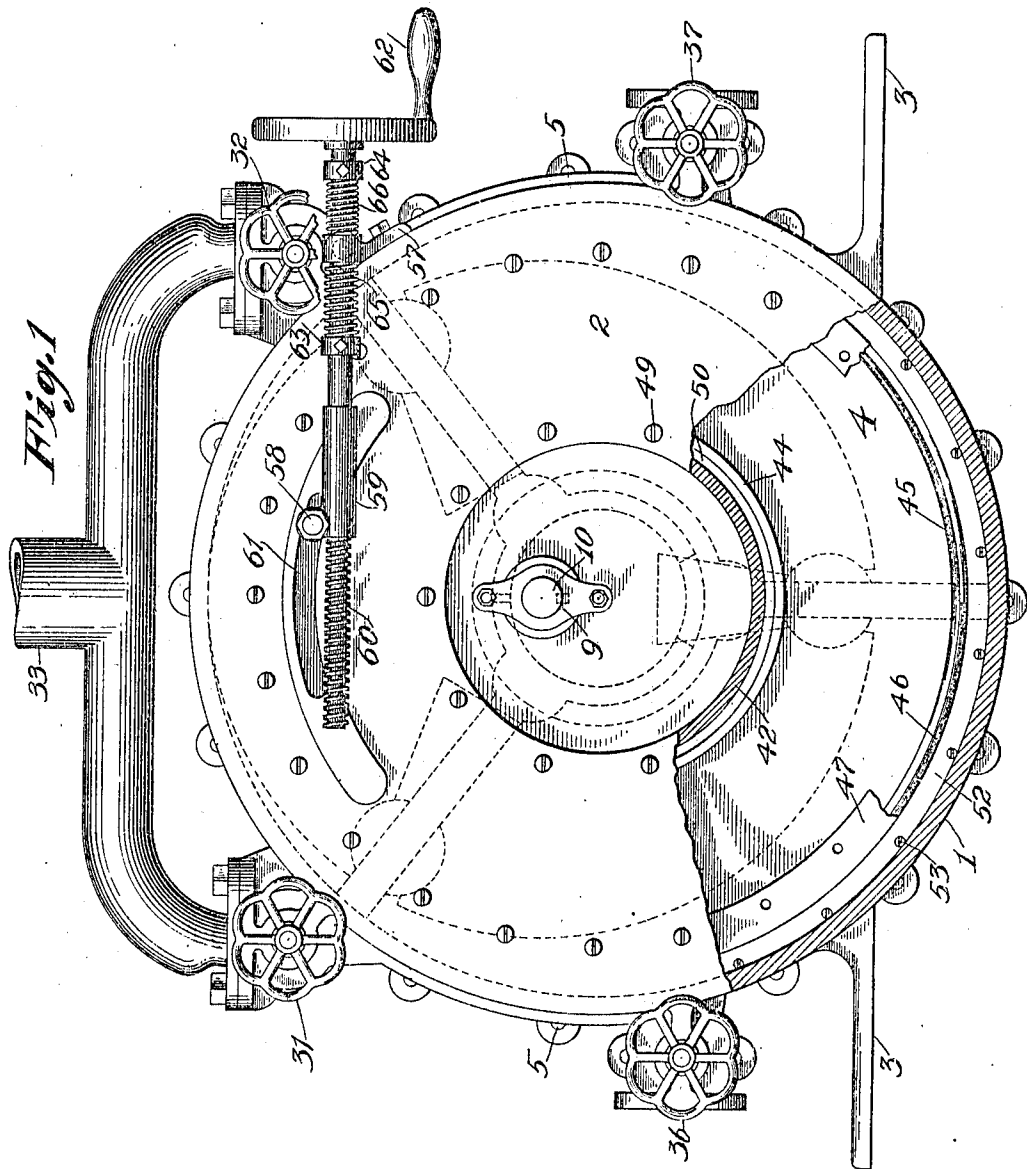


H. H. BENSON.
 ROTARY ENGINE.
 APPLICATION FILED OCT. 3, 1908.

949,410.

Patented Feb. 15, 1910.
 5 SHEETS—SHEET 1.



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E. Rehel.

