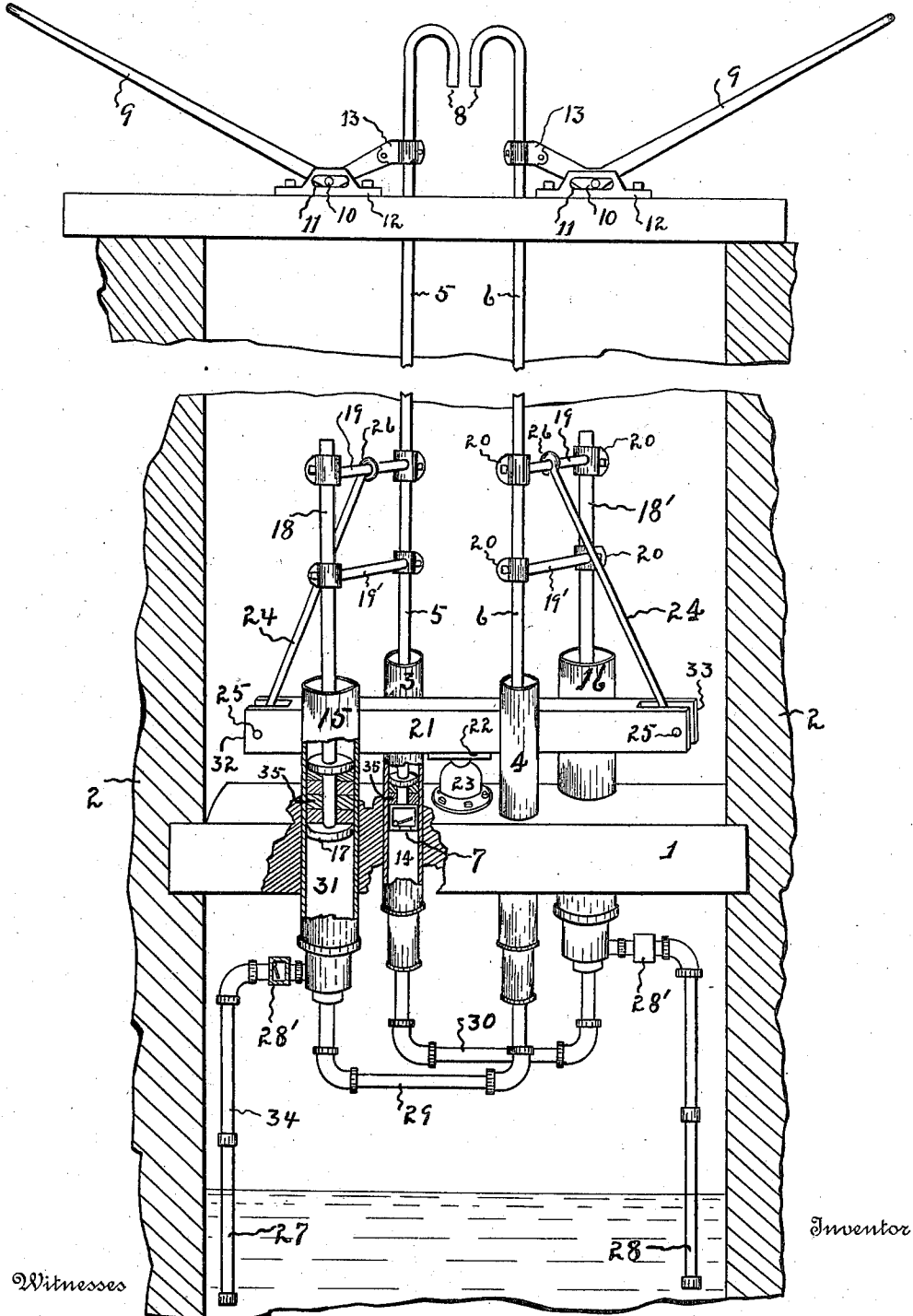


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FORCE PUMP.
APPLICATION FILED APR. 22, 1910.

984,158.

Patented Feb. 14, 1911.



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FORCE-PUMP.

984,158.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FRANK L. ROBERTSON, a citizen of the United States, residing at Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Force-Pumps, of which the following is a specification.

