(No Model.) 3 Sheets—Sheet 1.

J. J. E. H. PAYNE.

ROTARY REVERSIBLE STEAM ENGINE.

No. 420,094. Patented Jan. 28, 1890.

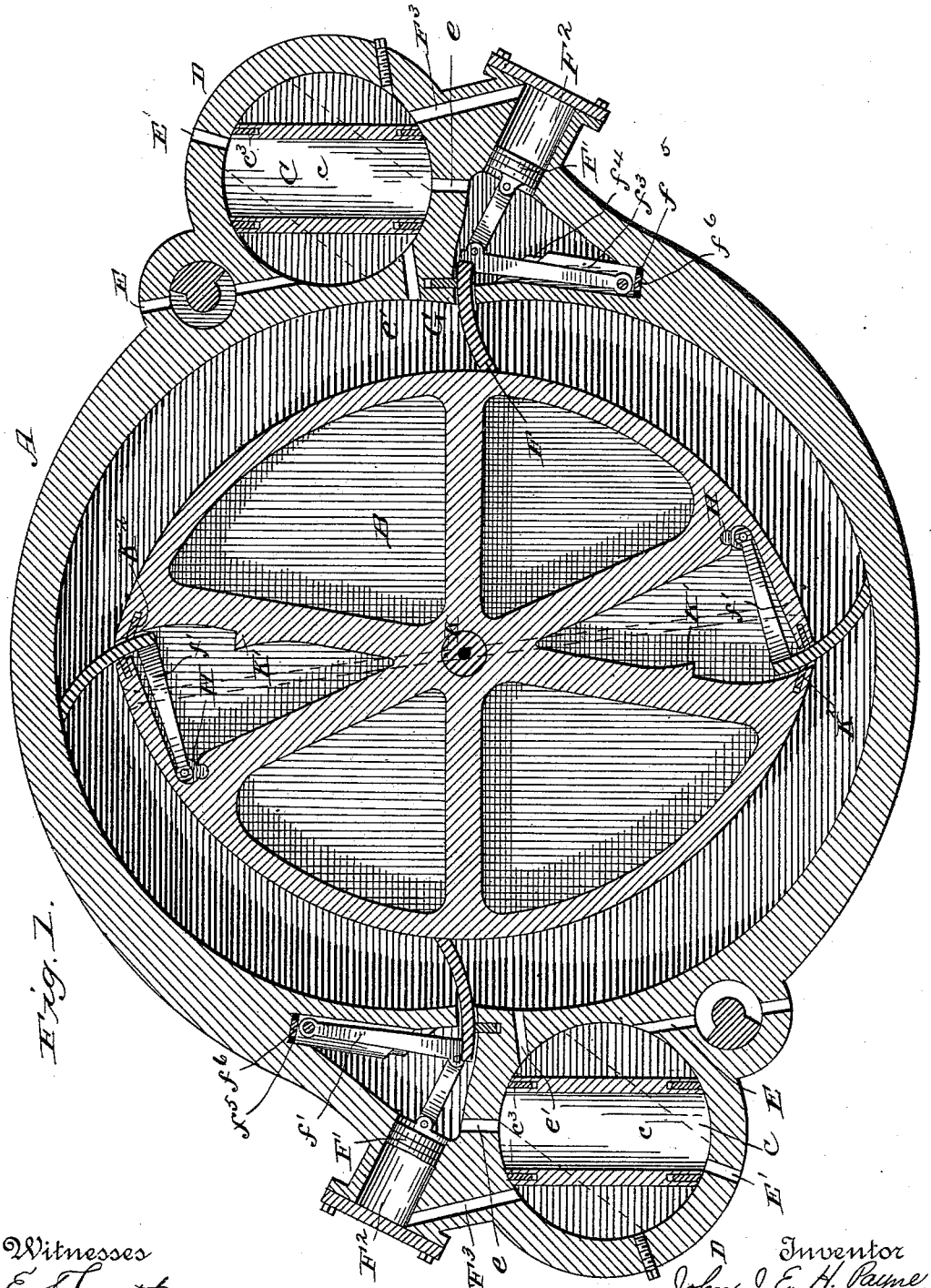


Fig. 1.

