H. L. SHARTLE.

VALVE CONSTRUCTION FOR PUMPS.

APPLICATION FILED JAN. 20, 1919.

1,334,507. Patented Mar. 23, 1920.

FIG. 1.

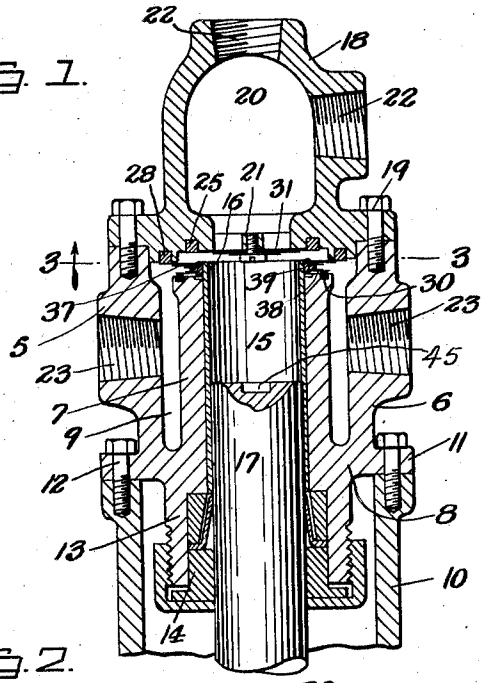


FIG. 2.

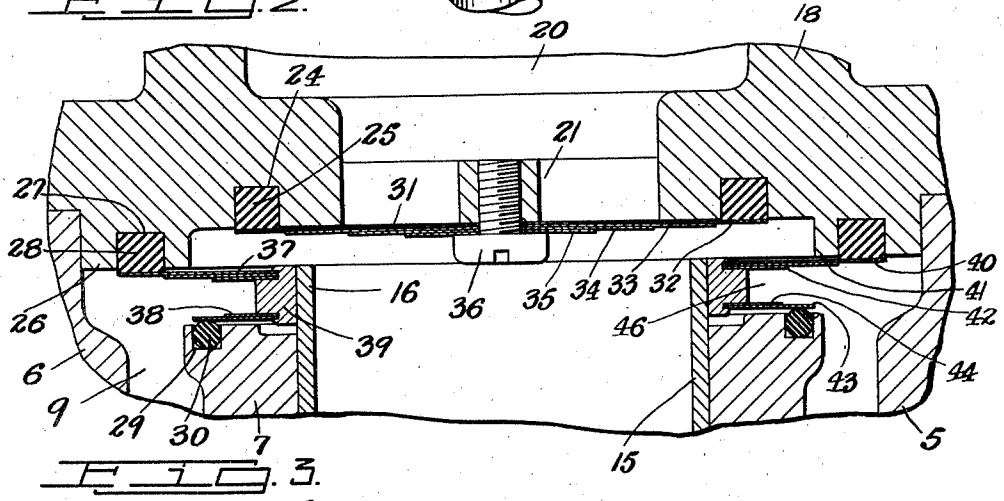
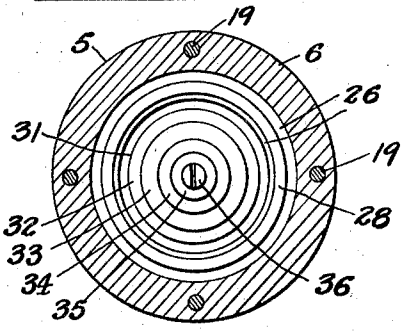


FIG. 3.



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VALVE CONSTRUCTION FOR PUMPS.

1,334,507. Specification of Letters Patent. Patented Mar. 23, 1920.

Application filed January 20, 1919. Serial No. 272,048.

To all whom it may concern:

Be it known that I, HARRY L. SHARTLE, a citizen of the United States, and residing at Walden, in the county of Orange and State of New York, have invented certain new and useful Improvements in Valve Constructions for Pumps, of which the following is a specification, such as will enable those skilled in the art to which it appertains to make and use the same.

This invention relates to pumps of various kinds and classes and particularly to what are known as water pumps, or the valve construction of such pumps; and the object of the invention is to provide pumps of the class specified with a differentially acting valve construction which will obtain a maximum port opening with but a minimum of motion, as well as to produce a valve construction which is very quiet and quick in action; and a further object of my invention is to provide a valve construction which will reduce the necessary clearance space between the plunger and suction and discharge valves; a still further object being to provide a pump construction of the class specified in which the suction and discharge valve seats are both mounted in and carried by the cylinder head; and with these and other objects in view the invention consists in an apparatus of the class and for the purpose specified, constructed and operating as hereinafter described and claimed.

