

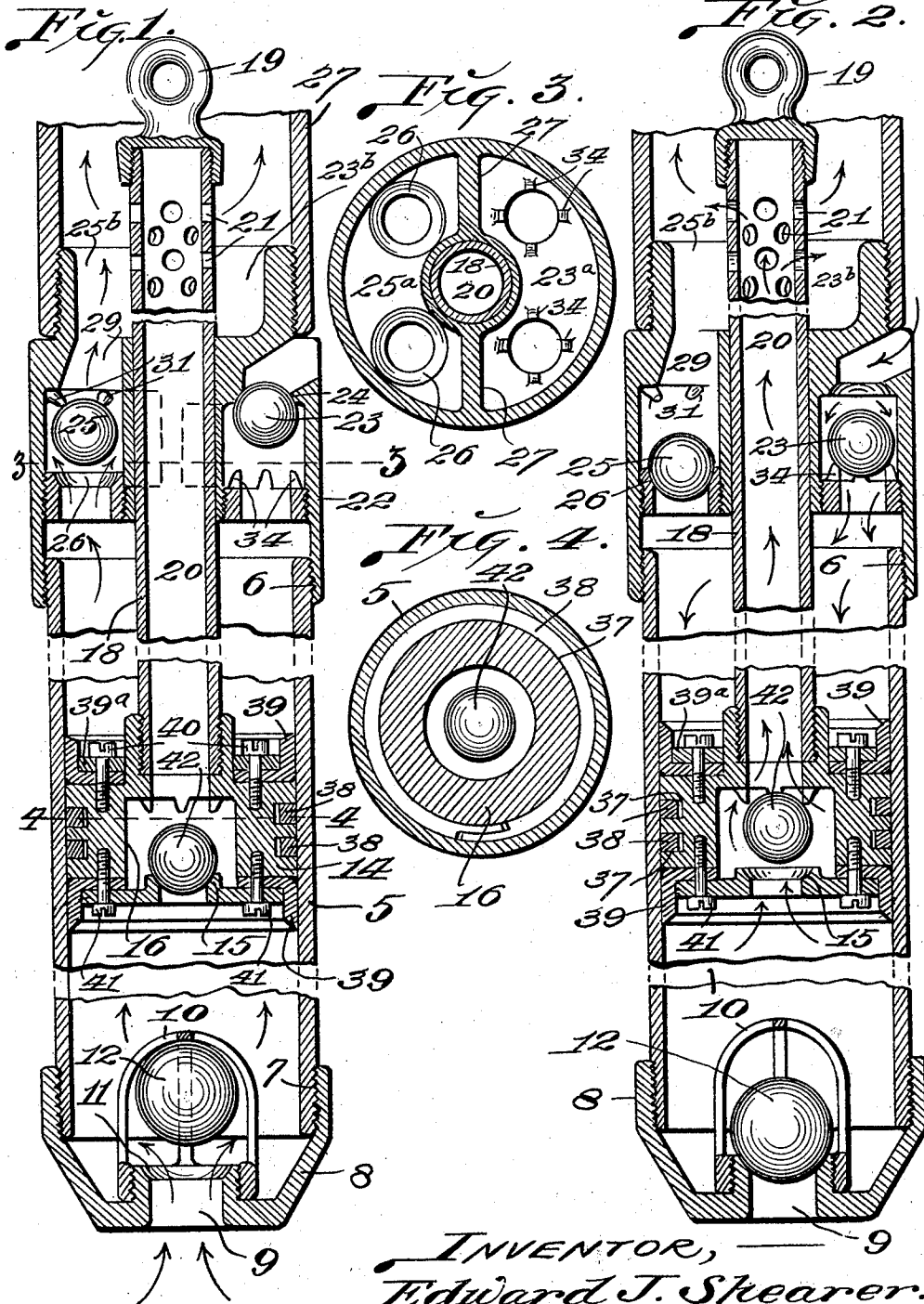
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DOUBLE ACTING PUMP

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UNITED STATES PATENT OFFICE.

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DOUBLE-ACTING PUMP.

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This invention relates to deep well pumps and has for its principal object the provision of a pump that will raise fluid on both strokes so that the production of a well may be doubled.

Another object of the invention is to provide a double acting pump construction which permits of the use of the simple, long lived ball valves, such as are preferred in oil well pumps.

Another object of the invention is to provide a pump that is readily assembled, or taken down for repair or replacement of parts, in which pump, the valves and valve seats are readily renewed.

Another object of the invention is to provide an improved piston or plunger for double acting pumps.

Another object of the invention is to provide a pump, particularly adapted for oil wells, in which pump, the plunger is well protected from sand which may settle down upon the pump from the tubing above.

Another object of the invention is to provide a double acting pump that is not appreciably greater in cost than a single acting pump of the same general construction.

Still other objects and advantages of my invention will appear hereinafter.

I have illustrated my invention by the accompanying drawings in which I have illustrated one practical embodiment of my invention.

In the said drawings:

Fig. 1 is a vertical mid section of the said embodiment, the parts in this view being shown in the respective positions they assume during the up stroke of the plunger.

Fig. 2 is the same but with the parts in the positions they assume on the down stroke.

Fig. 3 is a cross section on a line 3—3 of Fig. 1.

Fig. 4 is a cross section on a line 4—4 of Fig. 1.

In carrying out my invention in the embodiment illustrated I provide the tubular pump casing or jacket 5 externally threaded at each end as at 6 and 7. At the lower end of the jacket there is provided a cup-like fitting 8 having a coaxial inlet opening 9. Over the opening, there is fitted a valve cage 10, the fitting provides an integral seat 11 under the cage. Within the cage, there is disposed the standing valve 12 adapted to

rest upon the seat 11 to prevent return flow of fluid through the opening 9.

