Oct. 13, 1925. 1,557,224

C. WARNER

PUMPING APPARATUS

Filed Oct. 23, 1923 2 Sheets-Sheet 1

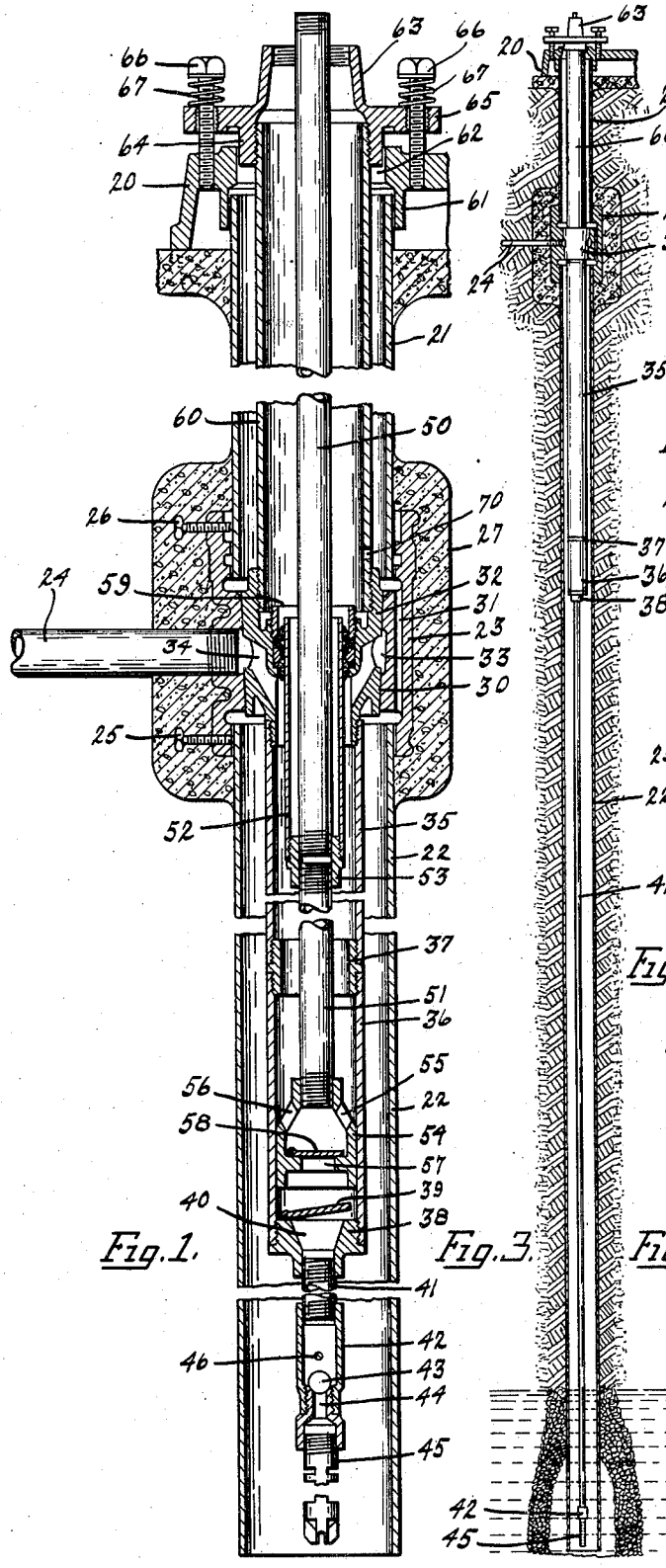


Fig. 1.

Fig. 3.

