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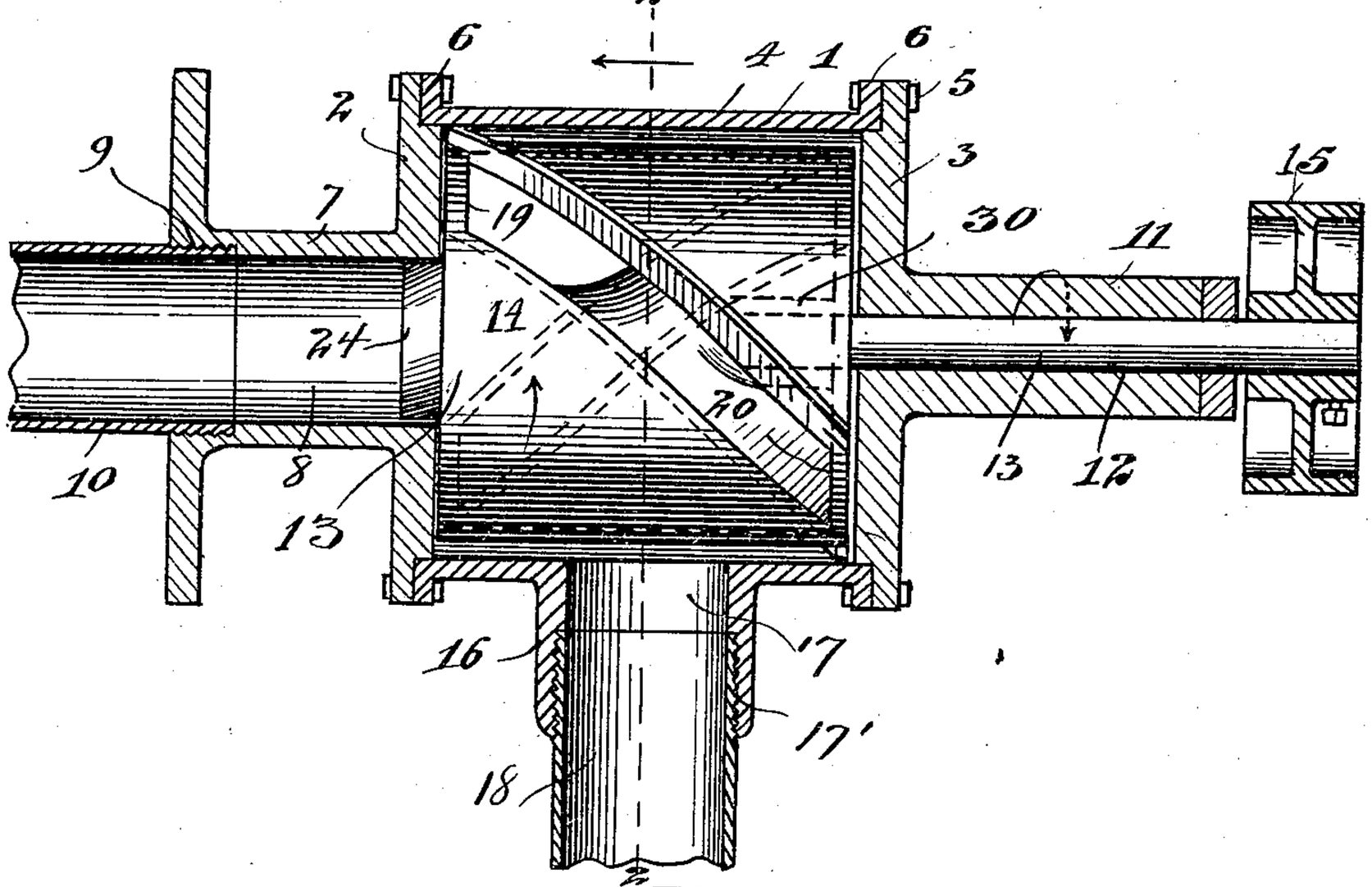
W. S. SHARPNECK.

ROTARY PUMP.

APPLICATION FILED SEPT. 25, 1901.

NO MODEL.

Fig. 1.



