C. L. PARKER.

PUMP.

APPLICATION FILED OCT. 14, 1910.

1,028,061.

Patented May 28, 1912.

4 SHEETS—SHEET 1.

Fig. 1.

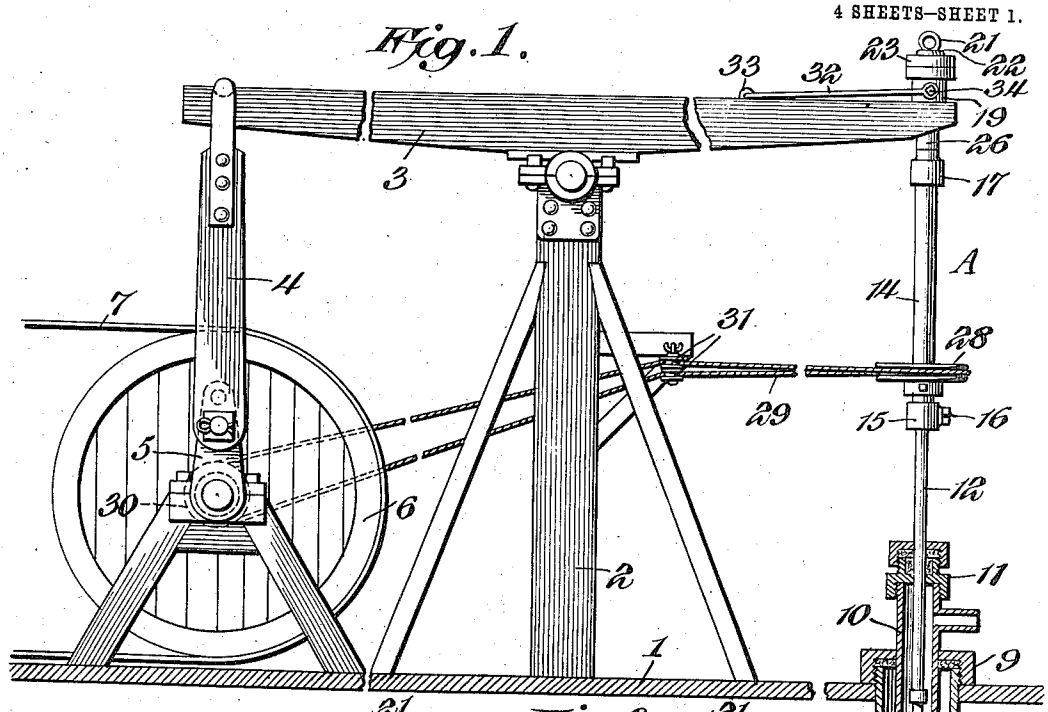


Fig. 2.

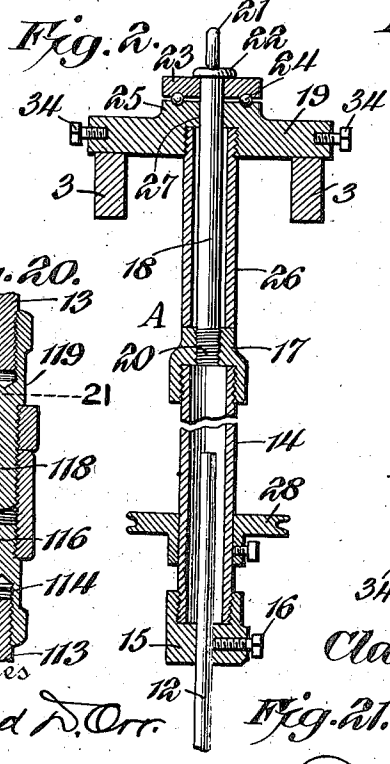


Fig. 3.

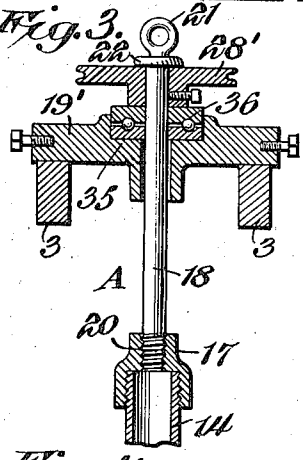


Fig. 20.

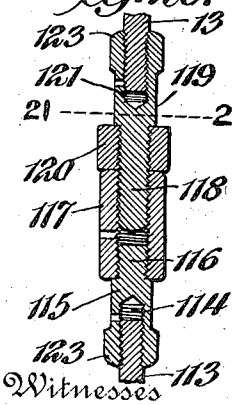


Fig. 4.

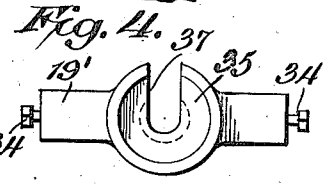
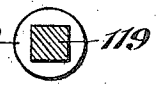


Fig. 21.



Witnesses

Howard D. Orr.

C. Bradway.

Clarence L. Parker, Inventor,

By E. G. Siggers.

Attorney

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4 SHEETS—SHEET 2.

Fig. 5.

