

Oct. 4, 1932.

E. V. ZAGST

1,880,650

MOTOR

Original Filed Sept. 28, 1928

Fig. 1.

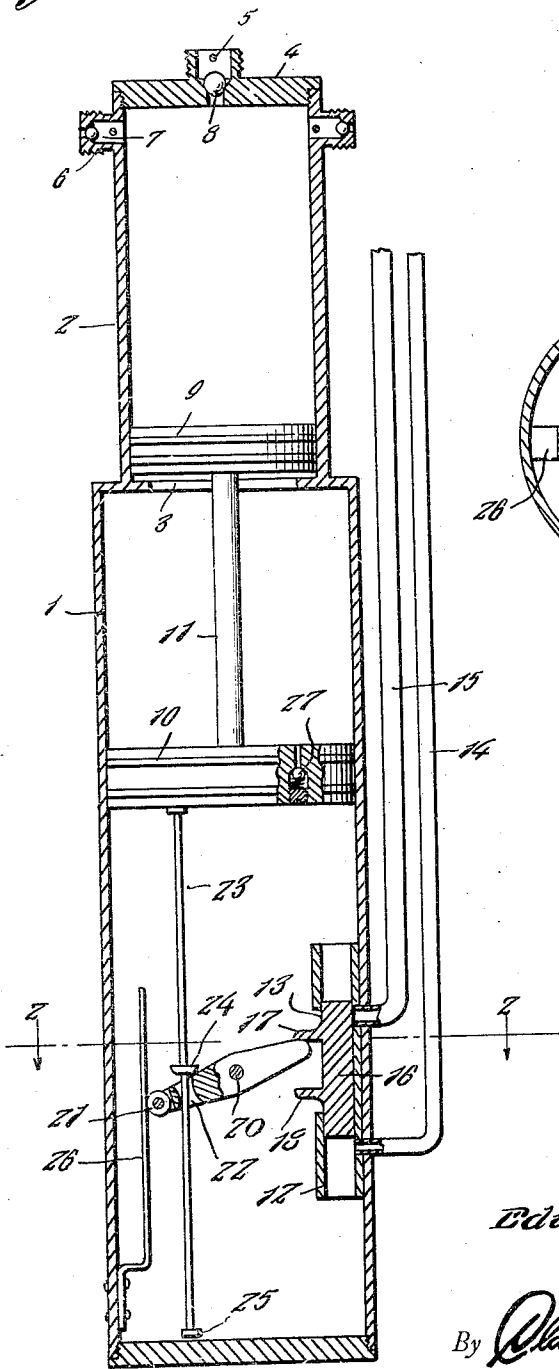


Fig. 2.

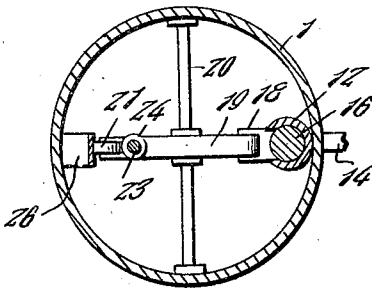
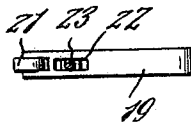


Fig. 3.



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MOTOR

Application filed September 28, 1928, Serial No. 308,938. Renewed February 1, 1932.

The present invention relates to improvements in pumps and has for its principal object to provide a pump for pumping fluids from wells and more particularly for pumping oil from oil wells.

One of the important objects of the present invention is to provide a pump which includes a cylinder into which the oil from the well flows, a piston being operable within the cylinder to force the oil out of the cylinder, fluid pressure operated means being arranged below the cylinder for actuating the piston.

A further object is to provide a pump of the above mentioned character which includes a pump cylinder arranged below the fluid cylinder, pistons being arranged for reciprocatory movement within the respective cylinders, said pistons being operatively connected together for simultaneous actuation.

Additional means is provided for regulating the intake and exhaust of the fluid to the pump cylinder.

A further object is to provide a pump of the above mentioned character which will, at all times be efficient and reliable in its operation, the same being further simple in construction, inexpensive, strong and durable and further well adapted to the purpose for which it is designed.

Other objects of the invention will become apparent during the course of the following detailed description taken in connection with the accompanying drawing.

