A. C. JOHNSON.

ROTARY STEAM ENGINE.

APPLICATION FILED AUG. 20, 1920.

1,389,874.

Patented Sept. 6, 1921.

4 SHEETS—SHEET 1.

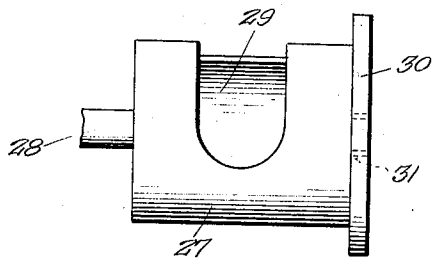


Fig. 7.

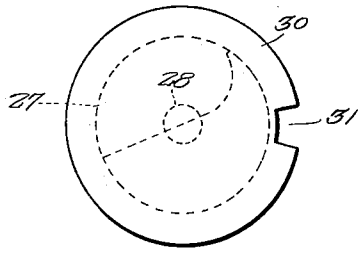


Fig. 8.

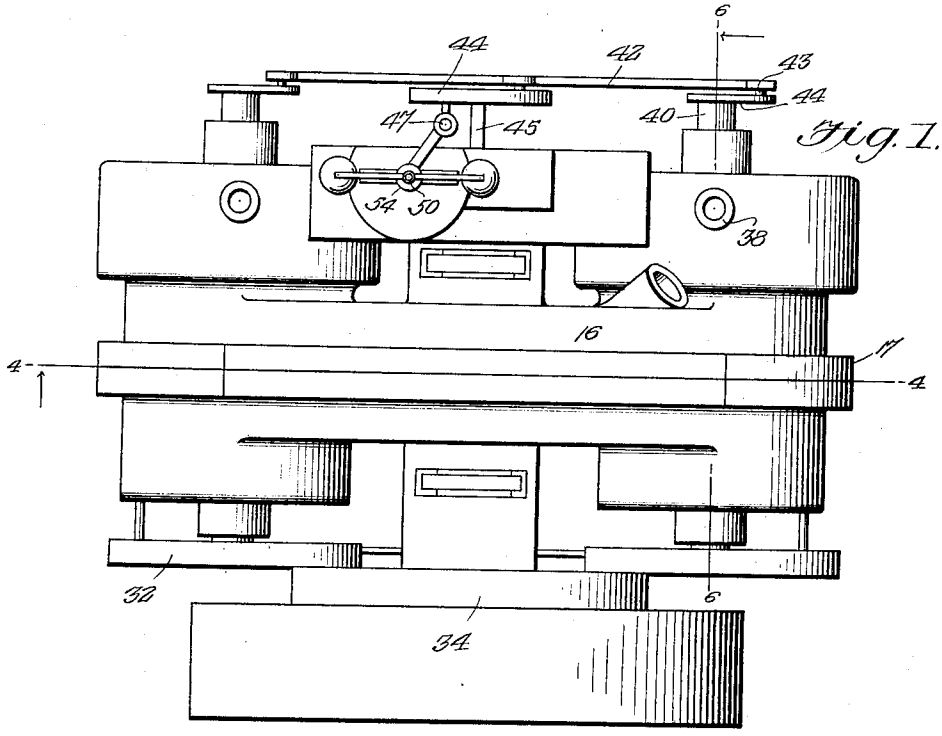


Fig. 1.

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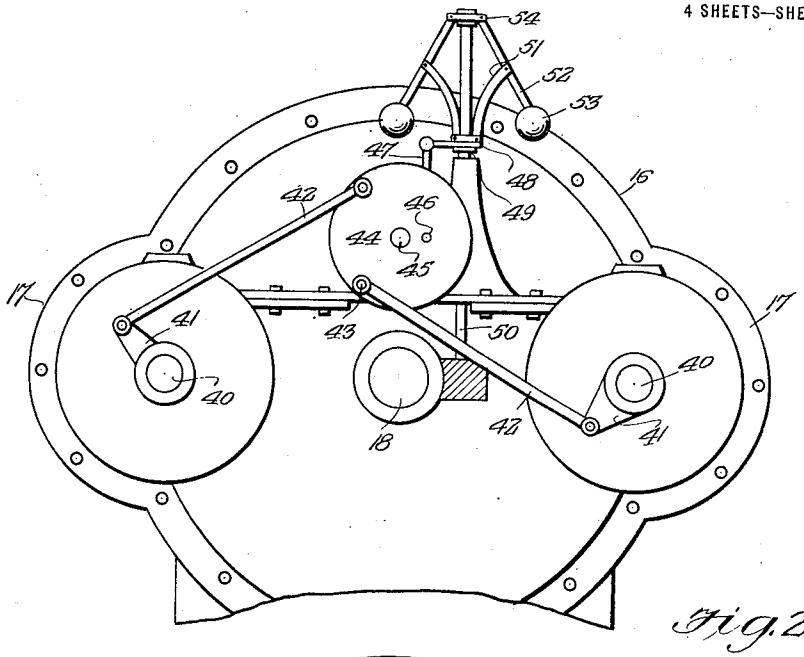


Fig. 2.

