(No Model.)

# F. C. WILSON.

## LIFT FORCE PUMP.

No. 555,989. Patented Mar. 10, 1896.

Fig. 1

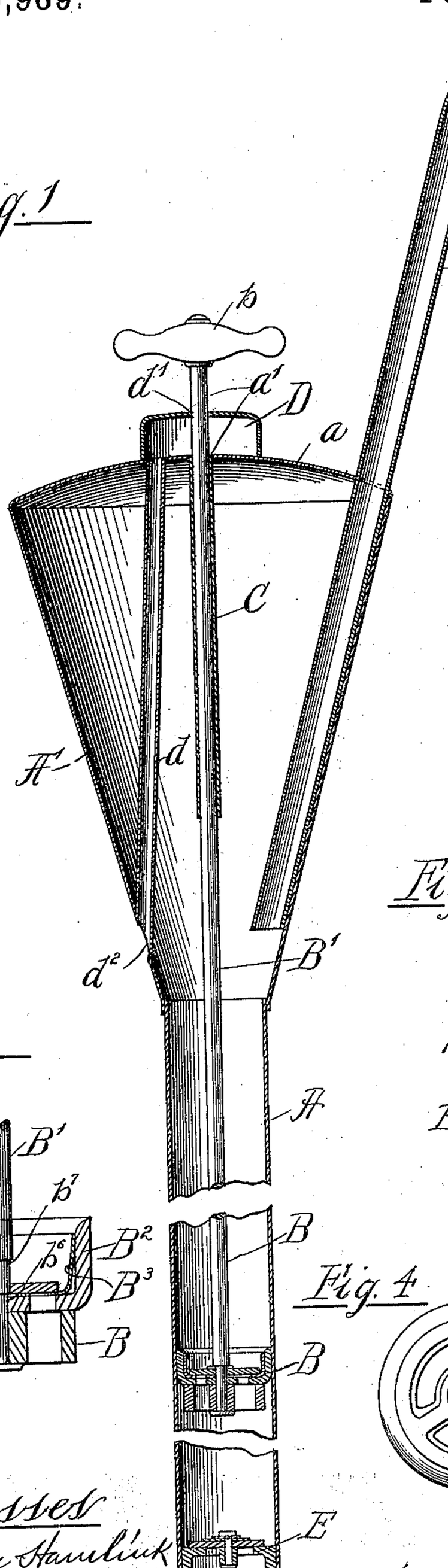



Fig. 3

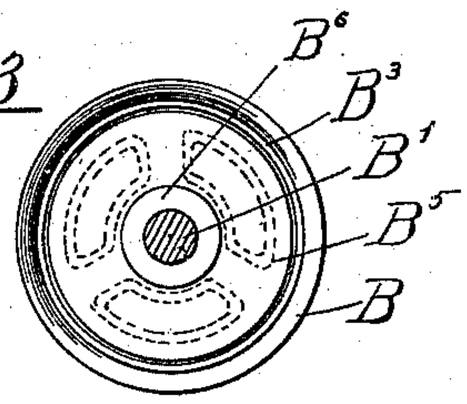



Fig. 2

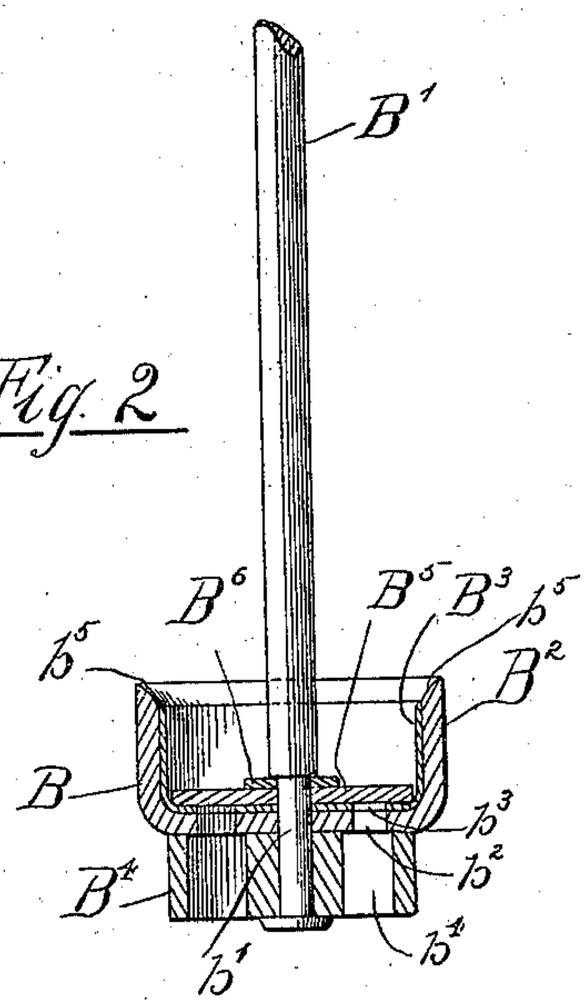



Fig. 5

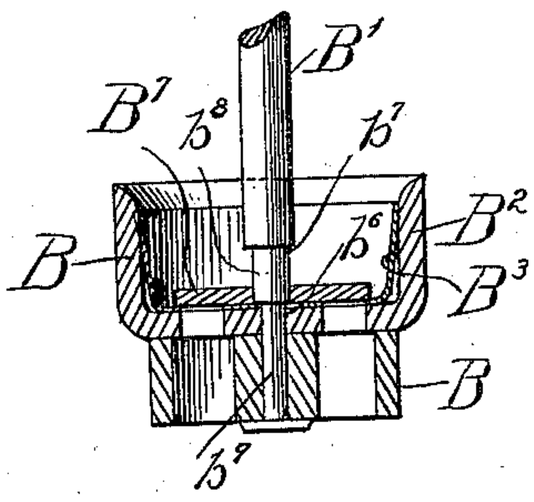
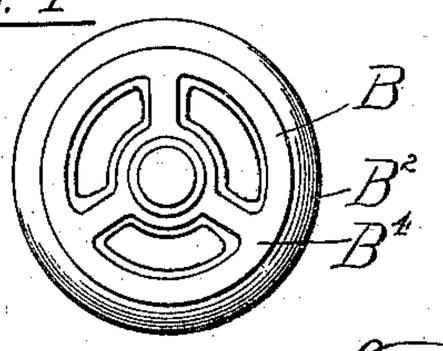



Fig. 4

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# UNITED STATES PATENT OFFICE.

F CORTEZ WILSON, OF CHICAGO, ILLINOIS.

## LIFT FORCE-PUMP.

SPECIFICATION forming part of Letters Patent No. 555,989, dated March 10, 1896.

Application filed July 29, 1895. Serial No. 557,542. (No model.)

*To all whom it may concern:*

Be it known that I, F CORTEZ WILSON, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Lift Force-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 pertains to improvements in lift force-pumps of that class which are commonly employed for pumping oil or the like from the barrel or tank in which it is stored. Lift-pumps of this variety usually comprise a tubular casing closed at its upper end and provided with a discharge-passage which leads out of the casing from a point some distance below the top wall thereof. That part of the casing above the lower end of the discharge-passage constitutes the air-chamber of the pump, and the casing is, therefore, preferably enlarged at its upper end to provide an air-chamber of ample capacity. Below the air-chamber the casing is made of cylindric shape and is provided with a valved plunger or piston, which is secured to the lower end of a piston or plunger rod and is adapted to be reciprocated thereby. Said rod extends upwardly through the casing and out through an aperture in the top wall thereof, and to prevent leakage around the rod at its point of exit a stuffing-box is usually employed. The use of a stuffing-box, however, is highly objectionable in devices of the character under consideration, since it adds materially to the cost of manufacture, must be kept carefully packed in order to be effective, and tends to bind the rod and render the pump difficult to operate, particularly on the downstroke, when the rod is apt to spring and chatter.

A main object of my present improvement, therefore, is to obviate the necessity of using a stuffing-box in this connection, and at the same time to provide a construction which is cheaper to manufacture and easier to operate.

My invention consists in the matters herein set forth and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a longitudinal section of a pump embodying my invention. Fig. 2 is an enlarged sectional detail of the valved plunger. Fig. 3 is a top plan detail of the plunger. Fig. 4 is a bottom view thereof. Fig. 5 is a view similar to Fig. 2 of a form of plunger somewhat modified from that previously shown.

