No. 753,763. PATENTED MAR. 1, 1904.

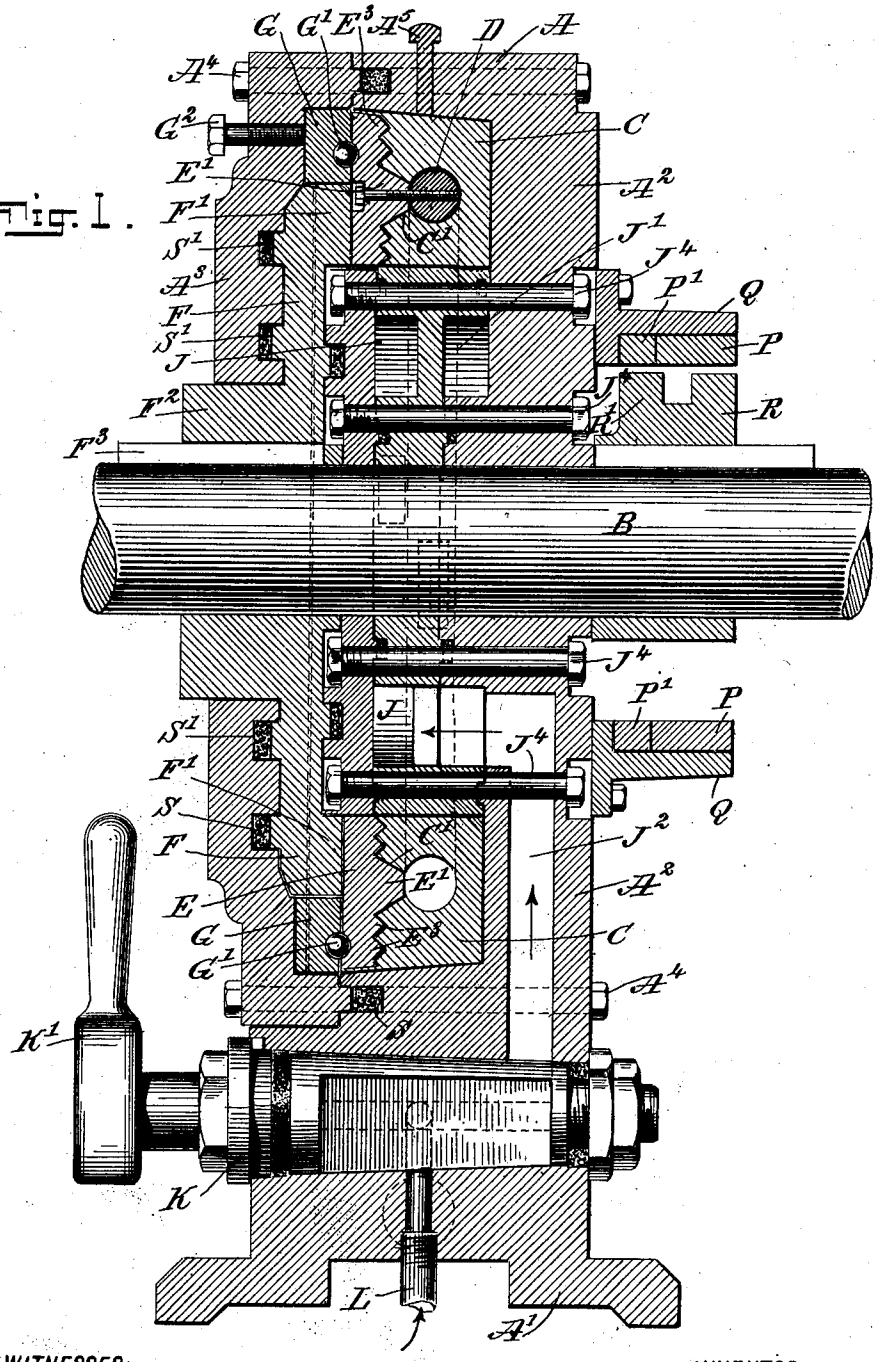
F. P. & B. F. UHRIG.

ROTARY ENGINE.

APPLICATION FILED JULY 22, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.



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NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.

