

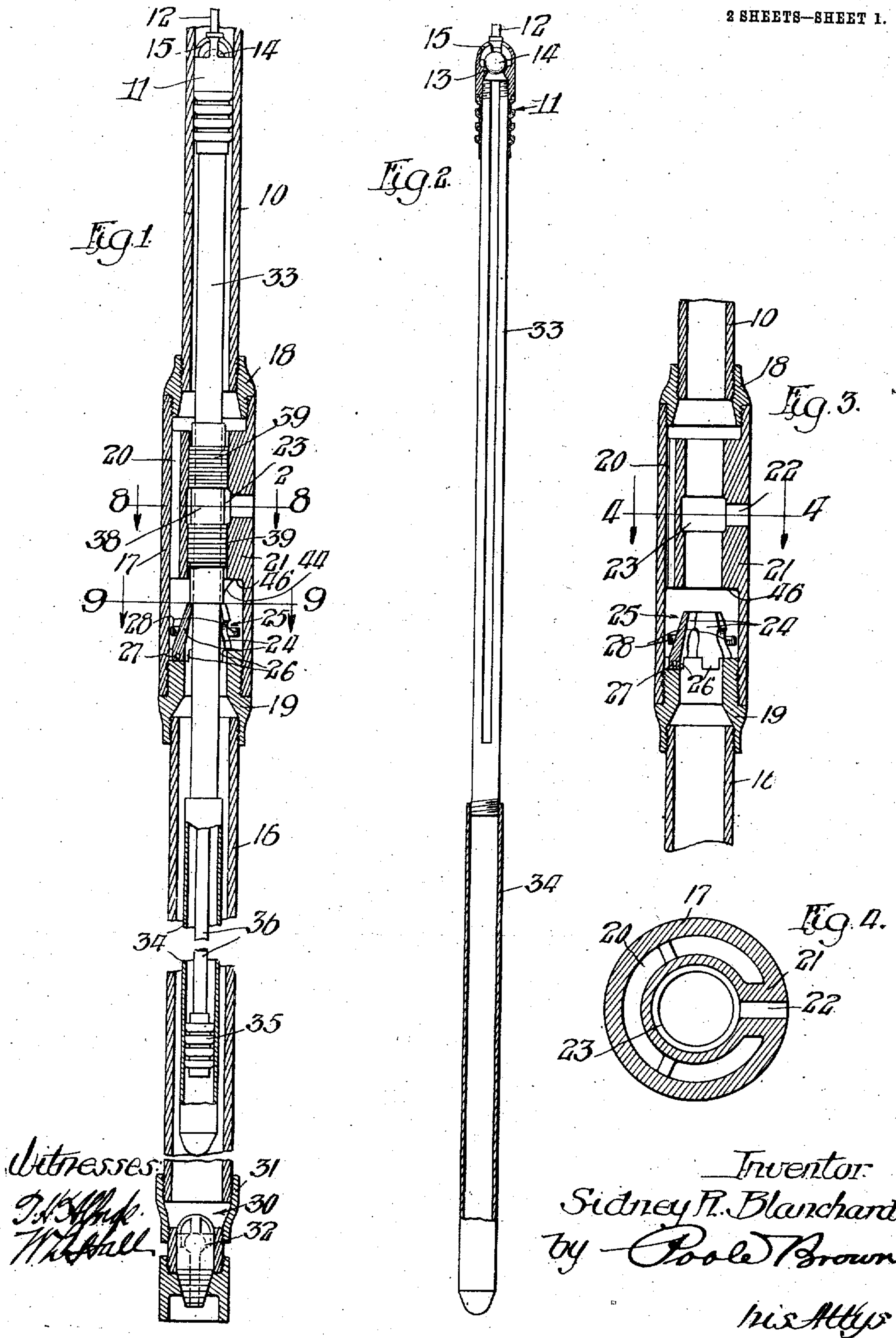
No. 876,618.

PATENTED JAN. 14, 1908.

S. R. BLANCHARD.  
PUMP.

APPLICATION FILED DEC. 11, 1906.