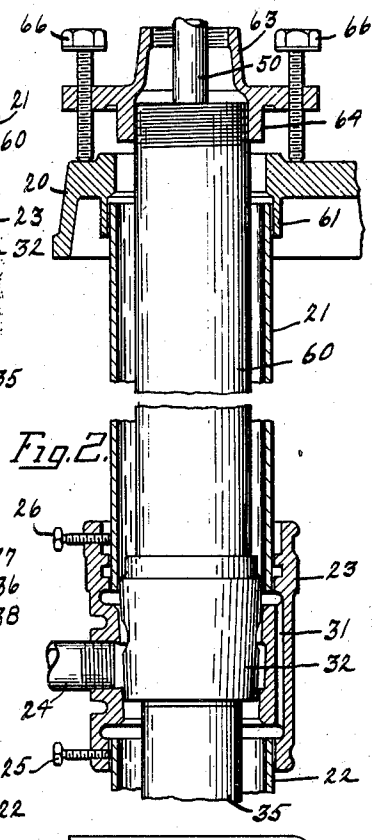


Fig. 2.

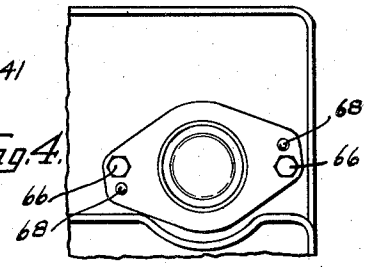


Fig. 4.

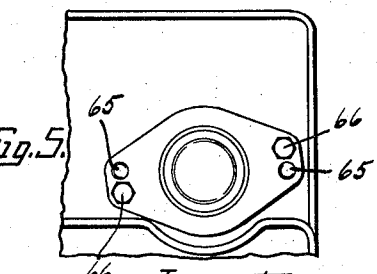


Fig. 5.

Inventor
Clarence Warner

By Spencer, Sewall & Hardman
His Attorneys.