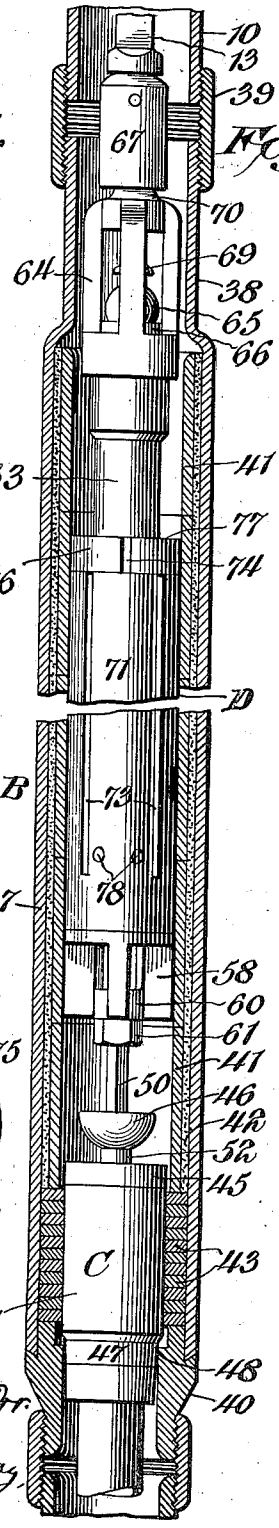


Fig. 6.

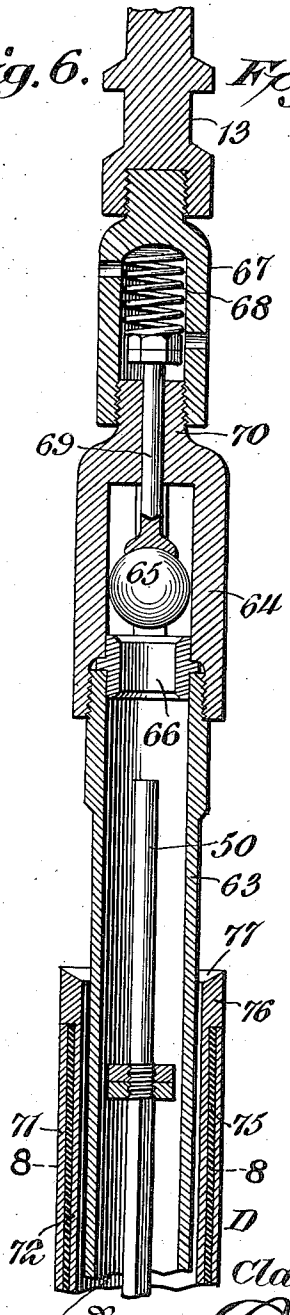


Fig. 7.

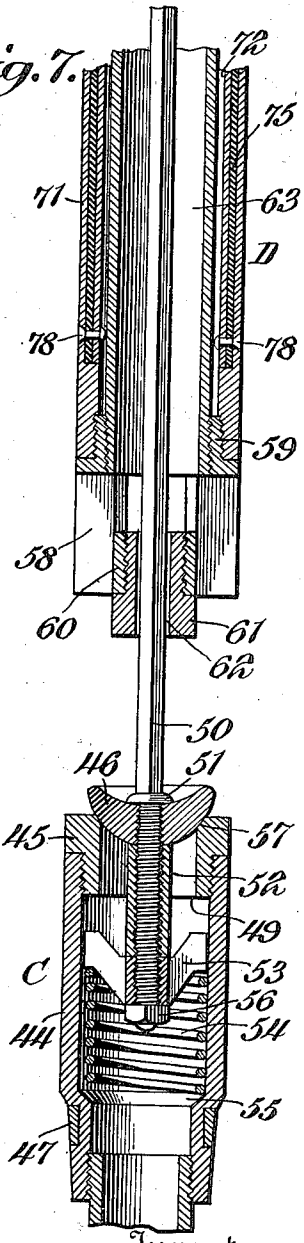
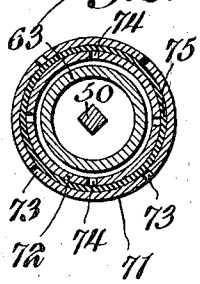


Fig. 8.



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C. Bradway.

Inventor,

Clarence L. Parker,

By E. G. Siggers.

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4 SHEETS—SHEET 3.

Fig. 9.

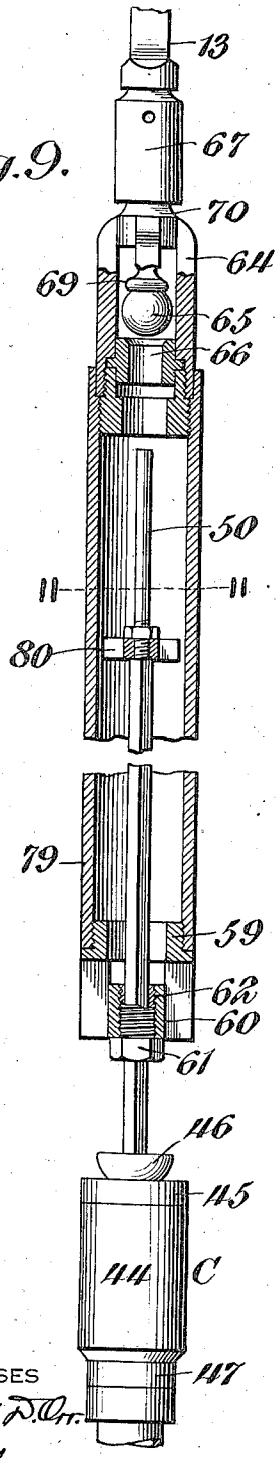


Fig. 10.

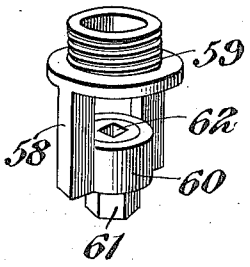


Fig. 11.

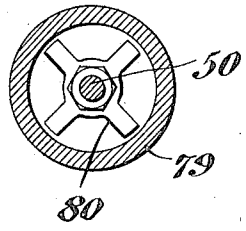


Fig. 13.

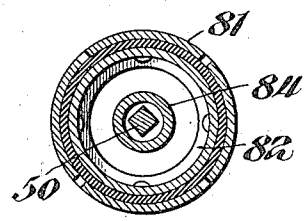


Fig. 14.

