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M. R. SHEEN

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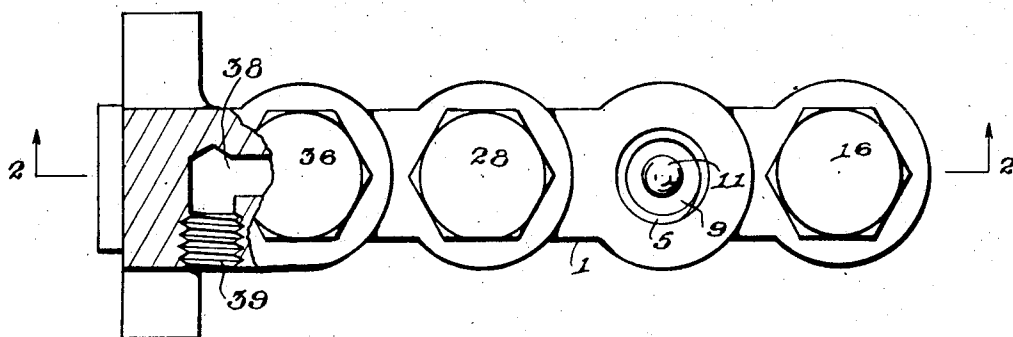


Fig. 1.

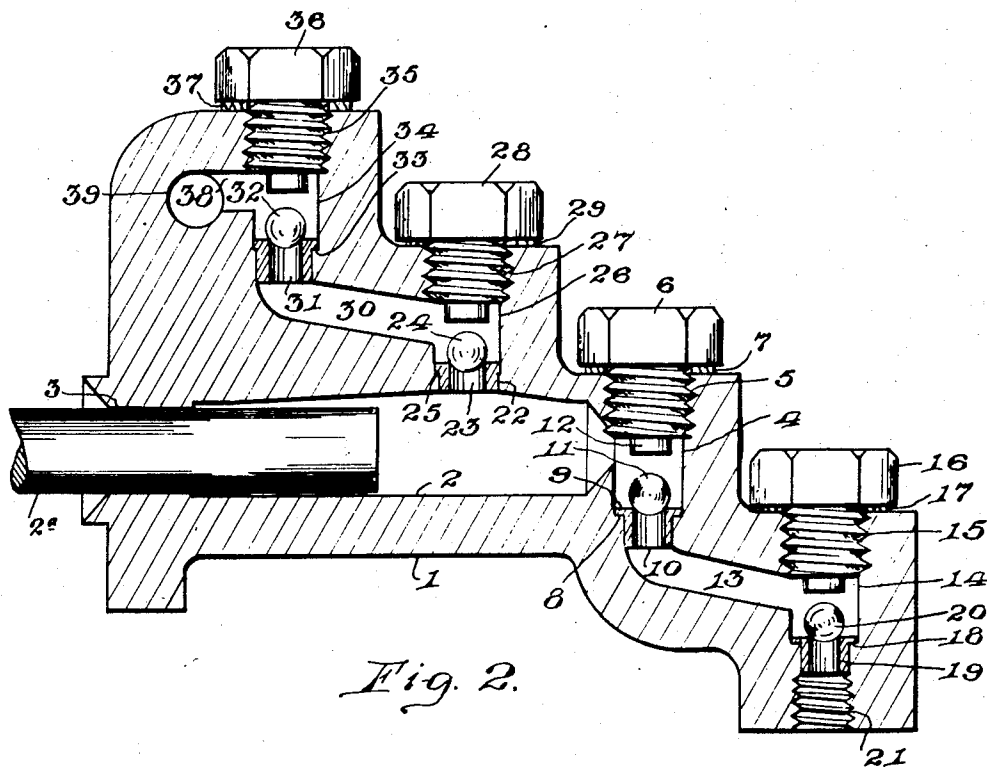


Fig. 2.

INVENTOR.

Milton Roy Sheen

BY

J. Stuart Freeman.

ATTORNEY.

## UNITED STATES PATENT OFFICE

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PUMP

Milton Roy Sheen, Philadelphia, Pa.

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2 Claims. (Cl. 103—153)

The object of the invention is to provide improvements in valves broadly, but more particularly in multiple valves such as are adapted for use in chemical and similar pumps.

