(No Model.)

A. CLÉMENT.

ROTARY MOTOR.

No. 525,532. Patented Sept. 4, 1894.

Fig. 1.

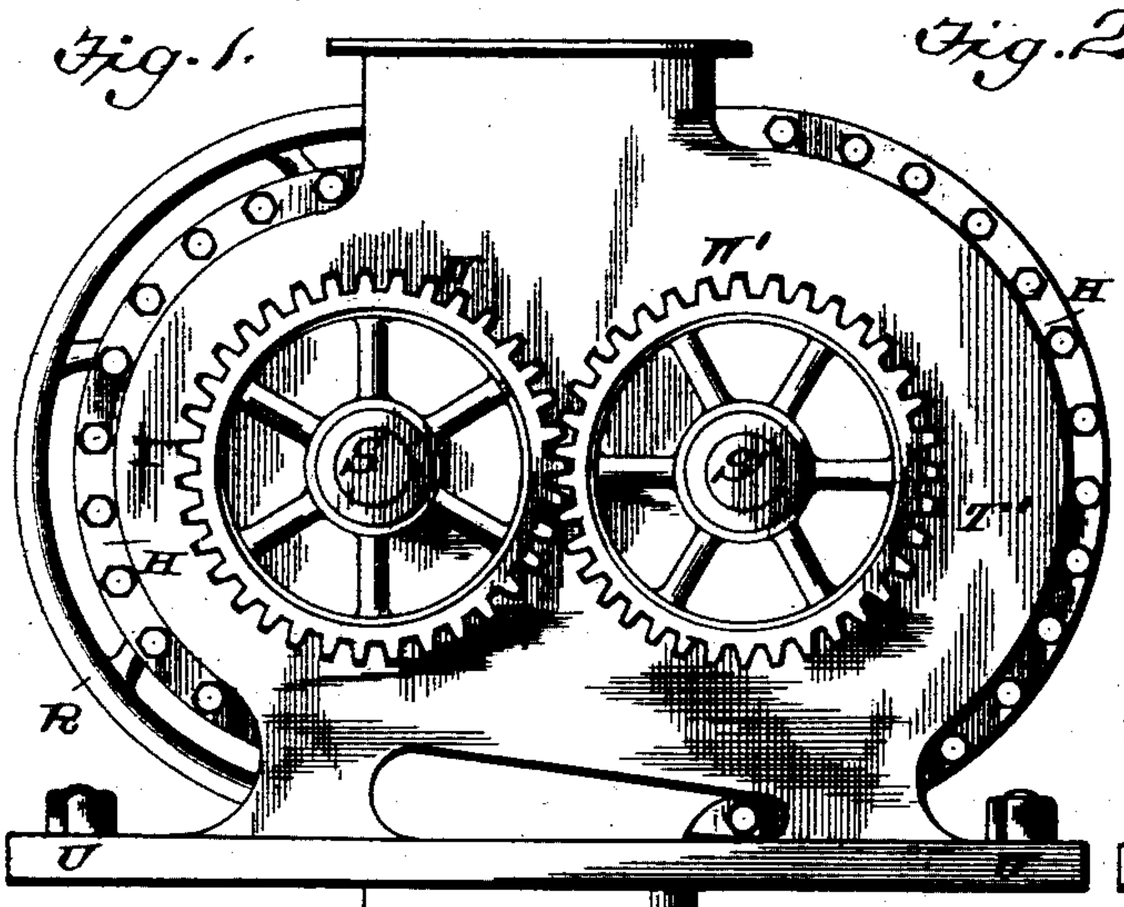


Fig. 2.

