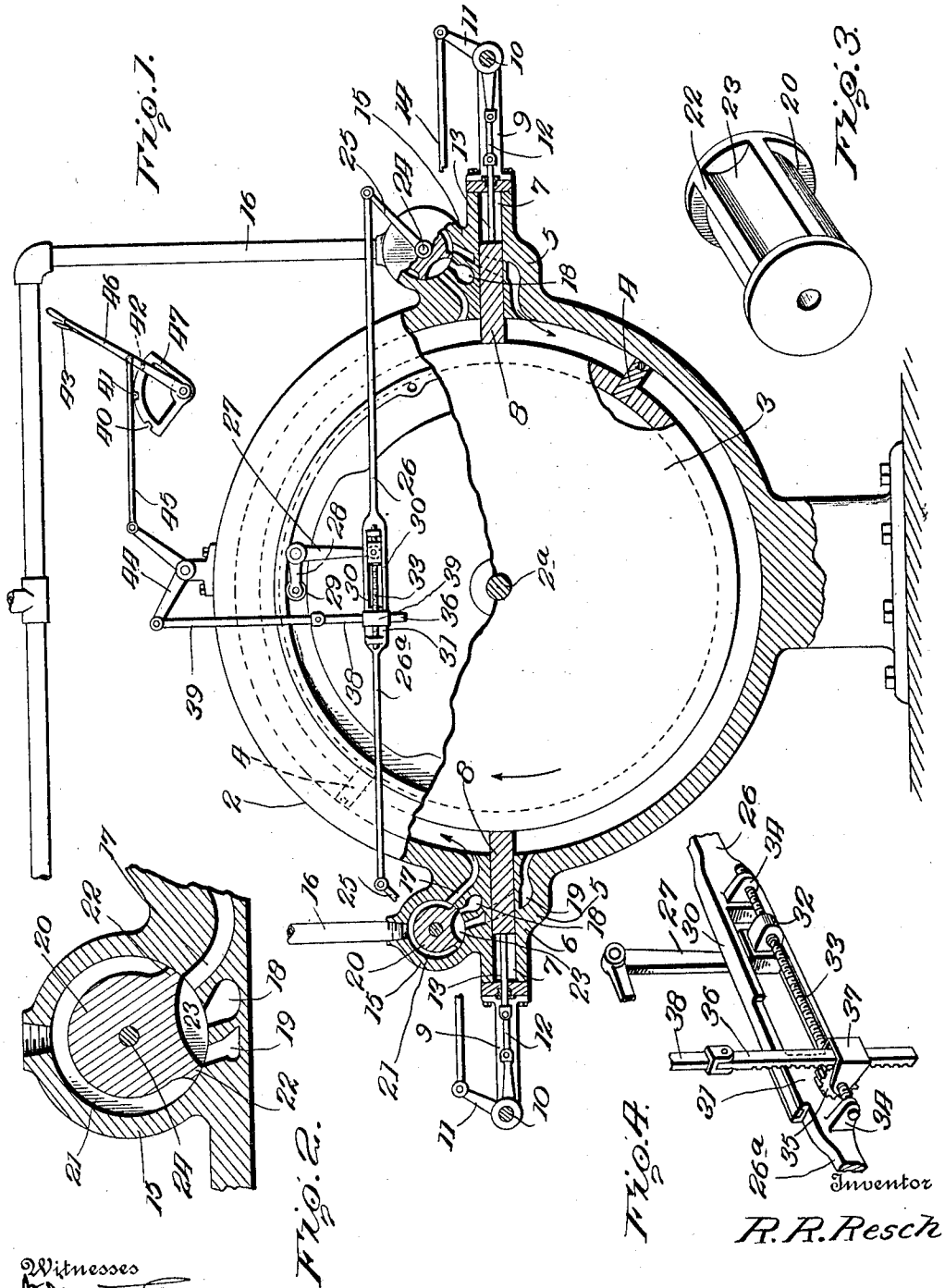


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VALVE FOR ROTARY STEAM ENGINES.
APPLICATION FILED JAN. 6, 1912.

