

Oct. 18, 1927.

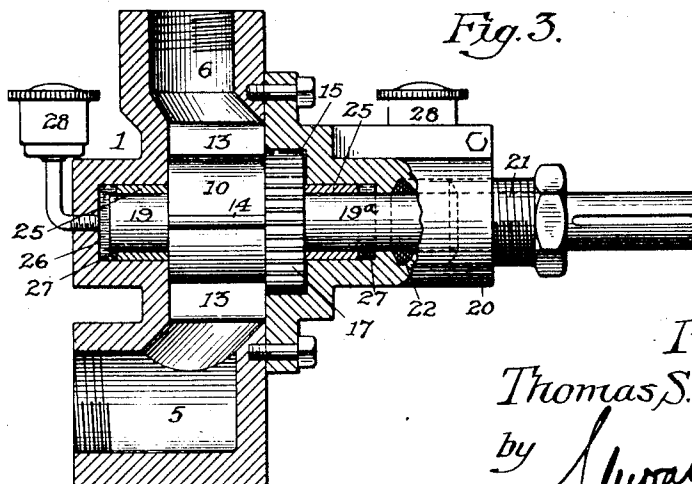
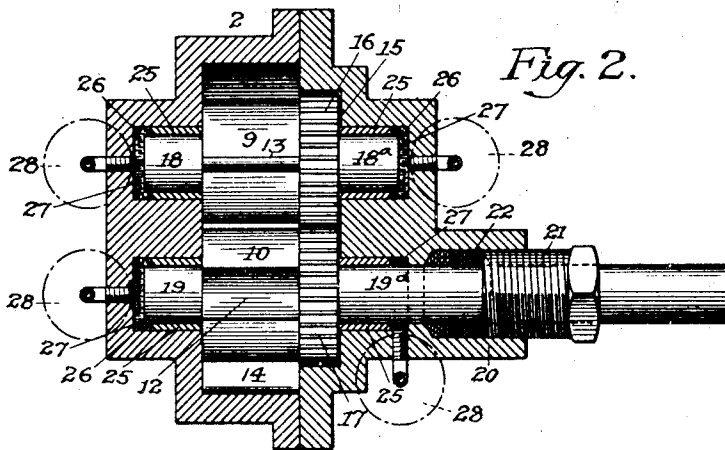
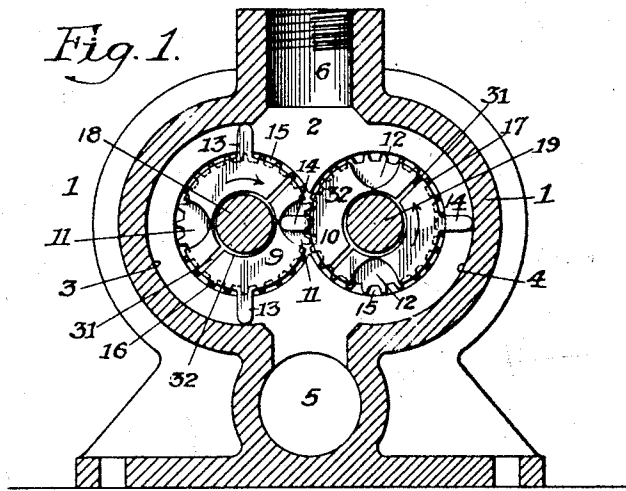
1,645,967

