Jan. 2, 1962 J. B. KING 3,015,280

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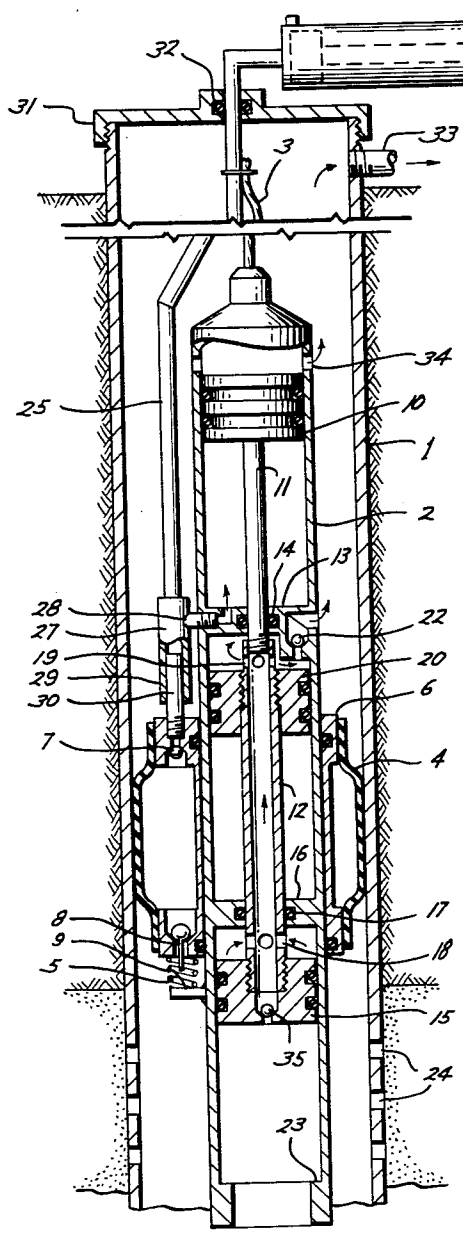



