

R. E. L. HOLMES.
 DOUBLE ACTING DEEP WELL PUMP.
 APPLICATION FILED DEC. 21, 1916.

1,247,113.

Patented Nov. 20, 1917.

Fig. 1.

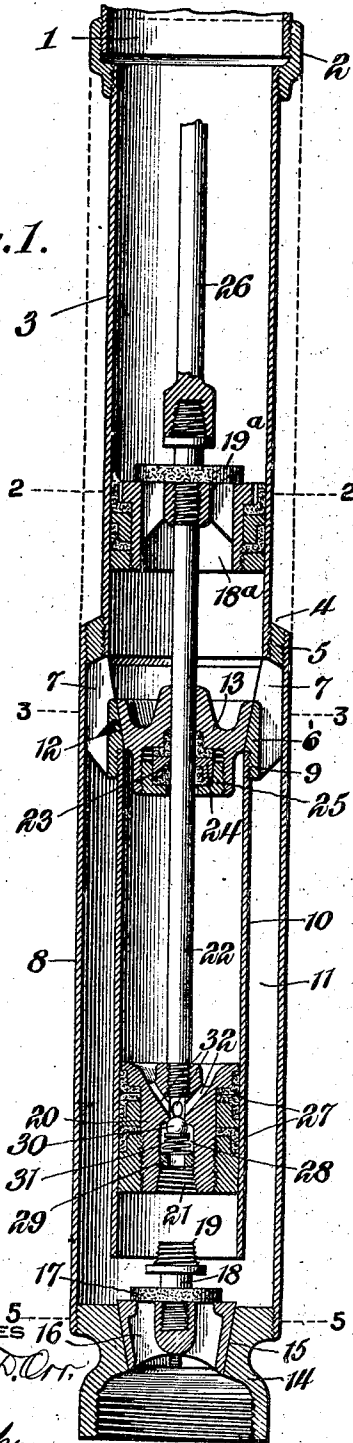


Fig. 2.

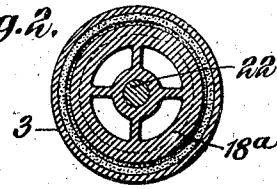


Fig. 3.

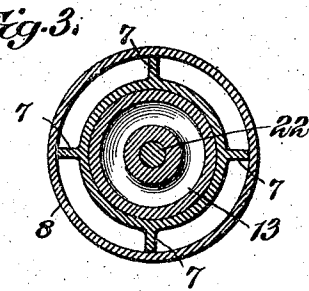


Fig. 4.

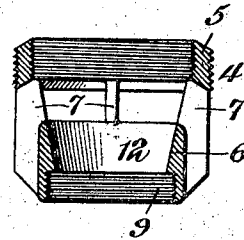
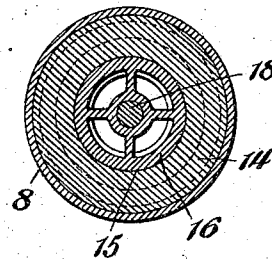


Fig. 5.



WITNESSES
 Howard R. Orr.
 H. J. Chapman.

R. E. L. Holmes, INVENTOR,
 BY *E. J. Siggers*
 ATTORNEY

UNITED STATES PATENT OFFICE.

ROBERT E. L. HOLMES, OF BEAVER FALLS, PENNSYLVANIA.

DOUBLE-ACTING DEEP-WELL PUMP.

1,247,113.

Specification of Letters Patent.

Patented Nov. 20, 1917.

Application filed December 21, 1916. Serial No. 135,238.

To all whom it may concern:

Be it known that I, ROBERT E. L. HOLMES, a citizen of the United States, residing at Beaver Falls, in the county of Beaver and State of Pennsylvania, have invented a new and useful Double-Acting Deep-Well Pump, of which the following is a specification.

This invention has reference to double-acting deep well pumps, and its object is to provide a pump barrel for deep wells wherein ducts of relatively large area are provided for the passage of water, so that friction to the passage of water is reduced and the power needed in pumping is correspondingly reduced.

In accordance with the invention working barrels are arranged in tandem with the lower barrel of less diameter than the upper barrel and inclosed in a casing forming a large water duct about the lower barrel, thus doing away with the necessity of a hollow pump rod and providing a water duct of relatively large area. The two working barrels contain connected pump plungers individual to the respective barrels, and the entire structure is so arranged that all working parts requiring inspection and repair from time to time may be bodily removed from the pump cylinder through the column pipe without disturbing the working barrels or other fixed parts of the device.

The invention will be best understood from a consideration of the following detailed description, taken in connection with the accompanying drawings forming part of this specification, with the further understanding that while the drawings show a practical form of the invention, the latter is not confined to strict conformity with the showing of the drawings, but may be changed and modified so long as such changes and modifications come within the scope of the appended claims.

