Dec. 22, 1931. J. F. JAWOROWSKI 1,837,714

ROTARY PUMP

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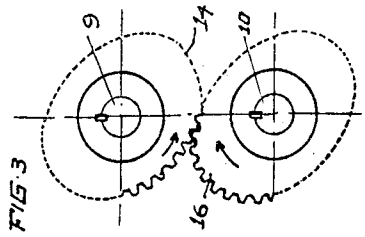


FIG. 3

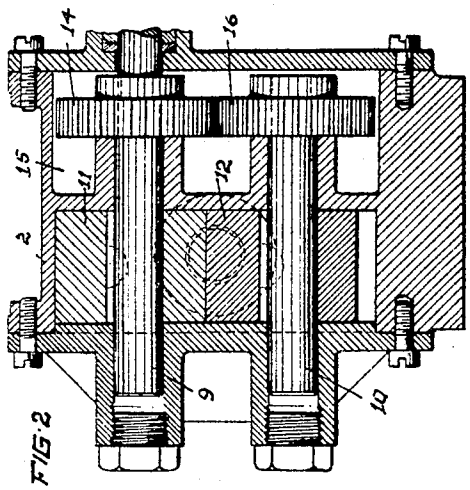


FIG. 2

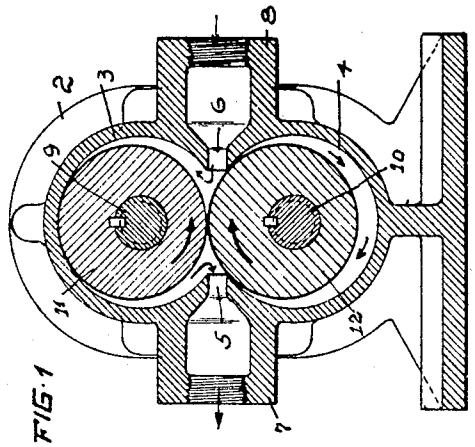


FIG. 1

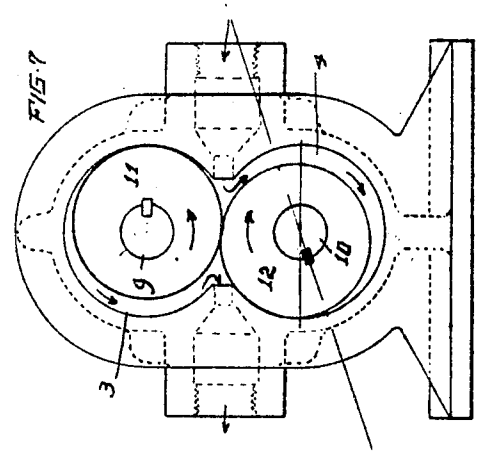


FIG. 7