In the accompanying drawing, forming a part of this application and wherein like reference characters designate like parts throughout the several views:

Figure 1 is a sectional view through the cylinders showing the position of the pistons in their lowermost positions and showing the slide valves closing the exhaust port.

Figure 2 is a sectional view, taken substantially upon the line 2—2 of Figure 1, looking downwardly, and

Figure 3 is a detail of the rocker arm, the rod passing through the slot in said arm being shown in section.

In the drawing, wherein for the purpose of illustration is shown the preferred em-

bodiment of my invention, the numeral 1 designates a vertically disposed relatively large pump cylinder, on top of which is mounted the smaller vertically disposed fluid cylinder 2, the upper end thereof being opened and as is shown very clearly in Figure 1, the connecting wall between the cylinders is formed with a central opening 3, the purpose of which will be presently described.

A closure head 4 is removably secured in the upper open end of the fluid cylinder 2 and the head 4 is formed with a valved outlet neck 5 that is adapted to be connected to the lower end of a fluid discharge pipe (not shown), the upper end of which extends above the surface. Valved inlet nipples 6 extend from the opposed sides of the upper cylinder 2, adjacent the top thereof, for disposition below the level of the fluid in the well that is to be pumped out of said well, and a ball valve 7 is associated with each inlet nipple to prevent the flow of the oil entering the cylinder 2, from passing back into the well through the inlet nipples. A similar ball valve 8 is associated with the outlet neck 5, as clearly shown in Figure 1. Any appropriate means may be provided for retaining the ball valves in position to prevent their displacement from the elements with which the same are associated.

While I have shown the upper cylinder 2 as being smaller than the lower cylinder, it is to be understood that I do not wish to limit myself to the particular size of either cylinder and furthermore the upper or fluid cylinder 2 may be of the same size as the pump cylinder 1. The size of the cylinders depends upon the distance the fluid has to be lifted or pumped.

Where the pumping is performed in the deep wells, the fluid cylinder is preferably smaller than the pump cylinder in order to attain the desired pressure necessary to lift the fluid entering the fluid cylinders outwardly therefrom into the discharge pipe.

Operable within the cylinder 2 is a piston 9, and a piston 10 is arranged for reciprocatory movement within the pump cylinder 1 and these pistons are operatively connected together with simultaneous actuation through

the medium of the stem or piston rod 11 that is operable through the opening 3, formed in the connecting wall between the superjacent cylinders. The cylinder 1 has arranged on the interior thereof at a point below the limit of downward movement of the piston 10 an auxiliary cylinder or sleeve 12, that is formed in its inner side with a longitudinally disposed opening 13, while the opposite side of this sleeve is formed with spaced upper and lower openings that communicate with similar openings formed in the adjacent portion of the wall of the cylinder 1 to provide exhaust and inlet ports respectively.

A supply pipe 14 extends downwardly along the cylinder and the lower end thereof has communication with the inlet port for supplying compressed air, gas or steam to the inlet port.

An exhaust pipe 15 extends adjacent the supply pipe 14 and has communication at its lower end with the exhaust port. This is clearly shown in Figure 1.

Arranged for reciprocatory movement within the auxiliary cylinder or sleeve 12 is the slide valve 16, for covering the exhaust and inlet ports, and vertically spaced lugs 17 and 18 are formed on one side of the slide valve 16 for disposition through the slot 13, for a purpose to be presently described.

The slide valve 16 is of such size, as to completely cover both the exhaust and inlet ports at the same time, when the slide valve is in a predetermined position, or in a position known as dead center.

The actuating means for the slide valve constitutes a rocker arm 19 that is pivotally supported intermediate its ends on the cross rod 20, arranged in the central portion of the cylinder 1, and the inner end of the rocker arm 19 is operable between the lugs 17 and 18 for engagement therewith, as suggested in Figure 1. The outer end of this rocker arm is bifurcated and journaled therein is the roller 21, the purpose of which will be presently described. The outer end portion of the rocker arm is furthermore formed with a vertically disposed slot 22, the function of which will also be presently apparent.

In Figures 1 and 3 there is clearly illustrated the construction of the rocker arm.

