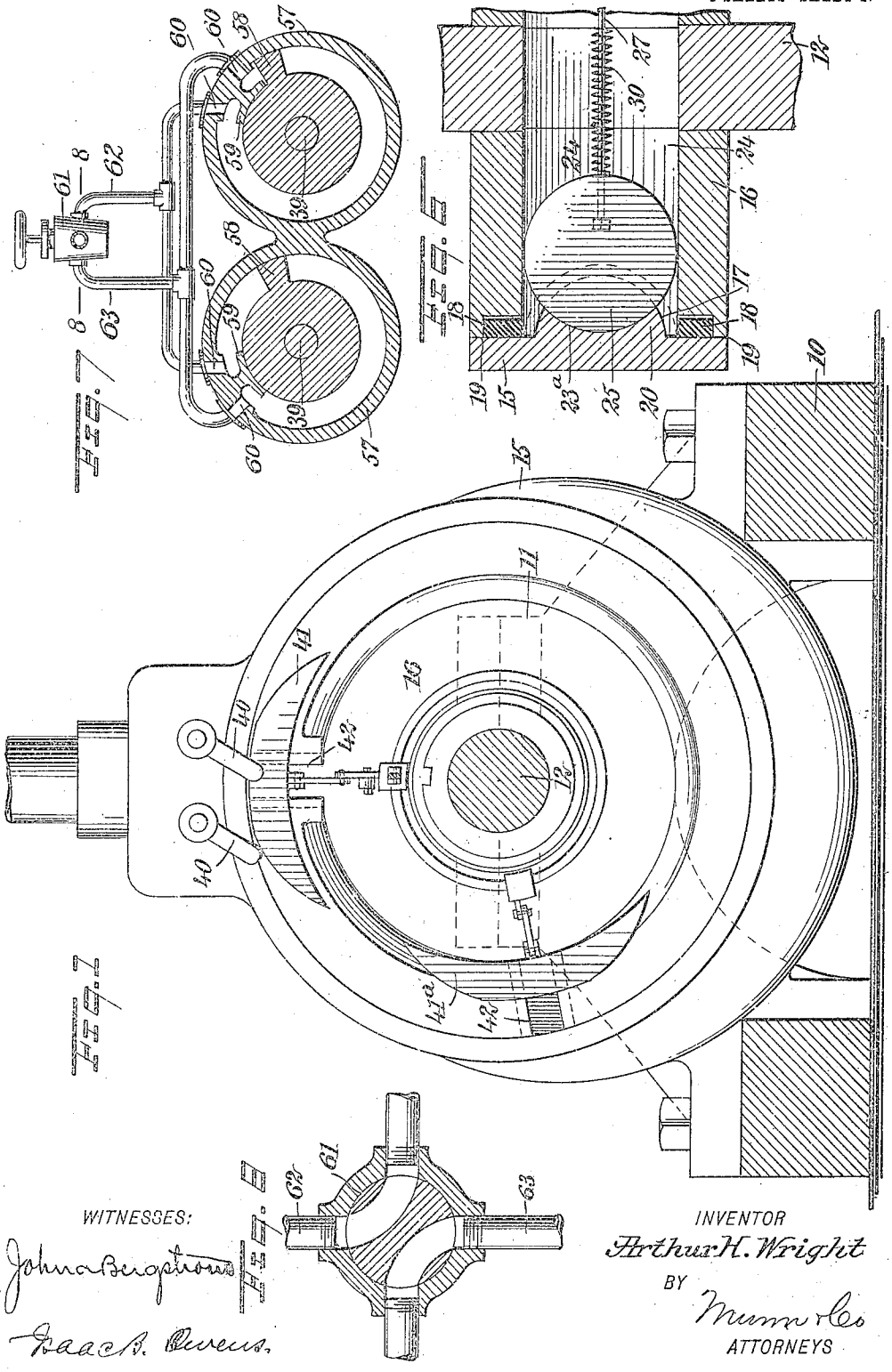
No. 818,399. PATENTED APR. 17, 1906.

A. H. WRIGHT.

ROTARY ENGINE.

APPLICATION FILED JAN. 16, 1906.

