Oct. 10, 1939. C. F. TEEPLE 2,175,947

PUMP

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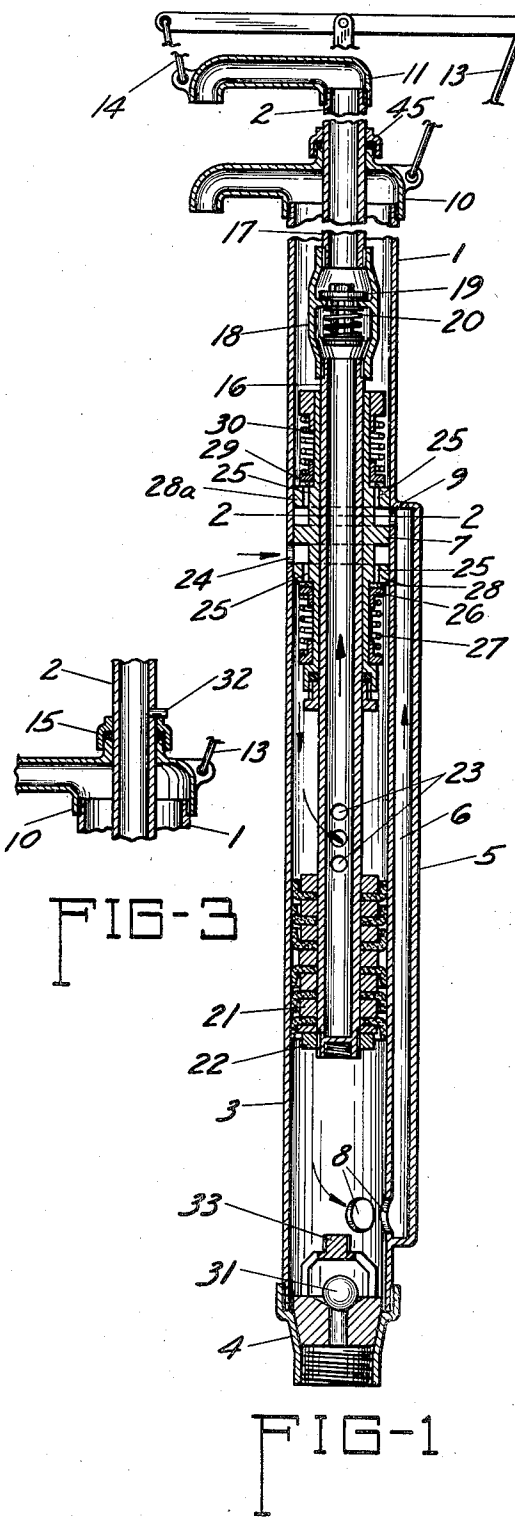
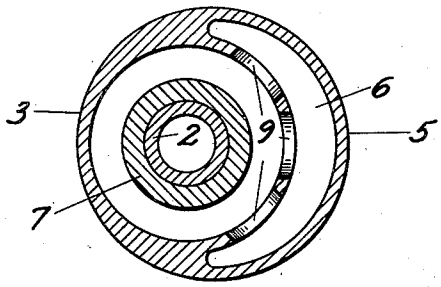


FIG-1

FIG-3

FIG-2



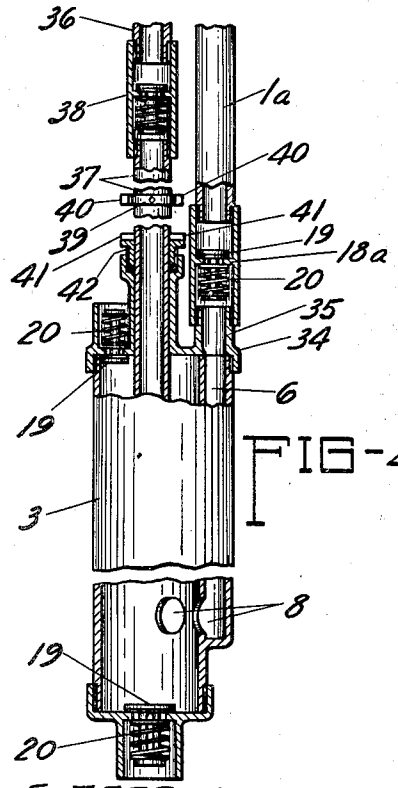


FIG-4

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4 Claims. (Cl. 103—201)