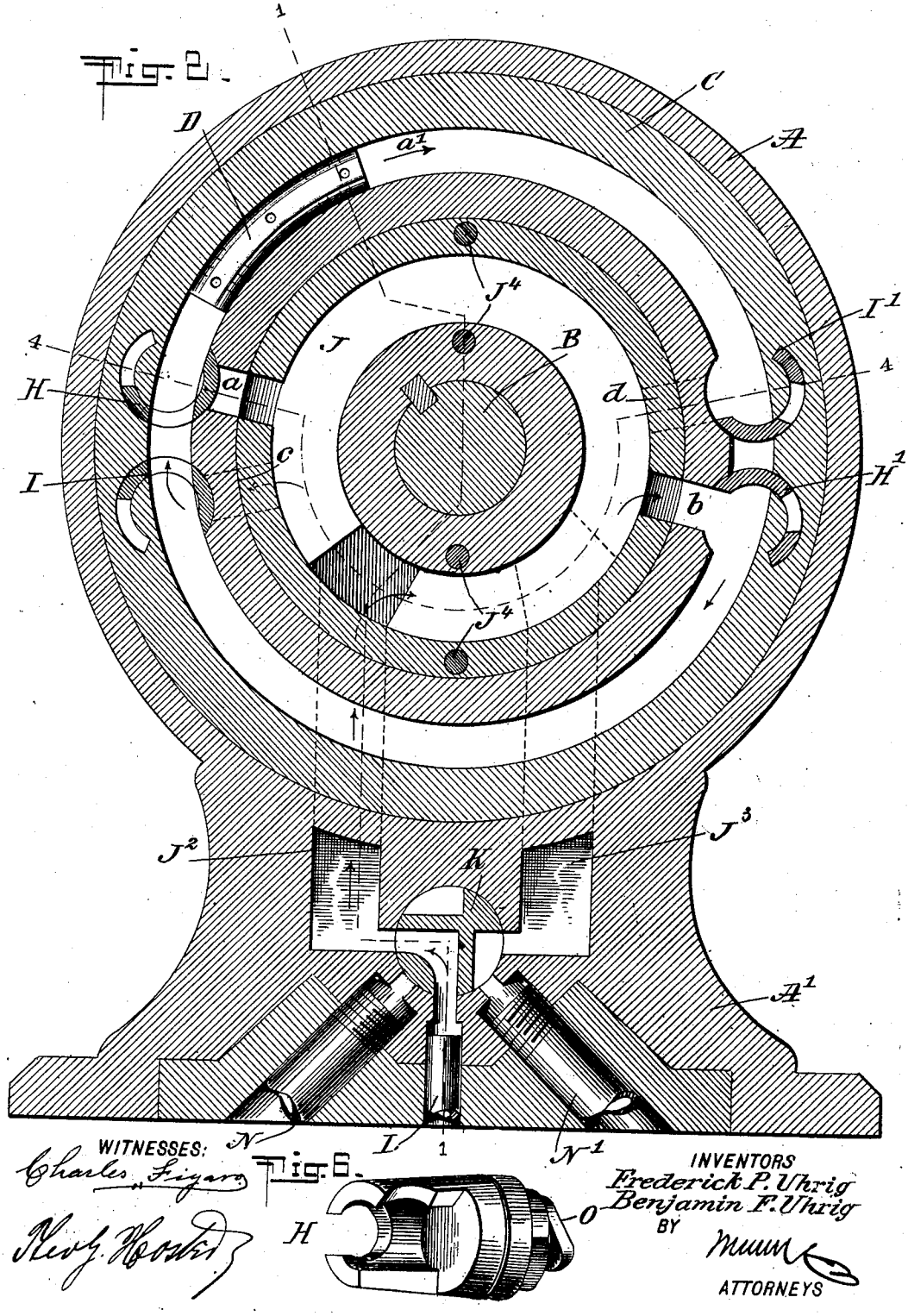

Fig. 6.

