the piston 48 is provided with a central passage 49 with which the upper piston-rod 29 communicates. The lower end of said passage 49 opens laterally and communicates with a transverse passage 50 which opens into the cylinder 15 below the piston, as shown in Figs. 1 and 5. Said cylinder is also provided with one or more vertical passages 51, the lower ends of which communicate with the lower piston-rod 42, as shown in Fig. 2. The upper ends of said passages 51 extend through the upper end of the piston, as shown in Fig. 2, and are normally closed by a valve-disk 52 which rests thereupon, being yieldingly held down in place by a spring 53 between said disk and the collar 43, as shown in Figs. 1 and 2. It will thus be seen that water may flow upward through the lower piston-rod 42 and passages 51, entering the cylinder 15 above the piston, where it will be held by the check-valve 52.

54 indicates packing between the piston 48 and the cylinder 15. This packing may be of any suitable construction, provided it is of such character as to pack the piston and the cylinder when said piston is moved

either upward or downward. Preferably, I employ cup-shaped disks 55 of leather in connection with metallic rings 56, which hold the packing in place. Rings 57-58 are secured upon one end of the piston so that the packing may be compressed as desired or removed when necessary.

The operation is as follows:—Assuming the piston to be below the level of the water in the cylinder 15, when the piston is raised the water will be held above the piston by the check-valve 52 and will be lifted as the piston moves up, flowing through passages 25 and above the valve 26, which will be lifted by the upwardly-moving body of water. The lower portion of the pipe 16 will therefore be filled with water, which will be held therein by means of the valve 26 as soon as the upward movement of the piston ceases. At the same time, the water will fill the cylinder 15 below the piston, either flowing in by gravity or being drawn up by suction as the piston rises, and will be held therein by means of the check-valve 38, which drops as soon as the upward flow of water ceases. The piston being then moved downward, the water below the piston will be forced up through passages 50 and 49 through the upper piston-rod 29 to the pipe 16, passing the valve 46, which is lifted by the pressure of the upwardly-flowing water. It will thus be seen that when the piston moves upward the water in the cylinder 15 above it is discharged into the pipe 16, while when the piston moves downward the water below it in the cylinder 15 is in like manner discharged into the pipe 16, and as these volumes are substantially equal it follows that a practically uniform flow of water is secured. In practice the working barrel or cylinder 15 is placed a considerable distance—perhaps a hundred feet or more—below the surface of the ground and preferably below the normal level of the water in the well, and the valve-cage 45 is connected by a rod with some suitable reciprocating mechanism for actuating it.

By the construction described I provide an apparatus which may readily be placed in or removed from the well, and one which provides for delivering a practically continuous and uniform volume of water in an upward direction. I also avoid the use of tortuous water passages, as the passages in my apparatus are substantially straight and are continuous in an upward direction, so that there is less resistance to the upward flow of water, thereby increasing the efficiency of the pump.

I wish it to be understood that while I have described my specific form of apparatus with a considerable degree of particularity my invention is not restricted to the details of the construction shown and de-

scribed, except in so far as they are specially claimed, as it includes generically the subject-matter of the broader claims.

That which I claim as my invention and desire to secure by Letters Patent is,—

1. In a pump, the combination of a cylinder, a piston adapted to reciprocate therein, said piston having a central passage, a transverse passage near one end communicating with said central passage and having also one or more passages extending therethrough from end to end, the latter passages being arranged to extend around said transverse passage and a central pipe connected with the latter passages.

2. In a pump, the combination of a cylinder, a piston adapted to reciprocate therein, said piston being tapered at one end, a transverse passage at said tapered end, a central passage communicating with said transverse passage, and extending to the opposite end of said piston, a tubular piston-rod connected with said central passage, a tubular piston-rod connected with the tapered end of said piston, and one or more passages extending from the latter rod to the opposite end of said piston.

3. In a pump, the combination of a cylinder, a piston adapted to reciprocate therein, tubular piston-rods connected with the upper and lower ends of said piston, a central passage in said piston communicating at its upper end with the upper piston-rod and at its lower end with said cylinder, passages in said piston around said central passage, said last-mentioned passages communicating at their lower ends with the lower piston-rod and at their upper ends with the cylinder, and a check-valve upon the upper end of the piston for closing said last-mentioned passages against downward flow of water there-through.

4. In a pump, the combination of a cylinder, a piston adapted to reciprocate therein, tubular piston-rods connected with the upper and lower ends of said piston, a central passage in said piston communicating at one end with the cylinder and at the other end with one of said piston-rods, passages in said piston around said central passage, said last-mentioned passages communicating at one end with the other piston-rod and at the other end with the cylinder at the side of the piston opposite that with which the latter piston-rod is connected, and a valve for preventing the flow of water through said passages in one direction when it is closed.