2 SHEETS—SHEET 1.



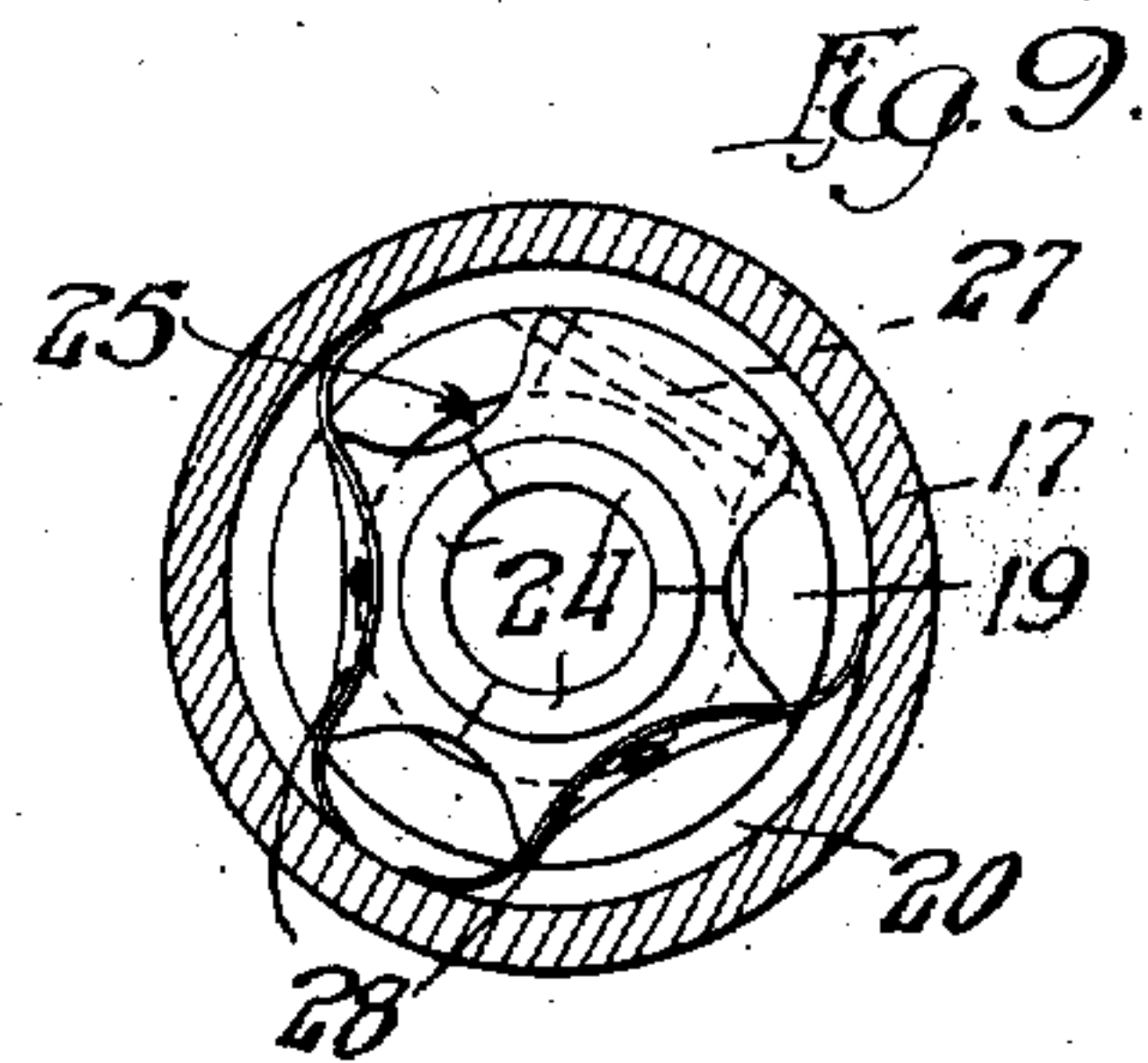
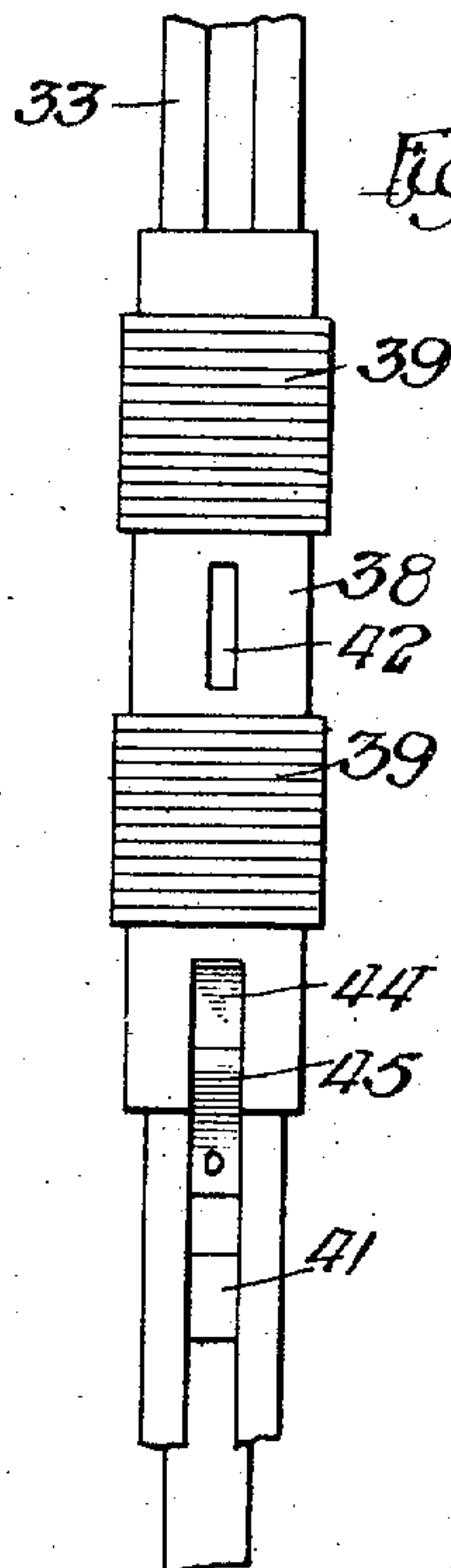
