July 17, 1923. 1,462,445

T. W. DELANEY

PUMP PISTON

Filed June 7, 1921 2 Sheets-Sheet 1

Fig.2.

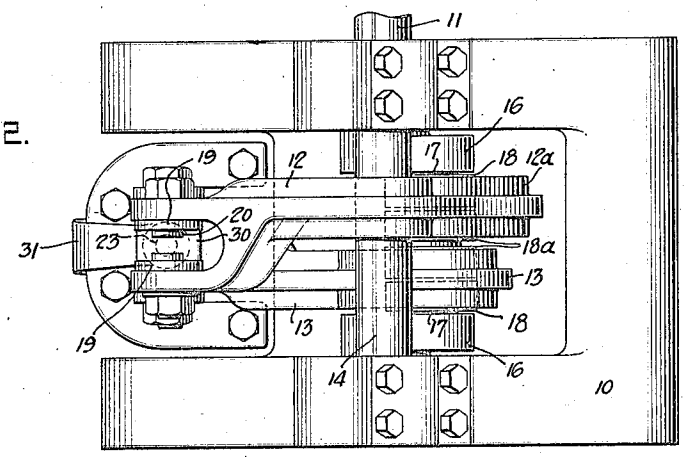


Fig.1.

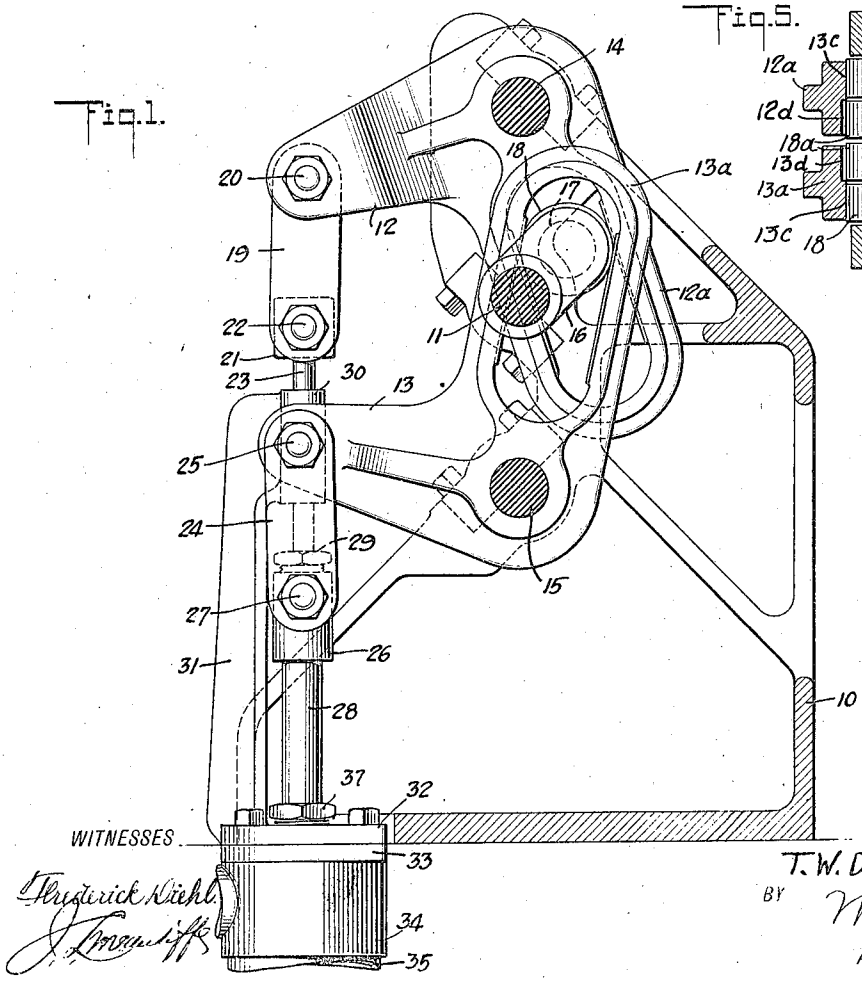
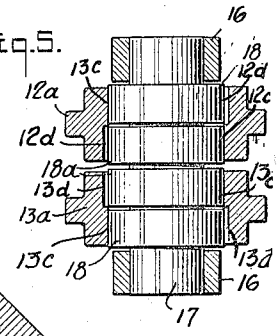


Fig.5.



WITNESSES.

Frederick Diehl.

