June 19, 1923.

1,459,637

M. J. POYET

ROTARY MACHINE

Filed Feb. 2, 1921

4 Sheets-Sheet 1

Fig. 1

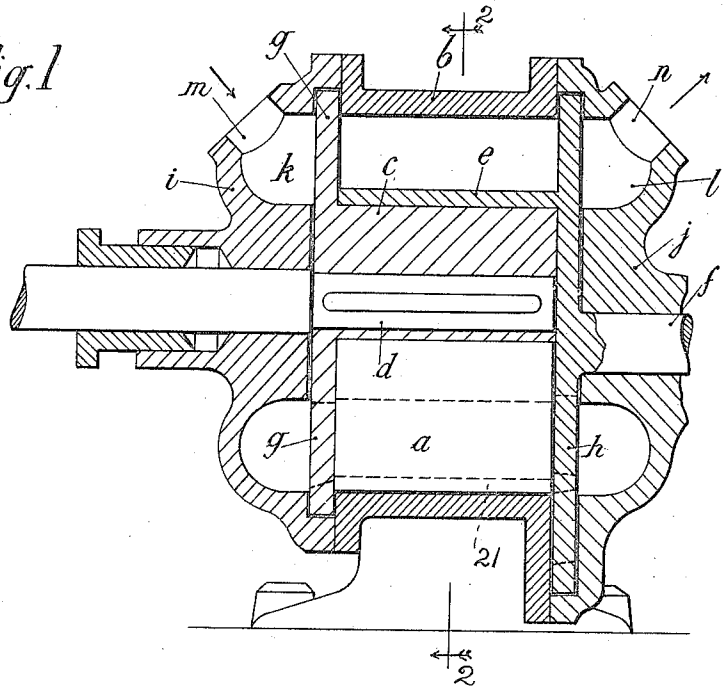
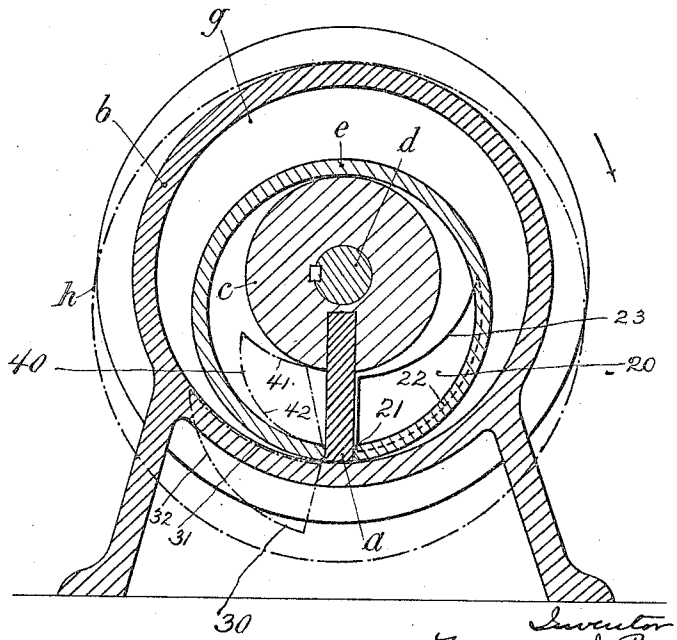


Fig. 2



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June 19, 1923.

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Filed Feb. 2, 1921

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Fig. 3.