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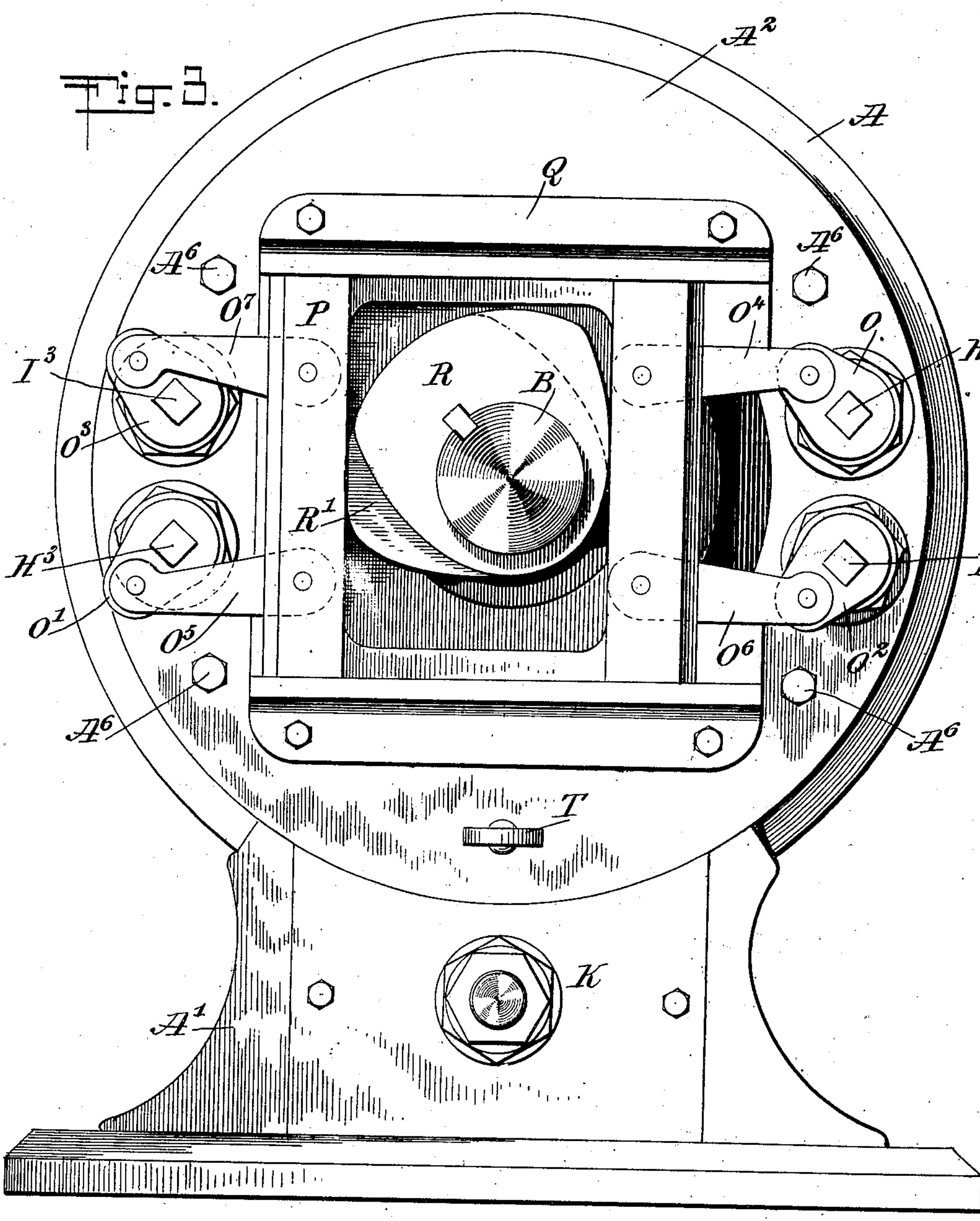
NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3.



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ROTARY ENGINE.

APPLICATION FILED JULY 22, 1903.

NO MODEL. 4 SHEETS—SHEET 4.

Fig. 4.