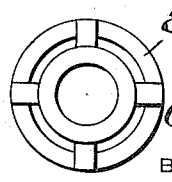
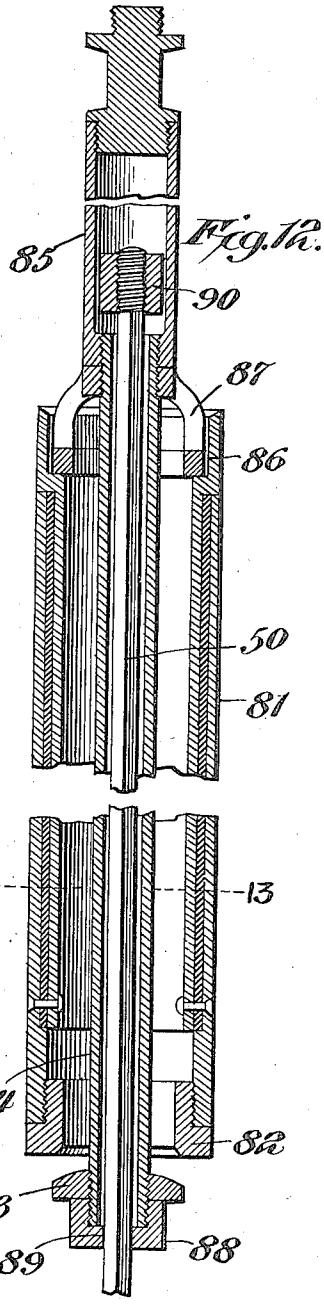


Fig. 12.



WITNESSES

Howard D. Orr.

F. T. Chapman.

Clarence L. Parker, INVENTOR,

BY

E. G. Siggers.

ATTORNEY

C. L. PARKER.

PUMP.

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4 SHEETS—SHEET 4.

Fig. 15.

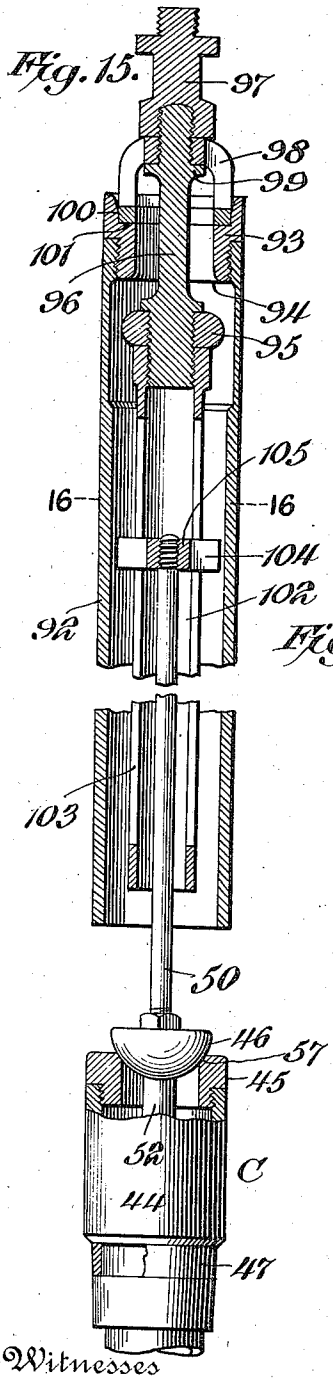


Fig. 16.

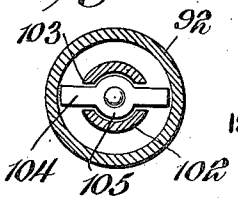


Fig. 17.

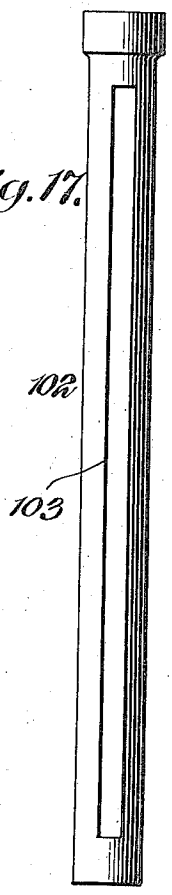


Fig. 18.

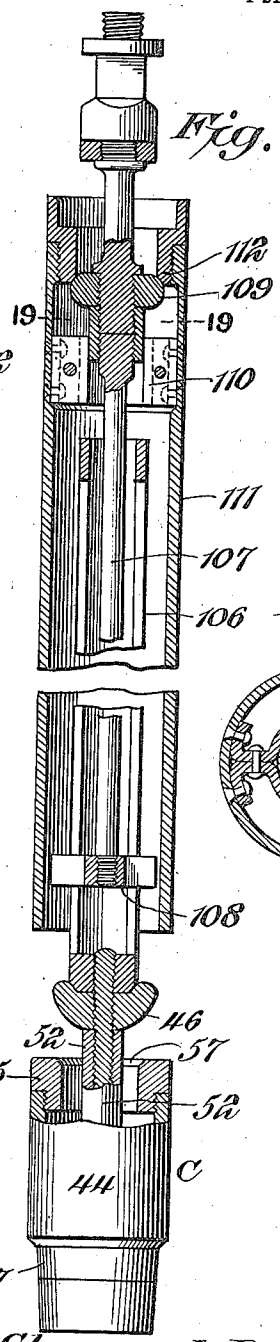
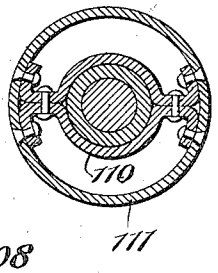


Fig. 19.



