

J. W. TYGARD.
 ROTARY PUMP OR MOTOR.
 APPLICATION FILED MAR. 8, 1901.

1,047,340.

Patented Dec. 17, 1912.

3 SHEETS—SHEET 1.

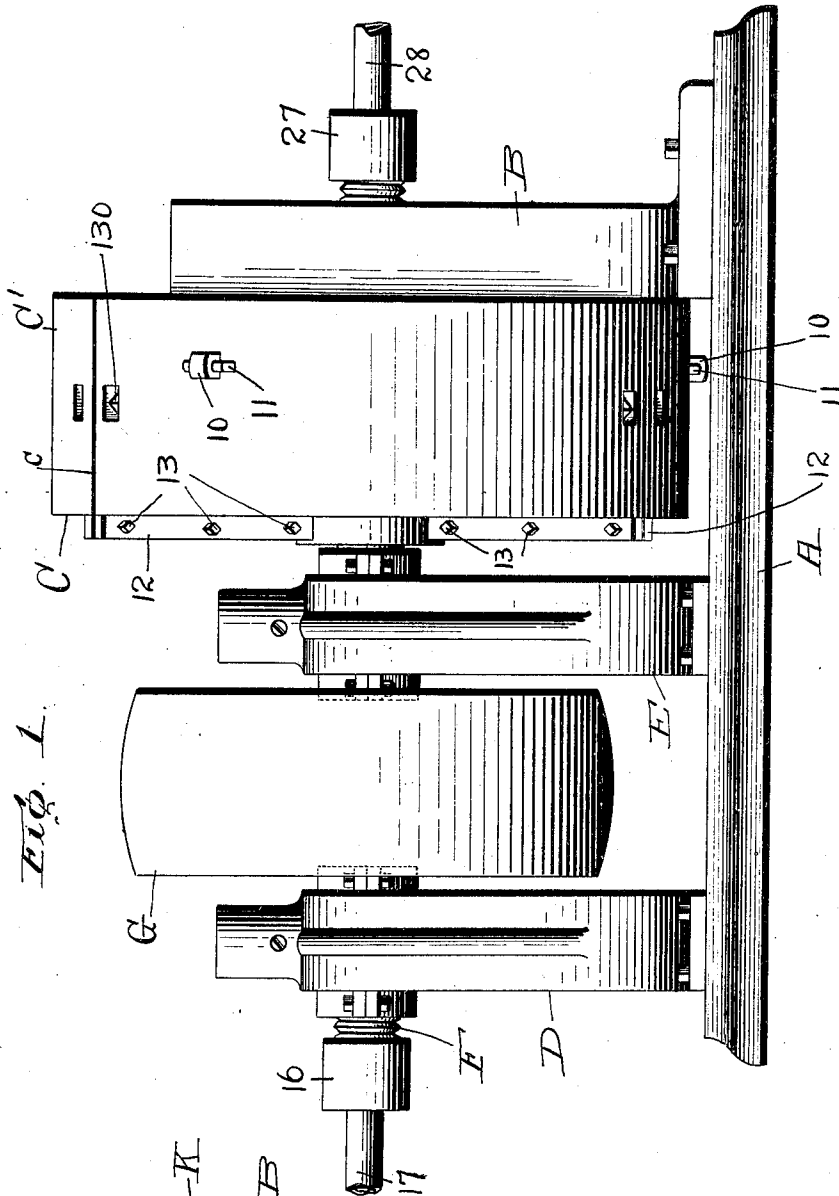


Fig. 1.

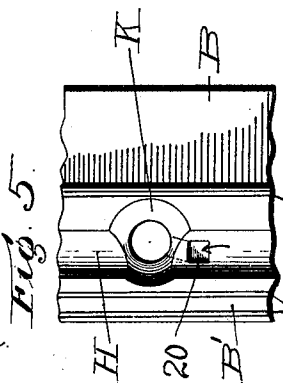


Fig. 5.

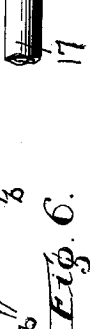


Fig. 6.