1,048,735.

Patented Dec. 31, 1912.



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UNITED STATES PATENT OFFICE.

RALPH R. RESCH, OF TRINIDAD, COLORADO.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, RALPH R. RESCH, citizen of the United States, residing at Trinidad, in the county of Las Animas and State of Colorado, have invented certain new and useful Improvements in Valves for Rotary Steam-Engines, of which the following is a specification.

My invention relates to valves particularly adapted for rotary engines, and particularly to an improved valve designed for use with the rotary engine illustrated and described in the application of Lambert and Resch, filed on the 9th day of May, 1911, Serial No. 625,833.

In that application there was disclosed a rotary engine having two pairs of oppositely disposed inlet valves with a sliding abutment between each pair of valves, and also two pairs of exhaust valves, the exhaust valves of each pair being placed one on each sliding abutment.

My present improvement is designed to simplify very greatly the valve structure illustrated in said pending application, and to do away with the necessity of separate exhaust and inlet valves, and to provide a valve which will operate both as an exhaust and an inlet valve, thus doing away with the mechanism necessary to operate the separate exhaust valves as disclosed in said application.

A further object is to provide a valve which when in its middle position will permit the engine to "drift".

A further object is to provide a valve which will not only act as an inlet valve, but also as an exhaust valve, which valve may be reversed so as to cause the engine to run in one or the opposite direction, or which may be set in a middle position as above described when the engine is driven.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings wherein:

Figure 1 is a vertical section of a rotary engine and the valve mechanism therefor, the valve actuating mechanism being shown in elevation. Fig. 2 is an enlarged section of one of the valve chambers. Fig. 3 is a perspective view of the valve removed from the chamber. Fig. 4 is a perspective view of a part of the reversing mechanism.

Corresponding and like parts are referred to in the following description and

indicated in all the views of the accompanying drawings by the same reference characters.

While I do not wish to limit myself to the use of my improved valve with any particular form of engine, I have for purposes of illustration shown the valve as applied to a rotary engine of the type described in said prior application of Lambert and Resch. This engine comprises a rotor casing designated 2 in the drawings, and a rotor 3 disposed within the casing and mounted upon a shaft 2^a. The exterior face of the rotor is spaced from the inner face of the casing 2 and the rotor carries a plurality of piston blades 4 projecting out radially and engaging the inner face of the casing. As illustrated, there are two of these blades set diametrically opposite to each other.

Placed at diametrically opposite portions of the rotor casing are the abutment casings 5. Both of these casings are substantially alike and therefore a description of one will apply equally well to the other. Each casing is formed with an abutment recess 7 in which the abutment 8 travels, the abutment being designed to be projected against the face of the rotary casing or to be shifted outward to permit the passage of one of the piston blades 4. The mechanism whereby this is accomplished is fully illustrated in the application of Lambert and Resch before referred to, and therefore needs no description at this time. It is sufficient to say that each rotor casing carries upon it the outwardly projecting brackets 9, and that mounted upon a rock shaft 10 carried in the extremity of each bracket is a bell crank lever 11 having a link connection 12 to a plunger rod 13 connected to the corresponding abutment 8, this plunger rod moving through stuffing boxes. There are two bell crank levers 11, oppositely disposed with relation to each other and connected by means of a jointed or sectional connecting rod designated 14. This connecting rod 14 is given a lateral reciprocating movement whereby the bell crank levers are actuated to alternately shift the abutments inward and outward just before the pistons 4 pass the abutments. Any desired means may be used for actuating the sectional connecting rod 14, and as there are many obvious means of securing this actuation through the rotation of the rotor, I have not deemed it necessary to illustrate any such means. In the

construction shown in the before mentioned application of Lambert and Resch, this connecting rod is actuated by means of a cam mounted upon the rotor shaft.