Witnesses

Howard D. Orr.

C. Bradway

Inventor,

Clarence L. Parker,

By E. G. Siggers.

Attorney

UNITED STATES PATENT OFFICE.

CLARENCE L. PARKER, OF LOS ANGELES, CALIFORNIA.

PUMP.

1,028,061. Specification of Letters Patent. Patented May 28, 1912.

Application filed October 14, 1910. Serial No. 587,056.

To all whom it may concern:

Be it known that I, CLARENCE L. PARKER, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Pump, of which the following is a specification.

This invention relates to oil well or other pumps, and it has for its principal object to provide a pump in which the foot valve is mounted to rotate continuously during the operation of the pump so as to insure the proper seating of the valve and thus prevent leakage so that the pump is especially adapted for deep well operation.

Another object of the invention is the provision of a pump of this character which is of extremely simple and inexpensive construction, reliable and efficient in use, and so designed that the necessity of "well pulling" for inspection and repair of the parts is reduced to a minimum.

Another object of the invention is the employment of a novel plunger construction whereby a tight working fit is provided between the plunger and barrel at all times, since the plunger is designed to compensate for wear.

An additional object is the employment of an upwardly-closing working valve connected with the sucker rod or some part rigidly attached thereto in connection with a plunger which is connected with the sucker rod through a lost motion connection, so that the rod has a limited independent movement at the beginning of each stroke for opening and closing the working valve.

With these objects in view and others, as will appear as the description proceeds, the invention comprises the various novel features of construction and arrangement of parts which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawings, which illustrate one embodiment of the invention, Figure 1 is a side view of the pump operating mechanism and the upper portion of the pump casing and tubing in section. Fig. 2 is an enlarged sectional view of the connection device between the sucker rod and walking beam of the operating mechanism, together with the means for rotating the sucker rod during the reciprocation thereof. Fig. 3 is a modified form of connecting means between the sucker rod and walking beam. Fig. 4 is a plan view of the cross head forming a part of the connecting means shown in Fig. 4. Fig. 5 is an enlarged sectional view of the barrel of the pump showing the plunger and valves in elevation. Figs. 6 and 7 are longitudinal sectional views of the upper part of the plunger and working valve, and lower part of the plunger and foot valve, respectively. Fig. 8 is a transverse section on line 8—8, Fig. 6. Fig. 9 is a longitudinal section of a modified form of plunger. Fig. 10 is a perspective view of the device for connecting the standing valve rod with the plunger, whereby the said valve is rotated. Fig. 11 is a transverse section on line 11—11, Fig. 9. Fig. 12 is a longitudinal section of a further modified form of plunger in which the working valve is at the bottom thereof and closes upwardly. Fig. 13 is a transverse section on line 13—13, Fig. 12. Fig. 14 is a top plan view of a guide ring for the plunger. Fig. 15 is a longitudinal section of a further modified form of plunger of the upwardly-closing working valve type. Fig. 16 is a transverse section on line 16—16, Fig. 15. Fig. 17 is a side view of the tubular link forming a portion of the connecting means between the foot valve and rotary sucker rod. Fig. 18 is a longitudinal section of a plunger which is a modification of that shown in Fig. 15. Fig. 19 is a transverse section on line 19—19, Fig. 18. Fig. 20 is a detail view showing the manner of connecting adjacent sections of the sucker rod together. Fig. 21 is a section on line 21—21, Fig. 20.

Similar reference characters are employed to designate corresponding parts throughout the views.

Referring to the drawings, 1 designates the pump platform or floor, from which rises the sampson post 2 on which is mounted the walking beam 3 that is connected by a pitman 4 with the crank 5 of the driving wheel 6, the latter being driven in the usual manner by a belt transmission 7. Extending through the floor 1 is the well casing 8 provided with the usual cap or head 9 through which passes the tubing 10, there being a stuffing box 11 for the tube through which passes the polished rod 12 that connects the sucker rod 13 with the walking beam. Since the foot valve of the pump is adapted to rotate, the polished rod 12 is connected with the walking beam in such a manner that the sucker rod can be rotated. For this pur-

pose, a connecting device designated generally by A, Figs. 1 and 2, is employed, the same consisting of a section of pipe or tube 14 that has a cap 15 on its lower end in which the polished rod 12 is adjustably clamped by a set screw 16 on the collar, and the upper end of the tube 14 is connected by a coupling 17 with an eye bolt 18 operatively connected with a cross head 19 mounted on the end of the walking beam 3. The eye bolt, which forms a suspending rod, has its lower end 20 threaded in the coupling 17 and its upper end formed with an eye 21 and a shoulder 22 below the eye which bears on the ring 23 which sustains the eye bolt on the cross head. This ring forms a part of a bearing box that includes anti-friction devices 24 disposed between the ring 23 and boss 25 formed on the upper part of the cross head. Surrounding the eye bolt 18 is a spacing sleeve 26 that has its upper end threaded in the bottom counterbored end of the opening 27 in the cross head 19 through which the eye bolt 18 passes, and the lower end of the sleeve bears against the upper end of the coupling 17. It will thus be seen that the eye bolt is free to rotate with the pipe 14 and sucker rod. Rotation is imparted to these parts by a pulley 28 clamped to the polished rod pipe 14, which pulley is driven by a belt 29 that passes around a pulley 30 connected with the driving wheel 6, the belt being guided on idler pulleys 31 so arranged that the power is transmitted directly from the pulley 30 to the pulley 28, which latter has its axis of rotation at right angles to that of the pulley 30. By the construction thus far described, the rotation of the driving wheel 6 imparts a vertical reciprocatory movement to the sucker rod through the walking beam and its connection with the sucker rod and driving wheel, and at the same time the sucker rod is rotated through the belt and pulley transmission 28, 29 and 30, between the driving wheel 6 and device A. The cross head 19 is held in place on the walking beam by links 32 connected at 33 with the walking beam to the ends of the cross head by bolts 34. By loosening the links 32 from the cross head and removing the latter from the walking beam, the sucker rod and attached parts can be drawn out of the well in the usual manner.