Witnesses
E. B. Smith
Alex. J. Stewart

Inventor
John J. E. H. Payne,
By His Attorneys
Church & Church

(No Model.) 3 Sheets—Sheet 2.

J. J. E. H. PAYNE.

ROTARY REVERSIBLE STEAM ENGINE.

No. 420,094. Patented Jan. 28, 1890.

Fig. 2

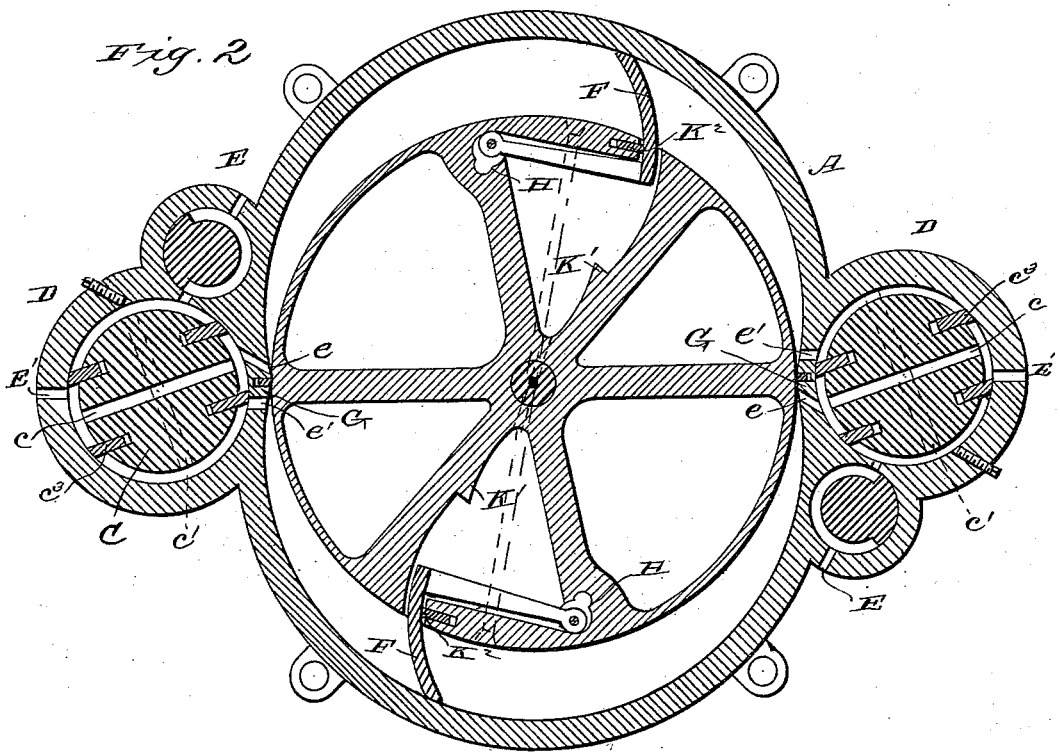
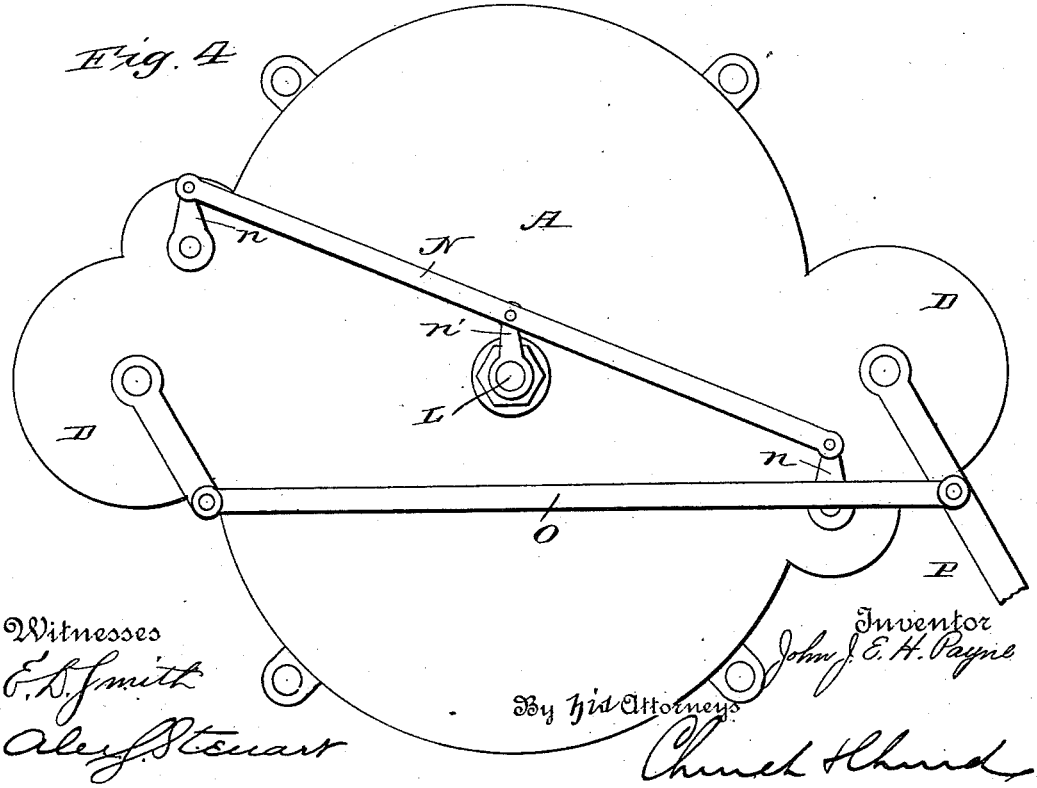