Inventor:
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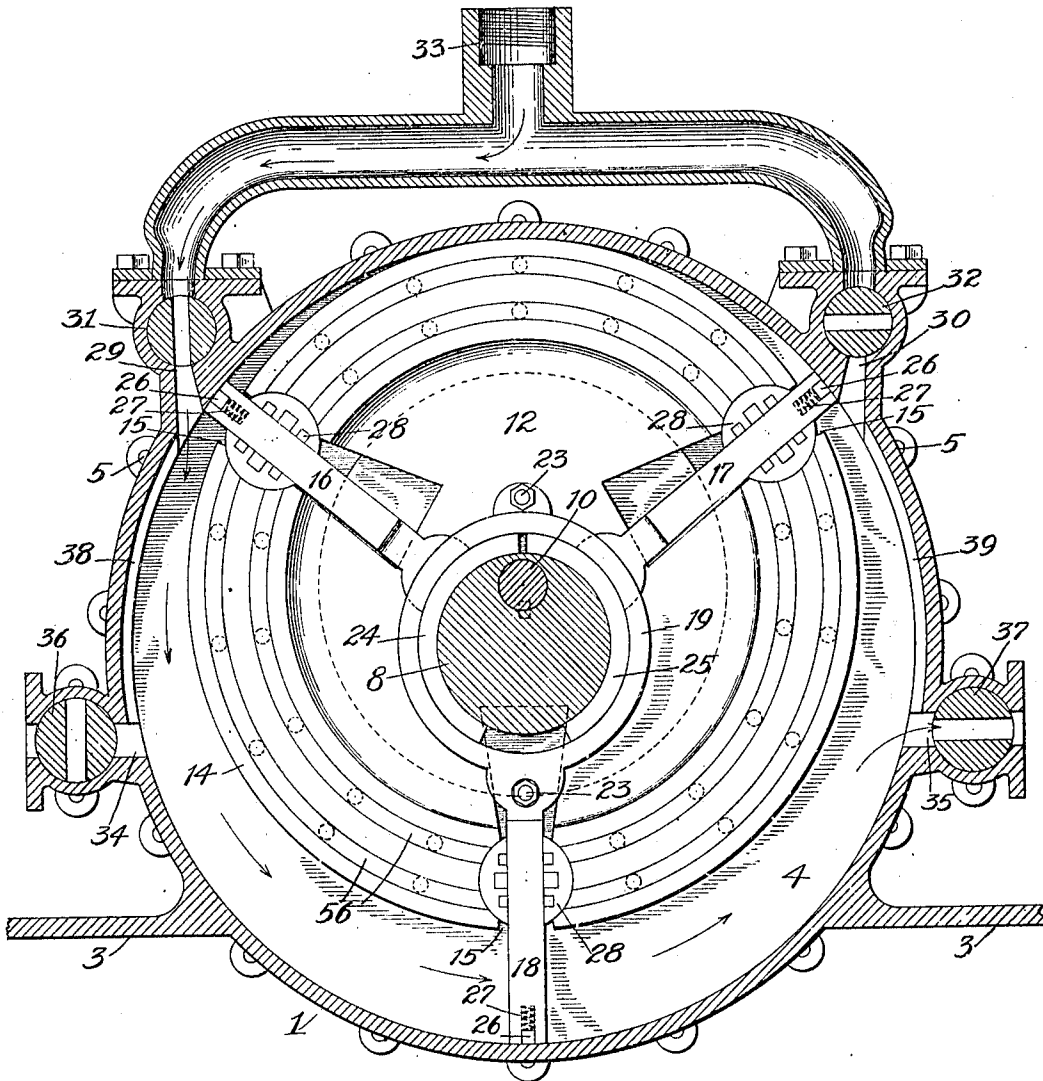
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Fig. 2



