No. 705,079. Patented July 22, 1902.

J. T. HAYS & J. W. WILSON.

ROTARY STEAM ENGINE.

(Application filed Mar. 12, 1901.)

(No Model.) 2 Sheets—Sheet I.

Fig. 1.

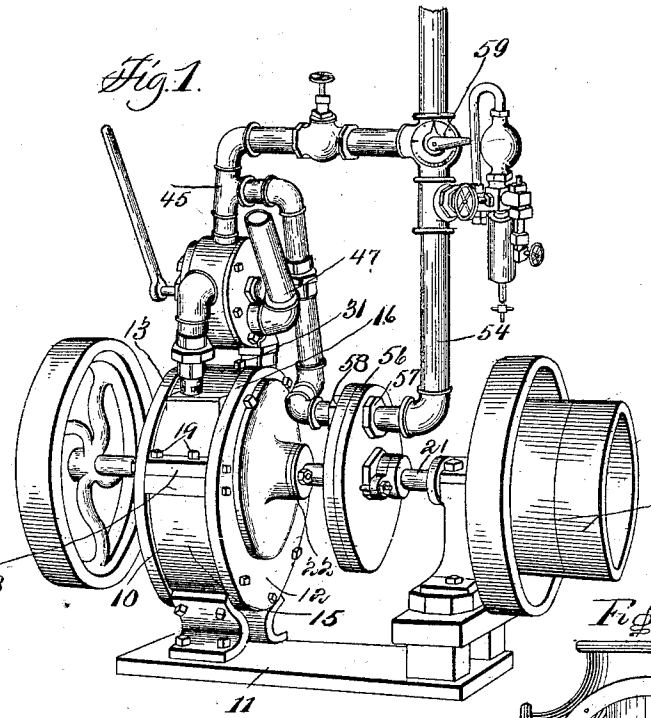


Fig. 2.

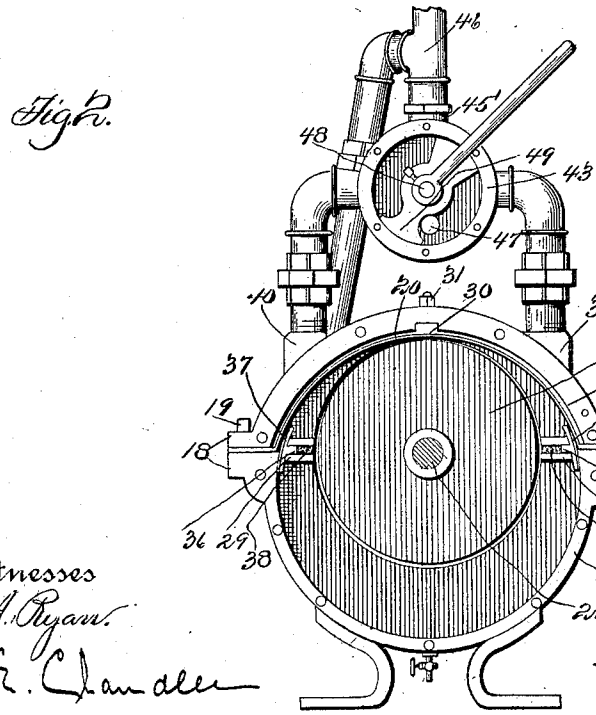
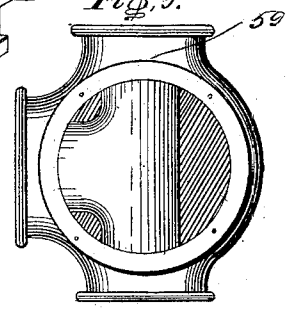


Fig. 9.



Witnesses
E. A. Ryan.
H. E. Chandler

Inventors
J. T. Hays.
J. W. Wilson
by Munn & Co
Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 705,079. Patented July 22, 1902.

J. T. HAYS & J. W. WILSON.

ROTARY STEAM ENGINE.