3 SHEETS—SHEET 1.



WITNESSES:

John A. Brophy

Isaac B. Reeves.

INVENTOR

Arthur H. Wright

BY

Munn & Co

ATTORNEYS

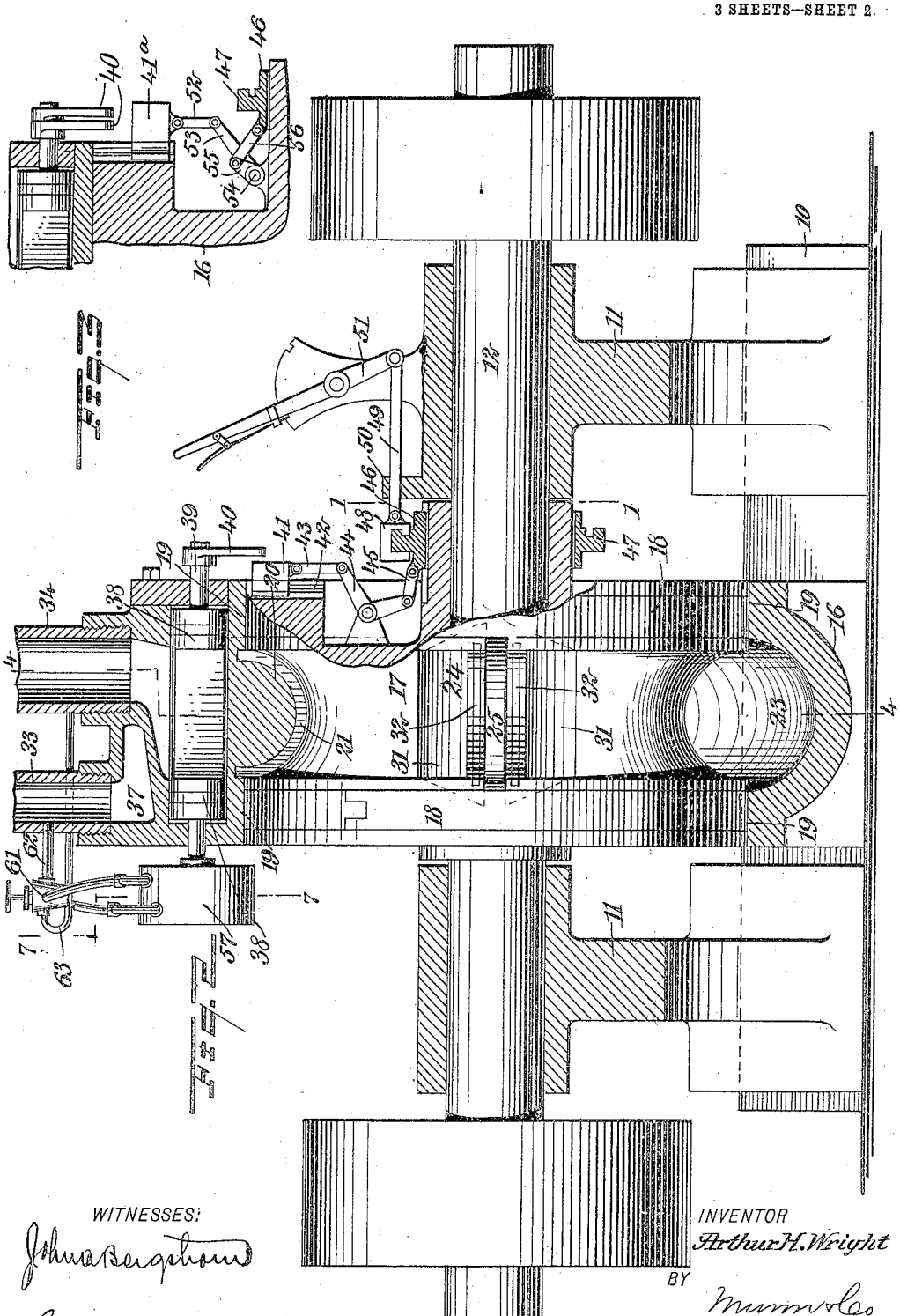
No. 818,399. PATENTED APR. 17, 1906.

