Aug. 20, 1935. J. MANN 2,011,936

ROTARY PUMP

Filed Nov. 4, 1932 2 Sheets-Sheet 1

FIG. 1.

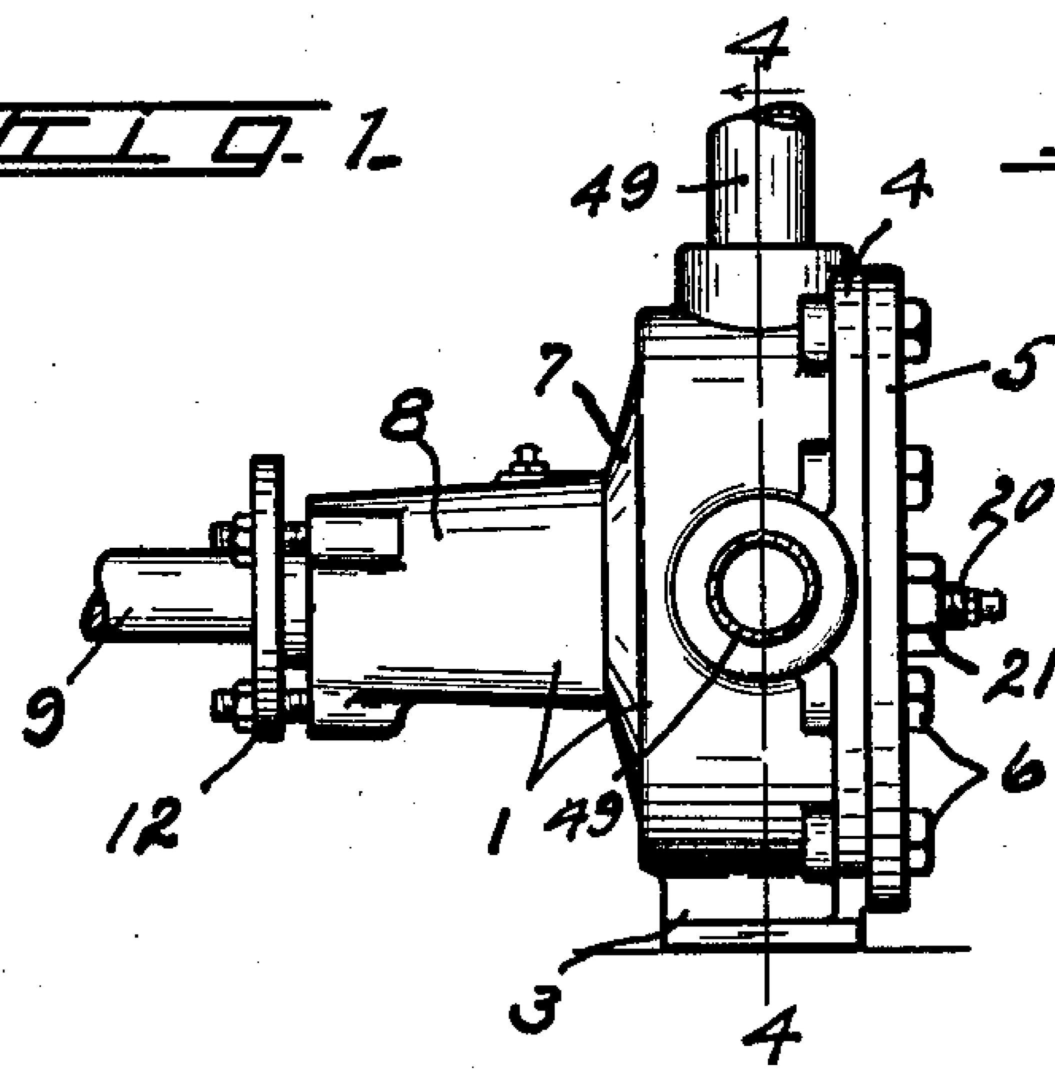


FIG. 2.

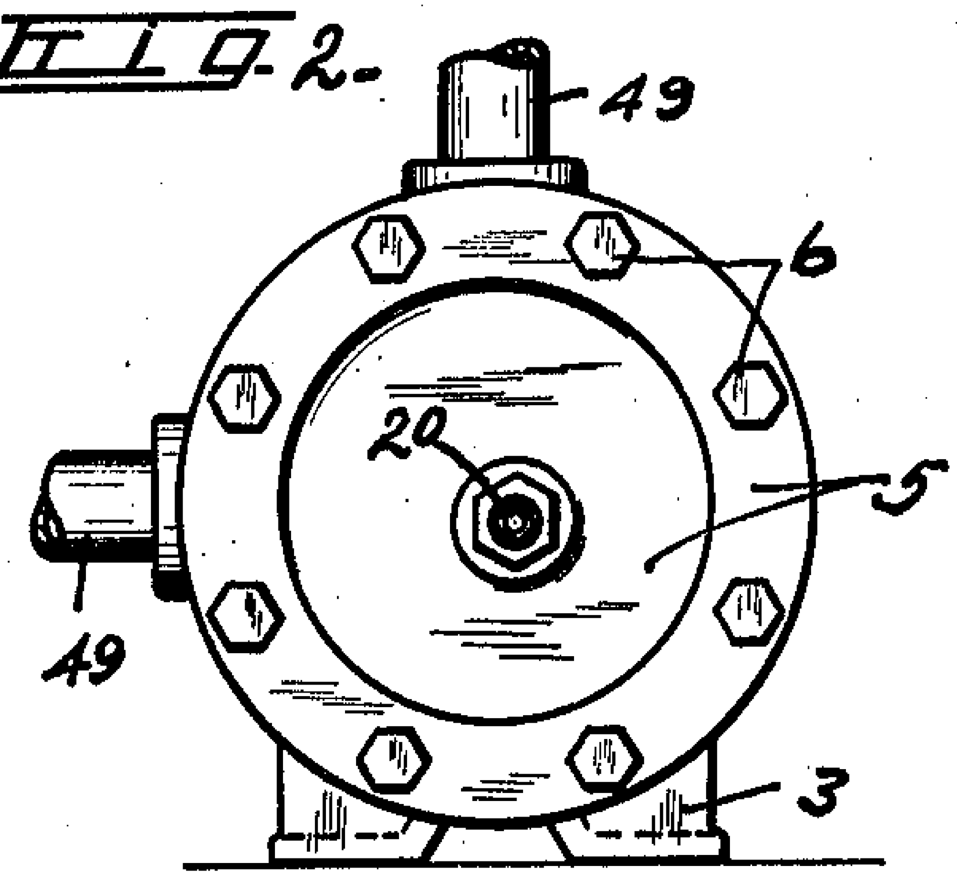


FIG. 3.