In the modification shown in Fig. 3, the cross head 19′ has a cup-shaped hub 35 in which the bearing box 36 is seated and one side of the hub is cut away at 37, Fig. 4, to permit the eye bolt or rod 18 to be disconnected from the head by a lateral movement, as when the well is to be pulled, and in this modified form, the driving pulley 28′ is mounted on the eye rod 18 between the head of the latter and bearing box 36.

Attached to the lower end of the tubing 10 is the pump barrel B, Fig. 5, which is preferably of the construction set forth in my copending application Serial No. 587,055, filed October 14, 1910. The barrel comprises an outer casing 37 that has a contracted neck 38 at its upper end connected by a coupling 39 with the tubing 10, and the lower end of the casing 37 carries a shoe 40. Within the casing is a lining 41 composed of cylindrical sections held in perfect alinement by a binding 42 filled in the space between the lining and casing. Packing rings 43 are arranged in the lower end of the barrel between the shoe and lining for fitting the body of the foot valve.

The foot valve C is of the same construction in the various modifications of the pump and it comprises a hollow cylindrical body 44, best shown in Fig. 7, that carries at its upper end a seat 45 for the rotary valve 46. The lower end of the body 44 is contracted and carries an inset packing ring 47 that wedges against the seat 48 of the shoe 40, as shown in Fig. 5. The valve seat is in the form of a ring threaded in the upper end of the valve body 44, so as to form an internal shoulder 49. The valve 46 is threaded on the lower end of a centrally disposed rod 50, the valve being clamped between a collar 51 on the rod and a sleeve 52 screwed on the rod below the valve. Threaded on the rod at a point below the sleeve is a guide 53 that moves back and forth in the valve body 44 to hold the valve 46 in central position, and the arms of this guide are adapted to strike the shoulder 49 to limit the opening movement of the valve. The opening of the valve is assisted by a helical compression spring 54 housed in the body 44 with its upper end bearing against the arms of the spider-shaped guide 53 and its lower end bearing on the shoulder 55 of the valve body 44. To insure the retention of the parts on the rod 50, a jam nut 56 is screwed on the lower end of the rod at a point under the guide 53. When the valve is seated, as shown in Fig. 7, the spring 54 is compressed so as to be in readiness to force the valve open during the suction stroke of the plunger. The ring 54 has a conical seat 57 of substantial area for engagement by the valve 46, and by the continuous rotation of the latter, the seat and valve are kept in perfect fitting relation, both wearing together so that leakage is prevented. By arranging the foot valve in this manner, the use of a cage is avoided, and, as the result, the passage of the oil is not obstructed, and furthermore, there is no danger of the valve being clogged with sand.

Referring to Figs. 5 to 8, inclusive, it will be observed that the plunger D is a hollow tubular structure disposed above the foot valve and mounted for combined reciprocatory and rotary movement in the barrel.

It has at its lower end a spider-like guide 58 that has its upper portion 59 screwed into the plunger, and in the hub 60 is a plug 61 that has a non-circular vertical bore 62 through which the foot valve rod 50 slidably extends, the said rod being non-circular so as to be rotated by the plunger. The plunger has an inner tubular member 63 open at its lower end where it screws into the cage-like guide 58. The upper end of the tubular member 63 extends out of the body of the plunger and is threaded in the bottom of the cage for the working valve 65. In the bottom of the cage 64 is a seat 66 for the valve, which latter closes downwardly. The cage is attached to the sucker rod 13 by a connector 67 which houses a spring 68 bearing on a buffer or yielding abutment 69 mounted in the tubular hub portion 70 of the cage 64 so that as the working valve opens, the buffer will be engaged and the spring compressed. The foot valve rod 50 extends upwardly through the tubular member 63 of the plunger and is so arranged as to positively unseat the working valve 65 in case the same should become sanded or stuck to its seat. By means of the member 63, cage 64, and connector 67, the plunger is rigidly connected with the sucker rod so that the plunger will be positively rotated by the latter for the purpose of maintaining the foot valve and its seat in properly ground condition. The plunger D is so designed as to always maintain a snug working fit with the lining of the barrel, and, for this purpose, the plunger body is composed of two telescoping tubular parts or sleeves 71 and 72, which are split longitudinally throughout the major portion of their length from the upper ends. As shown in Fig. 8, the slits 73 of the outer member 71 are staggered with respect to the slits 74 of the inner member 72. The inner member is of less external diameter than the internal diameter of the outer member so as to accommodate between them an imperforate tube 75 of rubber or other suitable material so as to prevent entrance of sand between the members. The weight of the column of liquid above the plunger acts on the split walls of the latter and forces them outwardly into engagement with the lining of the barrel so that leakage past the plunger will be effectively prevented. The upper end of the inner member 72 is of increased thickness as shown at 76 to extend over the upper split end of the outer member and the packing 75 to provide a substantial wearing surface. The upper end of the inner member may be beveled at 77 to form a sharp edge to effectively scrape the sand from the lining of the barrel and thus minimize the cutting action which would result if the sand enters between the plunger and lining. The inner and outer members of the plunger body are secured together by rivets 78 located at the lower ends of the members, as shown in Figs. 5 and 7, whereby the plunger body is a unitary structure free to expand throughout substantially its entire length except at its lower end to afford a good working fit with the barrel.