Fig. 4



Witnesses
E. D. Smith
Alex. J. Stewart

Inventor
John J. E. H. Payne
By his Attorneys
Church & Church

(No Model.) 3 Sheets—Sheet 3.

J. J. E. H. PAYNE.

ROTARY REVERSIBLE STEAM ENGINE.

No. 420,094. Patented Jan. 28, 1890.

Fig. 3.

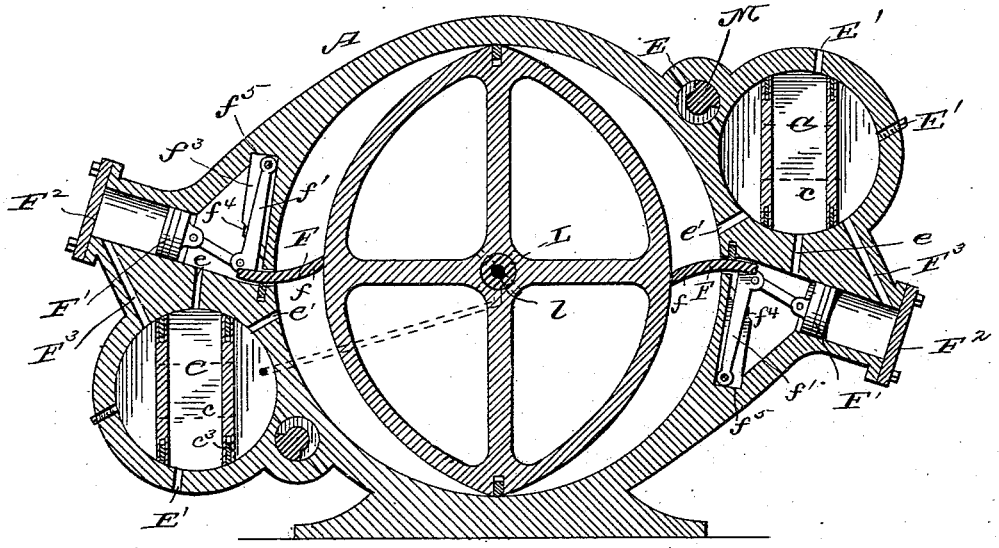


Fig. 5.

