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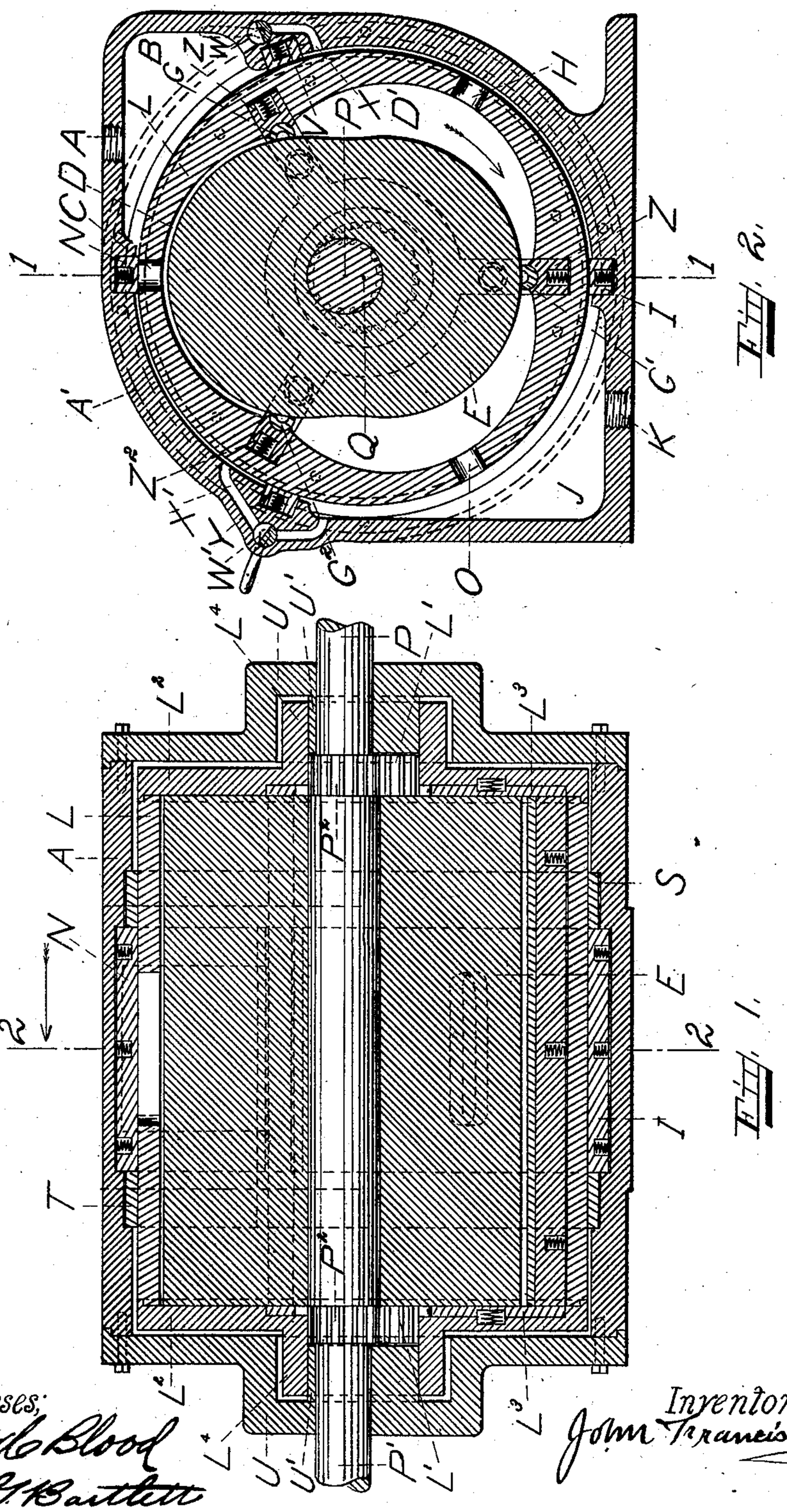
J. F. COOLEY.