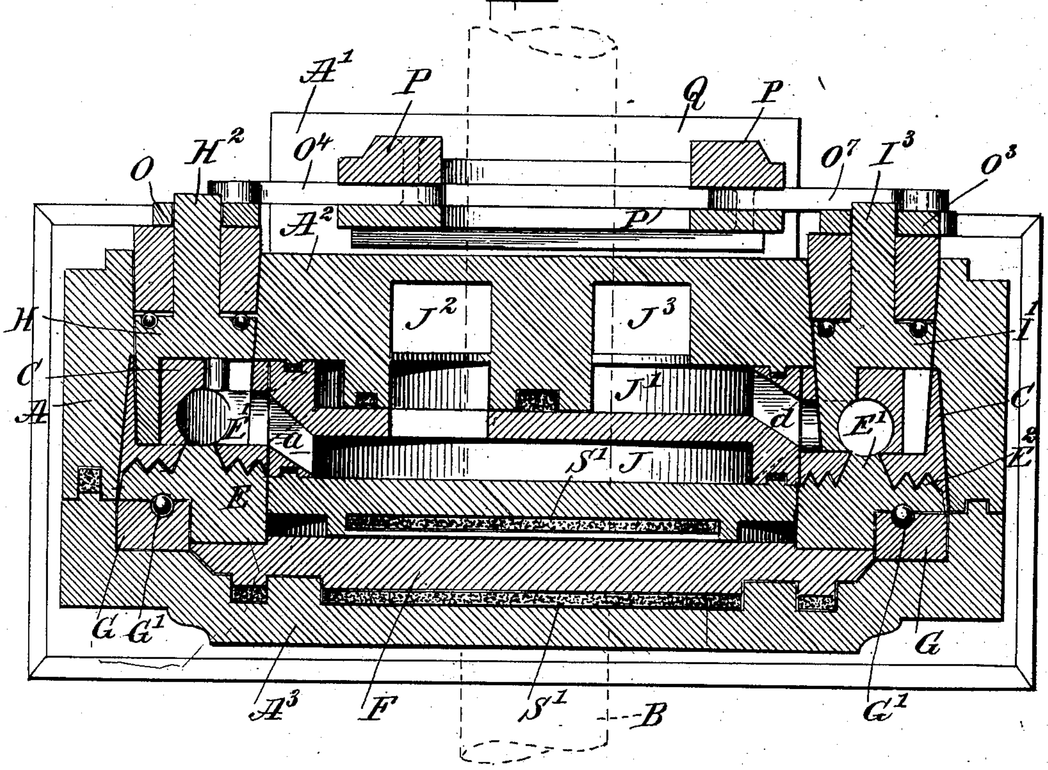
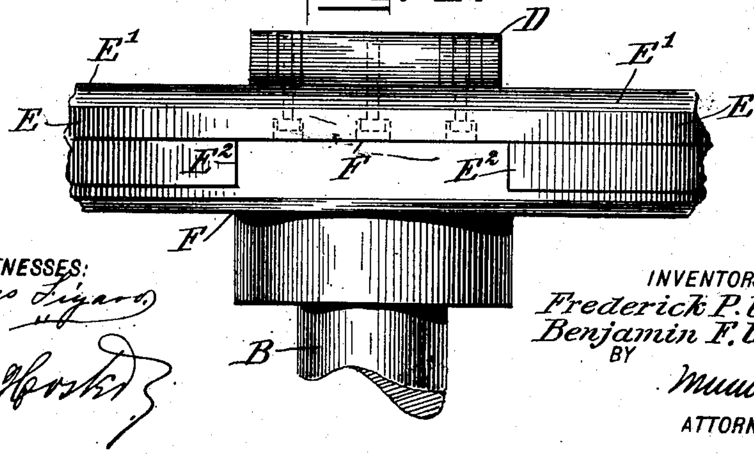


Fig. 5.



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No. 753,763. Patented March 1, 1904.

UNITED STATES PATENT OFFICE.

FREDERICK PHILLIP UHRIG AND BENJIMAN FRANKLIN UHRIG, OF ST. JOHNS, OREGON.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 753,763, dated March 1, 1904.

Application filed July 22, 1903. Serial No. 166,547. (No model.)

To all whom it may concern:

Be it known that we, FREDERICK PHILLIP UHRIG and BENJIMAN FRANKLIN UHRIG, both citizens of the United States, and residents of St. Johns, in the county of Multnomah and State of Oregon, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved rotary engine arranged to utilize the motive agent to the fullest advantage without danger of back pressure and to permit convenient and quick reversing of the engine whenever it is desired to do so.

The invention consists of novel features and parts and combinations of the same, as will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a longitudinal sectional elevation of the improvement on the line 1 1 of Fig. 2. Fig. 2 is a cross-section of the same. Fig. 3 is an end view of the same, showing more particularly the gear for operating the admission and exhaust valves. Fig. 4 is a sectional plan view of the improvement on the line 4 4 of Fig. 2. Fig. 5 is a plan view of the piston and its connection with the main shaft, and Fig. 6 is a perspective view of one of the admission and exhaust valves.

