

3 SHEETS—SHEET 1.



C. S. BOWEN.
HYDRAULIC PUMP.
APPLICATION FILED JAN. 27, 1920.

1,377,871.

Patented May 10, 1921.

3 SHEETS—SHEET 2.

Fig. 2.

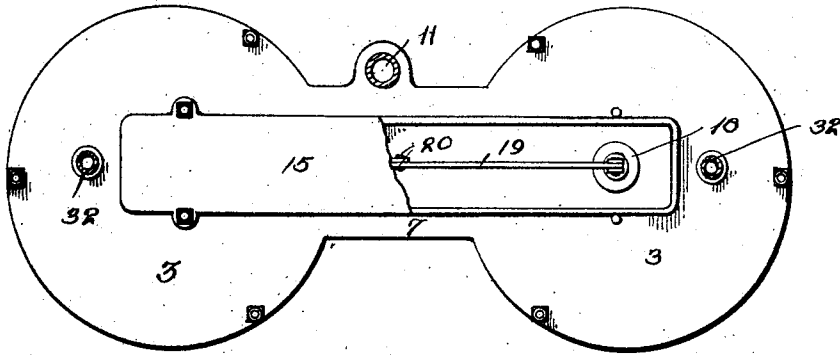


Fig. 7.

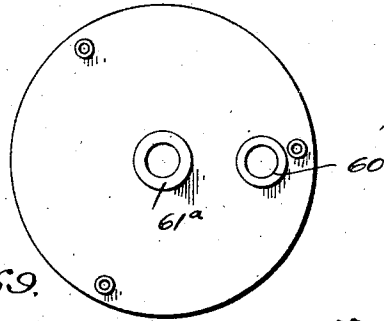


Fig. 6.

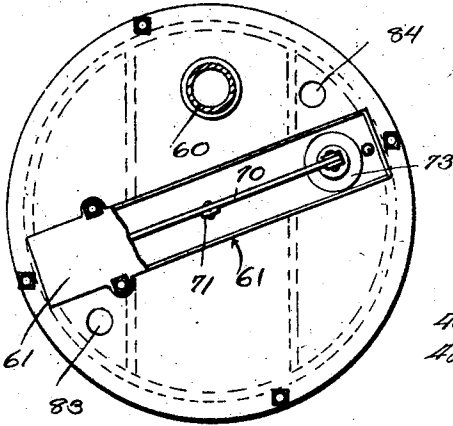
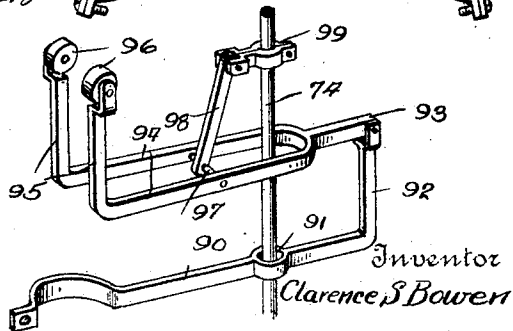


Fig. 9.



Fig. 8.