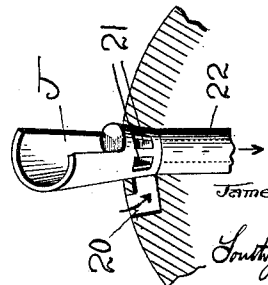


Fig. 7.

Witnesses
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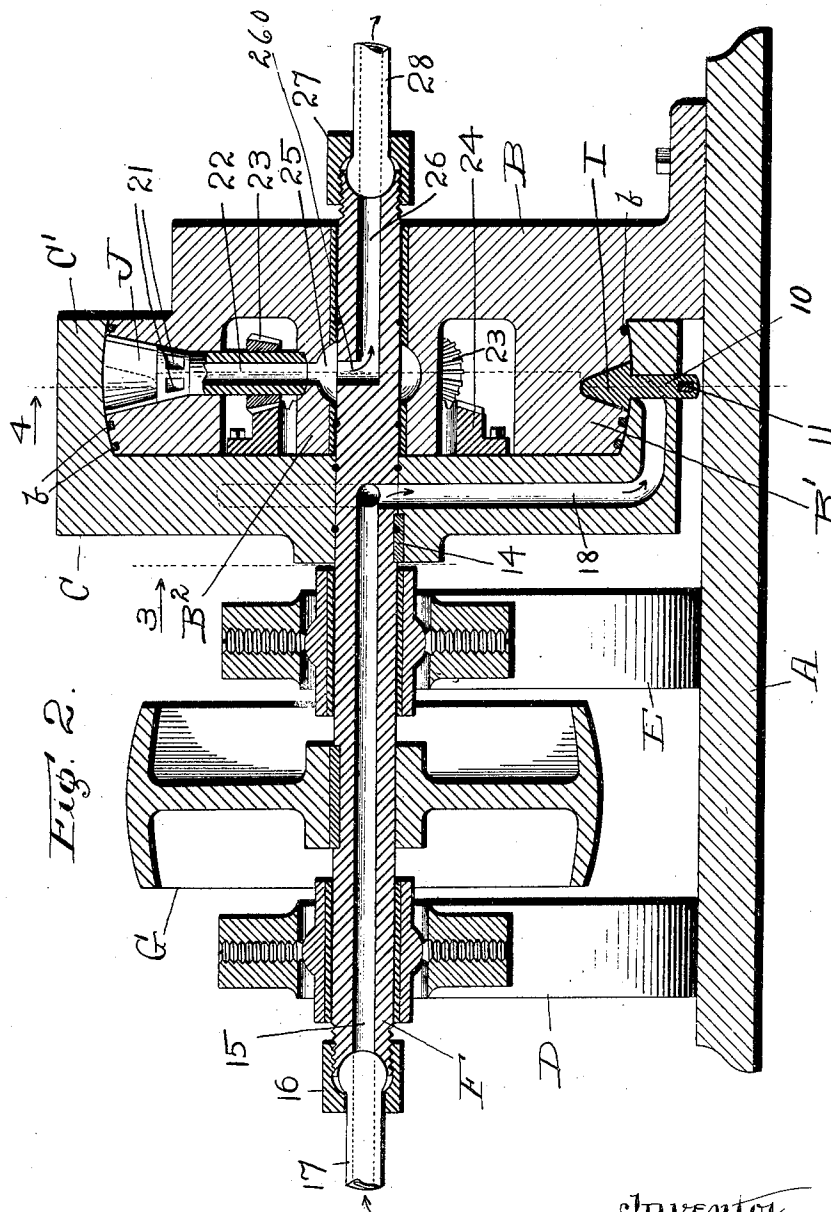


Fig. 2.