The cylindrical casing A of the engine is provided with a base A′, an integral head A^2, and a removable head A^3, fastened by bolts A^4 or other means to the said casing. In the head A^2 is journaled the main shaft B for transmitting the rotary motion of the engine to other machinery, and in the said casing A is removably secured an annular working chamber C, concentric with the shaft B and abutting at one side against the head A^2. In this annular working chamber C is mounted to travel a piston D, secured at one side by bolts or other fastening devices to the annular rib E′ of a revolving piston-carrier E, the said rib E′ fitting into and closing an annular opening C′, leading from the interior of the working chamber to the outer side thereof—that is, the side opposite the one abutting against the head A^2. The piston-carrier E is ring-shaped and formed at its outer face with diametrical grooves E^2, (see Fig. 5,) engaged by correspondingly-shaped lugs F′, secured or formed on the inner face of a web F, having its hub F^2 fastened by a key F^3 or other means to the main shaft B, so that when the piston B is caused to travel around in the working chamber C, as hereinafter more fully described, then the piston carries the carrier E around with it, and the carrier in turn takes the web F along for the web to rotate the main shaft B.

In order to prevent leakage of steam between the revolving piston-carrier E and the working chamber C, the rib E′ has beveled sides fitting the correspondingly-shaped side walls of the openings C′, as plainly indicated in Figs. 1 and 4, and on opposite sides of the rib E′ are integrally formed on the carrier E annular ribs E^3, preferably made V-shaped and fitting corresponding grooves in the face of the working chamber.

In order to move and hold the ribs E′ and E^3 of the piston-carrier E in frictional contact with the openings C′ and the said grooves to prevent leakage of steam, the said carrier E is engaged by bearing-balls G′, arranged on an adjusting-ring G, fitted in a recess in the head A^3 and adapted to be adjusted longitudinally toward the carrier E by set-screws G^2. The bearing-balls G′ are arranged in an annular recess formed partly in the adjusting-ring G and partly in the piston-carrier E, as shown in Figs. 1 and 4, to hold the bearing-balls in position, the said bearing-balls serving to reduce the frictional contact to a minimum.

In order to control the admission and exhaust of the motive agent to and from the working chamber C and to allow of reversing the engine whenever it is desirid to do so, the following device is provided: In the working chamber C and diametrically opposite each other are arranged rocking valves H and H′, and a separate or additional set of said

