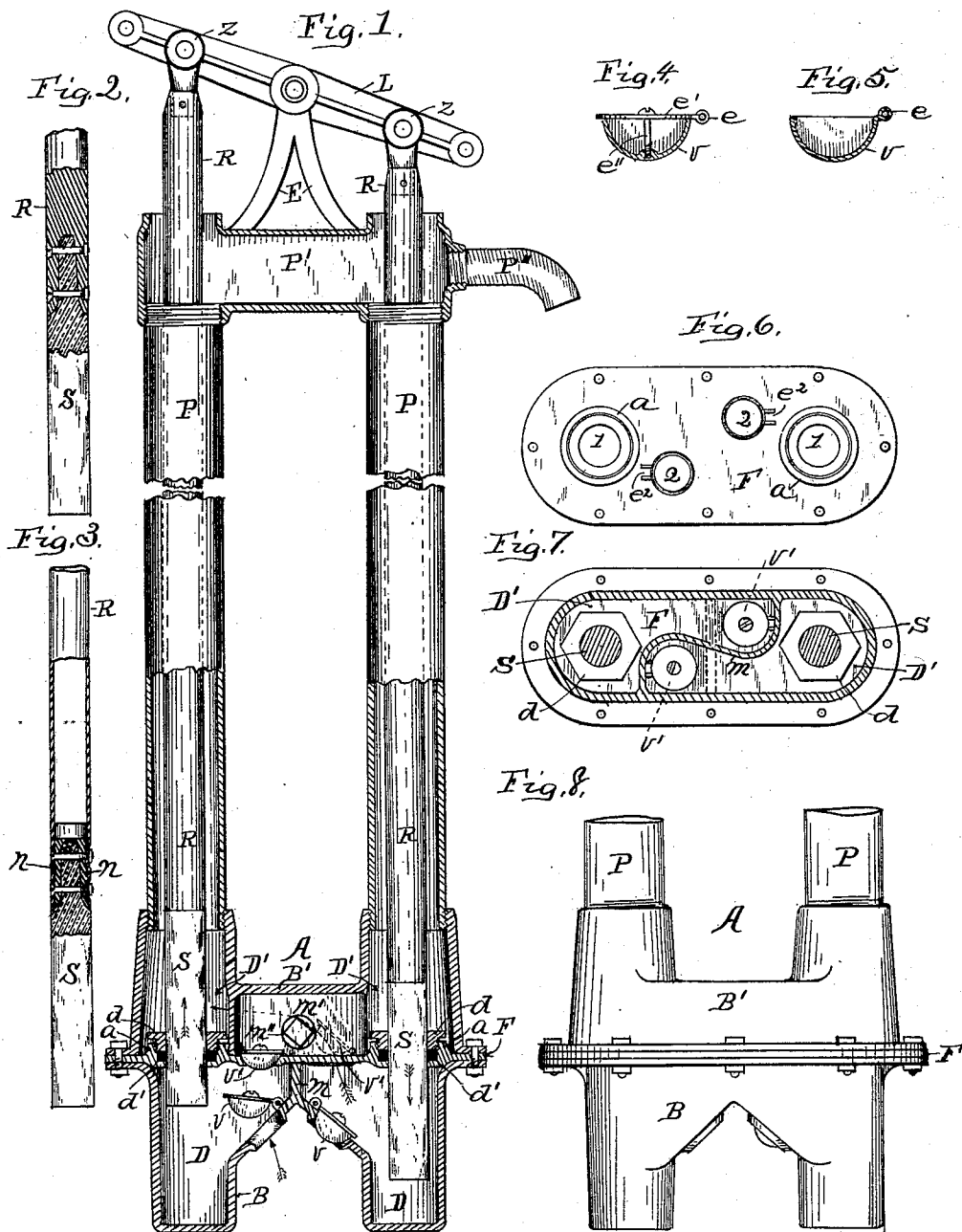


(No Model.)

G. W. BARTHOLOMEW.
DISPLACEMENT PUMP.

No. 487,595.

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Witnesses,

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UNITED STATES PATENT OFFICE.

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DISPLACEMENT-PUMP.

SPECIFICATION forming part of Letters Patent No. 487,595, dated December 6, 1892.

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To all whom it may concern:

Be it known that I, GEORGE W. BARTHOLOMEW, a citizen of the United States of America, residing at Wichita, in the county of Sedgwick and State of Kansas, have invented certain new and useful Improvements in Displacement-Pumps, of which the following is a specification, reference being had therein to the accompanying drawings and the letters and figures of reference thereon, forming a part of this specification, in which—

Figure 1 is a side elevation of the pump having portions broken away to show its interior construction. Figs. 2 and 3 are similar views of portions of the combined pump-rod and piston of the pump. Figs. 4 and 5 are detailed sections of valves such as are adapted for use in the pump mechanism; Fig. 6, a detailed top plan of the horizontal partition-plate of the pump-casing; Fig. 7, a horizontal section of the pump-casing above said plate, looking down; and Fig. 8, an exterior side view of said casing.

