

No. 726,686.

PATENTED APR. 28, 1903.

C. D. HOLT.
ROTARY ENGINE.

APPLICATION FILED FEB. 12, 1903.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 2.

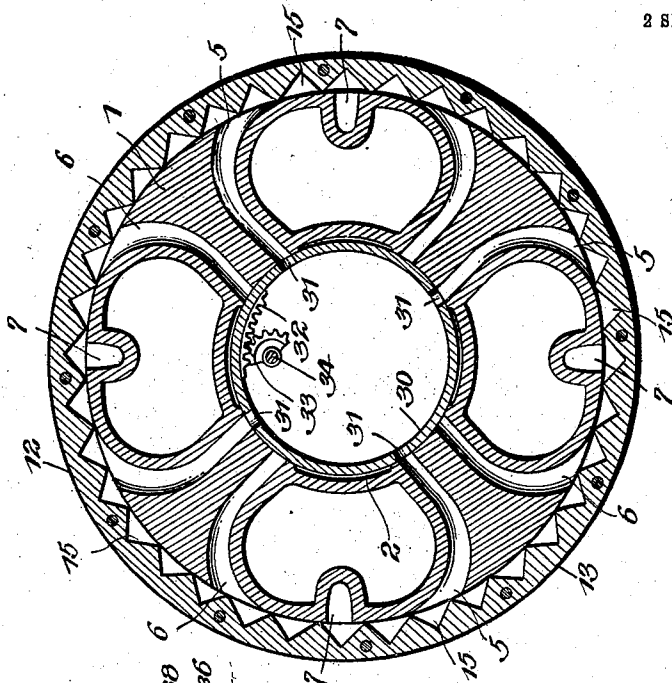
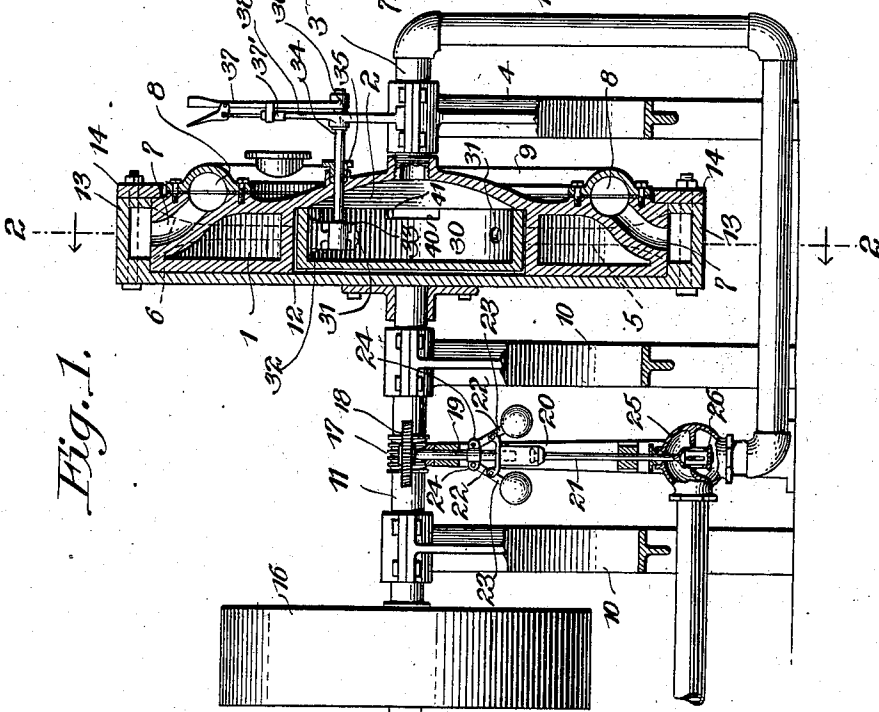


Fig. 1.



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2 SHEETS—SHEET 2.

