

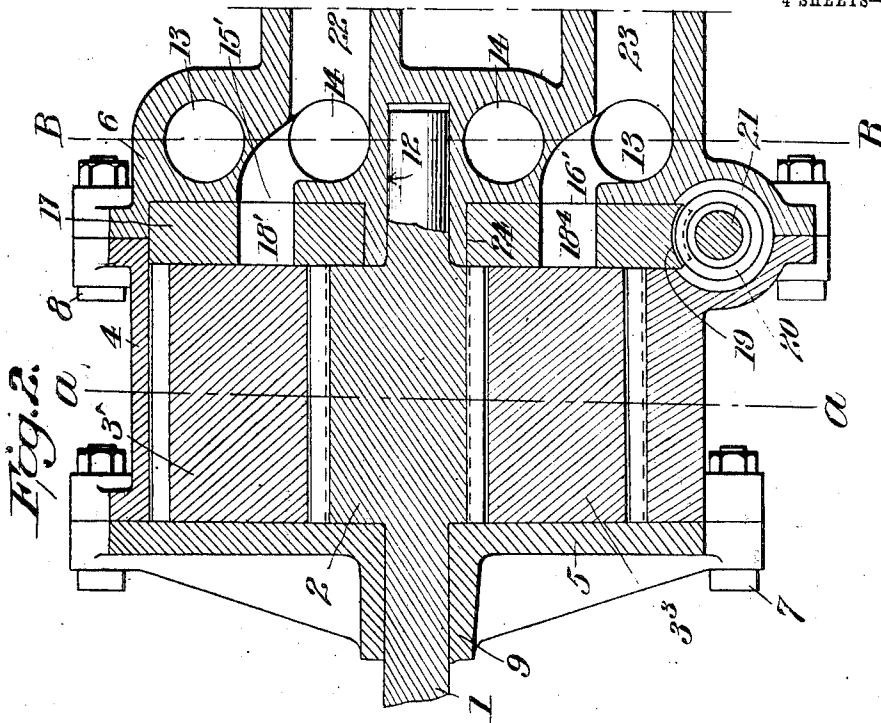
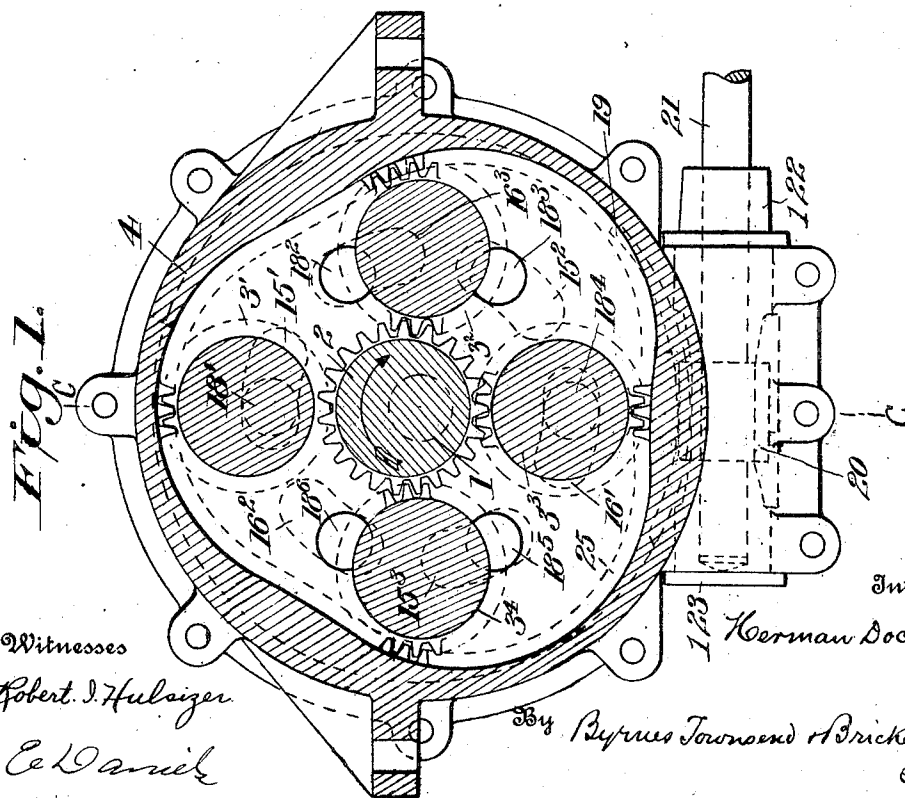
H. DOCK.
 ROTARY ENGINE.

