No. 677,088. Patented June 25, 1901.

T. M. KENNEY.

ROTARY ENGINE.

(Application filed Aug. 27, 1900.)

(No Model.) 2 Sheets—Sheet 1.

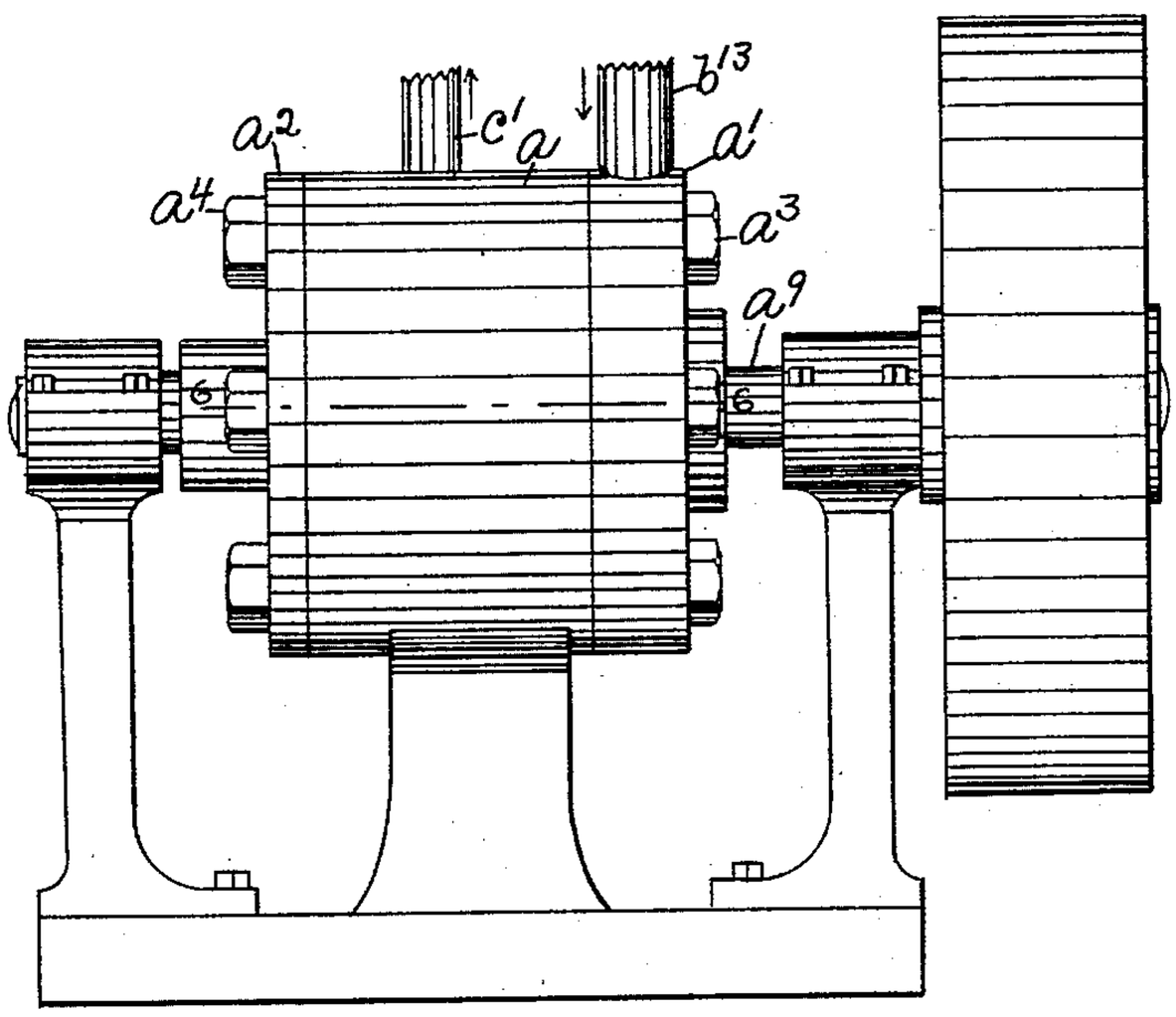

Fig. 1.

