

Jan. 1, 1929.

1,697,431

C. B. MARTIN

PUMP

Original Filed Oct. 2, 1923 2 Sheets-Sheet 1

Fig. 1.

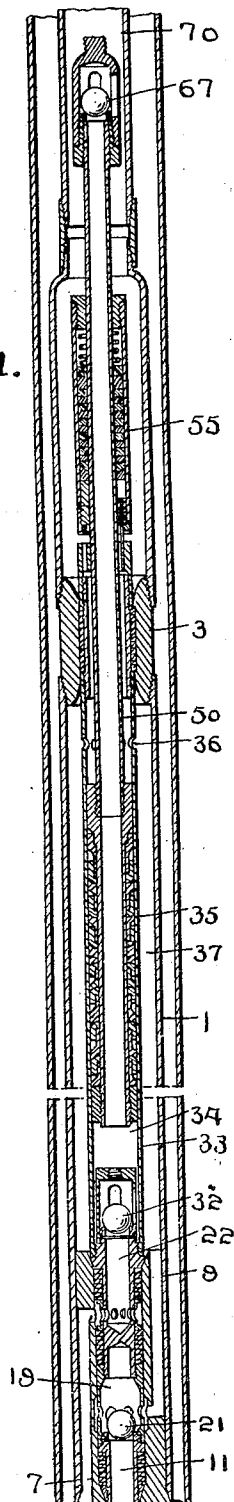
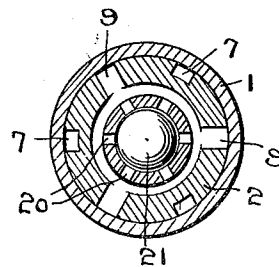
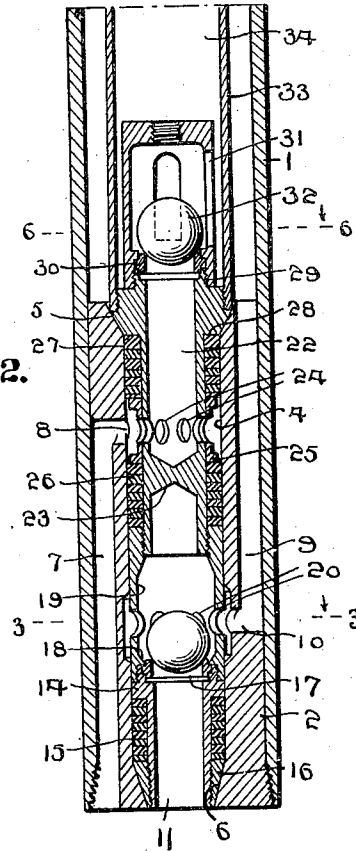


Fig. 2.



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Fig. 3.