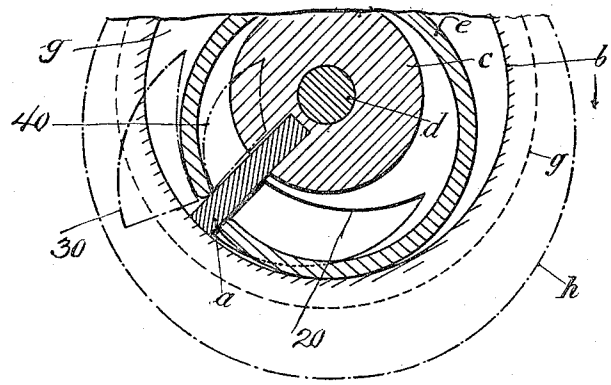

Fig. 4

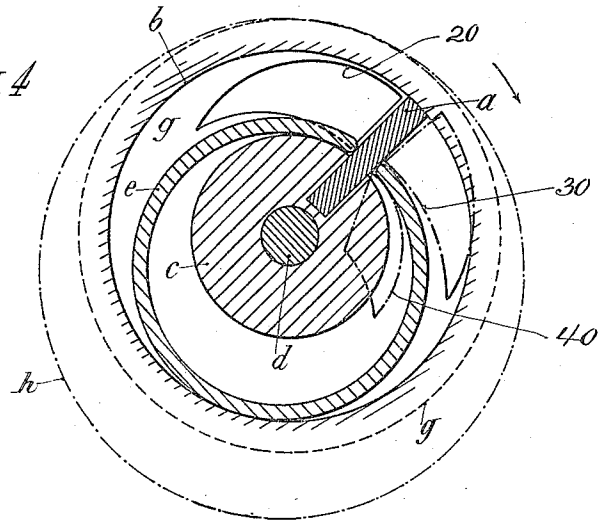

Fig. 5

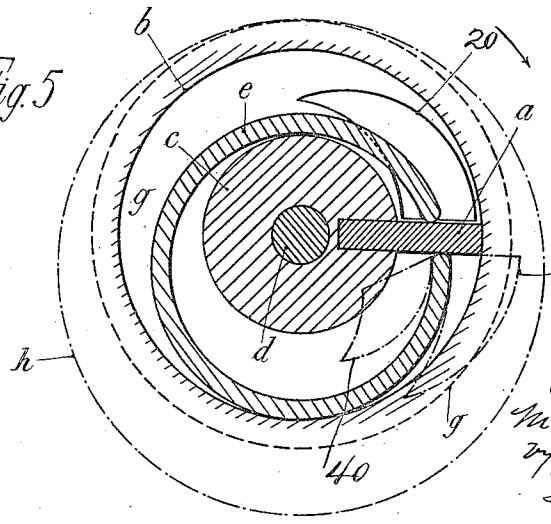

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Fig. 6.

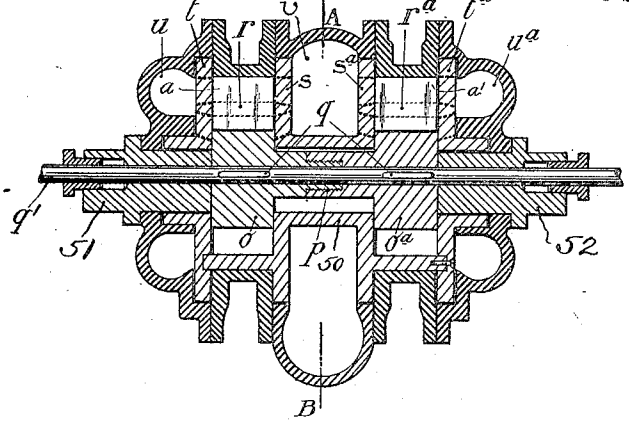


Fig. 14

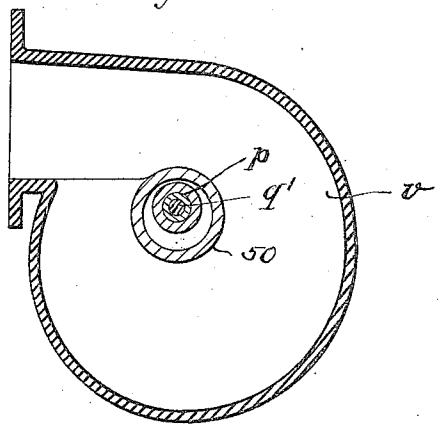
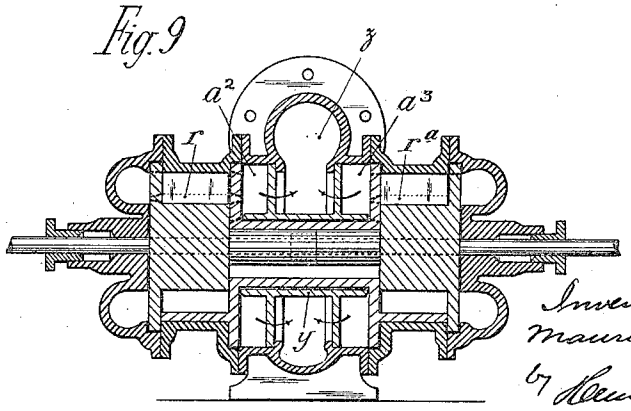


