(No Model.) 2 Sheets—Sheet 1.

J. N. McLEAN.

AIR PUMP.

No. 532,985. Patented Jan. 22, 1895.

Fig. 1.

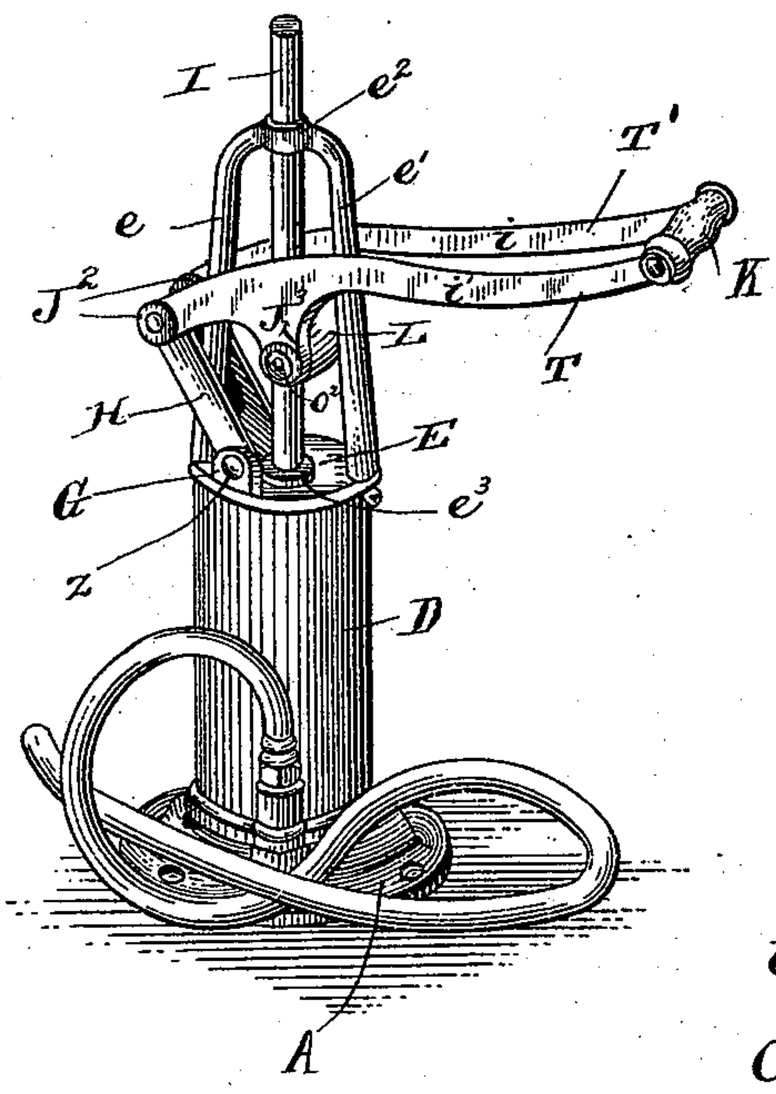


Fig. 2.

