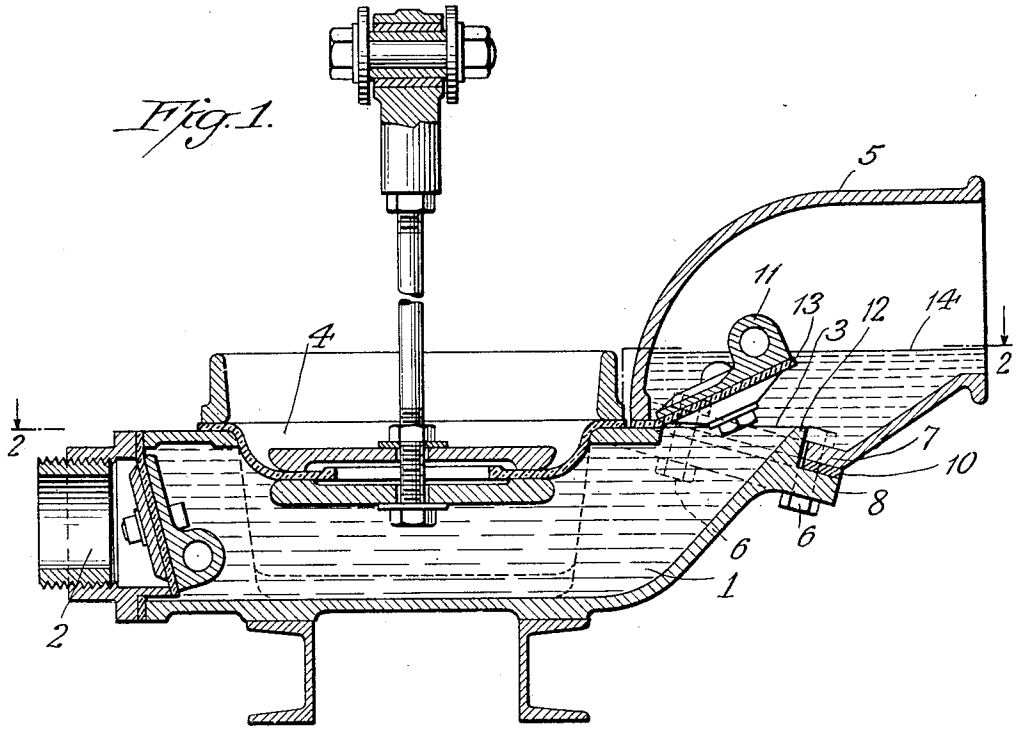
Dec. 8, 1931. A. S. MARLOW 1,834,957

OPEN DISCHARGE PUMP

Filed Feb. 18, 1928

Fig. 1.



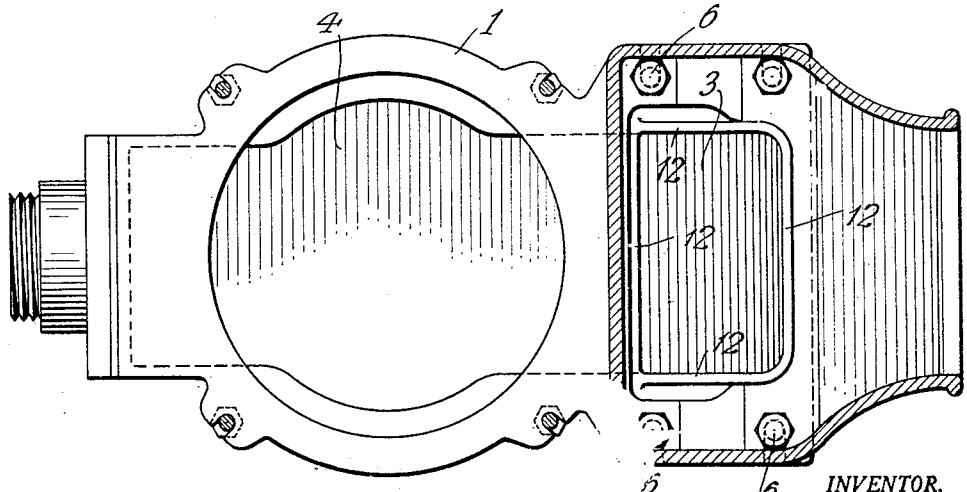


Fig. 2.

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OPEN DISCHARGE PUMP

Application filed February 18, 1928. Serial No. 255,235.

My invention relates to open discharge diaphragm pumps for pumping dirty water, sewage and other so called heavy fluids laden with foreign material.