Fig. 9



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June 19, 1923. 1,459,637

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ROTARY MACHINE

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Fig.7

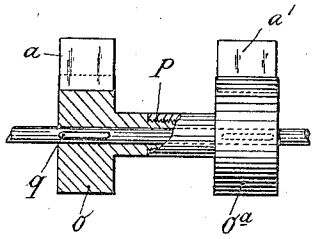


Fig.8

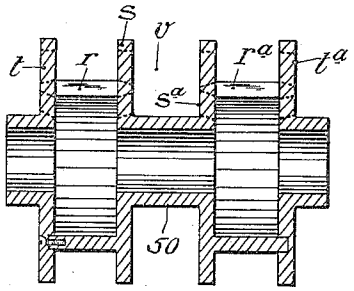


Fig.10

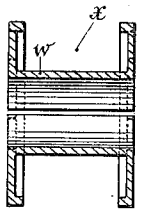


Fig.11

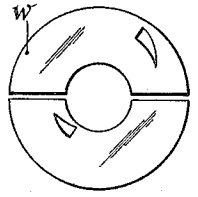


Fig.12

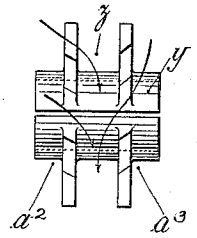
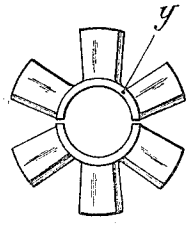


Fig.13



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by Henry Orth Jr
atty

Patented June 19, 1923. 1,459,637

UNITED STATES PATENT OFFICE.

MAURICE JULES POYET, OF PARIS, FRANCE.

ROTARY MACHINE.

Application filed February 2, 1921. Serial No. 441,863.

To all whom it may concern:

Be it known that I, MAURICE JULES POYET, citizen of the Republic of France, and residing at 40 Rue des Petits-Champs, Paris, in the said Republic, engineer, have invented certain new and useful Improvements in Rotary Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention comprises improvements relating to a type of rotary machines suitable for use as pumps, compressors, or motors, working with any liquid or gaseous fluid, and the improvements have for their object to improve and direct the flow of the fluid, while at the same time equilibrating the lateral pressures applied to the movable parts.

The type of machine to which these improvements are applicable is that comprising a cylinder in which turns a paddle or vane radially disposed and extending through a longitudinal slot in a ring which is eccentric to this cylinder in such a manner that a point on the exterior of the ring is tangential to the interior of the cylinder and a diametrically opposite point on its interior circumference is tangential to a central hub or piston body which is concentric with the cylinder. In one construction, two discs turning at the same speed form the end walls of the cylinder and one of these carries at its centre the hub or piston body in which is mounted the paddle or vane. The other disc carries the said ring through which passes the paddle or vane, this ring being concentric with its disc so that it does not change its position when this disc turns. However, the disc is eccentric in relation to the disc carrying the paddle or vane and the central hub or piston body in such a manner that, as stated above, the ring is interiorly tangential to the central hub or piston body and exteriorly tangential to the cylinder.

The two discs are formed with distribution ports or orifices of special form, those of one disc serving (when the machine is used as a pump) for the suction and communicating with a circular channel formed in a cover plate or end of the casing, whilst those of the other disc communicate with a circular channel similarly formed in an opposite cover plate or end of the casing.

