

June 3, 1924.

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P. C. PETERSEN

ROTARY PUMP, MOTOR, OR ENGINE

Filed June 3, 1922

2 Sheets--Sheet 1

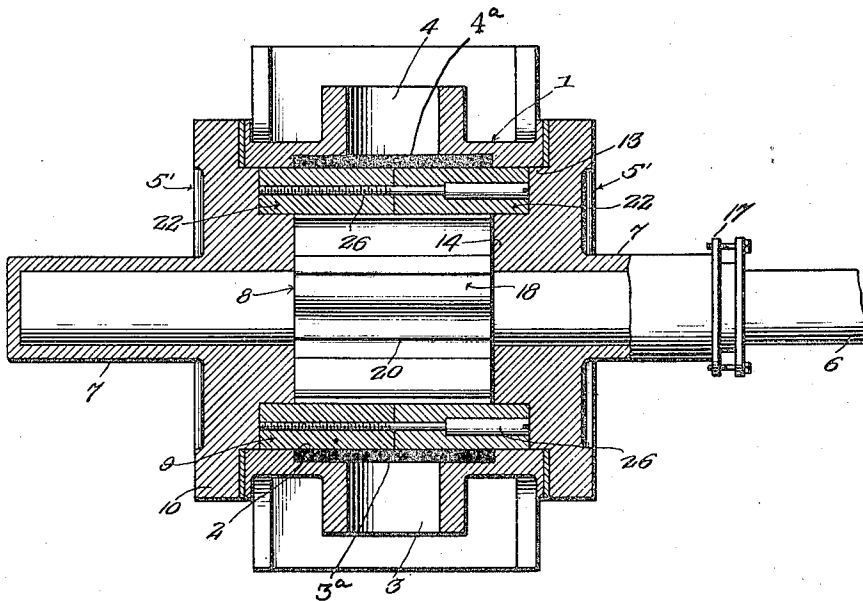
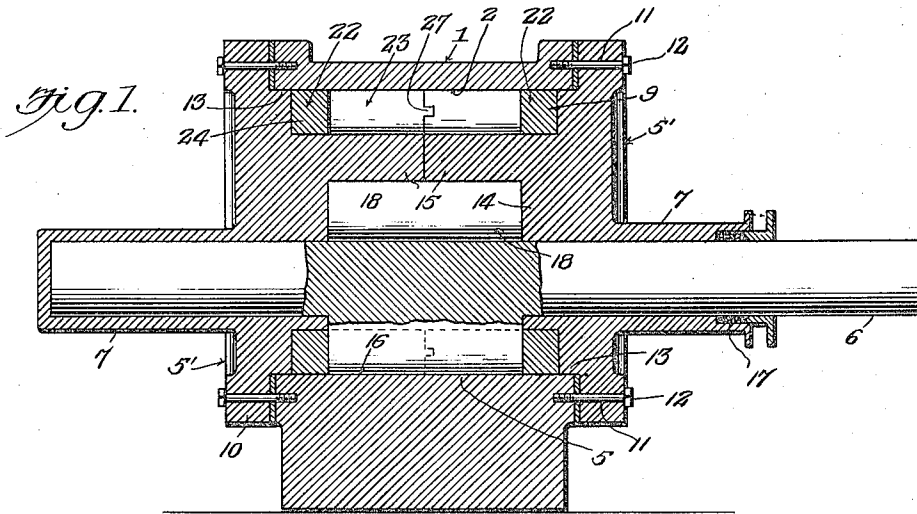