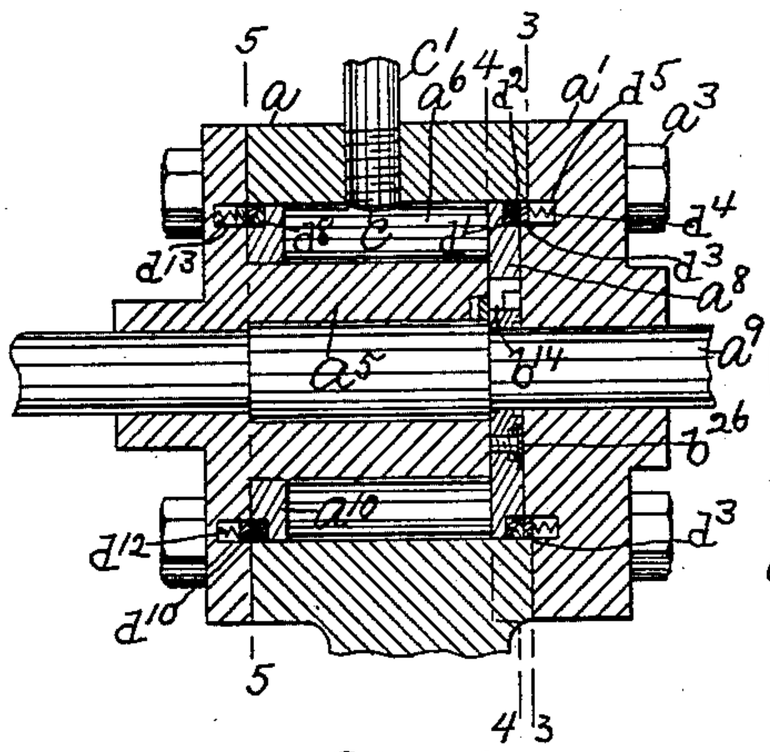

Fig. 2.

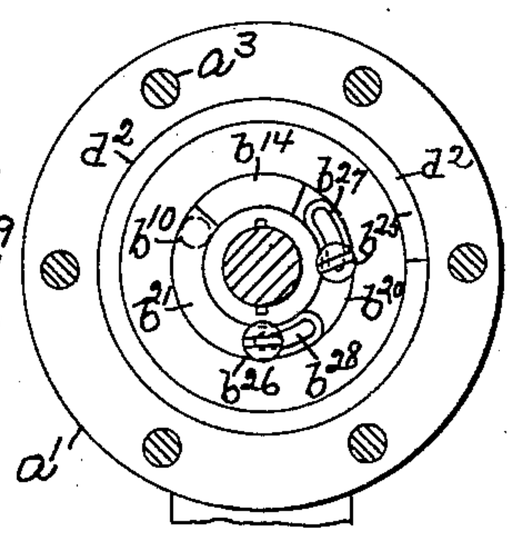

Fig. 3.

Witnesses.
C. H. Lamett
J. Murphy.

Inventor:
Thomas M. Kenney
by Jas. H. Churchill
Atty.

No. 677,088. Patented June 25, 1901.

T. M. KENNEY.

ROTARY ENGINE.

(Application filed Aug. 27, 1900.)

(No Model.) 2 Sheets—Sheet 2.