The present invention pertains to pumps and more particularly to pumps of the double-acting type. Pumps of this type, as heretofore constructed, do not provide for a balanced load and approximately equal discharge from both the up and down strokes of the pumping mechanism.

Among the objects of this invention are to provide a double-acting pump in which the static load on the two sides of the pumping mechanism will be substantially equal; to provide a pump of the character indicated in which the discharge volume will be approximately equal for the two strokes of the pumping mechanism; to provide a generally improved double-acting pump; to provide a simple, inexpensive, double-acting pump; to provide a pump of the character indicated in which it is unnecessary to remove the entire structure from the well when repair of the inner mechanism of the pump is required; to provide a pump of the character indicated in which the interior mechanism of the pump may be removed, and with it, the foot-valve of the pumping mechanism; and such further objects, advantages, and capabilities as will hereafter appear and as are inherent in the construction herein disclosed. My invention further resides in the combination, construction, and arrangement of parts illustrated in the accompany drawing and, while I have shown therein what is now regarded as the preferred embodiment of this invention, together with a modification thereof, I desire the same to be understood as illustrative only and not to be interpreted in a limiting sense.

In the drawing annexed hereto and forming a part hereof,

Fig. 1 represents a fragmentary longitudinal section of a pump embodying my present invention;

Fig. 2 represents a cross section of this structure substantially along the plane indicated by the line 2—2, Fig. 1;

Fig. 3 represents a fragmentary longitudinal section of a portion of the structure illustrated in Fig. 1;

Fig. 4 represents a cheaper embodiment of the invention illustrated in Fig. 1.

In Fig. 1 of the present drawing, there are shown two pipes 1 and 2. It will be understood that these pipes may be made up of one or more sections, as required, depending upon the depth of the well, when this structure is used as a well pump. It will be further understood that when more than one section is used, the sections of pipe are coupled together by means of couplings, in the usual manner. A pump cylinder 3 forms an extension of the pipe 1 and has a foot-valve 4 attached to its lower end. An extension 5 is formed on the outside of the cylinder and provides a by-pass 6 connecting the lower end of the cylinder with the interior of the pipe 1 above the closure member 7 for the head of the cylinder. The lower end portion of the cylinder is connected with the lower end portion of the by-pass 6 by an opening or openings 8. The upper portion of the by-pass 6 is connected with the pipe 1 above the head 7, as recited above, by a comparable opening or openings 9.

Heads 10 and 11 are connected to the pipes 1 and 2 to direct the outflow of liquid from these pipes when the pump is operated. The handle 12 and the links 13 and 14 represent any suitable operating means for causing the two pipes to reciprocate simultaneously in opposite directions. A stuffing box 15 surrounding the pipe 2 and connected to the head 10 prevents escape of liquid around the pipe 2, as will be understood. It will be understood that the parts 10 to 15, inclusive, are indicated more or less diagrammatically and that in actual application of the principle these parts will be changed, as required.