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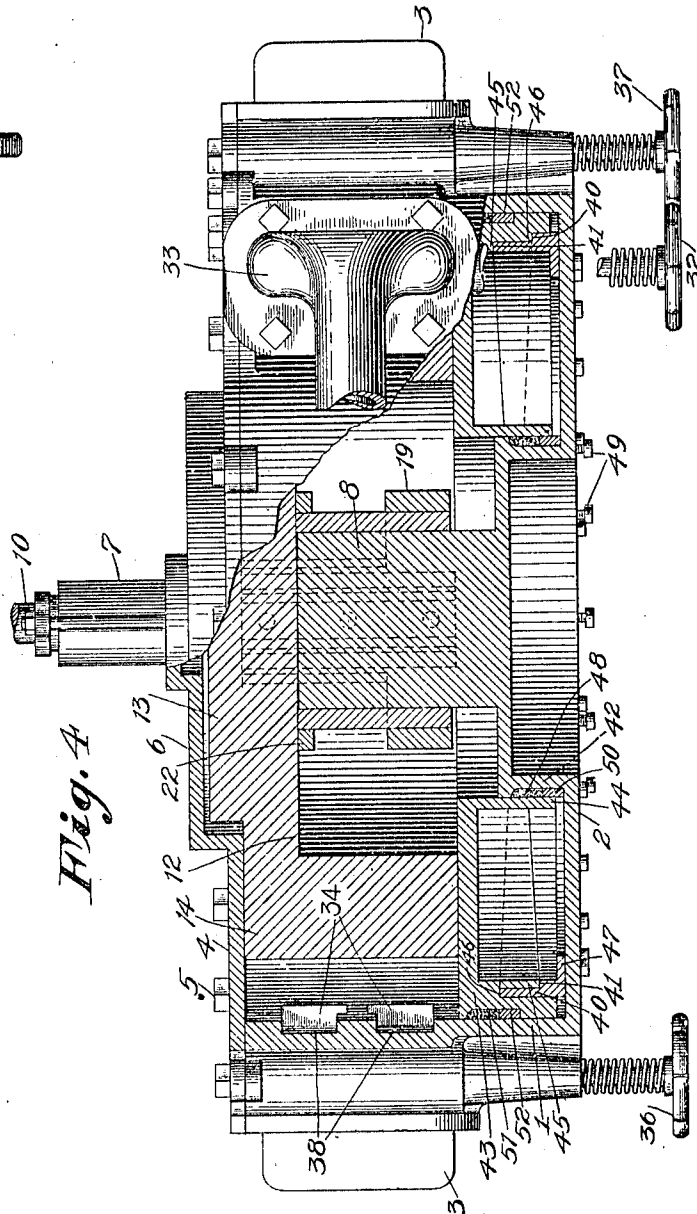
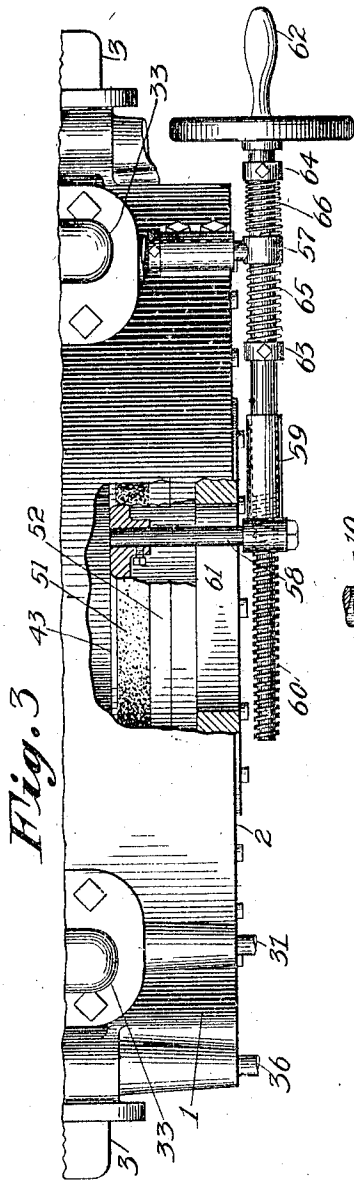
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5 SHEETS—SHEET 3.



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5 SHEETS—SHEET 4.