Oct. 13, 1925. 1,557,224

C. WARNER

PUMPING APPARATUS

Filed Oct. 23, 1923 2 Sheets-Sheet 2

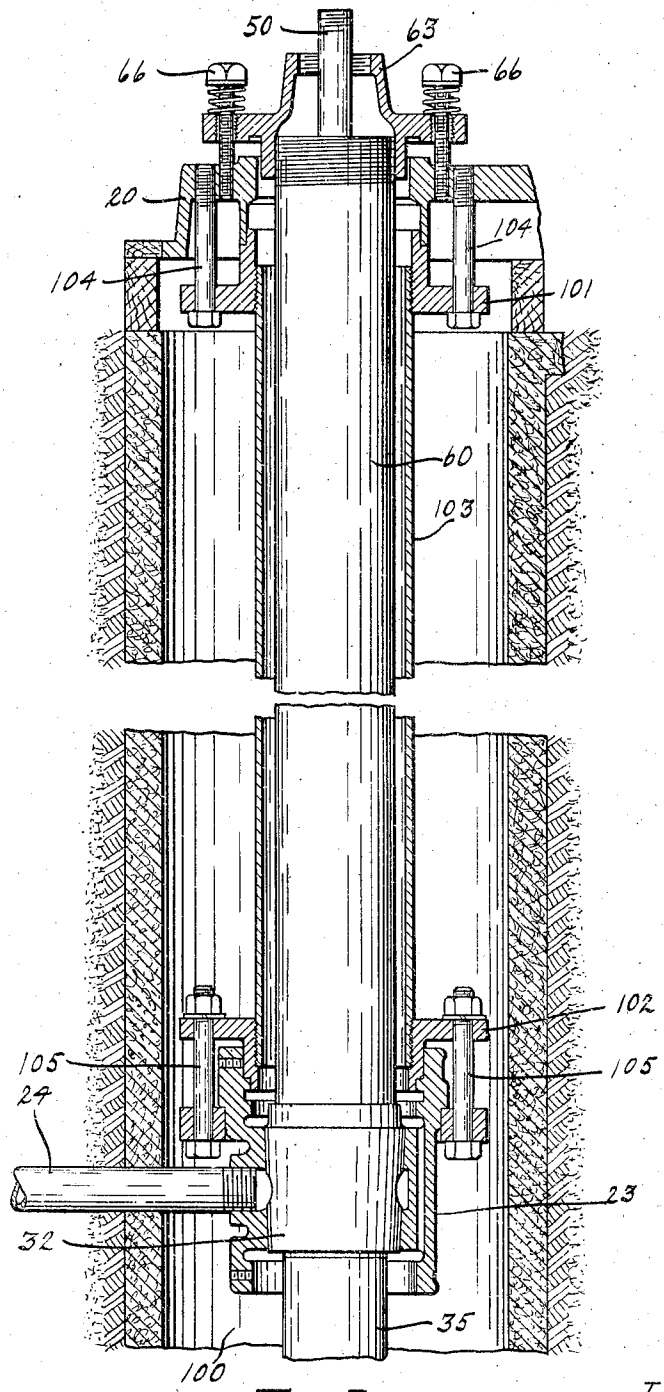


Fig. 6.

Inventor
Clarence Warner

By Spencer, Sewall + Hardman
His Attorneys

Patented Oct. 13, 1925. 1,557,224

UNITED STATES PATENT OFFICE.

CLARENCE WARNER, OF DAYTON, OHIO, ASSIGNOR TO DELCO-LIGHT COMPANY, OF DAYTON, OHIO, A CORPORATION OF DELAWARE.

PUMPING APPARATUS.

Application filed October 23, 1923. Serial No. 670,355.

To all whom it may concern:

Be it known that I, CLARENCE WARNER, a citizen of the United States of America, residing at Dayton, county of Montgomery, State of Ohio, have invented certain new and useful Improvements in Pumping Apparatus, of which the following is a full, clear, and exact description.

The present invention relates to pumping apparatus wherein the pump is located within a well and the operating mechanism above the well.

It is among the objects of the invention to prevent freezing of water in the apparatus, and to provide for the removal of certain pump parts in assembled relation from the well casing by devices which are easily accessible from above the well.

More particularly, the present invention contemplates the use of a suction-lift pump for a well in which the distance from the low level of the water therein to the level of the pump outlet, is somewhat in excess of the distance which it is practical to lift water by suction, namely, in excess of twenty-two feet which is the limit of lift characteristics of most suction type pumps. The present invention permits the use of a suction pump in such a well to draw the water the maximum distance by suction, and then force or lift the water the remaining distance to the discharge level.

One manner of carrying out these aims of the invention is to locate within the well and below the frost line a support connected to the well casing and having a discharge port connected with an outlet pipe located so as to be out of danger of freezing. This part of the apparatus can be permanently installed. The drop pipe enclosing the suction-lift pump is removably mounted upon the support and has an outlet to the discharge port of its support. The pump parts and drop pipe are removed as a unit from the well casing and from the support by the use of the devices accessible from above the well.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred embodiment of one form of the present invention is clearly shown.

In the drawings.

Fig. 1 is a sectional view of a pump and the underground structure embodying the present invention.

Fig. 2 is a fragmentary sectional view, similar to Fig. 1, showing the drop pipe in elevation and unseated from its support.

Fig. 3 is a sectional view on a reduced scale, the drop pipe and parts carried thereby being shown in elevation to give an idea of the proportions existing in the present mechanism.

Fig. 4 is a top plan view of the mechanism as shown in Fig. 1.

Fig. 5 is a top plan view of the mechanism as shown in Fig. 2, and

Fig. 6 is a view similar to Fig. 2 showing how the apparatus can be adapted for an open well with the pump drive exposed above ground.

In the drawings, a base 20 may support a suitable pump driving mechanism such as shown in the copending application of G. A. Buvinger and C. Warner, Serial No. 634,323, filed March 12, 1923. Base 20 is placed directly over a well casing having an upper portion 21 and a lower portion 22 which are coupled together by a discharge head 23. Discharge head 23 is connected to discharge pipe 24 which may lead to a suitable storage tank located in a basement or other location out of the weather. Casing 21 is of such length that the discharge head 23 and the discharge pipe 24 are buried in the ground below the frost line.