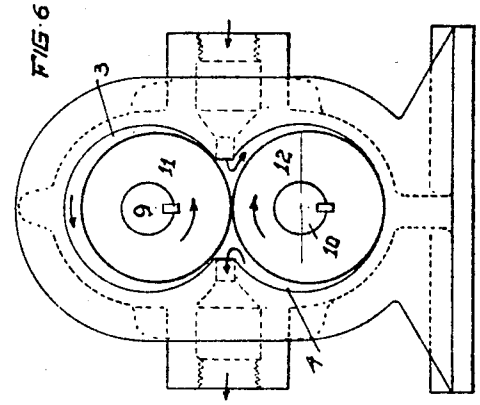


FIG. 6

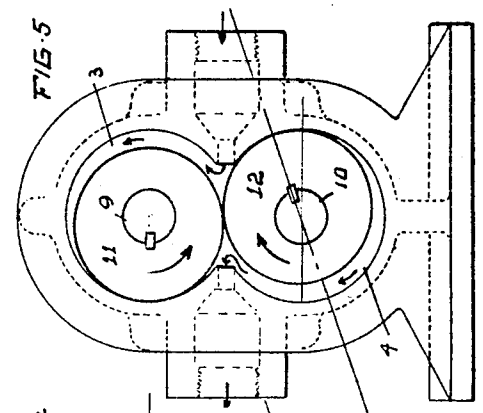


FIG. 5

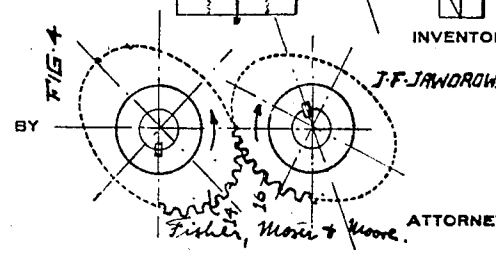


FIG. 4

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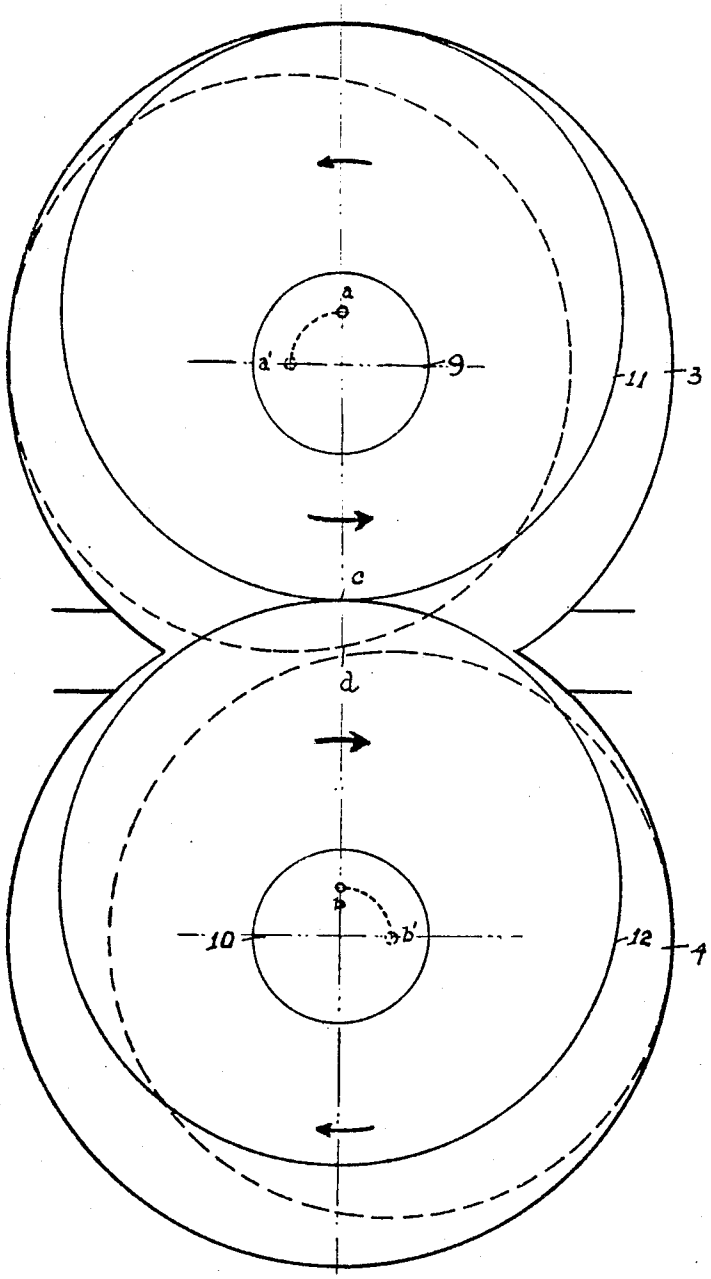
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FIG. 8



