July 21, 1936. A. BOHNENBLUST 2,048,098

PUMP

Filed Aug. 9, 1933 2 Sheets-Sheet 1

Fig. 1

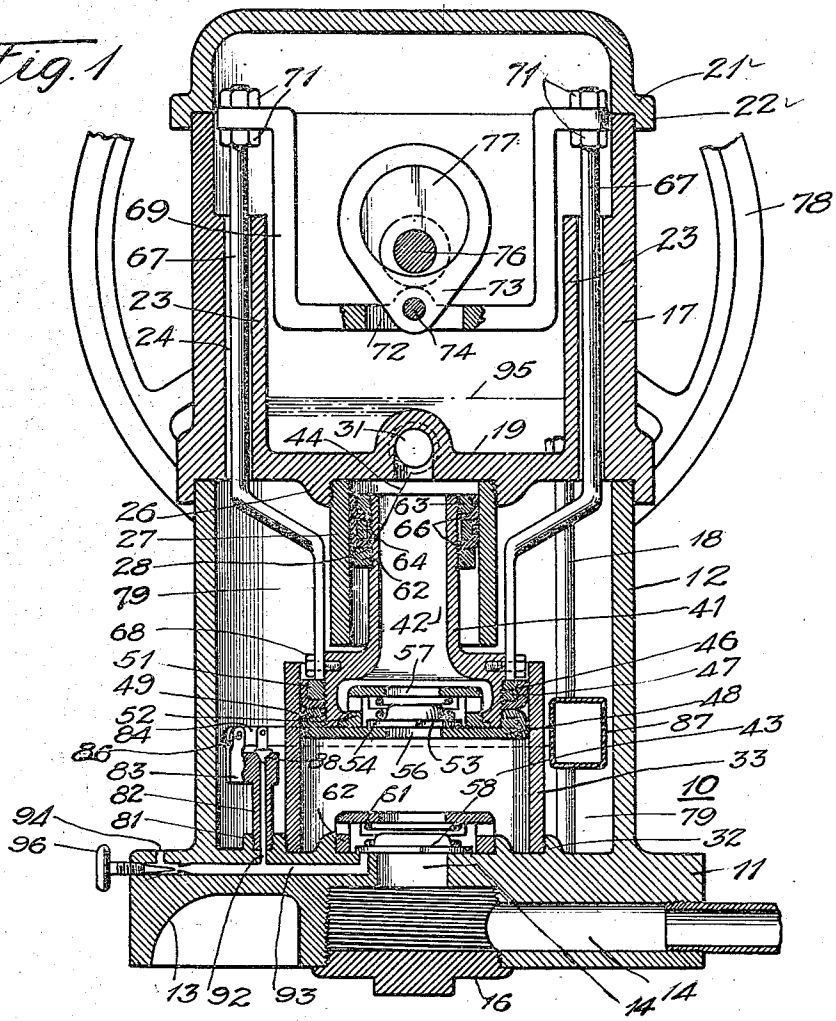
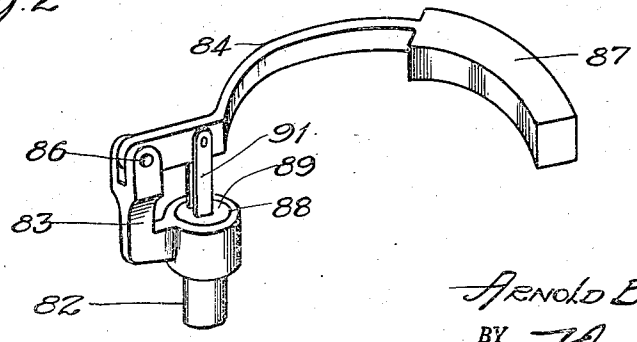


