April 10, 1928. 1,665,639

E. W. PATTERSON

TANDEM SINGLE ACTING PUMP

Filed March 30. 1926 2 Sheets-Sheet 1

Fig. 1.

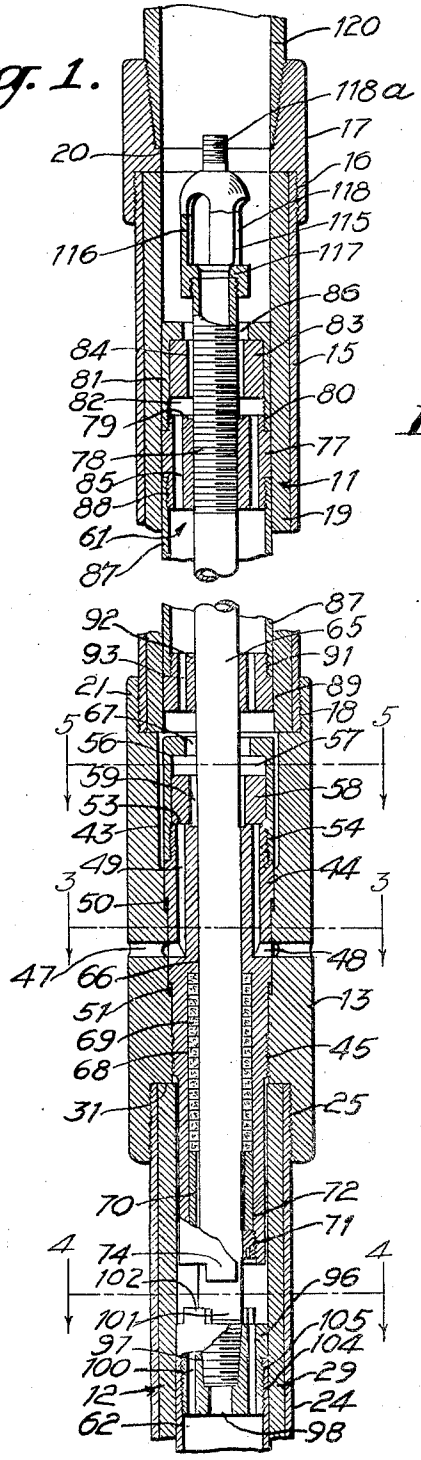
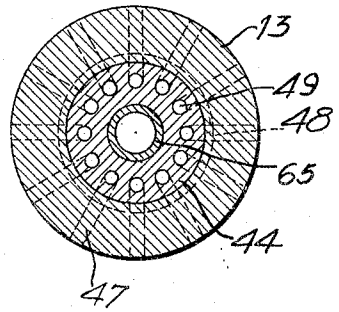


Fig. 3.



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TANDEM SINGLE ACTING PUMP

Filed March 30. 1926 2 Sheets-Sheet 2

Fig. 2.

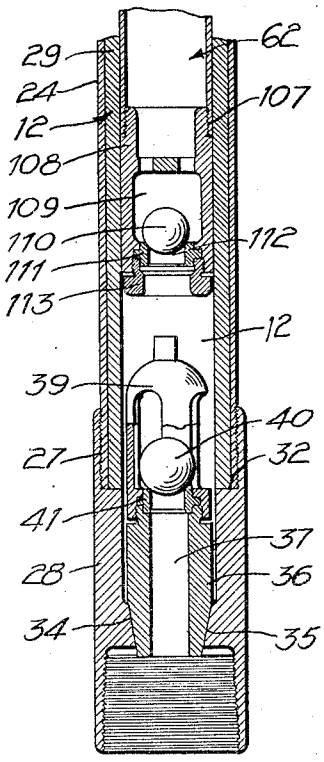


Fig. 4.