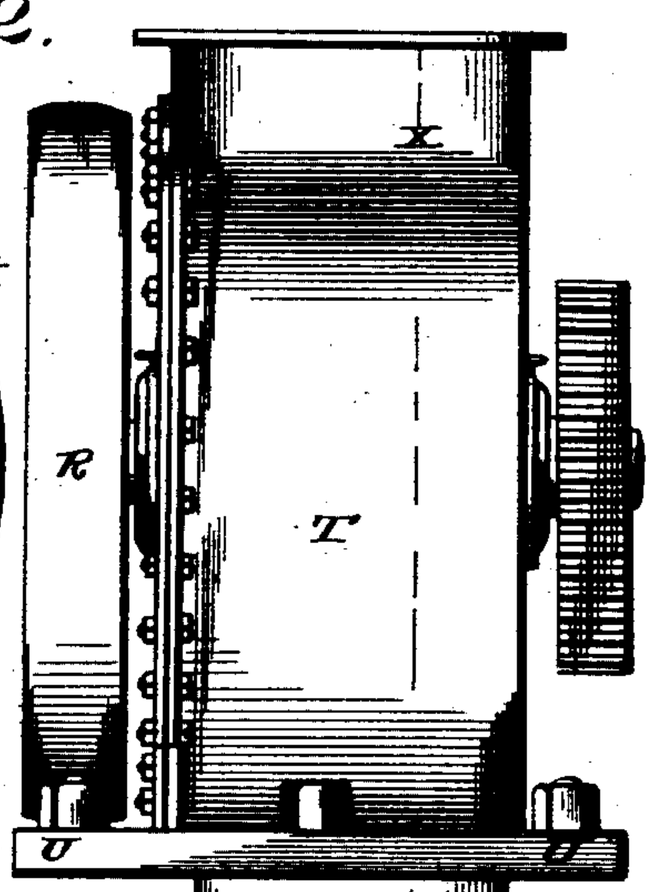


Fig. 3

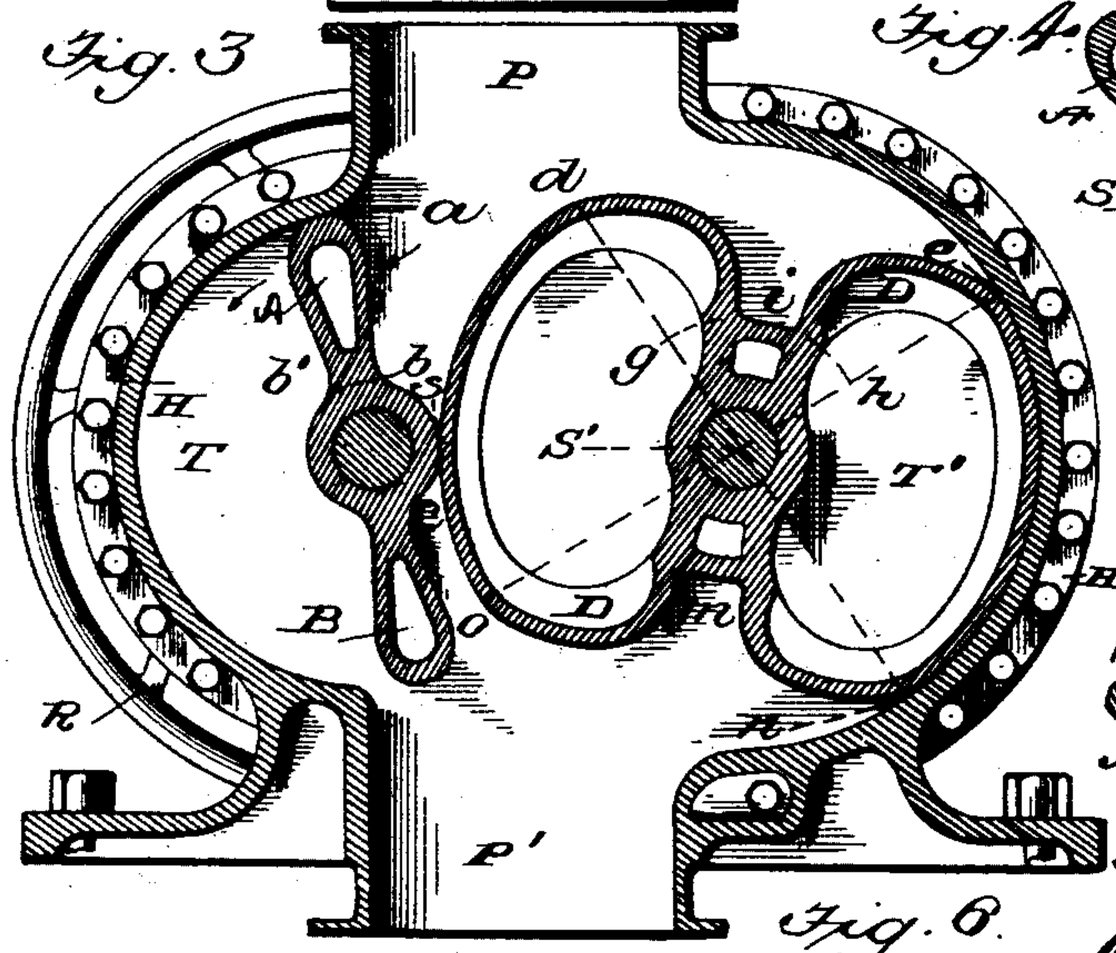


Fig. 4.