A. H. WRIGHT.

ROTARY ENGINE.

APPLICATION FILED JAN. 16, 1906.

3 SHEETS—SHEET 2.



WITNESSES:

Johnson Berghaus

Isaac B. Owens.

INVENTOR

Arthur H. Wright

BY

Munn & Co

ATTORNEYS

No. 818,399. PATENTED APR. 17, 1906.

A. H. WRIGHT.

ROTARY ENGINE.

APPLICATION FILED JAN. 16, 1906.

3 SHEETS—SHEET 3.

FIG. 5

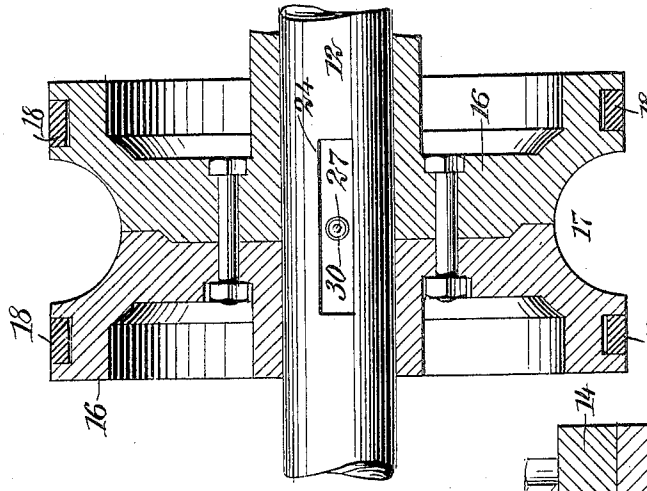
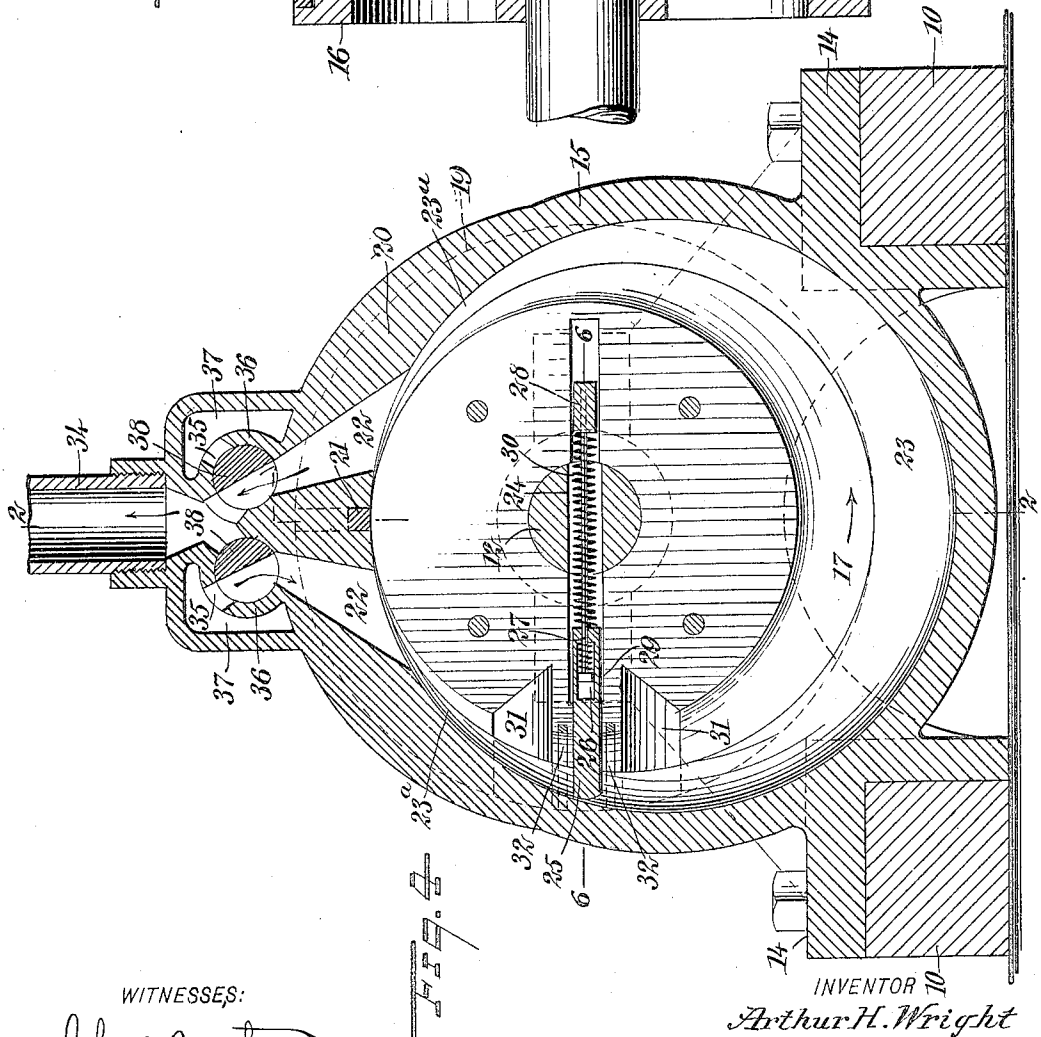


