F. W. WINTERHOFF.

MEMBRANE PUMP.

APPLICATION FILED MAY 20, 1908.

992,837. Patented May 23, 1911.

2 SHEETS—SHEET 1.

Fig. 1

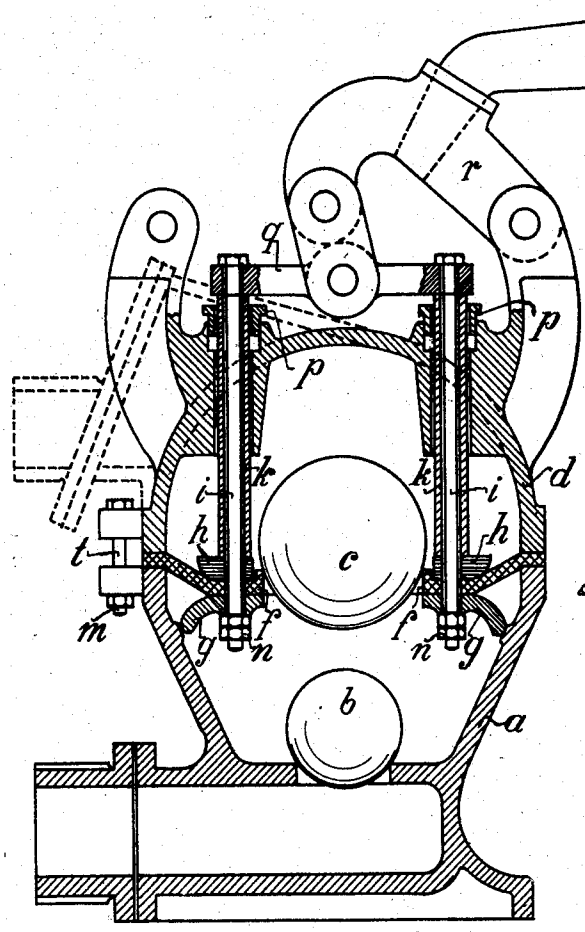
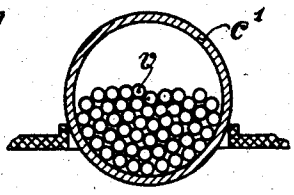


Fig. 2



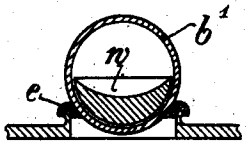


Fig. 3

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2 SHEETS—SHEET 2.

Fig. 4

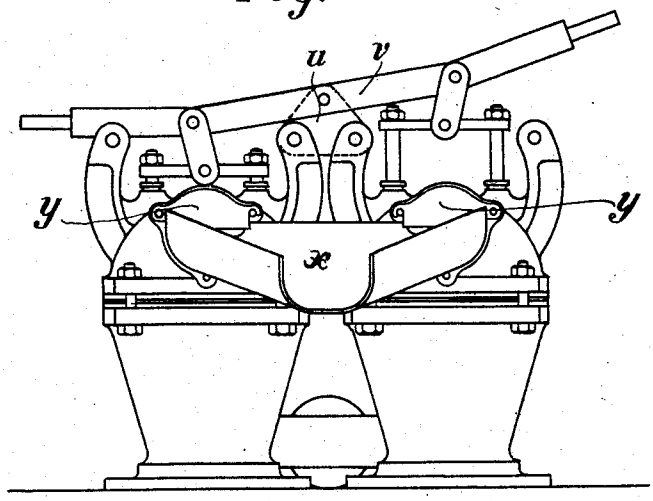
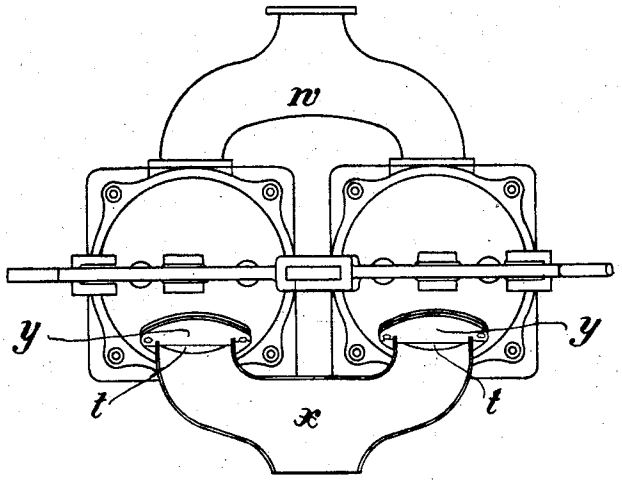