After the well casing 22 has been driven into the drilled well in the usual manner, a small pit is dug around the casing to a depth below the frost line. The casing 22 is cut off below the frost line and the discharge head 23 is placed on top of casing 22 and secured thereto by screw 25. The upper casing 21 is placed in vertical position with its lower end received by the head 23 and is secured thereto by screw 26. After pipes 25 and 22 are attached, the pit is filled with cement 27 so as to provide a seal for the well casing which extends above ground and is protected in a manner to be described.

Discharge head 23 is provided with a seat 30 which is tapered about five degrees and is less in diameter than the internal diameter of casing 21. The seat 30 is by-passed by a passage 31 which is provided for a purpose to be described. The seat 30 provides a support for devices which support the pump cylinder or drop pipe and provide packing

for a differential piston operating within said drop pipe, the seat 30 cooperating with these devices to provide a seal preventing water issuing from the pump above the frost line.

One of these sealing and supporting devices comprises a hanger 32 provided with a conical outer surface adapting the hanger to rest upon the seat 30. The hanger 32 is provided with a groove 33 and an opening 34 to provide a water passage into the discharge head 23. Hanger 32 supports a pump cylinder comprising sections 35 and 36 joined by a coupling 37. The section 36 extends to within substantially twenty two feet or less of the lowest level which the water may reach within the well. Secured to the bottom of section 36 is a hollow plug 38 which forms a seat for a valve 39 which controls passage 40. Threaded in the bottom of plug 38 is a pipe 41 which may be substantially twenty two feet or less in length. Secured to the bottom of pipe 41 is a foot valve body 42 in which is located a ball valve 43 for controlling passage 44. A strainer 45 of the usual type is secured to the bottom of valve body 42. Pin 46 in valve body 42 limits upward movement of ball 43.

A pump rod having upper and lower sections 50 and 51 respectively are connected by a coupling 53 which supports a differential piston 52. A piston 54 having ports 55, 56, and 57, is secured to the lower end of section 51 of the pump rod, and is provided with a valve 58 for controlling port 57. Piston 54 is adapted to be reciprocated within the cylinder section 36 and differential piston 52 is adapted to be reciprocated within section 35 and the hanger 32 by the pump driving mechanism referred to.

Another device which cooperates to provide packing between the hanger 32 and the differential piston 52 is a stuffing box 59 which has threaded connection with the hanger 32. Hanger 32 has threaded connection with an extension pipe 60, extending above the upper end of well casing 21.

The pump base 20 is provided with a downwardly extending flange 61 into which the casing 21 extends. By permitting the casing 21 to slide within the flange 61, expansion or contraction of the casing 21 longitudinally can take place without raising or lowering the base 20. Base 20 is provided with an opening 62 into which a pulling flange 63 may extend. Pulling flange 63 is connected with flanged portion 64 having threaded connection with extension pipe 60 above the upper end of casing 21. Pulling flange 63 can move vertically through the opening 62 whereby expansion or contraction of the pipe 60 may take place without affecting the pump base 20. Tapped holes 65 are provided in the flange 63 through which bolts 66, having a diameter less than the diameter of the tapped holes 65, are adapted to extend and to screw into the pump base 20. Springs 67 are interposed between the heads of these bolts 65 and the flange 63 and tend to maintain the hanger 32 upon its seat 30. In this manner the hanger 32 is held in nested relation with respect to the discharge head 23 by means which can yield in response to differences in expansion or contraction of parts of the apparatus. Thus the discharge head will be maintained sealed for all temperatures and without danger of breakage of parts.

Mode of operation.