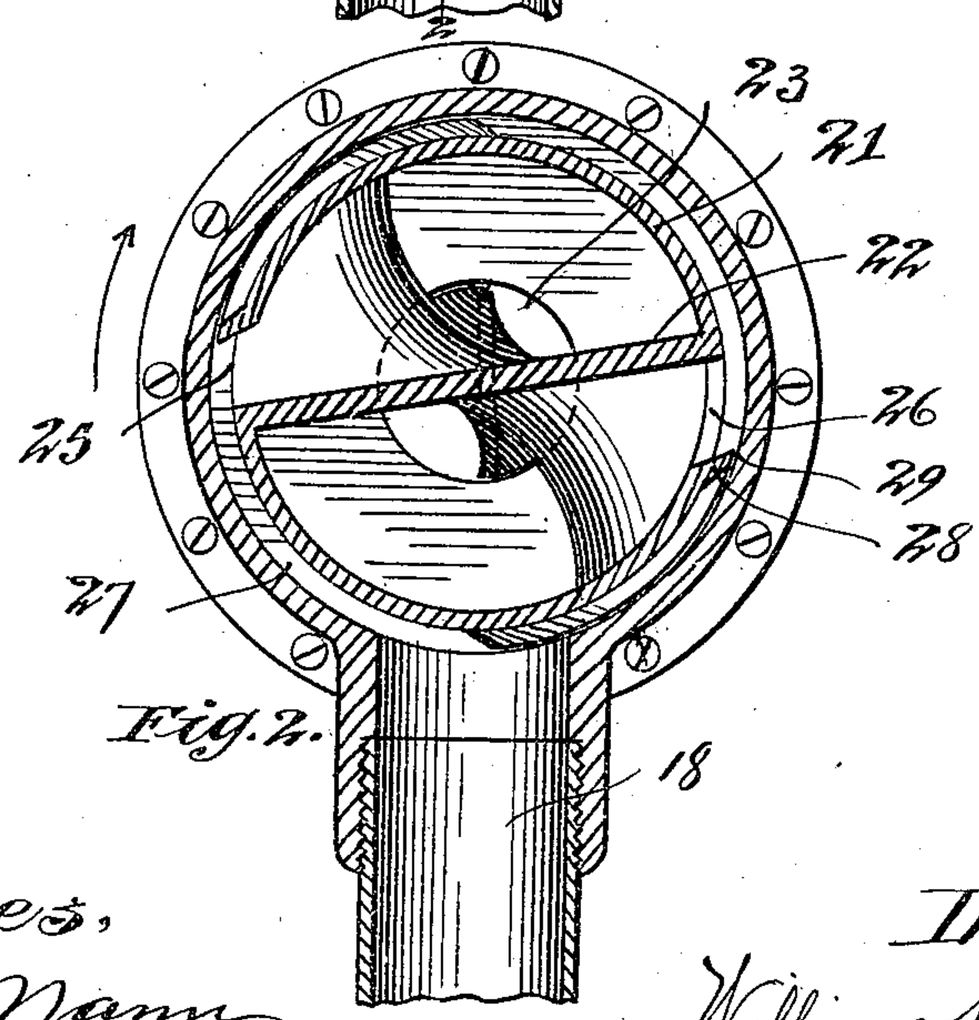


Fig. 2.

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UNITED STATES PATENT OFFICE.

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ROTARY PUMP.

SPECIFICATION forming part of Letters Patent No. 725,784, dated April 21, 1903.

Application filed September 25, 1901. Serial No. 76,525. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. SHARPNECK, a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Rotary Pumps, of which the following is a specification.

This invention relates to improvements in rotary pumps, and refers more specifically to improvements in pumps of the centrifugal variety and of that type in which a hollow shell-like piston provided internally with pallets or blades is rotated and operates to pump the liquid by the combined centrifugal action imparted thereto and the impelling action imparted by the shape of the blades.

The object of the present invention is to provide a construction in which the pallets or blades of the rotary piston are so shaped as to act in conjunction with the surrounding casing to impart a positive propelling movement to the liquid, while at the same time imparting the rotary or whirling motion which results in generating centrifugal force; to provide in a piston having the above characteristics a piston-shell so constructed and arranged as to induce a more effective exhausting or sucking action; to provide in a rotary piston having substantially closed sides restricted outlets or discharge-ports leading therefrom, a peculiar form of outlet which also contributes to the efficiency of the exhausting action, and, in general, to provide a simple and improved construction of the character referred to.

To the above ends the invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims, and the same will be readily understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is an axial sectional view of a pump-head and connected parts embodying a preferred form of my invention, and Fig. 2 is a transverse vertical sectional view taken on line 2 2 of Fig. 1 and looking in the direction of the arrows.