In the operation of the pump, the plunger is continuously reciprocated and rotated while the foot valve is continuously rotated therewith but does not participate in the reciprocatory movement of the plunger. During the downward movement of the plunger, the working valve opens to permit the oil under the same to pass through the plunger, and during this movement, the foot valve is held on its seat. As soon as the working valve closes on the initial part of the upstroke to raise the column of oil in the tube, the foot valve will open, by the combined action of the suction from the plunger and the expansion of the spring 54, to permit oil to enter through the foot valve to the space between the latter and plunger.

In Fig. 9, a construction similar to that of Fig. 5 is shown except as to the design of the plunger body. The working valve is of the downwardly-closing ball type and the plunger is composed of a single tubular member 79, and on the standing valve rod is a spider-shaped guide 80. This guide 80 cannot leave the plunger when the latter is pulled out of the well, so that the foot valve must be removed with the plunger.

In Fig. 12, the working valve is arranged at the bottom of the plunger and closes upwardly. The plunger 81 is made after the construction shown in Fig. 5, as regards the expansibility of the plunger under the weight of the column of oil in the pump tubing so as to snugly fit the lining of the barrel. In the lower end of the plunger is threaded a seat ring 82 with which engages the working valve 83 that is carried by a tubular rod 84 that extends longitudinally through the plunger and connects with the lower part of a hollow sucker rod 85. The upper end of the plunger body is internally enlarged, as shown at 86, to receive a guide frame 87 screwed to the upper end of the rod 84. On the upstroke of the rod 84, the plunger is moved therewith as soon as the valve 83 engages its seat. It will thus be seen that the plunger is idle during the first part of each stroke of the sucker rod for the purpose of positively opening and closing the working valve. The working valve 83 is threaded on the rod 84 and is retained thereon by a jam nut 88 which has a non-circular opening 89 through which the standing valve rod 50 moves. On the upper end of the rod 50 is an enlargement in the form of a head 90 lodged in the tubular sucker rod 85, which head prevents the rod 50 from pulling out of the jam nut or head

88 when the plunger is removed from the pump, thus insuring the removal of the working valve at the same time. The structure shown in Fig. 12 admits the use of a large standing valve rod, which is important in deep well pumps. When the parts are in the position shown in Fig. 12, the oil is passing upwardly through the plunger as the working valve is open. As the stroke of the sucker rod reverses, the valve 83 is brought into engagement with its seat 82 during the first part of the movement, while the working valve remains seated, and during the continued upward movement of the sucker rod, the plunger and working valve move together so as to raise the column of oil above the plunger and at the same time cause the standing or foot valve to open to admit a fresh charge of oil to the barrel. The standing valve is not positively connected with the plunger or sucker rod, and after it reaches the limit of its opening movement, the plunger can continue to move upwardly to the limit of its stroke by the sliding connection between the standing valve rod 50 and the rod 84. After the plunger reaches the end of its upward movement, the sucker rod is reversed to produce the downstroke. The plunger remains stationary during the first part of this movement until the ring 87 strikes the shoulder formed by the internally enlarged portion 86, when the plunger moves with the sucker rod, the valve 83 being opened in the meantime. The foot valve is self-seating so that the column of oil above the plunger cannot flow downwardly out of the barrel through the foot valve.

Another form of pump having an upwardly-closing working valve is shown in Figs. 15 to 17, in which the plunger 92 carries at its upper end a valve seat ring 93 which screws into the plunger, the lower end of the ring being formed with a seat 94 to be engaged by the working valve 95. The working valve 95 is screwed on a member 96 that extends upwardly out of the plunger and connects with the sucker rod, a portion of which is shown at 97. The member 96 has its upper end threaded to screw into the sucker rod and carried by this threaded end is a cage-like depressor 98 which is clamped between the part 97 of the sucker rod and the flange 99 on the member 96. This depressor is of less diameter than the plunger and is adapted to enter the ring 93 which is counterbored at 100 for that purpose. The base of the depressor engages the internal shoulder 101 of the ring 93 so that after the working valve is moved to open position, the depressor will engage the plunger to move the same downwardly as the sucker rod descends. This depressor serves to center the sucker rod with respect to the plunger. Arranged within the plunger is a tubular link 102 which is internally threaded at its upper end to screw on the lower end of the member 96 and to serve at the same time as a jam nut for holding the valve 95 on the said member. The tubular link 102 has longitudinal slots 103 at opposite sides in which reciprocate the wings 104 of the head 105 on the standing valve rod 50. The link 102 and head 104 constitute a slip joint between the sucker rod and foot valve, whereby the latter is free to move, during its opening and closing, independently of the sucker rod, while the latter, nevertheless, continuously rotates the foot valve. When the plunger moves downwardly, as shown in Fig. 15, the working valve 95 will be opened so that the oil can rise through the plunger, the foot valve being, at this time, seated. As soon as the sucker rod reverses its stroke, the valve 95 moves first to closed position and then causes the plunger to move upwardly with it, the foot valve opening after the seating of the valve 95 so as to permit oil to enter the barrel. It will thus be seen that the working valve is positively opened and closed and that the foot valve is continuously rotated.

In the construction shown in Fig. 18, the parts that form the slip joint in Fig. 15 are reversed; that is to say, the tubular link 106 is rigidly secured to the movable part of the foot valve, while the rod 107 is connected with the working valve, the winged head 108 being located at the lower end of the rod 107. Instead of using the depressor 98 of Fig. 15, the valve 109 in the modified form, Fig. 18, constitutes the depressor. A fixed spider or guide 110 is arranged in the plunger 111 at a point slightly below the valve seat 112 with the valve between the seat and guide. When the valve is moved open, the bottom thereof strikes the guide 110 so that the plunger will move downwardly with the valve. In other respects, the operation of the pump is similar to the pump shown in Fig. 15.