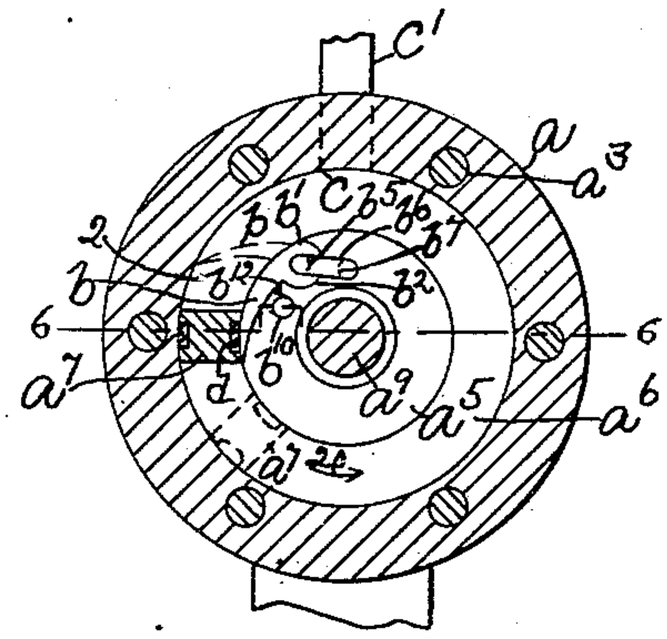

Fig. 4.

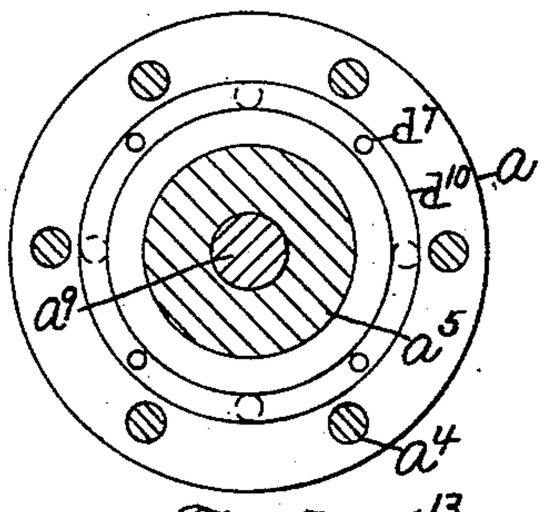

Fig. 5.

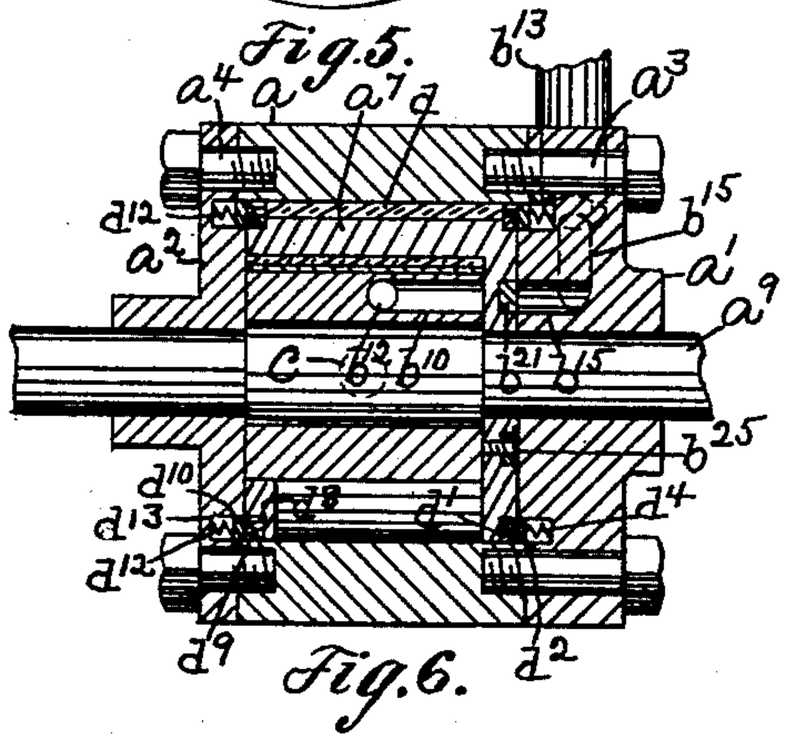

Fig. 6.

Witnesses.
C. H. Emmett.
J. Murphy.

Inventor:
Thomas M. Kenney
by Jas. H. Churchill
Atty.

UNITED STATES PATENT OFFICE.

THOMAS M. KENNEY, OF CAMBRIDGE, MASSACHUSETTS, ASSIGNOR OF TWO-THIRDS TO HENRY COWAN AND ELIAS A. COWAN, OF BOSTON, MASSACHUSETTS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 677,088, dated June 25, 1901.