Fig. 5



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UNITED STATES PATENT OFFICE.

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MEMBRANE-PUMP.

992,837. Specification of Letters Patent. Patented May 23, 1911.

Application filed May 20, 1908. Serial No. 434,000.

To all whom it may concern:

Be it known that I, FRIEDRICH WILHELM WINTERHOFF, a subject of the German Emperor, residing at Kronprinzenstrasse 51, Dusseldorf, Germany, have invented certain new and useful Improvements in Membrane-Pumps, of which the following is a specification.

My invention relates to improvements in membrane-pumps and it consists in the novel features of construction and combination of parts, hereinafter described, reference being had to the accompanying drawings which illustrate one embodiment of my invention.

The object of my invention is to provide with certain novel features of construction, membrane pumps of well-known type.

This invention contemplates the use of suction-balls as well as pressure-balls. These balls have been provided one over the other, the pressure-ball, resting freely on top, so as to facilitate the temporary displacement thereof in case of any foreign matter, such as mud, wood, sewerage, etc. being contained in the water which passes through the pump. However, in order to prevent the temporary displacement of the pressure ball from becoming permanent and to assure a return of the ball to its proper place, there is provided an upper casing comprising a cap portion secured to the lower casing, this cap casing having a socket formation corresponding to the shape of the pressure ball, and which serves as a receiver therefor in case of its displacement. The diameter of this pressure ball is much greater than the diameter of the suction ball, and the valve seats for said balls vary in size correspondingly whereby the pressure valve seat formed on the membrane is sufficiently large to permit the removal of the suction ball therethrough by manual means.

The membrane pump is provided with a housing corresponding to the shape of the balls, and in which is provided a discharge opening of sufficient size to permit the removal of the suction and pressure balls without taking the pump apart. To adapt the pump to be used as a force pump, the housing is provided with stuffing boxes where the rods pierce its walls and thereby adapt the upper part of the housing to serve as an air chamber for the delivery pipe. By the peculiar manner in which the membrane is secured in the pump, it is made readily exchangeable.

By the arrangement of two pumps with joined fulciments, connected one with the other by a corresponding junction-piece, in which is mounted a double-armed lever, a double-chambered pump is made in the simplest manner. The two inlet-pipes and the two discharging-pipes will then be joined by a T-shaped double-inlet or double-discharge.

In order to make the suction- and pressure-balls fit tightly and to wear out uniformly, said balls can be made hollow and partly filled with grains, square pieces or a semi-globular mass of heavy metal.

Figure 1 is a vertical section of a pump embodying my invention. Figs. 2 and 3 are sections of the suction balls; Fig. 4 is a side elevation of another embodiment; and Fig. 5 is a plan view of the same.

The new membrane pump is represented in cross-section by the accompanying drawing in Fig. 1. It is provided in the lower part *a* with a seat of iron or interchangeably, rubber, for the suction-ball *b* and above with the cap *d* forming the valve-chamber. The annular membrane *f* is fastened on one edge between the lower part *a* and the cap *d* by screws *m* and on the other edge between the two rings *h* and *g* by means of the bolts or rods *i* passing through the upper bridge *q* the pipes *k* and the rings *h* and *g* and held by the nuts *n*. In order to obtain great rigidity of the membrane which forms the valve seat for pressure ball, the ring *h* is so arranged as to normally press downward thereon, while the downward movement thereof is limited by the ring *g* which is located beneath the membrane and normally in contact with the pump casing *a*. The membrane is moved by the lever *r*. The nuts *n* of yellow brass have been provided inside the pump-box at the lower end of the bolts *i* so as to permit the membrane to be easily replaced after the screws *m* have been withdrawn and the upper part *d* of the membrane-pump lifted. It is thus unnecessary to remove the bolts *i*.