In building excavations, irrigation works, mines and other places, the builder or contractor is in need of a pump that will raise a large amount of water that contains a high percentage of dirt, sand and often gravel. There are mainly two types of pumps used in practice for this purpose. One is known as the force pump which discharges against a head of water. The other is known as the open discharge pump which discharges directly into the atmosphere.

This invention relates to improvements in the latter type of pump, sometimes called a "lift" pump.

It is the object of this invention to produce a pump of the type which discharges freely into the atmosphere, in which there are no sharp angular bends in the water passageway, the latter being substantially straight through the pump body for the purpose of successfully handling dirty, muddy or sand-laden water, thereby increasing the efficiency of the pump, and in which the discharge valve is horizontally seated and operates substantially parallel to the flow of water through its seating outlet to provide quick passage of sedimentary material and prevent the valve from being clogged by same, which also serves to increase the efficacy of the valve and the action of the pump as a whole.

Another object of the invention is to provide for the discharge valve a horizontal seat of comparatively small surface entirely free from the surrounding casing to prevent accumulation of sedimentary material on the valve seat with the surrounding casing so disposed relatively to this seat that there is great freedom of flow of water and sedimentary material through and away from the valve seat, which increases the capacity of the pump.

A further object of this invention is the provision of a pump body whereby the discharge valve can be positioned horizontally when seated, parallel to the level of the outflowing water, close to this level and substantially parallel to the flow of water in the passageway in order to minimize the effort necessary to open the valve and to provide maximum efficacy of valve motion responsive to the action of the flexible diaphragm.

Still another object of the invention is the provision of a pump body whereby the discharge valve can be positioned away from the flexible diaphragm to provide accessibility to the latter in case of repairs.

A straight horizontal water passageway through the pump body is desirable but in open discharge diaphragm pumps, this design of pump body has not been attempted, since it involves the problem of the correct placement of the discharge valve in the pump body so as to operate efficiently under all working conditions and cause the water to be discharged uniformly into the atmosphere. Hence the importance of maintaining the proper operation of the discharge valve is such that prior design in the case of the open spout diaphragm type of pump has been to do away entirely with the straight water passageway, and seat the discharge valve horizontally and centrally of the flexible diaphragm whereby the water discharges horizontally through a spout located above the passageway in the pump above the flexible diaphragm and discharge valve. With this design, however, the water passageway through the pump body is irregular, forming pockets below the diaphragm and discharge valve, in which gravel, stones, etc., may lodge, thereby impairing the discharge capacity for which the pump is designed. This design has also adversely affected the accessibility to the interior moving parts of the pump and adding particularly to the difficulty of renewing or replacing the diaphragm.

My improved design of pump body makes it possible to retain continuous priming of the discharge valve, horizontal placement of the valve, close to the level of the outflowing water and substantially parallel to the flow of water immediately past the discharge valve, to provide great efficacy of valve motion, these features being effected without

impairing a substantially straight passageway of water through the pump body. Furthermore, as a result of this improved body design, the discharge valve can be positioned at one side of the flexible diaphragm, thereby providing easy accessibility to the diaphragm, thus facilitating a renewal of the diaphragm when required.

One embodiment of the invention is illustrated in the accompanying drawings, in which like parts in each of the several figures are designated by similar characters of references, and in which:

Fig. 1 is a section taken through a pump provided with my improved body structure, and showing the usual flexible diaphragm reciprocating rod and suction inlet valve and a discharge outlet valve positioned in accordance with my invention.

Fig. 2 is a plan view taken on the line $2^{\times}$—$2^{\times}$, Fig. 1, with diaphragm and outlet valve removed.

Numeral 1 represents the main body member of my pump which may be formed of cast iron or any other suitable material, 2 being the water inlet opening and 3 the outlet opening. A horizontal opening 4 is provided for the fitting of the usual flexible diaphragm as shown in Figure 1. The upper wall of member 1 is horizontal. From inlet 2, the lower wall is parallel to the upper wall to a point substantially in line with that end of the upper wall which forms one of the edges of outlet opening 3; from that point, the lower wall curves upwardly, then slopes at an angle of approximately 45 degrees and ends in line with the upper wall. The lower wall of the spout member 5 also slopes upwardly for the greater portion of its length, then becomes straight and horizontal, while the upper wall of this member curves upwardly, describing substantially a quadrant of a circle, until a point in line with the lower edge of the lower wall, is reached and from there on the upper wall becomes straight and horizontal.