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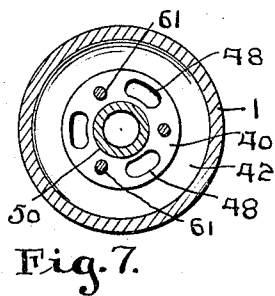
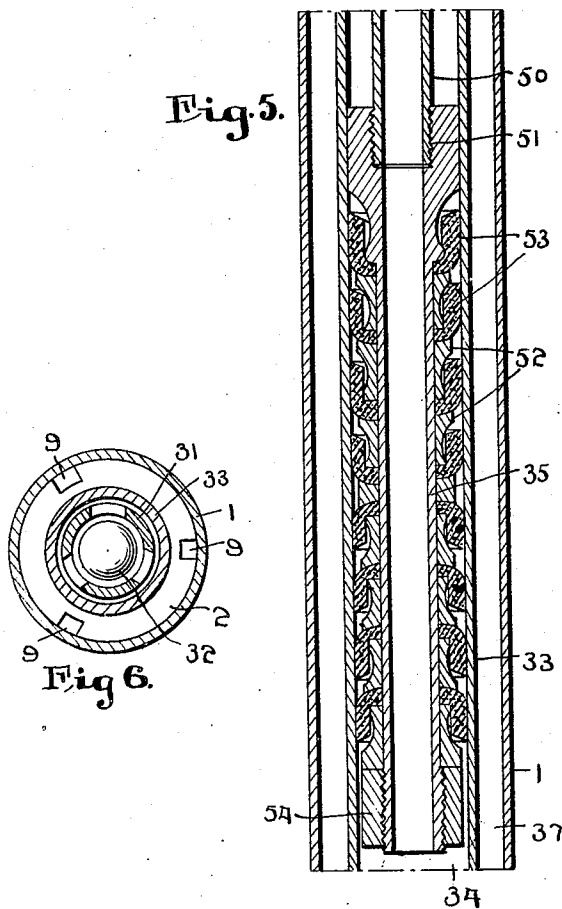
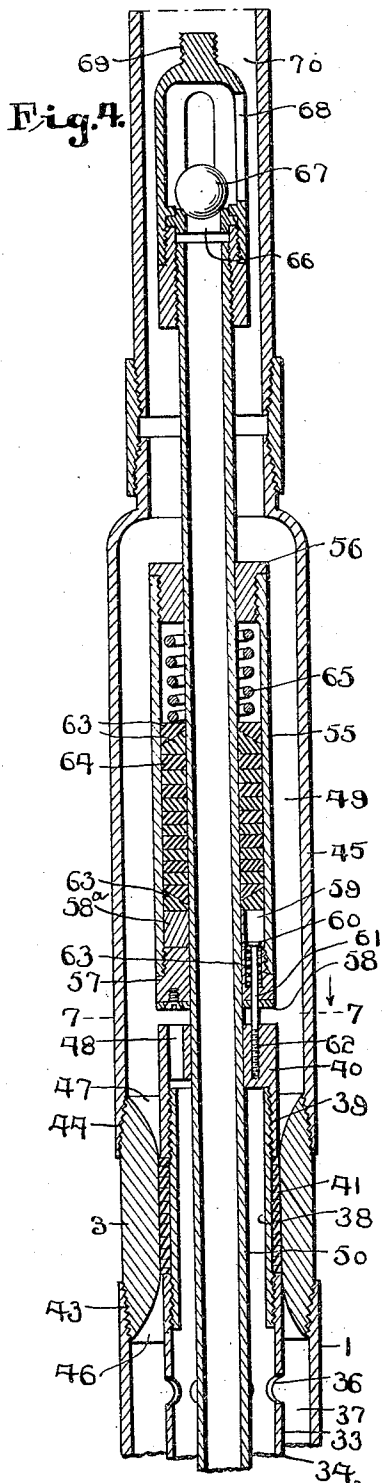
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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PUMP.

Application filed October 2, 1923, Serial No. 666,115. Renewed May 1, 1928.

This invention relates to improvements in pumps and more particularly to pumps used in forcing fluid from deep wells.

The primary object of the invention is to furnish a double acting pump capable of forcing about 70% more liquid than a single acting pump of the same size.

Another object of the invention is to provide a pump of this character constructed to permit the withdrawal of all of the valves, piston and pump barrel with the sucker rod of the pump, so that repairs and replacements of parts may be facilitated.

A further object of the invention is to provide improved packing means for the various parts of the pump.

Another object of the invention is to provide a pump in which the various parts are detachable from one another, so that the parts may be readily assembled or dismantled.

With the foregoing objects outlined and with other objects in view which will appear as the description proceeds, the invention consists in the novel features hereinafter described in detail, illustrated in the accompanying drawings and more particularly pointed out in the appended claims.

Referring to the drawings:

Figure 1 is a vertical longitudinal sectional view of the pump in the position which it occupies in a well casing.

Fig. 2 is a similar enlarged view of the lower portion of the pump.

Fig. 3 is a transverse horizontal sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is an enlarged vertical sectional view of the upper portion of the pump.