APPLICATION FILED APR. 18, 1913.

1,087,735.

Patented Feb. 17, 1914.

4 SHEETS—SHEET 1.



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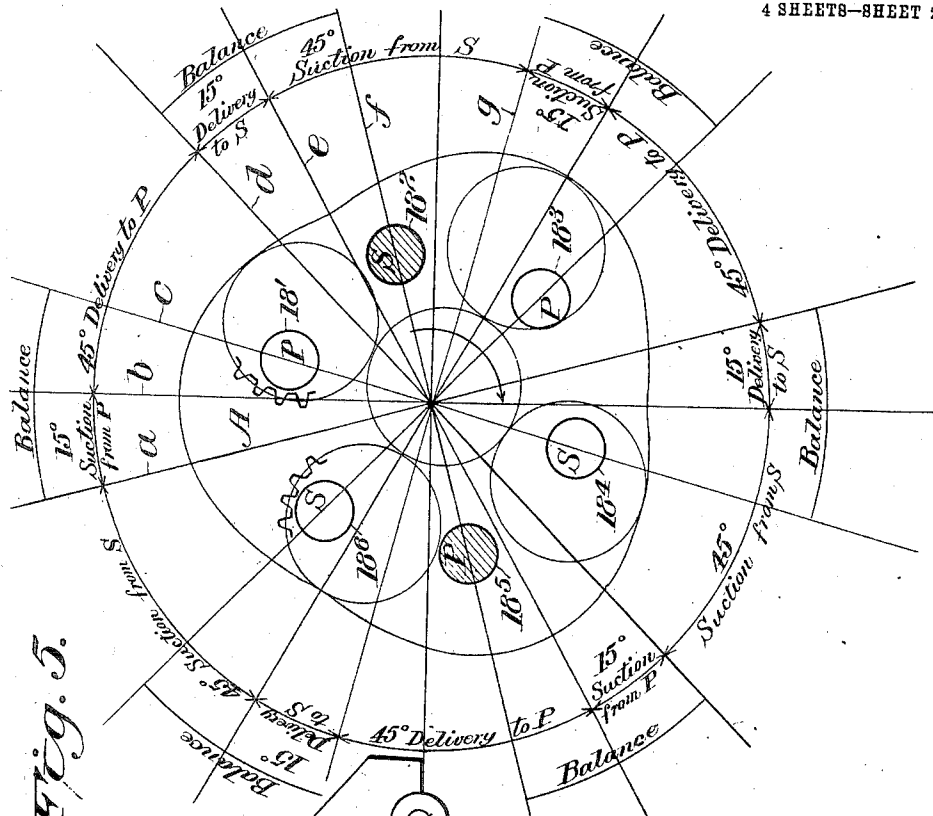


Fig. 5.