Within the jacket, there is provided reciprocal plunger 14 that will be further described hereinafter. Said plunger includes a working valve seat member 15 fixed relative to a working valve cage member 16. From the member 16, there is continued a plunger tube 18 that is fitted at the upper end with a ring 19 to which the pump rods (not shown) may be attached. The plunger tube provides a bore 20 through which fluid may rise, and the upper end of the tube is provided with perforations 21, for the escape of the fluid.

It will be apparent now that the plunger and its working valve will coact with the jacket and standing valve in the same manner in which like parts cooperate in the usual single acting pump. As the plunger ascends, it draws fluid through the standing valve, and raises the fluid that is above the working valve.

To make the pump double acting, I provide an upper coupling 22, that includes intake balls and seats 23 and 24 respectively, and discharge balls and seats 25 and 26 respectively. The coupling is divided into two chambers 23^a and 25^a, by a wall 27. Both chambers lead upward through the coupling as at 23^b and 25^b. The coupling connects the jacket to the tubing 27, through which fluid is carried to the surface. The coupling is provided with a plurality of discharge ports 29, into which are screw seated the valve seats 26.

Above each discharge port, integral fingers 31 are provided to form a cage for the corresponding ball, to limit its upward movement and to allow fluid to pass while the ball is in the position shown in Fig. 1. Inlet ports 32 are also provided in the coupling. Said ports open, from the side of the coupling and lead downwardly through the coupling and through the inlet chamber. For each inlet port, there is provided the integral seat 24, and below each inlet port, a fingered cage 34 is screw-threaded into the coupling. The inlet seats are so arranged that they may be ground by passing a tool through the underlying cage and causing it to work against the valve seat. The discharge valve seats are removable for grinding or replacement.

The plunger tube is a close working fit

through the coupling so that fluid discharged above the coupling cannot return into the pump chamber 36. The cage member of the plunger is provided with grooves 5 37 in which are fitted expansion piston rings 38. Cup leathers 39 are provided, one at the upper end of the cage member 16, and one at the lower end. The upper cup leather is held by a ring 39^a and screws 40. The lower 10 cup leather is held by the valve seat 15 and screws 41^a. The working valve ball 42 is placed in its cage before the seat and cup leather are secured by the screws 41. All parts of the plunger are readily removed for 15 inspection, repair or replacement, and the upper coupling is also readily removed from the pump for inspection, repair or replacement of the balls and seats.

In the operation of the pump, the plunger 20 is first raised to accomplish its upstroke, the parts assuming the position shown in Fig. 1. As the plunger rises, fluid is drawn into the lower part of the main pump chamber, through the standing valve and inlet port 9. 25 During the upstroke, fluid above the working valve is forced upward through the discharge valve as indicated by the arrows. When the plunger first moves upwardly, the fluid drives the intake balls up against their 30 seats, as shown in Fig. 1, thus preventing the fluid from being forced back into the well. During the up stroke of the plunger, the working valve is closed.

When the plunger descends, the standing 35 valve closes and all fluid below the plunger is trapped. As the space below the plunger decreases, the displaced fluid rises through the working valve and the plunger tube, and enters the tubing above the pump through 40 the perforations.

It will be apparent now that fluid is raised through the tubing on both strokes of the plunger. When the plunger is descending, 45 the discharge valves in the coupling close and a pressure diminution is created in the pump chamber above the descending plunger. This induces fluid through the inlet ports and valves so that the pump draws oil from the well on the downstroke of the plunger 50 as well as on the upstroke.

It will be apparent now that each stroke of the plunger draws fluid from the well, and each stroke also impels fluid upward

through the tubing and the pump is there- 55 for truly double acting and of double the capacity of the same size of single acting pump.

It sometimes happens that when an oil well has been pumped for awhile and the operation of the pump has been discontinued 60 that the well starts to flow, and in this event, oil will pass ball check 23 and when the oil develops sufficient pressure, ball check 25 will be lifted from its seat to permit the oil to flow upward into and through tube 27. 65 Likewise the pressure of the oil will force ball checks 12 and 42 off their seats so as to permit the oil to flow upward through duct 20 in piston rod 21.

Thus it will be seen that I have provided 70 an economical, readily assembled, double acting pump of simple construction, adapted to lift and discharge fluid on both of its strokes, and, while I have shown and described a specific embodiment of my invention, I do 75 not limit myself to any specific construction or arrangement of parts and may alter the construction and arrangement of parts as I desire, without enlarging the scope of my invention, as set forth in the appended 80 claim.

I claim as my invention:

In a double acting pump, a cylinder, an inwardly opening ball check valve at the lower end thereof, a hollow fitting at the 85 upper end of said cylinder, the lower portion of the chamber within said fitting being divided by a diametrically arranged partition, a plurality of ball valve seats removably seated in the lower portion of said fit- 90 ting on one side of the partition therein, downwardly seating ball check valves adapted to rest on said valve seats, a plurality of upwardly seating ball check valves arranged within the chamber on the other side of said 95 partition, a fingered cage removably seated in the lower portion of the fitting beneath each upwardly seating ball check valve, a piston arranged for operation within the cylinder and a tubular piston rod connected to said 100 piston and extending upwardly through the center of said fitting between the chambers that are formed in the lower portion thereof.

In testimony whereof I affix my signature.

EDWARD J. SHEARER.