Fig. 5 is a similar view of the intermediate portion of the pump.

Fig. 6 is a transverse sectional view taken on line 6—6 of Fig. 2; and

Fig. 7 is a similar view taken on line 7—7 of Fig. 4.

Referring to the drawings, 1 designates a tubular pump casing threaded at its lower end to a stand valve housing 2 and threaded at its upper end to a guide cuff or sleeve 3. The housing 2 has a bore 4 having an enlarged conical surface 5 at its upper end and a smaller conical surface 6 at its lower end. Downwardly extending grooves or channels 7 are provided in the periphery of the housing and as shown in Fig. 3 these channels are equally spaced around the periphery. These channels extend from the lower surface of the housing to ports 8 which communicate with

the bore 4 near the upper end of the housing. The housing also has upwardly extending peripheral channels 9 equally spaced around the housing as shown in Fig. 3 and extending from the upper end of the housing to ports 10 communicating with the bore 4.

Removably arranged in this housing 2, is a stand valve constructed in the following manner. A liner pipe 11 has an annular shoulder 10 and packing rings 15 surround the pipe and are pressed toward said shoulder by means of a nut 16 having a conical surface engaging the conical surface 6, in order to aid in limiting the downward movement of the stand valve. A valve seat 17 rests on the upper end of the pipe 11 and is held in place by an internal annular shoulder 18 integral with a tube 19 which is in threaded connection with the upper end of the pipe 11. This tube is provided with ports 20 and encloses a ball valve 21, which at certain times cooperates with the seat 17 to prevent liquid from passing down the channels 9 and through the tube 19 into the pipe 11, for a purpose hereinafter described.

Arranged above the tube 19 is a conduit 22 having a solid partition wall 23 which closes communication between the interior of the tube 19 and the interior of the conduit. The conduit has a number of ports 24 and at the place where the ports occur, the conduit is surrounded by a slidable collar 25 having ports communicating with the ports 24 and with the bore 4. Packing rings 26 surround the lower portion of the conduit and rest on the upper end of the tube 19, which is in threaded engagement with the conduit 22. Upper packing rings 27 surround the upper portion of the conduit and bear against the collar 25 and against a shoulder 28 at the upper portion of the conduit. It will be understood that when the tube 19 is tightened on the lower end of the conduit, the packing rings 26 and 27 and the collar 25, will be forced toward the shoulder 28, for the purpose of packing the space between the bore 4 and said conduit.

The conduit has a threaded extension 29 at its upper end which supports a valve seat 30 held in place by a slotted valve cage 31, which houses a ball valve 32.

The upper end of the conduit is in threaded engagement with the lower end of the pump 33. From Figs. 1 and 5, it may be seen that this pump barrel extends upwardly to form a chamber 34 in which the pump piston

35 reciprocates. The upper end of the barrel is provided with ports 36 which places its chamber 34 in communication with a chamber 37 arranged between the barrel and the casing 1. The barrel at its upper end is in threaded engagement with a short pipe 38, which in turn has its upper end screwed into the skirt portion 39 of a head 40. Packing rings 41 surround the short pipe 38 and are squeezed by tightening the barrel 33 on the pipe 38 or by tightening the skirt 39 on said pipe. These packing rings engage the conical inner surface of the cuff 3, which latter is in threaded engagement with the upper end of the casing 1 as shown at 43. The upper end of this cuff is in threaded engagement at 44 with a casing extension 45. The ends of the bore of the cuff are flared as shown at 46 and 47 for the purpose of facilitating the passage of certain parts through this cuff, in a manner hereinafter explained.

The head 40 is provided with ports 48 through which the fluid pumped passes from the chamber 34 into the chamber 49 formed by the casing extension 45. A hollow piston rod 50 extends through the head 40, and as best shown in Fig. 5, its lower end is in threaded engagement at 51 with the head of the piston 35. This piston includes a sleeve or tube provided with a number of metal rings 52 and cup packings 53, all held in place by a nut 54 at the lower end of the piston.