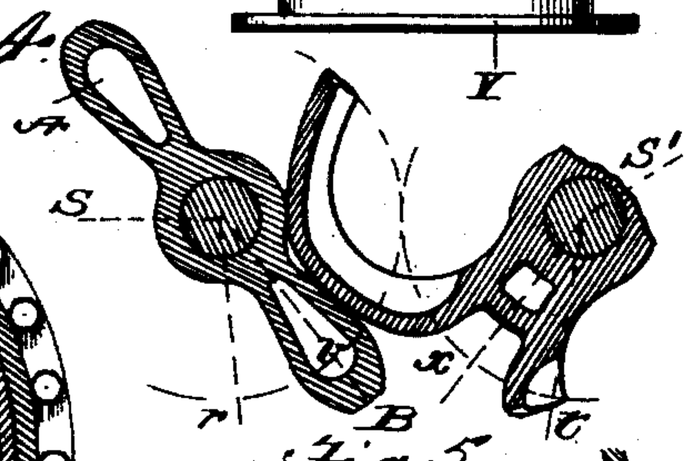


Fig. 5.

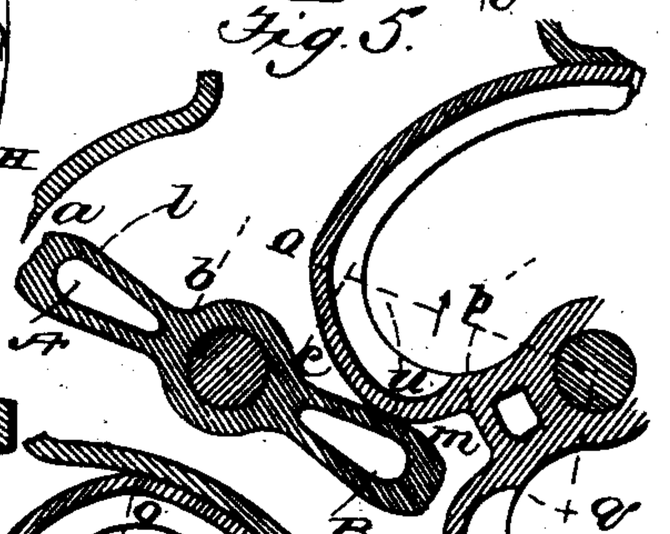


Fig. 6.

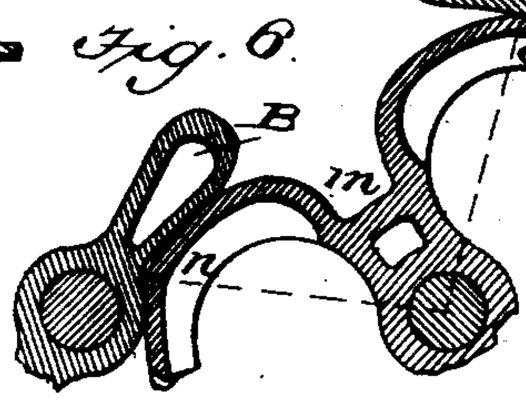
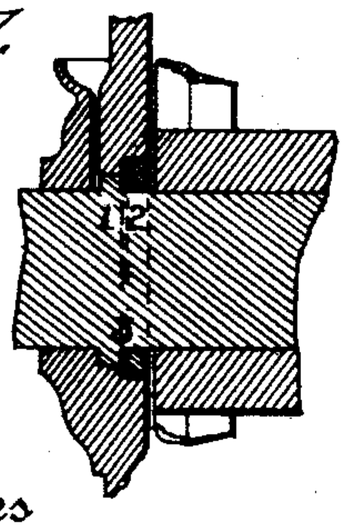


Fig. 7.



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UNITED STATES PATENT OFFICE.

AUGUSTE CLÉMENT, OF SAN FRANCISCO, CALIFORNIA.

ROTARY MOTOR.

SPECIFICATION forming part of Letters Patent No. 525,532, dated September 4, 1894.