Fig. 5

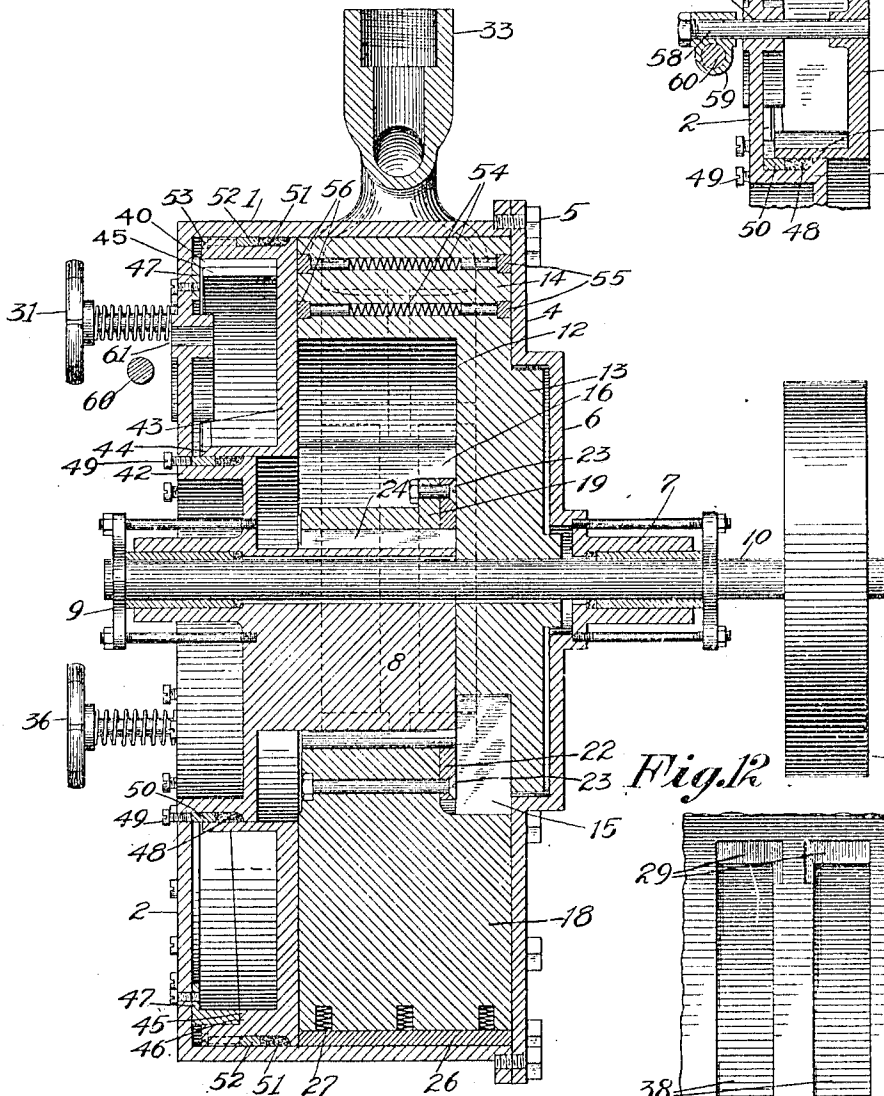


Fig. 6

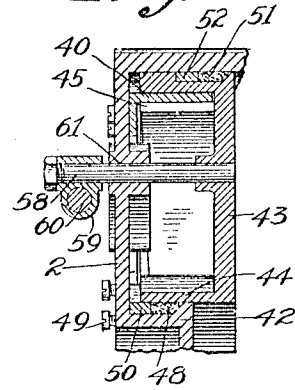
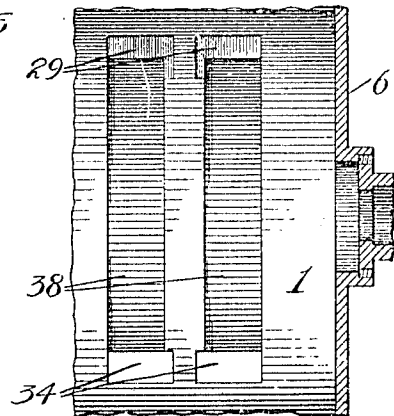