Fig. 2



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PUMP

Filed Aug. 9, 1933 2 Sheets-Sheet 2

Fig. 3

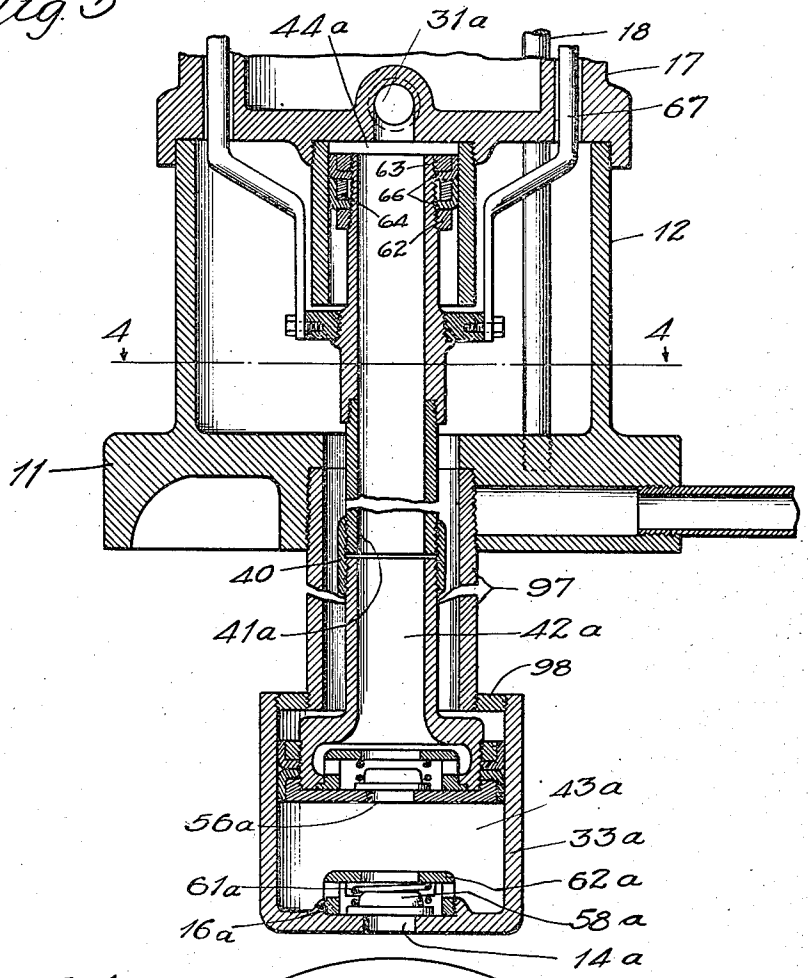
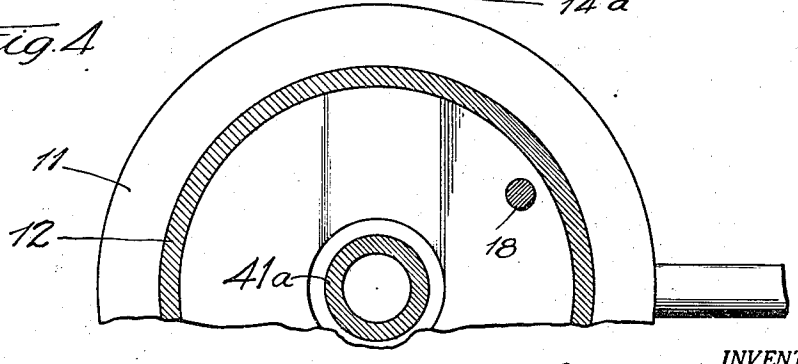


Fig. 4



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Patented July 21, 1936 2,048,098

UNITED STATES PATENT OFFICE

2,048,098

PUMP

Arnold Bohnenblust, Riley, Kans.

Application August 9, 1933, Serial No. 684,375

3 Claims. (Cl. 103—196)

My invention relates to pumps and the like and has particular relation to a reciprocating type pump adapted for producing a continuous fluid flow.

While pumps of the above type are one of the oldest machines in the mechanic arts, there has been little progress in the art in late years. Substantially the same structures are employed as were used years ago. These structures require stuffing or packing boxes for the pump rods and necessitate the use of at least four valves in order to secure the comparatively continuous flow of fluid resulting from the use of a double acting pump.

A general object of my invention is to overcome the difficulties above pointed out and to provide a reciprocating pump which will secure a substantially constant fluid flow, which will require a substantially constant power input, and which will require a minimum number of valves and parts.

Another object of my invention is to provide a reciprocating, double-acting pump which uses only two valves for securing continuous flow of the fluid.

Another object of my invention is to provide a pump of the above description in which one of the cylinders may be located deep in a well and the other located near the surface of the ground.

Another object of my invention is to provide a pump which does not need stuffing boxes and the like for sealing the pump operating plunger.

Another object of my invention is to provide means for oiling the rotating and reciprocating parts of a pump of the above character.

Another object of my invention is to provide means for leading off fluid which may collect in certain parts of the pump.

Another object of my invention is to provide means for injecting air or gas into the fluid being pumped, if so desired.

