Dec. 8, 1925. 1,564,428

P. G. MacGREGOR

PUMP

Filed June 26, 1922 2 Sheets-Sheet 1

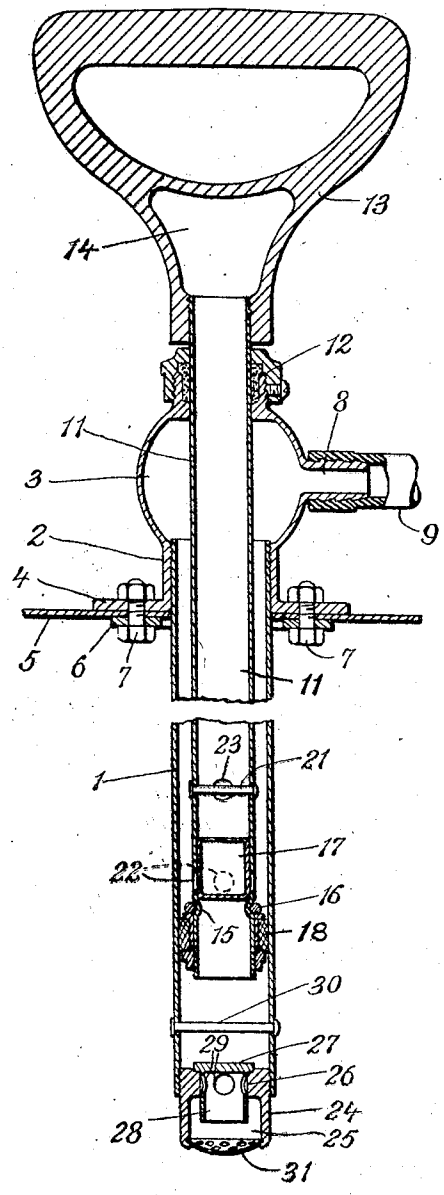


Fig. 1.

Inventor
Peter G. MacGregor
By his Attorney
Lewis J. Dooliale

Dec. 8, 1925. 1,564,428

P. G. MacGREGOR

PUMP

Filed June 26, 1922 2 Sheets-Sheet 2

Fig. 3.

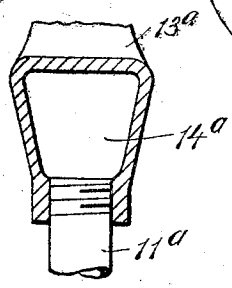


Fig. 2.

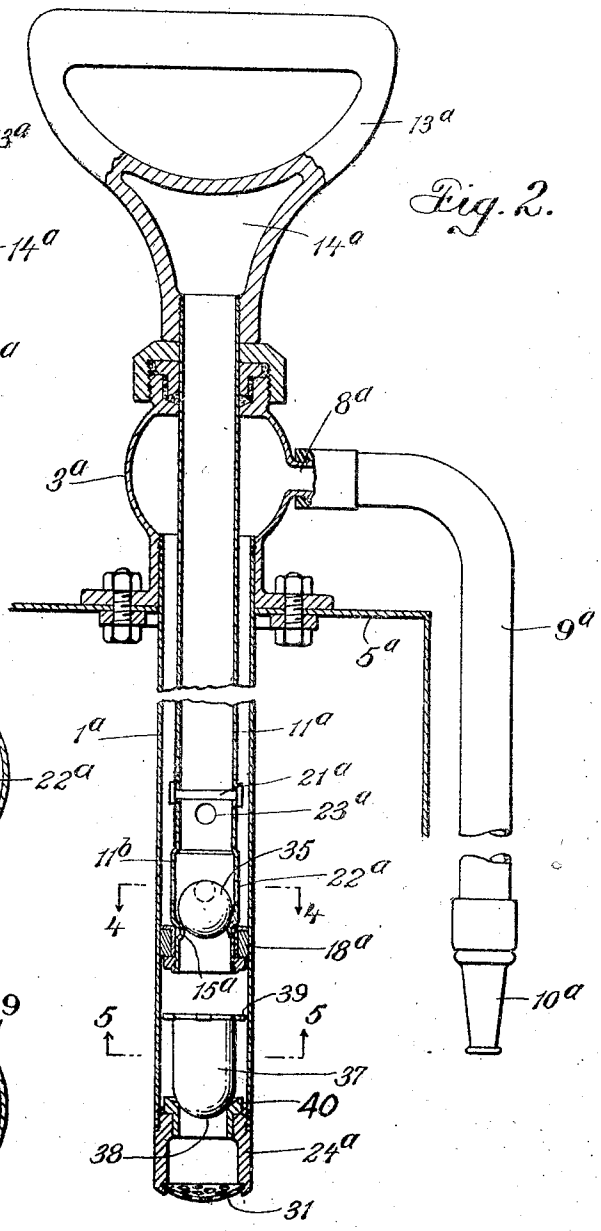


Fig. 4.