T. S. PATTERSON

ROTARY PUMP

Filed Aug. 29, 1924

2 Sheets-Sheet 1



Inventor:
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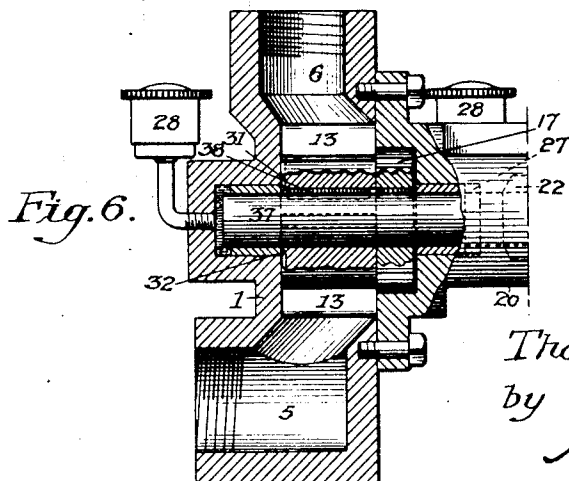
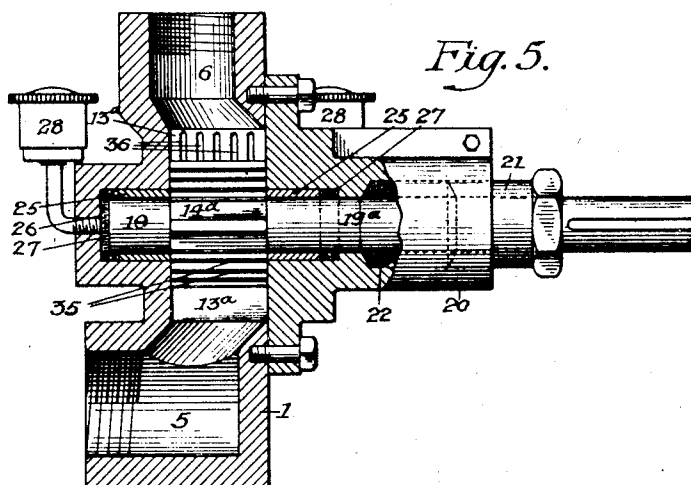
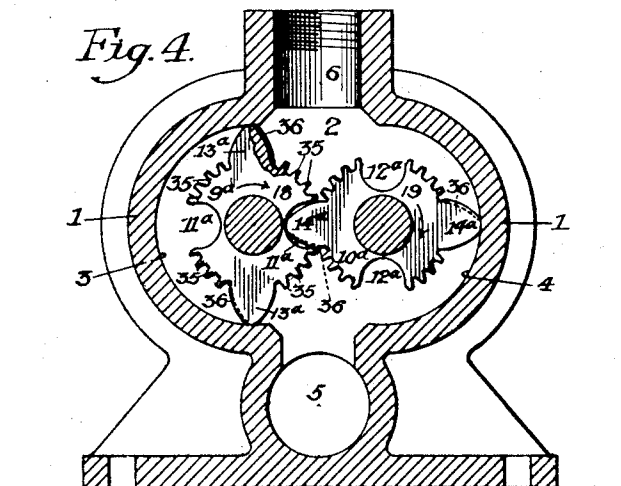
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T. S. PATTERSON

ROTARY PUMP

Filed Aug. 29, 1924

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

THOMAS S. PATTERSON, OF MALAGA, NEW JERSEY.

ROTARY PUMP.

Application filed August 29, 1924. Serial No. 735,029.

My invention relates to rotary pumps of the type in which a pair of impellers are rotated by suitable means and serve to discharge at varying pressures, depending upon the speed at which such impellers are rotated, a liquid body; such body being supplied to the impellers without pressure or head, and being lifted and discharged by the rotation of said impellers.

My improved structure comprises a pair of impellers which are connected to or associated with gearing so as to rotate in unison with each other; each of said impellers comprising a body generally cylindrical, more or less deeply recessed at opposite points and provided, at opposite points at right angles to said recesses, with blades which register with and enter said recesses upon rotation of said impellers. The bodies of the impellers between the respective blades and recesses are in substantial rolling contact with each other, and the extremities of the blades substantially clear the walls of the chamber in which the impellers are located.

A further object of my invention is to provide a rotary pump having impellers which are directly geared together; the blades constituting teeth which register with deep grooves or recesses formed in the bodies of the impellers at right angles to the teeth which form the blades, and the surface of the latter between said blades and grooves having teeth formed thereon the full width of the impellers, which teeth are in mesh and constitute the means whereby movement imparted to one impeller may be transmitted to the other. In such form of structure there are preferably the same number of teeth formed on the surface of the impeller body between each blade and recess.

A further object of my invention is to provide a structure of the foregoing type with means for relieving any compression of the fluid that may be set up between the blades and the walls of the recesses with which said blades register.

A further object of my invention is to provide improved means for supporting such impellers in floating bearings, with improved means for lubricating said bearings.

A further object of my invention is to provide floating bushings or sleeves between the impeller journals and the pump casing, between which lubricant may be forced by the pressure developed upon rotation of said impellers.

A further object of my invention is to provide means for introducing lubricant into the casing adjacent the bearings.