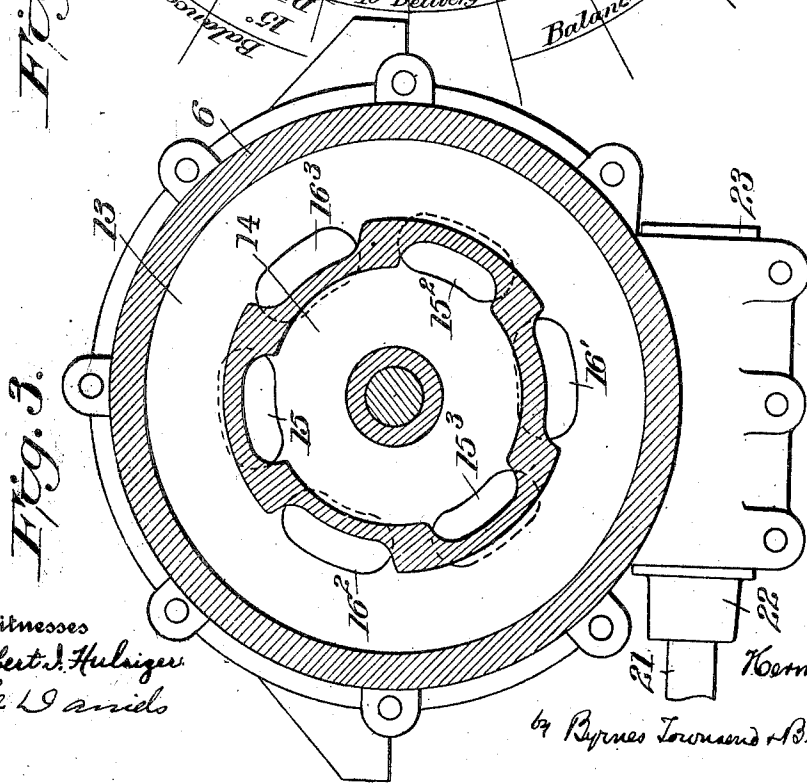


Fig. 3.

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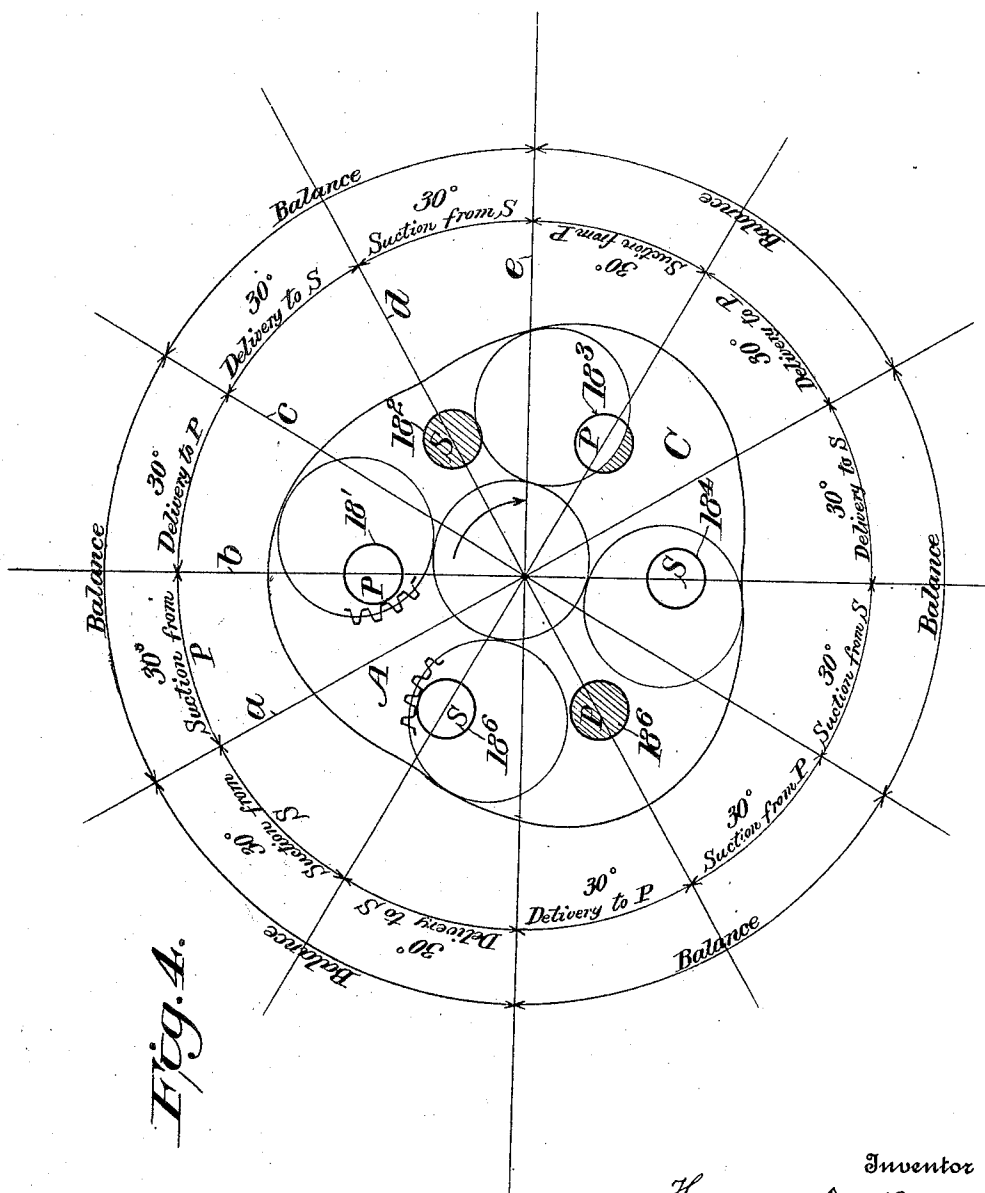