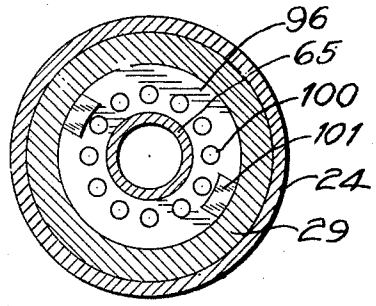
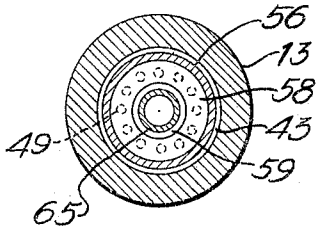


Fig. 5.



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Patented Apr. 10, 1928. 1,665,639

UNITED STATES PATENT OFFICE.

EDGAR W. PATTERSON, OF LONG BEACH, CALIFORNIA.

TANDEM SINGLE-ACTING PUMP.

Application filed March 30, 1926. Serial No. 98,442.

My invention relates to the oil producing industry, and it relates particularly to an oil pump.

After a well has been drilled and the oil string is set into place, an oil pump consisting of a pump barrel and a pump plunger is placed near the bottom of the well, the pump barrel being attached to the lower end of a pump tubing which extends upwardly through the oil string to the surface of the ground. The pump plunger is attached to the lower end of a string of sucker rods which extends upwardly through the pump tubing and which is connected at its upper end to a walking beam of the derrick of the well, whereby it is reciprocated and whereby the pump plunger is reciprocated in order to elevate oil through the pump tubing to the surface of the ground.

Obviously, it is advantageous to have as large a pumping capacity as possible. Different inventors have endeavored to increase the pumping capacity in a well by providing a double acting pump, that is, a pump which works on its down stroke as well as on its up stroke. Double acting pumps, however, are not satisfactory due to the fact that it is substantially impossible to furnish power on the down stroke, this being due to the fact that the sucker rods are of smaller diameter and are very flexible.

My invention consists of a single acting pump which comprises two pump units which are placed in tandem with each other. Each pump consists of a barrel and a plunger and each pump unit has a separate intake; both the pump units, however, introduce the oil into the pump tubing which supports the pump. Both of the plungers of the two units are operated through the same string of sucker rods.

It is accordingly an object of this invention to provide a single acting pump having substantially twice the capacity of the common form of oil well pump.

It is necessary to remove the plunger of a pump for the purpose of repair or inspection and it is highly desirable that the pump be so constructed that the plunger may be elevated to the surface of the ground without removing the barrel from place. This is desirable since to remove the barrel from the well, it would be necessary to uncouple each length of the pump tubing which would take considerable time and effort. My invention includes a connector whereby the barrels of the two units are secured together. Inside this connector is a plug which separates the spaces of the two barrels so that they may operate independently. The connector is formed in such a manner that it may be engaged by one of the plungers of the pump and actuated in such a manner that it may be removed from place. By this provision the pump plungers of my invention may be removed to the surface of the ground without removing the barrel.

It is accordingly another object of my invention to provide a single acting tandem pump of the character described in which the plunger structure may be removed to the surface of the ground without removing the barrel from the well.

Other objects and advantages of the invention will be made evident hereinafter.

Referring to the two sheets of drawings in which I illustrate a preferred form of my invention,

Fig. 1 is a vertical section taken through the upper part of the pump of my invention.

Fig. 2 is a vertical section taken through the lower part of the pump of my invention.

Fig. 3 is a section taken on the line 3—3 of Fig. 1.

Fig. 4 is a section taken on the line 4—4 of Fig. 1.

Fig. 5 is a section taken on the line 5—5 of Fig. 1.