Fig. 12



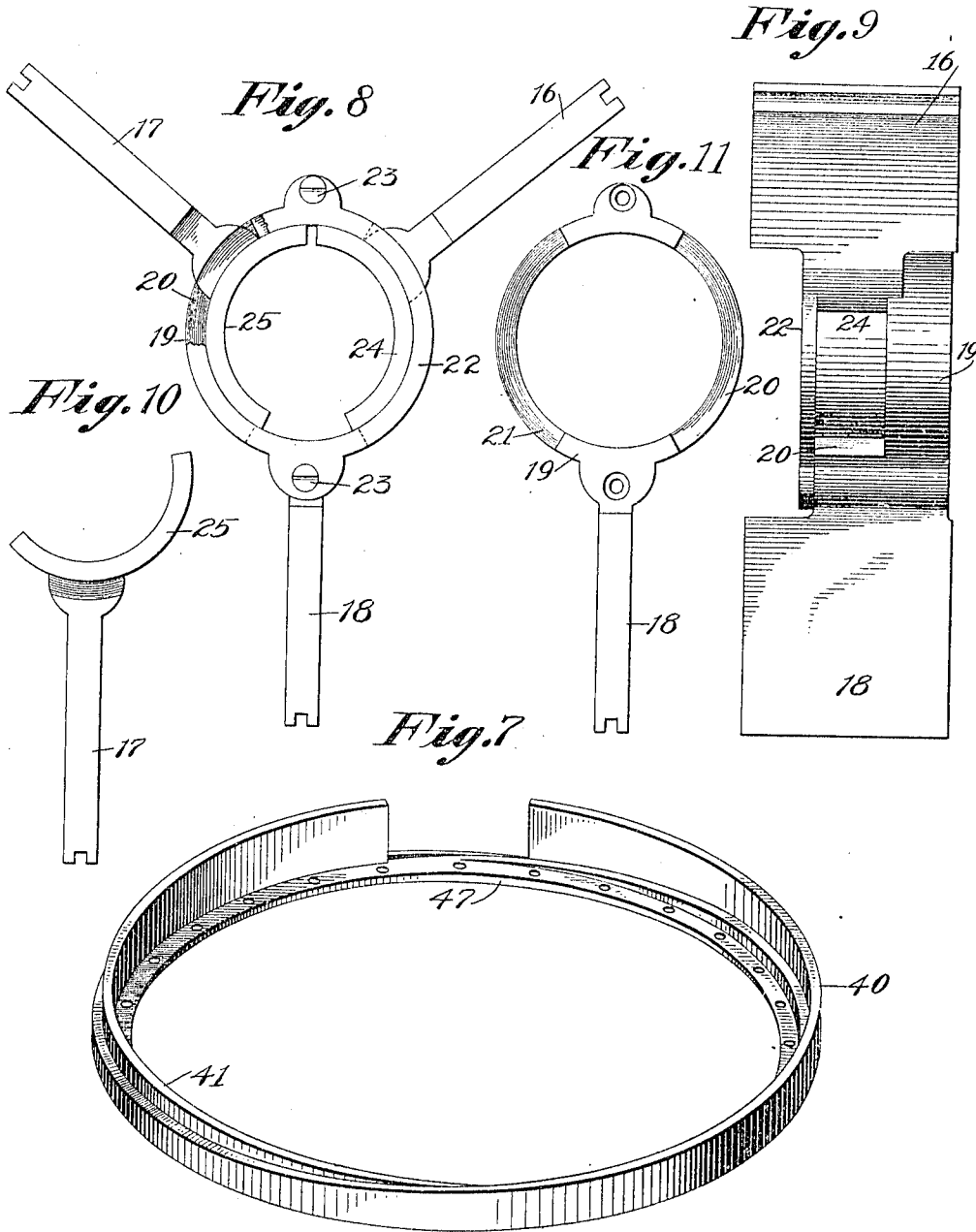
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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

949,410.

Specification of Letters Patent.

Patented Feb. 15, 1910.

Application filed October 3, 1908. Serial No. 456,007.

To all whom it may concern:

Be it known that I, HARRY H. BENSON, a citizen of the United States, residing at Rockford, in the county of Winnebago and State of Illinois, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

The object of this invention is to construct a reversible rotary engine.

The further object of this invention is to provide a by-pass for the steam around a blade during a portion of its movement in order that the steam may act upon two blades during a portion of their movements.