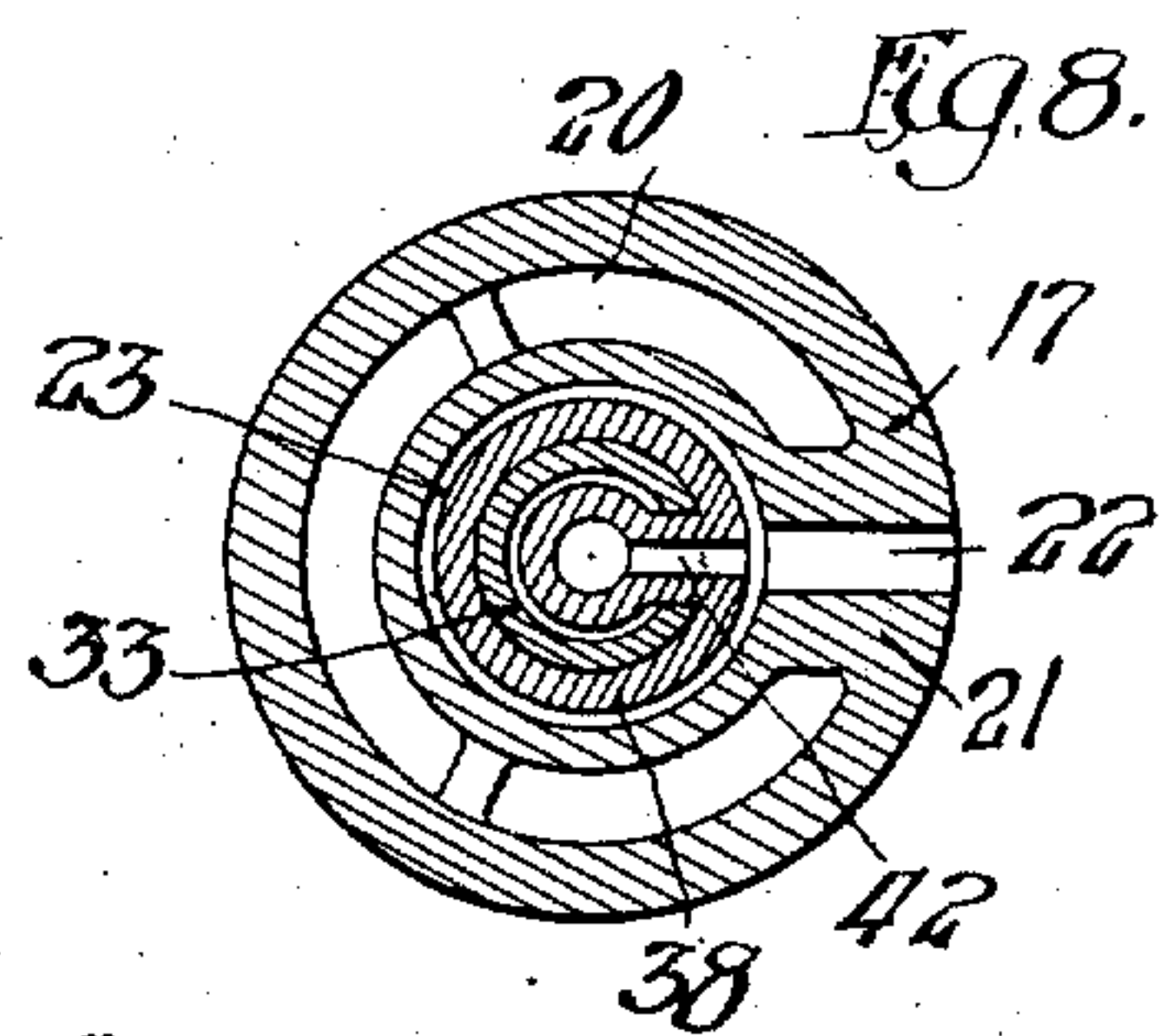
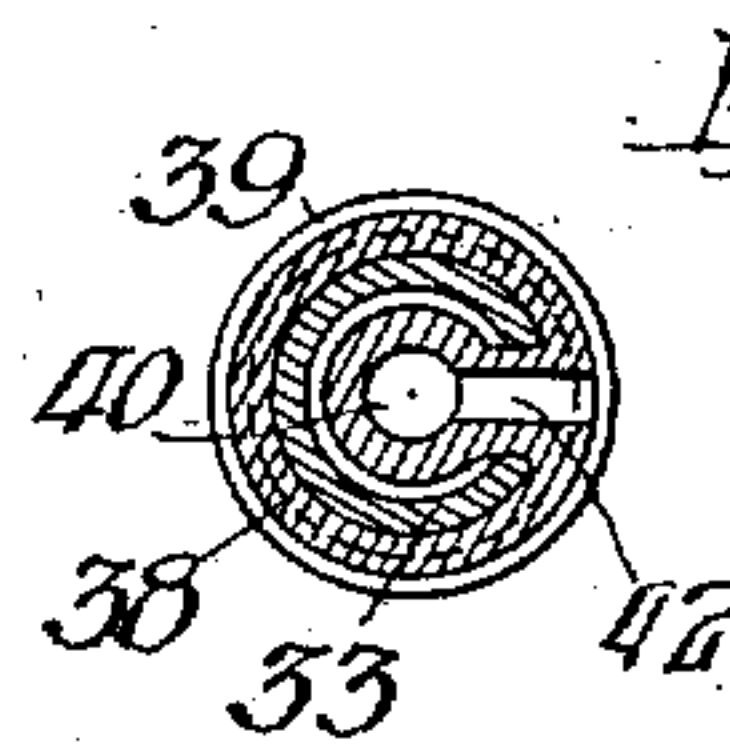