5 Forming part of each of the abutment casings 5 is a valve casing 15 shown as located upon the upper portion of the abutment casing. This valve casing has a cylindrical bore and is connected by a pipe 16
10 to a source of steam. Each valve casing 15 is provided with three ports 17, 18 and 19. The port 17 as illustrated in Fig. 1, leads to the interior face of the rotor casing above the corresponding abutment 8. The
15 port 19 is spaced from the port 17 and leads to the inner face of the valve casing below the abutment 8, this port passing around the abutment 8. Preferably both of the ports 17 and 19 as they near the inner
20 face of the valve casing are angularly extended or curved in opposite directions, the port 17 being curved upward at its exit end, or in the direction of rotation of the rotor, when the rotor is moving in a clockwise direction, while the port 19 near its extremity
25 is turned downward or somewhat in the direction of rotation of the rotor, when the rotor is moving in a counterclockwise direction.

30 Opposite the ports 17 and 19 is the exhaust port 18. This port at one end communicates with the interior face of the valve chamber 15, while its other end extends out to the open air or is connected to any suitable exhaust pipe, muffler etc. (not shown).
35 It will be seen that the distance between the inlet port 17 and the exhaust port 18 is the same as between the exhaust port 18 and the port 19.

40 Disposed within each of the valve chambers 15 is the oscillating valve 20. This valve is approximately cylindrical in form and through its greater extent is considerably less in diameter than the interior diameter of the valve chamber 15, so that a
45 steam space 21 is left between the face of the valve and the inner face of the valve chamber. The valve is provided at two points of its periphery with the outwardly projecting ribs 22 which contact with the
50 inner faces of the valve chest or chamber and may be suitably packed, said packing, however, not being shown as it is not believed necessary to do so. The ribs 22 are
55 placed a sufficient distance from each other so that they will bridge in one position of the valve all three of the ports 17, 18 and 19 as shown in Fig. 2. The space 23 defined between these ribs is the exhaust space.
60 The ribs 22 each have a facial width equal to the width of the ports 17 and 19, and equal to the spaces between said ports. Thus when the valve is turned to the position shown in Fig. 1, one of the ribs 22 will
65 be disposed between the port 17 and the

port 18. As a consequence, the port 17 will be connected to the live steam space 21, while the port 19 will be connected with the exhaust port 18. If the valve is turned in a reverse direction, the port 17 will be connected to the exhaust port 18, while the port 19 will be connected to the live steam space. Each of the valves 20 is an oscillating valve.

In the position shown in Fig. 1, each valve will oscillate so as to alternately connect the port 17 with the steam space and cut off this port, but it will be seen that the space 23 between the ribs 22 is of sufficient length that when the valve is alternately cutting off and admitting steam to the port 17, the port 19 will remain in constant connection with the exhaust port 18. It will be understood that it is only when the rotor is rotating in one direction, that is, the direction of the arrow in Fig. 1, that the valve 20 alternately cuts off and admits steam to the port 17. If the rotor is moving in a direction reverse to that of the arrow in Fig. 1, the valve 20 will also be reversed so that each of the ports 17 will be connected at all times with the exhaust port 18, while the valve 20 will alternately cut off and admit steam to the port 19. When steam is admitted through the ports 17, the rotor will be driven in a clockwise direction. When steam is admitted through the port 19, the steam will be driven in a counterclockwise direction. When the valve is turned to the position in Fig. 2 so that the space 23 between the ribs 22 extends over all three of the ports 17, 18 and 19, no steam will be admitted to the space between the rotor and the rotor casing, but this space will be connected with the exhaust port. While the valve will oscillate when turned to a middle position as shown in Fig. 2, such oscillation of the valve will never be great enough to connect the port 17 or the port 19 with the live steam space 21. In this period the engine may drift.