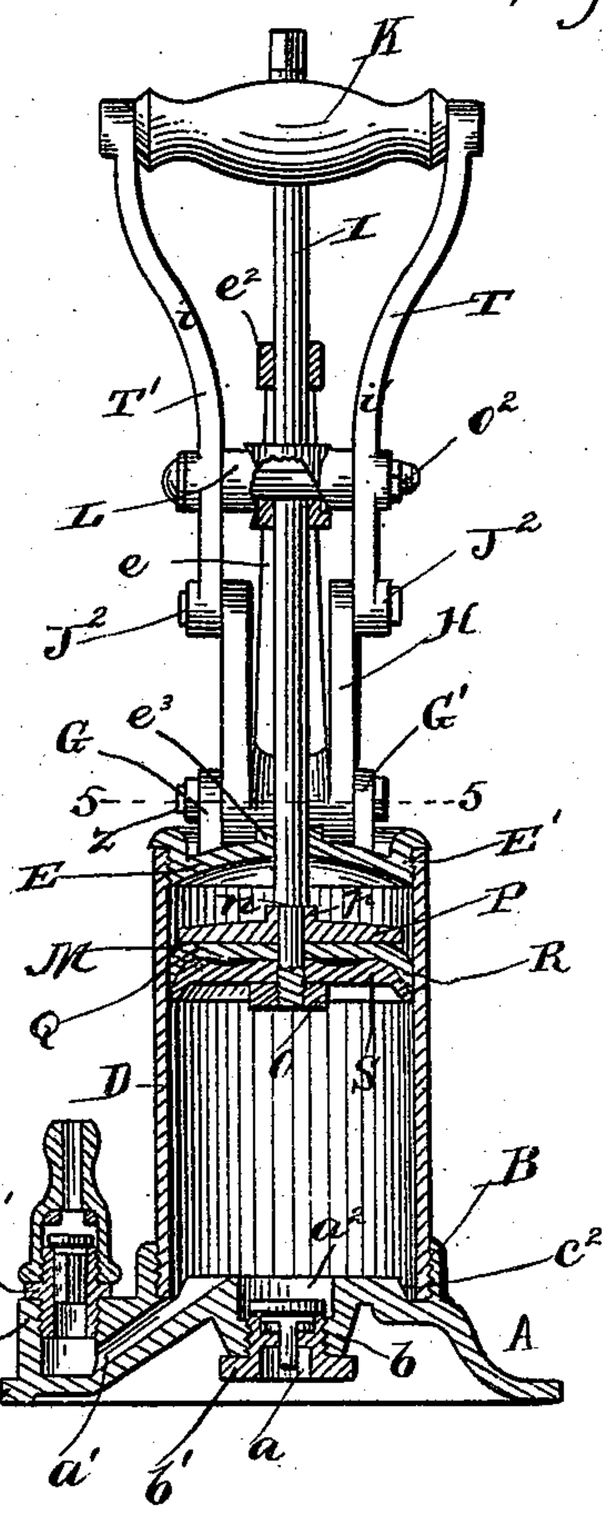
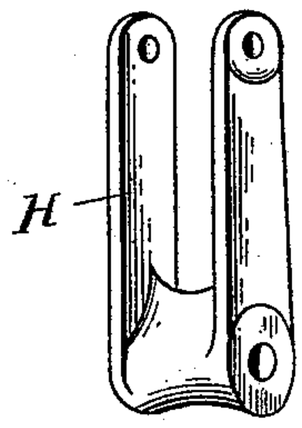


Fig. 6.



WITNESSES:

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J. E. U. Bowen

INVENTOR:

Jno. N. McLean

(No Model.) 2 Sheets—Sheet 2.

J. N. McLEAN.

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Fig. 3.