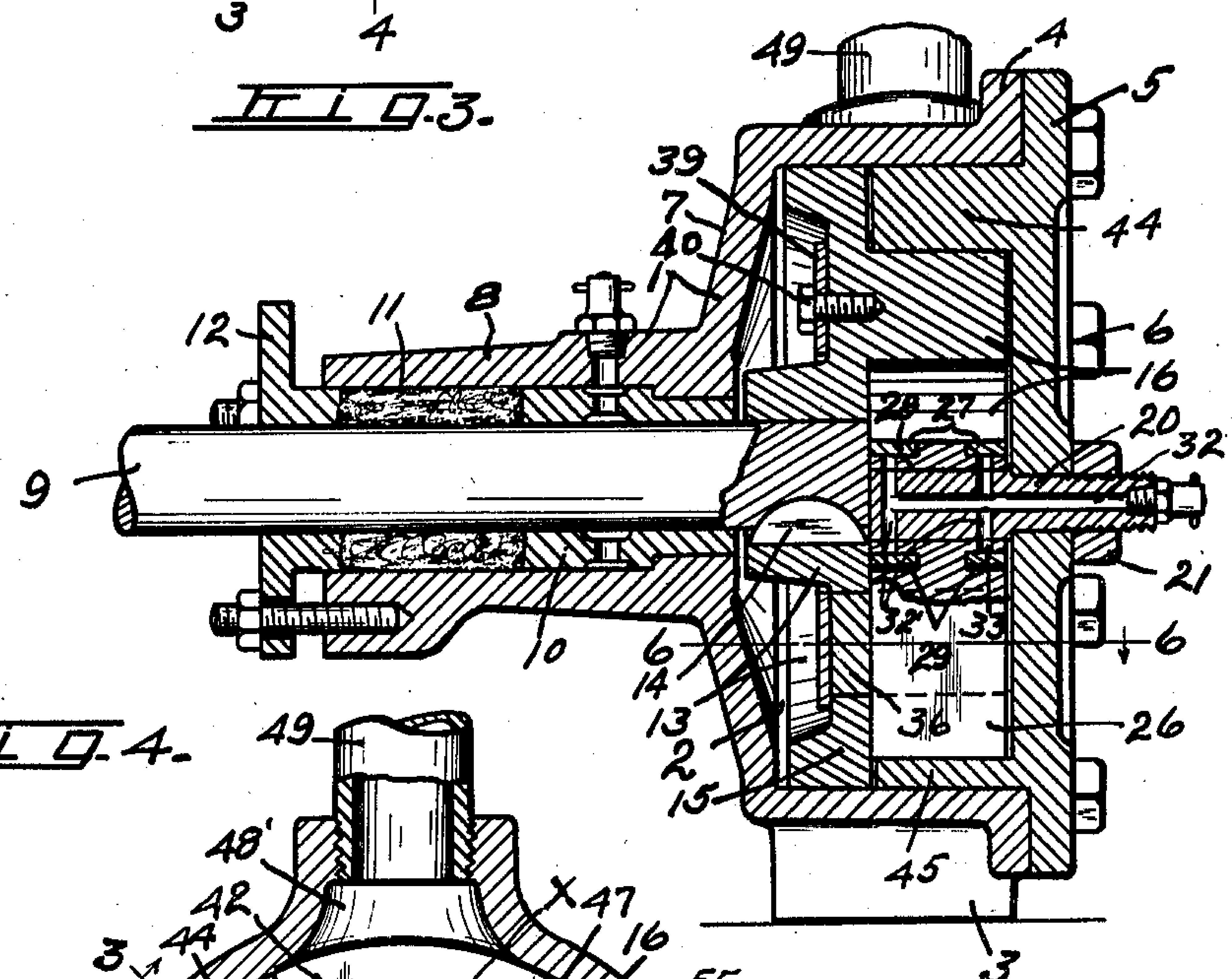
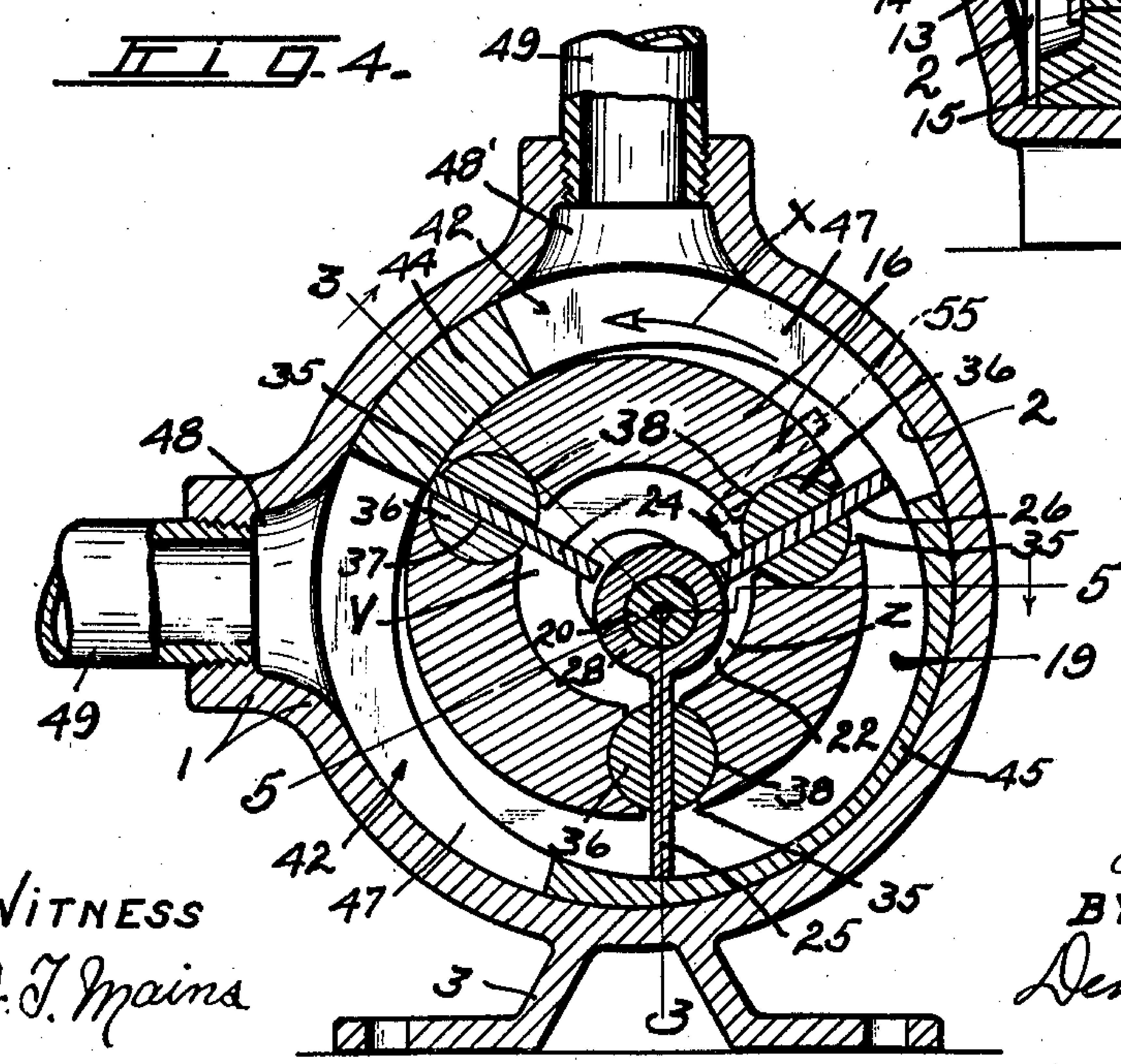


FIG. 4.



