No. 728,077. PATENTED MAY 12, 1903.

E. BLUCKER.

ROTARY ENGINE.

APPLICATION FILED JULY 17, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

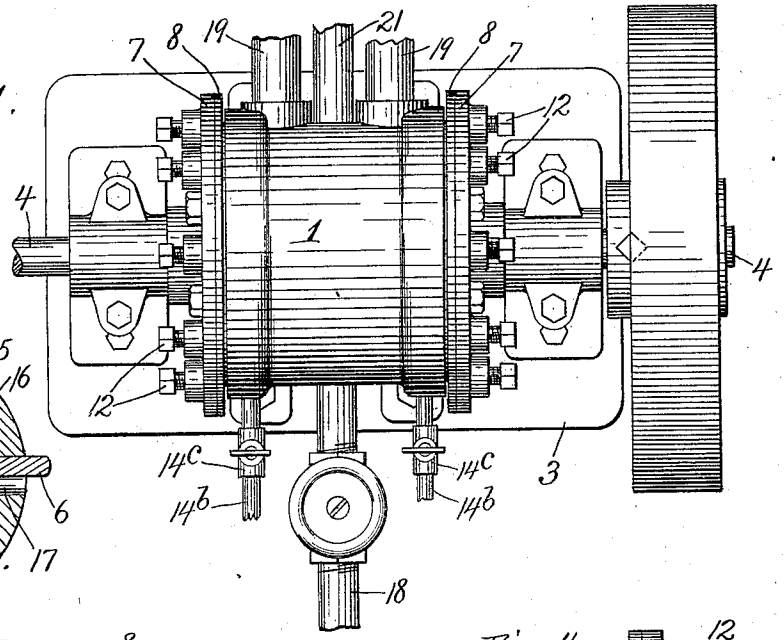



Fig. 5

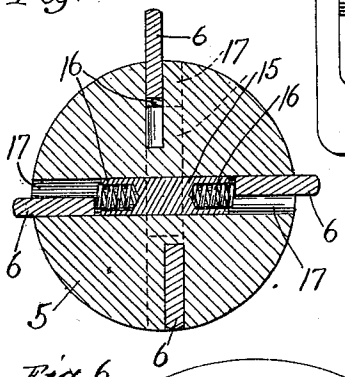



Fig. 6.

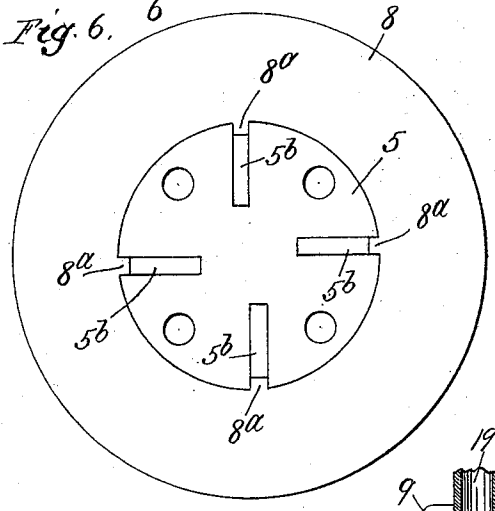



Fig. 4.

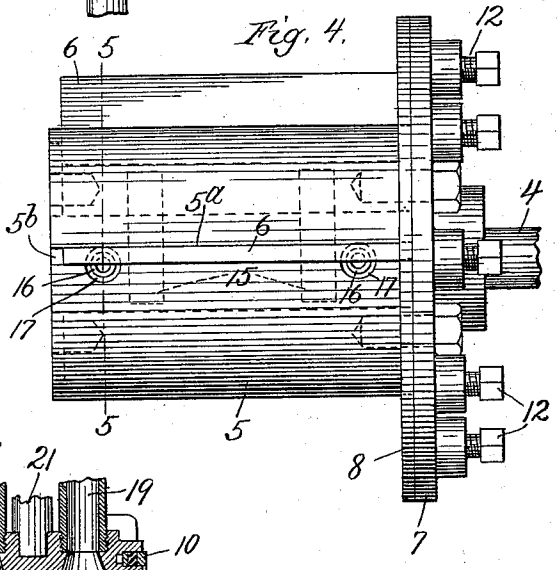
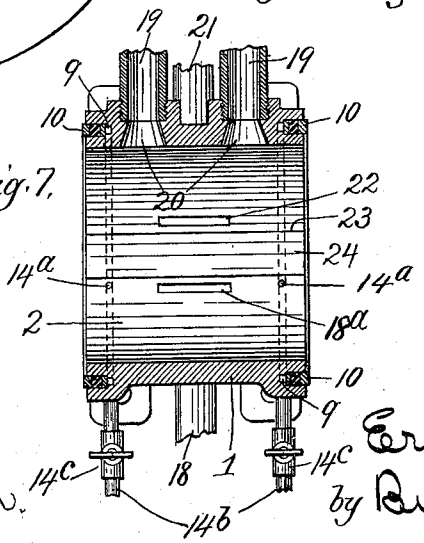



Fig. 7.