Fig. 1

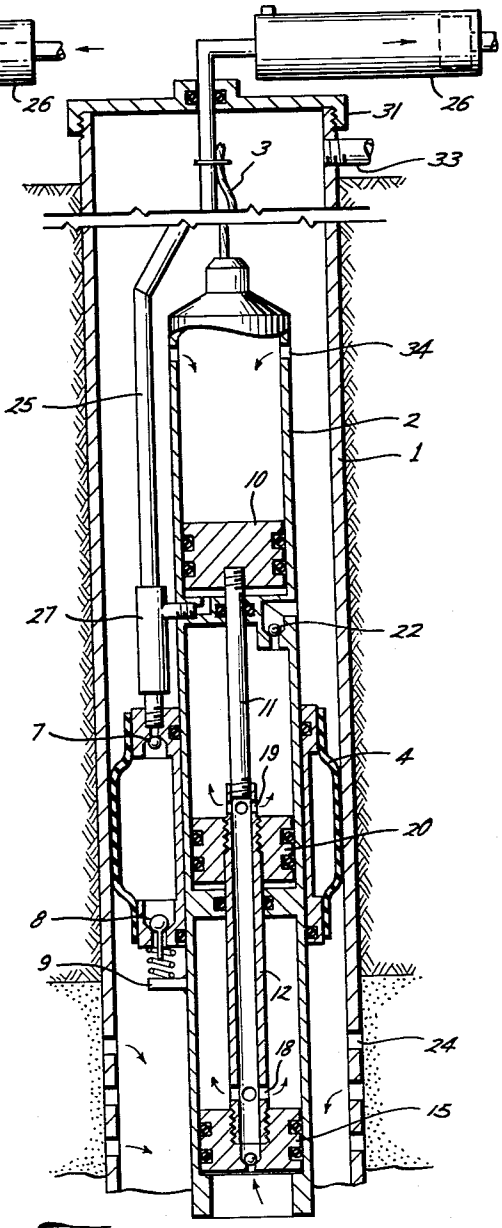



Fig. 2

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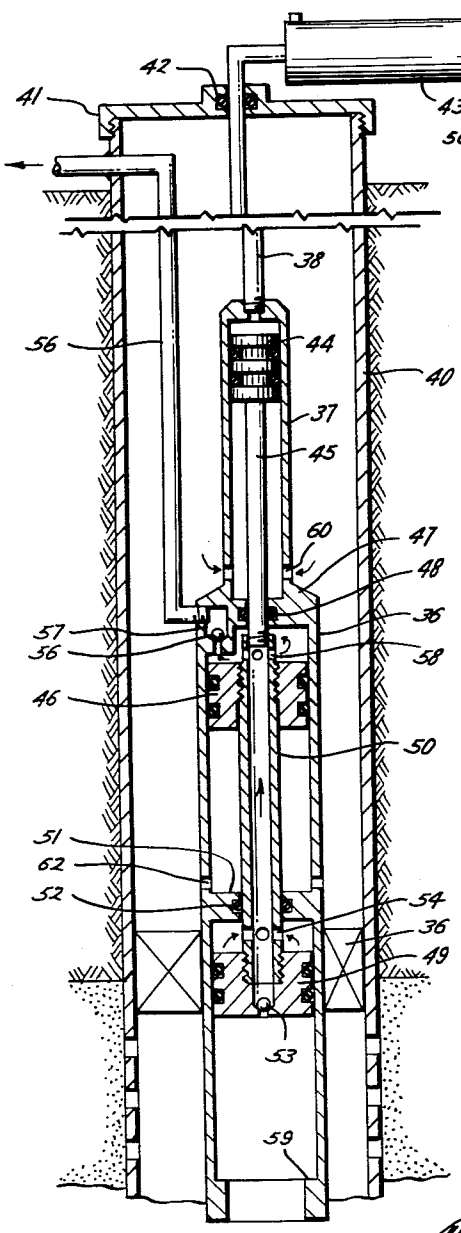



Fig. 3

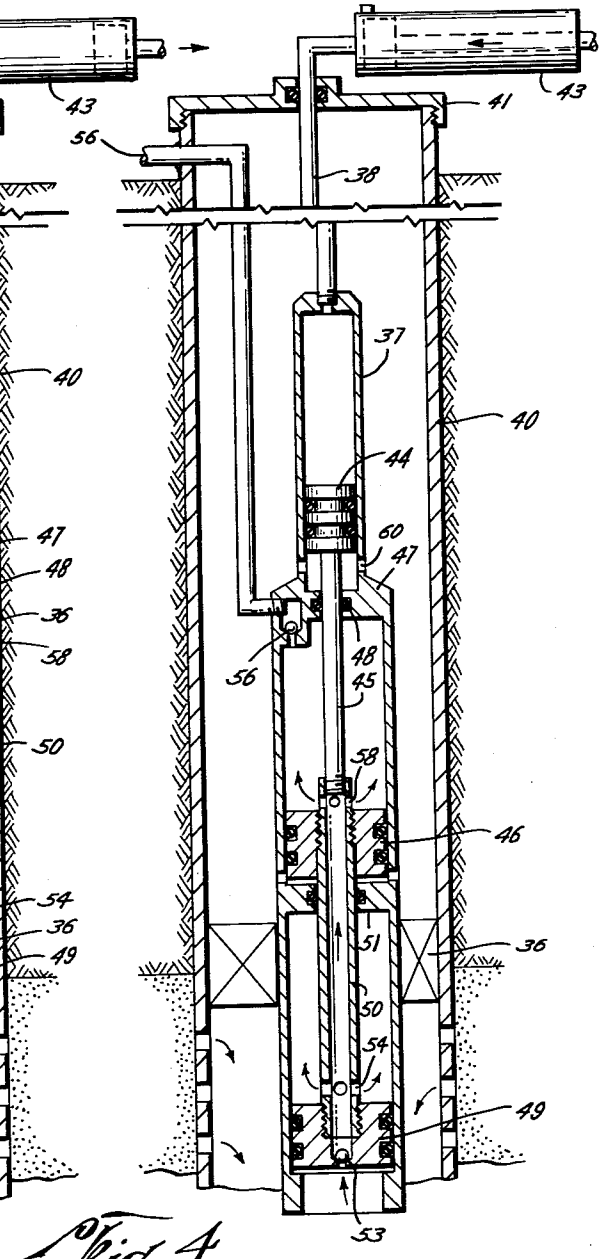



Fig. 4

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# PUMP

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This invention relates to new and useful improvements in a pump.

It is an object of this invention to provide a pump that may be quickly and easily transported from well to well and quickly and easily placed in operation at a minimum cost, to pump liquids from a well bore.

It is another object of this invention to provide a portable pump complete in itself, having novel means for packing off the casing of the well at the desired point and for releasing the packing mechanism for ready removal of the pump from the well bore.

With the above and other objects in view, the invention has relation to certain novel features of construction, operation and arrangement of parts more particularly defined in the following specifications and illustrated in the accompanying drawings, wherein:

FIGURE 1 is an elevational view, in cross section, showing the pistons in one position.

FIGURE 2 is an elevational view, in cross section, showing the pistons in another position.

FIGURE 3 is an elevational view, in cross section, of another form of the invention, showing the pistons in one position, and

FIGURE 4 is an elevational view, in cross section, of the form shown in FIGURE 3, showing the pistons in another position.

