J. W. CURTIS & M. M. PARKER.

ROTARY ENGINE.

APPLICATION FILED JUNE 10, 1912.

1,058,157.

Patented Apr. 8, 1913.

3 SHEETS—SHEET 1.

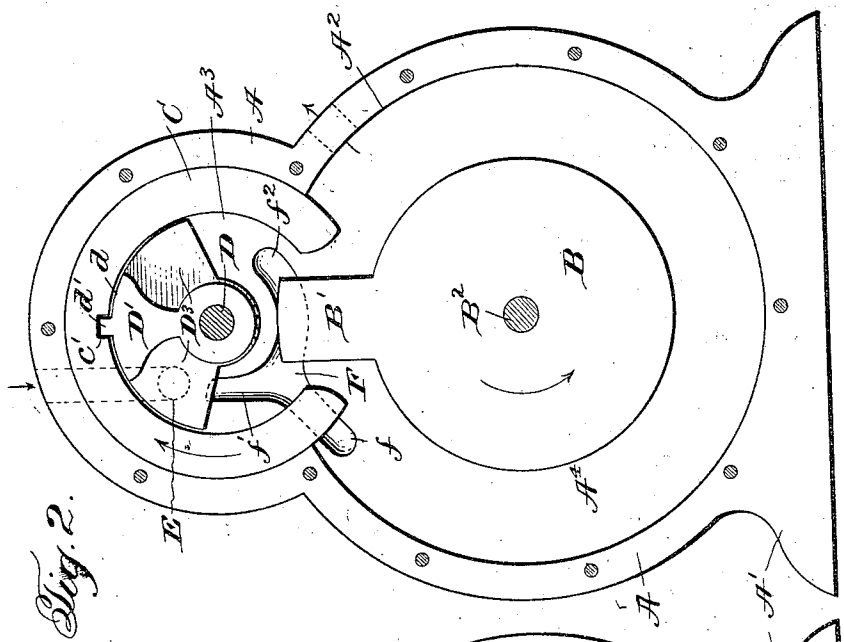

Fig. 2.

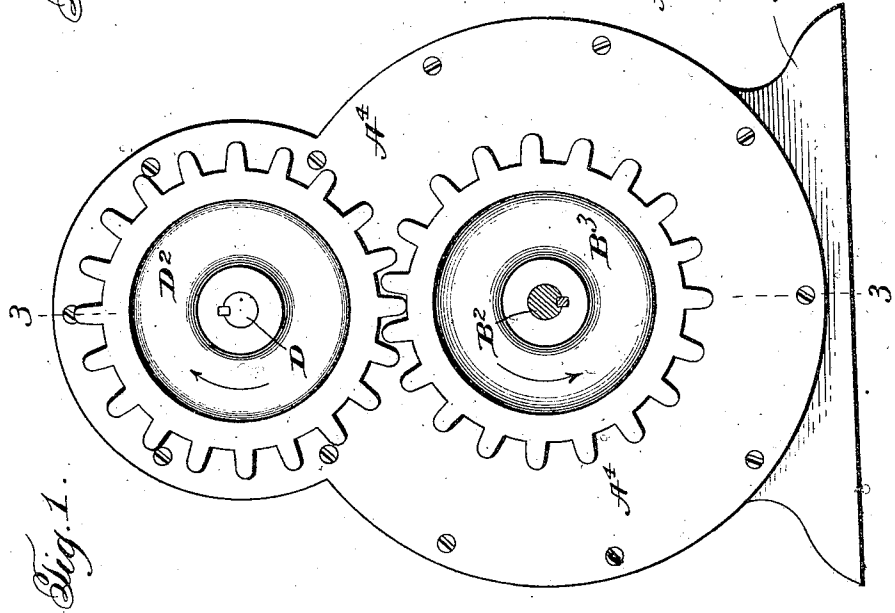

Fig. 1.

Witnesses

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Fig. 6.

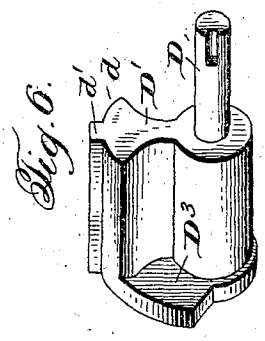


Fig. 4.