INVENTOR

T. W. DELANEY.

BY Munn & Co.

ATTORNEYS

July 17, 1923. 1,462,445

T. W. DELANEY

PUMP PISTON

Filed June 7, 1921 2 Sheets-Sheet 2

Fig.3.

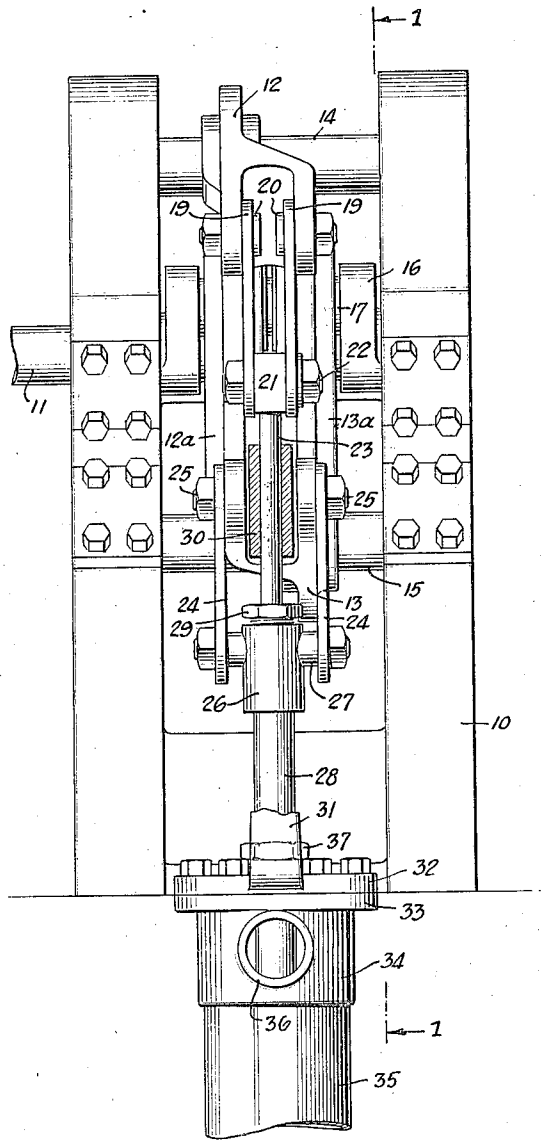
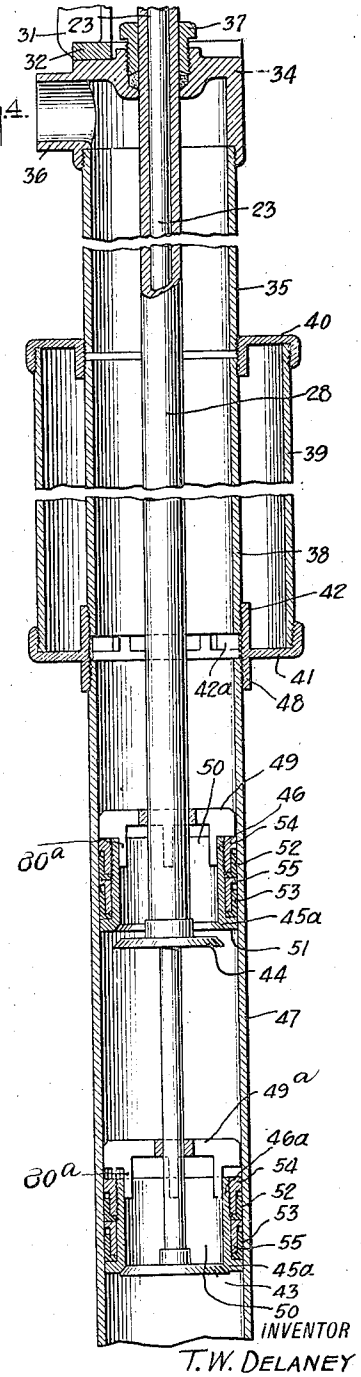


Fig.4.



WITNESSES

Frederick Diehl.

J. Lincoln Cliffe

INVENTOR

T. W. DELANEY

BY Munn & Co.

ATTORNEYS

Patented July 17, 1923. 1,462,445

UNITED STATES PATENT OFFICE.

THOMAS W. DELANEY, OF ST. PAUL, MINNESOTA.

PUMP PISTON.

Application filed June 7, 1921. Serial No. 475,616.