FIG. 4



WITNESSES:

John A. Bergstrom

Isaac B. Owens.

INVENTOR

Arthur H. Wright

BY

Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

ARTHUR H. WRIGHT, OF SOUTH ST. PAUL, MINNESOTA.

ROTARY ENGINE.

No. 818,399. Specification of Letters Patent. Patented April 17, 1906.

Application filed January 16, 1906. Serial No. 296,274.

To all whom it may concern:

Be it known that I, ARTHUR H. WRIGHT, a citizen of the United States, and a resident of South St. Paul, in the county of Dakota and State of Minnesota, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

The invention relates to a rotary engine designed to operate with steam or other elastic fluid under pressure, and it belongs to that class in which the rotating element or rotor turns eccentrically in the stationary casing or stator and carries a radially-movable piston-head, which bears the pressure of the working fluid and transmits the same to the engine-shaft and rotor.

The invention resides in a certain peculiar formation of the coacting surfaces of the rotor and stator and in the manner in which these elements are relatively arranged.

It also resides in peculiar devices for distributing and reversing the direction of flow of the steam or other fluid pressure whereby to control the speed and direction of rotation of the engine.

The invention involves various other features of major or minor importance, all of which will be fully set forth hereinafter, and pointed out in the claims.

Reference is to be had to the accompanying drawings, which illustrate as an example the preferred embodiment of my invention, in which—

Figure 1 is a side elevation of the engine with the shaft in section on the line 1 1 of Fig. 2. Fig. 2 is a vertical longitudinal section of the engine on the line 2 2 of Fig. 4. Fig. 3 is a detail view showing the manner of operating one of the valve-actuating cams. Fig. 4 is a vertical cross-section on the line 4 4 of Fig. 2. Fig. 5 is a sectional view of the rotor. Fig. 6 is a detail section on the line 6 6 of Fig. 4. Fig. 7 is a detail section on the line 7 7 of Fig. 2, showing the devices for reversing the valves; and Fig. 8 is a detail section of the four-way valve on the line 8 8 of Fig. 7.