The invention is fully disclosed in the following specification, of which the accompanying drawing forms a part, in which the separate parts of my improvement are designated by suitable reference characters in each of the views, and in which:—

Figure 1 is a central longitudinal section through the cylinder and cylinder head of a water pump and showing my improved valve and cylinder construction.

Fig. 2 a view similar to Fig. 1 but showing only a part of the construction and showing the same on an enlarged scale; and

Fig. 3 a section on the line 3—3 of Fig. 1.

In Fig. 1 of the drawing I have shown at 5 a cylinder casting of a water pump, said cylinder casting comprising an outer casing or jacket 6 connected with a cylinder 7 as shown at 8 and between the cylinder 7 and the casing or jacket 6 is an annular chamber 9. A tubular casing 10 is connected with a flange 11 at the bottom of the cylinder casting 5 by screws 12. Within the tubular casing 10 is an extension 13 of the cylinder 7, the end portion of which is provided with a packing or stuffing box 14.

A cylinder liner consisting of a sleeve 15 is mounted in the cylinder 7 of the cylinder casting 5 with the upper end 16 thereof projecting beyond the top of the cylinder 7 as clearly shown in Figs. 1 and 2. A piston 17 is slidably mounted in the cylinder 7, or the liner 15 therein and the stuffing box 14 in the extension 13.

A cylinder head 18 is secured to the top of the cylinder casting 5, or the casing or jacket 6 thereof by screws 19, and formed in said head is a suction chamber 20 placed in communication with the annular chamber 9 through a web construction 21 in the central bottom portion of the cylinder head 18.

The cylinder head 18 is provided with tapered and threaded apertures 22 to either or both of which a water supply pipe may be connected, and the cylinder casting 5 is provided with tapered and threaded apertures 23 to either or both of which the water discharge pipe may be connected.

The bottom face of the cylinder head is provided adjacent to the web construction 21 with an annular groove 24 in which is mounted an annular valve seat 25 preferably composed of rubberized material, and said bottom face of the cylinder head 18 is provided outwardly of the groove 24 with a downwardly directed annular flange 26 having an annular recess 27 in the bottom face thereof, and in which is placed an annular valve seat 28 preferably of the same material as the valve seat 25.

The top face of the cylinder 7 of the cylinder casting 5 is provided adjacent to the periphery thereof with an annular groove 29 in which is mounted an annular valve seat 30 preferably composed of soft or gummy rubber and which is circular in form in cross section.

The valve seat 25 forms the seat for a suction valve 31 which, in the construction shown is a laminated diaphragm valve, or is composed of four disks or laminæ 32, 33, 34 and 35 of different dimensions, 32 being the largest disk and 35 the smallest disk, and it will be noted on consideration of Fig. 2 of the drawing that the large disk 32 bears on the face of the valve seat 25. A screw 36 passes through the central portion of the laminated valve 31, or the disks 32—35 thereof and into the web construc-

tion 21 at the bottom of the cylinder head 18 and serves to support said valve. With this valve construction it will be evident that I produce a freely and yet positively acting valve as well as one of great sensitiveness and resiliency thus producing a quick acting valve as well as a noiseless one.

I also employ a differentially acting discharge valve construction which involves two laminated diaphragm valves 37 and 38 secured to the opposite sides of an annular band 39 which is mounted on the top or extension 16 of the cylinder liner 15, which forms a stem for said valve, as clearly shown in Fig. 2 of the drawing, and said valves and band 39 are free to move longitudinally of said liner. The valve 37 is, in the form of construction shown, composed of three annular rings or laminæ 40, 41 and 42 of different outside diameters, the ring 40 being the largest and adapted to bear on the face of the valve seat 28 as clearly shown in Fig. 2. The valve 38, in the form of construction shown, is composed of two rings, or laminæ 43 and 44 of different outside diameters and the larger ring 43 is adapted to bear on the valve seat 30 as clearly shown in Fig. 2.