Witnesses.

Edward T. Wray.

Weston B. Hazlar.

Inventor.

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Our attys

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

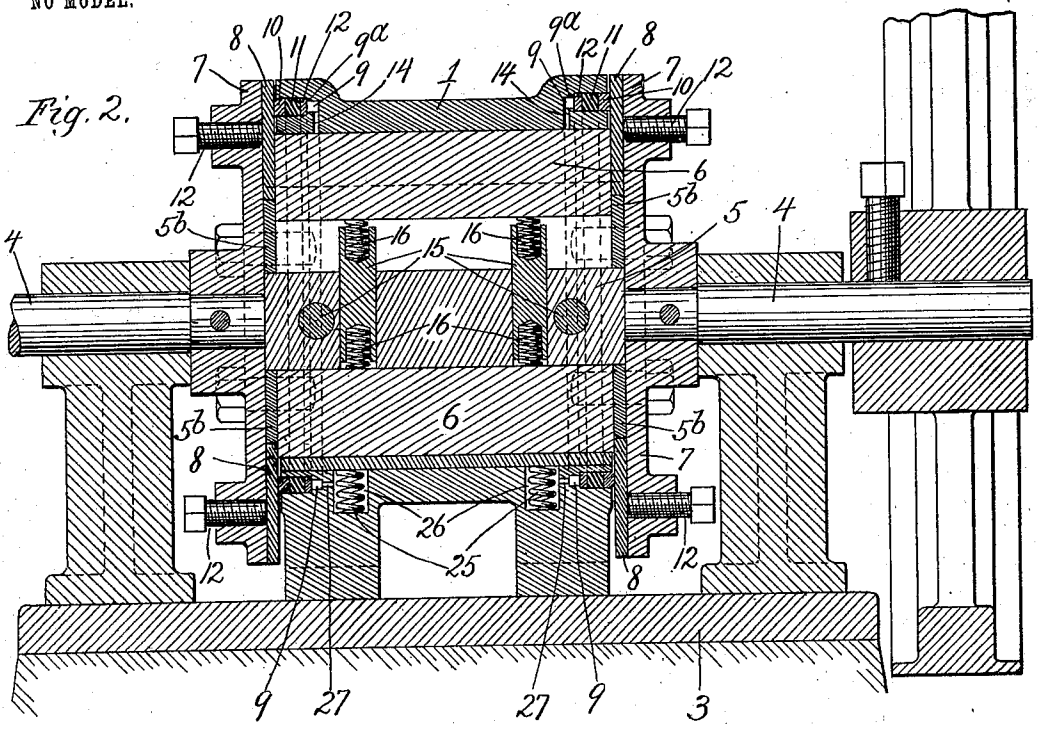
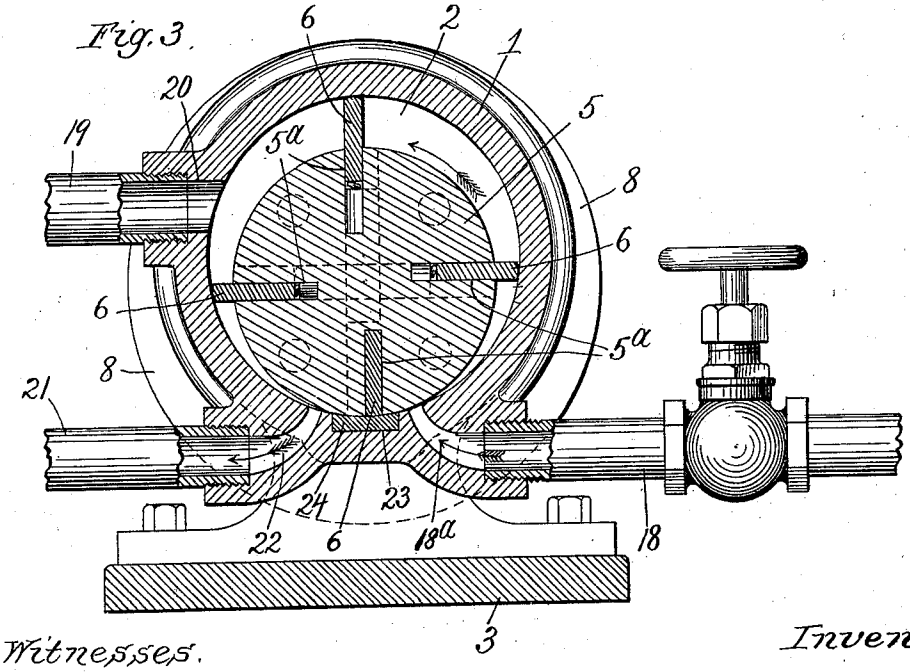



Fig. 3.