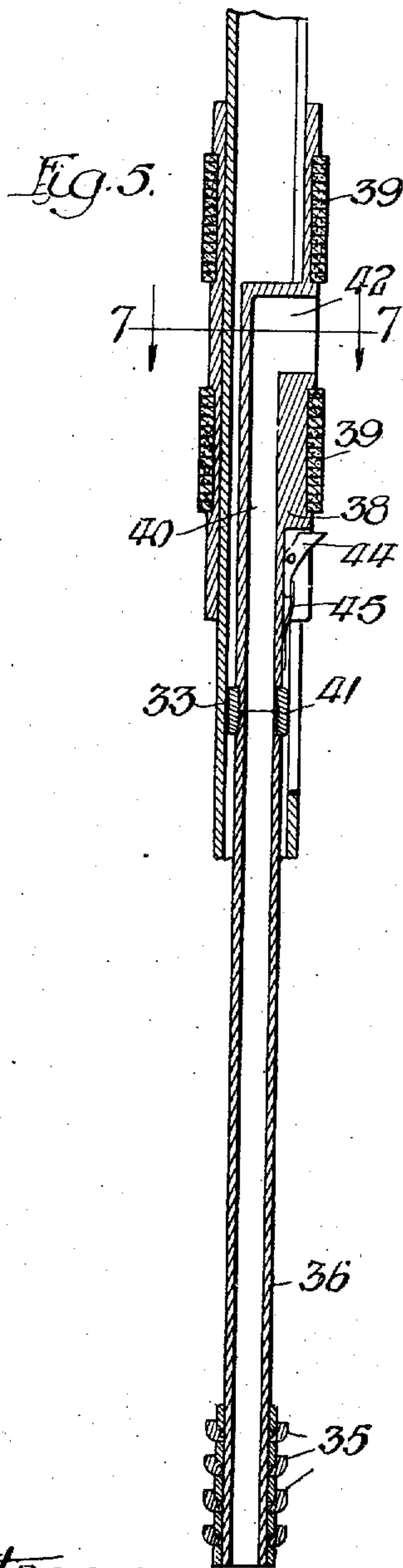
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2 SHEETS—SHEET 2.