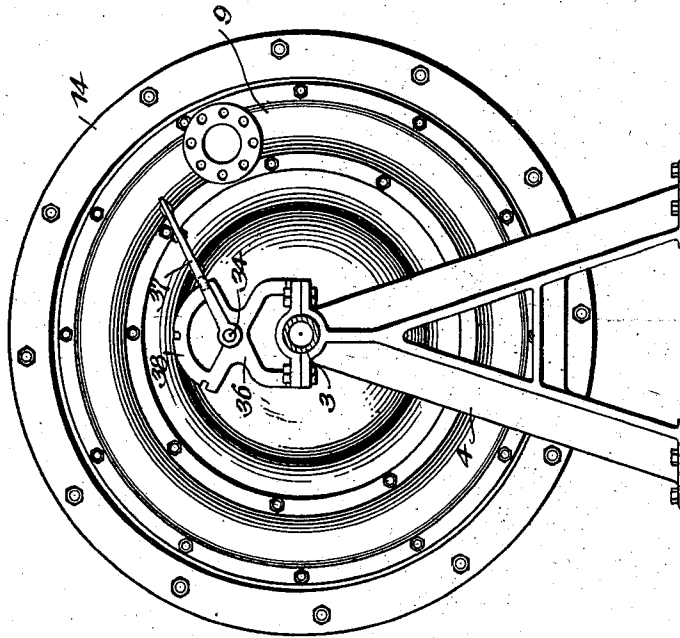


Fig. 3.

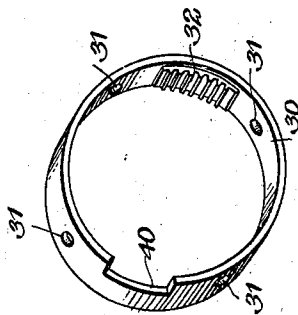


Fig. 4.

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UNITED STATES PATENT OFFICE.

CRAWFORD D. HOLT, OF MURRAY, KENTUCKY.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 726,686, dated April 28, 1903.

Application filed February 12, 1903. Serial No. 143,120. (No model.)

To all whom it may concern:

Be it known that I, CRAWFORD D. HOLT, a citizen of the United States, residing at Murray, in the county of Calloway and State of Kentucky, have invented a new and useful Rotary Engine, of which the following is a specification.

This invention relates to certain improvements in rotary engines, and has for its principal object to provide an engine of simple and economical construction and in which the steam will be utilized to the fullest advantage.

A further object of the invention is to construct a rotary engine of the impact type in which the area of the steam ports or channels is gradually increased toward the discharge ends of the ports in such manner as to obtain the full force of the impact and overcome the tendency of the steam to ricochet and issue from the port in the swirling stream caused by the frictional resistance of the walls of the ports to the passage of the current.

A still further object of the invention is to construct an impact-engine in which the movable member or piston is in the form of a ring disposed outside a cylinder, or that portion of the engine corresponding to the cylinder, and containing the steam-chest, ports, and valve mechanisms.

A still further object of the invention is to construct an engine comprising but few parts, which may be readily assembled, and in which the parts may be as readily detached for purposes of examination or repairs.

A still further object of the invention is to provide an engine of this class with an improved form of governing-valve, whereby the valve may be set by hand to stop the engine, to permit its movement in either direction, and to regulate the quantity of steam used.

With these and other objects in view the invention consists in the novel construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is a longitudinal sectional elevation of a steam-engine constructed in accordance with the invention. Fig. 2 is a transverse sectional elevation of the same on the line 22 of Fig. 1. Fig. 3 is a front elevation of the engine. Fig. 4 is a detail perspective view of the valve removed.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The cylinder or stationary member of the engine comprises a circular body portion 1, having a centrally-disposed circular steam-chest 2, to the central portion of which is connected one end of a steam-supply pipe 3, extending through a suitable guiding-opening in a bracket or supporting-standard 4. The cylinder 1 is provided with a plurality of oppositely-facing ports 5 and 6, a number of ports of each kind being employed and all extending from the central steam-chest 3 to the peripheral line of the cylinder. These ports are arranged on substantially radial lines for a short distance after leaving the steam-chest and thence are continued on curved lines approximately tangential to the peripheral line of the cylinder, and at this discharge-point the area of the ports is slightly increased, so as to permit some expansion of the steam before the latter makes contact with the wings or blades of the outer revolvable piston. The body portion of the piston is further provided with exhaust-ports 7, one of which is disposed between each two ports 5 and 6, and the several exhaust-ports are extended to and communicate with an annular channel 8, formed in the front face of the cylinder. A portion of the main exhaust-channel is formed by an annular ring 9 of semicircular form in cross-section and provided with suitable bolting-flanges, by which it may be secured to the face of the cylinder.