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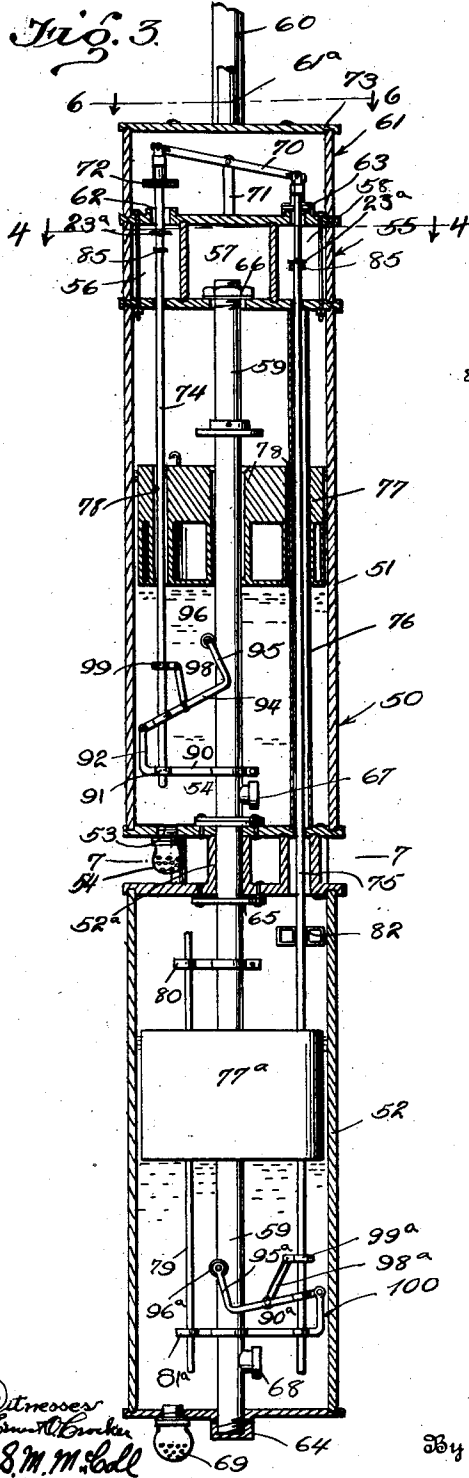
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3 SHEETS—SHEET 3.

Fig. 3.



UNITED STATES PATENT OFFICE.

CLARENCE S. BOWEN, OF PICKENS, SOUTH CAROLINA.

HYDRAULIC PUMP.

1,377,871.

Specification of Letters Patent.

Patented May 10, 1921.

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To all whom it may concern:

Be it known that I, CLARENCE S. BOWEN, a citizen of the United States, residing at Pickens, in the county of Pickens and State of South Carolina, have invented certain new and useful Improvements in Hydraulic Pumps, of which the following is a specification.

This invention relates to hydraulic pumps for both bored and dug wells.

The object of the invention is to provide a pump of this character equipped with weights for shifting the valves and in which the emptying of the cylinders shifts the valves, the filling of a cylinder not in any way affecting them.

Another object is to so construct such a pump that a great saving in compressed air will be effected.

Another object is to so construct such a pump that the cylinders will fill completely with water without shifting the valves.

Another object is to equip a pump of this character with means for insuring filling of the cylinders when the air pressure is for some reason cut off.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

In the accompanying drawings:

Figure 1 represents a side elevation partly in section of a pump constructed in accordance with this invention and equipped for use in a dug well.

Fig. 2 is a horizontal section with parts broken out taken on the line 2—2 of Fig. 1.

Fig. 3 is a central vertical section of the pump constructed for use in a bored well.

Fig. 4 is a transverse section taken on the line 4—4 of Fig. 3.

Fig. 5 is a detail side elevation of the upper portion of the pump shown in Fig. 3 and the pipes used in connection therewith.

Fig. 6 is a horizontal section taken on the line 6—6 of Fig. 3 with parts broken out.

Fig. 7 is a top plan view of the form shown in Fig. 3.

Fig. 8 is a detail perspective view.

Fig. 9 is a plan view showing a modified form of pipe brace; and

Fig. 10 is a side elevation thereof.

The embodiment illustrated in Figs. 1 and 2 is designed for use in connection with a dug well and comprises a pair of vertically disposed parallel cylinders 1 and 2 which are exactly alike in construction, hence one only will be described in detail. These cylinders are each made of suitable material and with closed tops and bottoms 3 and 4 respectively. These tops and bottoms are preferably in the form of plates projecting beyond the walls of the cylinders and secured by bolts or rods 5 passing through the extensions of said tops and bottoms. These plates 3 and 4 have seats 6 to receive the cylinder ends and form a water tight connection between them.

The tops 3 of the two cylinders are shown connected by an integral neck 7, but obviously this neck need not be integral, but might be secured to the tops in any suitable manner.