Application filed August 27, 1900. Serial No. 28,089. (No model.)

To all whom it may concern:

Be it known that I, THOMAS M. KENNEY, a citizen of the United States, residing in Cambridge, county of Middlesex, and State of Massachusetts, have invented an Improvement in Rotary Engines or Motors, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to a rotary engine or motor of a novel construction, as will be described.

The engine or motor referred to may be actuated by steam, hot air, gas, water, or other suitable medium or agent; but to facilitate description it will be hereinafter referred to as a "steam-engine."

The engine or motor may be simple or compound, and in the present instance I have chosen to illustrate it as a single engine or motor.

In accordance with this invention the engine comprises, essentially, a cylinder or casing provided within it with a hollow hub of substantially the length of the cylinder and through which the shaft of the engine is extended. The hollow hub referred to forms, with the cylinder or casing, an annular chamber or passage, into which is projected or extended an arm or piston connected to the shaft, as will be described, and adapted to travel or move in the circular passage about the said hub. The circular passage or chamber constitutes the cylinder proper of the rotary engine and is provided with suitable steam inlet and exhaust ports, as will be described, and the said chamber is provided with a movable abutment which coöperates with the said revoluble piston and which is movable into and out of the said circular path in which the said piston revolves, as will be described.

The engine may and preferably will be provided with a cut-off valve, as will be described.

These and other features of this invention will be pointed out in the claims at the end of this specification.

Figure 1 is a front elevation of a rotary engine or motor embodying this invention; Fig. 2, a vertical longitudinal section of the engine shown in Fig. 1; Fig. 3, a transverse section on the line 3 3, Fig. 2, looking toward the left; Fig. 4, a transverse section on the line 4 4, Fig. 2, looking toward the left; Fig. 5, a transverse section on the line 5 5, Fig. 2, looking toward the right; and Fig. 6, a horizontal longitudinal section on the line 6 6, Fig. 1, looking up.

The rotary engine herein shown as embodying this invention comprises a cylindrical casing a, provided with the heads a' a^2, firmly secured to the said casing, as by screws or bolts a^3 a^4. The cylindrical casing a contains within it a hollow hub a^5, of substantially the length of the cylinder and secured to or forming part of one of the cylinder-heads, it being shown in the present instance as integral with the head a^2. The hollow hub a^5 is cylindrical in shape, as herein shown, and forms, with the cylinder a, a circular passage or chamber a^6, in which moves an arm or piston a^7, (see Figs. 4 and 6,) secured to or forming part of a disk a^8, keyed or otherwise rendered fast on a shaft a^9, extended through the hub a^5 and the heads a' a^2, as herein shown.

The piston or arm a^7 is designed to be moved in the circular passage or chamber about the hub a^5, and the said piston at its end opposite to the disk a^8 may and preferably will have secured to or forming part of it a ring a^{10}, (see Fig. 2,) which is adapted to fit over the hub a^5 and to make substantially close contact with the same and with the inner circumference of the cylinder a. The piston or arm a^7 has coöperating with it a movable abutment normally removed from the path of revolution or travel of the piston a^7—that is, the movable abutment is normally removed from the circular passage a^6. The movable abutment may and preferably will be made as herein shown and consists of a movable segment of the hub a^5, (see Fig. 4,) preferably made separate therefrom and composed of a curved arm b and a rounded enlargement or knuckle b', which latter is adapted to turn in a substantially semicircular socket, channel, or groove b^2, extended substantially the length of the hub a^5, the said hub also having its outer circumference chamfered off or shaped to a depth sufficient to permit the outer sur-