Referring to the drawings, the pump of my invention has an upper barrel 11 and a lower barrel 12 which are joined together by a connector 13. The upper barrel 11 has a jacket 15, the upper end of which is screwed at 16 into an upper collar 17 and the lower end of which is threaded into a threaded cavity 18 formed at the upper end of the connector 13. The upper barrel 11 also includes a liner 19 which is enclosed and protected by the jacket 15 and which is held in place between a shoulder 20 of the upper collar 17 and a shoulder 21 of the connector 13. The lower barrel 12 consists of a jacket 24, the upper end of which is screwed into a threaded cavity 25 formed at the lower end of the connector 13. The lower end of the jacket 24 is screwed into a threaded cavity 27 formed at the upper end of a lower collar 28. The lower barrel 12 has a liner 29 which is held between a shoulder 31 of the connector 13 and a shoulder 32 of the lower collar 28. The lower collar 28 provides a conical seat 34 which is engaged by a conical face 35

of a standing valve body 36 which has a passage 37 formed therethrough. Connected to the upper part of the standing valve body 36 is a standing valve cage 39 which enshrouds a standing valve ball 40 adapted to engage a seat 41 secured at the upper end of the body 36 by means of the cage 39. When the ball 40 is seated, the passage into the lower barrel 12 from the exterior of the pump is closed. The body 36, the cage 39, the ball 40 and the seat 41 form a standing valve for the lower barrel 12. The connector 13 has an opening 43 formed therethrough in which a plug 44 is placed. This plug 44 is provided for the purpose of separating the interiors of the upper and lower barrels 11 and 12. The plug 44 is secured in place by threaded engagement with the connector 13, as shown at 45. The threads formed at 45 are left hand threads, whereas it is customary in oil pump construction to provide right-hand threads. The purpose of this will be explained hereinafter.

Radial openings 47 connect the exterior of the connector 13 to an annular channel 48 which surrounds the opening 43 in the connector 13 near the central part thereof. Passages 49 are formed in the plug 44, these passages connecting to the annular channel 48 and to the upper end of the plug. A packing 50 is provided between the plug 44 and connector 13 above the annular channel 48, and a packing 51 is provided between the plug and connector below the annular channel 48 to prevent any leakage. The upper end of the plug 44 is hardened to form a standing valve seat 53. Threadedly secured at 54 to the upper end of the plug 44 is an upper standing valve cage 56 having a chamber 57 in which a standing valve 58 is placed. The standing valve 58 is a ring type of valve having a central opening 59. The valve 58 is adapted to engage the seat 53 and close the passages 49 which extend through the plug 44. The seat 53, the cage 56 and the valve 58 provide a standing valve for the upper barrel 11. Adapted to operate in the upper barrel 11 is an upper plunger 61 and adapted to operate in the lower barrel 12 is a lower plunger 62. Connecting the upper and lower plungers together is a plunger tube 65. This plunger tube 65 extends through an opening 66 formed in the plug 44. It also extends through an opening 67 formed in the upper standing valve cage 56 and through the opening 59 of the upper standing valve 58. The lower part of the plug 44 is provided with a stuffing box 68, this stuffing box consisting of packing 69 which is compressed by a follower 70, this follower 70 being engaged by a nut 71 which is screwed into the lower end of a cavity 72 of the plug 44 in which the stuffing box is located. This stuffing box 68 provides a tight seal around the plunger tube 65 but permits it to reciprocate as will be described shortly. The lower end of the plug 44 is provided with projections 74 as shown clearly in Fig. 1.