ROTARY FLUID MOTOR.

APPLICATION FILED JAN. 31, 1903.

NO MODEL



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ROTARY FLUID-MOTOR.

SPECIFICATION forming part of Letters Patent No. 724,665, dated April 7, 1903.

Application filed January 31, 1903. Serial No. 141,364. (No model.)

To all whom it may concern:

Be it known that I, JOHN FRANCIS COOLEY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Rotary Fluid-Motors or Pumps, of which the following is a specification.

This my invention in its broad scope relates to improvements in rotary fluid-motors or pumps in which the operating fluid is capable of compression and expansion, as in vapors or gases.

In practice it substantially consists of an advantageous combination of fixed cut-off devices in rotary fluid-motors or pumps of the type as illustrated in my application Serial No. 111,810, together with by-passes for such devices controlled by suitable valves in such a manner as to insure adequate control of the operation or non-operation of said devices.

In the accompanying drawings, which illustrate a construction embodying my invention, Figure 1 is a central longitudinal sectional view of the motor or pump on the line 1 1, Fig. 2. Fig. 2 is a cross-sectional view of the motor or pump on the line 2 2, Fig. 1, looking in the direction indicated by the arrow.

Referring to the drawings, Fig. 2, the operation of the motor or pump is as follows: The steam or other fluid is admitted through the opening A into the pressure-chest B within the cylinder A′. The passage X′ is opened by means of the valve W′ to remove, by means of the exit-chamber J, any compression or load when starting the motor, and which valve W′ is closed after starting. As the piston E is on a dead-center the fluid is supplied from the pressure-chest B through the passage X by opening the valve W and thence into the space between the spacer L and the cylinder A′ and through the port H into the space or chamber D′, pressing upon the piston E between the shoes G and G′, the resultant of which pressure passes below the axis of revolution P of the piston E, thereby causing its rotating in the direction of the arrow. In other words, the distance on a radial line between the center or axis P to the shoe G is less than the distance between the axis P and the shoe G′, making a preponderance of pressure below the axis P and causing its revolution in the direction of the arrow, as below stated, which continues until the shoes G and G′ occupy positions corresponding to the present position, Fig. 2, of the ports H and O, when the radial distances of the shoes G and G′ from the center of revolution P of the piston E are equal and the port H is in position over the packing-strip I and the chamber D′ is about to exhaust into the exit-chest J, from which the fluid exhausts through the opening K. The shoe G^2, occupying a point corresponding to the packing-strip N, would thus be in a position which, measured upon a radius drawn from the center of revolution P of the piston E to the shoe G in its moved position, would correspond to the present position of the port H, (shown in Fig. 2,) making the preponderance of pressure to the right of the center of revolution P of the piston E and causing rotation in the direction of the arrow. The valve W should be closed if expansion of the operative pressure fluid is desired. The port C having reached a position directly over the partition V, communication is cut off between the pressure-chamber B and the space D, thereby confining the propelling operation of the pressure fluid to the expansion thereof. For instance, in the utilization of steam the cut-off confines the steam, allowing it to expand, thereby securing the highest efficiency with greater economy. The port C, passing the packing-strip I in the revolution of the spacer, the pressure fluid in the chamber or space D would exhaust into the exit-chamber J until the said port C is opposite the partition or cut-off device Y, and the motor having started and the valve W′ closed the fluid remaining in the space or chamber D is cut off, which in the further rotation of the parts causes a compression of the pressure fluid and filling the clearance between the piston E and spacer L and through the port H and between the spacer L and the cylinder A′. As each port is brought successively into communication