Witnesses:  
J. H. Lynde  
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Inventor:  
Sidney R. Blanchard  
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his Attys



# UNITED STATES PATENT OFFICE.

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## PUMP.

No. 876,618.

Specification of Letters Patent.

Patented Jan. 14, 1908.

Application filed December 11, 1906. Serial No. 347,339.

*To all whom it may concern:*

Be it known that I, SIDNEY R. BLANCHARD, a citizen of the United States, and a resident of Ottawa, in the county of LaSalle and State of Illinois, have invented certain new and useful Improvements in Pumps; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in pumps and refers more specifically to that class of pumps provided with an auxiliary cylinder secured to and movable with the single acting lift piston of the pump and operating in connection with a fixed piston to produce a flow of liquid during the down-stroke of the pump piston and thereby increase the capacity of the pump.

Among the objects of my invention is to improve the construction and operation of pumps of this type and to provide a construction wherein the pumping mechanism may be lifted from the pump cylinder without removing the cylinder. Said improvements are herein shown as applied to a pump designed more specifically for deep well pumping such, for instance, as pumping oil from oil wells, and the improvements are capable of demonstrating their more superior advantages in this capacity.

In the drawings:—Figure 1 is an axial section of the pump cylinder and its extension, showing in elevation the pumping mechanism. Fig. 2 is a view partly in side elevation and partly in section of the pump piston, the plunger-barrel and the slotted tube connecting the same. Fig. 3 is an axial section of the connection or coupling for connecting the cylinder with the extension. Fig. 4 is a cross-section, taken on line 4—4 of Fig. 3. Fig. 5 is an axial section of the stationary piston, its rod and holder, showing also a portion of the slotted tube extending through said holder. Fig. 6 is a side elevation of the stationary piston holder and parts immediately associated therewith. Fig. 7 is a cross-section, taken on line 7—7 of Fig. 5. Figs. 8 and 9 are cross-sections, taken on lines 8—8 and 9—9, respectively, of Fig. 1.

As shown in the drawings, 10 designates the cylinder or barrel of a pump, and 11 the usual reciprocating piston therein, connected

with the lower end of a pump-rod 12 which is designed for connection at its upper end with the pump actuating mechanism. Said piston is made hollow and is provided with a seat 13 through which communication is had from one side to the other of the piston. The passage in the piston is closed by a suitable form of valve 14 herein shown as consisting of a ball-valve, which is inclosed in a cage 15 carried by the piston. The rod 12 is herein shown as connected with said cage.

16 designates a cylindric extension of the cylinder 10, it being of slightly greater diameter than said cylinder 10. The cylinder and extension are connected by means of a tubular connecting piece 17 of special form which is joined to the cylinder and extension by screw-threaded fittings 18 and 19 respectively. The said coupling 17 is provided, radially outside of its bore, with passages which afford communication between the cylinder 10 and extension 16 when the central passage of said connection is closed, as will more fully appear hereinafter. The connection is provided at one side with a thickened wall 21 having a port 22 through which communication is afforded between the outer and inner side of the cylinder, said port opening into an annular groove 23 formed in the inner wall of the fitting.

24 designates, as a whole, a hollow expandible seat within said connection, composed of a plurality of segments 25 that are hinged at their lower ends in the upper end of the fitting 19 and are designed by spring pressure to rest against each other to form an upwardly facing supporting seat, but are capable of being spread apart to enlarge the opening therein to permit parts to pass therethrough as will hereinafter appear. The hinge connections for said segments comprise lugs 26 thereon entering suitable recesses in the fitting 19 and hinged thereto by means of pins 27. Springs 28 attached to the outer faces of the segments and bearing against the cylindric inner wall of the coupling hold the segments normally inwardly toward each other.

30 designates the hollow stand-valve, of ordinary type, located at the lower end of the extension cylinder 16 in a fitting 31, said valve comprising the usual casing that has screw-threaded engagement with said fitting and a ball-closure 32 controlling the opening in said casing.

33 designates a slotted tube attached at its



upper end to the piston 11 and extending downwardly therefrom and rigidly connected to and communicating with a plunger-barrel 34 that is movable up and down in the extension 16 in unison with said piston 11.