This invention relates to improvements in force pumps, and has for its object to provide a pump of this class for use in deep wells, which will operate reliably and will consist of few parts so that the same may be economically manufactured.

The invention has reference to a structure whereby the weight of columns of water confined in supply pipes of substantially the same height will counterbalance, the pipes also to operate as pistons; and includes the use of certain cylinders with pistons, and a rocking attachment connected with the pistons and supply pipes for balancing the weight of the water columns and for causing the pistons or plungers to move in alternation.

The invention consists of the novel construction, combination and arrangement of parts as described herein and claimed and as illustrated in the drawing, it being understood that changes in form, size, proportion and minor details may be made within the scope of the claims without departing from the spirit of the invention or sacrificing any of its advantages.

The single figure of the drawing is a perspective view of a force pump embodying my invention, parts being broken away and in section to disclose construction.

Referring now to the drawing for a more particular description, numeral 1 indicates a horizontal bed-plate or support, mounted within wall 2 of the well.

At 3 and 4 are indicated pump cylinders or casings within which are respectively seated supply pipes 5 and 6 of any desired length, each being provided at its lower terminal with a valve 7, the opposite or upper terminals of these pipes being indicated at 8. It will be understood that the supply pipes mentioned operate as piston rods within the respective cylinders mentioned, and they may be actuated or moved longitudinally by any suitable means, the means shown herein consisting of hand levers 9 pivotally mounted as indicated at 10 in slots 11 of bearing plates 12, the inner ends of

the levers being rigidly secured to pipes 5 and 6 by any convenient means, the means herein shown being clips 13. By operation of hand levers 9, the supply pipes may be vertically reciprocated with the result that valves 7 will move longitudinally within chambers 14 of cylinders 3 and 4.

At 15 and 16 are indicated vertical cylinders of greater diameter than cylinders 3 and 4, and all of the cylinders mentioned are mounted in fixed relation and supported by plate 1. Cylinders 15 and 16 are each provided with pistons 17 and with plungers or piston rods indicated respectively at 18 and 18', said rods being rigidly connected with supply pipes 5 and 6 as by the pairs of upper and lower arms 19 and 19' which extend therebetween, the terminals of these arms being formed with clips 20 which are secured rigidly upon the rods and supply pipes; and it will be seen that at the time supply pipes 5 and 6 have their longitudinal movements, piston rods or plungers 18 and 18' will have like movements.

At 21 is indicated a rocker arm provided midway between its ends with a bearing plate 22, said plate being provided with a convex projection for a seating within the concavely-formed recess of block 23, said block being rigidly secured upon the upper surface of the bed-plate.

At 24 is indicated a pair of links, each link having a pivotal mounting of its lower end upon a terminal of the rocker arm, indicated at 25; and the upper ends of the links have a pivotal mounting indicated at 26, upon the pair of arms 19. As thus described, the weight of each supply pipe is sustained by the link 24 with which it is connected, the weight of the links being sustained by the rocker arm; and the weight of the rocker arm and the parts resting thereon is sustained by plate 1.

In operation, when supply pipe 5 is elevated, as by use of lever 9, the end 32 of the rocker arm will obviously be elevated, and by reason of the elevation of pipe 5 the opposite end 33 of the rocker arm will be lowered, and thereby supply pipe 6 will be lowered, this being for the reason that the link connected with said pipe 6 is lowered by action of the rocker arm.

At 27 and 28 are indicated intake pipes communicating respectively with cylinders 15 and 16 through valves 28'. At 29 and 30 are indicated connecting pipes, pipe 29

communicating between the lower ends of cylinders 4 and 15, pipe 30 connecting between cylinders 3 and 16.

The herein described construction provides means for pumping water from wells of great depth with a minimum of power since the weight of one water column substantially balances the other; and, in operation, pipes 5 and 6 will have upward movements in alternation, the upward movement of each supply pipe causing a discharge of water from its terminal 8. When pipe 5 is moving upward, by operation of lever 9, chamber 31 of cylinder 15 will become filled with water which passes through valve 28' of intake pipe 27. Since terminal 32 of rocker arm 21 is moving upward, at this time, terminal 33 of this arm will swing downward and the water contents of the chamber of cylinder 16 will be discharged through conducting pipe 30 and will pass within chamber 14 of cylinder 3, and it will also pass upward through valve 7 of conducting pipe 5; and while supply pipe 5 is moving upward water will be discharged through its terminal 8 for the reason that cylinder 16 has a greater diameter than the diameter of cylinder 3.