An inverted T-shaped water delivery pipe 8 has its arms or branches 9 opening through the bottoms 4 of cylinders and these arms are composed of detachably connected sections and are equipped with check valves 10 which permit the water to pass from the cylinders to the shank or body portion 11 of the pipe and prevent its return to the cylinders.

The bottoms 4 are also provided with water inlets 12, here shown in the form of globular shells, having threaded necks 13 screwed onto the bottoms 4. These shells have their lower portions perforated for the entrance of the water from the well, and above said perforated portions are equipped with check valves 14 which permit the entrance of water to the cylinders and prevent its discharge.

The body portion or shank 11 of the delivery pipe extends up through neck 7 and discharges at any desired point, the neck 7 operating to hold it in upright position.

An air chamber 15 here shown rectangular is mounted on the tops 3 and neck 7 and communicates with both cylinders through openings 16 in the tops of said cylinders. These openings are equipped with valve seats 17 for cooperating with valves 18 here shown in the form of disks carried by rods

22 suspended from a lever 19 fulcrumed midway its ends on a post 20 rising from neck 7 in chamber 15. These rods 22 are provided at their upper ends with couplings 22^a having threaded connection with the rods and bifurcated to receive the ends of lever 19, said couplings having a pin and slot connection with lever 19, as shown at 21. These rods 22 extend through the openings 16 into the cylinders and reach nearly to the bottoms of said cylinders when at the limit of their inward stroke. Pins 23 and 24 extend laterally from said rods 22 at points near their upper and lower ends and are designed for a purpose presently to be described.

Cross bars 25 and 26 are arranged in the cylinders near their tops and bottoms being secured at their ends to the side walls of the cylinders and are apertured for the passage of the rods 22 to insure the rods being retained in upright position. The top bars 25 also operate as stops to prevent the weights 40, soon to be described, from rising to the tops of the cylinders and interfering with the exhaust valves 29.

Depending into the cylinders, from their covers or tops 3, are brackets 27 which form fulcrums for levers 28. These levers 28 each carries an air exhaust valve 29 at one end and a weight 30 at its other end. These valves 29 are designed to control the exhaust openings 31 of the cylinders from which openings lead branches 32 of the air exhaust pipe 33. Stems 34 carry the valves 29 and project upwardly into the pipes 32 to retain the valves 29 always in proper position, said stems being pivoted to the levers 28.

Located in each cylinder below the bar 25 is a weight 40 through which loosely passes the rod 22. This weight 40 is constructed of light material, being preferably provided with recesses or cavities 41, to cause it to be supported by the water in the cylinder, it being nearly submerged when the cylinder is full of water, as shown in Fig. 1, so that a small quantity only of compressed air is required to expel the water.

A small float 35 is fixed on the rod 22 disposed in cylinder 2. This float is designed to keep the cylinders primed and operates in a manner hereinafter to be described.

An air inlet pipe 36 opens into the chamber 15 and supplies compressed air from any suitable source for operating the pump, as will be described hereinafter.

A brace 36^a connects the delivery pipe 11, exhaust pipe 33, and air inlet pipe 36, and may be of any desired construction, one form being shown in Figs. 1 and 5, and another in Figs. 9 and 10. The form shown in Figs. 1 and 5 comprises a clamp 37 which encircles the delivery pipe 11, being tightened by a bolt to bring the jaws together and which has arms 38 and 39 radiating therefrom and provided with clamps for

engaging the exhaust pipe 33 and the air inlet pipe 36. This brace operates to hold the pipes against lateral movement and prevents them from falling against the wall of the well.

In Figs. 9 and 10 the brace is shown in the form of a bar 42 having clamps 43 and 44 at its ends for engaging the exhaust and inlet pipes with an arm 45 extending downwardly and obliquely and equipped with a clamp 46 for engagement with the delivery pipe 11. The clamps 43, 44 and 46 are exactly alike, being each composed of two adjustably connected members 47 and 48 to adapt them for use in connection with pipes of different sizes.