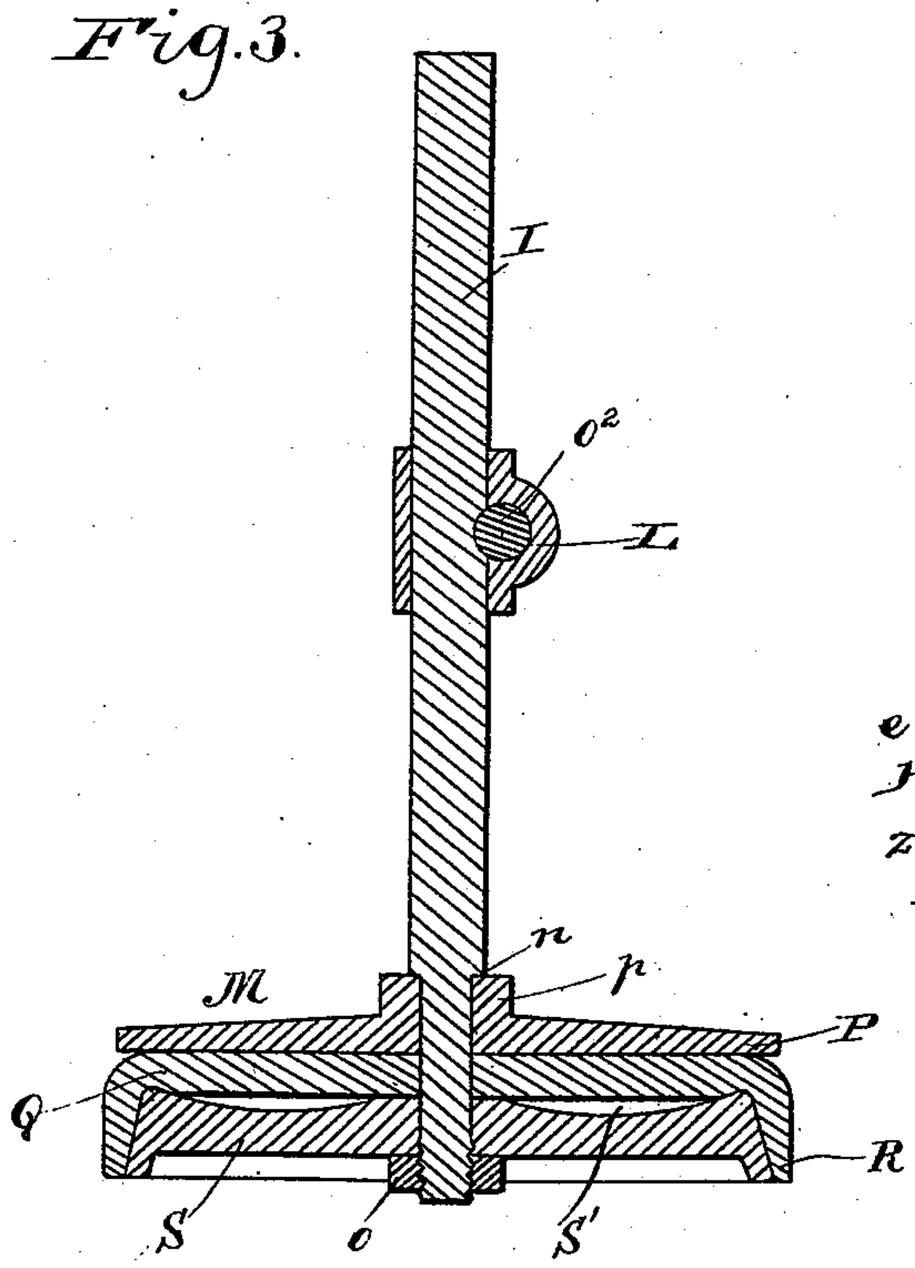


Fig. 4.