In the accompanying drawings. Figure 1 is a face representation in which a portion of the outer casing is broken away. Fig. 2 is a vertical section. Fig. 3 is a partial plan view in which a portion of the outer casing is broken away. Fig. 4 is a partial plan and partial section. Fig. 5 is a vertical section. Fig. 6 is a vertical section through the upper portion of the casing, and the connection with the movable cam surfaces. Fig. 7 is a perspective view of the stationary cams. Figs. 8 to 11 inclusive are representations of the connections between the three blades. Fig. 12 is an innerface representation of the edging 1.

The main shell or casing comprises the circular edging 1 having an end 2 formed integral therewith, and from the edging extend brackets 3 which support the casing upon a suitable bed. To the open end of the edging 1 is secured a face plate 4 by the screws 5. The face plate 4 has an enlargement 6 which is located eccentrically with relation to the edging 1. A stuffing box 7 is supported by the enlargement 6. The end 2 has a center 8 located within the casing and is concentric with the edging 1. A stuffing box 9 is formed a part of the end 2, and is located in line with the stuffing box 7. A shaft 10 is supported in the stuffing boxes 7 and 9 and has a pulley 11 connected thereto.

To the shaft 10 is keyed a piston 12 which is provided with an extension 13 said extension being located in the enlargement 6 of the face plate 4. This portion has its rim 14 provided with three radially extending openings 15, one for each blade. This piston is circular and is located concentrically of the shaft but is located eccentrically

within the casing so that its periphery will contact with the inner face of the edging 1 directly over the shaft.

Around the center 8 and within the piston are located three blades 16, 17 and 18. The blade 18 has a ring 19 from which extends the blade proper. The ring has cut-away side portions 20 and 21. A ring 22 is held in connection with the ring 19 by the bolts 23.

The blade 16 is formed with a segment of a ring 24 which is located within the ring 19 and adjacent to the center 8. The blade 17 is also formed with a segment of a ring 25 which is located within the ring 19 and against the center 8. Each of the blades 16 and 17 have a neck portion which extends through the cut-away side portion of the rings 21 and 20 respectively of the ring 19 of the head 18, and the ring 22 holds them in position. The ring segments 24 and 25 are located around the center 8 so that they may revolve around it as the center remains stationary.

Each of the blades 16, 17 and 18 support a packing strip 26 which is held yieldingly against the inner face of the edging 1 by the springs 27. These blades are guided in oscillatory packing guides 28 which are held in cavities formed in the edging of the portion.

The edging 1 is formed with two steam intake ports 29 and 30 which are opened and closed by the valves 31 and 32 respectively. A steam supply pipe 33 furnishes steam to the intake ports 29 and 30. Two exhaust ports 34 and 35 connect with the interior of the casing through the edging 1 and are controlled by the valves 36 and 37 respectively. In the inner face of the edging 1 are formed steam ducts 38 and 39. The duct 38 communicating with the steam intake port 29 and the exhaust port 34. The duct 39 communicating with the steam intake port 30 and the exhaust port 35.

To the inner face of the end 2 is secured a double cam comprising the flange sections 40 and 41. The end 2 is formed with an inwardly extending flange 42. A movable double cam comprises the plate 43, rim 44 and two cam sections 45 and 46. The rim 44 contacts with the flange 42 and a packing 48 serves to make a steam tight joint between the parts, and the screws 49 and ring 50 serve to hold the packing in place. Pack-

ing 51 is located between the outer edge of the plate 43 and the inner face of the edging 1, and is held in place by the ring 52 and screws 53.

5 The sections 45 and 46 of the movable cam rest in contact with the sections 41 and 40 respectively of the stationary cam secured to the end 2, and the inner face of the plate 43 contacts faces of the blades 16, 17 and 18. 10 Springs 54 are carried by the piston and exert their force against the plate rings 56 which bear against the faces of the face plate 4 and against the plate 43 thereby preventing steam from passing the sides of the piston. 15

The means for moving the movable cam comprises a bracket 57 secured to the outer face of the edging 1 of the casing. From the plate 43 of the movable double cam extends a stud 58. This stud 58 supports a screw-threaded sleeve 59 with which a screw-threaded shaft 60 engages. This stud 58 extends through a slot 61 in the end 2. The shaft 60 is also supported by the bracket 57 through which it passes in a manner to slide lengthwise therein. To the shaft 60 is secured a crank 62 by which it may be rotated, and to the shaft are set screwed two collars 63 and 64 one located each side of the bracket 57. A coiled spring 65 is located on the shaft 60 and bears against the bracket 57 and on the collar 63, and a spring 66 is located on the shaft and bears against the bracket 57 and collar 64. 20