And a still further object of my invention is to provide a shaft for the impellers which may be splined thereto and with such looseness of fit as to permit movement of the impeller or shaft with respect to each other longitudinally of said shaft.

These and other features of my invention are more fully described hereinafter; reference being had to the accompanying drawings, in which:

Figure 1, is a vertical section of one form of my improved pump structure.

Fig. 2, is a sectional plan view on the axis of the impellers.

Fig. 3, is a sectional view at right angles to Fig. 1; partly on the vertical axis of one of the impellers.

Fig. 4, is a sectional view similar to Fig. 1, illustrating a modified form of structure within the scope of my invention.

Fig. 5, is a sectional view similar to Fig. 3, of the form of structure illustrated in Fig. 4, and

Fig. 6, is a sectional view similar to Fig. 5, illustrating another detail of construction within the scope of my invention.

In Figs. 1, 2 and 3, of the drawings, 1 represents the casing of the pump structure providing a chamber 2, having semi-cylindrical walls 3 and 4. The point of feed or inlet of fluid being moved by the impellers is at 5, and 6 is the discharge outlet which may communicate with a pipe leading to a reservoir or to any point of discharge.

Within the chamber 2, the impellers 9 and 10 are mounted; the same comprising substantially cylindrical bodies grooved at 11 and 12, respectively; such grooves being opposite each other on an axial line passing through the centre of the impeller bodies. In addition to said grooves, the impellers are provided with blades 13 and 14, respectively, disposed radially with respect to said impellers and at right angles to the grooves 11 and 12; said blades registering with said grooves when the impellers are in motion.

The casing is recessed at 15, for the reception of the toothed portions of said impellers, indicated at 16 and 17, and the pitch line of said gears coincides with the cylindrical surfaces of the impellers, between the blades and recesses, which surfaces are

adapted, substantially, to roll upon each other. The extremities of the blades are arranged so as to substantially clear the walls of the chamber in which they are mounted.

As illustrated in Figs. 1, 2 and 3, the impellers are provided with trunnions 18 and 18^a and 19 and 19^a, that is to say, supporting members which are integral with the impellers; one of said trunnions or supporting members, that indicated at 19^a, being extended through a stuffing box 20, having the usual gland 21, adapted to engage packing 22, whereby a fluid tight joint may be maintained, and forming a shaft for connection with a driving element, which connection may be in the form of a flexible coupling of usual type in operative engagement with a prime mover of any suitable design.

The several trunnions of the impellers are mounted in loose sleeves or bushing 25, disposed in recesses 26, formed in the pump casing; such sleeves being shorter than the recesses so as to provide a space 27, at the ends of the respective sleeves and adjacent to the outer ends of the recesses 26, adapted to receive heavy lubricant; certain of the trunnions being shortened to provide enlarged spaces. In order that such lubricant may be supplied to the spaces 27, the casing opposite each space carries a grease cup 28, of the pressure type, so that upon said cups being filled with grease and the caps being secured in place under proper conditions common to grease cups of this type, such grease will be forced into the spaces 27, under pressure; the sleeves or bushings having the proper loose fit with respect to recesses 26 and the trunnions, this pressure will cause such sleeves or bushings to be moved toward the impellers in the position shown in the drawings.

Upon rotation of the impellers under the action of the prime mover coupled to the combined shaft and trunnion 19^a, pressure will be set up in the chamber 2, and this pressure finding its way between the impellers and the walls of the casing and the ends of the sleeves, will cause the latter to move outwardly against the body of lubricant confined in the spaces 27 and such motion of the sleeves will force the lubricant between the latter and the trunnions and between the sleeves and the walls of the recesses 26 in which such bearing sleeves or bushings are mounted. To facilitate the pressure reaching the ends of the sleeves, the impellers may be grooved at 31 and 32; the grooves 32 being annular and disposed opposite the ends of the sleeves, and in some instances the ends of the sleeves adjacent to the impellers may be annularly grooved. It will be understood, of course, that the fit of the bushings or sleeves with respect to the walls of the recesses 26 and the trunnions is sufficiently loose to permit a film of lubricant to be

forced between the same in the manner indicated, although it is not possible to illustrate such looseness of fit in the drawings.