35 designates a stationary piston within the plunger barrel 34. It is mounted on the lower end of a hollow stationary piston-rod 36 that is fixed relatively to the cylinder extension 16. As herein shown, said stationary piston 35 is carried by what is hereinafter termed a piston-holder 38 that fits closely within the central bore of the connection 21 and is detachably locked therein. The said piston-holder fits closely within said connection so as to separate the cylinder from the cylinder extension through the central bore of said connection. Suitable packing 39 surrounds said stationary piston-holder above and below the annular recess 23 in the connection 21. The holder 38 is formed with a central passage 40 that communicates with and is disposed in axial extension of the bore of the hollow, stationary piston-rod 36. The said holder is shown as made of cast-metal and the hollow stationary piston-rod is attached thereto by a coupling 41. The upper end of the central passage 40 of said holder communicates with one or more laterally directed ports 42 located between the packing rings 39, 39, and said ports discharge into the annular recess 23 through which they communicate with the port 22. The slotted tube 33 is encircled by the piston holder 38, through which latter said tube works freely up and down without packing. The slot in said tube is made of a width to pass over the solid part of the holder in which is formed the port 42, whereby said tube may work freely within the hollow holder, while at the same time inclosing said stationary piston rod and permitting communication between said hollow piston rod and the port 22 of the connection 17. The said piston holder rests at its lower end on the upper end of the expansible seat 24. Thus the expansible seat predetermines the lowermost position of the holder and the stationary piston carried thereby. Said stationary piston holder and the parts carried thereby are held from rising by means of a swinging, spring-pressed locking pawl 44 that is pivoted to the stationary piston holder and is adapted, under the influence of a spring 45, to spring out into engagement with a downwardly facing shoulder 46 in the connection when the holder is lowered in place.

In order to insert the slotted tube 33 through the stationary piston holder, and at the same time insert the stationary piston and its rod in the plunger barrel 34 and the slotted tube 33, the stationary holder is disconnected from the piston rod 36 at the coupling 41 and the slotted tube is disconnected

at its upper end from the piston 11, and at its lower end is disconnected from the plunger barrel 34. The stationary piston holder is then inserted over the upper end of the slotted tube and down to the lower end thereof, the locking pawl 45 passing through the slot of said tube, which slot opens to the extreme upper end of the tube. The piston holder is thereafter attached to the stationary piston rod 36 at the coupling 41, the stationary piston and its rod is inserted into the plunger barrel and the slotted tube is connected with the plunger barrel 34 at its lower end and with the piston 11 at its upper end. The said mechanism is now ready to be inserted in place in the cylinder and cylinder extension.

In installing the pump the lower end of the extension 16 is connected by means of the coupling shown at said lower end with the usual perforated tube or screen and such anchor tubing as may be desired. Sufficient tubing is then attached to the upper end of the barrel 10 to lower it into the well to the depth desired. If the standing valve has not already been inserted, it is placed in the usual manner, as by means of a rod inserted through the tubing, into the cylinder and its extension. When it arrives at the expansible seat 24 as it is being lowered the conical advance end thereof spreads the segments of said seat, thus permitting the valve to pass and to be inserted into place. The interior mechanism, comprising a plunger barrel, the stationary piston therein, the stationary piston-holder, the piston 11, and its slotted tube connecting the piston 11 and plunger barrel, are then inserted in place by means of the usual pump rod. As this mechanism enters the upper end of the coupling 17 the lower tapered closed end of the plunger barrel 34 opens the expansible seat 24 which permits the plunger barrel to pass through the device. Thereafter the segments of the seat close around said plunger-barrel as it moves downwardly therethrough and around the descending slotted tube 33, until said parts are arrested by engagement of the expansible seat with the lower end of said stationary piston holder. When the stationary piston-holder enters the barrel or cylinder 10, the close fit of the packing 39 therein requires force to press the holder through said cylinder. The holder thus remains stationary until the descending piston 11 strikes the same. Thereafter the weight of the pumping rod above forces the piston-holder through the barrel 10 and the connection 17 until the said stationary piston-holder rests on the seat 24. By reason of the square or abrupt lower end of the piston-holder, said seat is not expanded but arrests said holder and supports it in this position. During the passage of the holder through the connection, the locking-pawl 45 has been pressed in-