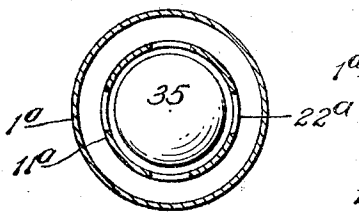
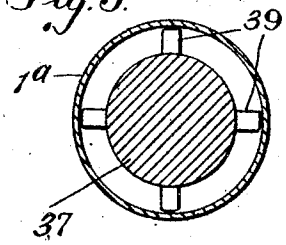


Fig. 5.



Inventor
Peter G. MacGregor
By his Attorney
Lewis J. Doolittle

Patented Dec. 8, 1925. 1,564,428

UNITED STATES PATENT OFFICE.

PETER GRAHAM MacGREGOR, OF PEQUANNOCK, NEW JERSEY, ASSIGNOR TO PYRENE MANUFACTURING COMPANY, OF NEWARK, NEW JERSEY, A CORPORATION OF DELAWARE.

PUMP.

Application filed June 26, 1922. Serial No. 570,894.

To all whom it may concern:

Be it known that I, PETER G. MacGREGOR, citizen of the United States, and resident of Pequannock, in the county of Morris and State of New Jersey, have invented certain new and useful Improvements in Pumps, of which the following is a specification.

This invention relates generally to pumps and more particularly to pumps of the portable hand operated type adapted for use in a receptacle for throwing a stream of liquid through a suitable nozzle, the present application being a continuation in part of the application filed by me on April 15, 1919, under Serial No. 290,261, patented Jan. 16, 1923, #1,442,488, from which certain feature were divided out.

One of the objects of the invention is to provide a novel arrangement of parts in a double acting pump of this type whereby the discharge of the liquid is maintained during the periods when the pump piston momentarily comes to rest at the end of each stroke, thus providing a continuous flow of liquid from the nozzle.

A further object is to provide a construction in which the passage through the pump presents no restricted portions, thus increasing the ease and smoothness of operation of the pump. Another object is to provide a novel form of automatically acting inlet valve controlling the passage from the receptacle to the pump, which valve is so constructed and arranged as to prevent accidental syphoning of the liquid from the receptacle through the pump and the flexible discharge hose, in the event that the latter, while still containing liquid, is allowed to hang down with its nozzle below the level of the liquid in the receptacle.

For a further comprehension of the invention and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims, in which the various novel features of the invention are more particularly set forth

Fig. 1 of the drawings is a vertical sectional view showing the pump disclosed in the previous application above referred to.

Fig. 2 is a similar view to Fig. 1 but showing certain modified features of construction.

Fig. 3 is a sectional view of a portion of the pump handle, taken at right angles to Figs. 1 and 2.

Figs. 4 and 5 are enlarged horizontal sectional views taken, respectively, on the lines 4—4 and 5—5 of Fig. 2, looking in the direction indicated by the arrows.

Referring first to the construction shown in Fig. 1, the pump cylinder is shown at 1, which may be made of metal tubing, the upper end being threaded into the neck 2 of a globular shaped head 3, preferably of larger diameter than the cylinder, The neck 2 may be formed with an integral flange 4 for attaching the pump to a suitable receptacle, a portion of which is indicated at 5.

As here shown, a ring 6 is secured to the inner side of the top wall of the receptacle 5 and the pump secured thereto by means of bolts 7 passed through this ring 6, wall of the receptacle 5 and the flange 4 of the pump.

The liquid is dischraged from the head 3 of the pump, which is provided with a tubular projection 8 to which one end of a flexible hose 9, provided with a suitable nozzle, may be attached.

The piston 18 of the pump is operated by a hollow piston rod 11, to which it is attached, which piston rod extends through the globular head 3 through a stuffing box 12 to the exterior of the pump. A handle 13 is attached to the upper end of the piston rod 11, this handle being provided in its lower portion with an enclosed chamber 14 with which the hollow piston rod 11 communicates, the piston rod 11 being open at both ends and at its lower end extending through the piston 18, providing a passage therethrough.