Referring now more particularly to the drawings, the numeral 1 designates a casing in a well, in which the tubular member 2 is to be inserted. The member 2 is lowered into the casing 1 in any suitable manner as by the cable 3, and mounted on the member 2 is an inflatable packing member 4 which is slidably mounted on the member 2 and has a rigid base 6 and a back pressure valve 7. A relief valve as 8 is mounted in the lower end of the packing member 4 and an outwardly projecting finger 9 is mounted on the member 2 beneath the valve 8. A suitable yieldable means, such as the coil spring 5, maintains the packing member 4 and valve 8 spaced above the finger 9.

A power piston 10 is mounted in the upper portion of the member 2 and a connecting rod 11 extends from the piston 10 to the tubular connecting shaft 12, passing through the wall 13 where it is suitably sealed against leakage as by the O-rings 14. The rod 11 is connected to the shaft 12 at one end and the other end of the shaft 12 is connected to the pump piston 15. The shaft 12 passes through the block 16 and is sealed against leakage as by means of the O-ring 17. A check valve 35 is mounted in the lower end of the piston 15 and inlet ports 18 are formed in the lower end of the shaft 12 and outlet ports 19 are formed in the upper end of the shaft 12. The pump piston 15 is mounted on the lower end of the shaft 12 and another pump piston 20 is mounted on the upper end of the shaft 12 beneath the ports 19.

An outlet port 21 is formed in the wall 13 providing a passageway from the area above the piston 20 to the annulus between the member 2 and the casing 1 and a suitable back pressure valve 22 prevents back flow into the member 2. The lower end of the member 2 has the internal shoulder 23 forming a stop which terminates the downward movement of the piston 15, and the bottom of the member 2 is open to the fluid in the well casing 1, which may enter the casing through the usual perforations as 24.

A conduit, such as a flexible hose, 25, extends from the power pump 26 to the coupling 27, which has a lead



off connection 28 through the block forming the wall 13 into the area beneath the piston 10 and has the telescoping connection 29 with the conduit 30 which leads to the valve 7.

A cap 31 is mounted on the top of the casing 1, through which the conduit 25 passes, and which is suitably sealed against leakage as by means of packing 32. A discharge outlet 33 is formed in the casing 1 adjacent the cap 31.

The member 2, with the packing 4 and conduit 25 mounted thereon, is lowered into the casing by means of the cable 3 until it has reached the desired depth. A pump 26 is then started and a suitable pressure fluid is pumped through the conduit 25, inflating the packing 4, and sealing the casing above the packing against down flow of the fluid in the casing. The location of the packing 4 in the casing will be well into the fluid in the casing so that a pressure head of fluid will be exerted against the upper end of the piston 10, which enters the member 2 through the ports 34. After the packing 4 has been inflated, the piston 10 will be forced upwardly by pressure entering through the passageway 28 and upon return stroke of the pump, the pressure against the lower end of the piston 16 will be relieved and the head pressure exerted on the upper end of the piston 10 will move the piston 10 downwardly, carrying the pistons 15, 20 downwardly at the same time, causing fluid in the area beneath the piston 15 to pass through the check valve 35 and ports 18 into the area above the piston 15. Upon the next power stroke of the pump 26, the piston 10 will again be lifted, and the fluid in the area above the piston 10 forced outwardly through the ports 34 into the casing, and the fluid in the area above the piston 20 forced out through the valve 22 into the casing and the fluid in the area above the piston 15 is forced the through the ports 18 and shaft 12 and ports 19 into the area above the piston 20 and out through the check valve 22 into the casing, so that upon each upward movement of the piston 10, the volume measured by the contents of the area above the pistons 15 and 20, is moved into the casing, and after the casing has filled, through the discharge opening 33.

When it is desired to remove the pump from the well, the member 2 is drawn upwardly by the cable 3, with the packing member 4 maintained in position in the casing, and the finger 9 will be moved against and will open the valve 8, relieving the pressure in the packing 4 and the member 2 drawn out of the casing, or moved to another position in the casing where the packer may again be inflated and the pump again placed in operation.

In the form shown in FIGURES 3 and 4, the tubular member 36 has a reduced upper chamber 37, and a conduit 38 is connected to the upper end of the chamber 37 and suitable packing 39 seals the area between the member 36 and the casing 40. The conduit 38 passes through the head 41 and is sealed as by the packing means 42, and is connected to the pump 43. A piston 44 is mounted in the chamber 37 and a connecting rod 45 extends from the lower end of the piston 44 to the upper end of the piston 46 through the wall 47 where it is sealed against leakage as by means of the O-ring 48. The piston 46 is connected to the piston 49 by means of the tubular shaft 50 which extends through the block 51 and is sealed against leakage as by means of the O-ring 52. A check valve 52 in the piston 49 connects the shaft 50 with the lower area of the member 36 beneath piston 49 and ports 54 in the shaft 50 above the piston 49, permit flow of fluid into the shaft 50 and ports 55 in the shaft 50 above the piston 46 permit flow of fluid into the area above the piston 46. Inlet ports 61, 61 are formed in the member 36 above the wall 51 leading from the area beneath the piston 46 into the casing 40. A passageway 57 extends through the wall

47 into the discharge line 56 and a check valve 57 prevents back flow through the passageway 57.