Witnesses:
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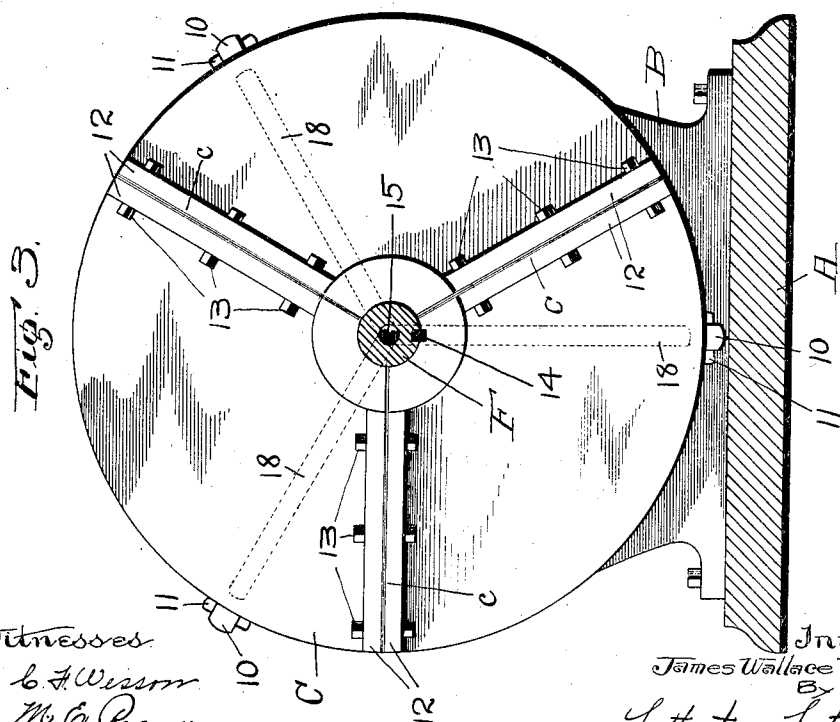
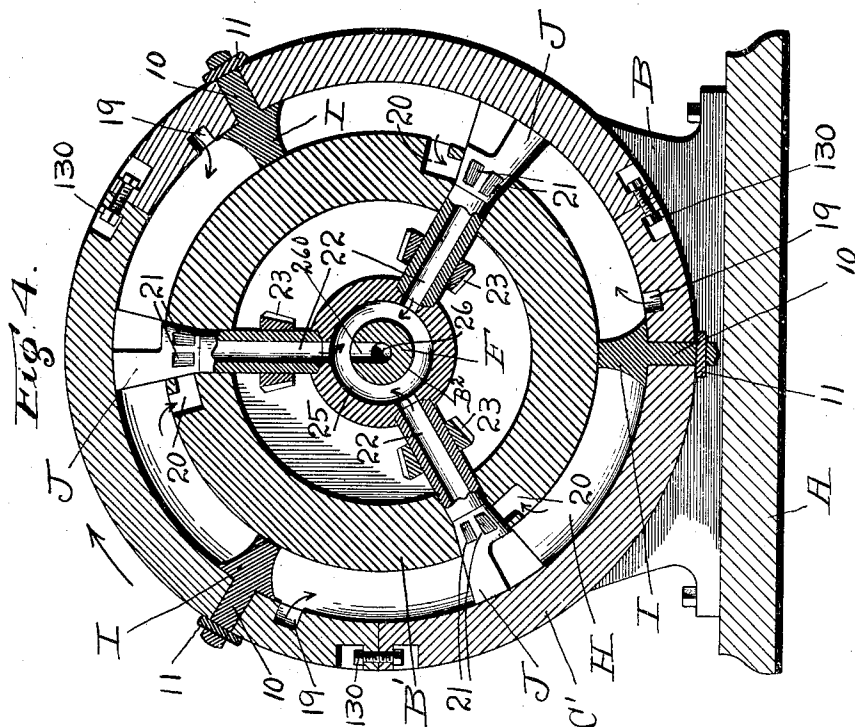
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

JAMES WALLACE TYGARD, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO HENRY A. WISE WOOD, OF NEW YORK, N. Y., AND ONE-HALF TO THE TYGARD ENGINE, A CORPORATION OF NEW JERSEY.

ROTARY PUMP OR MOTOR.

1,047,340.

Specification of Letters Patent.

Patented Dec. 17, 1912.