It is clear that if the paddle or vane be turned, this will constantly produce a suction behind it and a delivery pressure in front and that these actions will occur both interiorly and exteriorly of the ring, seeing that in these two capacities there is a tangential point forming a joint. The volume influenced, at any moment, by the portion of the paddle or vane on the outside of the ring is a complement of the volume influenced by the portion of the paddle or vane active within the ring, since each of these capacities has the form of a crescent and the two crescents are, as it were, turned exactly in opposite directions. The form of the distribution orifices is calculated so that the part of their section which is not masked or covered corresponds, either for suction or delivery, with the capacity of each of the compartments of the cylinder.

In the improved construction according to this invention, the machine comprises two cylinders, instead of a single cylinder, each enclosing a piston-paddle or vane and correlated or conjoined in such a manner (assuming the machine to be used as a pump) that the delivery or the suction of fluid takes place through a central channel, the inverse action taking place simultaneously in two lateral channels.

In order to enable the invention to be readily understood, reference is made to the accompanying drawing, in which:—

Figure 1 is a diagrammatic view in longitudinal section.

Fig. 2 is a transverse section thereof on line 2—2 Figure 1.

Figs. 3, 4 and 5 are diagrammatic views showing the relative positions of the ports with respect to the piston and ring, showing displacement from the position, Fig. 2, of 45°, 225° and 270° respectively.

Figure 6 is a vertical section in a plane passing through the axis of the shaft of a pump constructed in accordance with these improvements.

Figure 7 is a sectional elevation of two paddle-pistons removed from the machine.

Figure 8 is a central vertical section of two slotted rings with two detachable end discs fixedly connected so as to turn therewith.

Figure 9 is a section similar to Figure 6, but illustrating a modification in which a fixed central bearing is provided.

Figure 10 is a central longitudinal section and Figure 11 is an end elevation of a central bearing for the machine seen in Figure 9 when the latter is to be used for gaseous fluids, and

Figure 12 is a side elevation and Figure 13 an end elevation of a modified form of central bearing to be used when the machine is dealing with water or other liquid.

Figure 14 is a section on line A—B, Fig. 6.

In Figures 1 to 5, which exemplify, diagrammatically, a single cylinder machine, *a* is the vane or piston, and *b* its cylinder in which the paddle vane or piston *a* rotates. The piston *a* is secured in a hub *c* keyed to a shaft *d*. The shaft *d* is concentric to the stationary cylinder *b* and has a circular flange *g* provided with a semi-crescent shaped port 20. A ring *e* of suitable dimensions is interiorly tangent with the cylindrical hub *c* and exteriorly tangent with the cylinder *b*, and at one end is provided with a circular plate or head *h* provided with two substantially semi-crescent shaped ports 30 and 40 spaced radially from one another by substantially the thickness of the ring *e* and in one position of the machine, Fig. 2, the port 30 is exterior of the chamber formed between the ring *e* and cylinder *b* and the port 40 at the same time registers with the chamber formed between the hub *c* the ring *e*, the piston *a* and the tangent point between hub *c* and ring *e*. The port 20 is always on one side of the piston *a* and the other two ports 30 and 40 on the other side of the piston. The ring *e* has a longitudinal slot 21 through which the piston *a* passes as it travels in contact with the cylinder wall. The ring *e* extends from its head *h* along the hub *c* to the flange *g* on the hub.

The cylinder *b* is provided with ends *i j* in which are circular fluid channels *k* and *l* provided with pipe connections at *m* and *n* respectively.

It will thus be seen that the head *h* and ring *e* are excentric to the cylinder *b* and to the hub *c* and its flange *g*.

Theoretically, the port 20 in the flange *g* is bounded by circular arcs 22 and 23 whose centres lie in the centre line of the piston *a* both of which arcs have a radius substantially equal to the radius of the ring *e*. The centre of the arc 22 lies below the centre of shaft *d* and the centre of the arc 23 lies above the centre of shaft *d*, Fig. 2, a distance equal to the excentricity of *b* with respect to *e*. These arcs intersect forming two sides of the semi-crescent port 20 whose third side is formed by a substantially radial line adjacent the piston *a*.