In the use of this pump, the parts being in the position shown in Fig. 1 with the air inlet of cylinder 2 open and that of cylinder 1 closed, the water will be forced by the compressed air from cylinder 2 out through the delivery pipe 11. The lowering of the water in the cylinder will cause the weight 40 to descend until it engages pin 24 where it will remain until the water is pumped from around it. The weight 40 resting on pin 24 will cause rod 22 in cylinder 2 to be lowered and the rod 22 in cylinder 1 to raise thereby shifting the valves closing the air inlet valve 18 of cylinder 2 and opening that of cylinder 1. The closing of valve 18 in the cylinder 2 causes the pin 23 to engage lever 28 and open the exhaust valve 29 and the raising of rod 22 in said cylinder permits the weight 30 to close the exhaust valve 29. The water then flows into cylinder 2 through the inlet 12. The inflow of water to cylinder 2 operates to raise the weight 40 so that the weight in cylinder 1 may shift the valves when the water in cylinder 1 is discharged. This operation will continue automatically, one cylinder emptying while the other is filling and vice versa, unless for some reason the compressed air be cut off. Should this occur, there would be no pressure to retain valve 18 of cylinder 2 closed and therefore the weight 30 would raise rod 22 by its own action against the pin 23 and thereby close the exhaust valve 29 in cylinder 2. When this occurs, both exhaust valves would be closed and no filling of the cylinders could take place. Both air inlet valves would also be open so that should the pressure be returned both cylinders would empty at the same time and when emptied there would be no full cylinder to turn the air into. It is to overcome this defect that the float 35 is provided. With the parts in the positions above described, with pressure off, the float 35 of course would cause the valve 18 of cylinder 2 to close thereby opening the exhaust valve 29 of said cylinder, due to the fact there is no air pressure tending to hold valve 18 of cylinder 1 upon its seat, and the fact that the weight of the small float is sufficient to

overcome the friction of the valve mechanism and thus close the inlet valve 18 of cylinder 2. As the exhaust valve of cylinder 2 is opened by this operation, this cylinder may fill almost to the top with the liquid. The float would be raised by this inflowing water in cylinder 2 and the raising thereof would operate to open the air valve 18 in said cylinder and to close the exhaust valve thereof. By this operation the air valve 18 in cylinder 1 would be closed and the exhaust valve opened, thus permitting cylinder 1 to fill with water. Now, should the air pressure be turned on it would find only one air valve open, which is the valve leading into cylinder 2 which would result in the perfect operation of the pump. It will thus be seen that so long as the pressure is on, the float will not be required for use, but it is absolutely necessary to guarantee perfect action of the pump in case pressure should be cut off.

This float 35 causes the cylinder in which it is located to fill with water because of the weight thereof and then owing to its floating ability permits the other cylinder to fill. It is too light to cause any shifting of the valves, when pressure is on, and is also too small to shift the valves by floating when pressure is on, hence its only purpose is to insure the operation of the pump when pressure is cut off.

The pump 50 illustrated in Figs. 3 to 8 is designed for use in connection with a bored well and comprises two long slim closed cylinders 51 and 52, arranged one above the other in vertical alinement and spaced apart to provide for the entrance of water to the top cylinder 51 through an opening 53 in the bottom thereof which is equipped with a check valve 54.

A cylinder head 55 is mounted on the top of cylinder 51 and is divided into three chambers, 56, 57 and 58; 56 and 58 being air exhaust chambers for the two cylinders and 57 a water chamber into which a delivery pipe 59 empties and from which chamber 57 delivery pipe 60 discharges.

An air chamber 61 is mounted on the cylinder head 55 and communicates through openings 62 and 63 with the exhaust chambers 56 and 58.

The water pipe 59 passes through the lower cylinder 52 being secured outside its bottom by a nut, and having a washer 65 provided with a packing secured to the top of said cylinder around said pipe. This pipe 59 extends through the upper cylinder 51 into the chamber 57 and has a nut 66 thereon which secures said cylinder top in position.