In said drawings, A designates the lower or cylinder portion of the casing, and A′ the enlarged upper portion or air-chamber thereof, the latter being commonly made of funnel shape, as herein shown.

$A^2$ is the discharge-spout, which extends upwardly within the air-chamber A′ from a point near its lower end and passes out of the casing through the top wall *a* thereof, the tube of the spout being soldered or otherwise sealed to said wall where it passes through the same to prevent leakage at this point.

B designates a valved plunger fitting within the cylindric portion or cylinder A of the casing and secured to the lower end of a reciprocatory plunger-rod B′. The latter extends longitudinally upward through the center of the casing and out through an aperture *a′* in the top wall *a*, and is provided at its upper end with a handle *b*, by means of which it may be readily reciprocated.

Depending from the edges of the aperture *a′* and fitting closely around the rod B′ is an elongated tubular sleeve C, which is preferably made from a piece of brass tubing and is soldered or otherwise sealed to the top wall *a*. Said tube or sleeve C is made to fit the rod B′ as closely as is possible without binding the latter, and being of relatively great length affords a long close bearing for said rod which prevents the escape of any considerable amount of the oil or other liquid around the same as it passes from the casing. Whatever slight leakage may occur at this point is then received within a small closed chamber D from which a drainage-tube *d* leads downwardly through the air chamber and opens out of the casing at any suitable point of discharge.

The chamber D is preferably formed by soldering a drawn-metal cap centrally upon the top wall *a* of the casing, and the plunger B′ passes freely up through the chamber and out through an aperture *d′* in the top wall of the cap.

The pump is provided at the lower end of the cylinder A with the usual inlet-valve E, and operates substantially like other pumps of this class. The plunger-rod B′, however, works much more easily in the sleeve C than through the usual packed stuffing-box, and the minute quantity of oil which works through said sleeve around the rod only serves to lubricate the latter, so as to render the operation of the pump still easier. The sleeve C, furthermore, not only does not bind the rod, but furnishes a long guide which prevents said rod from buckling or bending under a downward pressure on the handle *b* and insures a smooth and easy reciprocatory movement thereof. Whatever oil does escape through the sleeve C is received within the chamber D and immediately trickles down through the drain-tube *d* and down the outside of the pump-casing back into the barrel or tank again. As herein shown, the drain-tube *d* extends almost vertically downward and opens out of the casing at a point $d^2$ just above the top of the cylinder A, but the exact point at which it discharges is obviously immaterial.

Preferably, and as herein shown, the tubular sleeve C is extended downwardly within the air-chamber nearly as far as the spout $A^2$, so that the escape of air through said sleeve will be completely cut off by the rise of the oil within the chamber before the effective capacity of the latter is materially reduced, it being obvious that the portion of the air-chamber above the lower end of the sleeve forms a sealed pocket from which no air can possibly escape after said lower end of the sleeve is covered. With this construction, therefore, the pump may be operated indefinitely without having the effectiveness of the air-chamber reduced by the gradual leakage of air around the plunger, even if the parts should have become so worn as to permit a considerable leakage of the liquid.