The top face of the piston or plunger 17 is provided with a recess 45 adapted to receive the head of the screw 36 at the limit of the upward movement of the piston in the cylinder 7. In Fig. 1 the piston 17 is shown in its depressed position, or partially depressed position, and in the operation of the pump, or the movement of the piston upwardly in the cylinder, and presuming that the cylinder 7 above the piston 17 and the chamber between the valves 31 and 37 is filled with water sucked thereinto in the downward movement of the piston, said upward movement of the piston will force said water into the chamber 9 through the valve 37, in which operation the valve 31 is closed by the pressure of the water and the valve 37 is open due to the increase of the pressure in the cylinder 7 caused by the upward movement of the piston 17. It will be noted on consideration of Figs. 1 and 2 of the drawing and in the above described operation of discharging water from the cylinder 17 into the chamber 9 through the valve 37, the pressure of the water in opening the valve 37 acts against the pressure in the annular chamber 46 between the valves 37 and 38 of the differential valve construction. The function of the valve 38 is to form a seal or closure between the chamber 9 and the liner 15 of the cylinder 7, and this valve is held seated by the pressure in the chamber 9.

When the water has been discharged from the cylinder 7 into the chamber 9, as above described, and presuming the piston 17 to be in its uppermost position, the downward movement of the piston in the cylinder 7 will suck water from the suction chamber 20 into the cylinder through the valve 31 in which operation the valve 37 is held closed by the pressure in the chamber 9. The closing of the valve 37 is gradual and quiet by reason of the differential action of said valve, or the pressure acting equally thereon and on the valve 38, and by reason of the movement of the band 39 on the liner 15. By again moving the piston upwardly of the cylinder 7, the above described operation of discharging the water into the chamber 9 will be repeated and the valve 31 will be held closed.

My improved pump construction involves the cylinder liner, the extension 16 of which forms a valve stem for the differential diaphragm valve made up of two laminated valves 37 and 38, the valve 37 sitting on a valve seat carried by the cylinder head, while the valve 38 operates on a valve seat carried by the cylinder 7 and the cylinder head also carries the seat for the laminated suction valve 31. As hereinbefore stated, the laminated diaphragm valves produce a very quiet valve action which work at much greater spread than was heretofore possible with the valves of pumps of the ordinary type and due to the flexibility of my improved valves a maximum valve opening is attained with a minimum of action. Further, with my improved pump construction involving the valves, the necessary clearance space between the piston or plunger 17 and suction and discharge valves 31—37 and 38 is reduced, whereby the pump will act as an efficient air compressor and will rid itself of any air making it self-priming to a greater extent than with pumps of the usual valve construction.

In the accompanying drawing, Fig. 1, my improved pump is shown in a vertical position with the inlet and discharge end directed upwardly and the foregoing description, of course, applies particularly to the pump when placed in this position, but it will be understood that in the use of my improved pump it may be placed either in a horizontal position, or with the inlet and discharge end directed downwardly.

The words "differential" and "differentially acting" used herein as descriptive of the valve construction or device involving the collar or band 39 which is movable on the sleeve liner 15 and the valves 37 and 38 connected with said collar or band, both in the foregoing description and in the appended claims, are used simply because they seem to define the construction and operation of said valve construction or device better than any other words or terms that could be selected. The valve construction or device referred to comprises the movable collar or band 39 and the flexible valves 37 and 38 connected therewith, and said collar is mov-

able on the sleeve liner 15 and the valve 37 is of much greater dimensions than the valve 38, and the pressure between the valves 37 and 38 operating on the valve 37 by reason of the fact that its dimensions are greater than those of the valve 38, causes said valve 37 to be seated, but this operation is regulated largely by the pressure acting on the valve 38 which tends to retard quick action of the valve 37.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A pump of the class described provided with a cylinder having a sleeve lining which projects beyond one end of said cylinder, an annular band mounted on the projecting end of said cylinder, and annular valves mounted in connection with said band.

2. A pump of the class described provided with a cylinder having a sleeve lining which projects beyond one end of said cylinder, an annular band movably mounted on the projecting end of said cylinder, and annular valves mounted in connection with said band.

3. A valve construction for pumps of the class described, comprising a diaphragm suction valve and a differentially acting discharge valve device comprising two diaphragm valves, each of which is composed of a plurality of laminæ of different diameters.

4. A pump of the class described comprising a cylinder and a cylinder head, suction and discharge valve seats in said cylinder head, a suction valve mounted in the cylinder head, and a discharge valve mounted on the cylinder, said suction and discharge valves operating in connection with said suction and discharge valve seats respectively.