The two ports 30 and 40 are arranged on the opposite sides of the piston. The one 30 having its arc 31 with its radius substantially equal to the radius of cylinder *b* and its centre above the centre of ring *e* a distance equal to the excentricity. The other one, has substantially the same radius and its centre below the centre of the ring *e* a distance equal to the excentricity. These arcs intersect, and the third side of the port 30 is a straight radial line parallel to the piston.

The port 40 has its side an arc 41 whose centre is above the centre of cylinder *b* a distance also equal to the excentricity with a radius equal to the radius of the ring *e* and an arc 42 whose centre is below the centre of the ring *e*. These arcs are connected by straight lines.

In considering the operations of these diagrams it should be remembered that the assemblages *a*, *c*, *d g* and *e f h* rotate as units in unison and that one assemblage is excentric to the other. A single rotation in effect moves the ring *e* along the piston from *d* position tangent to cylinder *b*, Fig. 1, to a position tangent to the hub *c* and back again, thus causing the edge of the ring *e* to traverse the port 20 and causing the port 30 to traverse the maximum distance between cylinder *b* and ring *e*; and the one 40 to traverse the maximum distance between the ring *e* and cylinder *b*.

Keeping these facts in mind, the operation will be as follows:

Assume that a reversible machine is to run in the direction of the arrows Figs. 2–5, and that steam is the fluid in question.

The steam will enter at *m* Fig. 1, into the circular chamber *k* with which the port 20 is in communication throughout its rotation. In the position Fig. 2 this port admits steam between the hub *c* and ring *e* to the right of piston *a* the tangent point of hub and ring, closing the chamber. In the position Fig. 3, 45° rotation, the port 20 is also beginning to admit steam between the cylinder *b*, ring *e*, tangent point of cylinder and ring to the right hand side of piston *a*. At the same time exhaust port 30 has moved from the position Fig. 2, cut off position, into register with the steam chamber between the ring *e* and cylinder *b* and remains open for nearly a full rotation, and this port does not close until the piston *a* is about at the tangent point of ring *e* and cylinder *b*. The chamber to the left of piston *a* between it and tangent point of ring *e* and hub *c* is fully in register with exhaust port 40, Fig. 2. It continues to close until the tangent point between ring *e* and hub *c* is passed, at which time, Fig. 4, the inlet port 20 begins to admit steam to this chamber behind the piston. The ports 30 and

40 discharge into the ring chamber l which exhausts at n.

For reversal it is simply necessary to admit steam at n and exhaust steam at m.

When operating with other fluids, either as a motor or a pump, the ports will be slightly modified according to the fluid handled.

The pump shown in Figs. 6 to 8 and 14, comprises a combination of two such structures as described in the diagrams, in which o and o^a are two hub members corresponding to c Figs. 1–5. These hub members are rigidly connected together in any suitable manner, as by a threaded connection p. A driving shaft q' passes through both hubs and is connected to them by keys q, Fig. 7. The two slotted rings r and r^a with their heads s and s^a are connected together by a cylinder 50 through which the hub connection passes.

The exterior flanges t and t^a are connected to, the rings r and r^a by mortise joints to facilitate assemblage. The crescent shaped inlet ports are arranged in the flanges t and t^a but are directed in directions opposite to those in the heads s and s^a. Fluid is admitted to the annular channels u and u^a and passes through the ports t and t^a and exhausts through the exhaust ports s and s^a into the central spiral chamber v. The lateral pressures on the moving parts are thus equalized, and by reason of the excentric bearing of the shaft q' in the bearing members 51 and 52 the relative radial shifting of the rotor member Fig. 7 and ring member Fig. 8 is effected, due to the excentric movement.

In the modified construction Figs. 9–13, the rings r and r^a rotate in a two-part stationary support, and in the case where the fluid is a gas this support is constructed as at w Figs. 10 and 11, having flanges at its ends in which are the ports for the ring, in which case the pressure in the working chamber is equalized by the pressure in the single chamber t between the flanges.