The piston rod 11 is formed near its lower end with a peripheral indentation which provides a seat for a one way valve 17 slidably mounted in the piston rod above the piston. A ring 16 is secured in this indentation and provides an abutment for the piston 18, the specific arrangement of the piston and valve, 18 and 17, respectively, form a part of the particular subject matter of my previous application above mentioned.

The valve 17 is in the form of a cup with its closed end seated on the shoulder formed by the indentation 15, the upward movement of the valve away from its seat being limited by the pin 21 extending across the piston rod 11. A series of ports or openings 22 are

provided in the wall of the piston rod 11 just above the indentation 15 and are closed by the valve 17 when in its lower position, as shown in Fig. 1. A second series of ports or openings 23 are provided in the piston rod wall above the upper limit of movement of the valve 17.

The lower end of the pump cylinder 1 has attached thereto a head 24 which is recessed in its lower portion, as at 25, and is provided with a central aperture 26 in its upper portion, this aperture being closed by a valve 27 having a cylindrical extension 28 from its lower side sliding in the aperture 26 and constitutes a valve stem, this extension being provided with a series of ports or openings 29. The valve 27 seats on top of the head 24 and movement thereof away from its seat is limited by a pin 30 extending across the piston cylinder 1. The lower end of the head 24 may be covered by a perforated disk 31.

The cross sectional area of the piston rod 11 is approximately one-half that of the cylinder 1, consequently, the active piston area (the space above the piston in the cylinder 1) is substantially the same as the opening provided through the piston by the hollow piston rod 11. The opening 26 through the head 24 is also of the same area and, consequently, the intake to the pump cylinder is at all points substantially as large as the active piston area in the cylinder 1 and no extra pressure is required to draw or force the liquid through, in its flow to the active cylinder space, and the pump is operated with a minimum effort.

It will, of course, be understood that the area of the passages provided by the openings 22 and 23, the valve openings 29 and perforated cap 31 are also equal to the area of the piston rod 11.

The operation of the invention will be understood by reference to Fig. 1, as follows:

The upstroke of the piston draws the liquid in through the head 24, the valve 27 lifting from its seat permitting the liquid to flow through the ports 29 in the valve stem 28 to the pump cylinder 1 below the piston 18. At the same time the piston discharges the liquid which the previous down stroke has forced into the cylinder 1 above the piston.

When the piston starts its down stroke the valve 27 closes and the valve 17 moves upwardly to the stop 21, uncovering the ports 22 in the piston rod 11, and the liquid in the cylinder 1 below the piston passes through the open lower end of the piston rod through these ports 22 into the active cylinder space above the piston.

Since the interior of the hollow piston rod above the valve 17 is at all times in communication with the cylinder space above the piston, through the openings 23, it follows that the pressure exerted in both up and down strokes will tend to back up the liquid into the upper end of the piston rod 11 against the cushion of air which will be formed in the closed space included in the piston rod and in the chamber 14 in the handle 13, thus creating an air pressure on the liquid substantially equal to the piston pressure.

When the piston pressure or movement momentarily ceases at the end of each stroke, this air pressure forces the liquid which has been backed up in the piston rod 11 downward and thus continues the discharging action until the piston again becomes active, thus causing a continuous stream to be discharged from the nozzle during the reciprocation of the piston.

The amount of liquid entering the piston rod is small and since the pressure exerted on the handle 13 is light, the auxiliary chamber 14 is a necessary feature in order to provide a volume of air large enough to compress sufficiently under such conditions to permit sufficient quantity of liquid to enter the piston rod to continue the stream from the nozzle during the momentary intervals between the strokes.

The provision of the globular head 3 serves as a reservoir to insure against the occurrence of any slight fluctuation in the stream. As will be understood, an initial stroke or two must be taken to fill the pump before it operates continuously as above described.

The modification shown in Figs. 2, 4 and 5 is the same in its main features of construction and operation as that shown in Fig. 1, just described. The details of the valve mechanism as shown in Fig. 2, comprising a piston cylinder 1^a engaged with a globular head 3^a, which is provided with a discharge nipple 8^a to which the hose 9^a and its nozzle 10^a is attached; the means for securing the pump to the receptacle 5^a and the handle 13^a with its auxiliary air chamber 14^a, are all as above described in connection with Fig. 1, the piston rod 11^a being in the main similar to the piston rod 11 but differing slightly in the construction of the lower end.

