(No Model.) 6 Sheets—Sheet 1.

J. H. DARRAGH.

ROTARY ENGINE.

No. 343,441. Patented June 8, 1886.

Fig. 1.

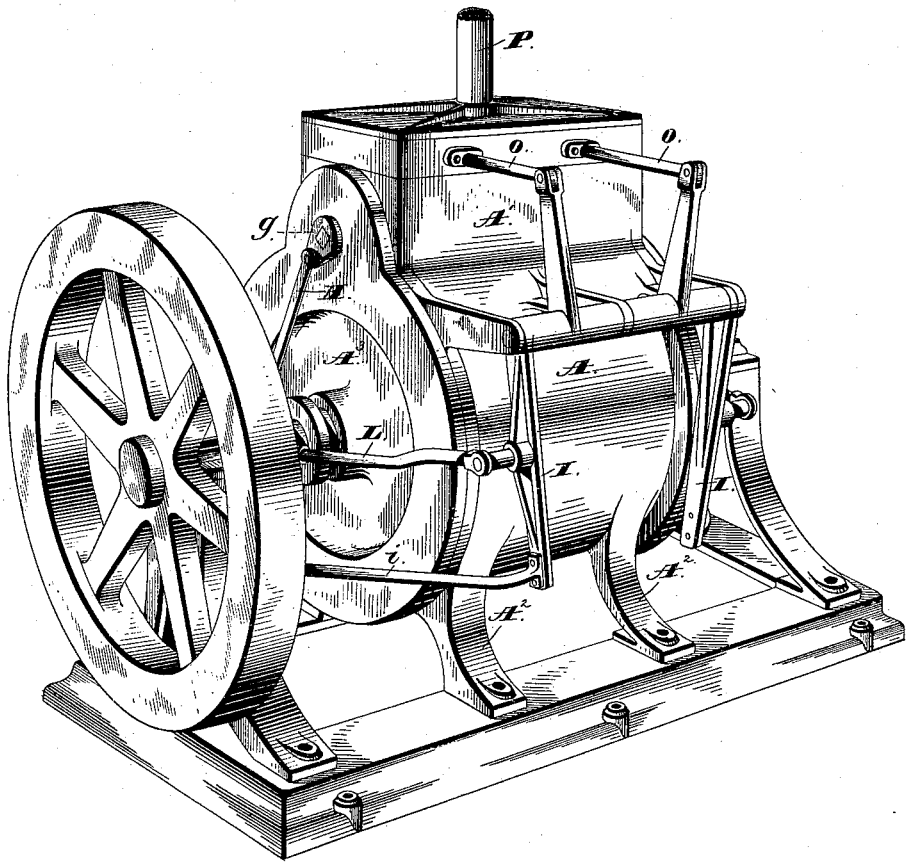

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Fig. 2.