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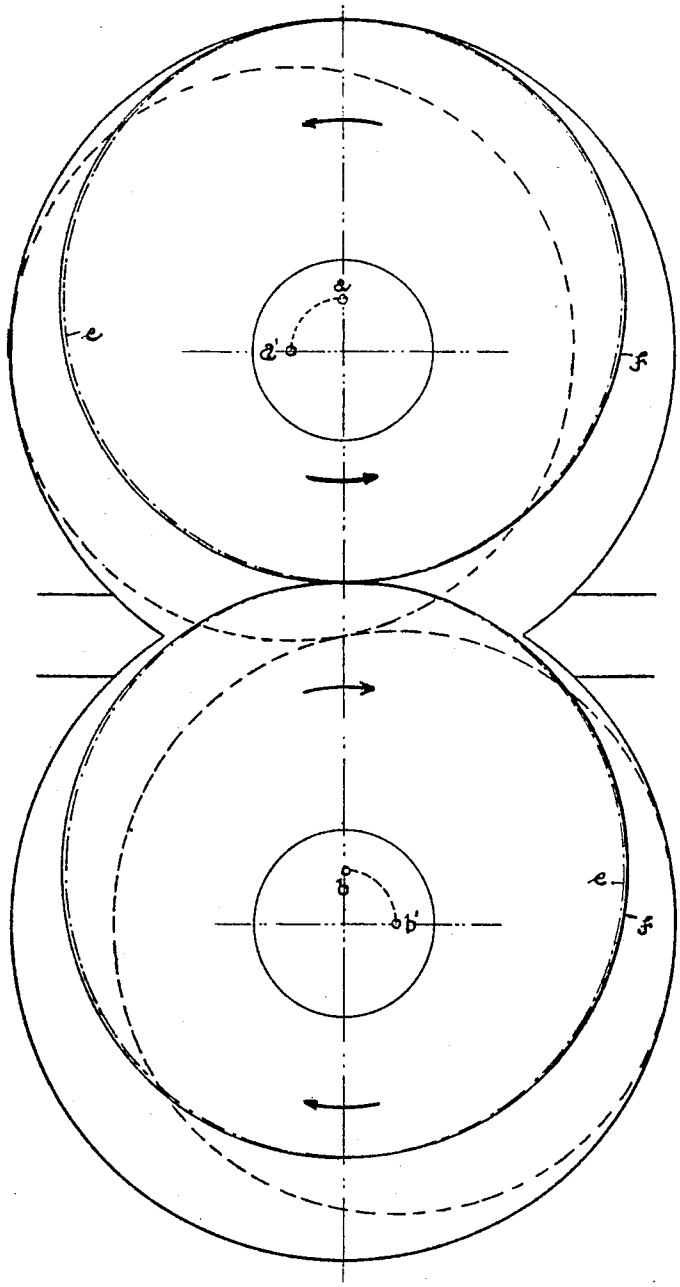
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FIG. 9



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Patented Dec. 22, 1931 1,837,714

UNITED STATES PATENT OFFICE

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ROTARY PUMP

Application filed February 13, 1929. Serial No. 339,542.

My invention relates to an improvement in rotary pumps, and in general my purpose is to provide a pump of simple construction in which all the moving parts rotate, and in which a pair of eccentric members are caused to coact in an efficient way to produce suction and pressure and thereby the transfer or compression of a liquid, substantially as herein shown and described, and more concisely set forth in the claims.

In the accompanying drawings, Fig. 1 is a sectional view transversely of my improved pump, and Fig. 2 is a sectional view longitudinally thereof. Figs. 3 and 4 are diagrammatic views of the elliptic driving gears for the eccentric pistons, two working positions of the gears being represented. Figs. 5, 6, and 7, are end elevations of the same pump showing three different working positions of the eccentric pistons. Fig. 8 is a diagram showing the eccentric pistons in full and dotted lines, in two different positions, for example, two positions which occur when the pistons are revolved in opposite directions at exactly the same speed. Fig. 9 is a diagrammatic view corresponding to Fig. 8, but showing two eccentric pistons of slightly elliptical shape.