In place of the cup-shaped valve 17 of Fig. 1, I provide a ball-valve 35 (Fig. 2) seating on a peripheral indentation 15^a in the lower end of the hollow piston rod 11^a, a piston 18^a encircling the lower end of the piston rod 11^a, the piston rod being enlarged, as at 11^b, for a distance above the indentation 15^a, forming an abutment against which the piston 18^a seats.

Formed in the wall of the piston rod 11^a, just above the indentation 15^a, is a series of ports or openings 22^a while a second series of ports or openings 23^a are provided

in the wall of the piston rod a distance above the ports 22^a. A pin 21^a extends across the piston rod 11^a a slight distance above the ports 23^a and serves to limit the upward movement of the ball valve 35. As shown in Fig. 2, the ports 22^a are located in horizontal juxtaposition with respect to the upper part of the ball valve 35, so that the entering liquid tends to hold the ball valve 35 on its seat 15^a.

In this construction, Fig. 2, the lower end of the cylinder 1^a has attached thereto a hollow head 24^a, similar to the head 24 of Fig. 1, having a perforated disk 31 at its lower end. I provide a weighted valve, in the form of a solid cylinder 37, having a semi-spherical lower end 38 seating on a bushing 40 in the head 24^a, this valve being guided in the cylinder 1^a by means of horizontal lugs 39 projecting from the upper end thereof into close proximity to the wall of the cylinder (Figs. 2 and 5). This valve 37 is of sufficient weight to overbalance the weight of any liquid in the hose 9^a and thus prevent the liquid from being siphoned from the receptacle 5^a should the hose 9^a be allowed to hang down while filled with liquid.

What I claim is:—

1. A pump comprising a cylinder having an inlet end provided with an inlet aperture, a valve for said aperture, a piston arranged within said cylinder, a hollow piston rod having an open end secured to and projecting through said piston and provided with a port leading from the interior of said rod to the active piston area of said cylinder for establishing communication between the inlet end of said cylinder and the active piston area of said cylinder through said piston, and a reciprocatory one-way valve arranged within said piston rod and adapted to move longitudinally thereof to open said port when said piston rod is moved in one direction whereby communication between the inlet end of said cylinder and the active piston area is established through said port and said open end of said rod and to close said port when said piston rod is moved in an opposite direction whereby communication between the inlet end of said cylinder and the active piston area is severed.

2. A pump comprising a cylinder having an inlet end provided with an inlet aperture, a valve for said aperture, a piston within said cylinder, a hollow piston rod having an open end projecting through said piston and secured thereto, said piston rod being provided with an opening adapted to maintain communication between the active piston area of said cylinder and the interior of said rod and provided also with a port adapted to establish communication between the inlet end of said cylinder and the active piston area thereof, a reciprocatory valve arranged within said rod and adapted to so move when said rod is moved in one direction as to establish communication between the inlet end of said cylinder and the active piston area thereof through said port and the open end of said piston and to so move when said rod is moved in an opposite direction as to sever communication between the inlet end of said cylinder and the active piston area thereof through said port and the open end of said rod, means for limiting the movement of said valve toward said opening whereby communication is at all times maintained between said rod and the active piston area through said opening.

3. A pump comprising a cylinder having an inlet end provided with an inlet aperture, a valve for said aperture, a piston within said cylinder, a hollow piston rod having an open end projecting through said piston and secured thereto, said piston rod being provided with a group of openings adapted to maintain communication between the active piston area of said cylinder and the interior of said rod and provided also with a group of ports adapted to establish communication between the inlet end of said cylinder and the active piston area thereof the total area of said openings being equal to the total area of said ports and substantially equal to the cross sectional area of said rod, and a reciprocatory valve arranged within said rod and adapted to so move when said rod is moved in one direction as to establish communication between the inlet end of said cylinder and the active piston area thereof through said ports and the open end of said piston and to so move when said rod is moved in an opposite direction as to sever communication between the inlet end of said cylinder and the active piston area thereof through said openings and the open end of said rod.

Signed at Newark, in the county of Essex and State of New Jersey, this 26th day of May, A. D. 1922.

PETER GRAHAM MacGREGOR.