face of the arm b to form a continuation or part of the outer circumference of the hub a^5 when the said arm is in its normal position. (Shown by full lines, Fig. 4.) The knuckle b' is pivoted at its opposite ends, which may be effected by providing one end of the knuckle with a suitable hole to enable that end of the hnuckle to fit over a stud or pin projecting from the head a^2 and not herein shown, the other end of the said knuckle having a suitable hole for the reception of a pivot-pin b^5, attached to an arm b^6, fastened to the end of the hub a^5, which may be effected by providing the arm b^6 with a second pin or stud b^7, which is driven into a suitable hole in the end of the hub a^5. By reference to Fig. 4 it will be seen that the segmental abutment normally completes the circumference of the hub a^5; but in order to revolve the piston a^7 the said segmental abutment is moved so as to extend across the circular passage a^6, which may be accomplished, as herein shown, by means of the steam admitted into the circular passage a^6 through an inlet-passage b^{10}, made in the hub a^5 and extended from the end longitudinally toward the center of the said hub, where the said passage communicates with a passage b^{12}, extended to the outer surface of the hub a^5 below the arm of the movable abutment. The steam-passage b^{10} is designed to be connected with a steam-inlet pipe b^{13} by a port or passage b^{14} in the disk a^8, (see Figs. 2 and 3,) and a passage b^{15} in the head a', which latter passage is herein shown as angular in form and as extended to the periphery of the head a', where it communicates with the steam-inlet pipe b^{13}. The steam port or passage b^{14} in the disk a^8 may and preferably will be made in the form of a segmental slot (see Fig. 3) extended through the disk and forming part of a circular groove b^{20} in the outer face of the disk, the said groove receiving within it a segmental ring b^{21}, constituting a cut-off valve, which is adjustably secured within said groove, as by set-screws b^{25} b^{26}, extended through slots b^{27} b^{28}, countersunk in the said segmental ring and into suitable threaded sockets in the disk a^8. (See Fig. 2.) By moving the ring in its groove so as to project beyond one end of the slot b^{14} the length of the steam port or passage in the disk may be varied, and thereby the length of time in one revolution of the disk a^8 that the port or passage is in communication with the steam-inlet is varied.

The steam admitted into the passage b^{10} through the port in the disk a^8, which latter practically constitutes the main valve for the rotary engine, passes into the port or passages b^{10} b^{12} and lifts the segmental arm b, turning it on its pivots until the end or edge of the said arm is brought into contact with the inner circumference of the cylinder a, as represented by dotted lines in Fig. 4. The movable abutment is thus acted upon by the steam as soon as the piston or arm a^7 in its travel or revolution in the direction indicated by the arrow 20, Fig. 4, passes off from or out of engagement with the segmental arm of the movable abutment, and when the piston a^7 has passed by the abutment and the latter has been thrown or forced out into its dotted-line position a live-steam chamber 2 is formed between the piston and abutment, and the abutment being stationary the piston is caused to travel in its circular path about the stationary hub a^5. As the piston a^7 is thus moved the valve-disk a^8 and the shaft a^9 are also simultaneously rotated. The piston referred to continues to be acted upon by live steam until the valve-disk a^8 in its rotation carries the port or slot b^{14} past the mouth of the passage b^{10} and closes the same by a solid portion of the said disk, thereby cutting off the admission of the high-pressure or non-expanded steam into the chamber 2, and thereafter the piston a^7 is carried around about the hub a^5 by the expansion of the steam, which continues to expand until the exhaust-port c, leading from the chamber a^6, is uncovered by the piston a^7, and when the piston passes by the exhaust-port c sufficiently to connect the chamber 2 with the exhaust-pipe c' steam-pressure upon the abutment is withdrawn and the latter is returned to its full-line position by gravity, assisted, it may be, by the piston a^7, which is carried over the abutment in its closed or normal position, as herein shown, by momentum. In Fig. 4 the piston a^7 is represented by full lines as over the arm b of the movable abutment, and the entire circular passage a^6 is in communication with the exhaust-pipe c', so that the piston is balanced and the momentum is sufficient to carry the said piston over and off from the movable abutment and permit the latter to be moved by the pressure of the live steam into the position indicated by dotted lines. When the piston a^7 is being driven or forced around the hub a^5 by the live steam in the chamber 2, formed by the piston a^7 and its abutment, the said piston is unbalanced, as the portion of the circular passage a^6 in front of the piston a^7 is in communication with the exhaust-port c, but any torsional strain or effect due to the unbalancing of the steam-pressure on the piston a^7 is wholly or largely counteracted by the solid bearing afforded the piston a^7 by the stationary hub a^5.