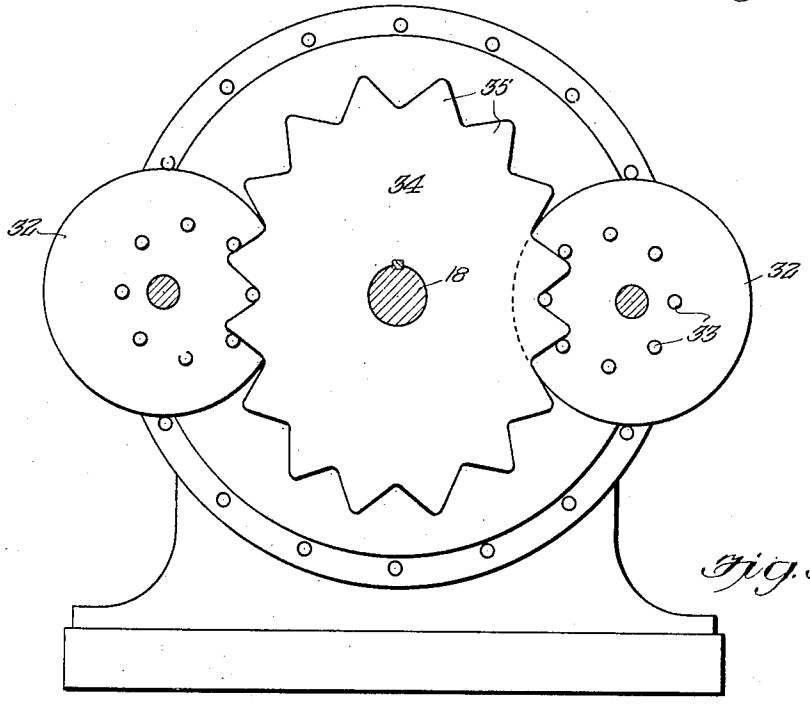


Fig. 3.

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4 SHEETS—SHEET 3.

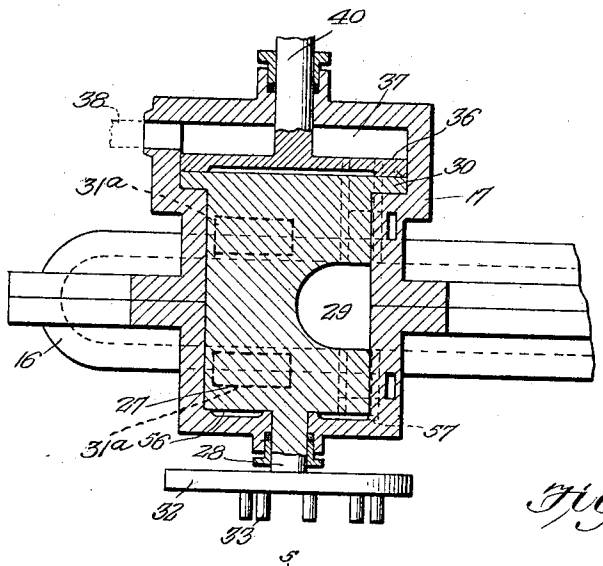


Fig. 6.