The two sections 16 and 17 of pipe 2 are connected by a valve mechanism 18 having a movable valve member 19 and a spring actuator 20. Whenever the liquid is forced up through the pipe 1, it raises the member 19 and passes into the upper section 17. When the pressure is relieved and no longer holds the valve open, then the spring 20 causes it to close, preventing back-flow of the liquid in the pipe 2. A piston 21 is connected to the lower end portion of the pipe 2, being held in place thereon by the ring 22. Openings 23 just above the piston 21 permit liquid to pass from the interior of cylinder 3 into the interior of pipe 2. When the piston 21 moves downwardly, liquid enters the cylinder through an opening or openings 24 near the top thereof and passes downwardly through a series of openings 25 controlled by a valve 26 which is spring-actuated by the spring 27. The openings 25 extend through a flange 28 which fits closely within the wall of the cylinder 3. There is another flange 28a which is likewise provided with openings 25 for the passage of fluids which leave the by-pass 6 by way of the openings 9. These upper openings 25 are controlled by a valve 29 which is actuated into closed position by a spring 30. It will therefore be seen that, as the piston 21 moves downwardly, the liquid is forced out

through the openings 8 of the by-pass 6, through the openings 9 and 25, through the pipe 1 above the cylinder, and from here out through the head 10. At the same time, the liquid is drawn in through the openings 24 and downwardly through the openings 25 into the section of the cylinder above the piston 21. Now, when the direction of travel of the pipes is reversed, the piston moves upwardly relatively to the cylinder and liquid is drawn through the lower valve 4 into the lower end of the cylinder to be later forced out through the openings 8. The opening through the valve 4 is controlled by a ball 31. As the piston 21 moves upwardly, the liquid is forced out through the openings 23 and upwardly through the valve 18 into the upper section of the pipe 2, from where it flows out through the head 11 to be discharged from the pump.

A pin 32 is removably secured in the wall of the pipe 2, above the packing nut 15 at such a point that the lower end of the pipe 1, when the pin 32 rests on the nut 15, will not engage the screw-threaded, substantially cylindrical lug 33 of the valve 4. However, when it is desired to remove the inner portion of this valve without withdrawing the pipe 1 and cylinder 3, the pin 32 is removed from the pipe 2 and this latter is allowed to rest on top of the lug 33. Now, when the pipe 2 is turned with relation to the pipe 1, the screw threads in the lower end of the pipe 2 will engage the corresponding threads of the lug 33, and the two parts will be screwed together. After this, the pipe 2 may be lifted and it will pull the inside of the valve 4 out of its seat and it can be removed from the cylinder by lifting the pipe 2 and unjointing the various sections. After suitable repairs have been made to any part of the underground structure, the parts are reassembled and the pipe 2 unscrewed from the lug 33. The part of pipe 1 above the cylinder has a slightly larger internal diameter than the diameter of the cylinder so that the parts may be easily withdrawn after they have been removed from the cylinder.

The principle of operation of the structure shown in Fig. 4 is identical with that of the structure shown in Fig. 1, though the apparatus differs slightly. At the lower end of the cylinder, a valve 19, 20 is used in place of the valve 4 for an obvious reason. A head cap 34 is applied to the upper end of the cylinder 3 and has an opening therethrough for the admission of fluid to the upper end of the cylinder. This opening is closed by the valve 19, 20. An outlet member 35 has its upper end screw-threaded for connection to a valve member 18*a*. This valve member is, in general, similar to the valve 18. From this valve member leads a pipe 1*a* which serves the same purpose as the pipe 1 in moving the cylinder 3 up and down. The section 36 of the pipe 2 is connected to the section 37 thereof by means of a valve 38 similar to 18*a* at the lower end of the pipe 1*a*. On the lower portion of the section 37 of pipe 2 is a suitably adjustable means 39 having lugs 40 which may engage cooperating lugs 41 on a gland 42. If it is desired to tighten the packing below the gland 42, the pipe 2 is lowered until the lugs 40 engage the lugs 41, when the pipe is rotated, causing the gland 42 to be screwed in so as to compress the packing. In this way, the packing around the portion of the pipe 37 where it passes through the packing may be compressed into sufficiently tight engagement with the pipe to prevent leakage of liquid out of the top of the cylinder around the pipe. This type of construction is much less expensive to manufacture than that illustrated by Fig. 1 and may be sold at a price which will make it attractive.