Referring to Fig. 4, it may be seen that the hollow piston rod 50 also extends upwardly through a sliding valve 55. This valve is adapted to close the ports 48 and to be opened by the pressure exerted on the liquid passing through said ports 48. The valve itself consists of a tubular casing having a threaded head 56 and a threaded base 57, the latter carrying a valve head 58, which seats on the upper surface of the head 40 and closes the ports 48. Arranged above the base 57 is a stationary ring 58^a having radial slots 59, only one of which is shown. In practice, preferably three of these slots are equally spaced around the periphery of the ring 58^a and they are provided to accommodate the heads 60 of screws 61, which pass through the base 57 and are threaded into the head 40 as shown at 62. Each one of these screws is provided with a spring 63, which bears against the head of the screw and against the base 57, for the purpose of forcing the latter toward the head 40 and to close the ports 48. Arranged above the ring 58^a are packing glands 63 and packing rings 64, which are forced toward the ring 58^a by means of a spring 65 which bears against the upper packing gland 63 and against the threaded head 56.

The upper end of the piston rod 50 is provided with a valve seat 66, which cooperates with the ball valve 67 arranged in a slotted cage 68 having a threaded extension 69 adapt-

ed to be connected to the sucker rod of the pump.

In operation the sucker rod is reciprocated and this causes the piston rod 50 and the piston 35 to reciprocate in the pump casing. As the piston rises and falls in the pump barrel 33, the liquid will be drawn in and forced out of the pump. Assuming that the piston 35 is moving downwardly, said piston will tend to create a vacuum in the upper portion of the chamber 34 above the piston 35 and this will cause liquid to pass upwardly through the pipe 11 past the valve 21, through the ports of the conduit 19, and then through the ports 10 into the channels 9 and upwardly through the chamber 37 and ports 36 into the pump barrel. At the same time liquid which has previously been drawn into the chamber 34 of the barrel below said piston, in the manner hereinafter explained, will be forced upwardly through the hollow piston rod, past the valve 67 and through the cage 68 into the tubing 70 of the pump, which will convey the same to the top of the well.

When the piston has reached the bottom of its downward stroke and starts on its upward stroke, pressure will be exerted on the liquid previously drawn into the chamber 34 above the piston 35 and this pressure will extend into the tube 19 and seat the valve 21. Then as the piston moves upwardly the liquid in the chamber 34 above the piston 35 will be forced upwardly through the ports 48 and will unseat the sliding valve 55, and this liquid will pass into the chamber 49 and up the tubing 70 of the pump. As the piston rises, the valve 32 will be unseated and the valve 67 will be seated, so that liquid on the upward stroke of the piston will travel up the channels 7 through the ports 8 and 24 into the conduit 22 and from this conduit, past the valve 32 and through the slots 31 into the lower portion of the chamber 34.

It will thus be seen that on each downward stroke of the piston liquid is drawn into the pump and on each upward stroke of the piston liquid is drawn into the pump. Also liquid is discharged from the pump on each downward and on each upward stroke of the piston.

Should it be desired to withdraw the stand valve, piston, sliding valve, etc. from the pump, the sucker rod may be elevated and this will cause the piston to rise until its upper end strikes the lower end of the short pipe 38. Then this short pipe will rise with the piston and draw the packing 41 through the cuff 3. At the same time the short pipe 38 will lift the barrel 33, and as the lower end of this barrel is connected to the upper end of the conduit 22 of the stand valve, said stand valve will also be raised. The flared surface 46 of the cuff facilitates the passage of the stand valve through the cuff 3 when the stand valve is

moved upwardly, while the flared surface 47 facilitates the introduction of the stand valve into the pump casing. Furthermore when the parts are introduced into the pump casing, the flared surface 47 functions to gradually compress the packing rings 41.