The movable parts of the engine or motor may be provided with suitable packing in order to obtain steam-tight joints, and in the present instance the piston a^7 is represented as provided with strips d of packing material inserted into longitudinal slots in the upper and lower faces of the said piston; but the said piston may be packed in any other suitable or desired manner—as, for instance, the packing-strips may be secured to the front and rear sides or faces of the said piston. The valve-disk a^8 may be packed in any suitable manner, and I may prefer to pack the same, as herein shown, by means of two beveled split rings d' d^2, set in an annular recess in the face of the disk contiguous to

the head a', with the beveled faces of the said split rings in contact with each other, as shown in Fig. 6, the said recess being made at the outer circumference of the disk a^8, so that one of the split rings, as d^2, may make contact with the inner circumference of the cylinder a.

In order to automatically take up wear of the packing-rings d' d^2, the ring d^2 may be engaged by a ring d^3, fitted in an annular groove in the inner face of the head a' and pressed against the packing-ring d^2 by suitable springs d^4, set in suitable holes or sockets d^5 in the head a', as represented in Fig. 6, and the ring d^3 may be held from turning by means of studs or pins d^7 on it, (see Fig. 5,) extended into suitable holes in the head a'.

The ring a^{10}, attached to the piston a^7 at its end opposite to the disk valve a^8, may be packed in a similar manner by split beveled rings d^8 d^9 and a spring-pressed ring d^{10}, acted upon by springs d^{12} in sockets d^{13} in the head a^2, the ring d^{10} being prevented from moving with the piston by pins or studs. (Not shown, but similar to the pins or studs d^7.) If desired, the movable abutment may also be provided with suitable packing.

I have shown my invention as embodied in a single-acting engine; but it may also be embodied in a compound engine by connecting the exhaust-pipe c' with the inlet-pipe of a duplicate engine arranged on the shaft a^9, with the cylinder a set so that its inlet-port b^{10} may be quartering or at any other desired angle with relation to the inlet-port b^{10}.

The rotary engine herein shown may be made reversible, if desired, by a proper arrangement of additional steam inlet and exhaust ports.

By reference to Fig. 4 it will be seen that when the arm b of the movable abutment is thrown outward by the live steam the said arm is cushioned by the exhaust-steam in the chamber a^6, and on the return movement of the said abutment it is again cushioned by the steam in the chamber a^6, thereby rendering the operation of the abutment noiseless.

I claim—

1. In a rotary engine, a stationary cylinder, a hollow stationary hub located therein and of substantially the length of the cylinder to form a circular passage or chamber between said hub and cylinder and extended entirely around said hub, a shaft revoluble in said hub, a piston or arm inserted into the circular passage and movable therein about the stationary hub, means to connect the said piston with the said shaft, a steam-actuated pivoted abutment normally removed from the path of the said piston, but adapted to be projected into the path of movement of the said piston by the steam and form a live-steam space with said piston, and suitable steam inlet and exhaust ports, substantially as described.

2. In a rotary engine or motor, a stationary cylinder, a hollow stationary hub located therein to form therewith a circular passage or chamber extended entirely around said hub, a shaft revoluble in said hub, a piston or arm movable in said circular passage about the said hub, a disk fast on said shaft and to which the said piston is attached, a steam-actuated movable abutment normally withdrawn from the circular passage but adapted to be projected by the steam into said passage to form an abutment coöperating with the said piston, an exhaust-port for the circular passage, and a steam-inlet port for said circular passage controlled by the said disk, substantially as described.

3. In a rotary engine or motor, a cylinder, a stationary hub located therein and forming therewith a circular passage or chamber, a steam-actuated movable abutment normally forming part of the said stationary hub, a steam-inlet port in said hub having its discharge-mouth below said movable abutment, and a piston movable bodily about the said hub over the said movable abutment and cooperating with said abutment to form a closed steam-space, substantially as and for the purpose specified.