The upper pump plunger 16 includes a seat bushing 77 which surrounds the upper end of the plunger tube 65 and which is threadedly secured thereto as indicated at 78. The upper end of the seat bushing 77 is hardened to provide an upper traveling valve seat 79. Threadedly secured at 80 to the seat bushing 77 is an upper traveling valve cage 81 having a chamber 82 in which an upper traveling valve 83 is placed. The upper traveling valve 83 is a ring type of valve having an opening 84 formed therethrough. The valve 83 is adapted to engage the seat 79 for closing passages 85 formed through the bushing 77. The upper end of the plunger tube 65 extends through the opening 84 of the valve 83 and through an opening 86 of the cage 81. The upper end of an upper plunger sleeve 87 is secured at 88 to the seat bushing 77. The lower end of the upper plunger sleeve 87 has a centralizing bushing 89 screwed thereto, as indicated at 91. The centralizing bushing 89 has an opening 92 formed therethrough through which the plunger tube 65 extends. Passages 93 are formed through the centralizing bushing 89, these passages surrounding the plunger tube 65 and permitting the passage of oil by the centralizing bushing 89. A bushing 96 is threadedly secured at 97 to the lower end of the plunger tube 65, this bushing 96 having a passage 98 which connects the passage of the plunger tube 65 with the interior of the lower barrel 12. The bushing 96 has passages 100 which are in circular arrangement around the lower end of the plunger tube 65, which permit a passage of oil from one side to the other thereof. The upper part of the bushing 96 is provided with projections 101 separated by spaces 102. The projections 101 are adapted to engage the projections 74 for interlocking the lower plunger 62 to the plug 44 so that the plug 44 may be rotated, as will be described hereinafter. A lower plunger sleeve 104 is threadedly secured at 105 to the bushing 96. The lower end of the lower plunger sleeve 104 is threadedly connected at 107 to the upper end of a lower traveling valve cage 108. The traveling valve cage 108 provides a chamber 109 in which a lower traveling valve in the form of a ball 110 is situated. A lower traveling valve seat 111 having a passage 112 formed therethrough is secured to the lower part of the cage 108 by means of a nut 113. The ball 110 may engage the seat 111 for closing the passage 112 formed therethrough. The extreme upper end of the plunger tube 65 threadedly receives a foraminous cap 115. This cap has a cage portion 116 formed upon a threaded

collar 117, which screws upon the threads 78 of the tube 65. The cage portion 116 has openings 118 therein through which oil may escape from the tube 65 and pass upwardly into the pump tubing 120. The upper end of the cage 116 is provided with a threaded pin 118ª, by means of which the plunger assembly may be attached to the lower end of a string of sucker rods such as is provided in ordinary equipment in the usual oil apparatus.

The operation of my invention is substantially as follows:

During the up stroke of the plunger unit the ball 40 is removed from the seat 41 to permit oil to be drawn into the lower end of the barrel 12. The valve 58 is disengaged from the seat 53 to permit oil to be drawn into the lower end of the upper barrel 11. The ball 110 is in engagement with the seat 111 so that oil in the lower barrel 12 above the lower traveling valve will be moved upwardly with the plunger assembly; the valve 83 is in engagement with the seat 79 so that oil in the upper barrel 11 above the valve 83 will be moved upwardly with the plunger assembly. Therefore, during the up stroke of the pump the space in the lower barrel 12 between the lower working valve and the upper end thereof is decreased. The oil is therefore displaced and forced from the lower barrel 12 through the plunger tube 65 into the upper end of the upper barrel 11 or into a pump tubing 120 to which the pump is secured. The upper plunger 61 moves upwardly with the lower plunger and the entire column of oil above the upper plunger traveling valve is moved upwardly therewith a distance commensurate with the distance the plunger assembly is moved. Therefore, it will be seen that the amount of oil pumped from the upper end of the oil tube 120 will equal the sum of the amounts displaced by the upper plunger 61 and the lower plunger 62. Also during the up stroke of the plunger assembly the space between the lower standing valve and the lower traveling valve is increased and oil is drawn thereinto from the exterior of the pump. Likewise the space between the upper traveling valve and the upper standing valve is increased and oil is drawn into this space in the barrel from the exterior of the pump. During the up stroke of the pump the upper and lower standing valves close and therefore the oil drawn into the lower ends of the upper and lower barrels is trapped therein. The upper and lower working valves, however, are opened during the down stroke and as the upper and lower plungers 61 and 62 lower, the oil will flow thereby to allow for the displacement. On the down stroke of the plunger assembly, a quantity of oil flows from the lower barrel 12 up the tube 65 equal to the space displaced by the additional length of the tube 65 which enters the lower pump barrel 12 during the downward movement of the plunger assembly. This quantity of oil issuing from the cap 115 at the upper end of the tube 65 during the down stroke of the plunger assembly does not cause an upward flow in the pump tubing 120 as it merely fills the space left in the upper end of the barrel 11 by the sliding downwardly of the tube 65 out of the barrel 11 into the plug 44.