Fig. 2

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2 Sheets-Sheet 2

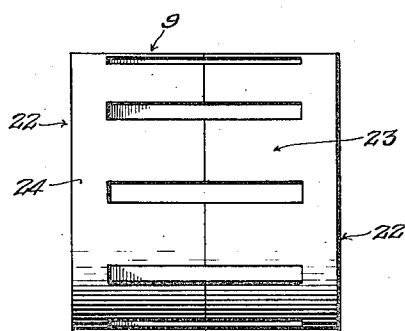
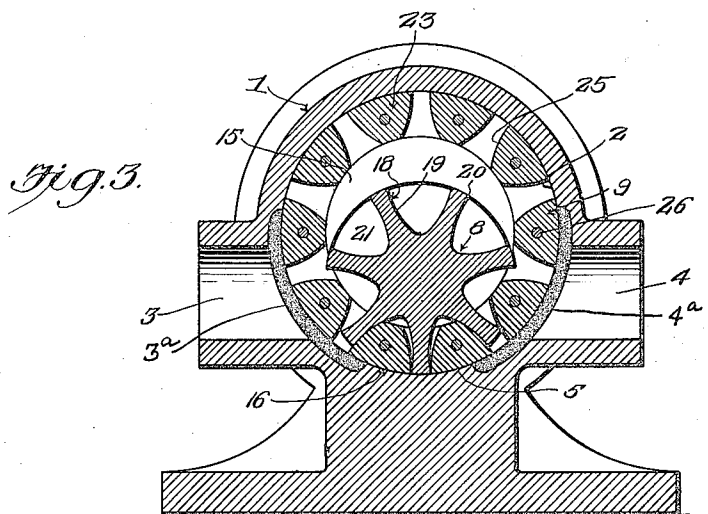


Fig. 5.

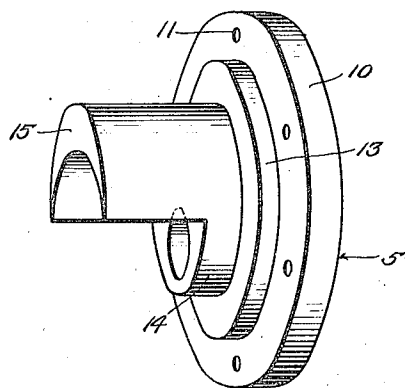


Fig. 4.

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UNITED STATES PATENT OFFICE.

PETER C. PETERSEN, OF CEDAR FALLS, IOWA, ASSIGNOR TO VIKING PUMP COMPANY,
OF CEDAR FALLS, IOWA.

ROTARY PUMP, MOTOR, OR ENGINE.

Application filed June 3, 1922. Serial No. 565,602.

To all whom it may concern:

Be it known that I, PETER C. PETERSEN, citizen of the United States, residing at Cedar Falls, in the county of Black Hawk and State of Iowa, have invented certain new and useful Improvements in Rotary Pumps, Motors, or Engines, of which the following is a specification.

This invention relates to improvements in rotary pumps, motors or engines and more particularly to that type of such mechanism including a pinion meshing with a rotor.

The primary object of the invention is to improve structurally the details of certain features of apparatus shown in known prior patents and to provide improved elements capable of rendering the known constructions more practical.

A further object of the invention is to provide an improved pump, motor or engine that has a larger capacity for its size and is more durable and efficient, especially when pumping against high pressures.

With the foregoing objects outlined and with other objects in view, which will appear as the description proceeds, the invention consists in the novel features hereinafter described in detail, illustrated in the accompanying drawings and more particularly pointed out in the appended claims.

Referring to the drawings:

Figure 1 is a vertical longitudinal sectional view of a pump constructed in accordance with the present invention.

Figure 2 is a horizontal longitudinal sectional view of the same.

Figure 3 is a transverse vertical sectional view taken through the inlet and outlet ports.

Figure 4 is a perspective view of one of the heads or end plates viewed on the inner side.

Figure 5 is a side view of the rotor.

In the drawing, 1 designates a casing having a circular inner surface 2. An inlet port 3 is provided at one side of said casing and an outlet port 4 is arranged at the opposite side of the same. An abutment 5 is arranged within the casing between said ports. The inner ends of the ports are enlarged as shown at 3^a and 4^a.

Two heads 5' of identically similar structure are provided for closing the ends of the casing and for other purposes as hereinafter described. A drive shaft 6 is provided, and

this shaft is mounted in sleeve bearings 7 forming part of the heads. This shaft carries a spur pinion 8 which internally actuates a gear rotor 9. These elements together constitute and comprise a rotary pump of the internal gear type.