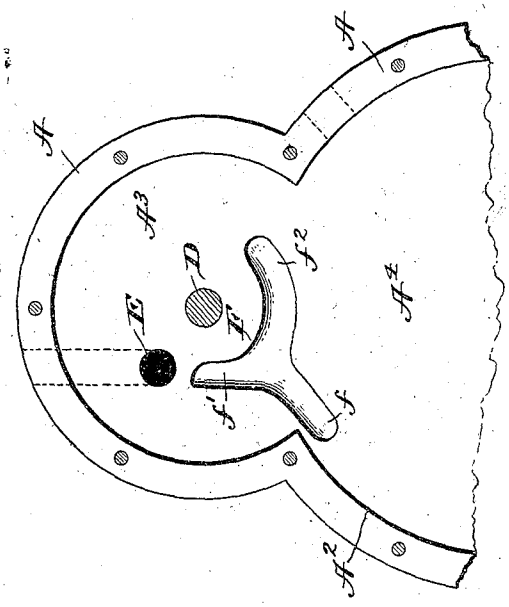


Fig. 5.

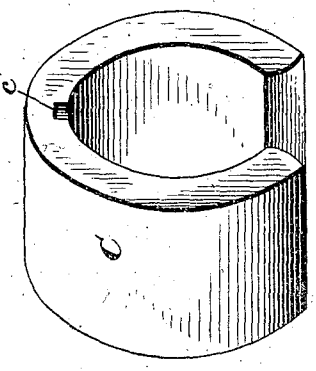
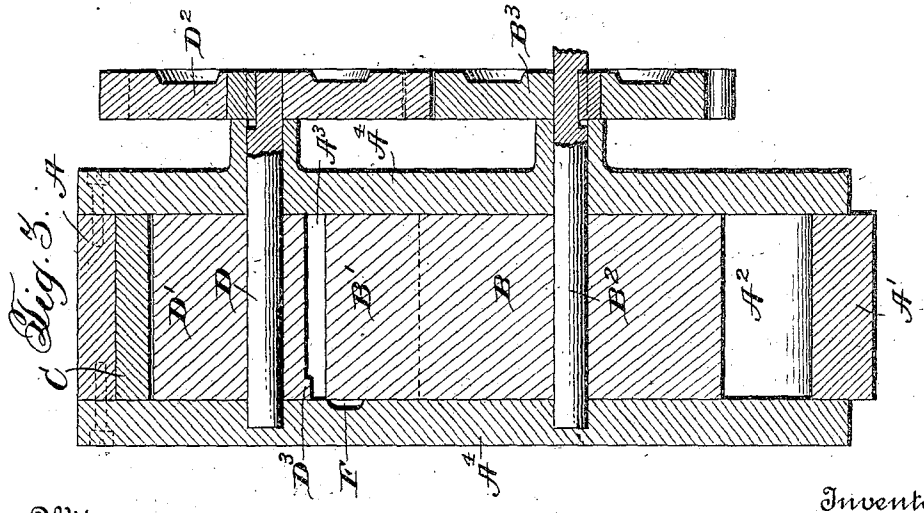


Fig. 3.



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3 SHEETS—SHEET 3.