It will be understood that the pump is constructed mainly from tubing, ball valves and packing rings, and the various parts are detachably connected together. This construction simplifies manufacture, reduces cost and facilitates assembling or dismantling.

From the foregoing, it is believed that the construction, operation and advantages of the invention will be readily understood without further description and it is apparent that changes may be made in the construction disclosed without departing from the spirit of the invention as expressed in the claims.

What is claimed and desired to be secured by Letters-Patent is:

1. A double-acting deep well pump including a casing, a stand valve associated with said casing and provided with a plurality of valve members to control the passage of liquid into said casing, a barrel associated with said stand valve and adapted to receive liquid passing one of said valve members, said barrel being directly connected to said stand valve, a hollow piston rod having a piston in said barrel, a valve for controlling the discharge of liquid from said hollow piston rod, a valve for controlling the passage of liquid from said barrel, and abutment means on said piston and barrel to permit the piston to raise the barrel and stand valve while the piston rod is being withdrawn from the well, the stand valve including a conduit having ports, a slidable collar surrounding said conduit and having ports communicating with the ports of the conduit, packing rings surrounding the conduit and bearing on said collar, and means for expanding said packing ring.

2. A double-acting deep well pump including a casing, a stand valve associated with said casing and provided with a plurality of valve members to control the passage of liquid into said casing, a barrel associated with said stand valve and adapted to receive liquid passing one of said valve members, said barrel being directly connected to said stand valve, a hollow piston rod having a piston in said barrel, a valve for controlling the discharge of liquid from said hollow piston rod, a valve for controlling the passage of liquid from said barrel, abutment means on said piston and barrel to permit the piston to raise the barrel and stand valve while the piston rod is being withdrawn from the well, and a cuff provided in said pump casing and having upwardly and downwardly flared surfaces at its ends to facilitate the passage of the stand valve through the cuff in either direction.

3. A double-acting deep well pump including a casing, a stand valve associated with said casing and provided with a plurality of valve members to control the passage of liquid into said casing, a barrel associated with said stand valve and adapted to receive liquid passing one of said valve members, said barrel being directly connected to said stand valve, a hollow piston rod having a piston in said barrel, a valve for controlling the discharge of liquid from said hollow piston rod, a valve for controlling the passage of liquid from said barrel, abutment means on said piston and barrel to permit the piston to raise the barrel and stand valve while the piston rod is being withdrawn from the well, a cuff provided in the casing and having upwardly and downwardly flared internal surfaces at its ends, and packing arranged at the upper end of said barrel and adapted to be squeezed by one of said flared surfaces.

4. A double-acting deep well pump including a casing, a stand valve associated with said casing and provided with a plurality of valve members to control the passage of liquid into said casing, a barrel associated with said stand valve and adapted to receive liquid passing one of said valve members, said barrel being directly connected to said stand valve, a hollow piston rod having a piston in said barrel, a valve for controlling the discharge of liquid from said hollow piston rod, a valve for controlling the passage of liquid from said barrel, abutment means on said piston and barrel to permit the piston to raise the barrel and stand valve while the piston rod is being withdrawn from the well, a short pipe connected to the upper end of said barrel, a head connected to said short pipe and provided with ports, one of the before mentioned valves controlling said last mentioned ports, packing rings surrounding said short pipe, and a cuff connected to said casing and constructed to compress said packing rings.

5. A stand valve for double acting pumps including a tubular structure having an imperforate partition intermediate its ends, ball valves arranged on opposite sides of said partition, upper and lower spaced conical surfaces formed on the stand valve, and a housing having conical surfaces cooperating with the conical surfaces of the stand valve.

6. A stand valve for deep well pumps provided near its upper end with a conical surface and near its lower end with a conical surface of smaller size, and a housing for said stand valve having conical surfaces cooperating with the conical surfaces of the stand valve to limit the downward movement of the stand valve relatively to said housing.

In testimony whereof I affix my signature.

CHARLES B. MARTIN.