Referring to the said drawings, 1 designates as a whole the pump-casting, which is shown in the present instance as internally cylindric and composed of two disk-like end castings 2 and 3, respectively, between which is interposed and secured a cylindric shell or casting 4, the peripheries of the end castings 2 and 3 and the end margin of the cylindric shell being united by means of bolts 5, extended through outturned flange portions 6 upon the shell member and through corresponding parts of the peripheries of the end castings, as shown clearly in the drawings. The end casting 2 is provided with an integral axially-disposed tubular extension 7, which forms the inlet-aperture 8 of the pump, the outer end of this extension being internally threaded, as indicated at 9, to receive the end of the suction-pipe 10, which leads to any suitable source of supply. The end member or casting 3 is also provided with an axially-disposed extension 11, which is axially bored, as indicated at 12, and forms a journal bearing and support for the actuating-shaft 13, upon the inner end of which is mounted the piston, (designated as a whole 14.) Upon the outer end of said shaft may be conveniently mounted a drive-pulley 15, by means of which the pump is actuated.

The cylindric shell member 4 is provided at a point intermediate its axial length and at one side thereof with a radially-extending tubular extension 16, which forms the outlet 17 of the pump-body, this extension being also internally threaded at 17′ to receive the end of the discharge-pipe 18. It will be understood that the direction in which the pump is arranged to discharge, whether upwardly, downwardly, or to either side, is immaterial, and for that matter the pump itself may be arranged either horizontally, as shown, or in any other position, as found convenient or desirable.

Describing now more specifically the construction of the piston, this member consists of a generally cylindric shell or body having disk-like end walls 19 and 20, cylindric side walls 21, and a diaphragm, (designated as a whole 22,) extending the full length of the interior of the shell and serving to completely partition the interior of the latter. The diaphragm 22 constitutes, in effect, a pair of pallet blades or vanes, the corresponding parts of which are diametrically opposite each other, the dia-

phragm being to this end arranged to divide the interior of the shell diametrically. In order to secure a propelling action upon the liquid, said diaphragm is twisted on the direction of its length or made in the form of a longitudinally-extending spiral or helix. The end wall 19 of the piston-head is provided with an axially-disposed port or opening 23, desirably of a size substantially equal to the inlet-passage 8 of the pump-casing, and in order to further enhance action of the diaphragm both in imparting a rotary motion to the liquid and in impelling it forwardly said diaphragm is provided with an extension or continuation 24, which extends a short distance into the inlet-passage 8, it being understood that this extension is a smooth or uninterrupted continuation of the adjacent end margins of the diaphragm proper and formed in continuation of the curve of the latter.

25 and 26 designate the outlet or discharge ports of the piston, which outlets are made in the form of slot-like passages extending the full length of the piston-body and respectively located coincident with the advance side of the lateral edge of each blade considered with reference to the direction of rotation of the piston. Except for the discharge-ports 25 and 26 the cylindric side walls of the piston are imperforate, so that the only outlet for the liquid is through said ports, and for the same reason ingress of air, which would tend to flow into the piston under the exhausting action of the latter, is prevented except through said ports. Obviously the more perfect the vacuum may be maintained within the piston-shell the more effective will be its exhausting and pumping action, and the outlet-ports 25 and 26 are therefore made of such restricted size as will barely permit the escape of the liquid with sufficient freedom.

Inasmuch as the piston is continually discharging at all parts of its revolution, the cylindric interior of the pump-casing is made of somewhat greater diameter than the exterior of the piston, so as to provide an annular surrounding space 27, through which the liquid may flow to the outlet-port 18. In order to facilitate the flow of the liquid around the interior of the casing and to the discharge-outlet and at the same time prevent the backflow of air through said annular space to the outlet-ports of the piston, I provide at the advance edge of each outlet port or slot an outturned extension or lip 28, the outer edge of which approaches as closely to the interior of the casing as is consistent with freedom of movement of the piston, as indicated at 29. Desirably and as shown herein these lips are inclined outwardly and rearwardly or approximately in direction in which the liquid is discharged in the interior of the piston.

The end wall or member 20 of the piston-shell is provided with an inwardly-extending hollow boss or socket 30, with which is rigidly engaged the inner end of the actuating-shaft 13 in such manner as to support the piston entirely free from the interior of the casing, so that it rotates with the utmost freedom therein.