valves I and I′ is arranged alongside the valves H and H′, the latter serving as admission-valves, while the valves I and I′ act as exhaust-valves; but the action of the said valves can be reversed, as hereinafter more fully described, for the valves I and I′ to become the admission-valves and the valves H and H′ the exhaust-valves. The valves H and H′ control ports *a* and *b*, leading to an annular steam-chest J, and the valves I and I′ control ports *c* and *d*, leading to an annular steam-chest J′, and the said steam-chests J and J′ are connected by channels J^2 and J^3 with a reversing-valve K, mounted in the base portion A′ of the casing and provided at its outer end with a handle K′, under the control of the operator, for turning the said valve, so as to connect either channel J^2 or J^3 with a steam-supply pipe L or with exhaust-pipes N and N′, as plainly illustrated in Fig. 2. Thus when the valve K is in the position shown in this figure the admission-pipe L connects with the channel J^2 for the steam to enter the steam-chest J and pass from the latter alternately by way of the ports *b* and *a* into the working chamber C, while the exhaust-steam passes from the said working chamber by way of the valves I and I′, ports *d* and *c*, steam-chest J^3, and reversing-valve K into the exhaust-pipe N′. When the valve K is reversed, then the channel J^3 is connected with the pipe L to allow the motive agent to pass through the said channel into the steam-chest J′ by way of the ports *c d* and valves I and I′ into the working chamber C, while the exhaust motive agent passes by way of the valves H and H′, ports *a* and *b*, steam-chest J, channel J^2, and valve K into the exhaust-pipe N. The steam-chests J and J′ are preferably made in sections, as plainly indicated in Fig. 1, and fastened by bolts J^4 to the head A^2 of the casing. The valve K is so arranged that when its handle K′ is thrown into a vertical position the valve closes the supply-pipe L, so as to shut off the steam from the engine to bring the latter to a stop. Each of the valves H H′ I I′ is arranged in such a manner as to form a passage for the piston D and to form an abutment in the chamber for the steam, as will be readily understood by reference to Fig. 1, and the valves H I H′ I′, respectively. As shown in this figure, the valves H and I are open to allow the piston D to pass the valves, while the valves H′ and I′ are in a closed position for the motive agent to pass from the steam-chest J by way of the port *b* into the working chamber or valve H′, now forming an abutment in this chamber between the piston and the valve for the motive agent to cause the piston to travel around in the direction of the arrow *a′*, and the other valve, I′, on account of its position, allows the exhaust-steam in front of the piston D to pass through the port *d* into the steam-chest J and from the latter pass by way of the passage J^3 and valve K into the exhaust-pipe N′. The valves H H′ and I I′ are successively actuated to move into reversed position, and for this purpose the following device is provided: On the outer ends of the valve-stems H^2 H^3 of the valves H and H′ (see Figs. 3 and 4) are secured arms O and O′, and similar arms O^2 O^3 are fastened on the outer ends of the valve-stems I^2 and I^3 of the valves I and I′, and the valve-stems O and O′ are connected by links O^4 and O^5 with a slide P, mounted to slide transversely in suitable guideways Q, attached to the outer face of the head A^2 of the casing. The arms O^2 O^3 of the valves I and I′ are connected by links O^6 O^7 with a slide P′, likewise mounted to slide transversely in the bearings Q, and the said slides are rectangular in shape and are engaged by cams R and R′, bolted or otherwise fastened on the shaft B, so as to rotate with the latter to impart a transverse sliding movement to the slides P and P′, which by their links O^4 O^5 and O^6 O^7 impart a rocking motion to the valves H H′ and I I′, as above explained. The cams R and R′ are so shaped (see Fig. 3) that the valves which are the admission-valves at the time are actuated somewhat sooner than the valves which are the exhaust-valves at the time, so as to let the motive agent into the working chamber C immediately behind the piston D by the admission-valve previous to opening the adjacent exhaust-valve. Thus when the piston D nears the exhaust-valve I′ then the valve H′ is moved into a closed position, while the valve I′ is moved into an open position and the valve I into a closed position for the piston D to pass the valves I′ and H′ and for the motive agent to pass through the port *a* and valve H into the working chamber to give another impulse to the piston D for propelling the latter in the direction of the arrow *a′*. The steam now in front of the piston D passes by way of the valve I and port *c* into the steam-chest J′ to be conducted by the passage J^3 and valve K into the exhaust-pipe N.

Suitable packings S are arranged between the head A^3 and the casing, and like packings S′ are arranged between the head A^3 and the web F, as plainly indicated in Fig. 1. A suitable drain-cock T, arranged in the head A^2, allows of draining the water of condensation from the steam-chests, into which may also pass the water of condensation in the working chamber by the action of the piston D driving the water through the corresponding ports into the said steam-chests.

When it is desired to remove the working chamber C from the casing A, the screws A^4 are unscrewed and the screws A^6 in the head A^2 are screwed up to dislodge the working chamber in the casing.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. A rotary engine comprising an annular

fixed working chamber, having an annular opening at one side, a piston mounted to travel in the said working chamber, a revoluble piston-carrier having an annular closing-rib fitting the opening in the side of the said working chamber, the said piston being secured to the said rib, and valves for controlling the admission and exhaust of the motive agent to and from the said working chamber, the valves also serving as abutments for the motive agent in the said working chamber, as set forth.

2. A rotary engine comprising an annular fixed working chamber, having an annular opening at one side, a piston mounted to travel in the said working chamber, a revoluble piston-carrier having an annular closing-rib fitting the opening in the side of the said working chamber, the said piston being secured to the said rib, the said carrier having a plurality of annular packing-ribs on opposite sides of the said closing-rib, for engaging corresponding annular grooves on the side of the working chamber having the opening, and valves for controlling the admission and exhaust of the motive agent to and from the said working chamber, the valves also serving as abutments for the motive agent in the said working chamber, as set forth.

