Sept. 20, 1927. 1,642,996

H. C. JOHNSON

ROTARY STEAM ENGINE

Filed Feb. 25, 1925 2 Sheets-Sheet 1

Fig. 1.

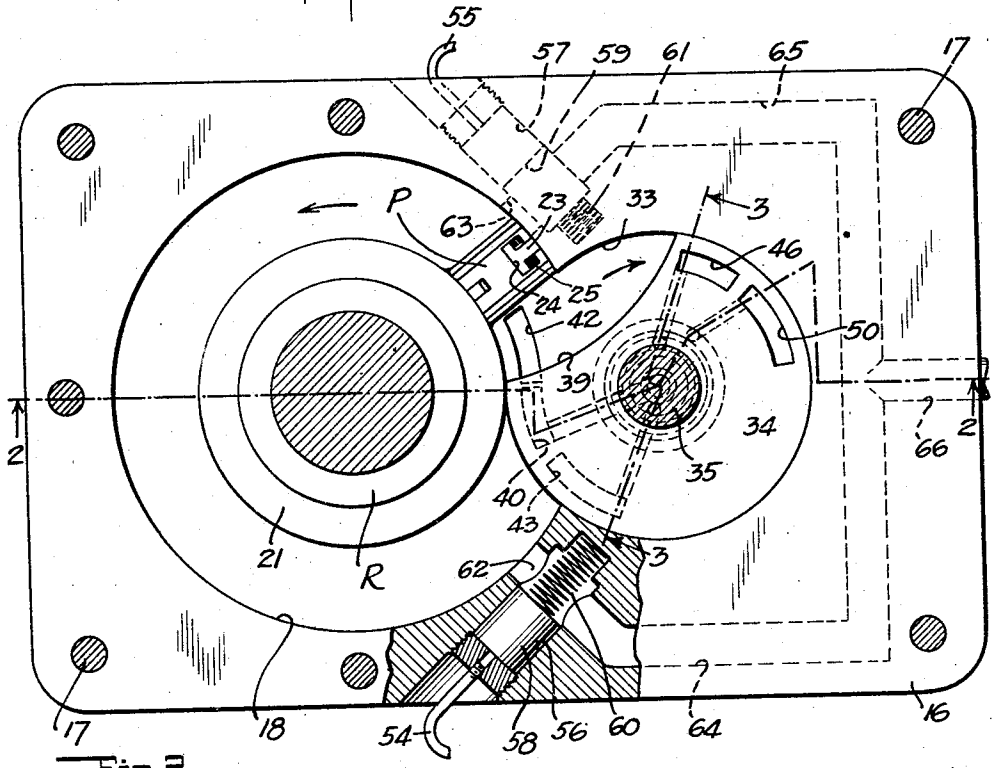


Fig. 2.

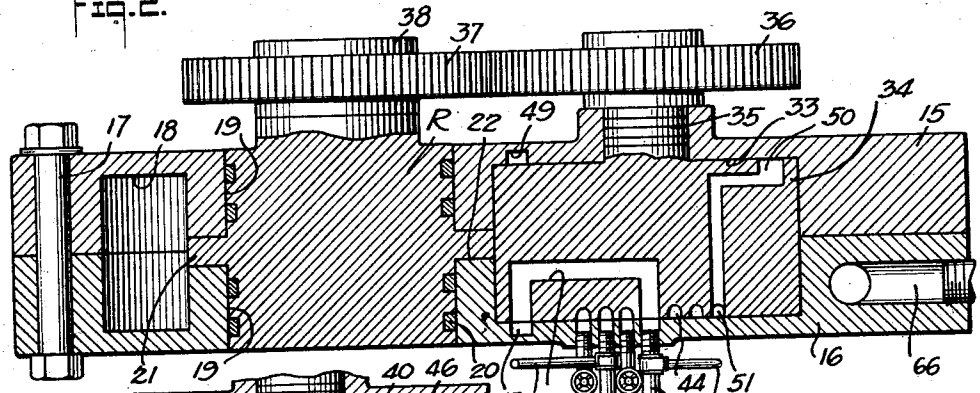
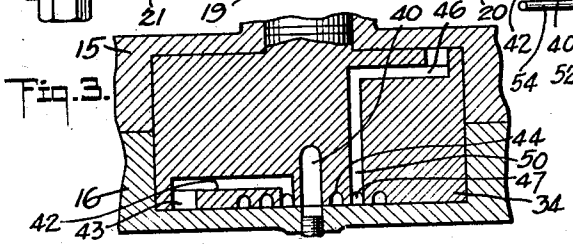