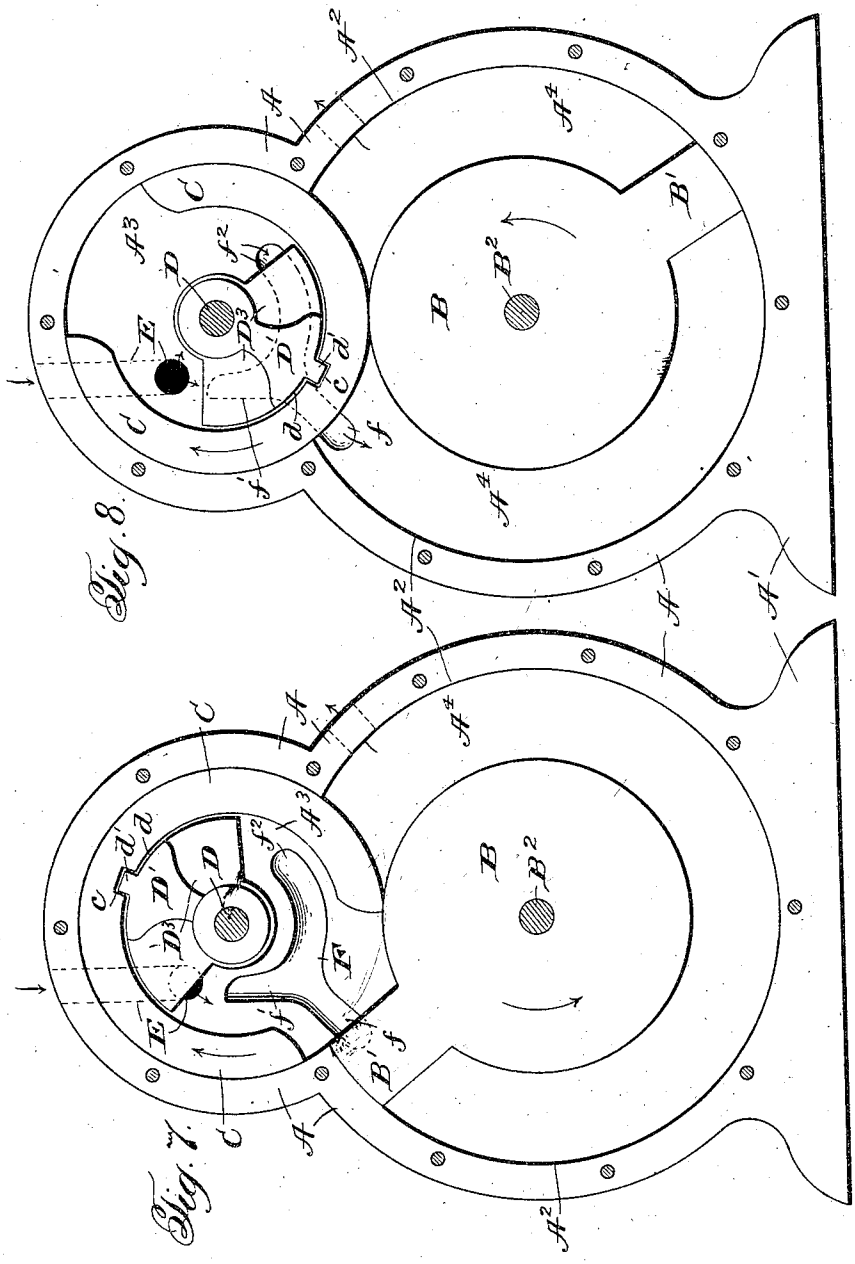

Fig. 8.

Fig. 7.

Witnesses:

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UNITED STATES PATENT OFFICE.

JOHN W. CURTIS AND MALCOLM M. PARKER, OF WILMINGTON, NORTH CAROLINA.

ROTARY ENGINE.

1,058,157. Specification of Letters Patent. Patented Apr. 8, 1913.

Application filed June 10, 1912. Serial No. 702,811.

To all whom it may concern:

Be it known that we, JOHN W. CURTIS and MALCOLM M. PARKER, citizens of the United States, residing at Wilmington, in the county of New Hanover and State of North Carolina, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to an improvement in rotary engines and the primary object of the invention is the provision of an efficient device of this character of such a construction as will enable a large number of the parts and a great amount of the packing heretofore employed in connection with devices of this character to be dispensed with.

To this end, the invention contemplates in a rotary engine of a rotary piston and rotary abutment type, the provision of an abutment of such a construction that the desired steam tight joint may be maintained between the abutment and piston without the employment of any packing at that point.

The invention further contemplates in an engine of this character, the admission of steam direct to the abutment chamber and a rotary abutment of such a construction that it will control the admission of steam to the abutment chamber and the passage of steam from the abutment chamber to the piston chamber.

Other objects of the invention will be apparent from the detailed description hereinafter when read in connection with the accompanying drawings forming a part hereof, wherein a convenient embodiment of the invention is illustrated, and wherein like characters of reference refer to similar parts in the several views.

In the drawings: Figure 1 is a side elevation of a rotary engine embodying the present invention; Fig. 2 is a vertical transverse section of the engine with the parts shown in the positions occupied when the piston is traveling under momentum; Fig. 3 is a cross section on line 3—3 of Fig. 1; Fig. 4 is a transverse vertical section through the abutment chamber and the upper portion of the piston chamber, the abutment and piston being removed; Fig. 5 is a perspective view of the ring like member of the abutment; Fig. 6 is a perspective view of the shaft and arm for supporting and rotating the ring like member of the abutment; Fig. 7 is a transverse vertical section of the engine showing the position of the parts just as steam is being admitted to the abutment chamber; and Fig. 8 is a similar view showing the position of the parts after the piston has been rotated for a part of a revolution and while steam is still being admitted to the abutment chamber and from thence to the piston chamber.