Application filed March 8, 1901. Serial No. 50,382.

To all whom it may concern:

Be it known that I, JAMES WALLACE TYGARD, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a new and useful Rotary Pump or Motor, of which the following is a specification.

The object of this invention is to provide a new and improved construction adapted for use in rotary pumps or motors.

A mechanism constructed according to this invention comprises a base, mounted on which is a member which contains an annular groove or channel, and which has revolving valves or abutments dividing said groove into a number of compartments. The main shaft of the device is provided with a member which has a flange fitting over the first named member, and which has pistons which fit in and work in said annular groove. Three valves or abutments located at 120° apart in said groove are preferably employed in connection with an equal number of pistons, although any number of valves and pistons may be used. The revolving valves are suitably geared, and are recessed, so that as they rotate, they permit each piston to pass, but separate said compartments at all other times. Behind each piston is an opening, and in the stem of each of the valves or abutments is a passage which leads into a port. The inlet and outlet passages are preferably carried through the shaft.

To use this device as a pump, the shaft is driven by suitable power, and the fluid or liquid to be compressed or pumped is preferably taken in through that end of the hollow shaft which will conduct the same to the openings behind each piston, (although it may be taken in at the other end of the shaft, as hereinafter described), so that as the pistons travel around in their groove or channel they will cooperate with the valves or abutments to draw or suck in successive charges. That is to say, the rear face of each piston will draw a charge into each compartment, which will be forced from said compartment by the front face of the following piston. By turning the pump in the other direction, the medium to be acted upon can be forced through the pump in the other direction. By letting an actuating medium pass through the device in either direction under pressure, a rotary motor is provided,

which will turn in one direction if the medium is introduced at one end of the shaft, or in the other direction if the medium is introduced at the other end of the shaft.

The invention further consists of important points of construction hereinafter pointed out in the specification.

Accompanying this specification are three sheets of drawings which form part of this application.

Referring to said drawings and in detail, Figure 1 is a side elevation of the device, Figure 2 is a central sectional elevation, Fig. 3 is a cross sectional view taken on the line 3—3 of Fig. 2, Fig. 4 is a cross sectional view taken on the line 4—4 of Fig. 2, Fig. 5 is a plan detail view illustrating the annular groove and valve seat, and Fig. 6 is a partial perspective view illustrating one of the valves or abutments and the port controlled by the same.

In detail A designates a suitable base-piece. Secured to this base-piece is a valve member B, which has an extending hollow flange B' and a projecting hub B². The outside surface of the flange B' is turned, so that the same constitutes part of the surface of a sphere; that is to say, all points in the outside portion of the flange are equally distant from its center point.

C designates a piston member which has a flange C' fitting over the flange B' of the member B.

Suitable packings *b* are arranged in the flange B' of the member B. Journaled in bearings D and E secured in the base A, and in the hub B² of the member B, is a shaft F, mounted on which is a pulley G. An annular groove or chamber H is cut in the flange B' of the member B, and fitting tightly in this groove are a number of pistons I carried by the member C. The annular groove H is divided into a number of compartments by hollow conical valves J, which are seated in valve-seats K cut into the flange B' of the member B so as to intersect the annular groove H, as shown in Fig. 5. The valves are preferably offset relatively to the center of the annular groove or chamber H. Three pistons and three valves are shown, whereby the annular groove or chamber is divided into three compartments. It is preferred to use the same number of valves and pistons. While these

are the preferred arrangements, of course, the number of valves and pistons is immaterial to the broad scope of my invention. The pistons I have projecting shanks 10
5 which pass through the flange C' of the member C, and which are held in place by keys 11.