Witnesses.

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No. 728,077. Patented May 12, 1903.

# UNITED STATES PATENT OFFICE.

ERIC BLUCKER, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO W. N. CHATFIELD, OF CHICAGO, ILLINOIS.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 728,077, dated May 12, 1903.

Application filed July 17, 1902. Serial No. 115,908. (No model.)

*To all whom it may concern:*

Be it known that I, ERIC BLUCKER, a citizen of the United States, and a resident of Chicago, Illinois, have invented a certain new and useful Rotary Engine, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

This invention relates to rotary engines to be operated by any form of expansive fluid, but particularly designed for steam.

It consists in improvements in the devices for keeping the rotating pistons or vanes tight at their seats in the cylinder in which they travel and in other features of construction, all of which features are set out in the claims.

In the drawings, Figure 1 is a plan. Fig. 2 is a vertical axial section. Fig. 3 is a transaxial section through the steam-ports.

My improved rotary engine comprises a body 1, which consists of a cylindrical chamber 2 and a base 3, upon which are mounted journal-bearings for the shaft 4, which extends through the cylindrical chamber eccentrically with respect thereto and carries rigid within said chamber the eccentric rotating core 5, in which are mounted in radial channels $5^a$, so as to reciprocate radially, the piston-vanes 6 6 6 6, whose length is equal to the length of the cylindrical chamber. The width of the vanes is sufficient to afford them substantial bearing and guidance in the core when they are respectively protruded therefrom so far as to reach the wall of the cylinder at the point most remote from the eccentric core. To the shaft 4 there are secured the head-plates 7 7, which revolve with the shaft, and therefore with the core and piston-vanes. On the inner face of each head-plate I provide an annular wearing-plate 8, which seats against the ends of the piston-vanes and against packing, hereinafter described, lodged in an annular groove 9, formed in the end of the cylinder. This packing comprises an outer metallic annulus 10, a rubber or other yielding gasket 11 behind it, and back of the rubber gasket, still within the groove 9, a second metallic annulus 12. The wearing-plates 8 8 are carried with the rotation of the head-plate and core by projections $8^a$, which enter the end of the channels $5^a$ at the portion of the core which projects beyond the ends of the cylinder, the remainder of the channels at such projecting part being filled by plugs $5^b$, driven tightly thereinto, thus reducing the channels to pockets for the vanes, respectively. The wearing-plates 8 8 are adapted to be adjusted from the head-plates by screws 12 12, &c., set through the head-plates and impinging against the wearing-plates. From the interior of the cylinder-ducts 14 14 lead in the substance of the cylinder-wall to the bottom or back of the groove 9, and thereby the pressure of the motive fluid is admitted to the inner side of the inner metallic annulus 12 and operates to force the packing outward, causing the outer metallic annulus 10 to seat steam-tight against the inner face of the wearing-plate. The screws 13 serve to adjust the wearing-plate closely enough to insure such seating without permitting the outer metallic annulus 10 to escape from the groove 9, in which it is lodged. The cavities occupied by the steam behind the packing are drained of the water of condensation by ducts $14^a$, with the ends of which the drain-pipes $14^b$ are connected, said drain-pipes being controlled by valve $14^c$, past which the water is blown out when the valves are opened from time to time. The grooves 9 9 are reduced in width at the bottom to form shoulders $9^a$, by which the annulus 12 is stopped, so as to insure the entrance of steam in the reduced portion of the grooves behind the annulus and prevent it from entering between the same and the yielding packing.