Other and further objects and features of my invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawings and following specification, wherein is disclosed an exemplary embodiment of the invention, with the understanding, however, that such changes may be made therein as fall within the scope of the appended claims without departing from the spirit of the invention.

In the drawings:

Figure 1 is a view in vertical section showing a pump structure constructed according to one embodiment of my invention.

Figure 2 is a view in perspective of the valve and valve operating mechanism, shown in Figure 1, which is used for bleeding off fluid which may collect in the interior of the pump.

Figure 3 is a view in vertical section of a modified form of pump constructed according to another embodiment of my invention, and

Figure 4 is a view in horizontal section taken along the line 4—4 of Figure 3. Only a portion of the section is shown as the section is substantially symmetrical at this line.

In order to better understand the invention, reference may now be had to Figures 1 and 2 in which all the operating parts or units of the pump are incorporated into one compact unit. After an explanation of this structure has been given, a modified form of the invention, shown in Figure 3, will be explained, in which modified form one of the pumping units is located at an appreciable distance below the other.

Referring now more particularly to Figures 1 and 4, there is shown at 10, generally, a cylindrical casting which serves as an enclosure or housing for most of the reciprocating parts of the pump. The casting or lower housing 10 is comprised of a disk-like base plate 11 and an upstruck cylindrical housing 12. The under side of the portion 11 is hollowed out as indicated at 13 for lightness and is provided with a channel 14 leading from the edge of the base plate inwardly and up through the center thereof. A plug 16 at the central portion of the base plate has threaded engagement therewith and is thus removable therefrom for a purpose hereinafter described.

The upstruck cylindrical portion 12 serves as a mounting on which a cup-like tubular casing or upper housing 17 may be mounted. The upper housing 17 is held on the lower housing by means of bolts 18 which pass through the bottom portion 19 of the housing 17 and are threaded into the base plate 11.

A cap 21 rests on top of the housing 17 and is provided with a depending flange 22 at its outer edge to extend down over the outer wall of the casing 17. The cap serves as a covering for the housing 17 to prevent dirt and foreign material from entering the housing. It need not be fastened to the housing.

The inner wall of the housing 17 is provided with a pair of oppositely-disposed, vertically-extending ribs 23 and these ribs are provided with longitudinal bores as indicated at 24. A depending circular flange 26 on the lower side of the wall 19 of housing 17 is internally threaded

in order that the flange may act as a support for a small cylinder 27, the upper edge of which is threaded into the flange 26. A channel, as indicated at 28, extends upwardly from the chamber 44, formed by the cylinder 27, into the bottom wall 19 of housing 17 and out horizontally as indicated at 31 in order that fluid may pass from the chamber 44 and out through the channels 28 and 31 to be discharged from the pump.

An upstruck circular flange 32 is provided on the upper wall of the base 11 and this flange is provided with suitable internal threads in order that the large cylinder 33 may be secured to the base 11 inside of the housing 12.

The two cylinders 27 and 33 are the cylinders used in drawing fluid into and pumping it from the pump. It will be noted that the cylinder 33 is larger than the cylinder 27, and the cross-sectional area of the cylinder 33 is approximately twice that of the cylinder 27 for a reason hereinafter more particularly explained. A double ended piston 41 is fitted with the large lower end in the cylinder 33 and the smaller upper end in the cylinder 27. The piston 41 is hollow as indicated at 42 in order that fluid may flow through the piston from the chamber 43 provided by the lower cylinder 33, into the chamber 44 provided by the cylinder 27.

The large end of the piston is threaded on its outside wall as indicated at 46 and a ring 47 is threaded onto this outside wall. A cupped cap member 48 is provided with threads on the inner wall of the flange portion thereof, and this cup member may also be threaded on the piston. A pair of washers 49 and 51 are clamped on the large end of the piston 41 between the ring 47 and the cap 48. The washer 49 is placed on the piston with its outside edge depending downwardly over the end of the cap to resist pressure of the fluid within the chamber 43 and the washer 51 is arranged with its outer edge extending upwardly over the ring 47 so as to resist any flow or pressure of fluid downward into the chamber 43. The rings 49 and 51 thus form a seal over practically the entire width of the edge of the large end of the piston.

The cap 48 also serves to hold in place a valve cage 52, a flange of which is caught between the cap 48 and the lower end of the piston 41. A flat disk valve 53 is located within the valve cage 52 and is resiliently engaged against the upper face of the cap 48 by means of a spring 54. An opening 56 is provided through the cap 48 and when the piston moves downwardly, fluid trapped within the chamber 43 passes upwardly through the opening 56 in cap 48 and lifts the valve 53 from its seat. The fluid then passes through the opening 57 of the valve cage and upwardly through the conduit 42 in the piston 41.