Fig. 4.

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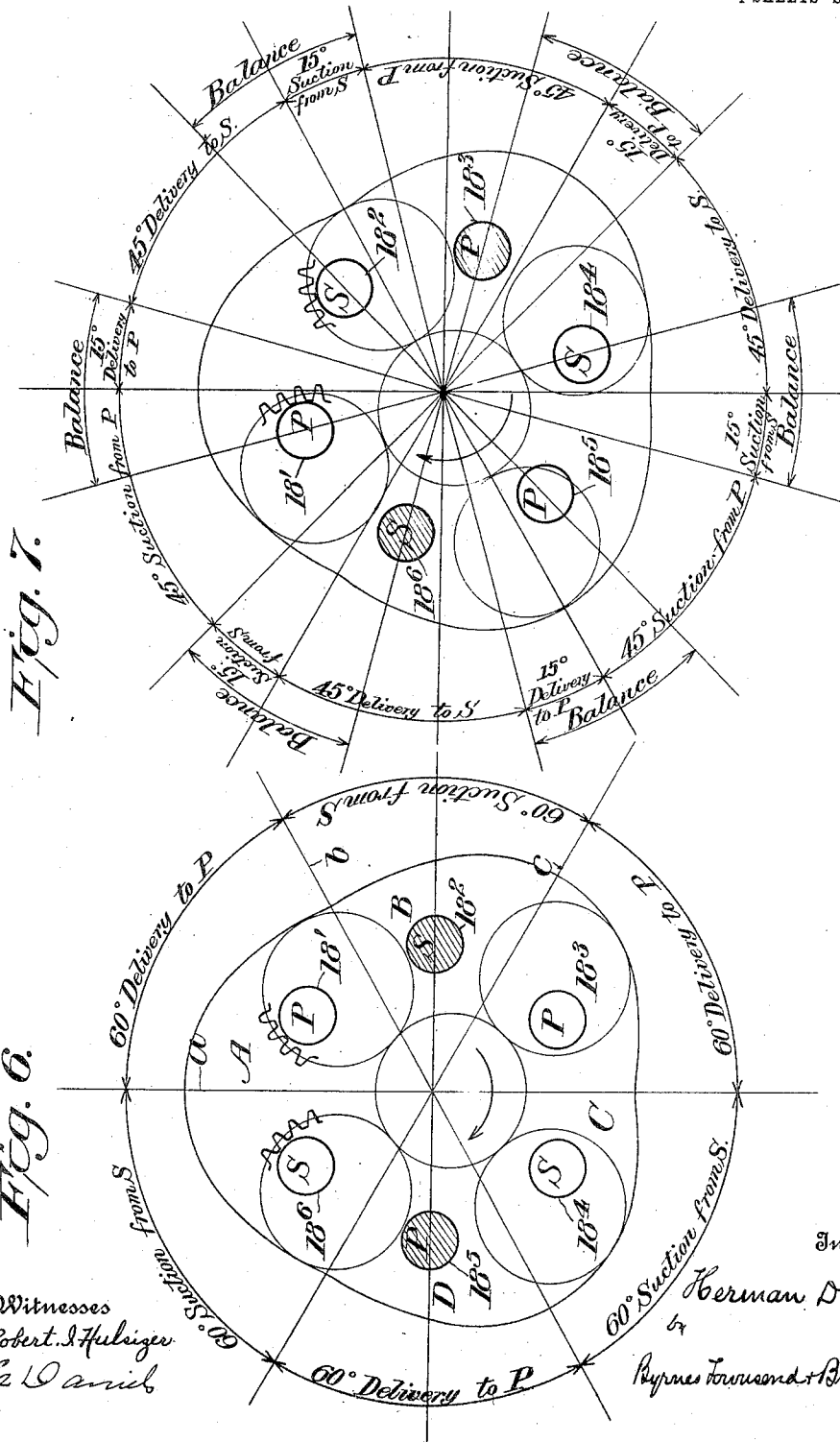