Referring now more particularly to the drawings, A designates a casing which is provided with a suitable supporting base A′ and with a cylindrical piston chamber A^2, and a smaller cylindrical abutment chamber A^3 therein, said chambers intersecting so that the abutment chamber is in communication with the piston chamber. The sides of the casings are closed by suitable heads A^4 which may be secured in position in any desired manner so as to render the abutment and piston chambers steam tight.

Concentrically mounted for rotation within the piston chamber A^2 is a rotary piston B which is equal in diameter to the diameter of the abutment chamber A^3. The piston B is conveniently in the form of a metallic cylinder having a machined outer surface and projecting radially from the piston is a piston wing B′ which is adapted to slidably engage the inner surface of the wall of the piston chamber A^2. The piston wing B′ may, if desired, be provided at its outer end with suitable packing to provide a steam tight joint between the same and the wall of the piston chamber, or the adjacent surfaces of the piston chamber and the piston wing may be formed of metal and machined if desired. The piston B is carried by a shaft B^2 which is journaled in suitable bearings carried by the casing heads A^4, one end of which shaft projects beyond the front casing head and has secured thereon a gear wheel B^3.

Closely fitting the abutment chamber A^3 and rotatably supported therein is a suitable abutment which is adapted during the operation of the engine to have a rolling contact with the cylindrical piston B and which is provided with a suitable pocket for coöperation with the wing B′ of said piston. In the embodiment of the present invention, the abutment comprises a ring like member C, the ends of which are separated to provide a gap for the accommodation of the piston wing B′, and means for rotatably

supporting the ring member in the abutment chamber, said ring like member being formed of yieldable metal and being provided with a finely machined outer surface, the outer surface of said abutment being adapted during the operation of the engine, to have a rolling contact with the outer surface of the cylindrical piston B. The edges of the ring like member C are finely machined so as to engage the inner surfaces of the casing heads A^4 with a steam tight fit although if desired, suitable packing may be interposed between the sides of said ring like member and the adjacent portions of the casing heads. Means for supporting the ring like member C of the abutment comprises a shaft D which is positioned concentrically of the abutment chamber and is journaled in suitable bearings carried by the cylinder heads A^4, said shaft being provided with an arm D′ which projects laterally therefrom and is operatively connected to the ring like member C intermediate the ends thereof so that as the shaft D is rotated, the ring like member C of the abutment will be rotated therewith. The ring like member C of the abutment is conveniently connected to the arm D′ projecting from the shaft D in such a manner that said ring like member will be permitted a limited movement radially of the shaft. To this end the arm D′ is provided at its outer end with a curved portion *d*, conforming to the curvature of the inner surface of the ring like member C and with a rib *d′* which extends transversely of the curved end of the arm D′ and projects outwardly therefrom, which rib is adapted, when the parts are in normal position, to project into a groove *c′* which extends transversely in the inner surface of the ring like member C. It will thus be seen that while rotation of the shaft D will rotate the ring like member C, such member is free to move a limited extent radially with reference to the shaft. The shaft D projects outwardly through the front casing head and has secured thereon a gear wheel D^2, which is of the same size as the gear wheel B^3 secured to the piston shaft B and meshes therewith so that the piston abutment will rotate in unison with the piston, during the operation of the engine. Carried by the shaft D and conveniently formed as a part of the arm D′ projecting therefrom is a segmental plate D^3 which is adapted to slide upon the inner surface of the rear casing head A^4 and to control the admission of steam to the piston chamber as will be hereinafter more particularly pointed out.

The casing A is provided with a steam inlet port E which leads directly into the abutment chamber A^3 just above the point where the shaft D passes therethrough. The casing A is also provided with a port for establishing communication between the interior of the abutment and piston chambers. In the embodiment of the invention illustrated the rear head A^4 of the casing is provided with a suitable Y-shaped groove F which serves this purpose, one branch *f* of said groove extending into the inlet end of the piston chamber A^2; another branch *f′* extending into proximity to the point where the steam inlet pipe E enters the abutment chamber, and the third branch f^2 which extends into the abutment chamber in close proximity to its connection with the exhaust end of the piston chamber A^2.