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ROTARY PUMP

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FIG. 5.

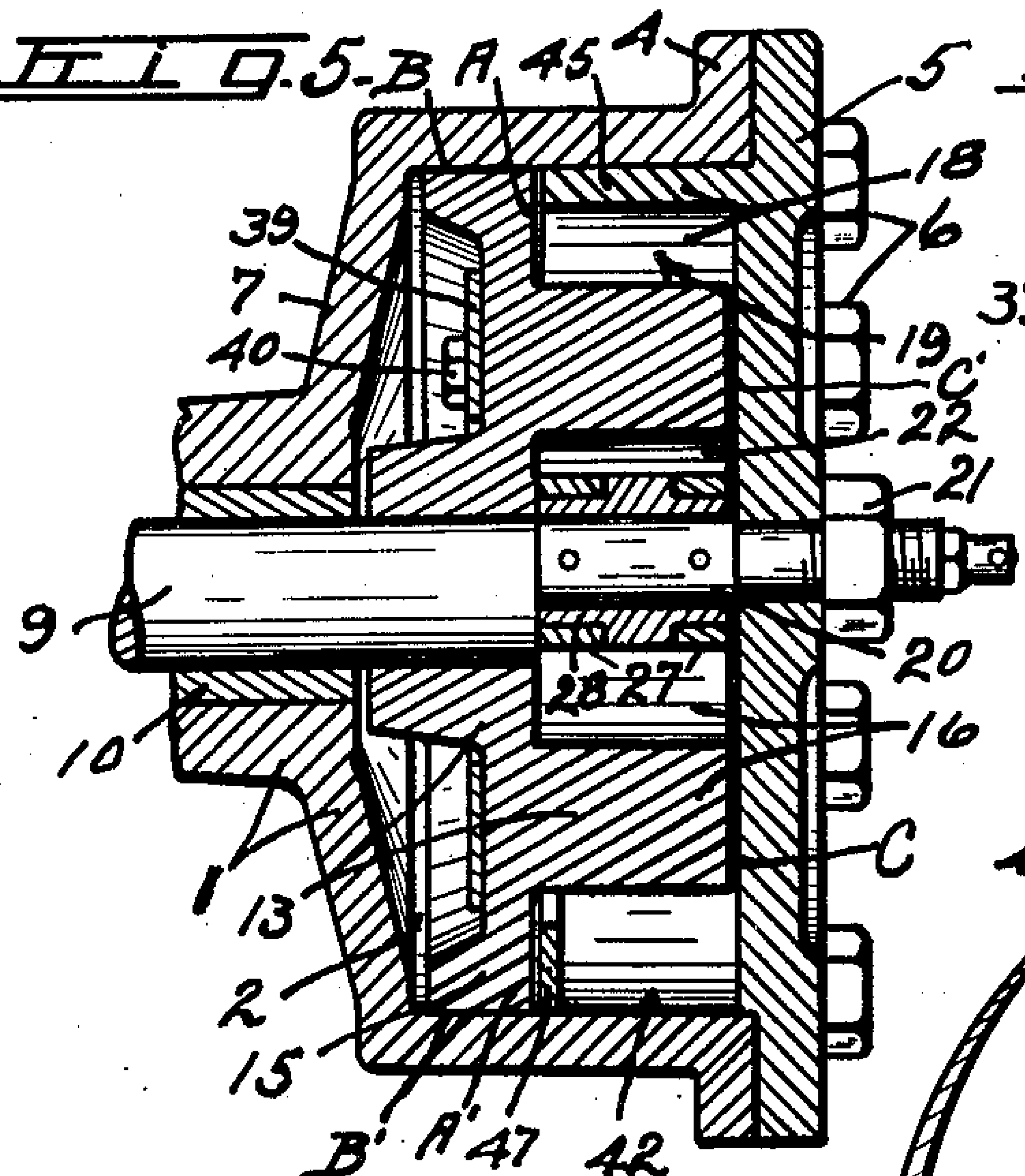


FIG. 6.

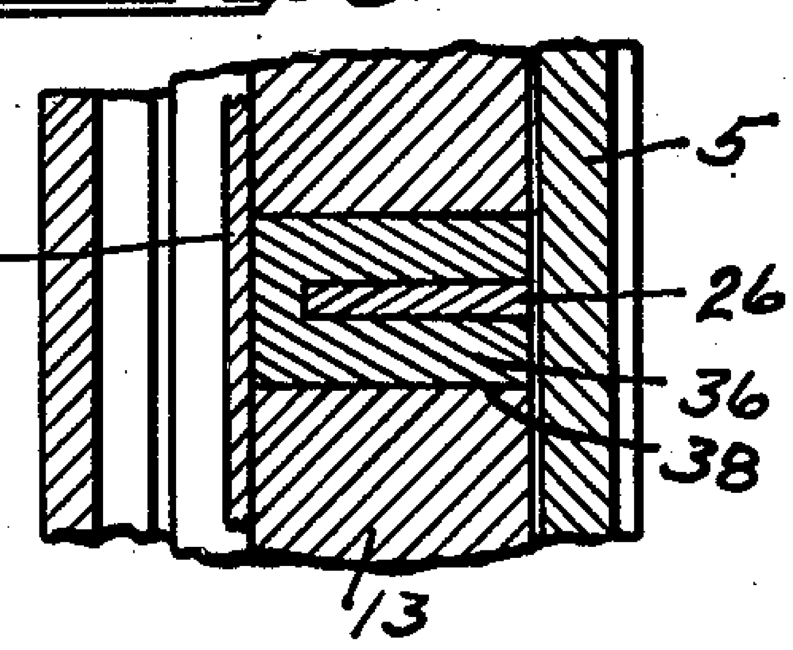


FIG. 7.