Fig. 3.



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Fig. 4.

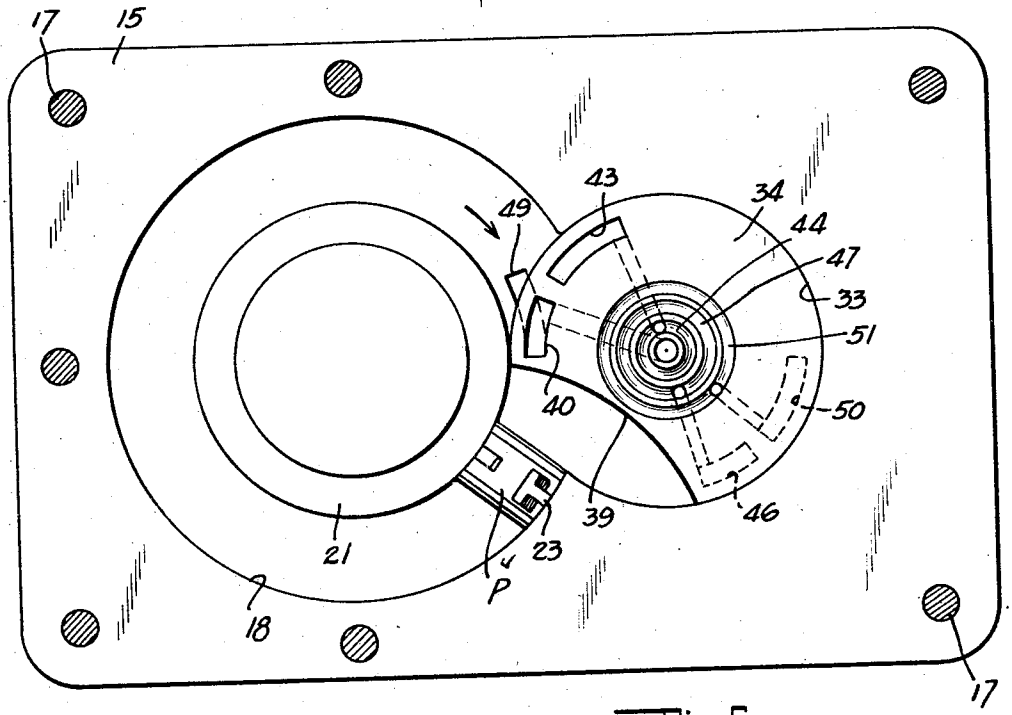


Fig. 5.