This invention relates to certain improvements in compound pumps; and it consists in the construction, arrangement, and operation of parts, substantially as set forth and explained in the following specification and claims.

The object of my invention is to produce what may be termed a "balance-pump" for service in deep wells, for irrigation, pumping, &c.; and with this object in view I have devised and constructed the pump in two like parts so connected and arranged as to be operated jointly, so that the pump-rod and piston of one part will operate in reverse direction from the other, and so that the water displaced from the induction-chambers of one part by the downward movement of its piston will enter the exit-chamber of the opposite part and assist in raising the pump-rod therein, which is made possible by reason of the pump-rods being made of material which will float in the water in the pump-pipes, and, further, by reason of the inflowing water at the base of the pump rising in the pipe and discharging from the top thereof at the same speed as the rod ascends, thus avoiding the usual friction of rod in contact with the water caused by rod and water not moving uniformly, and, further, in this invention by reason of the

rods being made to float they are when at rest in perfect balance, and at such times do not rely on other means than the water in the pump-pipes for support, and when in operation but little power is required to plunge them deeper into the pipes or raise them sufficiently from the pipes, and during the time of induction all other communication is cut off from the induction-chambers by means of valves, and hence but little power is required to charge the said chambers. Therefore the pump is by its compound construction and balance-rods and pistons adapted to be operated with but little applied power and raise water from a much deeper well than by the common construction of pumps.

Referring to the drawings, A represents the pump-case, made in two parts B and B', with an interposed plate F, forming a horizontal partition between the chambers of said parts, which parts and plate are secured together by means of bolts through their flanges in the manner shown.

P P are the pump-pipes, screw-threaded at each end, having a right-hand thread at one end and a left-hand thread at opposite end, and are turned into corresponding holes of the part B' of the case and similarly connected at their upper ends by means of a union receptacle P', which is provided with a spill-spout P." The lower portion B of the case is provided with a central partition *m*, vertically arranged, and with a beveled wall leading each side from the base of said partition to the piston-chambers or induction-chambers D D, and in these beveled walls are arranged openings formed as valve-seats, and with valves V V arranged to open or close said openings, there being one valve in each chamber D. The upper portion D' of the case is provided with the vertical cross-partition *m'*, as shown, which ranges at its center portion across the line of the lower partition *m*, and at its end portions it is extended to unite with the side walls of said part B', and by such arrangement said partition divides said part B' into two chambers D' D', with a portion of each chamber D' over the opposite chamber D of part B of the case.

F is a plate, being the horizontal portion of the case A, and is provided with the two opposite piston-bores 1 1, with annular screw-

threaded flanges *a* about each such bore, and with the two opposite openings 2 2, (see Fig. 6,) which are formed as valve-seats. The plate thus made is interposed between parts B B' of case A, with the partitions of the case parts bearing against it, and is held in position by means of the flange-bolts of the case in the manner shown, and if not properly fitted in metal packing may be used to insure water-tight joints where said parts unite. When thus put together, plate F is provided with the valves V' V', arranged seated in the openings 2 2, and are adapted by their arrangement, which is shown in Fig. 7, to open or close communication from the right-hand induction-chamber to the left-hand exit-chamber, or vice versa.

R represents the pump-rods, one in each pipe P, and are made either of wood or hollow metal in such manner as to float in the water in the pipes P and so adjusted by weighting or being relieved of weight as to balance in the water and relieve the actuating-lever L, to which they are connected at their top, from sustaining their weight when at rest and but a portion thereof when in operation. Each rod R is provided at its lower end with a piston S, preferably made of glass, of uniform size of the rod and clamped to the rod, as shown in Figs. 2 and 3, and when in position in the pump these pistons are arranged through their respective bore in plate F within case A, and at each bore I have provided a packing screw-threaded ring *d* and a packing *d'* to insure a perfect easy-working water-tight fit to the piston.

E is a standard fixed upon the receptacle P' for the purpose of a support for lever L and to which the lever is fulcrumed.

The pump-valves V and V' are made semi-spherical in form and their seats of a corresponding form, which permits the said seats to be inclined and therefore not liable to retain any obstacle liable to prevent the closing of the valve, and, further, such form serves in like manner as a ball-valve and is held in position by its hinge, which is an advantage over a ball-valve. The hinge of the valves is shown as consisting of the eye *e* of the valve and the eye-studs *e'* of the plate F or the other part where they are attached and of a pin passed through said eyes in the usual manner.