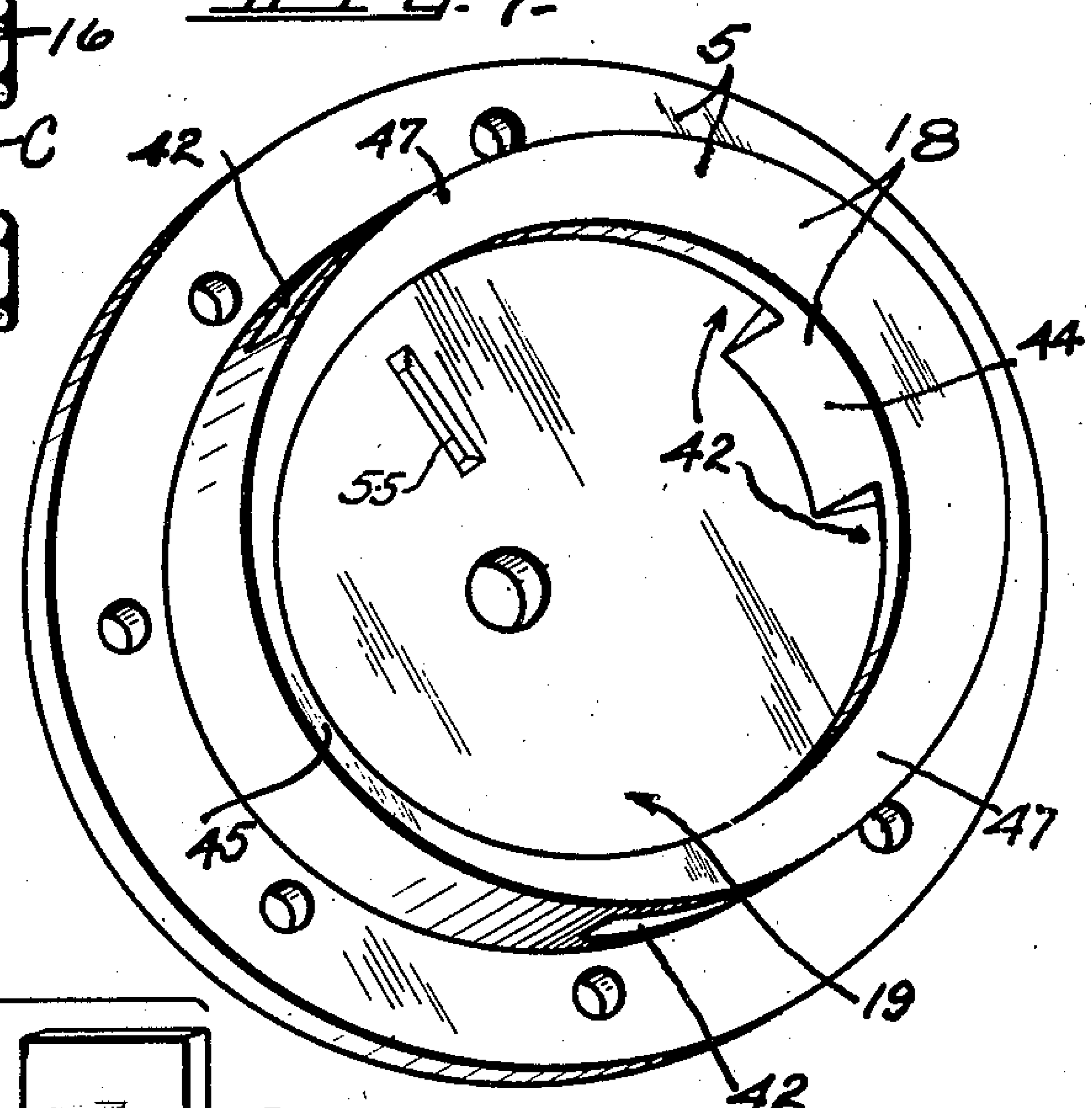


FIG. 8.

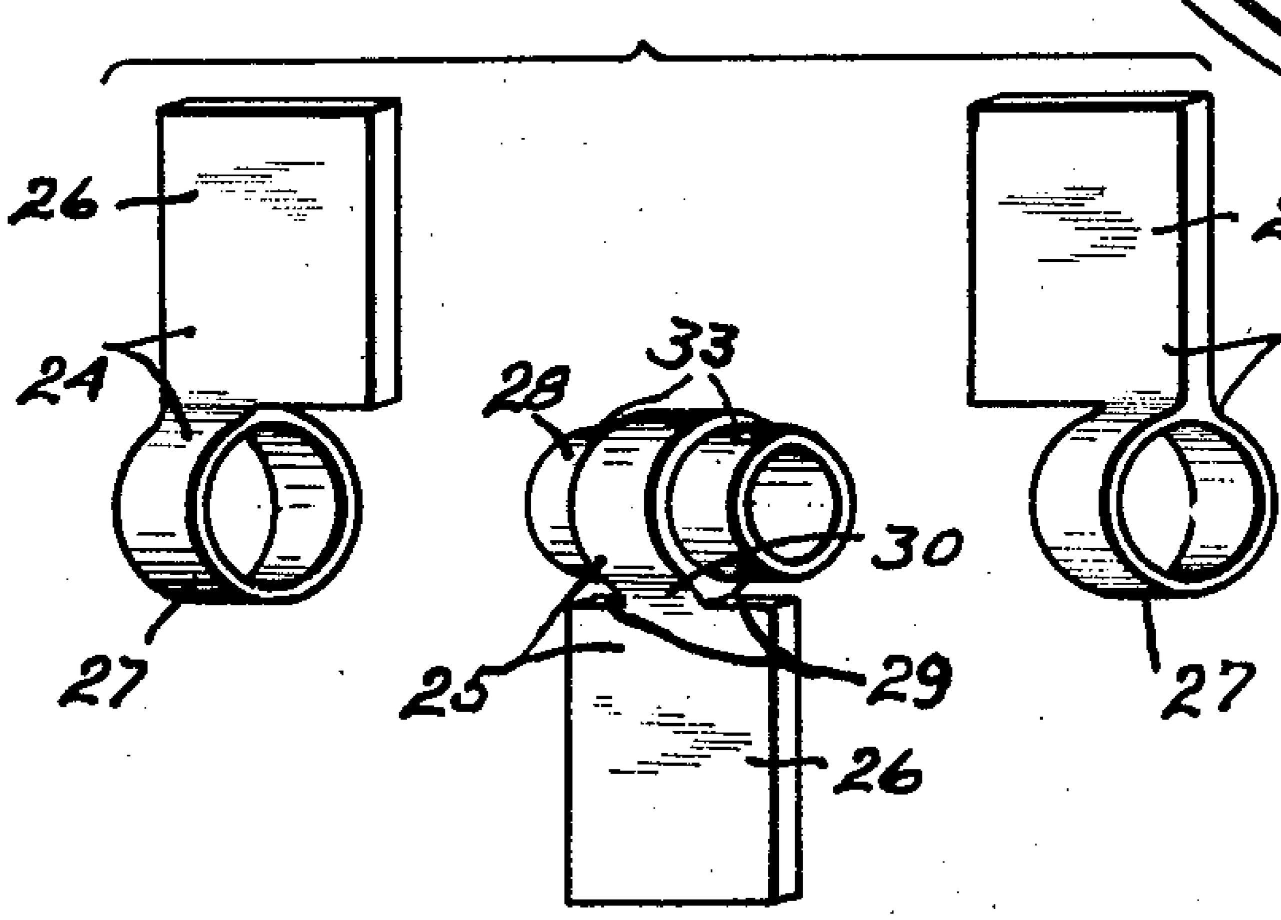
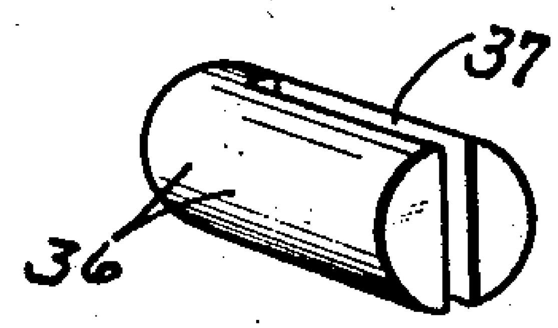


FIG. 9.