It will be obvious that many ways might be provided whereby the rotation of the rotor 3 would cause an oscillation of the valves 20. I have shown, however, for this purpose the mechanism illustrated in the prior application of Lambert and Resch. Each of the valve spindles 24 is connected at its exterior end to a radial arm 25. Broadly speaking, these two arms 25 are connected by a reciprocating connecting rod 26, reciprocated by means of a bell crank lever 27 mounted exterior to the rotor, this bell crank lever having an arm 28 carrying a roller 29 which engages in a cam track of a cam carried by the rotor, or on the rotor shaft, this cam track being so arranged that the rod 26 is reciprocated twice for each full rotation of the rotor. It is necessary to reverse the valves 20, and also necessary to

shift the valves 20 to a middle position, and for this purpose I have illustrated the same reversing mechanism fully described and illustrated in the application of Lambert and Resch before referred to.

The rod 26 is made in two sections, 26 and 26^a. The inner extremity of the portion 26 is bifurcated so as to provide two arms 30 which embrace a head 31 formed on the extremity of the section 26^a. These two arms have sliding engagement with this head 31. It will be obvious that when the two sections 26 and 26^a are drawn toward each other, the arms 25 will shift the valves 20 in one direction, while when the sections 26 and 26^a are forced away from each other so as to expand, the valves 20 will be shifted in the opposite direction. For the purpose of contracting or expanding the rod 26 by shifting the sections of which the rod is composed relatively to each other, I provide the mechanism illustrated in the perspective view, Fig. 4.

Attached to the lower end of the depending arm of the bell crank lever 27, is a bearing 32 for a screw rod 33. This rod 33 engages with screw threaded lugs 34 carried, one upon the section 26 and the other upon the section 26^a. Also mounted upon the screw 33 is a toothed wheel 35 with which engages a rack 36 held in engagement with the wheel 35 by means of a yoke 37. The rack 36 is carried upon a link 38, which in turn is pivotally mounted upon a depending arm 39 connected to a bell crank lever 36 mounted upon the rotor casing. This lever 44 is connected in any suitable manner as by a link 45 to a hand lever 46. This hand lever moves over an arcuate rack 47 provided with three notches 40, 41 and 42. The lever 46 is provided with a locking pawl (not illustrated) connected to a handle 43 whereby the lever may be locked in engagement with any one of the notches 40, 41 and 42.

When the lever 46 is shifted in one direction so that its locking pawl engages with the notch 42, then the valves will be shifted into the position illustrated in Fig. 1 and the rotor will revolve in a clockwise direction. When the lever 46 is shifted so that its locking pawl is in engagement with the notch 40, then the valves will be reversed and the rotor will revolve in a counterclockwise direction. When the locking pawl of the lever 46 is in engagement with the notch 41, then the valves will be in the position illustrated in Fig. 2 and no steam will be admitted into the space between the rotor and the casing.

It will be understood that the exhaust ports are never closed while the engine is running, and this rule applies without regard to the direction in which the rotor runs. As a consequence, there is never any compression. It may also be pointed out that

the shape of the steam ports is such that the steam as it passes from the ports into the space between the casing and the rotor is discharged, not directly towards the rotor but toward the piston blade.

In addition to the advantages above pointed out, it will be noted that my construction is extremely simple and does away in this class of engine with the necessity of having separate exhaust ports and separate exhaust valves. This in turn does away with the mechanism for operating the exhaust valves and thus reduces the friction of the operating parts and the cost of manufacture.

What I claim is:

1. A combined inlet and exhaust valve mechanism for rotary engines, including a valve chamber having a pair of spaced inlet ports and an exhaust port between the inlet ports, a valve smaller than the chamber to provide a steam space extending around the exterior of the valve, said valve having a pair of ribs contacting with the chamber and defining an exhaust space of such size as to cover all three of said ports when the valve is in one position, means for shifting the valve to cause the exhaust space to connect the exhaust port with one of the inlet ports and connect the other inlet port with the steam space surrounding the valve, and means for reciprocating the valve to close and uncloze the last named port.