Having now described my invention, I claim:

1. In a pumping mechanism, a pump cylinder having a by-pass cavity extending longitudinally thereof and externally thereto from a point adjacent the lower end of the cylinder to a point above the head of the cylinder, a pipe connected to said cylinder into which the by-pass opens, a valve to prevent back flow of liquid in said pipe and by-pass into said cylinder, the interior of the lower end of the cylinder being connected by an opening or openings with the lower end of the by-pass, said cylinder having adjacent its opposite end an opening or openings for admission of liquid into the upper end portion of the cylinder, said cylinder having at its lower end a valve-controlled admission port for admitting liquid into the lower end of the cylinder and preventing return thereof through said inlet opening, a valve in the upper portion of the cylinder to control admission of liquid into the upper end of the cylinder and to prevent return thereof through the upper liquid-admission opening or openings, a piston movable longitudinally of the cylinder in the central portion thereof, a pipe connected to said piston and serving as a piston rod therefor, said pipe having an opening or openings through the wall thereof for the admission of liquid from the cylinder into the pipe, valves controlling upward and reverse flow of liquid from and to said cylinder by way of the last last mentioned opening or openings, and mechanism for producing simultaneous alternate and opposite reciprocation of said piston and cylinder.

2. In a pumping mechanism, a hollow piston rod having a valve therein arranged to permit upward flow of liquid through the hollow rod and to prevent return flow thereof, a piston secured to the lower end portion of said piston rod, said piston rod having an opening or openings through the wall thereof and connecting the spaces within and outside of the rod, a pump cylinder in which said piston reciprocates between the upper and lower ends thereof, the opening or openings in the piston rod being located above the piston and receiving liquid from that part of the cylinder above the piston, the piston rod causing reciprocation of the piston relatively to the cylinder, a passageway external to the cylinder having an open connection with the lower end portion of the cylinder and a second opening beyond the upper end of the cylinder whereby to permit liquid in the lower end portion of the cylinder to be forced out therefrom and through said passageway, a pipe connected with said passageway and receiving liquid therefrom, a valve controlling flow of liquid from the passageway to said pipe and return, a closure member for the lower end of the cylinder having a valve-controlled opening therethrough, said cylinder having a valve member in its upper portion to control the passage of liquid into and from said upper portion of said cylinder, and mechanism for producing simultaneous alternate and opposite reciprocation of said piston and cylinder.

3. In a pumping mechanism, a cylinder having in its upper and lower end portions liquid-admission ports provided with valves for admitting liquid to the cylinder and preventing return flow through said ports, a by-pass externally to said cylinder and opening into the lower end portion of the cylinder and beyond the upper

end portion thereof, a pipe connected to the exit from said by-pass and having a valve therein to prevent return flow of liquid through the by-pass, a piston reciprocable in said cylinder, a pipe connected to said piston and serving to cause reciprocation thereof, said pipe having an opening or openings through the wall thereof above the piston through which water is received by the pipe from the portion of the cylinder above the piston, a valve in said pipe to prevent return flow of liquid through said pipe and into said cylinder, and means for reciprocating said piston and cylinder in opposite directions simultaneously.

4. A pumping mechanism, comprising a pump cylinder, a piston in said cylinder arranged for pumping upon reciprocation of said piston in either direction within said cylinder, said cylinder being provided at points beyond the maximum stroke of said piston in each direction with an inlet port, valves to allow inlet and to prevent outlet of liquid through said ports, a pipe connected to said piston and extending out of one end of said cylinder for effecting reciprocation of said piston with respect to the cylinder, said pipe being provided with an opening for communicating liquid from the space between the piston and said end of the cylinder into said pipe, a second pipe connected to said cylinder, means to provide liquid communication between the second pipe and the space at the opposite end of the piston, valve means to prevent back flow of liquid from each of said pipes to each of said spaces, and means to effect reciprocation of the first pipe and its associated piston and of the second pipe and its associated cylinder simultaneously in opposite directions.

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