The piston-vanes 6 6 6 6 are arranged in two pairs, each pair constituting a diametric diaphragm through the cylinder and core. The two vanes of each pair, however, do not necessarily meet within the core, but they are spaced from each other, and thereby adapted each to push the other by means of the spacing-plungers 15 15, which are lodged in suitable bores made through the core-connecting channels, in which the piston-vanes are lodged. In the ends of the spacing-plungers there are lodged coiled springs 16, which at their maximum extension protrude from the spacing-blocks and react directly upon the inner edges of the two opposite piston-vanes, tend-

ing to force them outward and apart. The bores 17, formed to accommodate the spacing-plungers, are constructed so as to open at the surface of the core, and being wider than the channels in which the vanes are guided and in which the bores merge their open ends are exposed alongside the vanes and admit the steam from the cylinder-chamber into the core to the back edges of the vanes, respectively, whereby the steam-pressure is caused to operate to force the vanes radially outward, maintaining them at all times in steam-tight contact at their outer edges within the inner wall of the cylinder. The steam is admitted to the cylinder through the pipe 18, its port $18^a$ through the cylinder-wall being extended longitudinally with respect to the cylinder and flattened circumferentially in respect thereto, so that as the vanes respectively reach and pass said port the maximum opening for inlet of steam is obtained quickly—that is, in very short angular movement of the rotating element. The steam is permitted to escape through the exhaust-pipe 19, which opens into the cylinder through a similar elongated and flattened port 20, said port being located in position to be uncovered by the piston-vanes, respectively, at the position at which the pocket or sectoral chamber next following the vane under consideration is maximum—that is to say, when the medial radial plane of said sectoral chamber or pocket coincides with the diametric plane containing the center of the cylinder and the axis of the shaft. This permits the exhaust-steam to escape immediately upon having attained the maximum expansion possible within the chamber. In order that the steam may be entirely exhausted from each pocket before that pocket again gets around to position to take live steam from the inlet and that no compression of the residual steam in the pocket may occur at any stage after it has expanded in doing its work, I provide a second exhaust-pipe 21, whose port 22, preferably elongated and flattened like the others, is reached and uncovered by each piston-vane before the vane which constitutes the other boundary of the sectoral pocket from which the exhaust-steam is to be evacuated passes by and closes the exhaust-port 19. This necessarily locates the exhaust-port 22 at such position that it will not be passed and covered until just about the time the vane reaches the lowest position—that is, just before it passes on to the inlet-port for the admission of live steam again to the pocket, which will thus have been fully evacuated of the exhaust-steam through the port 21. It will be noticed that the core is mounted with its exterior cylindrical surface coinciding with the interior cylindrical surface of the chamber at a line between the inlet and outlet ports, and it will be seen that to prevent communication between said ports at the parts of the rotation of the core at which there is no piston-vane occupying the interval between the ports the core itself must be constructed to make steam-tight contact at such seating-line. To insure this, I provide a longitudinal channel 23 in the cylinder-wall at this part, and in such channel I lodge a packing-strip 24, which is held inward toward the axis of the cylinder by springs 25 25, lodged in the pockets 26, so that the strip is always held in close contact with the core. From the grooves 9 at points opposite the ends of the channel 23 I provide ports 27, by which the steam may pass from the grooves 9 to the back of the packing-strip 24 and to hold it balanced against the steam-pressure, which from within the cylinder would tend to force it back out of contact with the core.

I claim—

1. In a rotary engine a cylinder, having open ends, and rotary core extending through the cylinder, journaled eccentrically with respect thereto; heads at the opposite ends of such core constituting flanges thereof, whose marginal portions lap by the ends of the cylinder; such cylinder ends having annular grooves, and packing in such grooves on which the lapping marginal portions of the flanges seat; piston-vanes mounted in the eccentric core and protruding radially therefrom with capacity for radial movement to cause them to seat at their outer edges on the inner wall of the cylinder, and ducts in the substance of the cylinder-wall leading from the cylinder-chamber to the bottom, or back of the packing-grooves; whereby the pressure of the motive fluid operates on the packing to seat it against the flanges.

2. In a rotary engine a cylinder and rotary core extending through the cylinder, journaled eccentrically with respect thereto; heads for closing the cylinder, radial piston-vanes mounted in the core and adapted to be protruded therefrom to make contact at their outer edges with the cylinder-wall; the cylinder having inlet and outlet ports for motive fluid at opposite sides of the longitudinal line of nearest approach of the core to the cylinder-wall; said wall having a longitudinal groove at said line of nearest approach; a packing-strip lodged in such groove, and adapted to be pressed inward to seat on the eccentric core; a duct provided in the cylinder-wall leading from the inlet side of the chamber to the back of the groove in which the packing-strip is lodged; whereby the motive-fluid pressure operates to seat such packing-strip against the eccentric core.

3. In a rotary engine a cylinder having open ends and rotary core expanding through the cylinder, journaled eccentrically with respect thereto; heads closing the cylinder at the ends; piston-vanes mounted in the eccentric core, and adapted to reciprocate radially therein to cause their outer edges to seat on the inner wall of the cylinder, said vanes being arranged in pairs, the two of each pair being diametrically opposite; a spacing-block extending between the two vanes of each pair,

whereby they are adapted to crowd each other back and forth through the core as the latter revolves eccentrically in the cylinder, the two vanes then coöperating, being free to move outward independently of each other, yielding means tending to force them apart.