35 The springs 65 and 66 serve to hold the shaft 60 against lengthwise movement except as hereinafter set forth, and by turning the shaft, the sleeve 59 is moved along the shaft which will carry the stud 58 with it. 40 As the stud 58 is fixedly connected with the movable double cam, this cam will be moved to either side of the vertical center of the casing. The object in moving this double cam is to hold the plate 43 against the edge 45 of the blades and piston in order that a steam tight joint may be maintained. The plate 43 is moved contrary to the direction of rotation of the blades and piston as shown at Figs. 1 and 2. Should the parts expand 50 the plate 43 will be moved axially in the same direction the piston and blades are rotating which will move the cam surfaces of the movable cam down the cam surface of the stationary cam. As the shaft 60 is held 55 against lengthwise movement by the spring 66, the expansion of the parts in moving the movable cam will pull on the shaft 60 thereby compressing the spring 66, and when the parts have cooled, the spring 66 will return 60 the parts to their adjusted position.

When the stud 58 is moved to the left hand end of the slot 61 facing the engine, the spring 65 will act the same as spring 66, that is, its tendency is to hold the stud in 65 its adjusted position, but will yield should

the parts expand. In moving the stud into the left hand end of the slot 61, the piston and blades are intended to rotate contrary to the way they are rotating in Figs. 1 and 2.

When the engine is rotating as indicated 70 in Fig. 2, steam is admitted through the intake port 29, and is exhausted through the port 35. The intake port 30 and exhaust port 34 being closed.

In Fig. 2 live steam is being admitted 75 against the blade 18, while the steam between the blades 18 and 17 is being exhausted through the port 35. After the blade 16 has passed the intake port 29 live steam 80 will contact with the blade 16, and live steam will still be admitted against the blade 18 by passing around the blades 16 by way of the ducts 38 until the blade 16 passes below the exhaust port 34, when live 85 steam will only contact with the blade 16 until blade 17 has been moved into position past the intake port 29.

In reversing the direction of rotation of the piston, the valves 31 and 37 are closed and the valves 32 and 36 are opened, and 90 the movable cam turned into position so that the stud 58 will occupy the left hand end of the slot 61.

By this construction a reversible rotary steam engine is had. 95

I claim as my invention.

1. In a rotary engine, the combination of a cylinder, a shaft, a piston rotatable with the shaft and located concentrically therewith, a stationary portion located eccentrically 100 to the shaft and concentrically to the cylinder, a plurality of blades located around the stationary portion, one blade formed with a ring end, the other blades formed with segmental ends and located inside the ring end of the other blade and in 105 contact with the stationary portion, and a ring overlying the shank portions of the blades having the segmental ends and connected to the ring end. 110

2. In a rotary engine, the combination of a cylinder, a shaft, a piston rotatable with the shaft and located concentrically therewith, a stationary portion located eccentrically 115 to the shaft and concentrically to the cylinder, a plurality of blades located around the stationary portion, one blade formed with a ring end having edge recesses, the other blades formed with segmental ends and located inside the ring end of the other 120 blade, and in contact with the stationary portion, the shanks of the blades with the segmental ends located in the recesses, and a ring overlying the shank portion of said blades and connected to the ring end. 125

3. In a rotary engine, the combination of a cylinder, a shaft, a piston connected with the shaft, blades movable by the piston, a plate contacting with the blades and piston 130 and carrying double cam sections, stationary

cam sections connected with the casing;
means for moving the plate comprising a
shaft having a screw-threaded connection
with the plate, a stationary bearing through
which the shaft passes, two collars connected
with the shaft, one located each side of the
bearing, and two springs, one located be-
tween the bearing and each of the collars.

In testimony whereof I have hereunto set
my hand in presence of two subscribing wit- 10
nesses.

HARRY H. BENSON.

Witnesses:

A. O. BEHEL,

E. D. E. N. BEHEL.