In Fig. 4 I have shown the valve as consisting of a semispherical shell body and with a plate *e'*, having the hinge-eye secured to the body by means of a screw *e''*, and in Fig. 5 as of a similar body independent of plate and with the hinge-eye as a part of the body.

Z Z represent the parts for connecting the pump-rods to the actuating-lever L, and I have shown said lever as being provided with an eye at each end for the pivotal attachment of a windmill connecting-rod or other connecting rod or device for operating said lever; but any form of lever may be employed, or a handle may be used, as may be desired.

In Fig. 2 the pump-rod R is represented as being wood and in Fig. 3 as of hollow metal. In either construction it is clamped to the piston by means of bolts, as shown, so as not to change their uniform size, and with the metal rod wood is interposed between the metal and glass, as shown at *n* in Fig. 3.

In operation the case A is submerged into the water in a well or other place, and the pipes extend therefrom to a desired height above the ground surface, where they are secured in position. The lever L is then given motion, which will cause the rods R and their pistons to reciprocate in reverse directions. To explain their action, it may be supposed that the pipes P are filled with water about the rods R, which will cause the said rods to float, and that the induction-chambers are also supplied with water. As one rod is plunged deeper into the pipe it will cause its piston to pass through its bore in plate F and enter deeper into the induction-chamber D below and into the water therein, which action will cause said chamber-valve V to close due to the water-pressure caused by the deeper entrance of the piston, which water-pressure will also cause the upper valve V' above said chamber to open to permit the water displaced by the piston in the induction-chamber to pass up into the exit-chamber D' at the opposite side of the pump-case, and thereby cause a like quantity of water to discharge from the top of the pipe in communication with said exit-chamber. At the same time the opposite rod will ascend at like speed with the uprising water in its pipe, which will cause a suction in the induction-chamber below said ascending rod, which will cause the valve V' above to close and the inlet-valve V to open to admit a fresh supply of water in said induction-chamber. In a reverse movement of the rods an exact reverse action takes place and a like quantity of water is displaced from the opposite induction-chamber and from the opposite pipe thereto.

It will be observed by closely observing the drawings that during the time water is being drawn into the induction-chambers all other communication is cut off by the closing of the upper valves, which will cause the water to be drawn in with but slight power and if the case is sufficiently submerged with no exertion of the piston but by the outward pressure of water, which will cause the water to rush in and fill the space vacated by the ascending piston; also, that as the descending piston commences its downward movement the upper valve of its induction-chamber opens, so that said induction-chamber is in direct communication with the exit-chamber at the opposite side of the pump, where the rod is ascending, and therefore the column of water in said exit-chamber, said communicating induction-chamber and the exit-pipe leading from said exit-chamber is as one body, and the action of the descending piston is such as to simply displace water from said column in pro-

portion to the volume of piston entered into the said induction-chamber, and as the weight of the pump-rod and piston is suspended by its floating in the water in its pipe, it is also
5 obvious that but slight power is necessary to plunge the rod and piston deeper into the water and cause such displacement of water.

By means of the partitions m' of the upper case portion B' the uprising water is
10 caused to accompany the ascending pump-rod and in that way prevent friction of water and rod in contact with each other, which would occur should the water and rod not move up uniformly. This feature I deem es-
15 sential in deep wells, but do not deem it as essential in shallow wells, and have therefore devised said chamber-partition with a screw-plug m'' , which may be removed and thereby
20 open the two exit-chambers into communication with each other, which will be equal to dispensing with said partition m' , which will permit the displaced water in either induction-chamber to rise jointly in both pipes P .

Having thus described my invention, what
25 I claim as new and useful, and desire to secure by Letters Patent, is as follows:

1. The combination, with the case provided with the vertical reversely-curved partition m , the duplicate induction-chambers, and the
30 exit-chamber divided from said induction-chambers, of the valves for admitting water into said induction-chamber, the valves for permitting water to pass from said chambers

to the exit-chamber, the pump-pipes communicating with the exit-chamber, the rods
35 and pistons thereof made of material which will float in water and of uniform size throughout their length, arranged in said pipes, with their pistons operating through bores of the case-partition, and the mechanism for re-
40 ciprocating said rods in reverse directions to each other, substantially as and for the purpose set forth.

2. In combination with the exit-pipe, the pump-rods operating therein and provided
45 with the pistons fixed to their lower end and with the rod-operating mechanism, the case A , horizontally divided by an interposed plate and vertically divided by means of partition-
50 walls above and below said plate, one of which walls is curved substantially S -shaped, the upper partition-wall being so arranged as to cross the line of the lower partition-wall, thereby forming two separate induction-
55 chambers and two exit-chambers, the valves arranged to open communication from the induction-chambers to the exit-chambers at the opposite side of the case therefrom, and the piston-bores and packings provided in
60 said horizontal plate for the pistons, and the induction-valves, substantially as and for the purpose set forth.

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Witnesses:

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