4. In a rotary engine a cylinder, and heads which close it at the ends; a rotary core extending through the cylinder from head to head, and journaled eccentrically with respect thereto; piston-vanes mounted in the eccentric core, and protruding radially therefrom; said vanes being in pairs, the two of each pair being diametrically opposite, and having spacing-blocks extending between their approximate edges whereby they are adapted to crowd each other back and forth through the core, as the latter revolves eccentrically in the cylinder, the core having passages leading from its surface to the bottom, or back, of the grooves, in which the vanes are guided, whereby the pressure of the motive fluid is admitted to the back edges of the vanes to force them outward and apart, and maintain their outer edges seated on an inner wall of the cylinder.

5. In a rotary engine a cylinder having heads to close its ends; a rotary core extending through the cylinder, and journaled eccentrically with respect thereto; piston-vanes mounted and guided in radial grooves in the core, and adapted to be protruded to cause their outer edges to seat on the inner wall of the cylinder, such vanes being in pairs, two of each pair being diametrically opposite spacing-blocks between the two vanes of each pair, by which they are adapted to crowd each other back and forth through the core as the latter revolves, said spacing-blocks having elastic, yielding terminals whereby they tend to holding the vanes yieldingly protruded; the core having ducts leading from its surface to the back, or bottom of the groove in which the vanes are guided to admit the motive fluid for holding the vanes protruded.

6. In a rotary engine, a cylinder having open ends; a rotary core extending through the cylinder, journaled eccentrically with respect thereto; heads at the ends of the core rotating as rigid therewith, and constituting flanges for the core, having their marginal portions lapping the ends of the cylinder; piston-vanes mounted in the eccentric core, with capacity for radial movement, and provided with means for holding the vanes protruding to the inner wall of the cylinder, combined with annular wearing-plates on the inner faces of the flanges, and means for causing the wearing-plates to be carried with the core and flanges in their rotation, and screws for setting up the wearing-plates to the ends of the cylinder.

7. In a rotary engine, a cylinder having open ends, a rotary core extending through the cylinder and journaled eccentrically with respect thereto; piston-vanes mounted in the eccentric core, with capacity for radial movement and with means for holding them protruding to the walls of the cylinder; heads at the end of the core and rotating rigid therewith and constituting flanges for the core, having their marginal portions lapping the ends of the cylinder, said cylinder ends having annular grooves, packing in such grooves, and means for forcing the packing outwardly; in combination with wearing-plates on the inner faces of the flanges respectively, bearing against the outwardly-thrust packing; means for carrying the annular wearing-plates with the core and flanges in their rotation, and screws set through the flanges impinging against the wearing-plates to set the latter inward to meet the thrust of the packing.

8. In a rotary engine, a cylinder having open ends; a rotary core extending through the cylinder, journaled eccentrically with respect thereto; piston-vanes mounted in the eccentric core, with capacity for radial movement, and with means for holding the vanes protruding to the walls of the cylinder; heads at the ends of the core rotating as rigid therewith and constituting flanges for the core, having their marginal portions lapping the ends of the cylinder; in combination with annular wearing-plates on the inner faces of the flanges, having from their inner circumference projections taking into engagement with the periphery of the core, for carrying the wearing-plates with the core and flanges in their rotation, and screws set through the flanges impinging on the wearing-plates to set the latter inward toward the cylinder ends.

9. In a rotary engine, a cylinder having open ends; a rotary core extending through the cylinder, journaled eccentrically with respect thereto; heads at the opposite ends of such core, constituting flanges thereof, their marginal portions lapping the ends of the cylinder, such cylinder ends having annular grooves and packing in such grooves on which the lapping marginal portions of the flanges seat; piston-vanes mounted in the eccentric core and protruding radially therefrom, with capacity for radial movement to cause them to seat at their outer edges on the inner wall of the cylinder; ducts in the substance of the cylinder-wall leading from the center of the cylinder-chamber to the back of the packing-grooves, to admit the pressure of the motive fluid to the packing to seat it against the flanges; drainage-ducts from the packing-grooves leading out through the bottom or lower side of the cylinder, and valves controlling such drainage-ducts.

In testimony whereof I have hereunto set my hand, at Chicago, Illinois, this 5th day of July, 1902.

ERIC BLUCKER.

Witnesses:
CHAS. S. BURTON,
J. S. ABBOTT.