

H. Q. HAWLEY.
Rotary Fluid Motors.

No. 140,367.

Patented July 1, 1873.

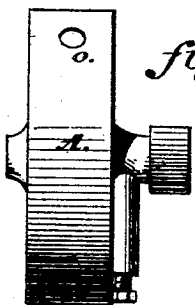


fig. 1.

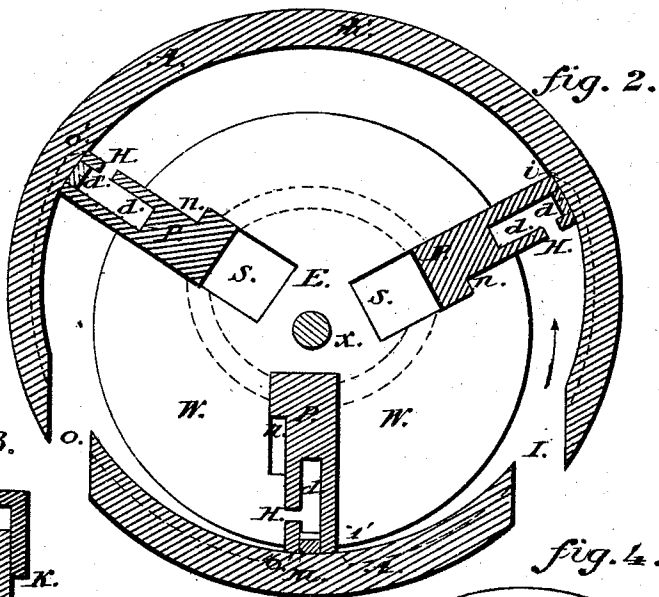


fig. 2.

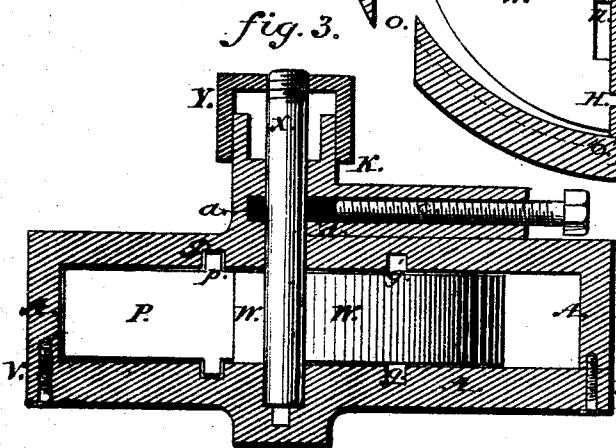


fig. 3.

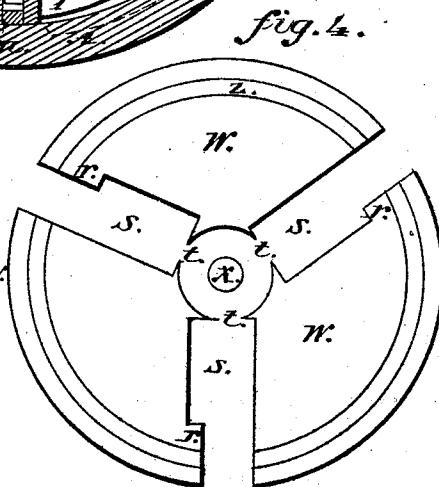


fig. 4.

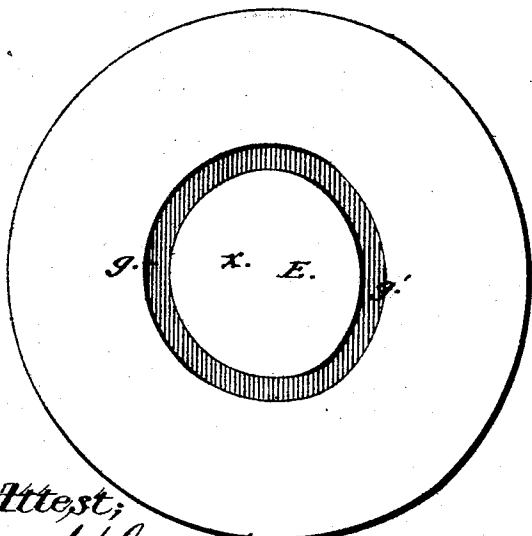


fig. 5.