10 indicates suitable standards having bearings at their upper ends for the reception of a shaft 11, the axis of which is coincident with that of the steam-pipe 3. At one end of the shaft is secured the central portion of a revolvable piston 12. This piston comprises a circular plate having a peripherally-disposed flange 13, fitting snugly over the periphery of the cylinder 1 and being held from

movement in one direction by the plate and in the opposite direction by a ring 14, fitting slightly over the opposite face of the cylinder 1 and bolted or otherwise secured to said 5 piston.

On the inner face of the flange or ring 13 are a number of impact-pockets 15, these being substantially V-shaped in form and presenting two angular surfaces, against which 10 the steam is forced as it issues from the steam-ports 5 and 6, one face or wall of the pockets being utilized for revolving the piston in one direction, while the other angular face is brought into play while the piston is revolving 15 in the opposite direction, and in either case the steam entering the pockets escapes through the exhaust-ports 7 after traveling a short distance, so that it is not necessary to carry dead steam around in the piston, and thus retard its rotative movement. 20 The shaft 11 also carries a belt or balance-wheel 16 and is further provided with a worm 17, intermeshing with a worm-wheel 18 on the upper end of a vertically-disposed shaft 19, having suitable bearings in a standard 25 20. The lower end of the shaft 20 extends within a vertically-disposed guiding-opening formed in a box or casing at the upper end of a shaft 21, and from said box or casing 30 extend a pair of arms 22, to which are pivoted the intermediate portions of weighted governor-arms 23, and the upper ends of said arms 23 are pivoted to lugs 24, projecting from the shaft 19. The construction is such 35 that on rotative movement of the shaft 11 a corresponding movement will be imparted to the shaft 19 and through the latter to the shaft 21, the two shafts which make up the governor rotating together, and as the speed in- 40 creases the weighted governor-arms 23 are thrown outwardly by centrifugal force in order to raise the lower shaft or spindle 21. The shaft or spindle 21 extends within a valve-casing 25, connected in the steam-supply 45 pipe 3, and is secured to a valve 26, adapted to a suitable valve-seat within the casing, so that as the speed of the engine increases the valve 26 will be closed or will be moved to a position corresponding to the speed of rota- 50 tion of the shaft 11.

The central steam-chest 2 is faced to form a seat for a cup or ring shaped valve 30, having a flat circular portion provided with a peripheral ring or flange in which are formed 55 steam-ports 31, and within the ring or flange are rack-teeth 32, intermeshing with the teeth of a segment 33, mounted on a rock-shaft 34, which extends out through a stuffing-box 35 in the wall of the steam-chest, the outer end 60 of said shaft being supported in a bearing formed in a bracket 36. The rock-shaft 34 is provided with an operating-lever 37, having the usual latch 37', adapted to lock the segment 38, and in said segment are three 65 notches for receiving the latch, so that the valve may be adjusted and locked either in a central inoperative position or may be

moved and locked in position with its ports 31 opposite either set of ports 5 or 6, or additional notches may be employed in order 70 that the size of the ports may be adjusted to increase or decrease the speed of the engine, although, as a rule, this may be accomplished by the governor.

In order to prevent excessive movement of 75 the valve in either direction, the circular wall of the valve is provided with a slot or notch 40 for the reception of a pin 41, extending inwardly from the wall of the steam-chest and serving by contact with the end walls of the 80 slot to limit the movement of the valve in both directions.

When steam or other fluid is forced under pressure through a pipe of uniform diameter, the frictional resistance of the walls of the 85 conduit to the outer surface of the stream tends to cause an uneven flow, the central portion of the steam traveling at a more rapid rate than the outer portions adjacent to the wall, and this tends to a ricochet movement, 90 which impedes the flow of the fluid on issuing from the mouth of the conduit. The stream is swirling when discharging into the open air and will be immediately expanded and the force of direct impact considerably 95 reduced.