In starting the engine, the parts are in the position shown in Fig. 7 of the drawings, and with the parts in this position, steam entering the abutment chamber A^3 through the steam inlet port E will pass through the gap between the ends of the ring like member C of the abutment and directly engage the piston wing B′, thus causing said piston to rotate to the left. As the piston rotates, the abutment rotates otherewith, and the gap between the ends of the ring like member C of the abutment will be moved into the abutment chamber. Steam will continue to pass from the abutment chamber to the piston chamber, however, through the branches *f′* and *f* of the passage F. As the piston and abutment continue to rotate, the segmental plate D^2 carried by the shaft D will cover the branch *f′* of the passage F. Simultaneously with the covering of the branch *f′* of the passage F, the plate D^2 will uncover the branch f^2 of the passage *f*, so that steam will continue to pass from the abutment chamber to the piston chamber through the branches f^2 and *f* of the passage F. Steam continues to pass from the abutment chamber to the piston chamber until the port E is closed by the segmental plate D^2. The piston will then be advanced by the expansive power of the steam in the piston and abutment chambers until the gap in the ring like member C of the abutment is moved into communication with the exhaust end of the piston chamber, at which time the steam in the abutment chamber will exhaust through the exhaust port G which leads from the piston chamber adjacent its connection with the abutment chamber, thus preventing condensation of the steam in the abutment chamber. The remainder of the rotation of the piston and abutment will be effected by momentum until the piston and abutment have been moved to a position to again admit steam to the interior of the abutment chamber through the inlet port E, when the operation will be repeated.

As the ring member C of the abutment is formed of yieldable metal, the pressure of the steam in the abutment chamber on the interior of said ring like member will

serve to move the same into engagement with the wall of the abutment chamber and with the outer surface of the cylindrical piston B so as to insure the forming of a steam tight joint between the parts, thus enabling all packing between the abutment and piston to be dispensed with. It will be seen that the formation of a steam tight joint between the parts in this manner is facilitated by the manner of connecting the ring like member C of the abutment with the arm D′ so as to allow the ring like member a limited movement relative to said arm.

While a convenient embodiment of the invention is illustrated in the accompanying drawings, it will be understood that many changes may be made to the particular form and construction therein shown without departing from the spirit and scope of the invention as defined in the appended claims.

We claim:—

1. In a rotary engine, a casing provided with a piston chamber and with an abutment chamber communicating therewith, a piston rotatably supported in said piston chamber, an expansible hollow abutment rotatably supported in said abutment chamber, and means admitting steam to the interior of said abutment.

2. In a rotary engine, a casing provided with a piston chamber and an abutment chamber communicating therewith, a piston rotatably supported in said piston chamber, and an abutment rotatably supported in said abutment chamber, said abutment being provided with yieldable end portions closely fitting the wall of the abutment chamber, said end portions being separated to provide a space placing the interior of the abutment in connection with the piston chamber, and means for admitting steam to the interior of the abutment chamber.

3. In a rotary engine, a casing provided with a piston chamber and with an abutment chamber communicating therewith, a piston rotatably supported in said piston chamber, and an abutment rotatably supported in said abutment chamber, said abutment comprising a yieldable ring like member closely fitting the abutment chamber and having its ends separated to place the interior of the abutment in communication with the piston chamber, and means for rotatably supporting said ring like member in the abutment chamber.

4. In a rotary engine, a casing provided with a piston chamber and with an abutment chamber communicating therewith, a rotary piston concentrically mounted in said piston chamber and provided with a piston wing projecting therefrom, an abutment rotatably supported in said abutment chamber, said abutment being adapted to make rolling contact with said piston and being provided with a pocket therein adapted to cooperate with the wing of the piston and with a yieldable wall adapted to be held in engagement with the piston by the pressure of steam in the abutment chamber.

5. In a rotary engine, a casing provided with a piston chamber and with an abutment chamber communicating therewith, a rotatable piston concentrically supported in said piston chamber, a piston wing projecting from said piston, an abutment rotatably supported in the abutment chamber, said abutment comprising a yieldable ring like member provided with spaced ends to provide a pocket for the accommodation of the piston wing, means for rotatably supporting the abutment, and means for admitting steam to the interior of the abutment chamber.

6. In a rotary engine, a casing provided with a piston chamber, and with an abutment chamber communicating therewith, a cylindrical piston rotatably supported in said piston chamber, a piston wing projecting from said cylindrical piston, an abutment rotatably supported in said abutment chamber, said abutment comprising a yieldable ring like member, having its ends separated to provide a pocket for the accommodation of the piston wing, said ring like member closely fitting the abutment chamber and adapted to make rolling contact with the piston, a shaft concentrically supported in said abutment chamber, an arm extending from said shaft and having its outer end operatively connected to said ring like member intermediate the ends thereof.