During the downward movement of supply pipe 5 the contents of chamber 31 of cylinder 15 will be forced through pipe 29 and will pass within the chamber of cylinder 4. At this time, as is obvious, pipe 6 will have an upward movement; and, as the diameter of cylinder 15 is greater than that of cylinder 4, the water will flow through discharge port 8 of the upper terminal of pipe 6.

It will be understood, of course, that if the diameters of cylinders 15 and 16 were not greater than the diameters of cylinders 4 and 3 with which they respectively communicate, additional check valves would be required; for instance, a check valve would be required for each of conducting pipes 29 and 30, said valves opening in the direction of cylinders 4 and 3, respectively.

It will be noted that supply pipes 5 and 6 are filled with water at all times, and their weight is counterbalanced since the weight of each is sustained upon the ends of rocker-arm 21.

Bed-plate 1 may be supported in any suitable manner above the surface of the water contents of the well, and any number of sections 34 may be employed for pipes 27 and 28 so that the lower ends of these pipes will be disposed below the water level.

At 35 is indicated any suitable packing and this is employed in the usual manner, within the cylinders, adjacent to the valves and pistons.

As thus described, the invention consists, broadly, of primary and secondary pumps arranged in pairs, each pair to move in uni-

son and to be reciprocated vertically; the primary pump of each pair having a less capacity of lumen than the secondary pump with which it is arranged to move, a tubular connection being provided between the pump-chamber of each primary pump of one pair and the pump chamber of a secondary pump of another pair.

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

1. In a force pump, the combination of primary pumps each having its piston-rod formed as a tubular member with a valve communicating interiorly thereof; secondary pumps; each of said secondary pumps being in communication with one of the primary pumps and having its piston-rod rigidly mounted upon the piston-rod of another of said primary pumps; means to actuate the piston-rods of the primary pumps, the lumen of the secondary pumps being of greater extent than the lumen of said primary pumps.

2. A pump of the class described, comprising, in combination with two primary pumps each having a piston-rod formed as a tube with a valve communicating interiorly thereof, a pair of secondary pumps, each having a conducting-pipe communicating with one of the primary pumps and having a rigid mounting of its piston-rod upon the piston-rod of the other primary pump; means to actuate the piston-rods of the primary pumps, the bore of the secondary pumps being of greater extent than the bore of said primary pumps.

3. A pump of the class described, comprising, in combination with two cylindrical primary pumps each having a piston-rod formed as a longitudinal hollow member with a terminal valve communicating with the pump-chamber thereof, a pair of cylindrical secondary pumps, each having a conducting-pipe communicating with one of the primary pumps and having a rigid mounting of its piston-rod upon the piston-rod of the other primary pump; and means to actuate the piston-rods of the primary pumps, the diameter of the secondary pumps being greater than the diameter of the primary pumps.

4. A pump of the class described, comprising, in combination with two cylindrical primary pumps each having a piston-rod formed as an upright longitudinal conduit with a terminal valve communicating with the pump chamber thereof, a pair of upright cylindrical secondary pumps each having a conducting-pipe communicating with one of the primary pumps and having a rigid mounting of its piston-rod upon the piston-rod of the other of said primary pumps; means to move the piston rods of the primary pumps longitudinally and in alterna-

tion, the diameter of said primary pumps being less in extent than the diameter of the secondary pumps.

5 5. A pump of the class described, comprising, in combination with a plurality of cylindrical primary pumps each having a piston rod formed as an upright tube with a valve communicating with the pump chamber thereof, of a plurality of upright cylindrical secondary pumps each having a conducting-pipe communicating with one of the
10 primary pumps and having its piston-rod

arranged to move in unison with the piston-rod of another of said primary pumps; means to reciprocate the piston-rods of the 15 primary pumps longitudinally, the diameter of said primary pumps being of less extent than the diameter of the secondary pumps.

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

FRANK L. ROBERTSON.

Witnesses:

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