As the pump 43 actuates on power stroke, the piston 44 is forced downwardly, carrying with it the pistons 46, 49 and the fluid in the casing beneath the piston 49 will enter the shaft 50 through the check valve 53 and will pass into the area above the piston 49 and will pass through the shaft 50 and ports 58 into the area above the piston 46. Upon reaching the bottom of the stroke, the piston 49 will abut the shoulder 59 and will be stopped from further downward movement, and upon return stroke of the pump 43, the pressure on the top of the piston 44 will be relieved and the head pressure of the fluid column in the casing will bear against the lower side of the piston 44, and the lower side of the piston 46, entering the chamber 37 through the ports 60 and entering the area beneath the piston 46 through the ports 62, and will lift the pistons 44, 46 and 49 forcing the fluid above the piston 46 through the check valve 56 into the discharge line 61.

The length of the member 2, in the form shown in FIGURES 1 and 2 and the member 36 shown in FIGURES 3 and 4, may be in accordance with the desire of the user. It is contemplated that this member may be as much as fifteen to thirty feet, in length, and that power stroke of the pump shall be slow, that is, about fifteen seconds, requiring a small amount of power, such as a small motor, and a gear box (not shown) and will allow sufficient time on return stroke for the head pressure in the well casing to bear against and actuate the power piston.

While the foregoing are considered preferred forms of the invention, they are by way of illustration only, the broad principle of the invention being defined by the appended claims.

What I claim is:

1. In a pump, a tubular member to be mounted in a well casing, inflatable packing means on said member movable into packing relation with the well casing, a pressure piston in said member and flexible conduit leading from the ground surface to the tubular member, means for pumping fluid under pressure through said conduit to inflate said packing and after said packing has been inflated to move said power piston to one direction, means for subjecting said power piston to the pressure head of the column of fluid in the casing to move said piston in the other direction, a pair of vertically aligned pump pistons actuated by said power piston and means for directing an upward flow of fluid through said pump pistons and said casing upon upstroke of said power piston, means on said tubular member for deflating and releasing said packing upon upward movement of said tubular member.

2. In a pump, a tubular member adapted to be lowered into a well casing by cable, pumping means in said tubular member, a power piston in said tubular member actuated in one direction by the pressure head of the fluid in the casing and in the other direction by hydraulic pressure, a flexible conduit connected to said tubular member for introducing hydraulic pressure into said member, an elongated inflatable packing on said tubular member, one end of said packing being connected into said conduit and a valve in said end permitting flow of fluid into said packing, a relief valve in the other end of said packing and means on said tubular member for selectively opening said last mentioned valve and deflating said packing.



3. In a pump, a tubular member, means for lowering said member into a well casing containing fluid, a power piston in said member, a flexible conduit extending from the ground surface to the tubular member and connected into the tubular member beneath said power piston through which pressure fluid may be introduced into said tubular member, an inflatable packing on said tubular member yieldably maintained in position thereon, a valve in said packing, a conduit connecting said valve with said flexible conduit through which pressure fluid may be introduced into said packing, pump pistons actuated by said power piston, and means for deflating said packing upon upward movement of said tubular member.

4. In a pump, a tubular member, means for lowering said tubular member into a well casing, a power piston in said member, pump pistons actuated by said power piston, a pressure fluid conduit extending from the ground surface to the tubular member and connected into said tubular member beneath the power piston, a flexible packing member mounted on said tubular member, an inlet valve in said packing member for the inlet of fluid under pressure, a conduit connecting said valve with said pressure fluid conduit, a discharge valve in said packing member for releasing the fluid pressure therein, means on said tubular member for opening said discharge valve upon upward movement of said tubular member.

5. In a pump, a tubular member, means for lowering said member into a well casing by cable, power pistons in said tubular member, a flexible conduit extending from a source of fluid power at the ground surface to said tubular member, said conduit having a flow connection into said tubular member beneath the power piston for introducing fluid under pressure into said tubular member, an inflatable packing member mounted on said tubular member, a flow connection from said conduit into said packing member, an inlet valve in said flow connection into said packing member, for introducing fluid under pressure into said packing, a discharge valve in said packing member and means for selectively opening said discharge valve upon upward movement of said tubular member to deflate said packing member.

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