The spout member 5 is rigidly secured to the main pump body members at the outlet opening 3 of the member 1, by means of bolts 6 passing through holes in the base 7 of the spout and slots provided in the inclined flange 8 externally surrounding the inclined portion of the bottom wall and the lateral walls of the body member 1. A gasket of resilient material 10 placed between the base and flange, provides a water-tight joint between the two pump body members 1 and 5.

The outlet discharge valve 11 is positioned on the discharge stroke as shown in Figure 1. The lateral walls and the bottom wall of pump body member 1 provide horizontal edges 12 in horizontal alinement with the upper surface of the top wall of the pump body 1; a portion of this upper surface together with these upper edges afford a horizontal seating for the discharge valve. It is readily seen that the curved portion in the upper wall of the spout member affords ample space for the action of the discharge valve. Member 13 is the flexible part of the discharge valve and if desired is made part of gasket 10. This member 13 bears against the horizontal seat 12 when the valve is seated, and also affords a hinge for the valve, a portion of this member being clamped between the upper wall of the body member 1 and the lower edges of the upper wall of the spout member 5. It is also noted that the lower lip of the spout 5 is located above the level of the discharge valve 11, thereby keeping the latter submerged in operating conditions.

With this design of body and spout member, the outlet opening 3 is horizontal and the discharge valve can be horizontally seated, parallel with and close to the level 14 of the outflowing water.

The horizontal seating of the discharge valve 11 permits a minimum amount of water above the valve and therefore minimum effort to open it. Its proximity to the level 14, of the outflowing water also minimizes this effort and yet the valve holds its priming, since it is at all times substantially submerged.

It is readily seen from the foregoing that this design of pump body 1 and spout member 5 makes possible the effective priming of the discharge valve, the lower wall of the spout 5 sloping upwardly for a predetermined distance in order to keep the valve submerged at all times, even though this design is such as to afford a substantially straight passageway through the pump and spout bodies. Furthermore the horizontal disposition of the seat of the discharge valve, substantially parallel to the flow of water in the passageway and past the valve, and the configuration of the surrounding casing provide a substantially free passage of the sedimentary material with the outflowing water through and away from the valve seat.

Also, it is evident that the placement of the discharge valve, parallel to the level of outflowing water in the spout member and substantially parallel to the flow of water through the pump body and spout members, affords a maximum efficacy of valve motion.

The substantially direct water passageway through the pump and spout and the great efficacy of discharge valve motion are primarily caused by the inclined portion of the lower wall of the main body member 1 and the lower inclined wall of the spout 5, the mean operating position of the discharge valve being substantially parallel to the flow of water immediately past its horizontal seating outlet. It is noted that the seating edges provided for the discharge valve by

the walls of the main body member 1 are entirely free from the surrounding casing; the small seating surface thus provided substantially prevents any accumulation of grit or sedimentary material on the valve seat, which makes possible an efficient operation of the pump as a whole or an increased capacity. The spout 5 is of larger cross-sectional area than the main body member 1 and meets the latter around and below these free horizontal seating edges; with this arrangement of parts the base of the spout provides a pocket around the valve seat for sedimentary material after passage through the horizontal seating outlet, this keeping the seating edges substantially free of sedimentary material at all times and insuring proper operation of the valve, the sedimentary material in said pocket being eventually carried away with the outflowing water owing to the inclined lower wall of the spout member 5.

As a result of my improved design, the pump will permit the outflow of a larger volume of water on one stroke of the pump and the discharge valve will quickly seat upon the succeeding stroke. This larger flow of water will further prevent the accumulation of sand, gravel or other material on the valve seat.

It is also seen that my improved design of pump body and the location of the discharge valve are such as to afford easy renewal of the flexible diaphragm by providing accessibility to same.

Tests made on my improved pump body structure provided with substantially straight water passageway, horizontal placement of the discharge valve, close to the level of the outflowing water and substantially parallel to the flow of water through the pump body structure to afford quick valve action and the submerging of this valve to hold its priming, have determined that the efficiency and capacity of this pump have been materially increased over other pumps of the open discharge type, for like displacement of the flexible diaphragm. Such tests further show that the capacity of a pump embodying my invention is greater than that type of open discharge pump in which the discharge valve is located centrally of the flexible diaphragm.

A 3 inch open discharge pump provided with my improved body structure and placement of discharge valve has a capacity of over 7000 gallons per hour and has lifted water more than 30 feet by suction.