An upward movement of the piston 41 creates a partial vacuum in the chamber 43 and draws fluid in through the conduit 14. The partial vacuum within the chamber 43 raises a valve 58 from its seat on the upper face of the disk 11 over the inner opening of the conduit 14, and permits fluid to flow into the chamber 43. When the piston moves downwardly the valve 58 is returned to its seat by the spring 61 which is held within the cage 62 and the fluid is forced up through the piston 41 as described.

The upper end of the piston 41 is also threaded on its outer wall. A pair of rings 62 and 63 are threaded onto the upper end of the piston and a loose ring 64 is held between these two rings. A pair of pump washers 66 are clamped between the rings 62 and 64, and 64 and 63 and the outer edges of these washers extend upwardly over the two uppermost rings to resist pressure within the chamber 44.

When the piston 41 moves downwardly, the fluid which is forced upwardly through the channel 42 of the piston fills the chamber 44 and the excess fluid flows out through the conduit 31. It may readily be understood, since the chamber 43 has substantially twice the displacement of the chamber 44, that when the piston is moving downwardly, half of the fluid from chamber 43 passes into the chamber 44 and the other half passes outwardly through the conduit 31. On the up stroke of the piston the fluid in chamber 44 is forced out through the conduit 31 by the closing of the valve 53, and a new supply of fluid is drawn into the chamber 43.

It may be readily understood that the same quantity of fluid is forced from the conduit 31 on the up stroke of the piston as well as the down stroke and thus a comparatively continuous flow of fluid is produced when the piston is reciprocated. The effort required to pump fluid is substantially the same on both strokes of the piston.

Reciprocatory movement of the piston 41 may be secured in any desired manner, but I prefer to utilize a pair of pump rods 67 which pass downwardly through the bores 24 and through the lower end of the housing 17. These rods are preferably bent inwardly near their lower ends, as indicated in the drawings, and are flattened out in order that they may be secured to the large lower portion of the piston 41 as by means of bolts 68. The upper ends of the rods 67 are threaded and the ends of a depending yoke 69 are fastened to the upper ends of the rods, as by means of nuts 71.

A longitudinal opening 72 is provided in the lower portion of the yoke 69 and an eccentric strap 73 is pivotally connected to the yoke in the opening 72 by means of a pivot pin 74. A shaft 76 extends transversely through, and is journalled in, the walls of the housing 17 and an eccentric 77 is fastened to the shaft 76 within the eccentric strap 73. As may readily be understood, rotary motion of the shaft 76, by means of the eccentric 77 and strap 73, produces reciprocatory motion of the yoke 69, and hence of the piston 41. The shaft 76 may be rotated in any desired manner as by means of the pulley 78.

The chamber 79, within the lower housing 12, may tend to become filled with fluid which seeps past the piston 41, and in order to draw off this fluid, I may provide a boss 81 on the upper wall of the base plate 11, between the cylinder 33 and housing 12, and may provide a fitting 82 extending part way upwardly into the chamber 79, which fitting is threaded into the boss 81. The upper end of the fitting 82 is provided with a yoke 83 having a lever arm 84 pivotally attached at one end thereto as indicated at 86. The lever arm 84 is curved so as to curve about the cylinder 33 and is provided with a hollow float 87 of metal, or a cork float or the like. The upper end of the fitting 82 is enlarged to provide a valve seat, as indicated at 88, in which a valve 89 may be seated. A link 91 is loosely engaged to the valve 89 and the lever arm 84 so that raising of the float 87 occurs when the seepage fluid within the cylinder 12 reaches the float. A channel, indicated at 92, leads downwardly from the valve seat 88 into the base plate 11, and a transverse channel 93 leads in toward the center of the plate and up beneath the valve 58.

It may readily be understood that when the fluid within the chamber 79 reaches a level near the top of the float 87, the float rises and lifts the valve 89 from its seat. The fluid within the chamber then flows downwardly through the channels 92 and 93 and is caused to be drawn from the channels by the suction of the piston 41, to withdraw the seepage fluid from the chamber 79.

The channel 93 extends on outwardly and upwardly through the edge of the disk 11 as indicated at 94, and a needle valve 96 is adapted to close the channel 93. If desired the valve 96 may be opened to permit a certain amount of air to be drawn into the chamber 43 with each stroke of the piston.