The operation of the pump has probably been made clear in the description of its construction, but may be perfectly described as follows: The piston being rapidly rotated in the direction of the arrow shown in Fig. 2, or, in other words, in such direction as to cause its spiral diaphragm to tend to draw the liquid in through the axial inlet 8, the liquid receives a whirling motion, which causes it to flow radially outwardly through the ports of the piston and through the discharge-passage 18 of the pump As soon as the liquid enters the piston the effect of the spirally-shaped blades acting thereon tends to impel it longitudinally inwardly, while it is also moving radially under the centrifugal force, and a substantial part of the liquid will thus be drawn inwardly practically the full length of the piston and will be discharged through those ends of the ports remote from the axial inlet. Obviously this drawing-in action will result in distributing the discharge of the liquid more uniformly throughout the length of the piston than would be the case were suction alone depended upon for drawing the liquid in, so that the pumping efficiency of the piston is very substantially increased. Furthermore, the inclined or spirally-shaped blades act to expel the liquid positively independently of the centrifugal action, so that the pump proves much more effective as a force-pump for pumping water against high pressure than would be the case were the diaphragm or blades straight or in the form of longitudinally-extending plane surfaces.

The provision of the lips 28 is in itself a feature of importance in facilitating the discharge of the liquid from the pump-head, and it is to be noted in this connection that this feature is not necessarily combined with the spiral blades or pallets, but would be correspondingly effective if employed with a piston having straight blades and similar ports.

While I have herein shown what I deem to be the preferred embodiment of the invention, yet it will be understood that the details thereof may be modified without departing from the invention, and I do not, therefore, limit myself to the details shown, except to such extent as they are made the subject of specific claims.

I claim as my invention—

1. In a centrifugal pump, the combination with a suitable pump-casing of a hollow rotary piston provided internally with one or more pallet-blades having helically-curved impelling-surfaces, an inlet for admitting liquid to the axial portion of said piston, and one or more outlet-openings at the periphery thereof.

2. In a centrifugal pump, the combination with the pump-casing, of a hollow rotary piston of generally cylindric form and arranged

to rotate upon its longitudinal axis, a partitioning-diaphragm dividing the interior of the piston longitudinally and helically curved intermediate its ends, an axially-located inlet communicating with the interior of said cylinder at both sides of the diaphragm and restricted outlets formed through the cylindric side wall of the cylinder.

3. In a centrifugal pump, the combination with the pump-casing, of a hollow rotary piston of generally cylindric form and arranged to rotate upon its longitudinal axis, a partitioning-diaphragm dividing the interior of the piston longitudinally and helically curved intermediate its ends, an axially-located inlet communicating with the interior of said cylinder at both sides of the diaphragm and restricted outlets formed through the cylindric side wall of the cylinder at points coincident with the juncture of the diaphragm with the side walls of the piston, and at the advance sides of the respective lateral edges of said diaphragm.

4. In a centrifugal pump, the combination with the pump-casing, of a hollow rotary piston of generally cylindric form and arranged to rotate upon its longitudinal axis, a partitioning-diaphragm dividing the interior of the piston longitudinally and helically curved intermediate its ends, an axially-located inlet communicating with the interior of said cylinder at both sides of the diaphragm and restricted outlets formed through the cylindric side wall of the cylinder at points coincident with the juncture of the diaphragm with the side walls of the piston, and at the advance sides of the respective lateral edges of said diaphragm, said openings being in the form of continuous elongated slots extending through substantially the length of the piston.

5. In a centrifugal pump the combination with the pump-casing, of a hollow rotary piston of circular form in cross-section, a partitioning-diaphragm dividing the interior of said piston longitudinally or in the direction of its axis of rotation and helically curved throughout its length, an axially-located tubular inlet for admitting liquid to the end of said piston, an extension of said diaphragm extending beyond the end of the piston into said tubular inlet and restricted outlets formed through the side wall of the cylinder at the juncture of the side margins of the diaphragm with said side wall, substantially as described.

6. In a centrifugal pump, the combination with a hollow rotary piston having peripheral outlets, a casing inclosing said piston of larger internal diameter than the exterior of the piston and forming therewith an annular intervening space, and a lip-like projection extending longitudinally of the periphery of the piston and obliquely with reference to the axis of rotation thereof, and projecting radially outwardly beyond the periphery of the piston, as and for the purposes set forth.

7. In a centrifugal pump, the combination with a hollow rotary piston having elongated, obliquely-disposed peripheral outlets, a casing inclosing said piston of larger internal diameter than the exterior of the piston and forming therewith an annular intervening space, and a lip-like projection arranged to extend along the margin of each of said outlet-ports at the advance sides thereof considered relatively to the direction of the rotation of the piston, substantially as described.

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