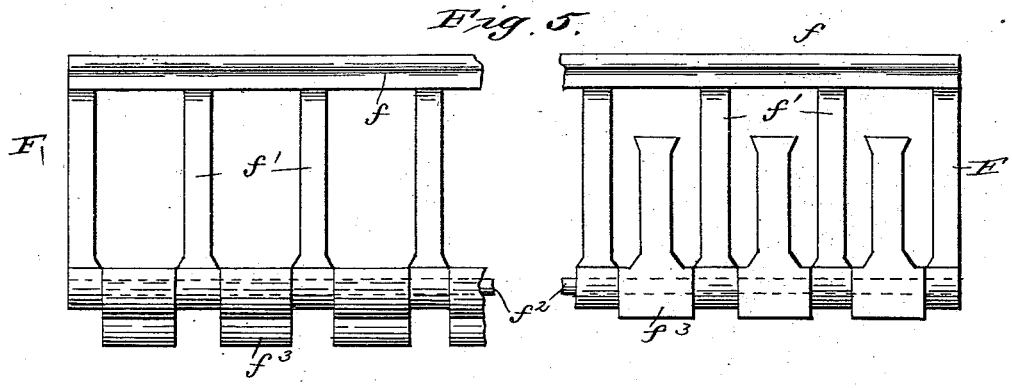


Fig. 6

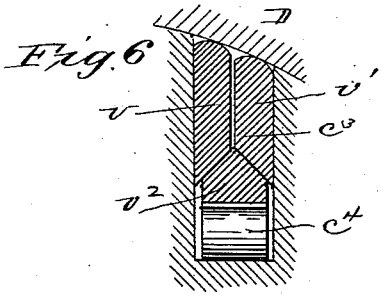
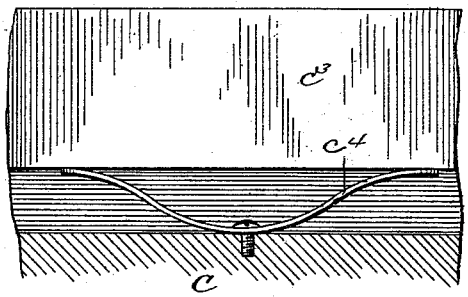


Fig. 7.



Witnesses
E. D. Smith
Alex. J. Stewart.

Inventor
John J. E. H. Payne,
By His Attorneys
Church & Church

UNITED STATES PATENT OFFICE.

JOHN J. E. H. PAYNE, OF LIPSCOMB, TEXAS.

ROTARY REVERSIBLE STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 420,094, dated January 28, 1890.

Application filed May 14, 1889. Serial No. 310,703. (No model.)

To all whom it may concern:

Be it known that I, JOHN J. E. H. PAYNE, of Lipscomb, in the county of Lipscomb and State of Texas, have invented certain new and useful Improvements in Rotary Reversible Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention relates to certain improvements in rotary engines, particularly those in which the direction of rotation may be changed at will, the object of the invention being to produce an engine of great simplicity of construction and economy in running, not easy to get out of order, and the parts of which can be readily removed and replaced when worn or broken.

With these ends in view the invention consists in certain novel details of construction and combinations and arrangements of parts, to be hereinafter described, and pointed out particularly in the claims at the end of this specification.

In the accompanying drawings, Figure 1 is a cross-sectional view of an engine constructed in accordance with my invention. Fig. 2 is a similar view of the engine with sliding abutments only on the piston, and also showing the valve for working the engine expansively. Fig. 3 is a similar view, with sliding abutments only in the cylinder. Fig. 4 is an end view showing the expansion-valve and reversing-valve-operating mechanism. Fig. 5 is a top plan view of one of the abutments, showing both forms of pivotal blocks. Fig. 6 illustrates the preferred form of packing. Fig. 7 is a longitudinal section of same.

Similar letters of reference in the several figures indicate the same parts.

The cylinder A, in which the rotary piston B works, may be of any desired length, according to the amount of power required, being in the preferred construction cast with suitable base projections on feet for attachment to a support, either in vertical or horizontal position, and at diammetrically-opposite points on the cylinder are arranged reversing-valves C, preferably working in suitable cylinders D, formed directly in extensions of the main cylinder. These valves C are formed with passages $c\,c'$, passing through the same at right angles, to permit of the simultaneous passage in opposite directions of the live and exhaust steam, such valve in the preferred form (shown in Fig. 2) consisting of a cylindrical piece of somewhat less diameter than the cylinder in which it works with the said passages bored through it, as just explained, and to define the chambers communicating with the passages sliding steam-tight packings c^3 are recessed into the cylindrical piece and kept pressed outward against the inner surface of the cylinder by springs c^4, as will be readily understood.