5. A pump of the class described, comprising a cylinder and a cylinder head, suction and discharge valve seats in said cylinder head, a discharge valve seat in the cylinder, a diaphragm suction valve carried by the head and operating in connection with said suction valve seat, and a differentially acting discharge valve device carried by the cylinder and operating in connection with the discharge valve seats in the cylinder head and cylinder.

6. A pump of the class described, comprising a cylinder and a cylinder head, suction and discharge valve seats in said cylinder head, a discharge valve seat in the cylinder, a diaphragm suction valve carried by the head and operating in connection with said suction valve seat, and a differentially acting discharge valve device carried by the cylinder and operating in connection with the discharge valve seats in the cylinder head and cylinder, said discharge valve device comprising two diaphragm valves each of which is composed of a plurality of laminæ of different diameters.

7. A pump of the class described comprising a cylinder and a cylinder head, a cylinder liner mounted in the cylinder and one end of which extends beyond the corresponding end of the cylinder, a piston movable in said cylinder, suction and discharge valve seats mounted in the cylinder head, a discharge valve seat mounted in said end portion of the cylinder, a diaphragm suction valve carried by the cylinder head and operating in connection with the suction valve seat, and a differentially acting discharge valve device mounted on the protruding end of the cylinder liner and operating in connection with the discharge valve seats in the cylinder head and cylinder.

8. A pump of the class described, comprising a cylinder and a cylinder head, a cylinder liner mounted in the cylinder and one end of which extends beyond the corresponding end of the cylinder, a piston movable in said cylinder, suction and discharge valve seats mounted in the cylinder head, a discharge valve seat mounted in said end portion of the cylinder, a diaphragm suction valve carried by the cylinder head and operating in connection with the suction valve seat, and composed of a plurality of disks or laminæ of different diameters, and a differentially acting discharge valve device mounted on the protruding end of the cylinder liner and operating in connection with the discharge valve seats in the cylinder head and cylinder, said valve device comprising two diaphragm valves each of which is composed of a plurality of laminæ of different diameters.

9. The combination with a pump cylinder and cylinder head of a diaphragm suction valve carried by the cylinder head, a differentially acting discharge valve carried by the cylinder and suction and discharge valve seats mounted in the cylinder head and in connection with which said suction and discharge valves operate.

10. The combination with a pump cylinder and cylinder head of a diaphragm suction valve carried by the cylinder head, a differentially acting discharge valve carried by the cylinder, suction and discharge valve seats mounted in the cylinder head and in connection with which said suction and discharge valves operate, and a discharge valve seat mounted in the cylinder and in connection with which the discharge valve also operates.

11. The combination with a pump cylinder and cylinder head of a cylinder liner mounted in the cylinder and protruding beyond one end thereof, suction and discharge valve seats mounted in the cylinder head, a discharge valve seat in the cylin-

der, a laminated diaphragm suction valve mounted in the cylinder head and operating in connection with the suction valve seat, and a differentially acting laminated diaphragm discharge valve device mounted on the protruding end of the cylinder liner and operating in connection with the discharge valve seats in the cylinder head and cylinder.

12. The combination with a pump cylinder and cylinder head, of a cylinder liner extending beyond one end of the cylinder and a discharge valve device mounted on the protruding end of said cylinder liner, said valve device comprising two laminated diaphragm valves secured to and carried by a ring or band.

13. The combination with a pump cylinder and cylinder head, and a cylinder liner mounted in said cylinder and protruding beyond one end thereof, of a valve device comprising two diaphragm valve members mounted on the protruding end of the cylinder liner, each of said valve members being composed of a plurality of rings or laminæ of different diameters.

14. The combination with a pump cylinder and cylinder head and a cylinder liner mounted in said cylinder and protruding beyond one end thereof, of a valve device comprising two diaphragm valve members secured together and spaced one from the other, said valve device being mounted on the protruding end of the cylinder liner and each of said valve members being composed of a plurality of rings or laminæ of different diameters.

15. A pump of the class described, said pump being provided with a cylinder having a sleeve lining which projects beyond one end thereof, and an annular valve device movably mounted in connection with the projecting end of said lining.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of the subscribing witnesses, this 16th day of January, 1919.

HARRY L. SHARTLE.

Witnesses:
ALBERT W. COLBY,
C. E. MULREANY.