(Application filed Mar. 12, 1901.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

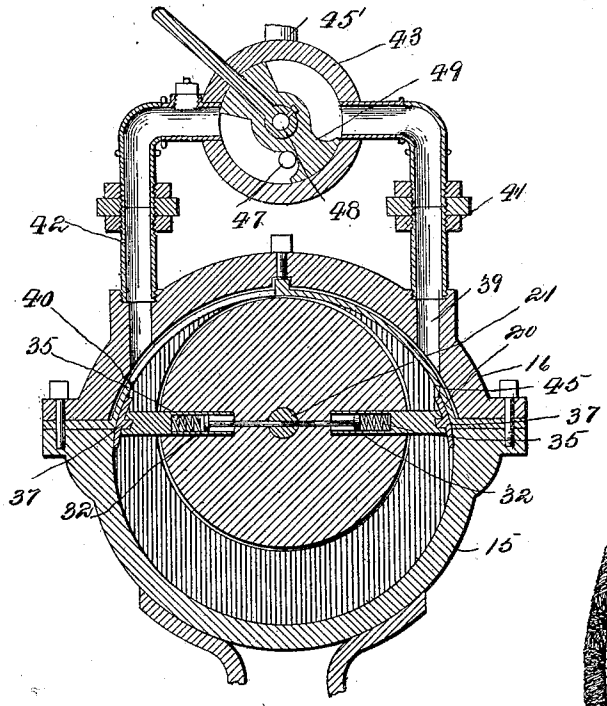


Fig. 8.

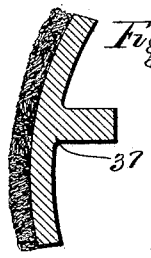
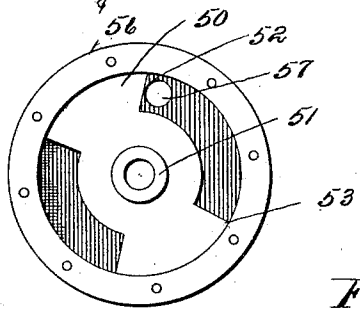


Fig. 4.



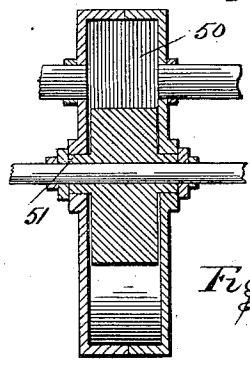


Fig. 5.

Fig. 6.

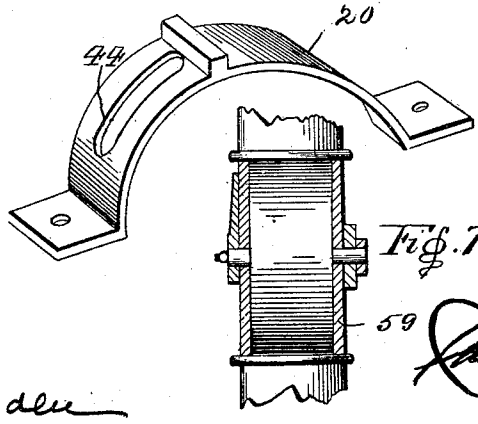


Fig. 7.

Witnesses
E. A. Ryan
M. E. Chandler

Inventors
J. T. Hays.
J. W. Wilson
By
Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JAMES T. HAYS AND JOHN W. WILSON, OF GARLAND, TEXAS.

ROTARY STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 705,079, dated July 22, 1902.

Application filed March 12, 1901. Serial No. 50,871. (No model.)

To all whom it may concern:

Be it known that we, JAMES T. HAYS and JOHN W. WILSON, citizens of the United States, residing at Garland, in the county of Dallas, State of Texas, have invented certain new and useful Improvements in Rotary Steam-Engines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to rotary engines in general, and more particularly to that class wherein a piston is disposed eccentric to the cylinder and is provided with radially-movable heads disposed to travel against the inner periphery of the cylinder and receive the steam-pressure, the object of the invention being to provide a simple and efficient construction which will develop a high speed with a minimum consumption of steam.

A further object of the invention is to provide a construction wherein the cost of manufacture will be low, it will occupy a small amount of floor-space, and wherein there will not be the usual packing-rings required.

An additional object of the invention is to provide means for starting the engine should the piston stop in a position to close the cut-off valve and to provide a simple and efficient cut-off mechanism and throttle-valve arrangement which will permit of the parts being readily removed for substitution or repair.