10 indicates the bed of the engine, on which rests the bearings 11 of the engine-shaft 12 and the feet 14 of the stator 15, the stator being located intermediate the bearings of the shaft and the shaft being carried revolubly in said bearings and passing through the stator. Fastened to the shaft 12 is the rotor 16, which is preferably formed, as shown in Fig. 5, of two unlike sections fastened together. The rotor is formed with a continuous peripheral groove 17 of cross-sectional form, and at each side of this groove it has a concentric circular portion carrying packing-rings 18, which run against corresponding interior walls 19 on the stator. (See Fig. 2.) Said rings 18 and walls 19 are concentric to the shaft 12. Interiorly the stator is formed with a protuberance 20, which is located at the top and projects into the groove 17 in the periphery of the rotor, as shown best in Fig. 2. At its middle, or that point which actually contacts with the walls of the groove 17, the protuberance 20 is provided with a semicircular packing-strip 21, (see Figs. 2 and 4,) which makes a steam-tight connection at this point, and at each side of this packing-strip the stator is formed with steam-ports 22, which admit or exhaust the steam according to the direction in which the engine is running. The protuberance 20 tapers from the point at which the packing-strip 21 is located toward each side of the stator until it finally runs into the line of the walls 19, and it forms in the stator inward of said walls 19 a crescent-shaped protuberance or projection which fits into the groove 17 of the rotor and the middle part of which is of the same cross-sectional form as the cross-sectional form of the groove, so as to produce at this point a steam-tight joint between the stator and rotor. The stator is also formed with a crescent-shaped groove 23, the deepest part of which is at the bottom of the stator or diametrically opposite the deepest part of the protuberance or projection 20. This groove 23 is eccentric to the walls 19 and tapers from each side of its greatest depth until it runs into the end portion of the protuberance 20, as indicated at 23^a in Fig. 4, and finally vanishes at the deepest point on the projection 20, which is to say the point of contact between the projection and the walls 17 of the rotor. It will be seen, therefore, that I have provided a concentric rotor which turns true against the concentric walls 19 of the stator, that the stator is provided with an eccentric or crescent-shaped protuberance located at the top of the stator and projecting into the annular groove in the periphery of the rotor, and that the stator is further provided with an interior groove located diametrically opposite the protuberance which is eccentric to the center of movement of the rotor and runs into the end portion of the protuberance or projection 20 to

vanish or become *nil* at the point of contact between the rotor and protuberance 20. This forms within the engine a working chamber the outer wall of which is circular and eccentric to the center of movement of the rotor and the inner wall of which is formed by the concentric periphery of the rotor producing a chamber defined by two eccentric circles, the one inclosing the other and the circles intersecting each other at one point.

The rotor is formed with a radial chamber 24, which extends from one side of the rotor through the axis thereof and across to a point near to a point diametrically opposite. Within this chamber is arranged a radially-movable piston-head 25, which is preferably circular in form, as shown in Fig. 6, and has a pocket 26 formed thereon, in which is loosely received the headed end of a rod 27. This rod extends toward the inner end of the pocket 24 and carries a counterweight 28. Springs 29 and 30 act on the parts 25, 27, and 28, so as to yieldingly connect the rod 27 with the piston-head. The piston-head is adapted to project out beyond the rotor, so as to form a barrier across the working chamber of the engine, dividing it into two compartments, and the piston-head is free to move completely within the chamber 24, so as to pass the projection or protuberance 20. Said piston-head is held out into contact with the walls of the stator by centrifugal force. At each side of the piston-head the rotor is provided with a steam-pocket or cavity 31 and with packing-strips 32. The pockets 31 serve to produce walls for properly receiving the impact of the steam admitted through the ports 22, and the packing-strips 32 serve to reinforce the packing-strip 31 to effect a steam-tight connection between the projection 20 and the stator. When, therefore, steam is admitted, for example, through the right-hand port 22, as indicated by the arrows in Fig. 4, and assuming that the piston-head 24 has just passed said port moving in the direction of the arrow shown in said view, the steam admitted will first act on the walls of the adjacent cavity 31 and will continue to act by impulse until the steam-flow is cut off, whereupon expansion of the steam follows until the piston-head 25 runs past the right-hand port 22, whereupon the steam will be exhausted.