2. A combined inlet and exhaust valve mechanism for rotary engines, including a valve chamber having a pair of spaced inlet ports and an exhaust port between the inlet port and connected to the open air, a valve smaller than the chamber to provide a steam space exterior to the valve, said valve having a pair of spaced ribs contacting with the inner face of the chamber and defining an exhaust space of such size as to cover all three of said ports when the valve is in an intermediate position, each rib on the valve having its edge face of such width as to close the adjacent inlet port when the valve is shifted from its intermediate position, means for shifting the valve to cause the exhaust space to establish connection between the exhaust port and one of the inlet ports and to establish connection between the other inlet port and the steam space surrounding the valve, and means for reciprocating the valve to cause one of said ribs to alternately cut off and connect said last named inlet port with said steam space.

3. A combined inlet and exhaust valve mechanism for rotary engines, including a cylindrical valve chamber having on its periphery a pair of spaced inlet ports and an exhaust port disposed between the inlet ports, a substantially cylindrical valve smaller than the casing and having a pair of radially arranged spaced ribs, the outside faces of which contact with the inner face

of the casing, said ribs defining on one side of the valve a steam space and on the other side of the valve between said ribs an exhaust space, said exhaust space being of such size as to cover all three of said ports when the valve is in an intermediate position, the faces of said ribs being equal in width to the width of said inlet ports and the space between the inlet ports, means for shifting the valve to cause the exhaust space to connect the exhaust port and one of the inlet ports, or to cause the exhaust space to connect both of said inlet ports with the exhaust port, and means for oscillating the valve to an angular distance equal to the thickness of said ribs.

4. In a rotary engine, the combination with a rotor having a radial piston blade, a casing surrounding the rotor and an abutment, of a valve chamber disposed adjacent to the abutment and having an exhaust port leading therefrom to the open air and a pair of inlet ports disposed, one on each side of the exhaust port and leading from the interior of the valve casing to the interior of the rotor casing, one on each side of the abutment thereof, of a valve disposed in said chamber, said valve being smaller than the casing to provide a steam space extending around the valve exterior thereto and having a pair of ribs contacting with the interior face of the chamber and spaced from each other to define an exhaust space, said exhaust space between the ribs being of such size as to cover all three of said ports when the valve is in an intermediate position, means operated by the rotor for reciprocating said valve, and manually operated means for shifting the valve to cause the exhaust space to connect the exhaust port and one of the inlet ports and to cause the other inlet port to be connected with the steam space surrounding the valve

or to cause the exhaust space of the valve to connect all of said ports.

5. In a rotary engine, the combination with a rotor having a radial piston blade, a rotor casing and a reciprocating abutment operating through the casing of a cylindrical valve chamber having an exhaust port leading to the open air and having a pair of inlet ports extending from the valve casing to the interior of the rotor casing and opening, one on each side of the said abutment, of a cylindrical operating valve disposed in said chamber, the exterior face of the valve being spaced from the interior face of the chamber to provide a steam space extending around the larger portion of the circumference of the valve, said valve being provided with radiating ribs, the faces of which contact with the inner face of the chamber, said ribs defining an exhaust space, the exhaust space being of such extent that when the valve is in its intermediate position, the exhaust space will cover all of said ports, said ribs being of such width as to cover the inlet ports in one position of the valve, means operated by the rotor for giving a constant oscillation to said valve to cause one of the ribs to alternately open or cut off communication between one of the inlet ports and the steam space, and manually operated means for rotating said valve in one or the other direction to cause the steam space to establish communication between all of said ports or establish communication between one of the inlet ports and the exhaust port.

In testimony whereof, I affix my signature in presence of two witnesses.

RALPH R. RESCH. [L. S.]

Witnesses:

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MUNGO O. DICK.