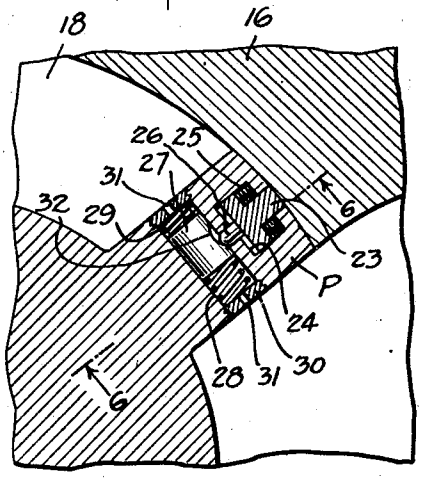
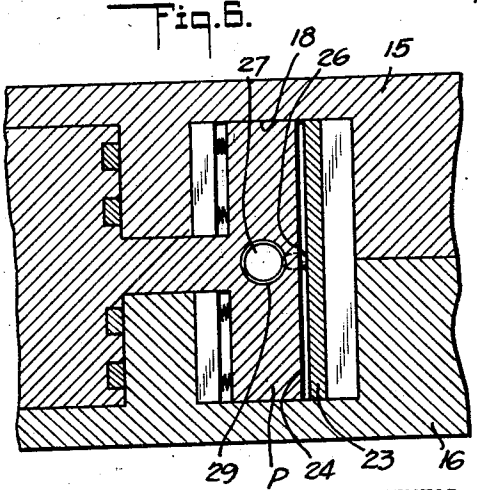


Fig. 6.



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UNITED STATES PATENT OFFICE.

HENRY CHARLES JOHNSON, OF COLTON, CALIFORNIA.

ROTARY STEAM ENGINE.

Application filed February 25, 1925. Serial No. 11,603.

My invention relates to rotary engines employing an expansible fluid and particularly, although not necessarily, to engine propelled by steam.

It is a purpose of my invention to provide a rotary engine having the following advantages: an engine which permits of its direct connection to a driven shaft to the elimination of connecting rods and a crank shaft; an engine which employs steam expansively and to a maximum point of efficiency to obtain maximum power; an engine extremely simple and light in construction and having a minimum number of working parts to reduce friction and simplify lubrication; an engine having a valve mechanism by which the quantity of expansible fluid supplied can be increased to facilitate starting of the motor or to secure proper operation thereof under heavy loads; and a valve mechanism which permits of the reversing of the engine.

I will describe only one form of rotary engine embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawings:

Figure 1 is a view showing in vertical section one form of rotary engine embodying my invention.

Figure 2 is a horizontal sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a fragmentary horizontal sectional view of the valve mechanism shown in Figure 2 but taken on the line 3—3 of Figure 1.

Figure 4 is a view showing the engine in side elevation with one section of the stator casing removed.

Figure 5 is an enlarged fragmentary sectional view showing the piston of the rotor.

Figure 6 is a sectional view taken on the line 6—6 of Figure 5.

Similar reference characters refer to similar parts in each of the views.

Referring specifically to the drawings, my invention in its present embodiment comprises a stator which as shown in Figure 2 is made up of two sections 15 and 16 secured together by means of bolts 17 and having their confronting sides formed with annular grooves to provide a chamber 18 in which the expansible fluid supplied to the engine is adapted to expand. The stator sections are also formed with openings that co-operate to provide a chamber 19 in which a rotor R is received, and the rotor consists of a circular body formed on its periphery with grooves in which are received rings 20 that form a fluid tight joint between the stator and rotor to prevent escape of the fluid as will be understood. A rotor is also provided on its periphery with an annular positioning flange 21 that is adapted to rotate in a circular opening 22 provided between the stator sections and to thus serve to maintain the rotor in proper position within the stator at all times. The rotor R is provided with a piston designated generally at P and formed on and extending radially from the flange 21.

In the present instance the piston P is of substantially rectangular form to correspond to the cross-sectional contour of the chamber 18 so as to have a sliding fit therein and against which the expansible fluid is adapted to act for rotating the rotor R. By virtue of the rectangular contour of the chamber 18, it will be manifest that the cross-sectional area of such chamber can be increased without increasing the diameter thereof. Wherefore it will be seen that by increasing in transverse dimensions the other parts of the engine, the horsepower developed by the engine can be increased accordingly.