As shown in Fig. 2, the engine is provided with a steam-supply pipe 33 and exhaust-pipe 34. The ports 22 lead directly into the exhaust-pipe 34, and the said ports 22 also communicate with the steam-supply 33 by means of ports 35, which are formed in valve-housings 36 and which open into a chamber 37, into which the steam-supply pipe 33 leads. The steam distribution is effected by means of two rotary valves 38, which operate in the casings 36 and are capable of adjustment so as to open one port 22 to the chamber 37 and the other port to the exhaust 34 or to reverse the order of communication, in this way to reverse the direction of steam-flow into the engine, and consequently the direction of rotation of the shaft. The stems 39 of the valves 38 project beyond the stator at each end, and at one end the stems carry tappet-fingers 40, which project downward and coact with cams 41 and 41^a, whereby to open the valves 38. Said tappet-fingers 40 are arranged out of transverse line with each other, and the cams 41 and 41^a are so arranged that one cam will actuate one finger exclusively and the other cam the other finger exclusively. Said cams are mounted on the stator to move radially thereon in guideways 42 and are adapted to be alternately thrown the one inward and the other outward, according to which of the cams it is desired to make active. As shown in Fig. 2, the cam 41 has a link 43 joined thereto, and this link is connected to an elbow-lever 44, fulcrumed on the rotor. Said elbow-lever is in turn connected by a link 45 with a collar 46, which is splined on the hub of the rotor so as to turn with the rotor or to move independently axially of the same. The collar 46 has an undercut flange 47, and this is engaged with a block 48, which is joined to a link 49. The link is held to slide in a box 50, carried on one of the bearings 11. It will thus be seen that the parts 41, 43, 44, 45, and 46 turn with the rotor, while the parts 48 and 49 are stationary relatively thereto. A hand-lever 51 is in connection with the link, so that by means of this lever the link 49 may be moved longitudinally of the shaft 12 and the collar 46 shifted on the hub of the rotor, so as to throw the hand-lever 44 and move inward the cam 41. This operation must be concurrent with an outward movement of the cam 41^a, and such latter movement is effected by the devices shown in Fig. 3, which consist in a link 52, pivoted to the cam 41^a and to an arm 53, carried by a rock-shaft 54, mounted on the rotor 16. Said rock-shaft 54 also carries an arm 55, and this arm is connected by a link 56 with the said collar 46, so that as the collar is moved leftward to move inward the cam 41 it also throws leftward the arm 53 and raises or moves outward the cam 41^a. Therefore it will be seen that by operating the lever 51 one cam may be moved inward and the other is moved outward, and vice versa. The cam 41 is intended to operate the left-hand tappet-finger 40, (referring to Fig. 1,) and the cam 41^a is intended to operate the right-hand tappet-finger 40. In operation the admission-valve is held yieldingly closed by devices which will be hereinafter described, and the exhaust-valve is held open. The cam 41 or 41^a which is associated with the inlet-valve, according to the direction in which the engine may be rotating, will periodically strike the corresponding tappet-finger 40 and open the inlet-valve for a period depending

upon the duration of contact between the cam and the tappet-finger. This will admit a quantity of steam which will act expansively on the piston-head, and when the valve closes this steam will be permitted to expand in the working chamber of the engine. When the engine is reversed, the order of operation of the valves is reversed correspondingly. In effecting this reversal of the engine the cams 41 and 41ª are caused to reverse their positions owing to and by means of the devices hereinbefore explained.

I will now describe the devices for yieldingly holding the valves 38 in their normal positions. The stems 39 of the valves at the side of the engine opposite that on which the tappet-fingers 40 are located respectively project into the circular casings 57, (best shown in Fig. 7,) and attached to the stems within these casings are piston-like members 58. Projecting into the chambers 57 are abutments 59, and at each side of these abutments are steam-ports 60. These ports 60 communicate by suitable piping with a four-way valve 61, one port of which is in communication with the steam-supply 33 by means of a pipe 62. The second port of said valve 61 is in communication with the exhaust 34 by means of a pipe 63, and the other two ports of the valve are in communication by the aforesaid pipes with the ports 60 of the casings or chambers 57. By turning the three-way valve 63 to one position steam is admitted on one side of each of the piston-like members 58, so as to hold said members, and consequently the valves 38, yieldingly in a certain predetermined position. When the tappet-fingers 44 are struck, the valves, and consequently the members 58, are moved against steam-pressure, and the instant that the pressure on the tappets is released the steam-pressure returns the valves to the aforesaid predetermined position. Assuming that the parts are operating as indicated by the arrows in Fig. 4, the left-hand valve 38 will be by the devices shown in Fig. 7 held closed, and the right-hand valve 38 will be by those devices held open. When the engine is reversed, the valve 61 should be operated to reverse the pressure on the piston-like members 58, whereupon the reversal of the positions of the valves 38 will take place.