Fig. 7.

Fig. 6.

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HERMAN DOCK, OF WESTERLY, RHODE ISLAND.

ROTARY ENGINE.

1,087,735.

Specification of Letters Patent.

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REISSUED

To all whom it may concern:

Be it known that I, HERMAN DOCK, a citizen of the United States, residing at Westerly, in the county of Washington and State of Rhode Island, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

My invention relates to a rotary engine capable of use either as a pump or motor, and comprises a main-shaft having thereon a motor element (driving or driven as the case may be) and a plurality of loose or floating elements, such as gear wheels, located between the shaft and the casing and coöperating with both to provide chambers of variable capacity, into which fluids are drawn and from which they are expelled when the device is acting as a pump, and in which the pressure fluids exert their power and from which they are exhausted when the device is acting as a motor.

The motor element carried by the shaft is preferably non-concentric, and is preferably a cylindrical gear, with whose teeth engage the teeth of a plurality of loose or floating gears, the teeth of the floating gears engaging also internal teeth on the wall of a properly shaped casing, whereby there are formed between the periphery of the motor element, the peripheries of two adjacent gears and the wall of the casing fluid tight chambers of variable capacity, sealed against the axial or radial escape of fluid, except through the proper predetermined ports or openings.

In the drawings, I have illustrated my invention as applied to a pump of the variable delivery type.

In said drawings—Figure 1 is a cross section on line A—A of Fig. 2; Fig. 2 is a longitudinal section on line C—C of Fig. 1; Fig. 3 is a cross section on line B—B of Fig. 2, showing ports and passages in port plate 6; Fig. 4 is a diagram showing position of valve when pump is not discharging; Fig. 5 is a diagram showing position of valve when pump is discharging at half its capacity; Fig. 6 is a diagram showing position of valve when pump is discharging its maximum capacity; and Fig. 7 is a diagram showing position of valve for discharging half its maximum capacity with reverse flow.

Referring to the drawings, 1 is the driving shaft, mounted upon which is the ec-

centric gear 2, around which and engaging with the same, are the loose or floating gears 3¹, 3², 3³, and 3⁴, which engage also with the internal heart-shaped gear 25 in the case 4. One end of the casing 4 is inclosed by the plate 5, and bolted to the said casing by the bolts 7, the plate 5 supporting one end of the shaft 1 in the bearing 9, which is provided with a suitable packing-box, not shown; the other end of the shaft 1 is supported in a bearing 12 in the port plate 6 which incloses the other end of the casing 4 and which is bolted to the same by the bolts 8. There are thus formed within the casing a series of chambers of variable capacity, whose inner and outer walls are portions of the eccentric gear 2 and of the internal gear 25, whose side walls are the portions of adjacent floating gears and whose end walls are the plate 5 and the valve 17, if one be used. The intermeshing gears seal the chambers fluid-tight on the sides, and at the ends, the ends of the gears move with a sliding fit, or may be provided with annular packing rings located near the base of the teeth.