7. In a rotary engine, a casing provided with a piston chamber and with an abutment chamber communicating therewith, a piston rotatably supported in said piston chamber, an abutment rotatably supported in said abutment chamber, said abutment comprising an expansible ring like member having its ends separated, a shaft rotatably supported in said abutment chamber, an arm extending from said shaft and loosely connected at its outer end to said ring like member whereby said member is permitted a limited movement relative to said arm.

8. In a rotary engine, a casing provided with a piston chamber and with an abutment chamber communicating therewith, a piston rotatably supported in said piston chamber, and an abutment rotatably supported in said abutment chamber, said abutment comprising a yieldable ring like member having its ends separated, a shaft supported concentrically of the abutment chamber, an arm projecting from said shaft, the outer end of said arm and the adjacent portion of said ring like member being provided one with a recess and the other with a projection adapted to fit into said recess.

9. In a rotary engine, a casing provided with a piston chamber and with an abutment chamber communicating therewith, said casing being provided with a steam inlet port leading directly into the abutment chamber, and with a passage connecting the abutment and piston chambers, a rotary piston rotatably supported in said piston chamber and provided with a piston wing projecting therefrom, an expansible hollow abutment rotatably supported in said abutment chamber, said abutment being provided with a pocket for coöperation with the piston wing, and with means for controlling the flow of steam through the inlet port into the abutment chamber and from the abutment chamber to the piston chamber through the passage connecting the same.

10. In a rotary engine, a casing provided with a piston chamber and with an abutment chamber communicating therewith, said casing being provided with a steam inlet port leading directly into the abutment chamber, and with a passage connecting the abutment and piston chambers, a rotary piston rotatably supported in said piston chamber, and provided with a piston wing projecting therefrom, an abutment rotatably supported in said abutment chamber, said abutment being provided with a yieldable outer wall, the ends of which are separated to provide a pocket for coöperation with the piston wing, and with means for controlling the flow of steam through the inlet port into the abutment chamber and from the abutment chamber to the piston chamber through the passage connecting the same.

11. In a rotary engine, a casing provided with a piston chamber, and with an abutment chamber communicating therewith, said casing being provided with a steam inlet port leading directly into the abutment chamber through one of the end walls thereof, and with a passage connecting the abutment and piston chambers, said passage leading into the abutment chamber through the end wall thereof, a cylindrical piston rotatably supported in said piston chamber and provided with a piston wing projecting therefrom, a hollow abutment rotatably supported in said abutment chamber and provided with an opening in the outer wall thereof for coöperation with the piston wing, said abutment being provided at one end with a plate movable over the ports in the end wall of the piston chamber to control the flow of steam into the abutment chamber and from the abutment chamber to the piston chamber.

12. In a rotary engine, a casing provided with a piston chamber and with an abutment chamber communicating therewith, said casing being provided with a steam inlet passage leading directly to the abutment chamber through one of the end walls thereof, said casing being also provided with a passage communicating with the piston chamber adjacent the inlet end thereof, and provided with branches communicating with the abutment chamber through the end wall thereof, a cylindrical piston rotatably supported in the piston chamber and provided with a piston wing projecting therefrom, a hollow abutment rotatably supported in the abutment chamber, the outer wall of said abutment being provided with an opening therein for coöperation with the wing of the piston, said abutment being provided with a segmental end wall adapted to slide over the openings in the end wall of the abutment chamber to control the flow of steam to the abutment chamber and its passage from the abutment chamber to the piston chamber.

13. In a rotary engine, a casing provided with a piston chamber and with an abutment chamber communicating therewith, a piston rotatably supported in said piston chamber and provided with a piston wing projecting therefrom, an abutment rotatably supported in said abutment chamber, said abutment comprising a ring-like member having its end separated to provide a pocket for coöperation with the piston wing, a shaft rotatably supported in said abutment chamber, and an arm extending from said shaft and loosely connected at its outer end to said ring like member intermediate the ends thereof whereby said member is permitted a limited movement relative to said arm.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN W. CURTIS.
MALCOLM M. PARKER.

Witnesses:
THOS. R. HEATH,
H. N. RAMSEY.