An entrance port or ports E is provided, opening either directly into the valve-chamber or through a suitable cut-off valve, to be presently described, and at a proper distance from the entrance port or ports is an exhaust port or ports E′, two or more in number for great speed, ports $e\,e'$ being provided leading from the valve-chamber into the cylinder, one or more on each side of the abutment which separates the exhaust from the live steam. When the valve is in one position, the port or ports on one side are in communication with the live-steam port or ports, and the port or ports on the other side with the exhaust port or ports, and when the valve is in reversed position to change the direction of rotation of the engine the position of the ports is reversed and steam let in and exhausted in the opposite direction.

In the form of engine illustrated in Figs. 1 and 3 pivoted sliding abutments F are provided in the cylinder at diametrically-opposite points, which, bearing on the piston, separate the live-steam from the exhausting chambers. These abutments consist of solid sliding sections f, forming the division-wall, and arms f', connected thereto at the upper end and pivotally connected to the cylinder-casing by means of a rod f^2, held by blocks f^3, dovetailed into the said casing, as shown in Fig. 1, the dovetail recess being formed by the projections f^4 and the recess f^5. These blocks f^3 are placed between each of the arms, as shown in Fig. 5, and a wedge-shaped piece

f^6, placed at the rear end for tightening them after they are in place. The abutments are located in chambers which form part of the passage from the valve-chamber to the cylinder, the part to the cylinder being formed directly beside the abutment, and in order to keep the abutment pressed in at all times a small piston F′, working in a cylinder F^2, is connected thereto, the pressure being constantly maintained above said piston through a port F^3, communicating with the steam-passage from the boiler.

With the construction thus far described the engine may be operated with a piston having stationary abutments, as illustrated in Fig. 3, the steam entering on one side of the sliding abutments and exhausting from the other, and the pressure being exerted on the abutments in the proper direction to rotate the piston in the well-known manner.

Although the engine as thus constructed will be found to be sufficient and of practical value, I prefer to employ pivoted sliding abutments on the piston, as illustrated in Figs. 1 and 2, the cylinder in such cases being made with inwardly-extending portions G, which, when the piston is cylindrical, as in Fig. 2, bear against the surface of the same throughout the whole circumference, and which, when the piston is elliptical, as in Fig. 1, only comes in juxtaposition thereto at the points where the sliding abutments are located, in order that the abutments may pass, abutments being in this instance also located in the cylinder at the points of the projections.

The pivoted sliding abutments when located in the piston are essentially the same as those heretofore described, the manner of pivoting them, however, being slightly changed as follows: Circular dovetail recesses H are formed inside of the piston, preferably by boring at opposite points, and blocks I, having apertures in one end, through which the rod on which the abutment's pivot passes, are provided for fitting in such recesses, thus enabling the abutments and blocks to be slipped out from one end of the piston when the cylinder-head is removed, thus permitting of the ready repair or renewal of the abutments. As the cutting of the slot in the wall of the piston might weaken the same, I preferably provide bolts K, which pass way across the piston between the arms of the abutments and connect with the portions of the outer wall of the piston lying between the radial arm, which might be so weakened, thus bracing and strengthening the same. The inward movement of the abutments is limited by the stops K′ on one of the radial arms, and steam-tight packing K^2 is arranged on each side of the abutment to prevent the steam from leaking in or out of the piston past the abutments. The abutments in the piston may be held outward by spring-pressure in the well-known manner; but I preferably connect the interior of the piston with the live-steam port or valve-chamber by means of a passage l, entering the piston through the drive-shaft L.

When it is desired to run the engine expansively or to cut off the supply of steam before a complete operative movement of the piston is made, permitting the steam already in the cylinder to rotate the piston by expansion, cut-off valves M are employed, located in the live-steam passages and controlling the admission of steam to the reversing-valves. These cut-off valves consist simply of cylindrical valves having the steam-passages in them arranged to cut off at the proper moment when rotated in unison with the piston, such rotation being communicated to them by means of the cranks n on the ends of the valves and the crank n' on the drive-shaft connected thereto by the rod N.

In order to insure the simultaneous movement of the reversing-valves, a rod O connects crank-arms thereon, and an operating-handle P, connected to one, serves to operate both.