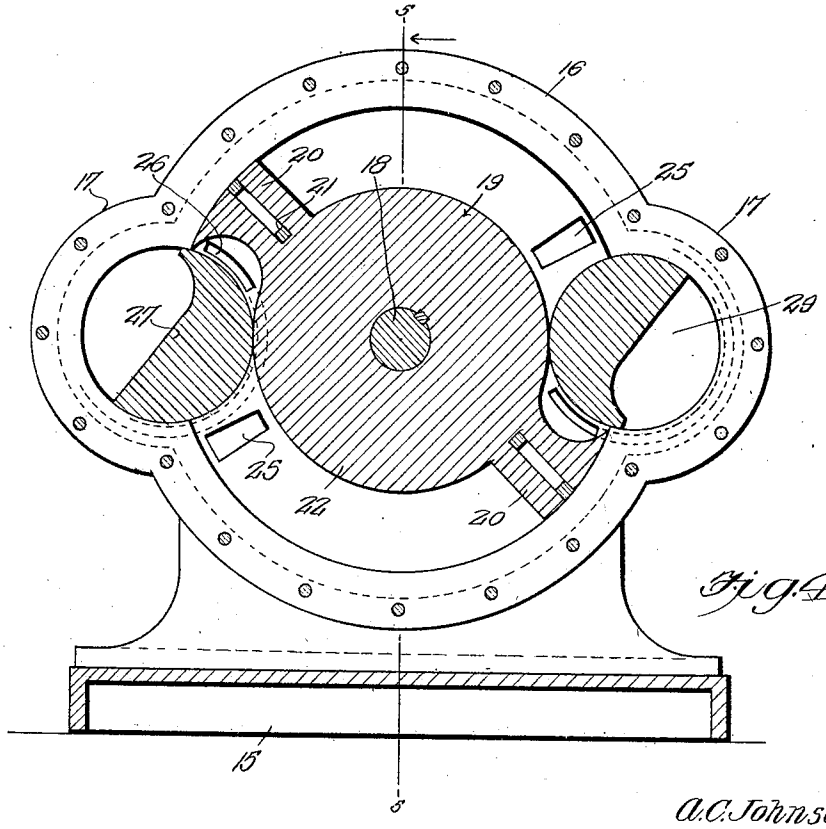


Fig. 4.

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4 SHEETS—SHEET 4.

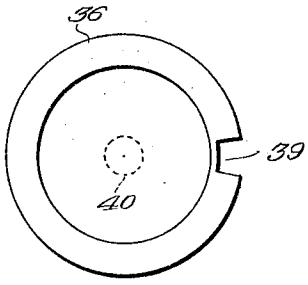


Fig. 9.

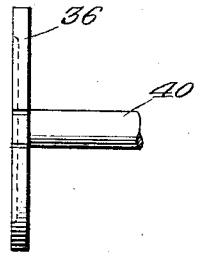


Fig. 10.

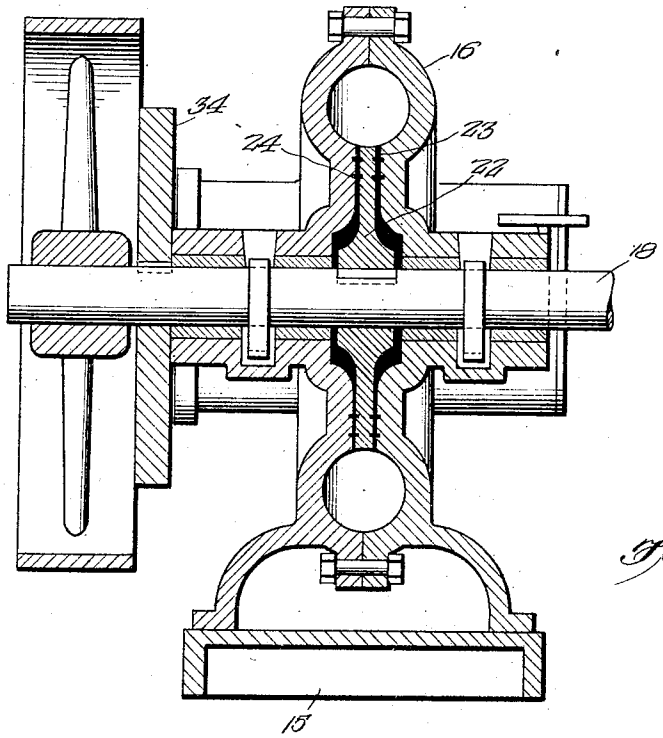


Fig. 5.

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UNITED STATES PATENT OFFICE.

ALBERT C. JOHNSON, OF STILLWATER, MINNESOTA.

ROTARY STEAM-ENGINE.

1,389,874. Specification of Letters Patent. Patented Sept. 6, 1921.

Application filed August 20, 1920. Serial No. 404,749.

To all whom it may concern:

Be it known that I, ALBERT C. JOHNSON, a citizen of the United States, residing at Stillwater, in the county of Washington and State of Minnesota, have invented new and useful Improvements in Rotary Steam-Engines, of which the following is a specification.

This invention relates to rotary engines, particularly to that type employing the expansible action of fluids as driving means, and has for its object the provision of a rotary steam engine in which the rotor is evenly balanced as the steam is admitted simultaneously at opposite sides and this balancing will result in elimination of the greater part of the vibration present in most engines.