4. In a rotary engine or motor, a stationary cylinder, a stationary hub located therein and forming therewith a circular passage or chamber extending entirely around said hub, a piston or arm movable bodily in said circular passage about the said stationary hub, a shaft revoluble in said stationary hub, means to connect the said piston with the said shaft, an inlet and an exhaust port for the circular passage, and a steam-actuated pivoted abutment normally removed from the circular passage and adapted to be projected across the same after the said piston has passed by the said abutment, and to be withdrawn from the said passage in front of the piston, substantially as described.

5. In a rotary engine or motor, a cylinder provided with heads a' a^2, a hollow hub attached to one of said heads and extended into the cylinder to near the other head to form a circular passage or chamber, a shaft extended through said hub and heads, a disk fast on said shaft between the end of the said hub and the head a' of the cylinder, a piston attached to said disk and extended into the circular passage toward the opposite head of the cylinder, a movable abutment normally forming a segment of the said hub and pivotally secured thereto, a steam port or passage in said hub extended from its end toward its center and opening under the segmental abutment, a steam-inlet port in the head a', a port or opening in the disk adapted to connect the steam-inlet in the head a' with the steam-passage in the hub, and an exhaust-port for the circular passage, substantially as described.

6. In a rotary engine or motor, a cylinder provided with heads a' a^2, a hollow hub attached to one of said heads and extended into the cylinder to near the other head to form a circular passage or chamber, a shaft ex-

tended through said hub and heads, a disk fast on said shaft between the end of the said hub and the head a' of the cylinder, a piston attached to said disk and extended into the circular passage toward the opposite head of the cylinder, a movable abutment normally forming a segment of the said hub and pivotally secured thereto, a steam port or passage in said hub extended from its end toward its center and opening under the segmental abutment, a steam-inlet port in the head a', a port or opening in the disk adapted to connect the steam-inlet in the head a' with the steam-passage in the hub, means to regulate the size of the port or opening in the said disk, and an exhaust-port for the circular passage, substantially as described.

7. In a rotary engine or motor, a cylinder provided with heads a' a^2, a hollow hub attached to one of said heads and extended into the cylinder to near the other head to form a circular passage or chamber, a shaft extended through said hub and heads, a disk fast on said shaft between the end of the said hub and the head a' of the cylinder, a piston attached to said disk and extended into the circular passage toward the opposite head of the cylinder, a ring a^{10} attached to the end of the piston opposite to the said disk, packing-rings carried by said disk and the ring a^{10}, a movable abutment normally forming a segment of the said hub and pivotally secured thereto, a steam port or passage in said hub extended from its end toward its center and opening under the segmental abutment, a steam-inlet port in the head a', a port or opening in the disk adapted to connect the steam-inlet in the head a' with the steam-passage in the hub, and an exhaust-port for the circular passage, substantially as described.

8. In a rotary engine or motor, a cylinder provided with heads a', a^2, a hollow hub attached to one of said heads and extended into the cylinder to near the other head to form a circular passage or chamber, a shaft extended through said hub and heads, a disk fast on said shaft between the end of the said hub and the head a' of the cylinder, a piston attached to said disk and extended into the circular passage toward the opposite head of the cylinder, a ring a^{10} attached to the end of the piston opposite to the said disk, split and beveled packing-rings carried by said disk and the ring a^{10}, means carried by the heads a' a^2 to act on the said packing-rings to take up the wear of the same, a movable abutment normally forming a segment of the said hub and pivotally secured thereto, a steam port or passage in said hub extended from its end toward its center and opening under the segmental abutment, a steam-inlet port in the head a', a port or opening in the disk adapted to connect the steam-inlet in the head a' with the steam-passage in the hub, and an exhaust-port for the circular passage, substantially as described.

9. In a rotary engine, the combination with a casing, of a hub extended into said casing and provided with a movable abutment normally forming a segment of said hub and pivoted to it to be moved away from said hub and into engagement with the wall of the casing, said hub having a substantially radial passage in it opening under said abutment, and a longitudinally-extended passage communicating with said radial passage and extended to the end of the said hub, and a steam-inlet in the casing adapted to communicate with the end of said longitudinally-extended passage, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THOMAS M. KENNEY.

Witnesses:
JAS. H. CHURCHILL,
J. MURPHY.