For water, or other liquids, the stationary support y, with the casing Figs. 9, 12 and 13, forms a central discharge chamber z and lateral chambers a^2 and a^3 separated from the central chamber by inclined partition blades between which the liquid is directed in the direction of exit through the central chamber z and acts somewhat as a diffuser.

I claim—

1. A rotary and reversible machine adapted for use as a pump, compressor or motor, comprising in combination, two cylinders, two cylindrical piston bodies each carrying a piston-paddle or vane and centrally arranged in a respective cylinder, two slotted rings arranged excentrically in the said cylinders with one point on the exterior of each ring tangential to the interior circumference of the respective cylinder and a diametrically opposite point on the exterior of each ring tangential to the said central piston body, two discs arranged at the extremities of each of said slotted rings, crescent shaped ports formed in the said discs, the ports in the outer discs being disposed inversely in relation to the ports in the inner discs, a channel between the two cylinders, a circular channel at the exterior face of each of the cylinders and a central shaft upon which said piston bodies are fixedly mounted.

2. A rotary and reversible machine adapted for use as a pump, compressor or motor comprising in combination two cylinders, two cylindrical piston bodies each carrying a piston paddle or vane and centrally arranged in said respective cylinders, two slotted rings excentrically mounted in the said cylinders with one point on the exterior of each ring tangential to the interior circumference of its cylinder, and a diametrically opposite point on the interior of each ring tangential to the said central piston body, two discs arranged at the extremities of each of the said slotted rings, crescent-shaped ports formed in the said discs, the said ports in the outer discs being disposed inversely in relation to the ports in the inner discs, a circular channel between the two cylinders, a circular channel at the exterior face of each cylinder, a central shaft upon which said piston bodies are fixedly mounted, and a support in which turns a sleeve connecting the two excentric ported rings, and two ported discs on said support.

3. A rotary machine adapted for use as a pump, compressor or motor, comprising two cylinders having a flow space between them of one denomination and flanked on their outer sides by flow spaces of an opposite denomination, piston bodies concentrically revoluble in said cylinders, slotted rings excentrically encircling said pistons arranged to interiorly contact at a point on the exterior of said bodies and externally contact at a diametrically opposite point with the interiors of said cylinders, vanes fixedly mounted in respective piston bodies and extending through the slots in said rings, ported inner end discs, sleeves rigidly connecting said discs and rings, ported outer discs flanking said rings and piston bodies and connected to revolve therewith and a shaft mounting for said piston bodies.

4. Rotary machine adapted for use as a pump, compressor or motor, comprising two cylinders separated by a flow space of one denomination and flanked on their outer sides by flow spaces of an opposite denomination, a shaft, piston bodies therein concentrically revoluble in said cylinders, slotted rings excentrically encircling said pistons and arranged at any instant to

make contact at one point with their interiors against the exteriors of the respective piston bodies and at a diametrically opposite point with their exteriors against the interiors of respective cylinders, vanes fixedly mounted in respective piston bodies and extending through the slots in said rings, ported inner end discs, sleeves integrally connecting said discs and rings, ported outer discs flanking said rings and piston bodies and revolving therewith, a fixedly mounted sleeve surrounding the sleeve connecting said ported inner discs and rings, fluid control means mounted on the fixedly mounted sleeve and extending into the flow space between said cylinders, and a shaft mounting for said piston bodies.

5. A rotary machine comprising two alined stationary cylinders, rigidly connected rotors therein, a piston vane on each rotor, two slotted, rigidly connected rings mounted interiorly tangent to the rotor and exteriorly tangent to said cylinder said vanes passing through the slots in said rings, heads for said rings having distributing ports therein, a fluid chamber between the adjacent heads of the cylinders communicating through the ports in the adjacent heads with the cylinders, and separate fluid chambers at each of the outer heads communicating with the cylinder.

In testimony that I claim the foregoing as my invention, I have signed my name.

MAURICE JULES POYET.