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Patented Aug. 20, 1935 **2,011,936**

UNITED STATES PATENT OFFICE

2,011,936

ROTARY PUMP

John Mann, Seneca Falls, N. Y., assignor to Goulds Pumps, Inc., Seneca Falls, N. Y., a corporation of New York

Application November 4, 1932, Serial No. 641,253

11 Claims. (Cl. 103—144)

This invention relates to improvements in rotary engines or pumps in which radially disposed impelling blades or vanes are revolved in the pump casing or pressure chamber by a rotor eccentrically mounted in the chamber.

In general, it is an object of this invention to provide a highly efficient rotary vacuum or pressure pump which is equally applicable for all forms of fluid, whether liquid or gaseous substances, which is susceptible of long life, which may be economically constructed, and which is equally effective in either direction of rotation.

In attaining the above-mentioned objects, the rotor chamber has been provided with a rotor and vanes or impelling blades arranged in such a manner that slightly unbalanced pressure is obtained upon the rotor in such a manner that the rotor is constantly urged axially towards one end of the chamber. At the same time, a film of fluid is maintained between the adjacent relatively movable surfaces of the rotor, vanes and pump case sufficient to seal and take up automatically any wear which might occur between these surfaces and thus reduce by-pass losses, maintain efficiency and minimize wear.

Furthermore, I have provided simple and efficient means whereby the uneven end thrust upon diametrically opposite sides of the rotor caused by the difference in pressure between the suction and exhaust sides of the pump is reduced to such an extent that the rotor is constantly maintained in a practically balanced condition thereby obtaining a minimum degree of friction and wear.

Other objects and advantages pertaining to the details of the structure and form and relation of the parts thereof, will in part be obvious and will in part appear hereinafter. For a fuller understanding of the nature and objects of the invention, reference should be had to the following description, taken in connection with the accompanying drawings, in which:—

Figure 1 is a side elevation of a device embodying various features of this invention.

Figure 2 is an end view of the device illustrated in Figure 1.

Figure 3 is an enlarged longitudinal sectional view taken in the plane of the line 3—3, Figure 4.

Figure 4 is an enlarged vertical transverse sectional view taken on line 4—4, Figure 1.

Figure 5 is a horizontal sectional view with one end portion of the case broken away, taken on line 5—5, Figure 4.

Figure 6 is a detail sectional view taken on line 6—6, Figure 3.

Figure 7 is a perspective view of the end plate or head for the pump case.

Figure 8 is an exploded perspective view of the impeller vanes or blades illustrated in Figures 3 and 4.

Figure 9 is a perspective view of one of the impeller vane driving pins.

The embodiment of the invention illustrated in the drawings consists of a suitable case 1 provided with an internal chamber 2. The case is mounted on an integrally formed base 3. At one end of the case is formed an outwardly extending annular flange 4 to which is secured an end plate or head 5 by means of bolts or screws 6. The other end of the case 1 is closed by an integral end wall 7 which has formed integrally therewith a centrally positioned outwardly extending bearing member 8.

A drive shaft 9 is mounted concentric with the casing chamber 2 and is journaled in a suitable bushing 10 provided in the inner end of the bearing member 8. The outer end of bearing member 8 may be provided with suitable packing 11 and follower 12 for preventing the escapement of fluid along the shaft 9.

One end of the drive shaft 9 may, as shown, extend outwardly beyond the bearing member 8 for receiving a pulley, not shown, or other suitable means for rotating the shaft. The shaft 9 extends inwardly from the end wall 7 into the casing chamber 2 a relatively short distance and has mounted on the inner end thereof a rotor 13 which, in this instance, has a frictional fit upon the shaft 9 and is secured thereto to rotate therewith by means of a key 14.

The casing chamber 2, in this instance, is made circular in cross section and the rotor 13 consists of a relatively thin circular body portion 15 of substantially the same diameter as the casing chamber 2. The body portion 15 of the rotor is positioned adjacent the end wall 7 of the case 1 in slightly spaced relation thereto and has the inner face thereof provided with an inwardly extending annular piston or vane cylinder 16.

This cylinder 16 is of sufficient axial length to extend from the body portion 15 of the rotor to the inner face of the end plate 5. The cylinder is of considerably less diameter than the body portion 15 and is formed co-axially with the body 16 and shaft 9. The cover plate or head 5 is provided with an inwardly extending cylindrical member or annular wall 18 which has an outside diameter substantially equal to the diameter of the casing chamber **2** so as to have a close sliding fit in said chamber to prevent the escapement of fluid or pressure between the wall **18** and the wall of the pump chamber **2**, and at the same time, permit the ready removal of the head from the cylinder.

The inner face of the wall **18** terminates in close proximity to the inner face of the rotor body **15** so that the open end of the interior chamber formed by the wall **18** will be closed by the rotor body **15** to form a pressure chamber **19** between the body of the rotor and head **5**. This pressure chamber **19** is formed eccentrically in the wall **18** and is, therefore, eccentrically positioned in the casing chamber **2**, as clearly shown in Figure 4.

The amount of the eccentricity of the pressure chamber **19** is such that the perimeter of the cylinder **16** will be tangent to the wall of the pressure chamber with only sufficient clearance to permit the turning movement of the rotor member without friction.

The head **5** is also provided with a stub shaft or wrist pin **20** (positioned in the chamber **19**) which, in this instance, has the outer end portion reduced in diameter and extended through a suitable opening in the head **5** and is rigidly secured or clamped to the head by a nut **21**. The wrist pin **20** extends axially into the chamber **19** a distance approximately equal to the depth of the chamber and is arranged substantially coaxial with said chamber and, therefore, eccentric to the axis of rotation of the rotor **13** and to the inner chamber **22** of the rotor cylinder **16**.

The chamber **22** is arranged concentric with the rotor cylinder **16** and is of such a diameter as to receive easily therein the inner end of the wrist pin **20** and adjacent portions of the impelling vanes of the pump which are journaled on said wrist pin in the following manner: As illustrated in Figures 4 and 8, there are three of these vanes as **24** and **25**, each consisting of a relatively thin blade portion **26** having flat parallel sides and a tubular bearing member or bushing **27** or **28** respectively made integral with one end of the corresponding blade portion. The width of each blade **26** is slightly less than the depth of the pressure chamber **19**, while the distance from the longitudinal center of the bushings **27** and **28** to the opposite end of the respective blades is slightly less than the radius of the pressure chamber **19** so that the blades will have a close clearance relation with the chamber as the vanes are revolved in the chamber about the wrist pin **20**.

The bushing or bearing member **28** of the vane **25** is of substantially the same length as the width of the blade **26**, while the diameter of the bore of the bushing **28** is substantially equal to that of the wrist pin **20** for receiving the pin therein so as to permit the free rotary movement of the vane upon said pin. The vane **25** is also provided with a pair of slots **29** which extend inwardly from opposite longitudinal sides of the blades **26** adjacent the bushing **28**, with the inner ends of said slots terminating in spaced relation so as to form a central web **30** which connects the blade with the bushing **28**. These slots **29** are for the purpose of receiving a respective bearing member or bushing **27** of the vanes **24**.