Fig. 1 shows the pumping apparatus just starting on an upward stroke. As the piston 54 moves upwardly within section or cylinder 36, the suction created thereby will open valve 39 and foot valve 43, whereupon water will be drawn from the well through strainer 45, passage 44, valve body 42, pipe 41, passage 40, into the cylinder 36. As explained before, the distance from the valve 43 to the valve 39 must not be greater than approximately twenty two feet, this distance being the maximum distance which it is practical to draw water by suction. Then on the downward stroke of piston 54, the valve 39 will be closed and the valve 58 opened, thereby permitting water to flow from cylinder 36, through passage 57, ports 55 and 56 into the section 35. The water will then come into contact with differential piston 52, which is of such diameter as to displace substantially one half of the water lifted on the up-stroke into section 35. This piston 52 being on its downward travel will therefore force about one half of the water lifted into section 35 into hanger 32, through discharge opening 34 therein into the discharge pipe 24. On the next upward stroke of piston 54, water will be drawn into the cylinder 36 as before described, and the water remaining in section 35 will be lifted upwardly by piston 54 to the hanger 32, through discharge opening 34 therein and into discharge pipe 24. This cycle of operation will continue as long as the pumping apparatus is operated. Namely, the water will be drawn by suction from the well up to the level of the valve 39, and upon the down stroke of piston 54 and differential piston 52, about one half of the water previously lifted into section 35 will be forced out into discharge pipe 24, and on the upward stroke of piston 54, the water remaining in section 35 and section 36 above piston 54 will be lifted up and out through discharge pipe 24. Thus for each stroke of the pump rod in either direction, there will be a discharge of water through pipe 24. It will be apparent that the drop pipe, comprising sections 35 and 36, constitutes a

common cylinder for pistons 52 and 54, and pipe 60, hanger 32, and drop pipe sections 35 and 36 constitute a container for the pump.

The hanger 32, stuffing box 59 and differential piston 52 cooperate to form a wall whereby the water is normally prevented from moving into the casing 21 or the extension pipe 60 or any of the mechanism located above the discharge head 23. Should any water work its way above piston 52, it will build up in pipe 67 until it reaches the level of opening 70, at which time the water will flow through opening 70 into pipe 21, through passage 31, pipe 22 and to the well, to prevent water building up further in pipe 67 and thereby prevent flooding of the pump driving mechanism or freezing of water therein.

The pumping apparatus, including flange 63, extension pipe 67, hanger 32, section 35, section 36, pipe 41, valve body 42, strainer 45, pump rod including sections 50 and 51, piston 54 and differential piston 52 may be removed in assembled relation from the well casing for repairs or replacement of parts without disturbing discharge head 23 and discharge pipe 24. The pumping apparatus itself includes devices for assisting in removing the pump parts. The tapped holes 65 in the pulling flange 63 are of larger diameter then the bolts 66. The flange 63 is also provided with tapped holes 68 to be engaged by bolts 66. To remove the pumping apparatus, the driving mechanism is uncoupled from the pump rod section 50 and flange 63, and shifted to one side of base 20, and the bolts 66 are withdrawn from the base 20 as shown in Fig. 4, and are screwed into the holes 68 of the flange 63. When these bolts 66 are shifted so as to be screwed into the holes 68, they are thrown out of alinement with the holes 65 in the base 20 as shown in Fig. 5, and then by screwing the bolts 66 downwardly they will bear against the pump base 20 as shown in Fig. 2. Further movements of these bolts 66 will cause the pulling flange 63 to move upwardly thereby lifting hanger 32 from its seat 30 and permitting the pumping apparatus to be removed from the well casing in assembled relation, as above described. Fig. 4 shows the location of the bolts 66 when the mechanism is in normal operation while Fig. 5 shows the bolts in the position in which they are used for lifting the pulling flange 63. The tapped holes 65 are provided for receiving screw eyes (not shown) which may be attached to a hoist for lifting the pumping apparatus out of the well casing.