Application filed May 22, 1893. Serial No. 475,142. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTE CLÉMENT, a citizen of France, residing in the city and county of San Francisco, State of California, have invented an Improvement in Rotary Motors; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to that class of motors in which oppositely rotating pistons engage each other, and are mounted within an inclosing shell or cylinder, said motors being classed as pumps or engines, or otherwise, according to the uses to which they are put.

My invention consists of the construction and combination of parts which I shall hereinafter fully describe and claim.

The object of my invention is to provide a simple and effective motor of this class, adapted for use as an engine or as a pump as the case may be. Particular advantages will hereinafter appear.

Referring to the accompanying drawings for a more complete explanation of my invention,—Figure 1 is a front view of my motor. Fig. 2 is an end elevation of the same. Fig. 3 is a vertical section on the line X—Y of Fig. 2. Figs. 4, 5 and 6 are details of the same vertical section as Fig. 3, and showing the respective positions of the teeth or wings and the opposing drum during a revolution. Fig. 7 is a section on an enlarged scale taken of the shaft and the bottom of the cylinder in order to show the means for preventing leakage.

Similar letters and figures refer to similar parts throughout the several views.

The base U, the half cylinders T T′ and their head H constitute the frame-work of the motor.

In the center of the cylinder T is mounted the main shaft S which, within said cylinder, bears two teeth or wings A and B, though I do not confine myself to this number, as three or four in number may be employed, but I prefer two as here shown. In the center of the other half cylinder T′ is mounted the shaft S′ which, within the cylinder, carries the drum D, said drum being in two correspondingly shaped parts, as shown in Fig. 3, with a central intervening groove.

The two shafts S and S′ are connected by the gears W and W′, shown in Fig. 1, and of the same diameter. If, as in many cases, it may happen the main shaft S is not working directly, but is a driven shaft, it may receive the driving wheel R shown in Fig. 2.

Referring to Fig. 3 which shows the principal feature of my invention, and with the aid of the adjoining Figs. 4, 5 and 6, the mode of operation of my motor, when acting as an engine can now be readily understood. The wing A and the drum D intercepting the communication between the pipes P and P′ cause the water or other impelling fluid, entering by the pipe P, to exercise its full pressure upon the surface *a b* of the wing A, and on the portion *s d i e* of the drum D. In this latter, all the points of pressure between *s* and *d* are directly upon the shaft S′, observing that on the surfaces *d i* and *i e*, the pressure must be considered as acting perpendicularly upon the portions *d g h e* of the rays S′ *d*, S′ *e;* but these pressures being equal and opposite, counteract each other in that direction, and are converted into a single pressure on the shaft S′. The outflow of the impelling fluid in the descending column P′ effects, by exhaustion or suction, work, similarly upon the surface *o m* and *m n*.

In the half cylinder T, the pressure, acting normally against the surface *a b* of the wing A on one side, and by exhaustion or suction on the other side upon the surface *a′ b′* impels the wing A in the direction of the arrows, and communicates to the shaft S a rotary motion.

By means of the gears W W′, the shaft S′ receives an opposite and equal rotation, by which the drum D moves along the wing or hub *b s c* which connects the two wings A and B with the shaft S, and as in Fig. 4 the angle *r* S *v* is equal to the angle *x* S′ *t*, the tooth must move the drum to the position indicated in said Fig. 4. A little after, as in Fig. 5, the mode of operation is changing. Upon the two wings A and B, the pressures on the portion *c u* of the wing B and its corresponding surface *b l* of the wing A being equal and opposite, they become null in their driving action upon the shaft; the wing A is then only acted on by the pressure working on the surface *a l* and the exhaust or suction upon the symmetrical portion on the reverse side

of the wing A; but on the drum D the pressure *o p*, and the exhaust or suction *q n* progressively exert as shown by the arrows, their force upon the shaft S′, which by means of the gearing, communicates motion to the main shaft S. This mode of operation continues until the wing B has taken the position shown in Fig. 6; then the impelling fluid beginning to bear on the two faces of the wing B, the pressures on each side of said wing counteract each other; so also on the drum, the pressure *m n* is counterbalanced by the pressure *m o* and the main shaft is only driven by the tooth or wing A which acts with its full surface, until it takes the position occupied in the first place by the other wing or tooth B; this, at the same time beginning to act, as I have described for the operation of wing A, and so on.