A rod 23 is attached at its upper end to the bottom of the piston 10 for movement therewith and this rod extends downwardly through the slot 22 formed in the outer end portion of the rocker arm. An abutment or collar 24 is secured on the intermediate portion of the rod for disposition above the rocker arm and for engagement at a predetermined time with the top portion of said rocker arm as shown in Figure 1. A head 25 is formed on the lower end of the rod 23 for cooperation with the rocker arm 19 to actuate the same.

Forming a salient part of the present in-

vention is the leaf spring 26 that is attached at its lower end to the inner wall of the lower portion of the cylinder 1, at a point diametrically opposite the auxiliary cylinder or sleeve 12, and the vertically disposed leaf spring engages with the roller 21.

The operation of my improved pump may be briefly stated as follows:

When the parts are arranged as shown in Figure 1, it will be observed that the abutment 24 is in engagement with the rocker arm 19, causing the rocker arm to be disposed in such a manner as to maintain the slide valve 16 in position over the exhaust port, while the inlet port is uncovered.

Compressed air or other lifting fluid under pressure is admitted to the pump cylinder 1, so as to cause the piston 10 to move upwardly and simultaneously the piston 9 rises in the cylinder 2 and the fluid entering the cylinder 2 through the inlet nipples 6 will be forced out through the outlet neck 5 into the tube or pipe that extends to the surface.

The pistons continue to move upwardly in their respective cylinders until the projection 25 comes into contact with the rocker arm 19, causing the latter to be raised upwardly. The inner end of the rocker arm will simultaneously swing downwardly for engagement with the bottom lug 18, whereby to move the slide valve into position over the intake port. At the same time, the exhaust port is closed and the valve is then in a position known as dead center.

Before the dead center occurs, the outer end of the rocker arm which is in contact with the leaf spring 26 moves upwardly beyond the position at right angles to the spring. The spring pressure then forces the outer end of the arm 19 upwardly, until the inner end portion of the rocker arm will move the slide valve downwardly to uncover the exhaust port, allowing the compression in the pump cylinder to escape through the exhaust pipe 15.

As soon as the pressure is reduced, the pistons 9 and 10 by reason of their own weight and also the weight of the fluid acting on the piston 9 enters through the nipples 6 will move downwardly again permitting the cylinder 2 to be filled with the oil or fluid obtained from the well.

This action continues until the abutment 24 again comes in contact with the rocker arm 19, pushing it downwardly and simultaneously moving the slide valve 16 upwardly until said slide valve is again in a dead center position. The rocker arm has its outer end pushed downwardly at right angles to the leaf spring, so that said spring will exert sufficient pressure on the valve to continue to move the valve upwardly to uncover the inlet port and close the exhaust port, so that compressed air or steam will again enter the pump 1 to force the fluid from the cylinder

2 outwardly through the neck 5 in the same manner as heretofore described.

A release valve 27 is arranged in the piston 10 to permit the fluid that may leak past the piston 9 and enter the upper portion of the pump cylinder 1 to escape.

It will thus be seen from the foregoing description that I have provided a pump that will at all times, be positive and efficient in its operation and due to its simplicity, the same can be actuated at a very low cost.

Also a pump of this character will obviate the necessity of having to employ expensive machinery to lift fluid upwardly out of a well.

While I have shown the preferred embodiment of my invention, it is to be understood that various changes in the size, shape and arrangement of parts may be resorted to, without departing from the spirit of the invention or the scope of the appended claim.

I claim:

In a device of the class described, a motor comprising a cylinder having inlet and outlet ports, a pressure operated piston in said cylinder, a slide valve controlling the inlet and outlet ports, a slotted guide for said valve, said valve having spaced lugs extending through the slot of the guide, a rocker arm pivotally supported within the said pressure receiving cylinder, said rocker arm being slotted at one end and having its other end apertured to engage between the lugs of the slide valve for actuating the same, a wheel located in the said slot of the rocker arm, a leaf spring secured in the pressure receiving chambers and bearing against the said wheel of the said rocker arm for shifting the latter past the said center point, and a rod depending from the piston and extending through the slot of the said rocker arm, said rod having upper and lower abutment elements adapted to respectively engage the corresponding side of the rocker arm during the reciprocation of the said piston for actuating the said rocker arm and valve for alternately opening and closing the said inlet and outlet ports of the cylinder.

In testimony whereof I affix my signature.
EDWARD V. ZAGST.