When it is desired or necessary to elevate the plunger assembly to the surface of the ground for the purpose of inspection or repair, the plunger assembly is moved upwardly above its normal up position so that projections 101 formed at the upper end of the lower plunger 62 engage the projections 74 formed at the lower end of the plug 44. The whole plunger assembly is then rotated in a right hand direction by means of the string of sucker rods, and due to the fact that the threaded engagement of the plug 44 in the connector 13 is left-handed, it will be unscrewed so that the plug 44 is free. The threaded engagement 45 is purposely made left-handed so that the plug 44 may be unscrewed by a rotation of the string of sucker rods and the plunger assembly without danger of unscrewing any of the other parts. When the plug is completely freed, the whole plunger assembly may be elevated from the barrel assembly to the surface of the ground. It is a very important feature of the invention that this plug may be removed, since considerable labor and time is eliminated by not having to elevate the barrel assembly to the surface of the ground whenever the plunger is elevated thereto.

From the foregoing description it will be seen that my invention provides a pump having a capacity which is substantially twice the capacity of the ordinary oil well pump. It is worthy of note that my pump although it has twice the capacity does not have any longer stroke than the ordinary pump, and may therefore be used with standard oil well equipment which is a desired advantage over some special forms of pumps. The pump of my invention is single acting and should not be confused with the double acting pumps which are entirely impractical for oil well use and have never been successful. The pump of my invention is equivalent to two pumps but the parts are so designed that the pump units thereof cooperate so that they may be operated from a single string of sucker rods. The feature of the removable plug is important and the means whereby the removable plug may be freed from the connector 13 is likewise important.

I claim as my invention:

1. A pump for use in an oil well comprising: an upper barrel having an upper bore;

an upper plunger working in said bore; an upper working valve so arranged as to permit liquid to pass from the space below said plunger into the space above said plunger but preventing a reverse movement of said liquid; an upper standing valve arranged to admit liquid from the well into the space below said upper plunger but preventing a reverse movement of said liquid; a lower barrel having a lower bore; a wall separating said upper bore from said lower bore; a lower plunger working in said lower bore; a lower standing valve arranged to admit liquid from the well into the space below said lower plunger but preventing a reverse movement of said liquid; a lower working valve arranged to admit liquid from the space below said lower plunger to the space above said lower plunger but preventing a reverse movement of said liquid; and a hollow tube passing in fluid-tight relationship through said wall and connecting said upper and lower plungers, said tube providing a free connection at all times between the space above said lower plunger and the space above said upper plunger.

2. A pump for use in an oil well comprising: an upper barrel having an upper bore; an upper plunger working in said bore; and upper working valve carried by said upper plunger and so arranged as to permit liquid to pass from the space below said plunger into the space above said plunger but preventing a reverse movement of said liquid; an upper standing valve arranged to admit liquid from the well into the space below said upper plunger but preventing a reverse movement of said liquid; a lower barrel having a lower bore; a wall separating said upper bore from said lower bore; a lower plunger working in said lower bore; a lower standing valve arranged to admit liquid from the well into the space below said lower plunger but preventing a reverse movement of said liquid; a lower working valve carried by said lower plunger and arranged to admit liquid from the space below said lower plunger to the space above said lower plunger but preventing a reverse movement of said liquid; and a hollow tube passing in fluid-tight relationship through said wall and connecting said upper and lower plungers, said tube providing a free connection at all times between the space above said lower plunger and the space above said upper plunger.