The pump comprises a casing 2 containing two compression or working chambers 3 and 4, respectively, of circular shape which are so closely related that a sector of one chamber partly overlaps a sector of the other chamber. These chambers are therefore in open communication where overlapped or joined, and separate inlet and outlet ports 6 and 5, respectively, open into this communicating space or central area directly opposite each other where the circular walls merge or intersect and where separate liquid intake and discharge connections 7 and 8 respectively, are provided on opposite sides of the casing. Two shafts 9 and 10 respectively have rotatable bearing in the heads of the casing, and these shafts extend axially through the chambers 3 and 4 where two circular members 11 and 12 (hereinafter referred to as pistons) are mounted eccentrically upon said shafts so that each piston revolves within its own working chamber with a part of its circumference in constant sliding contact with the circular wall thereof. The circular pistons are of equal diameters and offset or eccentrically related to each shaft in the same degree so as to bring their flat peripheral surfaces closely together during the complete cycle of revolution of each piston. Preferably, the peripheral surfaces of the two pistons should be in constant rolling contact to completely shut off communication on a direct line between the inlet and outlet ports 5 and 6, respectively. However, when two such eccentric pistons are rotated in opposite directions at the same speed the peripheral surfaces separate or move apart twice during each complete revolution, substantially as indicated in full and dotted lines in Fig. 8.

Thus, it will be understood upon referring to said diagrammatic view, that when the two pistons rotate a quarter of a revolution in opposite directions at the same speed the respective centers a and b of the two circular members or pistons 11 and 12, will shift from the positions a and b, to a' and b', respectively, so that the distance between a' and b' on a straight line is perforce greater at the end of the quarter-revolution than at the beginning when the centers a and b were both lying in a plane or median line intersecting the respective axes of revolution of said pistons. Thus, at the beginning of the movement the peripheral surfaces of the pistons are in contact as indicated in full lines at c in Fig. 8, and at the end of a quarter-revolution of the pistons the peripheral surfaces have separated their maximum distance as indicated in dotted lines at d in the same figure.

To prevent such separation from occurring I may employ gearing to rotate the pistons in opposite directions at varying speed. As an exemplification and referring to Sheet 1, piston 11 is keyed to a drive shaft 9 which is provided with an elliptical gear 14 housed within an end chamber 15 within casing 2. The co-acting piston 12 is keyed to a driven shaft 10 having a second elliptical gear 16 secured thereto and meshing with gear 14. One complete revolution of drive shaft 9 imparts a like revolution to the driven shaft, but

a variable rotary motion is transmitted to driven shaft 9 and its piston 12, the variation in speed being determined by the relation between the lengths of the major and minor axes of the elliptical gears. As applied to the present pump the gearing operates as follows: Assuming that at the beginning of the movement the two pistons are related as shown in Fig. 1, with the center of each eccentric in line with or in the same plane as both centers of revolution, then the two elliptical gears are related as shown in Fig. 3, with the major axes of the ellipses parallel. The first quarter of revolution of driving shaft 9 and piston 11 will cause the driven shaft 10 and piston 12 to rotate in lesser degree, thereby maintaining substantially the same relative distance between the centers of the two eccentrics during the quarter revolution of the parts, see Fig. 5, and thereby keeping the peripheral surfaces of the two pistons closely together during that quarter revolution of the parts. The position of the elliptical gears at the beginning and end of the quarter revolution is depicted in the diagrammatic views, Figs. 3 and 4, which show the teeth in a minor section of the driving gear 14 meshing with the teeth in a major section of the driven gear 16 during this quarter of revolution of the parts. In the next quarter of revolution the major section of driving gear 14 operates upon a minor section of the driven gear and piston 12 is rotated in greater degree than piston 11. The respective positions of the pistons at the end of the half revolution are as shown in Fig. 6, with the centers of the eccentrics again in line with or in the same plane as the centers of revolution. Continuing from this position the same movements occur or are repeated in the last half of the cycle, see Fig. 7, which depicts the relative positions of the two pistons at the three-quarter stroke, and Fig. 1 which shows the relative positions of the pistons at the end and beginning of each cycle.