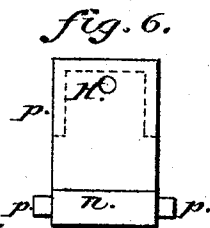


fig. 6.

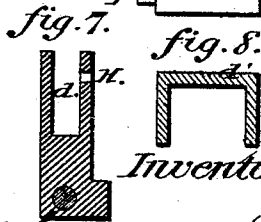


fig. 7.



fig. 8.

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IMPROVEMENT IN ROTARY FLUID-MOTORS.

Specification forming part of Letters Patent No. **140,367**, dated July 1, 1873; application filed March 7, 1873.

To all whom it may concern:

Be it known that I, HENRY Q. HAWLEY, of the city of Albany, in the county of Albany and State of New York, have invented certain new and useful Improvements in Rotary Fluid-Motors, which I think remove from such machines all or nearly all injurious friction, whether they are used as power-engines or for purposes of measurement; and that the following, taken in connection with the drawings, is a full, clear, and exact description thereof.

In machines of the above character, so far as known to me, the pistons while in operation are guided by jointed levers, or have a grinding motion either with the interior wheel in which they move, or with the exterior case against which they revolve, or with cams and grooves made in or upon the ends of said cases, and by reason of such friction materially diminish the power of the machine, and, especially when rapid motion generates centrifugal force, soon wear it out.

Now, the nature of my improvements consists in so constructing the aforesaid case-wheel and pistons that the latter cannot slide in the wheel, or be thrown against either the periphery of the case or the guiding cams or grooves upon or in its ends, except when not under pressure, and therefore operate without wearing friction while they are actuating the machine; and the nature of my improvements also consists in constructing the pistons of rotary fluid-motors with chambers in their upper ends, closed at the top, or at the top and sides by loose metallic packing, when they are so constructed, that the fluid actuating them can enter the said chambers to press the pistons back from the periphery of the case and the packing against it without the use of springs. And the nature of my improvements also consists in packing the ends of the wheels or cylinders of rotary fluid-motors against the ends of the case in which they revolve with metallic packing placed in annular grooves in said ends, (see Fig. 4,) between the piston-chambers therein, when said packing is kept pressed against the case by the fluid actuating the machine passing behind it through apertures made in the face of the wheel.

In the drawings, the machine being placed so that its outlet is over its inlet, Figure 1 is an elevation of the machine. Fig. 2 is a vertical section of the same. Fig. 3 is a horizontal section of the same through the points $m m'$ in Fig. 2. Fig. 4 is an end view of the wheel W. Fig. 5 is an interior view of the ends of the case, showing the groove G G'. Figs. 6 and 7 are front and end views of the piston P; and Fig. 8 is a view of the packing d' when it is in one piece.

In the above drawings, A is a case, the inner periphery of which is composed of parts of two circles, the part circle $o' m' i$ having the shaft X as its center, and the part circle $o' m i$ having the point E for its center. V V is the joint, by which one end of the case A is connected with it, and $i i'$ and $o' o''$ are extensions of the inlet and outlet passages of said case I and O. X is a shaft attached to the wheel W through its center, and having its bearings in the ends of the case A, and being so placed therein that the said wheel will revolve eccentrically to said case, in such manner that its periphery will touch or nearly touch the side of the same between its inlet and outlet passages I and O, and its ends will revolve against or very near the ends of said case. In these ends of said case, (see Fig. 5,) are annular grooves G G', the part G being a segment of a circle of which E is the center, and G' a segment of a circle of which X is the center. S are chambers in the wheel W, extending entirely across its face, and of a depth equal to the length of the pistons P against which they slide. r are shoulders in the chambers S, the same distance back of the periphery of the wheel W as the pistons P project beyond it when they are traversing the line $i m' o'$. To permit the air or other fluid in the lower ends of the chambers S to flow from one to the other, they are connected by a groove, $t t t$, in the ends of the wheel W. Z Z is also a groove in said ends near their outer edge, and arranged to contain packings. P are loose pistons, formed to make a close fit with the upper part of the chambers S, and having pins p on one or both sides, arranged to slide in the groove G G' for the purpose of keeping their outer ends near the periphery of the case A, while they are revolving within