The joints *a* between the sections of the sucker rod are constructed as shown in Figs. 20 and 21. The end of the sucker rod section 113 is threaded and enters a threaded socket 114 in a coupling 115, the other end 116 of which is reduced and externally threaded. To the end 116 there is applied a straight internally threaded coupling sleeve 117 receiving at the other end a long threaded stem 118 on another coupling 119 of greater diameter than the stem 118. There is also applied to the stem 118 an internally threaded collar 120. The end of the coupling 119 remote from the stem 118 is formed with an axial threaded socket 121 receiving the sucker rod 13. The sleeve 117 and the sockets of the couplings 115 and 119 are each provided with an opening 122 to

permit the sand and other foreign matter to pass out as the stems screw thereinto. The ends of the coupling are externally beveled at 123 so as to prevent the coupling from catching on the tubing in pulling up or letting down the sucker rod. The couplings 115 and 119 are square in cross section where necessary for the application of a wrench thereto. In using a coupling of this character, the sections of the sucker rod can be readily connected or disconnected, and by using the same size stems on different sized rods, it is necessary to have only one set of couplings. The parts of the joints *a* are interchangeable, so that such a joint becomes advantageous in deep wells, such as oil wells, since worn out parts may be readily renewed by new fittings, and expense is thereby saved.

The rotation of the sucker rod is highly advantageous and of importance in keeping the valves ground to perfect fit, whereby leakage is prevented. Also, the threaded connections will not unscrew, since the rotation of the rod tends to maintain the threaded connections tightly screwed together. Another advantage is that the couplings will not wear holes in the tubing, since if they touched the tubing at all it is at successively different points about the inner walls of the tubing, and the wear is, therefore, not localized and the tendency of the coupling to wear flat is to a great extent prevented.

From the foregoing description, taken in connection with the accompanying drawings, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains, and while I have described the principle of operation of the invention, together with the apparatus which I now consider to be the best embodiment thereof, I desire to have it understood that the apparatus shown is merely illustrative, and that such changes may be made when desired as are within the scope of the claims appended hereto.

The structure of the piston or plunger shown and described herein is not claimed, being, in connection with other features, shown and claimed in my application No. 656,606, for expansive plunger, filed October 25, 1911.

Having thus described the invention, what I claim as new, and desire to secure by Letters Patent, is:—

1. In a pump of the class described, the combination of a plunger, means for reciprocating the same, a working valve, a foot valve, and means for continuously rotating the reciprocatory foot valve by the said plunger-actuating means.

2. In a pump, the combination of a plunger, a reciprocatory actuating rod connected with the plunger to reciprocate the same, a working valve for the plunger, a foot valve arranged to automatically open and close by the action of the fluid entering the pump, means for rotating the said rod, and means operatively connecting the rod with the foot valve for rotating the latter.

3. In a pump, the combination of a plunger, a rotary and reciprocatory rod for actuating the same, a working valve, a foot valve, and a connection between the foot valve and rod permitting relative independent movement between them while the rod rotates the foot valve.

4. In a pump, the combination of a hollow plunger, a rod connected with the plunger for reciprocating the same, means for simultaneously reciprocating and rotating the rod, a foot valve, a member connected with and rising from the foot valve, and means for operatively connecting the member with the rod for permitting the valve to automatically open and close independently of the rod and to be rotated by the latter.

5. In a pump, the combination of a plunger, a rotary and reciprocatory rod operatively connected with the plunger for raising and lowering the same, a working valve automatically opened and closed, a foot valve, a member rigidly secured to the foot valve to move therewith, and a member to which the plunger is connected for rotating the foot valve by the rotation of the said rod.

6. In a pump, the combination of a plunger, an operating rod therefor, means for reciprocating and rotating the rod, a foot valve, and a slip joint between the foot valve and rod for permitting the valve to open and close independently of the movement of the rod and to rotate the foot valve by the said rod.

7. In a pump, the combination of a plunger, a working valve therefor, a sucker rod, means for operatively connecting the working valve to the sucker rod, a lost motion connection between the sucker rod and plunger, means for rotating the sucker rod, a foot valve, and means for operatively connecting the foot valve with the sucker rod for rotating the valve.

8. In a pump, the combination of a hollow plunger, an upwardly closing working valve therefor, an operating rod for the plunger operatively connected with the working valve, a lost motion connection between the rod and plunger whereby the latter is idle at the beginning of each stroke of the rod to open and close the working valve, a downwardly-closing foot valve, and means for continuously rotating the foot valve by the said rod.

9. In a pump, the combination of a hollow open-ended plunger, a sucker rod, a member connected with the rod and extending down-

wardly through the plunger, a foot valve, a sliding connection between the foot valve and member for rotating the valve, and a working valve connected with the said member.

10. In a pump, the combination of a plunger, a rotary and longitudinally movable operating rod, a foot valve, members disposed in the plunger connected with the foot valve and operating rod respectively and connected with each other for simultaneous rotary movement and independent longitudinal movement, and a working valve for the plunger.

11. In a pump, the combination of a plunger, an operating rod therefor mounted for rotary and reciprocatory movement, a lost motion connection between the rod and plunger, a foot valve, a member connected with the foot valve and extending into the plunger, a member connected with the rod and extending into the plunger, a connection between the two members for transmitting rotary motion from the rod to the foot valve and permitting the valve to open and close independently of the movement of the rod, and a working valve for the plunger.

12. In a pump, the combination of a hollow plunger open at its ends, a rotary sucker rod, a member connected with the rod and extending through the plunger, a working valve carried by the member, a foot valve disposed under the plunger, a member connected with the foot valve and extending upwardly into the plunger, a spring acting on the foot valve tending to open the same, and a connection between the members whereby both rotate together while the first member can reciprocate without reciprocating the foot valve.