The bushings **27** for the vanes **24** are positioned adjacent but one side portion of the inner end of the respective blade **26** and are adapted to be assembled on the outer end of the bushing **28** to be freely rotatably supported thereby. In other words, all of the vanes are supported by the wrist pin **20**, with the vane **25** journaled directly on the wrist pin, while the other vanes **24** are rotatably mounted upon the bearing member **28** of the vane **25**, as illustrated more clearly in Figures 3 and 4.

Any suitable means may be provided for lubricating the vanes **24** and **25** to contribute to the free rotary movement of the vane **25** upon the wrist pin **20** and also the slight relative movement of the vanes **24** and the vane **25** produced by the eccentric relation of the wrist pin **20** and the rotor cylinder **16**, as will hereinafter more fully appear.

For the purpose of lubricating the vanes the wrist pin **20** is provided with an inwardly extending central bore or conduit **32** which has the inner end portion thereof provided with lateral extensions or passages **32'** adapted to register frequently with aligned apertures **33** formed in the bushing member **28** of the vane **25**. The vanes **24** and **25** are arranged to extend radially from the wrist pin **20** through respective slots **35** formed in equal circumferential spaced relation in the rotor cylinder **16**. These slots **35** are disposed radially in the cylinder **16** and extend inwardly from the outer end thereof to the body portion **15** of the rotor, or a distance substantially equal to the width of the vane blades **26**. These slots **35** are of such a width as to permit the necessary pivotal movement of the vanes in operating in the cylinder **16**, due to the eccentric mounting of the rotor cylinder in the pressure chamber **19**.

Also associated with each impelling vane is a drive pin **36**. Each of the drive pins is a cylindrical member having a diametrically disposed slot **37** extending inwardly from one end thereof and adapted to receive slidably the blade **26** of a respective vane therein. Each of the drive pins **36** is journaled in a suitable recess **38** which extends through the rotor body **15** and cylinder **16** parallel with the axis of the rotor at each vane slot **35**, as shown in Figure 4. These pins are maintained against outward axial displacement in one direction by means of an annular retaining plate **39** which is secured to the outer face of the rotor body **15** by screws **40**. The drive pins are prevented from displacement in the opposite direction by the case head **5**.

The drive pins **36** and the wrist pin **20**, and the impelling vanes are preferably made of material of different degrees of hardness, such as brass and steel so as to attain the maximum length of life of these members.

The wall **18** of the pressure chamber **19** is provided with a pair of similarly formed slots **42** elongated circumferentially, adapted to form inlet and outlet passages for the pressure chamber **19**. These slots or passages **42**, as illustrated in Figures 4 and 7, divide the wall **18** of the pressure chamber into two diametrically opposed segments **44** and **45** of unequal circumferential length. The shorter segment, as **44**, is formed at that portion of the wall **18** having the greatest radial thickness and which is, in this instance, adjacent the point of tangency of the rotor cylinder **16**. The other segment, as **45**, is arranged in symmetrical relation with the segment **44** at the opposite side of the chamber **19** and is of greater circumferential length than the distance between two adjacent impelling vanes so that one or more of the vanes will always be in registration with the segment during the operation of the pump. The axial width of these slots **42** is such that the passages extend from the plane of the inner end of the pressure chamber **19** adjacent the head **5** to within a relatively short distance of the inner end of the pressure chamber, leaving a relatively thin rib or web 47 extending from the free or inner end of one segment portion of the wall to the other segment portion. These webs not only provide a suitable support for rigidly tying the otherwise free ends of the projecting segments 44 and 45 together, but also provide a convenient means by which any unbalanced thrust of the rotor 13 against the head 5 caused by different pressures between the intake or suction side and that of the pressure or exhaust side of the pump is substantially reduced, as will presently be more fully explained.

Each passage 42 has its end adjacent the segment 44 in communication with a respective port 48 and 48′ formed in the peripheral wall of the pump chamber, that is, in the case 1. Either one of the ports 48 or 48′ may be the inlet port for the device, depending upon the direction of rotation of the rotor 13, while the other port may constitute the exhaust port of the device. Each of the ports may, as shown, be provided with convenient means, as a conduit 49, for connecting the same with a source of fluid supply or with the means to which the fluid is to be discharged by the device.

The head 5 also has the inner face thereof within the wall 18 provided with a radially disposed recess or groove 55 which, as shown more clearly in Figure 4, is positioned at the exhaust side of the casing and extends across the end of the rotor cylinder so as to provide a by-pass adapted to bring the inner chamber 22 of the rotor cylinder 16 into communication with that portion of the pressure chamber 19 adjacent the periphery of the rotor cylinder.

While there is only one of these passages 55 illustrated in the drawings, it is evident that a similar by-pass may be positioned at the opposite side of the casing chamber if the rotor is to be operated in the opposite direction or if it is desired that the device should operate equally well in either direction, a by-pass 55 may be provided at opposite sides of the rotor at both the intake and exhaust sides.

Operation

Referring more particularly to Figures 4 and 5, it will be observed that when the device is being used as a pump the rotor 13 is driven in an anti-clockwise direction, as indicated by arrow X, the port 48 positioned at the left side of the case 1 as viewed in Figure 4, will be the intake port, while the other port 48′ will be the exhaust port.

It will also be observed by referring to Figure 4, that as there is always an impelling vane, which is shown as vane 25, in registration with the segment 45, the pressure in the pressure chamber and passage 42 at the rear of the vane will be below atmospheric pressure while the pressure ahead of the vane 25 at the exhaust side of the pump will be above atmospheric pressure, and by referring to Figure 5, it will be observed that the pressure in the casing chamber 2 at the back of the rotor body 15 will be substantially equal to that of the exhaust pressure in the pressure chamber 19 due to the leakage of this pressure from the discharge side of the pump between the end of the wall 18 and web 47 and the rotor body as at A and thence between the periphery of the rotor body and wall of the pump chamber as at B into the pump chamber at the rear of the rotor. Escape of some liquid from the chamber 2 into the suction portion of the pump chamber occurs between the rotor body and the casing, as shown at B′, and between the rotor body and the portions 47 and 45 which are exposed to suction pressure, as shown at A′. However, as will be seen, the exhaust pressure creates a transverse thrust to the left (Fig. 5) at the discharge side of the pump and the suction creates a transverse thrust to the right (Fig. 5) at the suction side of the pump, tending to cause a slight bias in the shaft and in the rotor which will open the passageway A—B to a greater extent than the passageway B′—A′ is open. Therefore, liquid can enter the chamber 2 from the discharge side of the pump more readily than it can escape from the chamber 2 at the suction side so that a pressure approaching the exhaust pressure will continually be maintained in the chamber 2; thereby producing a greater load upon the rear side of the rotor than upon the opposite or front side, since the pressure at the front of the rotor is in general a mean between discharge pressure and the suction pressure. Accordingly, since the rear of the rotor is subjected substantially to exhaust pressure and only a portion of the front of the rotor is subjected to exhaust pressure, the rotor will be urged to the front due to the greater surface area of the rotor subjected to the exhaust pressure being at the rear side thereof. This greater pressure at the rear of the rotor will urge the rotor axially toward the cover plate or head 5 with a greater or less degree of force, depending upon the difference in area of the surfaces subjected to the exhaust pressure at the front and rear of the rotor. This pressure at the rear of the rotor would produce an excessive unbalanced thrust upon the rotor at diametrically opposite sides thereof due to the vacuum pressure at the suction side of the pressure chamber were it not for the web members 47, which tend to dampen this effect.