In the organized operation of the engine, assuming that it be desired to drive the same in the direction indicated by the arrow applied to the rotor in Fig. 4, the lever 51 should be thrown so as to move the cam 41 into active position and the cam 41ª into inactive position. The valves 61 should be manipulated so that the left-hand valve 38 will be moved into closed position by the pressure applied to the member 58 in connection with this valve and the right-hand valve moved into open position by the pressure applied to the member 58 in connection with the right-hand valve. Then upon starting the revolution of the engine the cam 41 will periodically strike the left-hand tappet-finger 40 and periodically open the left-hand valve 38, admitting steam and causing the rotation of the engine in the manner before described. This operation will continue as long as the parts 51 and 61 are left in the adjustment above explained. To reverse the engine, it is only necessary to reverse the position of the parts 51 and 61, whereupon the parts change their relative function and steam is admitted into the engine in the opposite direction.

Having thus described the preferred form of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A rotary engine having a stator, a rotor operating concentrically therein, the rotor having a continuously-grooved periphery, and the stator having an internal protuberance projecting into the groove of the rotor to contact with the walls thereof at one point on its periphery, said protuberance having an inner wall curved eccentrically to the periphery of the rotor, and the stator also having an internal groove disposed oppositely to the said protuberance and running into the end portions thereof, the outer wall of the groove being curved eccentrically to the rotor, a piston-head radially movable on the rotor, and means for admitting and exhausting the working fluid at opposite sides of the point of contact between the rotor and said protuberance.

2. A rotary engine having a stator, a rotor operating concentrically therein, the rotor having a continuously-grooved periphery, and the stator having an internal protuberance projecting into the groove of the rotor to contact with the walls thereof at one point on its periphery, said protuberance having an inner wall curved eccentrically to the periphery of the rotor, and the stator also having an internal groove disposed oppositely to the said protuberance and running into the end portions thereof, the outer wall of the groove being curved eccentrically to the rotor, a piston-head radially movable on the rotor, and means for admitting and exhausting the working fluid at opposite sides of the point of contact between the rotor and said protuberance, said internal groove of the stator having a curved cross-sectional form.

3. A rotary engine having a stator, a rotor operating concentrically therein, the rotor having a continuously-grooved periphery, and the stator having an internal protuberance projecting into the groove of the rotor to contact with the walls thereof at one point on its periphery, said protuberance having an inner wall curved eccentrically to the periphery of the rotor, and the stator also having an internal groove disposed oppositely to the said protuberance and running into the end portions thereof, the outer wall of the

groove being curved eccentrically to the rotor, a piston-head radially movable on the rotor, and means for admitting and exhausting the working fluid at opposite sides of the point of contact between the rotor and said protuberance, the rotor having a steam-pocket therein at each side of the piston-head and directly adjacent thereto.

4. A rotary engine having a stator, a rotor operating therein and having a diametrical pocket, a piston-head movable in one end of the pocket, a counterweight movable in the opposite end portion of the pocket, and means effecting a yielding connection between the piston-head and counterweight.

5. A rotary engine having a stator, a rotor operating therein and having a diametrical pocket, a piston-head movable in one end of the pocket, a counterweight movable in the opposite end portion of the pocket, and means effecting a yielding connection between the piston-head and counterweight, said means comprising a rod attached to the counterweight and sliding on the piston-head, and springs connecting the rod with the piston-head.

6. In a rotary engine, the combination of a stator, a rotor, valves, cams for operating the same, means movably mounting the cams on the rotor, means for alternately throwing the cams in and out of action, the second-named means comprising a collar splined on the rotor, a linkage connecting the collar with each cam, a member having sliding connection with the collar, and means mounted independently of the rotor and connected with said member whereby to shift the collar through the medium of said member.

7. A rotary engine having a valve, a piston-like member connected to the valve, a casing in which the member operates, means for applying fluid-pressure to either side of said member at will, and means for periodically operating the valve.

8. A rotary engine having a valve, a rotary piston-like member attached thereto, a circular casing in which the said member operates, an abutment in the casing and engaging the member, means for entering fluid-pressure into the casing at either side of the abutment at will, and means for periodically actuating the valve.

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

ARTHUR H. WRIGHT.

Witnesses:
R. W. WRIGHT,
W. E. BUCKRETT.