the action is identical with those used as example. The pinions P^2, mounted on the shaft P′ of the piston E, and the integral gears L′, cut in the openings in the disks L^2, secured to the spacer L, intermesh and operate at the same correlative speed rotations as the piston and the spacer of the motor or pump. The rings S and T, (shown in dotted lines in Fig. 2) are provided to prevent longitudinal leakage to or from the chests. The wearing-rings L^3 are provided with radial projections (shown in dotted lines, Fig. 2) and are located in the two opposite end disks L^2, as shown in section of Fig. 1. On the outer ends of the engine are located the cylinder-heads U, through which the shaft P′ of the piston E projects, and which cylinder-heads have also inwardly-projecting hubs U′, which form a bearing for the hubs L^4 on the end disks L^2 of the spacer L and also for the shaft P′. The spring-pressed valve-piece packing-strips N and I are located diametrically opposite and bear upon the periphery of the spacer L. The partitions or fixed cut-off devices Y and V also bear upon the periphery of the spacer L, which is in continuous contact with the periphery of the piston E at points situated at radially equal distances from their axis of rotation Q, which is the center of rotation of the spacer L. The shoes G, G′, and G^2 rock, respectively, in spring-pressed splines Z, Z′, and Z^2, mounted within recesses in the spacer equidistant from each other. The valve W′ controls the passage X′, which is situated in the wall of the cylinder and permits the communication of the space between the partitions N and Y with the exit-chamber J. The valve W controls the passage X, which is situated in the wall of the cylinder and permits the communication of the space between the partitions I and V with the pressure-chamber B. The entrance and exit ports for fluids C, H, and O are laterally situated in the periphery of the spacer L and preferably intermediate between the points of contact of the spacer upon the piston.

Having thus described the nature of my invention and set forth a construction embodying the same, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a rotary motor or pump, an annular spacer and a cam-shaped piston mounted one within the other on parallel positionally-fixed axes, rotatable in the same direction at correlative constant speed rates, differing to an extent expressible by consecutive whole numbers, the spacer having interprojecting partitions whose extremities are equiradially distant from and equiangularly situated around its axis of rotation, said partition extremities in constant contact with the periphery of said cam-piston, and ports in the periphery of said spacer in communication with the spaces so formed, said piston and spacer mounted within a valve-cylinder having diametrically-situated interprojecting radial partitions whose extremities are in diametric contact with the periphery of said spacer, fluid-chambers in said cylinder oppositely situated on each side of said cylinder-partitions, and controllable cut-off devices dividing the chambers, and in contact with the periphery of the spacer.

2. In a rotary motor or pump, an annular spacer and a cam-shaped piston mounted one within the other on parallel positionally-fixed axes, rotatable in the same direction at correlative constant speed rates, differing to an extent expressible by consecutive whole numbers, the spacer having interprojecting partitions whose extremities are equiradially distant from and equiangularly situated around its axis of rotation, said partition extremities in constant contact with the periphery of said cam-piston, and ports in the periphery of said spacer in communication with the spaces so formed, said piston and spacer mounted within a valve-cylinder having diametrically-situated interprojecting radial partitions whose extremities are in diametric contact with the periphery of said spacer, fluid-chambers in said cylinder situated on each side of said cylinder-partitions, and cut-off devices dividing the chambers, and in contact with the periphery of the spacer.

3. In a rotary motor or pump, an annular spacer and a cam-shaped piston mounted one within the other on parallel positionally-fixed axes, rotatable in the same direction at correlative constant speed rates, differing to an extent expressible by consecutive whole numbers, the spacer having interprojecting partitions whose extremities are equiradially distant from and equiangularly situated around its axis of rotation, said partition extremities in constant contact with the periphery of said cam-piston, and ports in the periphery of said spacer in communication with the spaces so formed, said piston and spacer mounted within a valve-cylinder having diametrically-situated interprojecting radial partitions whose extremities are in diametric contact with the periphery of said spacer, fluid-chambers in said cylinder situated on each side of said cylinder-partitions, and a cut-off device in the cylinder on the entrance side and in contact with the periphery of the spacer.