As above stated the pressure in the casing chamber at the rear of the rotor adjacent the suction side of the pressure chamber will leak between the peripheral surface of the body of the rotor and the wall of the pump chamber as at B′ and thence between the inner face of the body of the rotor and the adjacent end of the wall 18 or respective web 47 as at A′. As the pressure in the space between the web and rotor is derived from and substantially equal to that at the opposite or rear side of the body of the rotor, it is evident that the action of the suction pressure at the intake side of the pump will not act upon that portion of the rotor lying at the rear of the wall 18. In other words, the pressure upon that portion of the rotor lying adjacent the webs 47 will be the same in both the suction and exhaust sides and this pressure will be substantially equal to the exhaust pressure of the pump and, therefore, the rotor will be substantially balanced at diametrically opposite sides while a slightly greater load will be exerted upon the rear of the rotor than upon the opposite or front side thereof due to the effect of suction pressure in the pressure chamber which will constantly permit the pressure in the chamber 2 to urge the rotor axially toward the case head 5, thereby taking up wear and maintaining pressure and efficiency. In other words, the provision of the web members 47 permits a desirable, mild thrust of the rotor to the front.

If the rotor is driven in a reverse or clockwise direction, the webs 47 will function in the same manner as when the rotor is driven in an anti-clockwise direction as just described, for maintaining a balanced condition of the rotor between the intake and discharge sides and, therefore, the pump will be equally efficacious for operating in either direction.

This end thrust of the rotor tends to maintain the rotor in constant contact with the case head 5 which would produce friction and excessive wear of these parts. In order to prevent this, I utilize the pumping action of the vanes in the inner chamber 22 of the rotor 13 to maintain a film of fluid between the head 5 and the adjacent end portion of the rotor cylinder 16. This is accomplished in the following manner:

By referring again to Figure 4, it will be noted that the greater area as Y of the chamber 22 lies between the wrist pin 20 and the wall of the chamber 22 at that side of the wrist pin at which the flange 44 of the head 5 is positioned, while the lesser portion as Z of the chamber lies at the opposite side of the wrist pin. During the movement of the vanes through the portion Y of the chamber 22 as they revolve about the wrist pin 20, much of the fluid contained in the portion Y of the chamber ahead of the vanes will be forced outwardly between the adjacent end portion of the rotor cylinder and the head 5 as at C, Figure 5, into the pressure chamber 19 as the vanes approach the smaller portion Z of the chamber, thereby producing a film of fluid between this portion of the rotor and the head. As the vanes leave the portion Z and again approach the larger portion Y of the chamber 22, the vanes are then in the discharge portion of their stroke so that a certain amount of fluid ahead of the vanes in the pressure chamber will be forced inwardly by the pressure produced at the discharge side of the pump between the rotor and head as at C′, Figure 5, and through the by-pass 55 into the expanding portion of the chamber 22. Thus means, separate from, or additional to, the means which urges the rotor toward the head, are provided for preventing frictional contact of the rotor with the head.

The by-pass 55 thereby forms a convenient passage connecting the pressure side of the pump with the chamber 22 so that fluid may readily pass from the pressure chamber into the chamber 22 for replenishing the fluid discharged from the chamber 22 at the intake side of the pump and maintaining the chamber 22 substantially full of the fluid or liquid being acted upon by the pump at all times.

It will now be clearly understood that while the rotor and vanes are constantly urged axially toward one end of the pump case, these members are maintained in spaced relation with the case by a film of fluid which acts as an automatic hydraulic balancing medium to maintain the rotating elements in proper clearance relation with the cover or case and that the amount of pressure provided at the rear of the rotor for urging the rotor axially toward the end of the pump chamber may be controlled by providing the webs 47 of greater or less radial width.

Although I have shown and particularly described the preferred embodiment of my invention, I do not wish to be limited to the exact construction shown, and more particularly to the form, relation and construction of the vanes, their supports and the driving means therefor, as various changes both in these and in other elements of the device may readily be made, without departing from the spirit of this invention, as set forth in the appended claims.

I claim:

1. In a device of the character described, a casing, means for introducing liquid into said casing, means providing a passage out of said casing, means providing a chamber within said casing and arranged eccentrically therewith, a rotor mounted in said chamber, said rotor comprising a body portion mounted in said casing and adjacent said chamber and a reduced cylindrical portion positioned in the said chamber in tangential relation to the wall of said chamber, impelling vanes mounted in said chamber to rotate about a fixed axis arranged coaxially with said chamber, said vanes having a pivotal sliding connection with the cylindrical portion of the rotor, and means tending to cause said cylindrical portion to be urged against one end of said casing, said vanes extending within said cylindrical portion and causing a continuous liquid flow between said cylindrical portion and said casing end to provide a film of liquid whereby pressure contact of the cylindrical portion with the casing end is prevented.

2. In a rotary pump, a case provided with a pressure chamber, a rotor eccentrically mounted in the chamber in tangential relation with the wall of said chamber, impelling vanes mounted in the chamber, driving connection between the vanes and rotor whereby the vanes will be actuated by said rotor, means for producing unequal forces by fluid pressures at opposite sides of the rotor for urging the rotor axially toward one end of said chamber into contact with the case, and means for continuously forcing a film of liquid between the rotor and the case at said end to prevent pressure contact of the rotor with the case.

3. In a rotary pump, a case provided with a pressure chamber, a rotor eccentrically mounted in the chamber in tangential relation with the wall of said chamber, impelling vanes mounted in the chamber, driving connection between the vanes and rotor whereby the vanes will be actuated by said rotor, means for producing unequal forces by fluid pressures at opposite sides of the rotor for urging the rotor axially toward one end of said chamber into contact with the case, and additional means for maintaining a substantially uniform pressure upon diametrically opposite sides of the rotor.

4. In a device of the character described, the combination comprising a case, an inlet thereto, an outlet therefrom, means providing a pressure chamber within said case and arranged eccentrically therewith, a rotor having a cylindrical portion eccentrically mounted in the pressure chamber in tangential relation with the wall of said chamber and having a body portion positioned in said case to extend beyond the wall of the pressure chamber, impelling vanes mounted in the pressure chamber and driving connection between the vanes and rotor whereby the vanes will be actuated by said rotor, and means tending to cause said cylindrical portion to be urged against one end of said case, said vanes extending within said cylindrical portion and causing a continuous liquid flow between said cylindrical portion and said case end to provide a film of liquid whereby pressure contact of the cylindrical portion with the case end is prevented.