It is obvious that the pumping apparatus may be installed as a unit by merely inserting it into the well casing, and when lowered therein, the hanger 32 will be automatically located upon its seat 30. The springs 67 are adjusted initially so that enough tension will remain in the springs to maintain a downward pressure upon the extension pipe 60 to maintain the hanger 32 upon its seat 30. Any freezing of the earth above the discharge head 23 will cause the base 20 to be moved upwardly away from the casing 21 and the extension pipe 60. This movement is possible since the casing 21 is free from positive connection with the base 20, and as the base 20 moves upwardly carrying the bolts 66, the tension in springs 67 will decrease.

Fig. 6 shows an installation when the power head base 20 is located in an exposed place on the ground over an open well 100. The discharge head 23 is suspended from the base 20 at a distance such as to be out of danger from frost by like flanges 101 and 102 attached to an extension pipe 103, bolts 104 attaching flange 101 to base 20, and by bolts 105 attaching discharge head 23 to flange 102.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In combination, a discharge head located within a well below the surface of the ground, a suction lift pump including a piston and a cylinder, a hanger attached to one end of the cylinder, said hanger adapted to be seated within the discharge head and provided with an outlet port in communication with an outlet port in the discharge head, and means for maintaining the hanger in seated position.

2. In combination, a discharge head located within a well and having an outlet port located below the surface of the ground, a suction lift pump including a piston and a cylinder, a relatively long suction pipe connected with the lower portion of said cylinder, and means carried by the discharge head and attached to the cylinder for supporting the cylinder, said means being provided with a port adapted to register with the outlet port in the discharge head.

3. In combination, a discharge head located within a well and having an outlet port located below the surface of the ground, a suction lift pump including a piston and a cylinder, a relatively long suction pipe connected with the lower portion of said cylinder, and a hanger suspended from the discharge head and attached to the cylinder for supporting the cylinder, said hanger being provided with a port adapted to register with the outlet port in the discharge head.

4. In combination, a discharge head located within a well casing and having an outlet port located below the surface of the

ground, a differential type suction lift pump including a pump rod, a plurality of pistons operated by the pump rod, a cylinder, a relatively long suction pipe connected with the lower portion of said cylinder, and means carried by the discharge head and attached to the cylinder for supporting the cylinder, said means being provided with a port adapted to register with the outlet port in the discharge head, one of said pistons providing a seal above said ports.

5. In combination, a discharge head located within a well casing and having an outlet port located below the surface of the ground, a relatively long suction pipe connected with the lower portion of said cylinder, means seated within the discharge head and attached to the cylinder for supporting the cylinder, said means being provided with a port adapted to register with the outlet port in the discharge head, and means for maintaining the first means in seated position, said last means including a member for withdrawing the pump from the well.

6. In combination, a discharge head located within a well casing and having an outlet port located below the surface of the ground, a relatively long suction pipe connected wth the lower portion of said cylinder, a hanger seated within the discharge head and attached to the cylinder for supporting the cylinder, said hanger being provided with a port adapted to register with the outlet port in the discharge head, and means for yieldingly maintaining the hanger in seated position, said means including a member for withdrawing the pump as a unit from the well.

7. In combination, a discharge head located within a well below the surface of the ground, a hanger adapted to be carried by the discharge head, a differential type suction lift pump including a container carried by the hanger, a pump rod extending into the container, a plurality of spaced pistons actuated by the pump rod, said container constituting a common cylinder for said pistons, and a relatively long suction pipe connected with the container.

8. In combination, a discharge head located within a well and having an outlet port located below the surface of the ground, a hanger adapted to be carried by the discharge head and having a port adapted to register with the port in the discharge head, a differential type suction lift pump including a container carried by the hanger, a pump rod extending into the container, a plurality of spaced pistons actuated by the pump rod, said container constituting a common cylinder for said pistons, one of said pistons cooperating with the hanger to provide a seal for the upper portion of the container above said ports, and a relatively long suction pipe connected with the lower portion of said container.

In testimony whereof I hereto affix my signature.

CLARENCE WARNER.