Another object is the provision of an engine of this character in which the steam inlet and exhaust ports are widely separated and do not overlap, the advantage being that the different parts of the cylinder will be maintained at substantially an even temperature, thereby reducing condensation and obtaining the maximum effect of the expansible power of the steam.

An important object is the provision of an engine of this character provided with an automatic centrifugal governor whereby to automatically control the inlet of steam to admit a greater or less amount thereof as required by different loads so that the action and speed of the engine will be uniform.

An additional object is the provision of an engine of this character which will be comparatively simple in construction, highly efficient in use, positive in action, durable in service, and a general improvement in the art.

With the above and other objects and advantages in view, the invention consists in the details of construction to be hereinafter more fully described and claimed, and illustrated in the accompanying drawings in which—

Figure 1 is a plan view of the complete engine,

Fig. 2 is an elevation of one side thereof,

Fig. 3 is an elevation of the opposite side with the fly-wheel removed,

Fig. 4 is a longitudinal section,

Fig. 5 is a central cross sectional view, taken on the line 5—5 of Fig. 4,

Fig. 6 is a cross sectional view on the line 6—6 of Fig. 1,

Fig. 7 is a detail side elevation of the rotary valve,

Fig. 8 is an end view thereof,

Fig. 9 is a face view of the distributer disk, and

Fig. 10 is a side elevation thereof.

Referring more particularly to the drawings, the numeral 15 designates the base of the engine upon which is mounted a cylinder 16 which has formed upon its opposite sides extensions 17 constituting valve cages. The cylinder 16 is formed substantially ring-like and has journaled centrally therethrough a shaft 18 upon which is keyed a rotor 19 provided at diametrically opposite points with pistons 20 having the usual packing rings 21. The central portion 22 of the rotor is provided with concentric grooves 23 opposite similar grooves 24 in the opposite walls of the cylinder and these grooves cooperate to form traps for water of condensation and oil which will fill the grooves and serve as a seal for preventing leakage of compression from the interior of the cylinder to the slight space around the shaft.

Formed in one wall of the cylinder 16 adjacent the cages 17 are exhaust ports 25 which lead to any suitable pipes or to an exhaust manifold. Also formed in the wall of the cylinder 16 at each cage 17 is an arcuate inlet port 26 which is concentric with the center of the cage.

Located within each cage 17 is a rotary valve 27 having a stem 28 journaled through one end of the cage. This valve is formed in one side with a cut-out portion 29 which will permit passage of the pistons 20 of the rotor when in a certain position. This valve 27 is provided at its other end with a flange 30 adapted to cover the adjacent inlet port 26 and this flange is formed with a cut-out portion 31 of less length than the port 26 but adapted to register therewith. The valve 27 is formed with shallow pockets 31ª which communicate with the cylinder ports to exert a balancing action and to reduce friction during rotation of the valve under pressure. Carried by the stem 28 of each valve 27 is a disk 32 having projecting therefrom a series of pins 33 arranged in a circular series eccentric with respect to the stem 28.

Carried by one end of the shaft 18 is an elliptical gear 34 having a series of teeth 35, there being twice as many of these teeth 35 as pins 33 and the gear 34 is of course so disposed with respect to the disks 32

carrying the pins that the pins will be successively engaged by the teeth. As the rotor 19 is rotated the gear 34 will also be rotated and will operate to rotate the valves 27 for controlling the entrance of steam through the ports 26 into the cylinder behind the pistons 20 and owing to the eccentricity of the series of pins 33 and the elliptical formation of the gear 34, it will be seen that the valves 27 will not rotate at a uniform speed but will rotate very rapidly throughout a portion of a revolution and will have their movement retarded during the remainder of the revolution, this retardation being necessary to permit the passage of the pistons 20 through the cut-out portions 29 of the valves. As the rotor carries two pistons it is obvious that there must be twice as many teeth 35 as pins 33 so that each valve 27 will make two revolutions to one revolution of the rotor.