Another and more specific object is to provide a device of this character, comprising a casing, a pair of wholly independent ball valves operating in parallel to control the inflow to said casing, and a second pair of similarly independent ball valves operating in parallel to control the outflow from said casing, each of said valves being accessible wholly independently of each of the others of said valves for repair and replacement purposes, access to each valve being had through an aligned aperture normally closed by a removable threaded plug, cap or equivalent device, and said openings being laterally positioned with respect to one another and at different elevations for each pair, and preferably also at different elevations for all of the valves of the said casing.

A further object resides in the fact, that in the improved construction there is an intermediate bore or cylinder into which a power-actuated piston reciprocates, and also two other bores laterally disposed with respect to the axis of said cylinder, unaligned valves connecting said cylinder with each of said last-mentioned bores, and a second valve for each of such last-mentioned bores connecting said last-mentioned bores respectively with inlet and outlet channels, the axes of said valves being parallel and spaced laterally with respect to one another.

Still another and more specific object resides in the fact that in the preferred form of the device said lateral bores are not only laterally spaced from the axis of said cylinder, but are arranged so that their axes extend substantially parallel with that of said cylinder, while the several valves communicating with said laterally spaced bores are in a substantially 1-2-3-4 stepped relation with respect to one another.

Still further objects reside in the provision of a device of this character which is notable for its extreme simplicity, and minimum number of parts liable to wear; a device in which there is a maximum efficiency of displacement, thereby giving the highest capacity with minimum power expenditure against a given pressure; the provision of a valve assembly which by virtue of its very design and construction insures the automatic and positive discharge of air and small particles of dirt, thereby making the valve as a unit self-cleaning and protecting it against cutting, grooving, wire-drawing and similar wear and resulting leakage from the lodgement other-

wise of foreign particles, in any one or more of the respective valve seats; the provision of a valve structure which automatically discharges and thereby prevents the accumulation of air and resulting air binding, and the provision of further details as will hereinafter appear.

With the objects thus briefly stated, the invention comprises further details of construction, which are hereinafter fully brought out in the following description, when read in conjunction with the accompanying drawing, in which Fig. 1 is a top plan view of a device comprising one embodiment of the invention, and Fig. 2 is a vertical section on the line 2—2 of Fig. 1.

Referring to the drawings, a valve casing is shown as comprising a body portion 1 into which extends, preferably horizontally, a primary cylindrical bore 2, defined outwardly by a relatively restricted aperture 3 which, if desired, may be sealed by means of any suitable type of conventional stuffing box or the like. Into this cylinder reciprocates a piston 2a. The innermost end of said primary bore opens into a valve chamber 4, the upper and otherwise threaded open end 5 of which is normally closed by means of a correspondingly threaded plug 6 and washer 7. Said chamber terminates downwardly in an annular shoulder 8, upon which rests the flanged portion 9 of a tubular valve seat 10, supporting a ball valve 11 downwardly biased by gravity or otherwise, the upper movement of which is limited either by the lower surface of the threaded portion of the plug 6 or an extension 12 thereof.

From the valve seat 10, which is removable for repair or replacement through the upper end 5 of the chamber 4, after first removing therefrom the plug 6, an auxiliary or branch channel 13 extends substantially horizontally, but preferably slightly downwardly so as to drain into a second valve chamber 14. This last mentioned chamber is similarly provided with an upper threaded portion 15, normally closed by a similarly threaded plug 16 and washer 17, while downwardly said chamber terminates in an annular shoulder 18 for a tubular valve seat 19, which supports a ball valve 20 and communicates downwardly with a threaded inlet bore 21, which is normally connected by piping or in other suitable manner with a source of liquid to be pumped under propulsion of the piston 2a. This pair of ball valves comprises a dual control for the inlet side of the pump and thus form a doubly positive means for preventing liquid flowing reversely through the channel 13 and out of the inlet 21 for the reason that if either of the balls is held ever so slightly above

its adjacent tubular seat, so as to thereby permit leakage of liquid past it, the other of said balls is certain to operatively seat itself and prevent such reverse flow of liquid.

The primary bore 2, instead of being unbrokenly cylindrical in shape, is preferably enlarged upwardly at a point slightly spaced from its inner end and is provided with an outlet bore 22, partly closed by means of a tubular seat 23 for ball valve 24, said seat resting upon an annular shoulder 25 which defines the downward limit of a valve chamber 26, the upper threaded portion 27 of which is normally closed by means of a similarly threaded plug 28 and a washer 29, all of said plugs like said ball valve and tubular seats being preferably of the same size and construction, so as to thereby permit their being interchangeable.