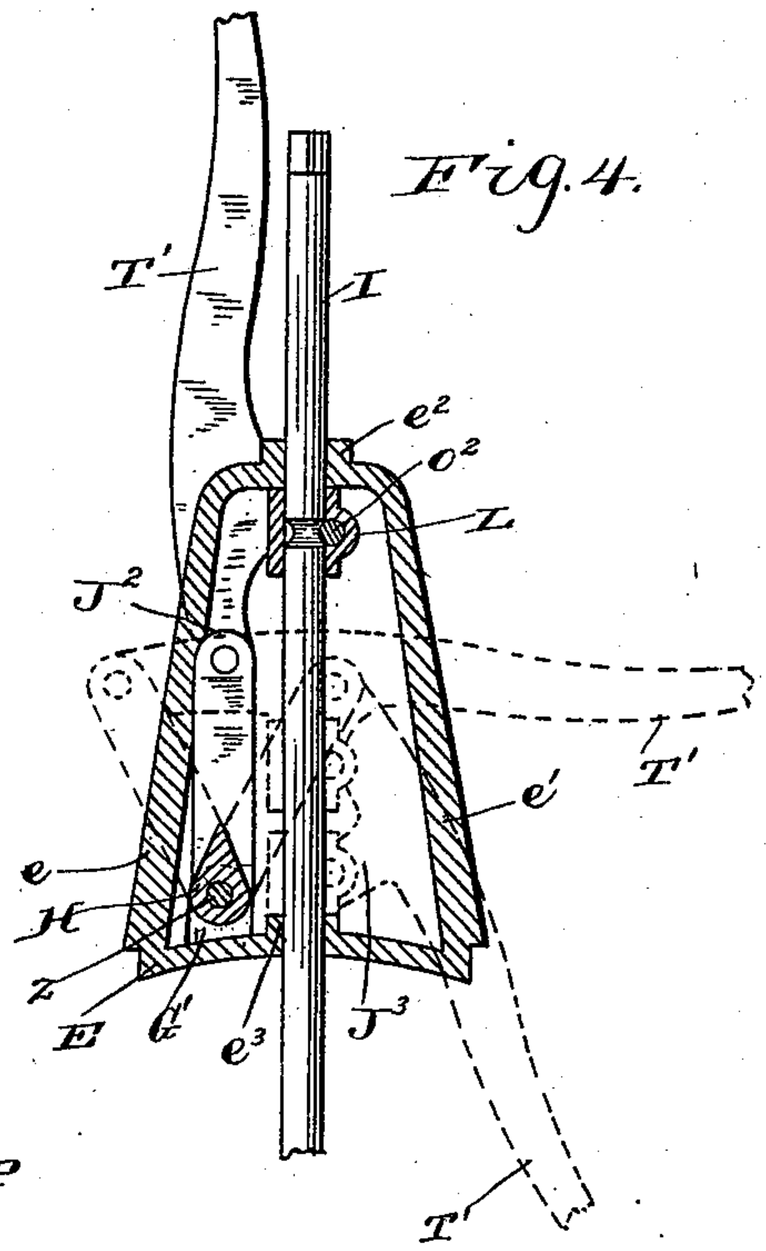
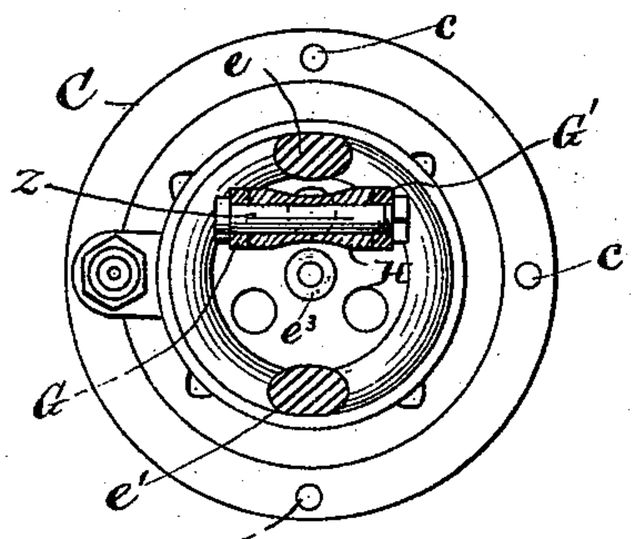


Fig. 5.



WITNESSES:

W. E. Bowen

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INVENTOR

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UNITED STATES PATENT OFFICE.

JOHN N. McLEAN, OF NEW YORK, N. Y.

AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 532,985, dated January 22, 1895.

Application filed July 3, 1890. Serial No. 357,663. (No model.)

To all whom it may concern:

Be it known that I, JOHN N. McLEAN, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Air-Pumps, of which the following is a specification.

My invention relates to pumps, and more particularly to that class of pumps used for forcing or compressing air, or other elastic fluids, and it has for its object a construction having a compound actuating mechanism that will be contained within small space, and that will be compensating in its character—that is to say, that when operated to compress an elastic fluid, the leverage actuating the plunger will increase as the resistance to its motion increases from the increasing density of the fluid; also to simplify and perfect the several parts and the manner of securing them together.