3. A pump for use in an oil well comprising: an upper barrel having an upper bore; an upper plunger working in said bore; an upper working valve so arranged as to permit liquid to pass from the space below said plunger into the space above said plunger but preventing a reverse movement of said liquid; an upper standing valve arranged to admit liquid from the well into the space below said upper plunger but preventing a reverse movement of said liquid; a lower barrel having a lower bore which is of smaller diameter than said upper bore; a wall surrounding a space forming an opening which connects said bores, a portion of the surface of said opening forming a supporting seat; a member resting in fluidtight relationship on said seat and thus closing said opening; a lower plunger working in said lower bore; a lower standing valve arranged to admit liquid from the well into the space below said lower plunger but preventing a reverse movement of said liquid; a lower working valve arranged to admit liquid from the space below said lower plunger to the space above said lower plunger but preventing a reverse movement of said liquid; and means for moving said plungers synchronously in the same direction in said bores, the space above said lower plunger being at all times in open communication with the space above said upper plunger.

4. A pump for use in an oil well comprising: an upper barrel having an upper bore; an upper plunger working in said bore; an upper working valve so arranged as to permit liquid to pass from the space below said plunger into the space above said plunger but preventing a reverse movement of said liquid; an upper standing valve arranged to admit liquid from the well into the space below said upper plunger but preventing a reverse movement of said liquid; a lower barrel having a lower bore which is of smaller diameter than said upper bore; a wall surrounding a space forming an opening which connects said bores, a portion of the surface of said opening forming a supporting seat; a member resting in fluidtight relationship on said seat and thus closing said opening; a lower plunger working in said lower bore; a lower standing valve arranged to admit liquid from the well into the space below said lower plunger but preventing a reverse movement of said liquid; a lower working valve arranged to admit liquid from the space below said lower plunger to the space above said lower plunger but preventing a reverse movement of said liquid; and a piston rod extending in fluidtight relationship through said member and connecting said plungers, there being an open channel at all times between the space directly above said lower piston and the space above said upper piston.

5. A pump for use in an oil well comprising: an upper barrel having an upper bore; an upper plunger working in said bore; an upper working valve so arranged as to permit liquid to pass from the space below said plunger into the space above said plunger but preventing a reverse movement of said liquid; an upper standing valve arranged to admit liquid from the well into

the space below said upper plunger but preventing a reverse movement of said liquid; a lower barrel having a lower bore which is of smaller diameter than said upper bore; a wall surrounding a space forming an opening which connects said bores, a portion of the surface of said opening forming a supporting seat; a member resting in fluidtight relationship on said seat and thus closing said opening; means for mechanically securing said member in fluidtight relationship to said seat; a lower plunger working in said lower bore; a lower standing valve arranged to admit liquid from the well into the space below said lower plunger but preventing a reverse movement of said liquid; a lower working valve arranged to admit liquid from the space below said lower plunger to the space above said lower plunger but preventing a reverse movement of said liquid; and means for moving said plungers synchronously in the same direction in said bores, the space above said lower plunger being at all times in open communication with the space above said upper plunger.

6. A pump for use in an oil well comprising: an upper barrel having an upper bore; an upper plunger working in said bore; an upper working valve so arranged as to permit liquid to pass from the space below said plunger into the space above said plunger but preventing a reverse movement of said liquid; an upper standing valve arranged to admit liquid from the well into the space below said upper plunger but preventing a reverse movement of said liquid; a lower barrel having a lower bore which is of smaller diameter than said upper bore; a wall surrounding a space forming an opening which connects said bores, a portion of the surface of said opening forming a supporting seat; a member resting in fluidtight relationship on said seat and thus closing said opening; a screw thread on said member adapted to engage a screw thread in said opening for mechanically securing said member in fluidtight relationship to said seat; a lower plunger working in said lower bore; a lower standing valve arranged to admit liquid from the well into the space below said lower plunger but preventing a reverse movement of said liquid; a lower working valve arranged to admit liquid from the space below said lower plunger to the space above said lower plunger but preventing a reverse movement of said liquid; and means for moving said plungers synchronously in the same direction in said bores, the space above said lower plunger being at all times in open communication with the space above said upper plunger.