The member C is made in parts, preferably three, so that it can be fitted over the
10 flange B' of the member B, and each part is provided with flanges 12 which may be secured together by bolts 13, as shown in Fig. 3. If desired, small packings or shims
15 c may be used between the three parts which constitute the member C, to provide an adjustment for wear. Bolts 130 having nuts threaded on their ends are also preferably used to connect the three parts of the
20 flange C', said nuts being placed in recesses as shown in Fig. 4. The member C is locked to the shaft F by means of a key 14. The shaft F is made hollow where it passes through the bearings D and E; that is, it has a passage 15 bored through the
25 same. This end of the shaft F is screw-threaded, and threaded on the same is a coupling-nut 16 which connects a pipe 17 thereto. Extending from the inner end of the passage 15 are three radial passages
30 18, which extend out into the flange C', and communicate with ports 19 at the rear of each of the pistons I.

A port 20 is cut in the bottom of the piston track or annular groove H, in each com-
35 partment and leads to a position to register with holes or ports 21 cut in the hollow valves J. The valves J have extending hollow valve-stems 22 which are stepped and securely fitted in the hub B² of the member
40 B. Bevel-pinions 23 are secured on each of the hollow valve stems and mesh with a bevel-gear 24 secured to the member C. The relation with this gearing is such, that the valves will make as many turns for each
45 revolution of the device as there are pistons. Thus, for example, in the particular construction shown, three pistons being used, the valves will make three turns for each revolution. A large channel or groove
50 25 is cut in the hub B² so that hollow valve-stems communicate therewith. The other end of the shaft F is bored out as at 26, and has a right-angled port 260 which connects with this channel 25. This end of the shaft
55 F is screw-threaded, and tapped on the same is a coupling-nut 27 which secures a pipe 28 to the end of the shaft.

The operation with this mechanism is as follows: If the device is to be used as a rotary pump with the pipe 17 as an inlet pipe
60 and the pipe 28 as an outlet pipe, power is applied to the pulley G to turn the piston carrying member C in the direction indicated by the arrow in Fig. 4. As the pistons
65 I turn around through the annular groove

or chamber H, the valves J will allow the same to pass, but will keep the various compartments of the groove separated from each other at all other times. This is accomplished by the peculiar shape of the valves
70 J. As will be seen by reference to Fig. 6, these valves are hollow, but cut out on one side so that as the piston passes, the valves will wind themselves around the piston, so to speak. In other words, the rotation of
75 the valves is timed in such a way that as they come opposite the piston, the opening in the side, shown clearly in Fig. 6, will be in such place as to admit the piston, and the valve will continue to rotate as it passes
80 the piston, so that the valve will close shortly after it passes, and will open only shortly before it comes to the piston. As the pistons travel, the medium to be acted upon will be drawn in through the passage
85 15, radial passages 18, out through ports 19 into each of the compartments by the rear faces of the pistons I, and will be forced therefrom by the front faces of the pistons I out through ports 20, valve passages 21,
90 hollow valve stems 22, annular chamber 25, ports 260, passage 26 into the pipe 28.

If the pipe 28 is used as the inlet pipe, and the pipe 17 as the outlet pipe, the reverse action takes place, power being applied to the pulley G in the reverse direction. If a medium under pressure is admitted into pipe 17, and the pipe 28 is used as an exhaust pipe, the member C will be rotated in the direction indicated by the arrow in Fig. 4 by the pressure acting on
100 the rear faces of the pistons, the front faces of the pistons acting to clear or exhaust the various compartments into which the annular groove is divided. If pressure is admitted into pipe 28, and the pipe 17 connected to the exhaust, the member C will turn in the opposite direction.

The spherical surface between the flanges C' and B' provides a bearing surface for the
110 outer ends of the hollow conical valves J which are radially arranged so that they can bear on the flange C' at all times and points in their operation, although they have an independent rotation of their
115 own.

It is immaterial to my invention whether the member B or the member C is the one which is secured to the base A, as either member can be made the rotating part, as
120 desired.

By the previously described arrangement, a device is provided which can be run at slow or high speed as desired, which may be proportioned to give almost any desired
125 volume, and which has the advantage of being free from valve-hammer.

The passage through the ports 21 in the valve stems is closed at the time when the valves are open to connect the pressure and
130

suction sides of the chambers in which they operate. There is also a transfer of air from one part of the piston groove to the other, which is recompressed in the next space by the oncoming piston therein.

When used as a motor, the same has a valuable measuring capacity which enables the device to act as a meter.