My invention consists in the peculiar arrangement of the parts of the actuating mechanism, whereby the object aforestated is attained, and in the general construction and combination of parts, as is hereinafter fully set forth and pointed out in the subjoined claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a perspective view of a complete pump—with hose attached. Fig. 2 is a central, vertical section of the base, cylinder, valves, valve-chambers, and plunger; the actuating part being shown in full. Fig. 3 is a central, vertical section of the plunger, and plunger rod on an enlarged scale. Fig. 4 is a vertical, central cross-section of the top plate, yoke, and some of the actuating parts, others being shown in full lines and in dotted lines, in various positions. Fig. 5 is a horizontal section on the line 5, 5, of Fig. 2 showing the top plate in full lines and an outline of the base. Fig. 6 is a perspective of the duplex link.

Like letters designate like parts in all the figures.

A is a base plate, preferably circular in form, having inlet and outlet ports a and a', provided with automatic valves, the inlet port a being located in the center of the plate. The upper portion of the base plate serves to form a cavity a^2 into which the plunger-nut o may descend, and its lower portion opening downward through a boss b that is adapted to receive the casing or seat of the inlet valve b'. An annular flange B internally screw-threaded to adapt it to receive the lower end of the cylinder D—which forms the compression chamber, extends upward a suitable distance around the cylinder D, and serves to reinforce its resistance to expansion by internal pressure. The outlet port a' opens from the upper face of the base A within the area inclosed by the annular flange B, and extends through the body of the base outward, and then upward, through a vertical boss b^2 located on the circular flange C, extending from the base-plate as shown, this flange C being provided with screw-holes c c c c adapting it for securing the completed pump in any desired place by bolts or ordinary wood screws. The boss b^2 serves as a means of securing the outlet valve casing c' to the base, it being internally screw threaded for that purpose. At the inner angle between the base A and the annular flange B an annular depression or groove c^2 is made in the base into which the rim of the flange R of the plunger may descend.

I consider it good proportion to make the length of the cylinder D about equal to twice its diameter and to the upper end of this cylinder the top-plate E may be secured in any suitable manner. I prefer to secure the plate E by means of a screw thread on its periphery which is made sufficiently broad by an upward extending flange E', the top end of the cylinder D being internally screw-threaded to receive it. From this top-plate E two arms e and e' that are integral therewith, extend upward a suitable distance and are integrally united at the top to a boss or hub e^2, which serves as a guiding bearing for the top end of the plunger rod (I), the center of this boss e^2 being in line with the longitudinal axis of the cylinder D. It will be observed that these arms incline inward and at their tops curve into union with each other, thus forming a yoke-shaped integral member of the top-plate E of ample strength and rigidity. The center