3. A rotary engine comprising an annular fixed working chamber, having an annular opening at one side, a piston mounted to travel in the said working chamber, a revoluble piston-carrier having an annular closing-rib fitting the opening in the side of the said working chamber, the said piston being secured to the said rib, the said carrier having a plurality of annular packing-ribs on opposite sides of the said closing-rib, for engaging corresponding annular grooves on the side of the working chamber having the opening, means for adjusting the carrier in the direction of its axis toward the working chamber, and valves for controlling the admission and exhaust of the motive agent to and from the said working chamber, the valves also serving as abutments for the motive agent in the said working chamber, as set forth.

4. A rotary engine comprising an annular fixed working chamber, having an annular opening at one side, a piston mounted to travel in the said working chamber, a revoluble piston-carrier having an annular closing-rib fitting the opening in the side of the said working chamber, the said piston being secured to the said rib, a power-transmitting web secured to the shaft to be driven and carried around by the said carrier, and valves for controlling the admission and exhaust of the motive agent to and from the said working chamber, the valves also serving as abutments for the motive agent in the said working chamber, as set forth.

5. A rotary engine comprising an annular fixed working chamber, having an annular opening at one side, a piston mounted to travel in the said working chamber, a revoluble piston-carrier having an annular closing-rib fitting the opening in the side of the said working chamber, the said piston being secured to the said rib, a web secured to the shaft to be driven and having offsets engaging diametrical grooves in the said carrier, and valves for controlling the admission and exhaust of the motive agent to and from the said working chamber, the valves also serving as abutments for the motive agent in the said working chamber, as set forth.

6. A rotary engine comprising an annular fixed working chamber, having an annular opening at one side, a piston mounted to travel in the said working chamber, a revoluble piston-carrier having an annular closing-rib fitting the opening in the side of the said working chamber, the said piston being secured to the said rib, an admission-valve, an exhaust-valve in the working chamber, the admission-valve forming an abutment for the motive agent in the working chamber, and means for actuating the said valves in unison, as set forth.

7. A rotary engine comprising an annular fixed working chamber, having an annular opening at one side, a piston mounted to travel in the said working chamber, a revoluble piston-carrier having an annular closing-rib fitting the opening in the side of the said working chamber, the said piston being secured to the said rib, sets, diametrically disposed, of admission and exhaust valves in the said working chamber, means for actuating the said valves in unison, and a reversing-valve controlling the motive agent to and from the said working chamber, as set forth.

8. A rotary engine comprising an annular fixed working chamber, having an annular opening at one side, a piston mounted to travel in the said workiug chamber, a revoluble piston-carrier having an annular closing-rib fitting the opening in the side of the said working chamber, the said piston being secured to the said rib, annular steam-chests having diametrically opposite inlet-ports and diametrically opposite exhaust-ports, the said ports leading to the working chamber, admission and exhaust valves for controlling the said ports and for forming abutments in the working chamber, and means for actuating the valves in unison with the said piston, as set forth.

9. A rotary engine comprising an annular fixed working chamber, having an annular opening at one side, a piston mounted to travel in the said working chamber, a revoluble piston-carrier having an annular closing-rib fitting the opening in the side of the said working chamber, the said piston being secured to the said rib, annular steam-chests having diametrically opposite inlet-ports and diametrically opposite exhaust-ports, the said ports leading to the working chamber, admission and exhaust valves for controlling the said ports and for forming abutments in the work-

ing chamber, means for actuating the valves in unison with the said piston, and a reversing-valve connected with a steam-supply and controlling passages to the said annular steam-chests, as set forth.

10. A rotary engine comprising an annular fixed working chamber, having an annular opening at one side, a piston mounted to travel in the said working chamber, a revoluble piston-carrier having an annular closing-rib fitting the opening in the side of the said working chamber, the said piston being secured to the said rib, annular steam-chests having diametrically opposite inlet-ports and diametrically opposite exhaust-ports, the said ports leading to the working chamber, admission and exhaust valves for controlling the said ports and for forming abutments in the working chamber, and means for actuating the valves in unison with the said piston, consisting of cams revolving in unison with the said piston, slides reciprocated by the said cams and links connecting each slide with arms on the valve-stems of the said valves, for operating a pair of oppositely-disposed valves from one slide, as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

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BENJIMAN FRANKLIN UHRIG.

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