As illustrated to advantage in Figures 5 and 6, the piston P is provided with a sealing abutment 23 movable in a pocket 24 of the piston and normally urged inwardly by means of springs 25 so that its outer end is flush with the outer end of the piston. The inner end of the abutment is formed with an extension 26 adapted to be engaged by a plunger 27 movable in a pocket 28 of the piston and normally urged to a medial position within the pocket by means of springs 29 held within the pocket by screw plugs 30. These plugs 30 are formed with ports 31 through which the expansible fluid employed is admitted to the pocket to act on the plunger for moving the latter in one direction or the other depending upon which side of the piston expansible fluid is acting upon. For example, presuming that the fluid is acting on the lower side of the piston as viewed in Figure 5, fluid will pass through the lower port 31 into the pocket 28 forcing the plunger 27 upwardly to the position shown. In this position of the plunger, the extension 26 is engaged and actuated to force the same outwardly and thereby produce a

fluid tight joint between the outer end of the piston and the contacting wall of the stator chamber 18. In the medial position of the plunger 27, the extension 26 is disposed within a recess 32 of the plunger so that the springs 29 can expand to retract the abutment for the purpose which will be described hereinafter.

By reference to Figures 1, 2 and 4, it will be seen that the stator sections 15 and 16 are constructed to provide a chamber 33 in which a valve body 34 rotates, the valve body being fixed to a shaft 35 journaled in the stator and provided with a gear 36 which constantly meshes with a similar gear 37 fixed to a shaft 38. The shaft 38 constitutes an extension of the rotor R whereby it will be seen that upon rotation of the rotor a corresponding movement will be imparted to the valve 34. As shown in Figure 4, the valve 34 is positioned to extend into the chamber 18, but to allow the passing of the piston P during rotation of the rotor R, the valve is formed with an arcuate recess 39. As shown in Figures 2 and 3 the valve is provided with a main inlet port 40, the inlet end of which is disposed axially of the valve body so as to have communication at all times with a fluid supply pipe 41, while the outlet end of the port is positioned to register with a stator inlet port 42 at each revolution of the valve body. This port 40 is designed for the purpose of supplying steam or other expansible fluid to the chamber 18 in such manner as to act upon one side of the piston P for rotating the rotor R in one direction, and under normal conditions the steam supplied by this port is sufficient to operate the rotor. However, under abnormal conditions such as when an extremely heavy load is imposed upon the engine so that the steam supplied by the port 40 is insufficient to start and maintain the rotor in operation, additional steam can be supplied by a subsidiary port 43 (Figure 3). This port has an inlet end which is at all times in communication with an annular passage 44 formed in one face of the valve body 34 and to which steam is supplied from a pipe 45. The outlet end of the port 43 is also adapted to register with the stator inlet port 42 once during each revolution of the valve body, but by reference to Figure 4 it will be seen that the ports 40 and 43 are arranged so that port 43 registers with the port 42 subsequent to the port 40. In this manner two separate charges of steam or other expansible fluid are supplied to the chamber 18 to act upon the piston P in rotating the rotor R in one direction.

To rotate the rotor R in the opposite direction, a main port 46 is formed in the valve body 34 with its inlet end communicating with an annular passage 47 formed in one face of the valve body and to which steam is supplied from a pipe 48. The outlet end of the port 46 is disposed at the opposite face of the valve body for registration with a stator inlet port 49 and once during each revolution of the valve body. For supplying additional steam to the chamber 18 when the engine is operating under abnormal conditions, a subsidiary port 50 is formed in the valve body with its inlet end in communication with an annular passage 51 formed in the valve body and to which steam is supplied from a pipe 52. This port 50 is also adapted to register with the stator inlet port 49 and successively with respect to the port 46 so as to supply further steam in a manner to provide additional power for rotating the rotor R in the opposite direction.