In the port plate 6 are two circular passages 13 and 14 and from the inside of casing to these passages are the ports 15¹, 15² and 15³, 16¹, 16² and 16³, the first-mentioned ports connecting with the passage 14 and the second-mentioned ports connecting with the passage 13. From the passages 13 and 14 lead the connections 23 and 22, respectively. Between the gears 2, 3¹, 3², 3³, 3⁴, and the port plate 6 is interposed the valve 17 which is rotatably mounted on the bearing 24. Through this valve 17 are the circular ports 18¹, 18², 18³, 18⁴, 18⁵, 18⁶, which register, in various position, with the ports 15¹, 16³, 15², 16¹, 15³, 16², respectively, in the port plate 6. On the lower circumference of the valve 17 are cut the teeth 19 which gear into the worm 20 mounted on the shaft 21 which is carried in the bearings 122 and 123, between casing 4 and the port plate 6.

The action of the pump in operation is as follows:—The shaft 1 is rotated in the direction of the arrow, and as the gear 2 is mounted on said shaft, revolves with the same. The floating gears 3¹, 3², 3³, 3⁴, mesh with the gear 2 and also with the internal gear 25 and are therefore carried around with the shaft 1 but at a slower speed. In this case, the shaft 1 revolves four times

while the gears 3¹, 3², 3³, 3⁴, are revolving around the gear 2 once. If the valve 17 is set in the position shown in Fig. 6, the pump will deliver its maximum capacity. As will readily be seen, there are six strokes per revolution of the shaft 1, three discharge strokes and three suction strokes. The chambers formed between the gear 2, the casing and adjacent floating gears will, for convenience be termed "cylinder portions."

Cylinder portion A is just beginning to deliver its contents through port 18¹ and has just closed port 18². Cylinder portion C is just beginning to suck from port 18⁴, and has just finished discharging through port 18³. Cylinder portion B is sucking from port 18², while cylinder portion D is discharging through port 18⁵. Taking cylinder portion A revolving in the direction of the arrow, as shown, it is at its maximum capacity or equivalent to the cylinder of a reciprocating pump, when the piston is at the outer end of the stroke. When cylinder portion A reaches a point "b" the volume will contract to that of the cylinder portion C and will have discharged its contents through the port 18¹, which will then be just closed while the port 18² will be just opening. During the next stroke to the position marked "c" the volume in the cylinder will be expanded; therefore it will suck from port 18² which will close when the cylinder reaches point "c", while the port 18³ will be just opening, and so on, giving the maximum discharge through ports 18¹, 18³, 18⁵ and 15¹, 15², 15³ into passage 14 and out through passage 22, the suction being drawn to the pump through the passages 23 and 13 to the cylinder through the ports 16¹, 16², 16³, and 18⁴, 18⁶, 18². Supposing the valve is now moved to the position shown in Fig. 4, which is the no-discharge position, then cylinder portion A, as shown, is at half stroke and in its movement from position "a" to "b" will suck from port 18¹. The next movement from "b" to "c" will be a delivery to port 18¹, from "c" to "d" a deliver to port 18², and from "d" to "e" a suction from port 18². Therefore there will be as much liquid sucked from port 18¹ as is discharged to it, and as much discharged to port 18² as is sucked from it, and, accordingly, there will be no discharge through the passage 22 or suction through the passage 23. If the valve is moved to any position between those shown in Fig. 6 and Fig. 4, there will be a varying discharge, varying according to the position of the valve. Fig. 5 is shown at position for half delivery.