13. In a pump, the combination of a hollow plunger open at its ends, a sucker rod, a member rigidly secured to the sucker rod, a depressor connected with the member and arranged to engage the plunger for moving the same downwardly in the descending stroke of the rod, a valve connected with the member and arranged to seat by the upward movement of the rod, a foot valve adapted to open and close automatically, and a connection between the foot valve and member for continuously rotating the valve.

14. In a pump, the combination of a plunger, a rotary and reciprocatory actuating rod therefor, a member connected with the rod and extending downwardly through the plunger, a working valve rigidly secured to the member and arranged to close by an upward movement, means coöperating with the valve to provide lost motion between the operating rod and plunger during the initial part of each stroke of the rod, a foot valve, and means for operatively connecting the foot valve with the said member for rotating the valve.

15. In a pump, the combination of a plunger, a seat at one end thereof, an actuating rod mounted to simultaneously reciprocate and rotate, a member connected with the rod and extending through the plunger, a working valve connected with the member and positively opened and closed by the rod, means for connecting the plunger with the rod to permit the latter to move independently of the plunger during the initial part of its stroke to open and close the working valve, a foot valve, a spring acting on the foot valve to raise the same, a member secured at its lower end to the foot valve and arranged in telescoping relation to the working valve carrying member, and a connection permitting relative longitudinal movement between the members while the first member rotates the second.

16. In a pump, the combination of a plunger open at both ends, a rotary and longitudinally movable actuating rod, a member connected with the rod and extending into the plunger, a working valve on the lower end of the member closing by an upward movement, a device connected with the member at a point below the valve, a foot valve, and a connection between the foot valve and device for permitting the foot valve to open and close simultaneously while the device rotates the valve.

17. In a pump, the combination of a plunger open at both ends, a rotary and reciprocatory actuating rod, a member connected with the rod and extending longitudinally of the plunger, a depressor on the member arranged to engage the plunger to move the same downwardly with the rod, a valve on the member below the depressor to close the plunger by an upward movement, a device secured to the member below the plunger, a foot valve, a member rigidly secured to the foot valve and connected with the device for relative sliding movement and for rotating the foot valve by the device, said depressor and working valve constituting a lost motion connection between the plunger and member.

18. In a pump, the combination of a plunger, a rotary and reciprocatory actuating rod, a valve seat on the plunger, a member connected with the rod and extending through the valve seat, a valve on the member disposed below the seat and closing upwardly against the seat, a depressor secured to the member and arranged to engage the plunger to move the latter downwardly after the valve opens, and a foot valve operatively connected with the member to be rotated thereby.

19. In a pump, the combination of a plunger, a rotary and reciprocatory actuating rod, a valve seat on the plunger, a member connected with the rod and extending through the valve seat, a valve on the member disposed below the seat and closing up-

wardly against the seat, a depressor secured to the member and arranged to engage the plunger to move the latter downwardly after the valve opens, a foot valve, a member connected with the foot valve and extending upwardly into the plunger in telescoping relation to the first member, and means connecting the members for independent longitudinal and simultaneous rotary movement.

20. In a pump, the combination of a plunger, a rotary and reciprocatory actuating rod, a valve seat on the plunger, a member connected with the rod and extending through the valve seat, a valve on the member disposed below the seat and closing upwardly against the seat, a depressor secured to the member and arranged to engage the plunger to move the latter downwardly after the valve opens, a foot valve, a member connected with the foot valve and extending upwardly into the plunger in telescoping relation to the first member, and a device on the first member located below the first-mentioned valve for permitting the first member to reciprocate independently of the second member while continuously rotating the latter.

21. In a pump, the combination with a barrel, of a foot valve mounted therein, said valve comprising a valve body, a seat carried by the body, a rotatable valve member engaging the seat, and a centering guide disposed within the body and connected with the valve member, and means for rotating said valve member irrespective of fluid passing through the foot valve.

22. In a pump, the combination with a barrel, of a foot valve mounted therein, said valve comprising a valve body, a seat carried by the body, a rotatable valve member engaging the seat, a centering guide disposed within the body and connected with the valve, and a spring housed in the body and pressing on the guide to open the valve, and means for rotating said valve member irrespective of fluid passing through the foot valve.

23. In a pump, the combination of a barrel, with a foot valve therein, said foot valve comprising a hollow body, a seat ring secured to the upper end of the body and forming an internal shoulder, a guide in the body, a spring urging the guide toward the shoulder, a rotatable valve member arranged to engage the seat and rigidly connected with the guide, whereby the spring is compressed when the valve member is seated, and means for rotating said valve member irrespective of fluid passing through the foot valve.

24. In a pump, the combination of a barrel, with a foot valve therein, said foot valve comprising a body open at both ends, internal shoulders at the upper and lower ends of the body, a spring resting on the lower shoulder, a guide movable into engagement with the upper shoulder by the spring, a seat above the upper shoulder, a rotatable valve member arranged to engage the seat, means for rotating said valve member irrespective of fluid passing through the foot valve, and a connection between the valve member and guide.

25. In a pump, the combination of a barrel, with a foot valve therein, said foot valve comprising a tubular body, a seat on the upper end of the body, a rod having a threaded end extending into the body, a valve member threaded on the rod to engage the seat, a guide mounted on the rod and disposed within the body, a sleeve interposed between the guide and valve member, a spring arranged within the body and pressing on the guide for operating through the same and rod to open the valve member, and means for rotating said valve member irrespective of fluid passing through the foot valve.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

CLARENCE L. PARKER.

Witnesses:
N. D. EUSTIS,
T. W. EUSTIS.