Though it may appear from the position occupied by the wing B, as shown in Fig. 3, and from the position which the tooth A had a moment prior, that a very small opening is left to the fluid for its admission into the half cylinder T and for its discharge into the pipe P′; yet it will be perceived that the teeth during their revolution having exactly the same speed as the impelling fluid, no obstruction is opposed to its discharge and admission by any position the wings or teeth may assume, the half cylinder T being filled up when the two wings have the position indicated in Figs. 6 and 5, and the fluid discharges constantly according to the movement of the wings enveloped in the fluid.

The comparatively large size of the pipes P and P′ is of advantage, as it will be observed that at their outer openings they are of circular section, while the longitudinal sections of the half cylinders T T′ are rectangular. The section of said pipes is calculated to afford the volume of fluid discharged by the half cylinder T, and the two sectors *d i e* and *o m n* the same velocity in the ascending and descending columns as it has in the engine, in order to avoid any loss of power by *vis inertiæ*.

Wherever there are points at which the impelling fluid could leak, suitable stuffing boxes may be placed, but I consider the construction illustrated in Fig. 7 of advantage as insuring the purpose in the simplest manner. In this figure the figure 1 is a small collar or flange on the shaft; the figure 2 is a sliding ring which, under the weight of the water, presses a washer 3 of lead, leather or rubber, upon the joint. It is to be observed that in the transmission of the motion of shaft S′ to shaft S, there is no shock between the gears W′ and W, for the latter when receiving the engagement of the former, is moving directly by the rotation of its own shaft S, which latter is driven constantly by the pressure on the wing A.

I have heretofore considered my device as an engine, but considering it from another point of view, it will readily be understood how it may operate as a powerful lift or force pump. Giving to one of the shafts or even to the two shafts simultaneously, as opportunity may afford, a reverse motion to that which it would receive from the pressure of the fluid, it is obvious that the tooth B of Fig. 3 will push forward and lift the water, filling half the cylinder T, and at the same time separating from the surface *c o* of the drum D, it will produce immediately above the pipe P′ a suction; and the tooth A approaching the drum by compression, will force the liquid in the pipe P. When the tooth B in the position indicated in Fig. 6 comes near the groove *m*, it will progressively expel from the sector *n m o* all the water filling it and by leaving the groove, as in Fig. 5, induce a suction in the pipe P′.

It will thus be seen that in my case I present a rotary motor with oppositely rotating double piston and abutment or drum geared together, the piston being formed of two large wings or teeth having a radial length about three times as great as the radius of the hub. This is important for utilizing the flow of water-falls. In addition to the foregoing there is a decided advantage in combining with these largely projecting teeth or wings of an abutment or drum D in which the recesses or grooves *m* have convex sides which is the prominent feature of my invention, not only because of the larger working surfaces the wings acquire, but also because the said convex sides of the grooves or recesses *m* permit the engine to run without shock or resistance produced by vacuum in the rear of the wings when they leave the recesses. The special form of my teeth or wings, that is, convex near the point, concave in the base, and convex again in the hub, is designed for operation with the peculiar form of the convex sides of the drum, the forms being such that there is always a point of contact between the sides of the wing and drum from the time that the cylindrical part of the drum engages the hub of the piston until the end of the wing leaves the bottom of the recess in the drum (or until the cylindrical part of the drum again engages the hub of the piston).

I am aware that heretofore rotary pumps and engines have been constructed with oppositely revolving interengaging pistons or valves, and I do not therefore claim such broadly, but

What I do claim as new, and desire to secure by Letters Patent, is—

An improved rotary motor consisting of a shell or case consisting of opposing segments of different radius and curvature with an inlet passage at its upper end and an outlet passage opposite to it at its lower end, a piston mounted in the smaller segment of the case and composed of oppositely radiating wings each of which is convex near the point, concave in the base, and convex again in the hub; a drum revoluble in the larger segment, having recesses on diametrically opposite

sides provided with convex walls to coincide with the ends of the piston wings which are curved to make a rolling contact therewith when they pass, while the intermediate connecting curved surfaces of the piston are adapted to conform to the convex portions of the drum with a continuous rolling contact.

In witness whereof I have hereunto set my hand.

AUGUSTE CLÉMENT.

Witnesses:
S. H. NOURSE,
J. A. BAYLESS.