As clearly shown in Figure 2, the several steam supply pipes are provided with valves 53 so that the passage of steam to the several ports can be controlled at will and to effect rotation of the rotor R in either direction. Communicating with the pipes 41 and 48 are branch pipes 54 and 55, respectively, which are designed to supply steam to chambers 56 and 57, respectively, for actuating plunger valves 58 and 59, respectively, against the expansive action of springs 60 and 61 for closing exhaust ports 62 and 63. The plunger valves 56 and 57 are normally urged to open position by the springs 60 and 61 whereby the ports 62 and 63 are placed in communication with exhaust passages 64 and 65 formed in the stator section 16 and communicating with the common outlet 66.

In the operation of the invention, the rotor R can be rotated continuously in one direction by opening the valve 53 for the pipe 41 whereby steam from the port 40 is admitted to the chamber 18 through the stator port 42 to act expansively on the piston P and thus rotate the rotor R. With rotation of the rotor, the valve body 34 is rotated in the opposite direction as indicated by the arrow in Figure 1 thus causing the port 40 to intermittently register with the port 42 and to thereby supply charges of steam successively to the chamber 18, as will be understood. With the opening of the valve 53 for the pipe 41 steam is also supplied to the chamber 57 through the pipe 55 whereby the plunger valve 59 is moved to closed position thus preventing exhaust of steam through the port 63 and thus sealing the passage 65. It is to be understood that the plunger valve 58 remains open so that steam from the chamber 18 can exhaust.

Should it be desired to increase the supply of steam to the chamber 18 for the purpose previously described, the valve 53 for the pipe 45 is opened thus admitting steam to the port 43 for subsequent delivery to the chamber 18 to further act on the piston P.

When rotating the rotor R in the opposite direction, the valve 53 for the pipe 48 is opened to admit steam to the port 46. From the port 46 steam is admitted to the chamber 18 through the stator inlet port 49 and in such manner as to act expansively upon the opposite side of the piston P. As the valve for the pipe 48 is opened, steam is supplied to the chamber 56 through the pipe 54 so as to move the plunger valve 58 to closed position and thus prevent the exhaust of steam through the port 64. To increase the supply of steam to the chamber 18, the valve 53 is opened to admit steam to the port 50, the steam being subsequently supplied to the chamber 18 through the stator inlet port 49.

It is to be noted that during movement of the piston P across the chamber 33, the sealing abutment 23 will be held in retracted position by the springs 25. However, upon completion of this movement of the piston, the steam acting on the plunger 27 through that port 31 exposed to the chamber 33, will move the plunger so as to engage the extension 26 and thus urge the sealing abutment outwardly into sealing contact with the adjacent wall of the chamber 18. By virtue of the two ports 31, the steam in the chamber 33 is free to act upon the plunger 27 to move the latter in one drection or the other depending upon which direction the rotor R is being rotated so as to maintain the sealing abutment in sealing engagement with the wall of the chamber 18 at all times whereby the complete expansive force of the steam can be utilized.

Although I have herein shown and described only one form of rotary engine embodying my invention, it is to be understood that various modifications and changes may be made therein without departing from the spirit of the invention and the spirit and scope of the appended claims.

I claim as my invention:

1. A rotary engine comprising a stator, a rotor in the stator to provide a chamber between the two, a piston on the rotor adapted to move in said chamber, a rotating valve having two sets of ports therein, one for delivering an expansible fluid to one side of the piston and the other for delivering an expansible fluid to the other side of the piston, and means for supplying an expansible fluid to one set of ports or the other, the ports of each set operating to supply separate charges of the expansible fluid to the same side of the piston and successively for the purpose described.

2. A rotary engine comprising a stator, a rotor in the stator arranged to provide a chamber between the rotor and stator, a piston on the rotor adapted to move in said chamber, and a valve having a pair of ports therein adapted to admit separate charges of an expansible fluid to act on one side of the piston and successively for the purpose described.

3. In a rotary engine, a stator, a rotor, a rotary valve, ports in the valve and stator, and means for supplying steam to certain of the ports, said ports being arranged to admit separate charges of steam to the rotor to act successively thereon and to rotate the rotor in either direction.

HENRY CHARLES JOHNSON.