The lower portion of the chamber 95 in the upper housing 17 serves as an oil reservoir. The ribs 23 extend part way up on the walls of the housing 17 and thus permit the bottom portion of the housing to be closed. Oil may be placed in this space to a depth, indicated by the dot and dash lines, such that the yoke 69 dips into the oil at the bottom of its travel and causes the oil to lubricate the parts of the eccentric and the bearings of the shaft. The rods 67 are a fairly close fit in the bores 24 of the ribs 23 so that the oil is prevented from passing into the lower part of the pump.

It is apparent that the cylinders 33 and 27 may be placed close together as shown in Figure 1 and a short piston 41 used for forcing fluid from the lower chamber 43 into the upper chamber 44 and out through the exhaust channel 31. It is apparent, however, that if desired, the cylinder 33 may be placed at a considerable distance below the cylinder 27, and the piston 41 correspondingly elongated so that the fluid may be drawn into the lower chamber and forced through the long piston into the upper chamber and out by the upper portion, so that the pump may be used in deep wells.

A modified form of pump utilizing this idea is shown in Figure 3. In this modification the channel 14 is closed off by means of a long pipe 97 which is substituted for the plug 16. The piston 41 is elongated by means of pipe sections 41*a* connected by pipe nipples 40. A cup-shaped cylindrical member 33*a* is substituted for the cylinder 33 and base plate 11 and an opening 14*a* is provided in the lower wall of the cylinder 33*a*. A valve cage 62*a*, valve 58*a*, and spring 61*a*, corresponding to the valve structure formerly placed on top of the plate 11, is placed over the opening 14*a* and is secured to the wall by threading the cage into a suitable threaded flange 16*a* on the upper face of the bottom of the cylinder 33*a*. The cylinder 33*a* is secured to the lower end of the pipe 94 by means of a ring 98 which has threaded connection with the cylinder 33*a* and the pipe 97.

It is apparent, by inspection of the drawings, that on upward movement of the piston 41*a*, fluid is drawn into the chamber 43*a* through the valve opening 14*a*, and that on downward movement of the piston, fluid is forced upwardly through the valve opening 56*a* at the bottom of the piston and through the conduit 42*a* within the piston. On continued reciprocation of the piston, the conduit 42*a* is finally filled and fluid is forced into the chamber 44*a* at the upper end of the piston. A portion of the fluid is driven outwardly and discharged through the conduit 31*a* while the other portion flows into the chamber 44*a* on downward movement of the piston. On the next up stroke of the piston, the fluid entrapped in the chamber 44*a* is forced out of the discharge conduit 31*a*.

It is apparent that by utilizing two cylinders, one of which is approximately half the volume of the other, I am enabled to secure discharge of fluid from the pump during both up and down movement of the piston. By utilizing my improved structure, including the hollow piston, I am enabled to provide a pump which does not need packing means for the pump shaft other than the means employed for sealing the piston itself.

It is apparent that my pump may be arranged for reciprocation in a horizontal rather than a vertical direction. This and other modifications may be made without departing from the spirit and scope of my invention as set forth in the appended claims.

I claim as my invention:

1. In a pump, a cup-like upper housing, a lower housing, a piston in the lower housing, piston rods passing through the lower wall of the upper housing, and the upper housing having means surrounding the rods for a portion of their length within the upper housing whereby a chamber is formed in which oil may be placed, and means for reciprocating the piston rods adapted to be lubricated by the oil in the chamber of the upper housing.

2. In a pump, an upper housing, an open cylinder depending from the lower wall of the upper housing, a lower housing, a valve in the lower housing, a piston in the depending cylinder, a valve in the piston, and a pair of pump rods engaged to the piston and passing upwardly therefrom through the lower wall of the housing, the lower wall of the housing being provided with upwardly extending ribs having bores therethrough in which the pump rods are located, whereby lubricating fluid may be placed in the cup-like upper housing for lubrication of the parts of the device.

3. In a pump, a lower housing, an upper housing, a cylinder depending from the lower wall of the upper housing, a cylinder extending upwardly from the upper face of the lower wall of the lower housing, a valve in the lower housing within the cylinder, a double-ended hollow piston with one end in one cylinder and the other end in the other cylinder for pumping fluid from the lower cylinder into the upper cylinder, the diameter of one end of the piston being greater than the diameter of the other, a valve within the piston, means for discharging fluid from the upper cylinder, and pump rods attached to the piston and extending through the lower wall of the upper housing and into the upper housing, and a reciprocating mechanism located in the upper housing.

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