5. In a device of the character described, the combination comprising a case, means for intro-

ducing liquid thereinto, means for conducting liquid therefrom, means providing a pressure chamber within said case, arranged eccentrically therewith, a rotor having a cylindrical portion eccentrically mounted in the pressure chamber in tangential relation with the wall of said chamber and having a body portion positioned in said case to extend beyond the wall of the pressure chamber, impelling vanes mounted in the pressure chamber and driving connection between the vanes and rotor whereby the vanes will be actuated by said rotor, said case being formed to provide a chamber beyond said body portion and being formed with a surface against which said cylindrical portion tends to be thrust by pressure in the last-mentioned chamber, and said vanes extending within said cylindrical portion and exerting during their movement a squeezing action on that part, which is within the cylindrical portion, of the fluid which is passing through said device, whereby a film of the fluid which is passing through said device is provided between said cylindrical portion and said surface, which film prevents the thrust on the rotor from causing pressure contact of the cylindrical portion with the adjacent end of the case.

6. In a device of the character described, the combination comprising a case, suction and exhaust ports in communication with said case, a head which closes the end of said case provided with a cylindrical wall which extends into the chamber provided by said case and concentrically therewith, said wall having a recess arranged eccentrically therein to form a pressure chamber within said case, passages in said wall which are in communication with the pressure chamber and with a respective port, a rotor having a cylindrical portion eccentrically mounted in the pressure chamber in tangential relation with the wall of said chamber and a body portion positioned in said case to extend across the inner end of the wall of said pressure chamber, impelling vanes in the pressure chamber, and driving connection between the vanes and rotor whereby the vanes will be actuated by said rotor, said case being formed to provide a chamber beyond said body portion and being formed with a surface against which said cylindrical portion tends to be thrust by pressure in the last-mentioned chamber, and said vanes extending within said cylindrical portion and exerting during their movement a squeezing action on that part, which is within the cylindrical portion, of the fluid which is passing through said device, whereby a film of the fluid which is passing through said device is provided between said cylindrical portion and said surface, which film prevents the thrust on the rotor from causing pressure contact of the cylindrical portion with the adjacent end of the case.

7. In a device of the character described, the combination comprising a case, means for introducing a liquid thereinto, means for conducting a liquid therefrom, a head which closes the end of said case provided with a cylindrical wall which extends into said case and concentrically therewith, said wall having a recess arranged eccentrically therein to form a pressure chamber within said case, passages in said wall which are in communication with said pressure chamber and with a respective port, a rotor having a cylindrical portion eccentrically mounted in the pressure chamber in tangential relation with the wall of said chamber and having a body portion positioned in said case to extend across the inner end of the wall of said pressure chamber, impelling vanes in the pressure chamber, driving connection between the vanes and rotor whereby the vanes will be actuated by said rotor, said case being formed to provide a chamber beyond said body portion and being formed with a surface against which said cylindrical portion tends to be thrust by pressure in the last-mentioned chamber, and said vanes extending within said cylindrical portion and exerting during their movement a squeezing action on that part, which is within the cylindrical portion, of the fluid which is passing through said device, whereby a film of the fluid which is passing through said device is provided between said cylindrical portion and said surface, which film prevents the thrust on the rotor from causing pressure contact of the cylindrical portion with the adjacent end of the case, and means providing communication between a portion of said pressure chamber and that part of the chamber within said cylindrical portion in which said squeezing action does not occur.

8. In a device of the character described, the combination comprising a case, suction and exhaust ports in communication with said case, a head which closes the end of said case provided with a cylindrical wall which extends into the chamber provided by said case and concentrically therewith, said wall having a recess arranged eccentrically therein to form a pressure chamber within said case, passages in said wall which are in communication with the pressure chamber and with a respective port, a rotor having a cylindrical portion eccentrically mounted in the pressure chamber in tangential relation with the wall of said chamber and a body portion positioned in said case to extend across the inner end of the wall of said pressure chamber, a wrist pin secured to the head to extend into the pressure chamber concentrically therewith, impelling vanes rotatably mounted on the wrist pin, and driving connection between the vanes and rotor whereby the vanes will be actuated by said rotor, said case being formed to provide a chamber beyond said body portion and being formed with a surface against which said cylindrical portion tends to be thrust by pressure in the last-mentioned chamber, and said vanes extending within said cylindrical portion and exerting, during their movement, a squeezing action on that part, which is within the cylindrical portion, of the fluid which is passing through said device, whereby a film of the fluid which is passing through said device is provided between said cylindrical portion and said surface, which film prevents the thrust on the rotor from causing pressure contact of the cylindrical portion with the adjacent end of the case, and means providing communication between a portion of the said pressure chamber and that part of the chamber within said cylindrical portion in which said squeezing action does not occur.

9. In a device of the character described, the combination comprising a case, means for introducing a liquid thereinto, means for conducting a liquid therefrom, a head which closes the end of said case provided with a cylindrical wall which extends into said case concentrically therewith, said wall having a recess arranged eccentrically therein to form a pressure chamber within said case, passages in said wall which are in communication with the pressure chamber and with a respective port, a rotor having a cylindrical portion eccentrically mounted in the pressure chamber in tangential relation with the wall of

said chamber and having a body portion positioned in said case to extend across the inner end of the wall of said pressure chamber, a wrist pin secured to the head to extend into the pressure chamber concentrically therewith, impelling vanes rotatably mounted on the wrist pin, and driving connection between the vanes and rotor whereby the vanes will be actuated by said rotor, said case being formed to provide a chamber beyond said body portion and being formed with a surface against which said cylindrical portion tends to be thrust by pressure in the last-mentioned chamber, and said vanes extending within said cylindrical portion and exerting during their movement a squeezing action on that part, which is within the cylindrical portion, of the fluid which is passing through said device, whereby a film of the fluid which is passing through said device is provided between said cylindrical portion and said surface, which film prevents the thrust on the rotor from causing pressure contact of the cylindrical portion with the adjacent end of the case, said case being formed on said end with a slot connecting the discharge portion of said pressure chamber with that part of the chamber within the cylindrical member wherein said squeezing action does not occur.

10. In a rotary pump, a case having an inlet port, an exhaust port and a pressure chamber in communication with said ports, a pumping element in the chamber adapted to draw fluid through the inlet port into the chamber and to discharge the fluid from the chamber through said exhaust port, means for producing unequal forces by fluid pressures at opposite sides of the pumping element for urging the same axially toward one end of said chamber, and means for continuously forcing a film of liquid between the rotor and the case at said end to prevent pressure contact of the rotor with the case.

11. In a rotary pump, a case having an inlet port, an exhaust port and a pressure chamber in communication with said ports, a pumping element in the chamber adapted to draw fluid through the inlet port into the chamber and to discharge the fluid from the chamber through said exhaust port, means for producing unequal forces by fluid pressures at opposite sides of the pumping element for urging the same axially toward one end of said chamber, and separate means for producing a film of fluid between the element and case at said end of the chamber to maintain the element and case in slightly spaced relation.

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