wardly, but when said holder reaches the seat the pawl springs outwardly under the shoulder 46 in the connection, whereby said piston holder is held, not only from descent but from rising. The pump-rod is then connected with the pump actuating mechanism above and the pump is ready for action. The piston 11, when thus inserted in the barrel, is at the downward limit of its down-stroke, and when the pump is started, the said piston and the plunger barrel 34 are raised upwardly to the upward limit of their stroke. The stationary piston 35 remains stationary in the plunger barrel 34 and on the first up-stroke of the plunger barrel, fluid or air contained in the lower end of the plunger barrel passes upwardly and outwardly through the hollow stationary piston and its rod to and through the port 22 of the connection 17. During such up-stroke of the piston the lowering of the pressure in the cylinder and its extension permits the standing-valve to open and liquid enters the said cylinder and extension. On the succeeding down-stroke of the parts the liquid between the piston-holder 38 and the piston 11 passes, in the ordinary manner, through the valved piston 11 to the upper side of said piston. At the same time the fluid in the extension cylinder 16 is displaced by the descent of the plunger barrel 34 and, inasmuch as no other avenue of escape for said fluid is provided, said fluid passes upwardly through the by-passes 20, through the slotted piston-rod 33, and the valved piston 11, to the upper side of the latter piston and the effect of such down-stroke is to produce an upward flow of the liquid and its discharge from the pump outlet equal to the quantity of liquid displaced by the descent of the plunger barrel. During such down-stroke of the plunger-barrel, the interior of the plunger-barrel below the stationary piston fills with air or with fluid through the ports 22 and 42 and the hollow piston-rod 36, thereby avoiding the formation of a vacuum in said plunger barrel below said stationary piston. If the cylinder and its extension be submerged in the liquid up to the level of the port 22, said plunger barrel will be filled with liquid; otherwise it will be filled with air. In cases where no provision be made for the admission of air or liquid to the plunger barrel below the stationary piston 35 on the down stroke of the movable piston, the vacuum produced between the piston 35 and the lower end of the plunger barrel 34 may be overcome by adding weight to the pump rod or by the exertion of additional power on the down stroke of the piston. It will thus be observed that during the down-stroke of the piston 11, liquid is transferred from the lower to the upper side of said piston in the usual manner of a single acting lift-pump and that during the succeeding up-stroke thereof, said piston operates to

lift the column of liquid above the same and discharge the liquid therefrom in accordance with the displacement represented by the travel of the piston. In addition to this usual action of the piston 11 an auxiliary flow of liquid is produced during the down-stroke of the pump corresponding to the displacement effected by the descending plunger barrel 34, such auxiliary flow passing upwardly through the by-passes 20, and through the valved piston 11 to the outlet or spout of the pump. The passages through the piston 11 and the standing-valve at the lower end of the cylinder extension are made larger than valves of ordinary lift-pumps to accommodate the increase flow of liquid.

The interior mechanism of the pump arranged as described may be completely withdrawn from the upper end of the pump cylinder and extension without the necessity of withdrawing or disturbing the cylinder and the tubing above the same, the said cylinder being open at its upper end and made of a diameter to permit the withdrawal of the pump mechanism. Such withdrawal of the parts is effected by upward pull on the pump rod 12, the parts attached thereto necessarily following. As the mechanism is raised, the holder 38 remains stationary until the lower wall of the slot at the lower end of the tube 33 strikes the locking pawl 45. Thereupon the inclined lower face of said pawl engages said lower slot wall and it is caused to swing inwardly past the shoulder 46 of the holder, to disengage the same, whereupon the parts of the mechanism are free to be lifted from the cylinder as will be obvious. The arrangement whereby said parts may be lifted from the cylinder without removing the latter is of considerable importance, inasmuch as it greatly decreases the work required to repair or replace said parts of the mechanism or to repair or replace the standing-valve at the lower end of the cylinder extension.

The barrel of the pump, while shown as made of two parts connected by the coupling 17 may, in some instances, be structurally regarded as a single piston barrel having means for fastening therein the stationary piston-holder in such manner that the pumping mechanism, including the stationary piston, may be removed from the cylinder. I do not wish to be limited to this, or other structural details except as hereinafter made the subject of specific claims.

I claim as my invention:—

1. In a pump, the combination with the pump barrel provided with a valve at its lower end, of a valved piston reciprocating in the upper end of the barrel, a plunger barrel reciprocating in the lower end thereof and connected to and movable with the piston, a stationary piston in said plunger barrel, and means for removably locking said stationary piston in place.



2. In a pump, the combination with the pump barrel provided with a valve at its lower end, of a valved piston reciprocating in the upper end of the barrel, a plunger barrel reciprocating in the lower end thereof and connected to and movable with the piston, and a stationary piston removably fixed in said plunger barrel, said barrel being constructed to permit withdrawal of the pumping mechanism upwardly through the upper end thereof.

3. In a pump, the combination with the pump barrel provided at its lower end with a valve, of a valved piston reciprocating in the upper end of the barrel, a plunger barrel reciprocating in the lower end thereof, a stationary piston within said plunger barrel, a rod connecting the reciprocating piston with said plunger barrel, and a holder within the pump barrel carrying said stationary piston through which holder said rod reciprocates.