of the top-plate E is also provided with a boss e^3, which, together with the thickness of the plate forms another guiding bearing for the lower portion of the plunger rod I. Two lugs G and G′ which also are integral members of the top plate E form fixed pivotal bearings for the lower end of a duplex or forked link H, the bolt *z* serving as the pivot and also as the means of securing them together. These pivotal bearings are located a suitable distance apart, their axis line being at right angles to the plane through the center of the two arms *e* and *e′*, and as near to the boss e^3 of the top-plate as may be, to allow the duplex link H freedom of motion. The two arms of this duplex link H are rigidly united at their lower ends either integrally or by any suitable means, so that the movement of the one will be the same as that of the other. Two three armed levers T T′ made right and left, and to pair, in the form as shown, having their longest arms *i i′* curved outward to allow space between them at their free ends for a hand grip, or handle K, are pivoted at their opposite ends J^2 J^2 to the upper, or free ends of the right and left arms respectively, of the duplex link H, and the shorter arms J^3 J^3 are pivoted respectively to the right and left ends of a cross-head L which is secured to the plunger rod (I) as hereinafter described—at a point near its center, and between the sliding bearings (e^2 e^3). The plunger rod (I) is made of sufficient length so that when the plunger (M) is close down to the base plate the rod will extend up through the boss (e^3) and up, through, and slightly above the boss (e^2). A portion of the plunger rod at its lower end is made smaller in diameter for a suitable distance so as to form a shoulder *n*, and terminates with a screw-threaded portion adapted to receive the nut (O). A plate of rigid material (P) of about one-twelfth less diameter than the inside of the cylinder D, and of form as shown, having a central boss (*p*) on its upper side through which, and, the plate, a hole is made fits closely to the smaller diameter of the rod, so that the boss (*p*) will engage the shoulder (*n*). Beneath this, an inverted cup Q of flexible material (I prefer belt leather) is placed. This also is provided with a hole in its center that will fit closely the less diameter of the plunger rod, its outer diameter being such as to fit closely the inside diameter of the cylinder (D). This cup (Q) is made in the form shown, its flange (R) being wedge-shaped in section, the rim or edge being the thinner portion. Beneath this cup (Q) another plate S of rigid material is placed whose periphery is conical in form, its diameter corresponding in size to the inside diameter of the flange (R) of the cup (Q). This plate also is provided with a hole in its center which will slip freely over the screw portion of the plunger rod, and beneath this the nut (*o*) is made to screw on the screw portion of the plunger rod and thereby the plate (S) and plate (P) are drawn together and the cup (Q) firmly clamped between them and secured to the bottom of the plunger rod—and, as will be seen, when the plate (S) is forced up by screwing on the nut *o*—its conical periphery acting in conjunction with the wedge shaped flange (R) of the cup (Q) will expand the diameter of said flange; thus affording efficient means of compensating for wear from time to time. It will be further observed that the nut (*o*) is accessible through the cavity a^2 in the center of the bottom plate (A), it being only necessary to take out the valve-casing (*b′*) and introduce a socket wrench for the purpose. It will also be observed that the resistance to the depression of the plunger by the condensing fluid will expand the flange R of the cup Q and cause it to completely fill the internal diameter of the cylinder—thus minimizing the leakage past the plunger, which may be depressed to contact with the base plate, inasmuch, as the cavity a^2 and annular groove c^2 provides room for the nut *o*—and the rim of the flange R—thus affording a maximum expulsion of the fluid.

The cross-head L is made in the form shown, its vertical portion forming a sleeve fitting tightly about the plunger rod, and is secured in place by a bolt (o^2) that passes through its horizontal portion, and through a notch in the side of the plunger rod. This bolt also serves as the pivotal attachment of the short arms of the levers (T T′) to the cross-head.

The several parts hereinbefore described of the mechanism for operating the plunger are assembled and arranged as shown by Figs. 1 and 2 As will be observed, the axis of the fulcrum of the operating parts being the lower end of the duplex link (H) is located as near to the vertical axis of the cylinder as the nature and function of the parts will admit. This arrangement as will be seen, affords a long movement to the free or operating end, of what are comparatively short levers.

The handle (K) attached to the free ends of the levers (T T′) starting from a position just above the upper end of the plunger rod moves in a curving course down near to the base plate (A), a motion which proves remarkably natural and easy for the human hand to make; a pull, merging into downward pressure and then a push downward and forward, the levers, assuming at their start, and in their course the positions shown at Fig. 4 by the full lines and dotted lines. It will be noticed that when this action is taking place the fulcrum of the levers T T′ being the top end of the link H traverses a long segmental course, passing considerably beyond the yoke arm (*e*) of the top plate, at one extremity and passing, or overlapping the plunger rod, at the other to allow which, it is made duplex, or two armed, as shown at Fig. 6.

As the fulcrum travels toward the plunger rod the leverage is increased, thus compensat-

ing for the increasing resistance to the downward stroke of the plunger due to the increasing density of the liquid being forced or compressed.

In order to permit the drawing up of the bottom plate by the nut (*o*) the top surface of said bottom plate is provided with an annular concavity *s'* leaving its center and rim at the periphery elevated. It will be seen that as the nut is drawn up the rim of said plate and the central elevation will be compressed into the flexible material of the cup, thus permitting considerable movement for the purpose of expansion of the flexible cup.

It is obvious that the operating mechanism may be inverted by pivoting the duplex link H to the top of the yoke, and therefore my claims are to be construed as broad enough to cover such a modification.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a pump, the combination with a cylinder, base and top plates secured to the cylinder, a piston and piston rod and a yoke to guide the piston rod, of links pivoted at the top end of the cylinder in close proximity to its vertical axis and levers fulcrumed to the free ends of said links and suitably connected to the piston rod, substantially as set forth.