5. In a pump, the combination of a cylinder, a piston adapted to reciprocate therein, tubular piston-rods connected with the upper and lower ends of said piston, a central passage in said piston communicating at its upper end with the upper piston-rod and at its lower end with said cylinder, passages in

said piston around said central passage, said last-mentioned passages communicating at their lower ends with the lower piston-rod and at their upper ends with the cylinder, and a check-valve for preventing the flow of water through said passages in one direction when it is closed.

6. In a pump, the combination of a cylinder, a piston adapted to reciprocate therein, tubular piston-rods connected with the upper and lower ends of said piston, a central passage in said piston communicating at one end with the cylinder and at the other end with one of said piston-rods, passages in said piston around said central passage, said last-mentioned passages communicating at one end with the other piston-rod and at the other end with the cylinder at the side of the piston opposite that with which the latter piston-rod is connected, a valve for preventing the flow of water through the passages in one direction when it is closed, and check-valves in said cylinder above and below the piston.

7. In a pump, the combination of a cylinder, a piston adapted to reciprocate therein, tubular piston-rods connected with the upper and lower ends of said piston, a central passage in said piston communicating at one end with the cylinder and at the other end with one of said piston-rods, passages in said piston around said central passage, said last-mentioned passages communicating at one end with the other piston-rod and at the other end with the cylinder at the side of the piston opposite that with which the latter piston-rod is connected, a valve for preventing the flow of water through said passages in one direction when it is closed, bearings for said upper and lower piston-rods, and check-valves in said cylinder above and below said piston.

8. In a pump, the combination of a cylinder, a piston adapted to reciprocate therein, tubular piston-rods connected with the upper and lower ends of said piston, a central passage in said piston communicating at one end with the cylinder and at the other end with one of said piston-rods, passages in said piston around said central passage, said last-mentioned passages communicating at one end with the other piston-rod and at the other end with the cylinder at the side of the piston opposite that with which the latter piston-rod is connected, a valve for preventing the flow of water through said passages in one direction when it is closed, and upwardly-removable check-valves in said cylinder above and below the piston.

9. In a pump, the combination of a sectional cylinder, a piston adapted to reciprocate therein, tubular piston-rods connected with the upper and lower ends of said piston, a central passage in said piston communicating at one end with the cylinder and

at the other end with one of said piston-
 rods, passages in said piston around said
 central passage, said last-mentioned passages
 communicating at one end with the other
 5 piston-rod and at the other end with the cyl-
 nder at the side of the piston opposite that
 with which the latter piston rod is connect-
 ed, a valve for preventing the flow of water
 through said passages in one direction when
 10 it is closed, couplings above and below the
 piston for connecting the sections of the cyl-
 nder together, said couplings having
 tapered valve-seats, valve-cages supported by
 said seats, and check-valves in said valve-
 15 cages.

10. A pump comprising, a cylinder, a sup-
 ply-pipe below and smaller than the cylin-
 der, a coupling connecting the cylinder and
 supply-pipe and having an internal tapered
 20 bore, a discharge-pipe above and larger than
 the cylinder, a coupling connecting the dis-
 charge-pipe and cylinder and having an in-
 ternal tapered bore, a tapered block carrying
 a valve and valve-seat disposed in the lower
 25 tapered coupling, a tapered block carrying a
 valve and a gland disposed in the upper
 tapered coupling, a piston disposed to re-
 ciprocate within the cylinder, a piston-rod
 30 extending down through the valve in the
 lower coupling and having means for en-

gaging and lifting the same, and a piston-
 rod extending upward through the gland
 and the discharge-pipe.

11. In a pump, the combination of a cyl- 35
 nder, a piston adapted to reciprocate there-
 in, upper and lower tubular piston-rods con-
 nected with the upper and lower ends of
 said piston, a central passage in said piston
 communicating at one end with the cylinder
 and at the other end with one of said piston- 40
 rods, passages in said piston around said
 central passage, said last-mentioned passages
 communicating at one end with the other
 piston-rod and at the other end with the cyl- 45
 nder at the side of the piston opposite that
 at which the latter piston-rod is connected,
 a valve for preventing the flow of water
 through said passages in one direction when
 it is closed, upwardly-removable check-
 valves in said cylinder above and below the 50
 piston, the lower piston-rod extending
 through the check-valve below the piston
 and having means for engaging the same
 whereby said lower valve may be removed
 with the piston.

ROBERT E. L. HOLMES.

Witnesses:

JOHN L. JACKSON,
 MINNIE A. HUNTER.