The pipe 59 is provided with lateral extensions 67 and 68 located one in each cylinder near the bottom thereof and each of these lateral extensions is provided with a

check valve (not shown) to permit water to enter the pipe 59 from the cylinders and to prevent an outflow therefrom.

The cylinder 52 is also provided in its bottom with a check valve equipped water inlet 69, similar to that shown in Fig. 1 to permit the entrance to the cylinder of water from the well and to prevent its outflow. These inlet valves for the two cylinders are constructed alike and are threaded into the bottoms of the cylinders so that when it is desired to pack the pump for shipment or storage the valves are removed and a bushing or rod is substituted and is designed to support the weights in the cylinders to relieve the other parts from strain during shipment. It is to be understood, of course, that these valves are supplied with the pump, and when it is set up for use the the weight supporting bushings are removed and the valves substituted.

A lever 70 is fulcrumed midway its ends on a post 71 and is coupled at its opposite ends with air inlet valves 72 and 73 which alternately closes the openings 62 and 63 of the exhaust chambers 56 and 58. Rods 74 and 75 depend from these valves, rod 74 terminating at a point near the bottom of cylinder 51 and rod 75 extending through a pipe 76 in cylinder 51 into cylinder 52 and terminates at a point near the bottom of said cylinder.

The pipe 76 connects the air chamber 58 with cylinder 52 and supplies air to said cylinder.

In the cylinders 51 and 52 are weights 77 and 77^a similar to those 40 of Fig. 1, being designed for the same purpose, each having three bores 78 extending there-through. The weight in the upper cylinder 51 has passing therethrough the pipe 59 and the rods 74 and 75 while the weight in the lower cylinder 52 has the pipe 59 and rods 75, and 79 extending through the bores thereof. The rod 79 is fixed to pipe 59 by a clamp at its upper end and at its lower end by a clamp 81. This rod 79 operates to prevent the weight 77^a in cylinder 52 from revolving around pipe 59 and interfering with the operating rod 75. The clamp 80 in addition to securing the upper end of rod 79 operates as a stop to limit the upward movement of weight 77^a.

Means for cooperating with the weight 77 in cylinder 51 for shifting the valves comprises an edge-wise disposed bar 90 having a collar 91 intermediate its ends for the free passage there-through of rod 74 and which is clamped to pipe 59. An arm 92 rises from the end of bar 90 opposite to that which is fixed to pipe 59 and is bifurcated at its free end to receive one end of a forked lever 93 which is fulcrumed thereto. The forks 94 of this lever 93 straddle rod 74 and have their free ends upturned at

right angles and equipped at their terminals with rollers 96. A pin 97 is mounted in the forks 94 and with which is connected at one end a link 98 pivoted at its other end to a clamp 99 secured to rod 74. The roller carrying arms 95 straddle pipe 59 with the rollers 96 positioned to be engaged by the weight 77 on the lower top incident to the emptying of cylinder 51. When this weight rests on said rollers the lever 93 is depressed and through link 98 exerts a downward pull on rod 74 thereby closing the air inlet valve 72 and opening the exhaust valve 83 of pipe 51 and opens inlet valve 73 closing exhaust valve 84 of cylinder 52. Therefore, it will be seen that both cylinders are allowed to fill without shifting the valves, since the emptying and not the filling of the cylinders shifts these valves. It will thus be seen that the use of weights instead of floats results in a great saving of compressed air, since a float must, of course, have room above the water in the cylinder to permit it to rise to perform its function and it requires almost as much air to fill this space as if it had filled with water and all of which air is lost.

Similar valve shifting means 100 are located in the cylinder 52, the only difference being that the bar 90^a corresponding to bar 90 of the other cylinder carries a clamp 81 which supports the lower end of rod 79 above described. The parts of the apparatus 100 are similarly numbered to correspond with those of cylinder 51, except that the character *a* is applied to the various numbers to distinguish them.

A small float 82 is fixedly mounted on rod 75 and operates in the same manner and for the same purpose as the float 35 of Fig. 1.