7. A pump for use in an oil well comprising: an upper barrel having an upper bore; an upper plunger working in said bore; an upper working valve so arranged as to permit liquid to pass from the space below said plunger into the space above said plunger but preventing a reverse movement of said liquid; an upper standing valve arranged to admit liquid from the well into the space below said upper plunger but preventing a reverse movement of said liquid; a lower barrel having a lower bore which is of smaller diameter than said upper bore; a wall surrounding a space forming an opening which connects said bores, a portion of the surface of said opening forming a supporting seat; a member resting in fluidtight relationship on said seat and thus closing said opening; means for mechanically securing said member in fluidtight relationship to said seat, said means being so constructed that they can be disengaged by a rotation of said member inside said opening; a lower plunger working in said lower bore; a lower standing valve arranged to admit liquid from the well into the space below said lower plunger but preventing a reverse movement of said liquid; a lower working valve arranged to admit liquid from the space below said lower plunger to the space above said lower plunger but preventing a reverse movement of said liquid; and means for moving said plungers synchronously in the same direction in said bores, the space above said lower plunger being at all times in open communication with the space above said upper plunger.

8. A pump for use in an oil well comprising: an upper barrel having an upper bore; an upper plunger working in said bore; an upper working valve so arranged as to permit liquid to pass from the space below said plunger into the space above said plunger but preventing a reverse movement of said liquid; an upper standing valve arranged to admit liquid from the well into the space below said upper plunger but preventing a reverse movement of said liquid; a lower barrel having a lower bore which is of smaller diameter than said upper bore; a wall surrounding a space forming an opening which connects said bores, a portion of the surface of said opening forming a supporting seat; a member resting in fluidtight relationship on said seat and thus closing said opening; a screw thread on said member adapted to engage a screw thread in said opening for mechanically securing said member in fluidtight relationship to said seat; means being provided for turning said member in said opening by turning the sucker rods of the pump; a lower plunger working in said lower bore; a lower standing valve arranged to admit liquid from the well into the space below said lower plunger but preventing a reverse movement of said liquid; a lower working valve arranged to admit liquid from the space below said lower plunger to the space above said lower

plunger but preventing a reverse movement of said liquid; and means for moving said plungers synchronously in the same direction in said bores, the space above said lower plunger being at all times in open communication with the space above said upper plunger.

9. A pump for use in an oil well comprising: an upper barrel having an upper bore; an upper plunger working in said bore; an upper working valve so arranged as to permit liquid to pass from the space below said plunger into the space above said plunger but preventing a reverse movement of said liquid; an upper standing valve; a lower barrel having a lower bore which is of smaller diameter than said upper bore; a wall surrounding a space forming an opening which connects said bores, a portion of the surface of said opening forming a supporting seat; a member resting in fluidtight relationship on said seat and thus closing said opening; spaced packing rings disposed between said member and said seat to seal off a space therebetween, there being a passage connecting said space to the exterior of the pump and another passage connecting said space with said upper standing valve; a lower plunger working in said lower bore; a lower standing valve arranged to admit liquid from the well into the space below said lower plunger but preventing a reverse movement of said liquid; a lower working valve arranged to admit liquid from the space below said lower plunger to the space above said lower plunger but preventing a reverse movement of said liquid; and means for moving said plungers synchronously in the same direction in said bores, the space above said lower plunger being at all times in open communication with the space above said upper plunger.

10. A pump for use in an oil well comprising: an upper barrel having an upper bore; an upper plunger working in said bore; an upper working valve so arranged as to permit liquid to pass from the space below said plunger into the space above said plunger but preventing a reverse movement of said liquid; an upper standing valve; a lower barrel having a lower bore which is of smaller diameter than said upper bore; a wall surrounding a space forming an opening which connects said bores, a portion of the surface of said opening forming a supporting seat; a member resting in fluidtight relationship on said seat and thus closing said opening; spaced packing rings disposed between said member and said seat to seal off a space therebetween, there being a passage connecting said space to the exterior of the pump and another passage connecting said space with said upper standing valve; threaded means for compressing said packing rings between said member and said seat by a rotation of said member; a lower plunger working in said lower bore; a lower standing valve arranged to admit liquid from the well into the space below said lower plunger but preventing a reverse movement of said liquid; a lower working valve arranged to admit liquid from the space below said lower plunger to the space above said lower plunger but preventing a reverse movement of said liquid; and means for moving said plungers synchronously in the same direction in said bores, the space above said lower plunger being at all times in open communication with the space above said upper plunger.