The details and arrangements herein shown may be further carried out, modified and changed by a skilled mechanic without departing from the scope of my invention as expressed in the claims.

Having thus fully described my invention, what I claim and desire to secure by Letters-Patent is:

1. A device for any of the purposes specified, comprising a member having an annular groove, rotary valves extending into said groove and dividing the same into compartments, said valves having hollow stems communicating through the valves with the groove, a piston carrying member having ports communicating with said groove, pistons on said member fitting said groove, and means for conducting a fluid to and from said hollow valve-stems.

2. A device for any of the purposes specified, comprising a member having a flange, an annular groove and a hollow hub, valves dividing said groove into compartments, said valves having hollow stems stepped or fitted in said hub, a piston carrying member having ports communicating with said groove, pistons carried by said member fitting in said groove, and means for conducting fluid to or from said hollow stems.

3. A device for any of the purposes specified, comprising a member having an annular groove, a hollow shaft, a piston carrying member having passages communicating with the hollow shaft and with said groove, pistons carried by said member and fitting said groove, and valves carried by the first named member and extending into the grooves, said valves dividing the groove into compartments, said valves being arranged at right angles to the axis of the first named member and shaft.

4. A device for any of the purposes specified, comprising a member having an annular groove, a piston carrying member having passages communicating with said groove for conducting a fluid to or from the groove, pistons carried by said member and fitting the groove, valves extending into said groove and dividing it into compartments, a hollow valve stem for each valve communicating with the groove through the valve, a shaft on which the piston carrying member is mounted, said shaft having a passage communicating with the passages in the piston carrying member, and means for conducting a fluid to or from the hollow valve stems.

5. A device for any of the purposes speci-

fied, comprising a member having an annular groove, rotary valves arranged with their axes at right angles to the axis of the groove and dividing the groove into a number of compartments, a series of pistons fitting in said groove, means for carrying said pistons, and means for conducting a fluid to and from the groove.

6. In a device for any of the purposes specified, the combination of a member having an annular groove, a piston carrying member having pistons fitting in said groove, means for rotating said piston carrying member, a series of rotary valves arranged with their axes at right angles to the axis of the piston carrying member and extending into said groove so as to divide it into compartments, and gearing between the piston carrying member and the valve for rotating the valves.

7. In a device for any of the purposes specified, the combination of a member having an annular groove, rotary valves arranged with their axes at right angles to the axis of the groove and dividing the groove into a number of compartments, a piston carrying member, pistons carried by said member and fitting in said groove, means for causing a relative rotation to take place between the first named member and the piston carrying member, gearing between said members and said valves for turning the valves as many times for each revolution as there are pistons, and means for conducting fluid to and from the groove.

8. In a device of the character described, the combination of a member having an annular groove, three rotary valves arranged with their axes at right angles to the axis of the groove and dividing the same into three compartments, a piston carrying member, three pistons carried by said member and fitting in said groove, means for producing a relative rotation between the first named member and the piston carrying member, gearing for turning the valves three times for each revolution of said piston carrying member having means for conducting a fluid to or from each compartment of the groove, and means for conducting a fluid to or from the groove to each of said valves.

9. In a device of the character described, the combination of a member having an annular groove, valves dividing the same into a number of compartments, a hollow valve stem for each valve, said valves having passages forming a communication between the valve stems and the grooves, a piston carrying member having means for conducting fluid to or from each compartment of the groove, pistons carried by said member and fitting in said groove, and means for conducting a fluid to or from said hollow valve stems.

10. In a device of the character described, the combination of a member having an annular groove, rotary valves arranged with their axes at right angles to the axis of the groove and dividing the same into a number of compartments, bevel pinions connected with said valves, a piston carrying member having means for conducting a fluid to or from the groove, pistons carried by said piston carrying member and fitting in said groove, means for rotating said piston carrying member, a bevel gear on said piston carrying member meshing with said bevel pinions, and means controlled by said valves for conducting a fluid to or from the groove.