To all whom it may concern:

Be it known that I, THOMAS W. DELANEY, a citizen of the United States, and a resident of St. Paul, in the county of Ramsey and State of Minnesota, have invented a new and Improved Pump Piston, of which the following is a description.

My invention relates to a double-acting deep-well pump and more particularly to a pump in which plungers are provided one above another.

The general object of my invention is to provide a pump of the indicated type improved in various particulars especially with respect to promoting simplicity and providing operative parts characterized by the minimum friction in operation, and discharging the liquid in practically a constant stream.

More specifically, the invention has in view to provide a simple form of a mechanically operated valve in the plungers with a novel arrangement of air chamber directly above the cylinder.

The nature of the invention, its distinctive features and advantages, will clearly appear as the description proceeds.

Reference is to be had to the accompanying drawings forming a part of this specification, it being understood that the drawings are merely illustrative of one example of the invention.

Figure 1 is a vertical section in a plane indicated by the line 1—1, Figure 3;

Figure 2 is a plan view of my improved pump;

Figure 3 is a front view being broken away and in section;

Figure 4 is a longitudinal vertical section taken through the drop pipe and plungers, the tubular plunger rod being shown partly in side elevation and partly in section to show the inner plunger rod in elevation;

Figure 5 is a horizontal section taken at the crank shaft through the slotted arms of the bellcranks.

In carrying out my invention in accordance with the illustrated example, a suitable frame 10 is provided having bearings for a crank shaft 11. Upper and lower bell-crank levers 12, 13 are mounted on shafts 14, 15 respectively above and below the crank shaft 11. One arm 12^a, 13^a of the respective bell crank levers 12, 13 is slotted, the slotted arms lying parallel and in overlapping planes. On the shaft 11 are two crank arms 16, the wrist pin 17 of each crank being provided with a pair of rollers 18, 18^a, the rollers of one crank arm being disposed in the slot of the arm 12^a of one lever and the pair of rollers on the other crank arm being disposed in the slot of the other lever arm 13^a so that during one revolution of the crank shaft 11, the rollers 18 will roll, first upwardly over the slotted arms at one side and in the down-stroke will roll over the slotted arms at the opposite side for rocking the levers 12, 13 alternately in opposite directions.

The other arm of the lever 12 has secured thereto by pins 20 a pair of depending links 19 between the lower ends of which is secured by a cross pin or bolt 22 a cross head 21 on the upper end of a solid plunger rod 23. The second arm of the lower lever 13 has secured thereto by transverse pins 25 depending links 24, the lower ends of which are secured to the cross head 26 of the hollow plunger 28 through which the solid plunger 23 extends, said cross head 26 being here shown as secured to the links 24 by side pins 27 projecting from said cross head. The cross head 26 is formed with a stuffing box into which a gland 29 screws, to pack the plunger rod 23. Solid plunger rod 23 is guided in the bore of a vertical head 30 on an upright bracket or standard 31, the base 32 of which is bolted to flanges or lugs 33 of T-fitting 34 which is threaded onto the upper end of the drop pipe 35, the lateral branch 36 of said fitting affording the discharge for the water. The hollow plunger rod 28 extends fluid-tight through the base 32 of standard 31 and through the fitting 34, the numeral 37 engaging the gland or stuffing box provided in said fitting for said plunger rod.

The lower end of the drop pipe 35 is secured to the cap 40 of an air chamber composed of inner and outer spaced walls 38, 39 having a permanent fluid-tight connection with the cap 40. The concentric plunger rods 23, 28 extend centrally through said air chamber and through a coupling 41 forming the bottom of said chamber. The coupling has a plurality of spaced members 42 thereon to which the inner tube 38 of the air chamber is secured, there being spaces 42^a between members 42 and beneath the inner tube 38 for the flow of water upwardly

through said inner tube 38 and through the drop pipe 35 to the discharge 36 at the upper end thereof. On the plunger 23 is a valve 43 and on the hollow plunger 28 is a similar valve 44, said valve being adapted to engage respectively valve seats 45, 45ª on pistons 46, 46ª in the cylinder 47 secured at its upper end to a depending flange 48 on the coupling 41. Each piston has a cylindrical inner wall 50 and above said walls of the respective pistons, spiders 49, 49ª are secured to the respective plungers 23, 28. Thus, the plunger has a limited movement relative to its piston 46 or 46ª, limited by the distance between the valves 43, 44 and the spiders 49, 49ª. The cylindrical wall 50 has an outwardly directed lateral flange 51. L-shaped cup leathers 52, 53 are disposed about the tubular inner walls of the pistons 46, 46ª and are engaged respectively by correspondingly shaped and reversely disposed followers 54, 55, the upper follower 54 in each piston engaging external threads on the tubular inner wall of the piston. The spiders 49 and 49ª, are formed with depending fingers 80ª, spaced from the outer annular edge of the spiders to engage the inner cylindrical walls 50 of the pistons 46 and 46ª, to prevent slop of the pistons by maintaining same centered on their respective rods.