4. In a rotary motor or pump, an annular spacer and a cam-shaped piston mounted one within the other on parallel positionally-fixed axes, rotatable in the same direction at correlative constant speed rates, differing to an extent expressible by consecutive whole numbers, the spacer having interprojecting partitions whose extremities are equiradially distant from and equiangularly situated around its axis of rotation, said partition extremities in constant contact with the periphery of said cam-piston, and ports in the periphery of said spacer in communication with the spaces so formed, said piston and spacer mounted within a valve-cylinder having diametrically-situated interprojecting radial partitions whose extremities are in diametric contact with the

periphery of said spacer, fluid-chambers in said cylinder oppositely situated on each side of said cylinder-partitions, and a cut-off device in the cylinder on the exit side and in contact with the periphery of the spacer.

5. In a rotary motor or pump, an annular spacer and a cam-shaped piston mounted one within the other on parallel positionally-fixed axes, rotatable in the same direction at correlative constant speed rates, differing to an extent expressible by consecutive whole numbers, the spacer having interprojecting partitions whose extremities are equiradially distant from and equiangularly situated around its axis of rotation, said partition extremities in constant contact with the periphery of said cam-piston, and ports in the periphery of said spacer in communication with the spaces so formed, said piston and spacer mounted within a valve-cylinder having diametrically-situated interprojecting partitions whose extremities are in diametric constant contact with the periphery of said spacer, fluid-chambers in said cylinder situated on each side of said cylinder-partitions, a cut-off device in the cylinder on the entrance side, a by-pass around said cut-off device, and a valve controlling said by-pass.

6. In a rotary motor or pump, an annular spacer and a cam-shaped piston mounted one within the other on parallel positionally-fixed axes, rotatable in the same direction at correlative constant speed rates, differing to an extent expressible by consecutive whole numbers, the spacer having interprojecting partitions whose extremities are equiradially distant from and equiangularly situated around its axis of rotation, said partition extremities in constant contact with the periphery of said cam-piston, and ports in the periphery of said spacer in communication with the spaces so formed, said piston and spacer mounted within a valve-cylinder having diametrically-situated interprojecting partitions whose extremities are in diametric contact with the periphery of said spacer, fluid-chambers in said cylinder situated on each side of said cylinder-partitions, a cut-off device in the cylinder on the exit side, a by-pass around said cut-off device, and a valve controlling said by-pass.

7. In a rotary motor or pump, an annular spacer and a cam-shaped piston mounted one within the other on parallel positionally-fixed axes, rotatable in the same direction at correlative constant speed rates, differing to an extent expressible by consecutive whole numbers, the spacer having interprojecting partitions whose extremities are equiradially distant from and equiangularly situated around its axis of rotation, said partition extremities in constant contact with the periphery of said cam-piston, and ports in the periphery of said spacer in communication with the spaces so formed, said piston and spacer mounted within a valve-cylinder having diametrically-situated interprojecting partitions whose extremities are in diametric contact with the periphery of said spacer, fluid-chambers in said cylinder situated on each side of said cylinder-partitions, a cut-off device in the entrance side of the said cylinder, a by-pass around said cut-off device, a valve controlling said by-pass, and a cut-off device in said cylinder on the exit side.

8. In a rotary motor or pump, an annular spacer and a cam-shaped piston mounted one within the other on parallel positionally-fixed axes, rotatable in the same direction at correlative constant speed rates differing to an extent expressible by consecutive whole numbers, the spacer having interprojecting partitions whose extremities are equiradially distant from and equiangularly situated around its axis of rotation, said partition extremities in constant contact with the periphery of said cam-piston, and ports in the periphery of said spacer in communication with the spaces so formed, said piston and spacer mounted within a valve-cylinder having diametrically-situated interprojecting partitions whose extremities are in diametric contact with the periphery of said spacer, fluid-chambers in said cylinder situated on each side of said cylinder-partitions, a cut-off device in the exit side of the cylinder, a by-pass around said cut-off device, a valve controlling said by-pass, and a cut-off device in said cylinder on the entrance side.

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

JOHN FRANCIS COOLEY.

Witnesses:

GEORGE H. BLOOD,

LOUIS G. BARTLETT.