4. In a pump, the combination with the pump barrel provided at its lower end with a valve, of a valved piston reciprocating in the upper end of the barrel, a plunger barrel reciprocating in the lower end thereof, a stationary piston within said plunger barrel, a holder within the pump barrel which carries the stationary piston, means for releasably locking said piston holder within the barrel, and a rod connecting said reciprocating piston with the plunger barrel and sliding through said holder, the cylinder being constructed to permit the pumping mechanism to be withdrawn upwardly through the upper end thereof.

5. In a pump, the combination with the pump barrel provided at its lower end with a valve, of a valved piston reciprocating in the upper end of said barrel, a plunger barrel reciprocating in the lower end thereof, a rod connecting the reciprocating piston with said plunger barrel, a stationary piston in the plunger barrel, and a holder carrying said stationary piston, through which said rod slides, said piston holder dividing the pump barrel into upper and lower parts, and a by-pass connecting said parts around the piston holder.

6. A pump comprising a barrel made of an upper cylinder and a lower cylinder extension connected by a hollow coupling, a valve at the lower end of said cylinder extension a reciprocating valved piston in the cylinder, a plunger barrel reciprocating in said extension, a stationary piston in said plunger barrel, a holder releasably locked in said coupling and carrying said stationary piston, and a tube attached rigidly at its ends to said reciprocating piston and plunger barrel and sliding through said piston holder.

7. A pump comprising a barrel made of an upper cylinder and a lower cylinder extension connected by a hollow coupling, a valve at the lower end of said cylinder extension a

reciprocating valved piston in the cylinder, a plunger barrel reciprocating in said extension, a stationary piston in said plunger barrel, a holder releasably locked in said coupling and carrying said stationary piston, a tube or rod attached rigidly at its ends to said reciprocating piston and plunger barrel and sliding through said piston holder, and a by-pass in said coupling or connection connecting the cylinder with the cylinder extension.

8. A pump comprising a barrel composed of an upper cylinder and a cylinder extension connected by a hollow coupling, a valve at the lower end of said cylinder extension a valved piston reciprocating in the cylinder, a reciprocating plunger barrel in the cylinder extension, a stationary piston in said plunger barrel, a piston holder in said coupling carrying said stationary piston, a tube or rod extending between and rigidly connecting the said reciprocating piston and plunger barrel, and sliding through said piston holder, an expansible seat in the coupling for supporting said piston holder, and a releasable lock in said coupling for preventing said piston holder from rising.

9. A pump comprising a barrel composed of an upper cylinder and a lower cylinder extension connected by a hollow coupling, a valve at the lower end of said cylinder extension a valved piston reciprocating in said upper cylinder, a plunger barrel reciprocating in the cylinder extension, a tubular stationary piston in said plunger barrel provided with a hollow rod, a holder releasably locked in said coupling to which said rod is fixed, and a rod or tube connecting said reciprocating piston and plunger barrel and sliding in said holder, said holder and the coupling being provided with registering ports which communicate with the hollow rod of the stationary piston and through the hollow piston to the interior of the plunger below said piston.

10. A pump comprising a barrel composed of an upper cylinder and a lower cylinder extension connected by a hollow coupling, a valve at the lower end of said cylinder extension a valved piston reciprocating in said upper cylinder, a plunger barrel reciprocating in the cylinder extension, a slotted tube connecting said piston and plunger barrel, a stationary piston in said plunger barrel, a holder in the coupling to which the rod of the stationary piston is fixed and through which the hollow-slotted tube slides, an expansible seat in the coupling on which the holder rests, and a spring pawl carried by the holder and projecting through the slot of said tube for engagement with a downwardly facing shoulder in said holder.

11. In a pump, the combination with the pump barrel provided with a valve at its lower end, of a valved piston reciprocating in



the upper end of the barrel, a plunger barrel reciprocating in the lower end thereof and connected to and movable with the piston, a stationary piston in said plunger barrel, means for removably locking said stationary piston in place, and means actuated by force exerted to withdraw the pumping mechanism from the barrel to release said locking means.

10 12. In a pump, the combination with a pump barrel provided with a valve at its lower end, of a valved piston reciprocating in the upper end of the barrel, a plunger barrel reciprocating in the lower end thereof

15 and connected to and movable with the pis-

ton, a stationary piston in said plunger barrel, and means for removably locking said stationary piston in place, said pump barrel being open at its upper end and of a diameter to permit the piston and plunger barrel to be removed upwardly from the barrel.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 3 day of December A. D. 1906.

SIDNEY R. BLANCHARD.

Witnesses:

A. C. MANTELL,  
M. O'BRIEN.