11. In a device of the character described, the combination of a member having an annular groove, a series of rotary valves arranged with their axes at right angles to the axis of the groove and dividing the same into a number of compartments, said valves being offset relatively to said groove, means for conducting a fluid to or from the groove controlled by said valves, a series of pistons fitting in said groove, and means having passages for conducting a fluid to or from the groove for rotating said pistons in the groove.

12. In a device of the character described, the combination of a member having a surface constituting a portion of a sphere, and an annular groove cut therein, valves dividing said groove into a number of compartments, means controlled by said valves for conducting a fluid to or from said groove, a piston carrying member having a spherical surface engaging the spherical surface of the first named member and having means for conducting a fluid to or from the groove, pistons carried by said piston carrying member and fitting in said groove, and means for causing a relative rotation between the first named member and the piston carrying member.

13. In a device of the character described, the combination of a member having a spherical surface and an annular groove therein, valves dividing said groove into a number of compartments, means controlled by said valves for conducting a fluid to or from the groove, a piston carrying member made in sections and having a spherical surface engaging the first named spherical surface and providing means for conducting a fluid to or from said groove, and a number of pistons carried by said piston carrying member and fitting in said groove.

14. In a device of the character described, the combination of a member having a spherical surface and an annular groove, valves dividing said groove into a number of compartments, means controlled by said valves for conducting a fluid to and from the groove, a piston carrying member fitting

on said spherical surface, means for rotating said piston carrying member, said valves being arranged with their axes at right angles to the axis of the piston carrying member and bearing thereon, said piston carrying member having means for conducting a fluid to or from the groove, and pistons carried by said piston carrying member and working in the groove.

15. In a device of the character described, the combination of a member having a spherical surface and an annular groove, valves dividing the groove into a number of compartments, means controlled by the valves for conducting a fluid to or from the groove, a piston carrying member made in sections and having flanges, bolts for connecting said flanges together, pistons carried by said piston carrying member and fitting in said groove, said piston carrying member having passages communicating with said groove.

16. In a device of the character described, the combination of a member having a spherical surface and an annular groove, valves dividing said groove into a number of compartments, means controlled by the valves for conducting a fluid to or from the groove, a piston carrying member having a flange fitting on said spherical surface and provided with passages communicating with the groove to conduct the fluid to or from the groove, and pistons secured in said flange and fitting in said groove, and means for rotating said piston carrying member, said piston carrying member and its extending flange being made in sections bolted together.

17. In a device of the character described, the combination of a member having a projecting flange, a hollow hub, and an annular groove in the flange, valves dividing said groove into a number of compartments, means controlled by said valves for conducting a fluid to or from the groove, a piston carrying member having a flange fitting over the flange of the first named member and provided with means for conducting a fluid to or from the groove, pistons carried by said piston carrying member and fitting in the groove, and gearing for rotating the valves, said gearing being arranged between the first named flange and the hollow hub.

18. In a device of the character described, the combination of a member having an annular groove, valves dividing said groove into a number of compartments, a shaft having passages in its opposite ends, said passages being separated from each other, fluid conducting pipes connected with the said passages, a piston carrying member having passages communicating with one of the passages in said shaft and with said groove, pistons carried by said piston carrying member and fitting in said groove, and

means for connecting said groove through said valves with the other passage and shaft.

19. The combination with a pair of rotatable elements having fitting surfaces, one of said elements having a groove, of means for rotating one of said elements with respect to the other, a series of rotary valves arranged with their axes at right angles to the axis of rotation, each valve having means for closing said groove and dividing the same into compartments, a series of pistons carried by one of said members and fitting the groove, each valve having a cut away portion adapted to permit the pistons to pass when the valve is turned into a cer-

tain position, and means for turning the valves into a position to permit the pistons to pass as each piston approaches the valve, said members being provided with means for conducting fluid to and from the groove, the valves constituting means for controlling the passage of fluid in one direction.

In testimony whereof I have hereunto set my hand, in the presence of two subscribing witnesses.

JAMES WALLACE TYGARD.

Witnesses:

SEYMOUR CONOVER,
JAS. H. CRAFT.