In the drawings:—

Figure 1 is a longitudinal vertical section of a double-acting deep well pump in the installed position.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a section on the line 3—3 of Fig. 1.

Fig. 4 is a vertical diametric section of a barrel head to which the adjacent ends of the working barrels are connected, and also carrying the casing exterior to the lower working barrel.

Fig. 5 is a section on the line 5—5 of Fig. 1.

Referring to the drawings, there is shown a column pipe 1, which, in the installed position, stands upright, and to the bottom end of this column pipe there is connected a coupling 2 constituting the top coupling of the pump. The coupling 2, which may be a reducing coupling, has the upper end of a working barrel 3 screwed therein, such working barrel constituting the upper or top working barrel of the pump, the expressions of position having to do with the installed pump.

The lower end of the barrel 3 is screwed into and carries a coupling 4 comprising spaced rings 5, 6 with circularly spaced connecting webs 7. The ring 5 is internally threaded for the reception of the barrel 3 and externally threaded for the reception of the upper end of a casing tube 8 in pendent relation to the ring 5 and exterior to the webs 7, which latter are upright in the installed position. The ring 6 has interior screw threads 9 at the lower end carrying another working barrel 10 in pendent relation thereto and interior to and concentric with the casing 8, leaving a circular space or chamber 11 about the barrel 10 and between it and the casing 8. The coupling 4 is of such diameter that the outer wall of the casing 8 coincides substantially in diameter with the exterior of the coupling 2, so that the column pipe and pump cylinder may be readily lowered into a well within the ordinary fixed well casing, which latter, however, is not shown in the drawings. The upper end of the ring 6 is formed with a taper seat 12 for a removable head 13 forming a head for the working barrel 10 constituting the lower or bottom working barrel of the pump. The seat 12 and the exterior of the head 13 are correspondingly tapered with the taper sufficiently steep so that the head may be tightly forced into the seat without liability of accidental displacement, but at the same time may be purposely displaced or removed.

Into the casing 8 there is screwed another coupling 14 with a central passage or seat 15 in which there is normally lodged a valve body 16 with passages therethrough and carrying a valve 17 constituting a check or foot valve for the pump. The valve 17 is movable along a stem 18 rising from the body 16 and provided at its upper end with a taper screw 19 for a purpose which will presently appear. The seat 15 and valve

body 16 are suitably tapered, so that the body 16 may be firmly seated against accidental displacement, but on the application of a suitable force may be removed from the seated position.

Lodged in the upper or top working barrel is a plunger 18^a provided with a check valve 19^a, which plunger may be taken as typical of any one of a number of commercial forms of plungers, whether provided with a disk, ball or conical valve, the disk form being shown, but all such forms of valves being in common use. In the lower or bottom working barrel is another plunger 20, which, however, is a valveless plunger in the particular showing of the drawings. The plunger 20 has its body portion provided with a threaded socket 21 adapted to the threaded stem 19, so that the plunger may be coupled to the valve body 16 for introduction of the latter into the seat 15, or its removal therefrom.

The two plungers 18^a and 20 are coupled together by a pump rod 22 extending through the head 13 and there surrounded by suitable packing 23 held in place by a gland 24 and nut 25 threaded into the head 13.

Secured to the top plunger 18^a is a sucker rod 26 which may be assumed to extend to the top of the well for the actuation of the pump plungers.

The two plungers are shown as provided with the usual cup leathers 27, or other suitable packing may be employed in accordance with the particular character of plunger.

In the structure shown the upper or top working barrel is of greater internal diameter than the lower or bottom working barrel, and the top and bottom plungers correspondingly differ in diameter. The head 13 is of such diameter that it may be moved through the barrel 3 and the foot valve body 16 is of such diameter that it may be moved through the barrel 10. With such a structure it is quite feasible to entirely remove all the valves and plungers when necessary for inspection or repairs without disturbing the working barrels in any way and the valve and plunger structures may be as readily introduced into the working barrels and the foot valves seated without disturbing the working barrels.

When the plungers are lifted water is drawn through the foot valve into both working barrels, the plunger 20 drawing the water into the working barrel 10 through its lower open end and the plunger 18 drawing water into the barrel 3 by way of the chamber 11 and around the ring 6 through passages defined by the webs 7, which passages open freely to the lower open end of the barrel 3 lodged in the ring 5. Water is thus drawn into the pump on the up stroke. On the down stroke the valve 17 is seated

while water in the barrel 10 is forced out through the lower end thereof into the chamber 11 and by the coupling 4 through the passages therein into the lower end of the barrel 3, with the water drawn into the barrel 3 together with the water forced therein by the plunger 20 finding escape past the valve 19^a which moves to the open position on the down stroke of the plunger.