Additional objects and advantages of the invention will be evident from the following description:

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a perspective view showing the complete engine. Fig. 2 is an elevation view of the engine-cylinder with one head thereof removed to show the interior and showing also the reversing-valve with one head of its casing removed. Fig. 3 is a vertical section taken in a plane at right angles to the shaft of the engine. Fig. 4 is an elevation of the cut-off valve with one head of the casing thereof removed. Fig. 5 is a diametrical section of the cut-off valve, taken through the ports thereof. Fig. 6 is a detail perspective view showing the spring wear-plate against which the piston-heads work. Fig. 7 is a vertical section through the throttle-valve. Fig. 8 is a section through one of the T-rails, showing the packing; and Fig. 9 is a view of the throttle-valve with the dial-plate removed, showing the interior portion in section.

Referring now to the drawings, the present engine comprises a cylinder 10, having a suitable base 11, this cylinder having a fixed head 12 at one end and a removable head 13 at the opposite end, this head 13 being adapted to be held removably in place by means of machine screws or bolts in the usual manner. The shell of the cylinder includes a lower section 15 and an upper section 16, the upper section being somewhat less than one hundred and eighty degrees, the chord which divides the two sections lying somewhat above the center of the cylinder. The two sections 15 and 16 are provided with flanges 18 at their ends, through which are engaged connecting-bolts 19. An arcuate wear-plate 20 has its ends turned outwardly in the plane of the chord of the arc, and these outwardly-turned ends are clamped between the ends of the sections 15 and 16. The upper section 16 of the cylinder-shell has a slightly-greater interior diameter than the lower section 15, and the arcuate plate 20 is adapted to lie in such position that its inner surface will form a continuation of the curvature of the inner surface of the lower section. Above the center of the cylinder and parallel with the axis thereof there is disposed a piston-shaft 21, which is mounted in bearings 22 in the heads of the cylinder, and these bearings are provided with interior stuffing-boxes 24, which prevent leakage of steam around the shaft. The heads of the cylinder are recessed, as shown in the drawings, to increase the length of the interior of the cylinder beyond the length of the central shell, and upon the piston-shaft there is fixed a cylindrical piston 26, which is thus eccentric to the cylinder, and this piston lies with its uppermost portion in contact with the wear-plate 20, said piston at all other points being spaced from the wear-plate and the lower section 15 of the cylinder. The wear-plate 20 receives direct wear of the piston and also of

the heads 28 and 29 thereof, hereinafter described, and to compensate for the wear of the plate and the contacting movable portions a seat is cut in the inner surface of the upper section 16 of the cylinder between it and the wear-plate, and in this seat is disposed a follower-plate 30, which bears against the wear-plate and is adapted for movement radially of the cylinder by means of set-screws 31, engaged with the shell of the cylinder, thus to move the wear-plate which may be adjusted toward the piston to compensate for wear and to prevent leakage, this wear-plate forming, in effect, the abutment of the engine. The piston-heads which are disposed in a diametrical slot 32, formed through the piston and the shaft thereof, includes two plates 30 and 31, one of these plates 30 having pins 33, which engage slidably the perforations 34 in the adjacent edge of the plate 31, and upon these pins are disposed helical springs 35, which act to hold the plates yieldably separated, as illustrated. The outer ends of the plates 30 and 31 are grooved longitudinally, as shown at 36, and in these grooves are movably placed the ends of the stems of T-rails 37, the heads of which are disposed in contact with the inner surface of the cylinder and are held in contact therewith by the action of the springs 35, which tend to move the piston-heads radially of the piston. Thus as the piston rotates should any inequalities in the diameter of the cylinder be encountered the piston-heads will automatically move outwardly or will be moved inwardly to maintain proper frictional contact with the inner wall of the cylinder to maintain a steam-tight joint, and thus prevent leakage. The side edges of the plates of the piston are grooved, as are also the rails 37, and in these grooves are disposed packing-strips 38, which contact with the ends of the cylinder. As above stated, the ends of the piston enter the recesses in the heads of the cylinder, so that the side edges of the plates 30 and 31 may contact closely with the ends of the contracted portion of the cylinder lying adjacent to the shell.

In the shell of the cylinder and at each side of the point of contact of the piston with the movable or adjustable wear-plate or abutment there is formed a port 39 and 40, respectively, and with these ports are connected pipes 41 and 42, which lead to diametrically opposite points in the sides of a cylindrical valve-casing 43, the wear-plate having longitudinal slots 44 and 45, extending from near its ends to near its center and which act to communicate the cylinder with the ports.