The operation of the pump is as follows: The crank shaft 11 turns clockwise, having reference to Figure 1, and in the positions shown the load arm of the lever 12 with its solid plunger rod 23 and the piston 46ª are moving downwardly, the load arm of lever 13 with the hollow plunger rod 28 and upper piston 46 are rising and lifting the water, the positions of the valve 43, 44 being at this time the reverse of that shown in Figure 4. As the rotation of the crank shaft continues the center line of the crank passes a point where it is at right angles to the medial plane of the slot in the lever 12, said lever 12 with the solid plunger rod 23, valve 43, and piston 46 start on the upward stroke, closing the valve 43 and taking the load from the upper piston 46 and its valve 44. Said upper piston, however, also continues on its upward stroke at this time and until the center line of the crank passes a point where it is at right angles to the plane of the slot in lever 13. The upper piston 46 is lifted from its seat by pressure when the lower piston 46ª attains a higher speed, the lever 13 then moves downwardly until the crank shaft has reached the position of slightly more than 180° than that shown in Figure 1 and carrying with it the hollow plunger rod 28 and upper piston 46. At this point the lever 13 and the hollow rod 28 and upper piston 46 start upwardly gradually assuming a load from the lower piston valve, which latter, however, continues the upward movement until the center line of crank passes at a point where it is at right angles to the medial line of the slot in lever 13, whereupon the lever 13, the hollow plunger rod 28, and the upper piston 46 start upon the return stroke, the relative movements of the parts continuing until the crank shaft again reaches the position shown in Figure 1 when the cycle is repeated.

In a given revolution of the crank shaft 11 with its cranks 17 having each a pair of rollers (18, 18ª), one roller of one pair on a crank will contact with and roll over one side of the slotted arm 12ª, the corresponding roller of the other pair will contact with the corresponding side of the other arm 13ª and in the continued revolution of the shaft 11 with its cranks 17, the other roller 18ª of the two pairs will be in action and contact with the opposite side of the lever arms 12ª, 13ª. It will be observed from Figure 5 that the surfaces 12ᶜ, 13ᶜ of the arms 12ª, 13ª against which the rollers 18 or 18ª contact at a given side are adjacent to depressed surfaces 12ᵈ, 13ᵈ of the respective arms so that the roller in contact with a given surface at one side will be afforded rolling clearance at the diametrically opposite side of the roller. Thus, a given roller can contact only with one side of an arm 12ª, 13ª.

I would state in conclusion that while the illustrated example constitutes a practical embodiment of my invention, I do not limit myself strictly to the mechanical details herein illustrated, since manifestly the same can be considerably varied without departure from the spirit of the invention as defined in the appended claims.

Having thus described my invention, I claim:—

1. In a pump, a plunger rod, a disk valve on the plunger rod, a cylinder in which the plunger rod and the valve operate, a piston above the valve and a spider provided with fingers engaging the inner wall of said piston snugly fitting in said cylinder, at the upper end of said piston, said piston being capable of movement in the cylinder relatively to the plunger rod and limited by the valve and spider, said spider centering said plunger rod and said fingers centering said piston to prevent piston slop.

2. In a pump of the class described, a cylinder, a plunger rod extending therein, a valve on the rod at the lower end thereof, a piston in said cylinder above said valve, said piston at its lower end being provided with a valve-seat for said valve, centering means on the rod above said piston for centering the plunger rod, and means integral with said centering means for centering said piston.

3. In a pump of the class described, a cylinder, a plunger-rod reciprocating with-

in said cylinder, a disk valve at the lower end of said rod, a spider on said plunger rod in spaced distance from said valve, said spider being provided with depending fingers spaced from the outer edge thereof, a hollow piston having a cylindrical inner wall arranged between the spider and the valve, said fingers engaging said cylindrical wall to center the same and prevent piston slop, said rod in its movement having a limited movement independently of said piston until the spider or the valve engage said piston whereby to open or close said valve on said piston.

THOMAS WILLIAM DELANEY.