The exhaust valves 83 and 84 are located one in each chamber 56 and 58 and each is carried by one end of a bar or lever 85 fulcrumed intermediate its ends or stems 86 depending from the top of the chambers 56 and 58. The other ends of these levers carry weights 87 similar to those 30 of Fig. 1 and which operate in the same manner.

The rods 74 and 75 are straddled by the forks of levers 85 and have pins 23^a above said forks similar to those 23 of Fig. 1 and which are designed for the same purpose; that is, they engage levers 85 when the inlet valves 72 and 73 are closed thereby depressing the respective levers and opening the exhaust valves carried by said levers. Another advantage of my invention is that it will operate in water of such shallow depth that it would be impossible for pumps of other types to operate in the same depth of water. This is due to controlling the shifting of the valves by weights coupled with the latter's sliding movement upon the rods 22 which extend to a point in close proximity to the bottom of the cylinders.

From the foregoing description, taken in connection with the accompanying drawings, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains and while I have described the principle of operation of the invention together with the device which I now consider to be the best embodiment thereof, I desire to have it understood that the device shown is merely illustrative and that such changes may be made as are within the scope of the claimed invention.

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

1. In a hydraulic pump, a plurality of cylinders each having a water inlet and outlet valve, automatically operated compressed air inlet and outlet valves for said cylinders, and means for breaking an equilibrium of the valves should the air pressure be cut off, and the pump is inert when pressure is on.

2. A hydraulic pump, comprising in combination, a plurality of cylinders, each having a water inlet and outlet valve, automatically operated compressed air inlet and outlet valves for said cylinders, and buoyant means in one cylinder for breaking an equilibrium of the valves when they are open should air pressure be cut off and the pump is inert when pressure is on due to the equilibrium of the valves.

3. A hydraulic pump, comprising in combination, a plurality of cylinders each having a water inlet and outlet valve, compressed air inlet and outlet valves for said cylinders, a lever pivoted between its ends and having an air inlet valve on each end, a valve rod in each cylinder depending from each valve, means associated with each rod for shifting the air inlet and outlet valves and buoyant means on one valve rod in one cylinder for opening the air inlet valve in the other cylinder when both cylinders are empty and the pump is inert, and for opening its respective air inlet valve and closing its air outlet valve when said cylinder is filled.

4. A hydraulic pump, comprising in combination, a plurality of cylinders, each having water inlet and outlet valves, compressed air inlet and outlet openings in the top of the cylinder, a compressed air chamber, inclosing both air inlet openings, a lever pivoted between its ends in said air chamber, a valve rod for each cylinder depending from the ends of said lever, an air inlet valve carried by each rod, an abutment on each rod, means slidably mounted on each rod for actuating the valves, a lever for each cylinder mounted between its ends adjacent the top of the cylinder, an upwardly closing exhaust valve on one end of each lever, and a

weight on the other end of each lever, said levers being disposed in the path of movement of the abutment on said valve rod.

5 5. A hydraulic pump, comprising in combination, a plurality of cylinders, each having a water inlet and outlet valve, compressed air inlet and outlet openings for the cylinders, valves for the air inlet openings, a valve rod for each valve depending into
10 its respective cylinder, means connecting the valves for the opening and closing thereof, a float for each cylinder slidably engaged with its respective valve rod, and means in each cylinder having connection with its
15 respective valve rod, and adapted for engagement with the central portion of its cooperating float.

20 6. A hydraulic pump, comprising in combination, a plurality of cylinders, each having a water inlet and outlet valve, com-

pressed air inlet and outlet openings for the cylinders, valves for the inlet openings, a valve rod for each valve depending into its respective cylinder, means connecting the valves for the opening and closing thereof, a 25 float for each cylinder slidably engaged with its respective valve rod, and means in each cylinder having connection with its respective valve rod, and adapted for engagement with the central portion of its cooperating 30 float, and a lever having rollers adapted for engagement with said float and having connection with its respective valve rod.

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

CLARENCE S. BOWEN.

Witnesses:

J. H. BRUCE,

FRANK McFALL.