All the water passages are large and offer a minimum of frictional resistance to the flow of water through them, wherefore the water moves with less speed than is usually the case where the water must flow through a hollow pump rod.

With the structure described the water passages are all large in proportion to the area of the plungers, thus permitting the pump to be run at maximum speed while preventing excessive speed of travel of water through the passages, so that because of the reduced frictional resistance there is a reduction of power necessary to force the water through the passages with a consequent saving of power.

The structure permits the use of the ordinary disk valve, as shown, or ball valves or conical valves at the suction entrance and in the top plunger with practically no changes in their construction from such valves as used in single acting working barrels.

There is a liability of water leaking past the packing of the plunger 20 and becoming imprisoned in the cylinder 10 between the plunger 20 and the head 13. To avoid the effect of such leakage the plunger 20 is provided with means for the escape of any water that may find its way above the plunger 20. Continuing axially from the socket 21 is a chamber 28 having a hollow nut 29 screwed thereinto, and within this chamber is contained a ball valve 30 and a spring 31 at one end engaging the nut 29 and at the other end normally seating against the upper end of the chamber 28. Leading from the chamber 28 are passages 32 opening through the top of the plunger 20 into the interior of the cylinder 10, the valve 30 normally closing these passages from communication with the chamber 28.

Should water leak past the leathers on the plunger 20 then on the up stroke of the plunger the water so leaking, if in sufficient quantity, will exert a greater pressure on top of the piston than is exerted by the water on the under side of the piston, whereupon the valve 30 will yield and the superior pressure on the water above the piston will cause it to pass through the passages 32 and escape through the plunger.

What is claimed is:

1. A deep well pump having upper and lower working barrels, a coupling comprising two spaced rings with longitudinal con-

necting webs, one ring being of greater diameter than the other and threaded both on the interior and exterior and the smaller ring having a threaded interior and formed with an internal taper seat spreading toward the first-named ring, a working barrel having its lower end entering the threaded interior portion of the larger ring, another working barrel entering the threaded interior portion of the smaller ring below the taper seat, a casing tube connected to the outer threaded portion of the larger ring and hanging therefrom, a coupling carried by the lower end of the casing tube and provided with an interior tapered valve seat, a sucker rod extending through the upper working barrel and there carrying a valved plunger, another plunger in the lower working barrel and carried by the sucker rod, a foot valve in the coupling carried by the casing, and a head adapted to the taper seat in the first-named coupling and provided with packing means traversed by the sucker rod, the lower working barrel having its lower end open and spaced from the coupling carried by the lower end of the casing tube, and said casing tube being spaced from the lower working barrel and communicating through the first-named coupling between the two rings thereof with the upper working barrel.

2. A deep well pump having upper and lower working barrels, a coupling comprising two spaced rings with longitudinal connecting webs, one ring being of greater diameter than the other and threaded both on the interior and exterior and the smaller ring having a threaded interior and formed with an internal taper seat spreading toward the first-named ring, a working barrel having its lower end entering the threaded interior portion of the larger ring, another working barrel entering the threaded interior portion of the smaller ring below the taper seat, a casing tube connected to the outer threaded portion of the larger ring and hanging therefrom, a coupling carried by the lower end of the casing tube and provided with an interior tapered valve seat, a sucker rod extending through the upper working barrel and there carrying a valved plunger, another plunger in the lower

working barrel and carried by the sucker rod, a foot valve in the coupling carried by the casing, and a head adapted to the taper seat in the first-named coupling and provided with packing means traversed by the sucker rod, the lower working barrel having its lower end open and spaced from the coupling carried by the lower end of the casing tube, and said casing tube being spaced from the lower working barrel and communicating through the first-named coupling between the two rings thereof with the upper working barrel, and said plunger in the lower working barrel having a normally closed yieldable relief valve therein, whereby packing of air or water between the plunger and the packing head at the upper end of the lower working barrel is prevented.

3. A deep well pump comprising upper and lower working barrels with the lower barrel permanently closed at its upper end when in operation, and connected plungers in the two barrels, the lower plunger being provided with a relief valve for the escape through the plunger of liquid leaking past the plunger into the portion of the lower barrel above it, and said relief valve having yieldable means associated therewith tending to maintain the valve in the closed position.

4. A deep well pump comprising upper and lower working barrels with connected plungers in the barrels and individually thereto, the upper plunger having a valved port for the up passage of liquid there-through and the lower barrel above the lower plunger being permanently closed, the lower plunger having a passage for the escape of liquid therethrough with a spring-controlled relief valve in the passage opening for the downward flow of liquid on the establishment above the plunger of a predetermined pressure.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

ROBERT E. L. HOLMES.

Witnesses:

F. F. COPELAND,
H. N. KITTOE.