2. In a pump, the combination with a cylinder, base and top plates secured to the cylinder, a piston and piston rod, and a yoke provided with a boss at its top through which the piston rod is guided, of links rigidly joined at their lower ends and pivoted to said top plate within the circumference of the pump cylinder and levers fulcrumed to the free ends of said links and connected to the piston rod, substantially as set forth.

3. In a pump, the combination with a cylinder, base and top plates secured to the cylinder, a piston and piston rod, and a yoke supported on said top plate and provided with a boss at its top to guide the piston rod, of a duplex link pivoted within the circumference of the top end of the cylinder and operating levers fulcrumed to the free ends of said duplex link and connected to the piston rod, substantially as set forth.

4. In a pump, the combination with the cylinder, base and top plates secured to the cylinder, a piston and piston rod, and a yoke supported on the top plate and provided at its upper end with a guiding boss for the piston rod, of a duplex link pivoted within the circumference of the top end of the pump cylinder and a pair of levers fulcrumed to the free ends of the duplex link, connected to the piston rod and provided with an operating handle connecting their free ends and at right angles to the plane of motion of said levers, substantially as set forth.

5. In a pump, the combination with a cylinder, base and top plates secured to the cylinder, a piston and piston rod, and a yoke having a guiding boss at its top for the piston rod, of a duplex link pivoted within the circumference of the top end of the pump cylinder and levers fulcrumed to the top of said duplex link and connected to the plunger rod and operating in a plane parallel to the piston-guiding yoke, substantially as set forth.

6. In a pump, the combination with a cylinder, a base plate having inlet and outlet ports therein, a top plate provided with a piston-rod guide-bearing in its center and with a yoke rising therefrom and provided with a second piston-rod guide-bearing, of a compound operating mechanism consisting of a duplex link fulcrumed to said top plate within the circumference of the pump cylinder and two levers fulcrumed to the top ends of said duplex link with one lever on the right of said yoke and the other on the left thereof, and a cross-head and bolt connecting said levers to the piston rod, the free ends of said levers united by a hand grip, substantially as set forth.

7. In a pump, the combination with a cylinder, base and top plates secured to the cylinder, the latter plate provided within its circumference with pivoting bearings and with a central guide-boss, and piston and piston rod, of a duplex link pivoted to the bearings of said top plate, a pair of three-armed levers connected to the piston rod and fulcrumed to the free ends of said duplex link, and a yoke secured to said top plate and provided at its top portion with a guide-boss for the piston rod, the free ends of said operating levers joined to an operating handle, substantially as set forth.

8. In a pump, the combination with a cylinder and top and base plates secured to said cylinder, the latter provided with a central cavity, as a^2, in which is removably secured the inlet valve of the pump, of a piston or plunger expansibly held to its rod by a nut which when the plunger is depressed seats in said central cavity which latter is of sufficient area to permit of the adjustment of said nut therethrough, substantially as set forth.

9. In a pump the combination with a cylinder, a base plate having a central cavity, as a^2, and an annular recess, as C^2, on its inner surface within which fits the lower end of the pump cylinder, of a plunger provided with a downwardly extending flange, as R, and a projecting nut as *o*, the said downwardly extending flange and projecting nut adapted to enter and closely fit said annular recess and central cavity respectively, when the plunger is depressed, substantially as set forth.

10. In a pump, a plunger consisting of a rigid top plate, a flexible cup-packing having a wedge-shaped flange, as R, and a rigid bottom plate provided with a conical periphery and with an annular cavity in its top surface, thus leaving the center and top rim at the periphery elevated, and an adjusting nut on

the end of the plunger rod, whereby when said rigid bottom plate is forced by the nut the elevated center and rim on the upper surface of said plate will be compressed into the flexible material of the cup which will be crowded into the annular cavity of said plate, substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 24th day of June, A. D. 1890.

JOHN N. McLEAN.

Witnesses:
W. E. BOWEN,
J. J. KENNEDY.