The seat for the pressure-ball *c* consists of the rubber membrane *f* which will hold out at least as long as the membrane does. The seat for the suction-ball *b* has been provided with an interchangeable ring *e* of rubber or the like. The seats can of course be

made of metal and the balls of rubber or covered with rubber. The cap *d* of the housing corresponds in shape with the upper balls so as to permit the water to enter on all sides from below the pressure ball *c* after which the water is forced in a stream from the discharge, shown in dotted lines. Said discharge is constructed of sufficient size to let the balls *b* and *c* pass through it and is provided with a flat cover plate with a smaller opening therein which is attached when the pump is used as a force pump.

The stuffing boxes *p* serve to pack the incased reciprocating rods *k* so that water is prevented escaping during the force stroke of the pump.

The reciprocating movement of the bridge or yoke *q* and the membrane *f* can be effected mechanically.

In order to procure a quick and exact seating of the suction- and pressure-balls and uniform wear of the same, they can be made hollow and filled with grains, square pieces or semi-globular particles of heavy material, as shown by the drawing.

Figs. 2 and 3, b^1 and c^1 are the hollow balls, *v* the grains and square pieces, *w* the semi-globular mass. By this means the balls are made heavy on one side.

Placing two membrane pumps adjacent one to the other and connecting the two fulciments of the pumps by a suitable member to which a double-armed lever *v* is attached we have a pump which acts on both strokes of the lever. The inlet-pipes of the two pumps are then joined by a T-shaped double-inlet *w*, while the two discharging-pipes are also joined by a T-shaped double-discharge *x*. The upper half of each is closed by a bolt-nab when an open discharging-pipe is used.

Having thus fully described my invention, what I claim is:

1. In a membrane pump, the combination with a valve casing having valve seats located therein, pressure and suction balls adapted to seat thereon, a cap portion having a socket formation corresponding to the shape of the pressure ball and adapted to act as a receiver therefor when it is displaced from its valve seat, said cap having a discharge of sufficient area to permit the removal by manual means of the suction and pressure ball valves without the removal of the cap.

2. In a membrane pump, the combination with a casing, having a valve seat, of a ball valve adapted to seat thereon, a membrane having a central opening forming a valve seat, a pressure ball valve therefor, a rigid ring positioned on the under face of said membrane and provided with a downwardly extending flange constructed and arranged to contact with the wall of the casing, whereby the downward movement of the membrane will be positively limited, and means for operating said membrane.

3. In a membrane pump in which balls are used for suction and pressure valves, the combination with the valves and the valve-seats, the pressure valve seat being large enough to permit the suction valve ball to be passed therethrough, a housing provided with a discharge opening permitting the balls to be removed, and a cap plate provided with a smaller discharge opening, said plate being adapted to be fastened to the housing over the large discharge opening to form an air chamber within the housing.

4. In a membrane pump, the combination with the suction valve seat; of a ball valve mounted thereon; a pumping membrane with a central pressure valve seat; valve rods connected with said membrane on opposite sides of said pressure valve seat, said valve rods being yoked together above and inclosed below from the water.

5. In a membrane pump, the combination with the lower portion of the valve casing provided with a suction valve seat; a ball valve on said valve seat; a pumping membrane provided with a pressure valve opening; a ball valve for the valve opening in the membrane; a cap mounted on the lower portion of said valve casing and clamping said membrane thereto; piston rods connected with said membrane on different sides of the valve opening, said rods being provided with water-tight housings extending from the membrane through said cap; a yoke connecting said rods together; and means for raising and lowering said yoke.

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Witnesses:

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