The cylinder portion A moving from position "a" to "b" sucks from port 18¹, moving from "b" to "d" delivers to port 18¹, moving from "d" to "e" delivers to port 18², and from "e" to "g" sucks from 18², but the quantity sucked from 18¹, from

positions "a" to "b" is balanced by it being discharged to 18¹. From positions "b" to "c" of cylinder portion A, therefore, the effective amount passing through the passage 22 is the quantity delivered from positions "c" to "d", and also on the suction side the quantity delivered to port 18², from positions "d" to "e" is balanced or neutralized by the amount sucked from 18², during movement from "e" to "f", therefore, amount sucked through the passage 23 is the same as is sucked into the cylinders through the movement from "f" to "g" which equals the quantity delivered through the passage 22 which, as the diagram shows, is equal to half the capacity of the pump. The same results are obtained by moving the valve the opposite way, that is, instead of moving from the position as shown in Fig. 6 to position in Fig. 5, it is moved to that shown in Fig. 7. In this case the flow of liquid is reversed, and more is delivered to ports 18², 18⁴, 18⁶ than is sucked from them and more liquid sucked from ports 18¹, 18³, 18⁵ than is delivered to them, and, therefore, the passage 22 becomes the suction, and 23 the delivery, and the flow of the liquid is reversed.

The floating gears may be provided with annular packing rings on their ends, to insure a more complete prevention of leakage between the ends of the gears and the casings.

While I have shown four loose and rotating gears, an appropriate larger or smaller number may be used. Other changes in mechanical details may be made. Thus, the internal gear of the casing is shown as heart-shaped, but this shape may be varied to have a different contour, if a different number of gears is used; the loose or floating gears, as well as the gear on the shaft, may be of other contour than circular.

The before-described operation is that of the device when used as a pump, but the device is equally capable of acting as an engine or motor, driven by steam or other gas under pressure, or water, oil or other liquid under pressure, and is adapted for all the uses to which other rotary fluid pressure engines or motors are applicable; and it is to be understood that by the term "engine", used in the claims I mean to include rotary devices of the kind in which power is derived from fluids under pressure, such as rotary steam engines, as well as those in which power is applied to the driving shaft to pump or apply pressure to liquids or gases.

I claim:—

1. A rotary engine comprising a casing, having an internal curved gear, a shaft extending through said casing, an eccentric gear secured to said shaft, and a plurality of loose gears whose teeth engage the teeth

on the eccentric gear and those on the internal gear, said loose gears being rotatable on their own axes and also about said shaft, and means for admitting fluid to the spaces between the gears and for withdrawing it from said spaces.

2. A rotary engine comprising a casing, having an internal curved gear, a shaft extending through said casing, an eccentric gear secured to said shaft, and a plurality of loose gears whose teeth engage the teeth on the eccentric gear and those on the internal gear, said loose gears being rotatable on their own axes and also about said shaft, said casing having admission and exhaust conduits, and a movable plate having port openings therein for controlling the flow of fluid.

3. A rotary engine comprising a casing, a power shaft, and loose or floating rotatable piston elements in fluid-sealing and power-transmitting engagement with said casing and shaft.

4. In a rotary engine, the combination with a casing, of a power shaft having thereon a motor element within the casing, and loose rotatable piston elements arranged between said motor element and casing, and inter-engaging said motor element and casing.

5. A rotary engine, comprising an inclosing casing, a rotatable motor element mounted within said casing, and loose or floating rotatable devices arranged in power-relation to said casing and motor element and forming with said parts pressure chambers of variable capacity.

6. A rotary engine, comprising an inclosing casing, a rotatable motor element mounted within said casing, and loose or floating rotatable devices arranged in power-relation to said casing and motor element and forming with said parts pressure chambers of variable capacity, and admission and exhaust conduits connected to said chambers.

7. A rotary engine, comprising a casing having port openings therein, a rotatable motor element within said casing, and loose or floating rotatable piston elements in power-transmitting and fluid-sealing engagement with said motor element and casing, said parts being constructed and arranged to form a series of rotating pressure spaces of variable volume.

In testimony whereof I affix my signature in presence of two witnesses.

HERMAN DOCK.

Witnesses:

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