Extending laterally from said last-mentioned valve chamber 26 in substantial parallelism with the axis of the primary bore 2, preferably upon a slight slant for drainage purposes, is a second branch or secondary bore 30, the opposite end of which opens through a tubular valve seat 31, supporting a valve 32 and resting upon an annular shoulder 33, which defines the lower extent of a fourth valve chamber 34, which is also provided upwardly with a threaded opening 35, normally closed by means of a similarly threaded plug 36 and a washer 37. From said last mentioned chamber a channel 38 leads to an internally threaded discharge or outlet bore 39, which may be connected by piping or otherwise to whatever tannic vat, or the like, into which a liquid is to be transferred by said pump.

As the valves 11 and 20 cooperate to provide a dual inlet control, as hereinbefore described, so the pairs of valves 24 and 32 similarly provide a dual outlet control and operate in the same manner as said first pair. Thus, as said piston reciprocates within said primary bore or cylinder 2, a positively uni-directional flow of liquid is maintained from the inlet 21 to the outlet 39, while it will be also seen that there has been provided a valve structure which by removing one or more of the plugs 6, 16, 28 and 36, access may be readily had to their corresponding balls and valve seats, while the slight slant given to said branch channels 13 and 30 permit liquid therein to drain towards and through the respective valve chambers 13 and 26, as when the several plugs and valves are removed for the purpose of cleaning the device as a whole.

In considering the scope of the present invention, it is to be understood that there is anticipated the condition in which two, three, or even more, valve units may be used upon one functional side of the pump or primary cylinder, while only one such unit is used upon the opposite side. For instance, there are conditions under which two or possibly three (or conceivably even more) such units may have to be used upon the intake side, while only one such unit will suffice upon the discharge side or vice versa. Therefore, all such combinations which include a plurality of the improved independent valve units upon either one or both sides are intended to be covered by

the appended claims. Similarly, while a horizontal piston or pump cylinder has been illustrated and described, it is to be understood that vertical and other angularly disposed pistons are included within the invention, both when the stepped valve arrangement is in the relative position herein shown, or with the branch bores substantially horizontal and the primary or pump bore is substantially vertical, or at any other angle with respect thereto.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent of the United States is:

1. A pump and valve assembly for liquids, comprising a casing provided with a substantially horizontal primary pump bore having an upwardly enlarged portion adjacent to its inner end and an opening leading therefrom, a piston adapted to reciprocate, within said bore, a discharge outlet in said casing, a diagonally upwardly extending channel connecting said opening with said outlet, a downwardly biased valve above said opening connecting said pump bore with said channel, a downwardly biased valve connecting said discharge outlet with said channel, an inlet aperture in said primary bore, an intake in said casing, a diagonally upwardly extending channel connecting said intake with said inlet aperture, a downwardly biased valve connecting said intake with said last-mentioned channel, and a downwardly biased valve connecting said inlet aperture with said last-mentioned channel, and the upper wall portion of the entire path taken by liquids between said intake and said discharge outlet including both of said channels and said pump bore being free from gas-receiving pockets or recesses.

2. A pump and valve assembly for liquids, comprising a casing provided with a substantially horizontal primary pump bore having an upwardly enlarged portion adjacent to its inner end and an opening leading therefrom, a piston adapted to reciprocate within said bore, a discharge outlet in said casing, a diagonally upwardly extending channel connecting said opening with said outlet, a downwardly biased ball valve above said opening connecting said pump bore with said channel, a downwardly biased ball valve connecting said discharge outlet with said channel, an inlet aperture in said primary bore, an intake in said casing, a diagonally upwardly extending channel connecting said intake with said inlet aperture, a downwardly biased ball valve connecting said intake with said last-mentioned channel, a downwardly biased ball valve connecting said inlet aperture with said last-mentioned channel, and the upper wall portion of the entire path taken by liquids between said intake and said discharge outlet including both of said channels and said pump bore being free from gas-receiving pockets or recesses, and removable, upwardly directed valve seats for and in which said valves are free to rotate, said valve seats being flush with said upper wall portion of said path.

MILTON ROY SHEEN.