In the structure illustrated in Figs. 1, 2 and 3, the bodies of the impellers are arranged to substantially roll upon each other, and the gearing moving the same is laterally disposed with respect thereto so as to be out of the way or path of the fluid (or liquid) moved by said impellers. In the form of structure illustrated in Figs. 4 and 5, the impellers themselves, indicated at 9^a and 10^a, are directly geared together by teeth 35, extending across the bodies of the respective impellers, and the blades 13^a and 14^a, of the respective impellers which effect movement of the fluid (or liquid), are additional teeth, which serve to effect movement of one impeller by the other when the teeth 35 are not in mesh. While the number of teeth 35 is not important, there should be the same number between the respective blades 13^a and 14^a, and the recesses formed in the impeller bodies intermediate said blade teeth.

The blade teeth 13^a and 14^a, register with the recesses 11^a and 12^a, in the bodies of the impellers, and their engagement with the walls of these recesses cause movement of one impeller by the other. As the impeller teeth blades when entering these recesses tend to confine a portion of the fluid and as a liquid body is not compressible, means must be provided to allow such fluid (or liquid) to escape, and for this purpose the face of the blade teeth 13^a and 14^a is grooved, as indicated at 36, so as to permit escape of any fluid (or liquid) that may be trapped by said blade teeth. These grooves do not extend over the ends of the blade teeth which, as in the form of structure illustrated in Figs. 1, 2 and 3, are maintained just out of contact with the walls of the chamber in which they are located. If desired, by reason of the possibility of the same condition, the blades carried by the impellers in the form of structure illustrated in Figs. 1, 2 and 3, may also be grooved, and if necessary for any purpose both faces of the blades may be grooved.

In all other respects, in regard to the mounting of the same and other features, and the mode of operation, the structure illustrated in Figs. 4 and 5, is similar to that illustrated in Figs. 1, 2 and 3.

In lieu of the arrangement shown in Figs. 1, 2 and 3, in which the trunnions are part of or are fixed with respect to the impeller bodies, and in addition to the sleeves which have movement with respect to said trunnions, I may provide shafts 37 passing through the impellers and splined thereto so as to be capable of movement longitudinally with respect to said impellers, or the latter to have sliding movement longitudinally with respect to said shafts; such form of

structure being illustrated in Fig. 6, and the shaft illustrated being the one coupled to the prime mover. In such case the spline, indicated at 38, is shorter than the width of the impeller body so that the latter may have movement equal to the clearance between the same and the walls of the casing and in the space formed by such clearance, pressure may find its way to move the sleeves with respect to the shafts and impeller bodies, or the latter may move with respect to the sleeves. The space in the impeller bodies receiving the spline extends entirely through the same. In this arrangement, the ends of the sleeves may be annularly grooved and the face of the impellers may also be grooved.

In such arrangement, the gears may be independent of the impellers, and be secured to the shafts by keys or splines carried by the shafts so that the latter will be held against undue longitudinal movement by the engagement of such key with the wall of the casing.

In the case of the trunnions 19^a which is extended and coupled to the driving element and in the case of the shaft 37 also to be coupled with the driving element, the space receiving the lubricant is an annular one encircling such trunnion and shaft respectively.

It will be understood, of course, that both faces of the impeller bodies may be provided with the grooves 31 and 32, for the passage of pressure to the ends of the sleeves.

I claim:

1. In a rotary pump, the combination of a

chambered casing, a pair of impellers mounted therein; each of said impellers comprising substantially cylindrical bodies with a pair of radially disposed blades and being grooved intermediate said blades to accommodate the blades of the companion impeller, meshing gears for coupling said impellers whereby they may be driven in unison, means for driving said impellers, journals for said impellers, floating bushings for said journals; said bushings being of a length to provide spaces at the respective ends of the same, and means for filling said spaces with lubricant; said bushings being movable endwise by the pressure set up by the impellers and directed against the body of lubricant in said spaces to force the same between the journals and said floating bushings and said impellers being grooved for the passage of pressure to said bushings.

2. In a rotary pump, the combination of a chambered casing, a pair of bladed impellers geared together and mounted therein, means for driving said impellers, floating shafts for said impellers, floating bushings for said shafts; said bushings being of a length to provide spaces at the respective ends of the same, and means for filling said spaces with lubricant; said bushings being movable endwise by the pressure set up by the impellers and directed against the body of lubricant in said spaces to force the same between the floating shafts and bushings.

In witness whereof I have signed this specification.

THOMAS S. PATTERSON.