In carrying out the invention the walls of each of the ports are inclined or tapering, so that the area will be gradually increased from the inlet to the discharge end, to permit slight 100 expansion of the steam, to reduce the frictional resistance to the stream, and to prevent the ricochet or swirling movement of the current, so that the impact force of the steam will not be lowered. 105

The engine is simple, compact, and may be revolved at an extremely high rate of speed with the expenditure of but small energy, and it may be driven by steam, air, or any other fluid under pressure. 110

Having thus described the invention, what is claimed is—

1. The combination in a rotary steam-engine, of the stationary body portion having a central steam-chest and provided with inlet 115 and exhaust ports, of a revoluble shaft, a revoluble piston carried by the shaft and comprising a ring having impact-pockets formed in its inner face, said impact-pockets presenting two angular faces against either of which 120 the steam may be forced, and means for controlling the flow of steam through the inlet-ports.

2. The combination in a rotary steam-engine, of a stationary member having a central 125 steam-chest, a steam-port extending from the steam-chest to the periphery of said member, said port being arranged on a substantially tangential line at a point near its discharge end and being of greater area at the discharge 130 than at the inlet end, and a revoluble ring forming a piston, said ring being provided with internal pockets for receiving the impact of steam issuing from the ports.

3. The combination in a rotary steam-engine, of the stationary member having a central steam-chest, steam-ports leading from the steam-chest to the periphery of the cylinder and arranged in sets for operation of the engine in opposite directions respectively, said ports being arranged on substantially radial lines for a short distance from the steam-chest and being thence continued on lines substantially tangential to the peripheral line of the stationary member and at their discharge ends being of slightly-increased area to permit expansion of the steam, and a piston comprising a revoluble ring having internal pockets to receive the impact of the steam issuing from the ports.

4. The combination in an engine, of the stationary member having a central steam-chest and provided with two sets of oppositely-facing steam-ports and with exhaust-ports arranged between the sets of steam-ports, an exhaust-channel arranged in one face of the stationary member and with which all of the exhaust-ports communicate, an annular ring bolted to the stationary member and forming a part of the exhaust-channel, and a revoluble piston-ring having internal pockets to receive the impact of steam issuing from the steam-ports.

5. The combination in a rotary engine, of the stationary member having a centrally-disposed circular steam-chest and provided with steam-ports leading from the chest to the peripheral line of said member, a ported valve-ring arranged within the steam-chest, means for circumferentially adjusting the valve-ring, and a revoluble piston-ring having internal pockets for receiving the impact of the steam issuing from the steam-ports.

6. The combination in a rotary engine, of the stationary member, having a centrally-disposed circular steam-chest, a plurality of sets of opposing steam-ports leading from the steam-chest to the peripheral line of said stationary member, intermediate exhaust-ports arranged at the periphery of the stationary member at points between the sets of steam-ports, a circular cup-shaped valve having a ported ring or flange disposed within the steam-chest, means for adjusting the valve to place either set of ports in communication with the steam-chest or to close communication between the steam-chest and both sets

of ports, and a revoluble ring-piston having internal pockets for receiving the impact of steam issuing from said ports.

7. The combination in a steam-engine, of the stationary member having a centrally-disposed steam-chest, a plurality of oppositely-disposed steam-ports leading from the chest to the peripheral line of the piston, intermediate peripherally-disposed exhaust-ports, a ported ring arranged within the steam-chest and forming a valve, a rack on said ring, a gear-segment intermeshing with said rack, a rock-shaft carrying the gear-segment, means for supporting and for adjusting said rock-shaft, and a revoluble ring-piston having internal pockets for receiving the impact of steam from the ports.

8. In a device of the class specified, a stationary member having a central steam-chest, ports leading from the steam-chest, a ported ring disposed within the steam-chest and forming a valve, an internal rack carried by the valve, a gear-segment intermeshing with said rack, a rock-shaft carrying the gear-segment, a stuffing-box through which said rock-shaft extends, a supporting-bracket having a journal or bearing for the rock-shaft, an adjusting-lever secured to said rock-shaft, a locking-latch carried by the lever, and a notched segment for engaging the latch and locking the valve in any position of adjustment.

9. The combination in a steam-engine, of a circular stationary member having a central steam-chamber and provided with exhaust-ports, a valve disposed within the steam-chest, means for adjusting the valve, a shaft, a piston comprising a flanged ring secured to the shaft, said ring having internal impact-pockets for receiving the steam from the ports, and a ring extending partly over the front face of the stationary member and secured to said flange, to thereby hold the ring and stationary member in proper relative positions.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

CRAWFORD D. HOLT.

Witnesses:

J. ROSS COLHOUN,
JNO. E. PARKER.