it. n is a projection on the lower end of the pistons P , of such length that it will reach the shoulder r in the chamber S when the said piston arrives at the point i in the side of the case A . d is a chamber in the upper end of the piston P ; H , an aperture through the front side of said chamber; and d' , loose metallic packing to close its upper end and sides in one or three pieces. $K' C a$ (Fig. 3) and z make a combined lubricator and stuffing-box, not described, as it is not necessary to do so here. The center E can be nearer to or more distant from the case at m than is shown in the drawings, provided space is left for the pistons to pass the shaft at m , and yet close the passage between the case and wheel at m' .

Instead of using grooves and pins for guiding the pistons P , as above described, cams on the ends of the case A can be used; but in that case the wheel W must be hollow, and therefore leakage cannot be prevented. The pistons P can also be solid, if preferred, and the number used is not necessarily three. They can also, if desired, be of curved form to counteract the influence upon them of centrifugal force, when, from their rapid motion, it would be a serious objection. It is also evident that the use of my improvements is not confined to machines in which the inner wheel is eccentric to the outer case, although that construction avoids the great friction necessary in guiding the pistons when the case and wheel are concentric.

The machine being constructed as above described, its operation is as follows: The fluid entering at I presses against the pistons P , and thereby causes them and the wheel W , in which they are placed, to revolve together within the case A in such manner that the said pistons are exposed to the action of the said fluid while traversing the space between the said wheel and case left for its passage, and are not so exposed when said wheel and case are in contact; and inasmuch as each of the said pistons on reaching the point i in the side of the case becomes fixed in the wheel W , from its projection n coming against the shoulder r in said wheel, and remains so fixed until it reaches the point o' in the side of said case—viz, while it is under pressure—it is evident that it cannot either slide in the wheel or be thrown against the case, or against the cams or grooves used in motors not of my construction to keep it from the case, while engaged in actuating the motor; and that the friction to which it is subjected when not so engaged is very slight, not only from the groove then guiding it be-

ing a regular curve, and the pressure being on both sides, but from its construction to resist the action upon it of centrifugal force; and, further, inasmuch as one of the pistons P must always be traversing the side of the case $i m' o'$, where, from said side being concentric with the wheel and at the same distance from it as the piston there projects beyond said wheel, it must form a close partition between said wheel and case without material friction, it is evident that a fixed quantity of the fluid actuating the machine must pass through it at each revolution of the wheel W , whether it revolves with greater or less velocity, and therefore that it can be used as a meter as well as motor, or for both uses combined.

It will also be observed that the pistons being loose are packed against the wheel on both their sides while under pressure, and therefore cannot leak, even when worn, as they must do when the inner wheel is hollow, and the pistons are kept steady by levers or joints with the cams or grooves; and further, as an illustration of the freedom from friction in machines of my construction, that if their operation were rapid and continuous neither grooves or cams would be required to guide the pistons or keep them near the case while under pressure.

Having now fully explained the nature and operation of my improvements in rotary fluid-machines, what I desire to secure by Letters Patent is—

1. In a rotary fluid-motor, an inner wheel carrying pistons in separate chambers communicating with each other, but not with the passage containing the actuating fluid, when said wheel revolves concentrically with a portion of the periphery of the case and eccentrically with the remainder, substantially as and for the purpose described.

2. The loose shouldered pistons P and the shouldered chambers S operating together, in combination with an exterior case, substantially as and for the purpose described.

3. The pistons P constructed with chambers and loose packing, as described, when combined with an inner wheel, operating substantially as and for the purpose set forth.

4. The combination of the grooved case A with the eccentric wheel W carrying the loose pistons P , said wheel and pistons having chambers, shoulders, and pins, substantially as described.

HENRY Q. HAWLEY.

Witnesses:

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