The two heads that close the ends of the casing, as before stated, are similar in construction and each consists of a flange or disk 10 provided with apertures 11 to receive bolts 12 employed in securing the head to the casing. Extending inwardly from the disk is an annular shoulder 13 that fits for a short distance inside the casing in order to provide an absolute and perfect centering of a stub-shaft 14, in the casing 1. A suitable packing can be interposed between the flange 10 and the end of the casing 1. A cylindrical reduced portion or stub shaft 14 projects inwardly from the shoulder and serves as a part of the shaft which carries the rotor. A crescent-shaped projection 15 extends inwardly from said reduced portion, and is of such length that the crescents of the two heads, when placed in the casing, meet end to end, and thus form one crescent-shaped member centrally located in the casing with reference to its length. It will be noted that the outer surface of the crescent forms a continuation of the surface of the stub shafts 14, and the rotor moves on the stub shafts and on the outer surface of the crescent.

Each of the heads carries one of the bearings 7 for the drive shaft and this bearing is off center relatively to the longitudinal axis of the casing 1, but it centers with the inner surface of the crescent 15 and also with the inner surface 16 of the abutment 5 at a point midway between the ports. In other words, the inner surface of the crescent and this point or longitudinal line on the abutment are in a circle drawn from the axis of the drive shaft.

The drive shaft 6 passes through both heads and one of said heads is provided with a stuffing box 17 for the shaft 6, the shaft projecting through said stuffing box and being provided on the outside with the usual means (not shown) for applying power to said shaft. The bearing 7 on the other head may be closed at its outer end and both bearings may have the usual means (not shown) for lubrication.

For heavy duty, the shaft may be extended further outside of the heads to move

in bearings of any type, such bearings to be mounted on standards, with the casing between them, on a common base. In this form both heads are provided with stuffing boxes. 5 It is understood that these last mentioned features are common in the art.

The drive shaft and pinion 8 may be made integral, or the pinion may be fastened to the shaft in any suitable manner. It will 10 be noted that the pinion has teeth 18 that have concave sides 19, that is, they are thicker near their outer ends than they are about half way in towards the hub. The corners 20 on the outer end portions of the 15 teeth are slightly rounded as shown. This shape of the teeth furnishes means for insuring a good contact with the convex cogs, hereinafter described, of the rotor and further insures a free and easy movement, slight friction and nearly noiseless running even at 20 high speed.

The spaces 21 between the teeth are cut deeper towards the hub than is sufficient to 25 give room for the cogs of the rotor. This construction is provided in order to permit the slight amount of fluid impinged between the teeth of the pinion and the cogs of the rotor, when both are at the abutment 5, a free chance to move from one side of a cog 30 to the other side of the latter, and thus avoid undue friction and possible water-hammer.

The rotor 9 is preferably constructed of two similar parts 22, each having cogs 23 of suitable length extending from a ring 24 35 that serves as a bearing for the rotor on the reduced portions or stub shafts 14. The cog portion of the rotor travels on the outer side of the crescent 15. It will be noted that the cogs 23 of the rotor have convex sides 25 40 which, as before stated, are adapted to engage the concave sides 19 of the teeth of the pinion 8.

The cogs of the two parts 22 of the rotor are joined and match end to end, as shown, 45 and are fastened together by any suitable securing means, such as bolts, screws, rivets or the like, 26, in a practical manner to form one unitary element with the cogs 23 in the central part with reference to the length of 50 the rotor, and a ring or main bearing portion 24 at each of its ends. The periphery of the rotor is in slidable contact with the inner surface 2 of the casing.

The enlarged ends 3^a and 4^a of the ports 55 3 and 4 extend the full length of the spaces between the cogs 23, and also extend circumferentially so that about two spaces in the rotor are always open to each port, all the fluid must pass in and out through the spaces 60 in the rotor as the rotor revolves, therefore, there must be adequate space between the rotor and the casing at the ports.

It is obvious from the foregoing that inasmuch as the rotor is entirely enclosed in the casing between the heads, and the shaft

has bearings of equal diameter in both heads, and the inlet and outlet ports are located on the sides of the casing, there is no end thrust whatever in this machine.

In operation either port may be inlet or 70 outlet depending only on the direction in which the shaft is turned.

Fluid is drawn into the rotor 9 through the spaces between the cogs in the same, when the teeth 18 of the pinion by revolving said rotor, move inwardly. Then the fluid follows said teeth and fills the spaces between the teeth of the pinion and between the cogs in the rotor, said fluid moving with said teeth and cogs past the crescent 15. On the 80 opposite side where the teeth and cogs intermesh again, the fluid by this action is forced through the outlet port, the intermeshing teeth and cogs and the abutment in the casing preventing the passage of fluid from 85 port to port except along with the teeth and cogs past the crescent.