What I claim is:

1. In an open discharge pump, a pump structure forming a water passageway and comprising a member the upper wall of which is horizontal and the lower wall of which has a portion parallel to the horizontal flow of water and another portion contiguous to the first inclining upwardly until it is in horizontal alignment with the upper wall, the latter portion together with the upper wall and the lateral walls of the member forming a horizontal outlet, said structure also comprising a spout member having an apertured base joined to the first member in proximity to the edges of said outlet, said spout member having upper and lower walls shaped so as to provide a substantially direct water passageway through the structure and to discharge the outflowing water substantially horizontally, and a discharge valve horizontally seated within said structure against the edges of said outlet and hinged longitudinally of the edge of the outlet formed by the upper wall to provide free passage for outflow of water and sedimentary material, the lower wall of said spout sloping upwardly for a predetermined distance to keep the valve submerged at all times and the inclined portion of the lower wall of said member and the inclined lower wall of said spout causing the mean operating position of the valve to be substantially parallel to the flow of water through said outlet.

2. In an open discharge pump, a pump structure forming a water passageway and comprising a member the upper wall of which is horizontal and the lower wall of which has a portion parallel to the horizontal flow of water and another portion contiguous to the first inclining upwardly until it is in horizontal alinement with the upper wall, the latter portion together with the upper wall and the lateral walls of the member forming a horizontal outlet, said structure also comprising a spout member having an apertured base joined to the first member below said outlet, said spout member being so shaped as to provide a substantially direct water passageway through the structure and to discharge the outflowing water substantially horizontally, a discharge valve horizontally seated within said structure against the edges of said outlet and hinged longitudinally of the edge of the outlet formed by the upper wall, the lower wall of said spout sloping upwardly to a predetermined point, and the edges of said outlet being entirely free from the surrounding spout member to provide free seating edges for said valve.

3. In an open discharge pump, a pump body member affording a passage for water having two lateral walls and top and bottom walls, the top wall being horizontal and the bottom wall having a horizontal portion and an upwardly inclined portion contiguous to the first, an inclined external flange surrounding the lateral walls and the inclined portion of the bottom wall, the upper edges of the inclining portion of the bottom wall and of the lateral walls together with the upper wall forming a horizontal outlet, a spout of larger cross-sectional area than said member, said spout having an apertured bot-

tom rigidly secured to said flange below and around said outlet, said spout having upper and lower walls shaped so as to provide a substantially direct passage of water through the member and spout and to discharge the outflowing water substantially horizontally, and a discharge valve seated against the free horizontal edges of said outlet and hinged longitudinally of the edge formed by the upper wall, the lower wall of said spout sloping upwardly to a predetermined point and the bottom of said spout forming a pocket for sedimentary material upon passage through said outlet.

4. In an open discharge pump, a pump body member affording a passage for water having two lateral walls and top and bottom walls, the top wall being horizontal and the bottom wall having a horizontal portion and an upwardly inclined portion contiguous to the first, an inclined external flange surrounding the lateral walls and the inclined portion of the bottom wall, the upper edges of the inclining portion of the bottom wall and of the lateral walls together with the upper wall forming a horizontal outlet, a spout of larger cross-sectional area than said member having an apertured base rigidly secured to said flange below and around said outlet, said spout having upper and lower walls shaped so as to provide a substantially direct passage of water through the member and spout and to discharge the outflowing water substantially horizontally, a discharge valve and a gasket secured between said base and flange, said gasket being formed integral with an extension to provide a seating part to said valve, said seating part being seated against the free horizontal edges of said outlet and affording a hinge longitudinal of the edge formed by the upper wall of the member, the lower wall of said spout sloping upwardly to a predetermined point, and the bottom of said spout forming a pocket for sedimentary material upon passage through said outlet.

5. In an open discharge pump, a pump structure forming a water passage-way, comprising a hollow member affording a horizontal passage for water and having a substantially horizontal outlet formed by the edges of said member, a discharge member having an apertured base joined to said first member below the edges of said outlet and affording a substantially horizontal water discharge in the direction of water flow in said first member, and a discharge valve substantially horizontally seated against the edges of said outlet and hinged so as to operate substantially parallel to the flow of water.

6. In an open discharge pump, a structure forming a water passage-way comprising a hollow member affording a horizontal passage for water and having a substantially horizontal outlet valve seat formed by edges projecting forwardly from said member in the direction of water flow through said member, said member having a discharge portion affording a substantially horizontal water discharge in the direction of water flow in said hollow member and providing a free passage for outflow of water and sedimentary material, its lower wall sloping upwardly to maintain liquid to keep the valve submerged when closed, and a discharge valve seating against the aforesaid edges and hinged so as to be when in its open position substantially parallel to the flow of water.

ALFRED S. MARLOW.