11. A pump for use in an oil well comprising: an upper barrel having an upper bore; an upper plunger working in said bore; an upper working valve so arranged as to permit liquid to pass from the space below said plunger into the space above said plunger but preventing a reverse movement of said liquid; an upper standing valve; a lower barrel having a lower bore which is of smaller diameter than said upper bore; a wall surrounding a space forming an opening which connects said bores, a portion of the surface of said opening forming a supporting seat; a member resting in fluidtight relationship on said seat and thus closing said opening; spaced packing rings disposed between said member and said seat to seal off a space therebetween, there being a passage connecting said space to the exterior of the pump and another passage connecting said space with said upper standing valve; threaded means for compressing said packing rings between said member and said seat by a rotation of said member; means being provided for turning said member in said opening by turning the sucker rods of the pump; a lower plunger working in said lower bore; a lower standing valve arranged to admit liquid from the well into the space below said lower plunger but preventing a reverse movement of said liquid; a lower working valve arranged to admit liquid from the space below said lower plunger to the space above said lower plunger but preventing a reverse movement of said liquid; and means for moving said plungers synchronously in the same direction in said bores, the space above said lower plunger being at all times in open communication with the space above said upper plunger.

12. A pump for use in an oil well comprising: an upper barrel having an upper bore; an upper plunger working in said bore; an upper working valve so arranged as to permit liquid to pass from the space below said plunger into the space above said plunger but preventing a reverse movement of said liquid; an upper standing valve; a lower barrel having a lower bore which is of smaller diameter than said upper bore;

a wall surrounding a space forming an opening which connects said bores, a portion of the surface of said opening forming a supporting seat; a member resting in fluidtight relationship on said seat and thus closing said opening; spaced packing rings of different diameter disposed between said member and said seat to seal off a space therebetween, there being a passage connecting said space to the exterior of the pump and another passage connecting said space with said upper standing valve; a lower plunger working in said lower bore; a lower standing valve arranged to admit liquid from the well into the space below said lower plunger but preventing a reverse movement of said liquid; a lower working valve arranged to admit liquid from the space below said lower plunger to the space above said lower plunger but preventing a reverse movement of said liquid; and means for moving said plungers synchronously in the same direction in said bores, the space above said lower plunger being at all times in open communication with the space above said upper plunger.

13. A pump for use in an oil well comprising: an upper barrel having an upper bore; an upper plunger working in said bore; an upper working valve so arranged as to permit liquid to pass from the space below said plunger into the space above said plunger but preventing a reverse movement of said liquid; an upper standing valve arranged to admit liquid from the well into the space below said upper plunger but preventing a reverse movement of said liquid; a lower barrel having a lower bore which is of smaller diameter than said upper bore; a wall surrounding a space forming an opening which connects said bores, a portion of the surface of said opening forming a supporting seat; a member resting in fluidtight relationship on said seat and thus closing said opening; means for mechanically securing said member in fluidtight relationship to said seat, said means being so constructed that they can be disengaged by a rotation of said member inside said opening; a lower plunger working in said lower bore; a lower standing valve arranged to admit liquid from the well into the space below said lower plunger but preventing a reverse movement of said liquid; a lower working valve arranged to admit liquid from the space below said lower plunger to the space above said lower plunger but preventing a reverse movement of said liquid; means for moving said plungers synchronously in the same direction in said bores, the space above said lower plunger being at all times in open communication with the space above said upper plunger; and interlocking means on said member and said lower plunger adapted to engage when said lower plunger approaches said member to permit said member to be disengaged from said opening by turning the lower plunger through said moving means.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 24th day of March, 1926.

EDGAR W. PATTERSON.