In the uppermost portion of the valve-casing 43 is an opening 45′, with which connects a feed-pipe 46, while in the rear head of the valve-casing, and diametrically opposite to this opening 45′ is an exhaust-opening 47. A shaft 48 is mounted axially of the valve-casing, and upon this shaft and within the casing is a valve 49, comprising two oppositely-disposed sector-shaped portions which act to divide the valve-casing into two chambers. This valve may be adjusted to establish a chamber connecting the pipe 41 with pipe 46 and the pipe 42 with the pipe or opening 47 to feed to the left of the piston, as illustrated, or the valve may be shifted to connect the pipe 42 with the feed-pipe and the pipe 41 with the exhaust, as will be understood. Thus is formed a simple and efficient reversing-valve, through the medium of which the steam may be directed against either side of a piston-head to correspondingly rotate the piston, the steam being discharged at the proper time.

The cut-off valve of the engine is isolated from the cylinder itself and includes a valve member 50, comprising a hub 51, having oppositely-disposed sector-shaped wings 52 and 53. This valve is secured rigidly upon the piston-shaft exteriorly of the cylinder to rotate therewith and is inclosed in a cylindrical casing, against the inner periphery and the inner faces of the heads of which it closely fits. The steam-supply pipe 54 from the source of supply communicates with the casing of this cut-off valve through one end or head thereof adjacent to the periphery of the casing, while the feed-pipe 45, which connects with the casing of the reversing-valve above described, communicates with the cut-off-valve casing through the opposite end thereof and directly in line with the communication of the pipe 54. Thus, as the shaft of the piston rotates, the casing 56 of the cut-off valve being held stationary, the openings 57 and 58, through which the pipes 45 and 54 communicate with the casing 56, will be alternately covered and uncovered by the wings of the valve, the period of uncovering corresponding to the proper period of supply of steam to the engine. A throttle-valve 59 is placed in the pipe 54 for controlling the supply of steam to the engine, and it will be seen that when this throttle is open the piston will be rotated, depending, of course, upon the position of the reversing-valve for its direction of rotation. With a cut-off valve of this nature there is of course a liability of either wing to stop in a position to cut off the supply of steam to the engine, and thus to establish a dead-center, and to start the engine under such circumstances a branch feed-pipe is taken from the pipe 45 direct to the pipe 54 and is connected with the throttle-valve 59. This valve 59 may be opened to permit a flow of steam direct to the casing of the reversing-valve and thence to the cylinder and upon being further operated to close the passage to the reversing-valve and form one to the cut-off valve 56.

Suitable pulleys 61 may be mounted upon the shaft of the engine for engagement by belts to convey power.

It will be understood that in practice various modifications of the specific construction shown may be made and that any suitable materials and proportions may be used

for the various parts without departing from the spirit of the invention, and, furthermore, it will be seen that with the present structure wear of the abutment may be compensated for, while the engagement of the ends of the piston in the recesses in the heads of the cylinder permits the use of straight-sided plates 30 and 31 and insures an absence of apertures that would permit the escape of steam and require packing.

What is claimed is—

1. A rotary engine comprising a cylinder divided in a plane parallel with and to one side of the axis of the cylinder, an arcuate plate disposed against the inner face of the minor section of the cylinder and having its ends turned outwardly and clamped between the sections, said plate having openings therein, ports in the cylinder leading to said openings, and a piston rotatably mounted in the cylinder eccentric to the cylinder and in contact with the plate, said piston having heads adapted for projection at diametrically opposite points of its periphery and in contact with the inner periphery of the cylinder.

2. In a rotary engine the combination with a cylinder having the rotatable piston therein provided with a shaft extending interiorly of the cylinder, said piston having heads and adapted for reverse rotation, of a throttle-valve including a casing, pipes connecting the casing with the cylinder and supporting the casing, a steam-feed pipe connected to the casing, a steam-exhaust pipe connected with the casing, a casing encircling the piston-shaft exteriorly to the cylinder and having ports in its opposite ends and with which casing the steam-feed pipe is connected at one of the ports to hold the casing against movement, a steam-supply pipe connected with the last-named casing at the second port thereof and a valve within the second casing fixed to and rotatable with the shaft for intermittently cutting off communication between the supply and feed pipes.

In testimony whereof we hereunto set our hands in the presence of two witnesses.

JAMES T. HAYS.
JOHN W. WILSON.

Witnesses:
G. W. CROSSMAN,
J. C. BANE.