From the foregoing it will be seen that the eccentric pistons or impellers 11 and 12 co-act to create and induce a steady flow of liquid through the two chambers 3 and 4 from the inlet to the outlet sides thereof, and that the liquid conveyed or transferred by each eccentric is compressed or placed under pressure at the discharge side of the pump during a part of the conjoint revolution of the eccentrics.

Viewing the invention in its broader aspects I do not wish to limit myself altogether to the use of elliptical gearing as shown and described herein inasmuch as other gearing may be substituted therefor to rotate the two eccentric pistons or impellers at uniform speeds. However, I prefer to employ such elliptical gears or their mechanical equivalents to keep the circular pistons closely together at their peripheries during the complete cycle of revolution, especially in pumps of large size or where a high efficiency is required or desired.

In Fig. 9 I show a pair of eccentric pistons of slightly modified form. Herein each piston is of slightly oval or elliptical shape, the dotted lines *e* representing a true circle and the full lines *f* representing an oval or elliptical figure. Pistons of such oval or elliptical shape permit continuous, rolling contact therebetween when operated at uniform speed throughout the cycle of movement. Elliptical gearing, used as described, permits the pistons to be developed as true circles and still maintain a close working relation between the peripheries during the full cycle of movements of the parts.

What I claim, is:

1. A rotary pump, comprising a casing containing circular intercommunicating chambers having inlet and outlet ports, shafts axially of said chambers, a pair of circular pistons within said chambers mounted eccentrically upon said shafts to engage the walls of said chambers and to contact with each other throughout their rotation, and means for rotating said pistons simultaneously.

2. A rotary pump, comprising a casing containing intercommunicating chambers of circular outline and inlet and outlet ports intermediate said chambers, shafts axially of said chambers, a pair of circular pistons eccentrically mounted upon said shafts within said chambers in contact with the walls thereof and in close contiguous relation opposite said ports, and means for rotating said pistons in unison in opposite directions within said chambers.

3. A rotary pump, comprising a casing containing a pair of circular intercommunicating working chambers having inlet and outlet ports, shafts axially of said chambers having circular pistons eccentrically mounted thereon and engaging each other and the walls of the chambers throughout their rotation, and means for revolving said pistons in their orbits in timed unison.

4. A rotary pump, comprising a casing containing circular working chambers in open communication, having inlet and outlet ports, including shafts axially of said chambers, a pair of pistons eccentrically mounted upon said shafts, and means for rotating said pistons at variable speed within said chambers, to assure contact of said pistons throughout their rotation.

5. A rotary pump, comprising circular intercommunicating chambers having inlet and outlet ports, shafts axially of said chambers having pistons eccentrically mounted upon said shafts within said chambers, and means for maintaining said pistons closely together during rotatable movements thereof.

6. A rotary pump, comprising a casing containing a pair of circular working cham-

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bers having inlet and outlet ports, shafts axially of said chambers, circular pistons mounted eccentrically upon said shafts to rotate off center within said chamber, and means for rotating said pistons in opposite directions concurrently within said chambers, including means for maintaining the peripheries of said pistons in closely moving relation during the full cycle of movements of the said parts.

7. A rotary pump, comprising a casing containing a pair of overlapping circular working chambers having inlet and outlet ports, shafts axially of said chambers, a pair of co-acting pistons mounted upon said shafts to rotate eccentrically within said chambers, and a set of elliptical gears for rotating said pistons concurrently.

8. A rotary pump, comprising a casing containing a pair of intercommunicating circular working chambers having inlet and outlet ports, shafts axially of said chambers, a pair of co-acting pistons mounted upon said shafts eccentrically within said chambers, and means for rotating said pistons concurrently, including elliptical means for maintaining the peripheral surfaces of said pistons in close working relation throughout the cycle of movement of said parts.

In testimony whereof I affix my signature.

JOSEPH F. JAWOROWSKI.