Disposed within each cage 17 and engaging the flange 30 of the valve 27, is a control disk 36 between which and the adjacent end of the cage is provided a chamber 37 into which extends the inlet pipe 38. This disk 36 is formed at its periphery with a cut-out portion 39 adapted to register with the cut-out portion 31 of the flange 30 during rotation of the valve so as to control the admission of steam to the cylinder through the port 26. Each disk 36 carries a stem 40 upon which is secured a crank arm 41 and these crank arms 41 are connected by links 42 with pins 43 extending from a disk 44 journaled upon a shaft 45. Connected with this disk 44, as shown at 46, is a link 47 which is connected with a fork 48 engaged by a sliding collar 49 on a vertical governor shaft 50 and this collar 49 has connected therewith links 51 which are in turn connected with arms 52 carrying weights 53 and pivoted upon a ring 54 carried by the governor shaft. This type of governor is well known and it will be seen that the outward or inward movement of the weighted arms 52 will control the passage of the fork 48 so as to move the disk 44 and consequently, by virtue of the links 42, and arms 41, to vary the positions of the disks 36 so as to bring the cut-out portions 39 thereof more or less into registration with the cut-out portions 31 of the flange 30 at a certain predetermined time. It will be readily apparent that the relative positions of these cut-out portions will regulate the inlet of steam.

The face of the disk 36 engaging the flange 30 is depressed, as indicated, so as to reduce the bearing area and consequently reduce friction. The end of the cage toward the valve 27, at the end thereof provided with the stem 28, is formed with an annular channel 56 with which communicates a passage 57 leading into the cut-out portion 29 of the valve and the purpose of this channel is that steam at boiler pressure may enter therein and serve as an end thrust to hold the valve against the disk 36.

In the operation of the device it will be seen that steam entering the chambers 37 through the pipes 38 will pass through the cut-away portions 39 in the disks 36 and pass through the cut-away portions 31 in the valve flanges 30 and pass into the cylinder 16 through the ports 26 which are uncovered at the proper time during the rotation of the valve. The steam entering the cylinder behind the pistons 20 will force the pistons away from the solid parts of the valves 27 which in the position shown in Fig. 4 act as abutments and radial movement will thus be imparted to the rotor 19. Spent steam in advance of the pistons 20 will of course be forced out through the exhaust ports 25. As the rotor 19 is keyed upon the shaft 18 and as the gear 34 is also keyed upon the shaft 18 the gear 34 meshing with the eccentric series of pins 33 will cause the proper rotation of the valves 27 to control the inlet of steam. When the engine is operating under different load conditions it will be seen that the governor mechanism will operate to shift the disk 44 and consequently the disks 36 so as to control the quantity of steam entering the cylinder.

From the foregoing description and a study of the drawings it will be apparent that I have thus provided a simply constructed rotary engine in which the action will be smooth and practically free from vibration as the inlet and exhaust occur simultaneously at both sides of the engine at diametrically opposite points so that a perfectly balanced action is obtained. It will also be observed that the inlet and exhaust ports are comparatively widely separated so that the heat throughout all parts of the engine will be substantially uniform which will result in minimizing the amount of condensation and in insuring more efficient action.

While I have shown and described the preferred embodiment of my invention, it is of course to be understood that I reserve the right to make such changes in the form, construction, and arrangement of parts as will not depart from the spirit of the invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. A rotary engine comprising a cylinder formed at diametrically opposite sides with extensions constituting valve cages and formed at diametrically opposite points with intake ports leading into the end portions of said extensions, inlet pipes leading into said extensions, said cylinder also being provided with outlet ports, a shaft journaled through the cylinder, a rotor on said shaft

and provided with diametrically opposite pistons, a rotary valve within each extension and having a cut-way portion for the passage of said pistons at certain predetermined points in the relative rotation of the rotor and valve, each valve being provided with a port adapted to register with the associated intake port of the cylinder, a disk within each extension having a port with which the port in said valve is adapted to register, means for rotating said valves simultaneously, said means comprising toothed wheels carried by said valves and mounted eccentrically thereon, and an elliptical toothed wheel carried by the shaft and meshing with said toothed wheels.

2. A rotary engine comprising a cylinder formed at diametrically opposite sides with extensions constituting valve cages and formed at diametrically opposite points with intake ports leading into the end portions of said extensions, inlet pipes leading into said extensions, said cylinder also being provided with outlet ports, a shaft journaled through the cylinder, a rotor on said shaft and provided with diametrically opposite pistons, a rotary valve within each extension and having a cut-away portion for the passage of said pistons at certain predetermined points in the relative rotation of the rotor and valves, each valve being provided with a port adapted to register with the associated intake port of the cylinder, a disk within each extension having a port with which the port in said valve is adapted to register, means for rotating said valves simultaneously, said means comprising toothed wheels carried by said valves and mounted eccentrically thereon, and an elliptical toothed wheel carried by the shaft and meshing with said toothed wheels, the number of teeth in said elliptical toothed wheel being double the number of the teeth in either of the first named toothed wheels.

In testimony whereof I affix my signature.

ALBERT C. JOHNSON.