It will be noted that the meeting ends of the cogs are provided with tongue and groove joints 27 in order to prevent any independent movement between cogs which 90 about one another.

From the foregoing, it is believed that the construction, operation and advantages of the invention may be readily understood by 95 those skilled in the art, and it is obvious that various changes may be made in details illustrated without departing from the spirit of the invention as expressed in the claims.

What is claimed and desired to be secured 100 by Letters Patent is:—

1. In combination, a casing member provided with a cylindrical inner surface, an annular open-ended rotor arranged in said casing provided with radially disposed longitudinal slots and cogs and having its periphery slidably engaging the inner surface 105 of the casing, a shaft extending through said casing and having its axis arranged off center relatively to the axis of the rotor, a pinion 110 on said shaft having teeth adapted to extend through said slots and engaging said rotor, cogs, substantially identical head members detachably connected to the ends of the casing member and each provided with an inwardly extending crescent-shaped element 115 engaging the inner surface of said rotor, said crescent-shaped elements having their ends arranged opposite and in close proximity to one another, an inlet port extending 120 through one of said members, and an outlet port also extending through one of said members.

2. A combination as claimed in claim 1 in which each head member is provided with 125 an inwardly extending cylindrical shoulder engaging the inner surface of said casing member.

3. A combination as claimed in claim 1 in which each of said head members, is pro- 130

vided with a stub shaft projecting into and forming an inner bearing for said rotor, and carrying the crescent-shaped element, the outer surface of said crescent-shaped element forming a continuation of the outer surface of said stub shaft.

4. A combination as claimed in claim 1 in which the teeth of the pinion have concave sides and are thicker near their ends than they are about half way to the hub, and each tooth being provided with rounded corners from side to end.

5. A combination as claimed in claim 1 in which the rotor cogs have convex side surfaces, and in which the pinion teeth have concave side surfaces adapted to contact with the side surfaces of the cogs.

6. In combination, an open ended casing provided with inlet and outlet ports at its opposite sides and having a substantially circular inner surface, an annular open-ended driven rotor arranged in said casing and slidably engaging the inner surface of the latter, said rotor having rings at its ends and being provided with radial slots and cogs intermediate its ends, said cogs having convex side surfaces, a pinion arranged in said casing and rotor and having teeth adapted to project through said slots and provided with concave side surfaces adapted to contact with the convex sides of the cogs in said rotor, a driving shaft fixed to said pinion, and heads closing the ends of said casing and each provided with an inwardly extending stub shaft terminating in a crescent-shaped member arranged between said pinion and said rotor and forming an inner bearing for the rotor.

7. In a machine of the class described, a rotor consisting of an open-ended hollow barrel with spaces cut out longitudinally in

the central part forming cogs between, and said cogs being joined together at each end by a ring, said rotor being formed of two similar parts, and the meeting ends of said cogs being provided with tongue and groove joints.

8. A machine of the class described including a casing of substantially cylindrical shape provided at opposite sides of its periphery with inlet and outlet ports, a support for said casing, the interior of said casing and the inner end of said support forming a cylindrical surface, an annular open-ended rotor arranged in said casing and engaging said cylindrical surface throughout the length of the rotor, said rotor consisting of end rings each having spaced cogs projecting from one side thereof, and means connecting the cogs of the two rings together, detachable end plates for said casing, each end plate having a cylindrical shoulder engaging the cylindrical surface of the casing and support, a smaller cylindrical shoulder projecting inwardly from the first mentioned circular shoulder, engaging one of the rings of the rotor, and forming an inner bearing for the latter, a crescent-shaped member integral with the smaller circular shoulder and engaging the inner surfaces of certain of said cogs, each of said end plates being provided with an eccentrically arranged bearing aperture, the inner surface of each of said crescent-shaped members being on the arc of a circle having its center at the axis of said bearing aperture, and a pinion engaging said cogs and the inner surfaces of the crescent-shaped members and provided with a shaft extending through said bearing aperture.

In testimony whereof I affix my signature.
PETER C. PETERSEN.