The valved plunger B of the pump thus described may obviously be of any suitable or usual type, so far as the features of improvement thus far described are concerned, and as ordinarily made such valve consists of a flexible disk of leather or similar material which is fastened at its center to the upper face of a perforated metallic frame or spider that is itself secured to the lower end of the plunger-rod. When the plunger is depressed, such flexible disk bends upwardly about its central fastening and permits the liquid to flow by the plunger around the margin of said disk. When the plunger is raised said disk closes down against its supporting-spider and engages the wall of the cylinder with its peripheral margin in such manner as to prevent the backward flow of liquid past the plunger. Inasmuch, therefore, as the entire wear upon a plunger of this character comes upon the margin of the flexible disk, the latter is rapidly worn out and must be frequently replaced in order to preserve the effective action of the pump. Especially is this true in those pumps which are used for pumping kerosene-oil and similar hydrocarbons, as such liquids speedily absorb the oil from the leather and render it stiff and inflexible, so that the edges of the disk no longer hug the wall of the cylinder when the plunger is lifted. To obviate these defects, therefore, I have, as a further improvement, designed the novel plunger herein illustrated, and which is constructed as follows: $B^2$ designates a cup-shaped washer, preferably made by forcing a piece of wet leather into a suitable die or former and permitting it to dry in said former, so as to permanently assume the shape thereof. $B^3$ is a metallic cup, which is conveniently stamped from sheet metal and is made of proper diameter to fit closely within the washer $B^2$. Said washer and cup are perforated centrally to receive the reduced end *b′* of the plunger-rod B′ and are secured thereon by means of a circular metallic spider $B^4$, the end *b′* of the plunger-rod being also passed through a central aperture in said spider and riveted over at its extremity to retain said spider in place. $B^5$ designates a flexible leather disk placed concentrically in the bottom of the metallic cup $B^3$ and secured on the rod B′ between said cup and a small washer $B^6$, that abuts on the shoulder formed at the base of the reduced end *b′* of the rod. Said disk normally covers and closes a plurality of interior ports, in this instance three in number, formed in the plunger by registering apertures $b^2$, $b^3$ and $b^4$, provided respectively in the washer $B^2$, cup $B^3$, and spider $B^4$. The cup-shaped washer $B^2$ of the plunger thus described is made of proper exterior diameter to fit closely within the cylinder A of the pump and is constantly held against the wall of said cylinder by its inner metallic cup $B^3$. Inasmuch, however, as said washer is strongly supported against downward pressure by the spider $B^4$, and at the same time offers a very considerable area of bearing-surface to engage the cylinder-wall, the wear upon the washer is almost imperceptible, and it will endure indefinitely, even if under constant use. The disk $B^5$ is entirely relieved from any marginal or rubbing friction and is consequently also extremely durable. The slip or escape of liquid past the plunger on its upward or working stroke is furthermore substantially obviated, since the increase of pressure above the plunger will simply tend to force the washer $B^2$ more closely against the cylinder-wall, especially when, as in this instance, the edges $b^5$ of said washer are extended slightly above the edges of the cup $B^3$ and are beveled off to more effectively hug the cylinder under the action of such pressure. The efficiency, as well as the durability of the plunger is, therefore, very great, and such efficiency will remain practically unimpaired throughout the life of the pump.

In Fig. 5 I have shown a modified construction of plunger in which an inner valve-disk

B$^7$, instead of being made flexible like the disk B$^5$, is made to lift bodily to uncover the plunger-ports in the downstroke of the piston. The plunger-rod B′ in this case is provided with a shoulder $b^6$ which engages the inner metallic cup B$^3$ and in connection with the riveted end of the plunger-rod serves to clamp the washer B$^2$, cup B$^3$, and spider B$^4$ together. The disk B$^7$ is perforated centrally to slide freely on the rod above the shoulder $b^6$ and is limited in its upward movement by a second shoulder or stop $b^7$. Said two shoulders $b^6$ and $b^7$ are herein shown as conveniently formed by milling down the end of the rod to form a reduced portion $b^8$ on which the disk B$^7$ slides, and a still smaller extremity $b^9$ which engages the fixed parts of the plunger, as before described. The disk B$^7$ is made sufficiently smaller in diameter than the cup B$^3$ to afford a free water-way around the disk when lifted. When dropped to its seat the disk covers and closes the plunger-ports and prevents any escape of liquid therethrough on the upstroke of the plunger.

I claim as my invention—

1. A pump having a casing comprising a cylinder and an air-chamber in open communication with said cylinder at the upper end of the latter, a plunger fitting within the cylinder, a plunger-rod attached to the plunger and extending upwardly through the top wall of the air-chamber, a long tubular sleeve depending from said top wall and fitting closely about said rod, a drip-chamber on said top wall above the sleeve and an open drain-tube leading downwardly through said air-chamber from the drip-chamber and discharging out through the wall of the casing, substantially as described.

2. A lift force-pump having a casing comprising a cylinder and an air-chamber in open communication with said cylinder at the upper end of the latter, a valved plunger fitting and reciprocating within said cylinder, a plunger-rod attached to said plunger and extending upwardly through the air-chamber and out and through an opening in the top wall thereof, a long tubular sleeve depending from said top wall and fitting closely about said rod, an exterior drip-chamber located on said top wall above the sleeve and about the plunger-rod and a drain-tube leading downwardly from said drip-chamber through the air-chamber and discharging out through the wall of the latter, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 8th day of July, A. D. 1895.

F CORTEZ WILSON.

Witnesses:
HUGH CUNNINGHAM,
B. A. PRICE.