The preferred form of packing used throughout the engine is illustrated in Figs. 6 and 7, wherein it will be seen that the packing itself is formed in three parts $v\,v'\,v^2$. v and v' constitute the wearing parts and are beveled at the inner ends for the accommodation of the wedge-shaped piece v^2, which is held outward by steam-pressure, or springs c^4 preferably being employed. This construction of packing insures a perfectly steam-tight joint, the inner piece v^2 keeping the outer pieces against the sides of the recess, and also affording a broad surface for the spring or steam to act against to keep the packing out and in firm contact with the co-operating surface.

An engine constructed in accordance with the foregoing description will be found to run smoothly without undue wear or friction, being easily reversed and of great rapidity and power. The sliding abutments in the piston, it will be noted, will, when the engine is in operation, tend to fly outward by reason of centrifugal force, thus dispensing, in a large measure, with the necessity of maintaining a high pressure of steam within the piston.

The operation and necessary movement of the valves to change the direction of rotation will now be readily understood, being as follows: Assuming that the parts are in the position shown in Fig. 1, steam will be passing through the ports E and rotating the piston to the left, the abutments being moved inward by the surface of the piston or cylinder, as the case may be, while passing the dead-center or point where the movable abutment passes from the exhaust to the live steam side. When now it is desired to reverse, the position of the valves is changed to the position indicated in dotted lines, Fig. 1, and steam admitted through the ports e, the exhaust being through the ports e'. If the cut-off valves be employed, the steam passing to

the piston will be cut off when the piston has completed the proper portion of its stroke, permitting the steam within the cylinder to act expansively in the well-known manner.

Having thus described my invention, what I claim as new is—

1. In a rotary engine, the combination, with the rotary piston and oppositely-arranged movable abutments, of the oppositely-arranged reversing and exhaust valves having passages therein for the live and exhaust steam and connected to work in unison, substantially as described.

2. In a rotary engine, the combination, with the rotary piston and oppositely-arranged movable abutments, of the oppositely-arranged reversing-valves connected to work in unison and having passages through the same at substantially right angles for the live and exhaust steam, arranged and combined for operation substantially as described.

3. In a rotary engine, the combination, with the rotary piston and cylinder having a movable head, with recesses in said piston and cylinder, of the removable blocks fitting in said recesses and the movable abutment pivoted in said block, substantially as described.

4. In a rotary engine, the combination, with the rotary piston, of the sliding abutments pivoted in removable blocks dovetailed in the casing, substantially as described.

5. In a rotary reversible engine, the combination, with the rotary piston, oppositely-arranged reversing-valves, and corresponding movable abutments with steam-ports on each side of the same, of the cylinders in communication with the valve-chambers, the pistons working in said cylinders and connected to the abutments for keeping the same pressed out, substantially as described.

6. In a rotary reversible engine, the combination, with the rotary piston, reversing-valve, and movable abutment having steam-ports on each side of the same, of the cylinder having a single port, which is in communication with the steam-supply, a piston working in said cylinder, and a link connecting said piston and movable abutment, whereby the abutment is held in at all times, substantially as described.

7. In a rotary engine, the combination, with the cylinder having the movable abutments pivoted in blocks dovetailed therein, of the rotary piston having the movable abutments pivoted in blocks dovetailed in the wall of the piston, substantially as described.

8. In a rotary engine, the combination, with the rotary piston and sliding abutments, of the valve having the passages passing through the same at right angles and the packing for defining the chambers with which said passages open, substantially as described.

9. In a rotary engine, the combination, with the rotary piston and movable abutments, of the reversing-valves formed of the cylinders having the ports through the same for the passage of steam, said cylinder fitting loosely within the valve-casing, and the packing located in seats in the cylinder between the ports, whereby chambers are formed into which the ports open, and ports for opening communication between said chambers and engine cylinder or exhaust, substantially as described.

10. In a rotary engine, the combination, with the rotary piston, movable abutments, and diametrically-opposite reversing-valves connected for simultaneous movement, of the rotary cut-off valves, one in the supply to each reversing-valve, the rod connecting said valves, and a crank-connection between said rod and engine-shaft, substantially as described.

11. In a rotary engine, the combination, with the cylinder and rotary piston, of the movable abutments, the blocks in which they take their bearings recessed into the cylinder, and the wedges for tightening said blocks, substantially as described.

JOHN J. E. H. PAYNE.

Witnesses:
H. B. SPILLER,
O. H. BUTTON.