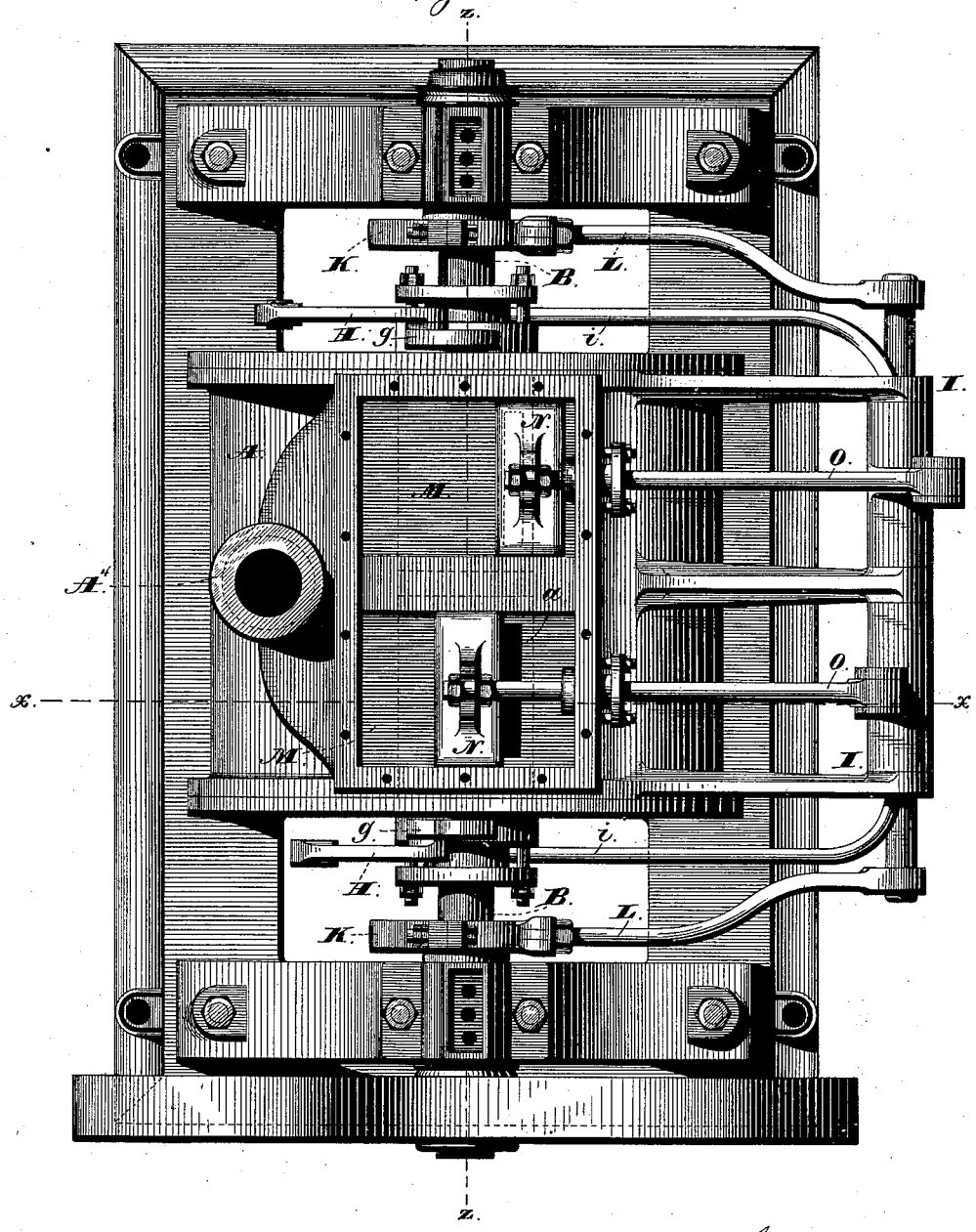

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Fig. 3.

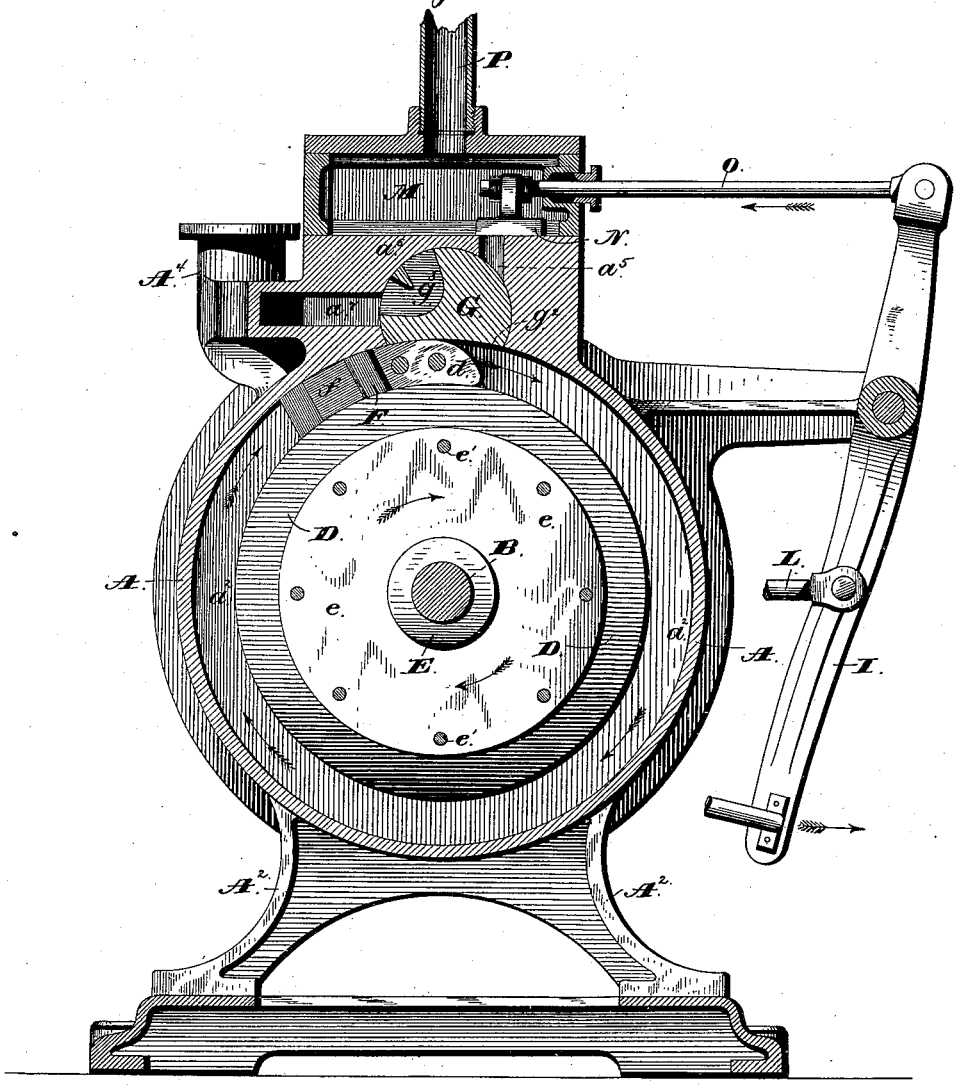

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Fig. 4.

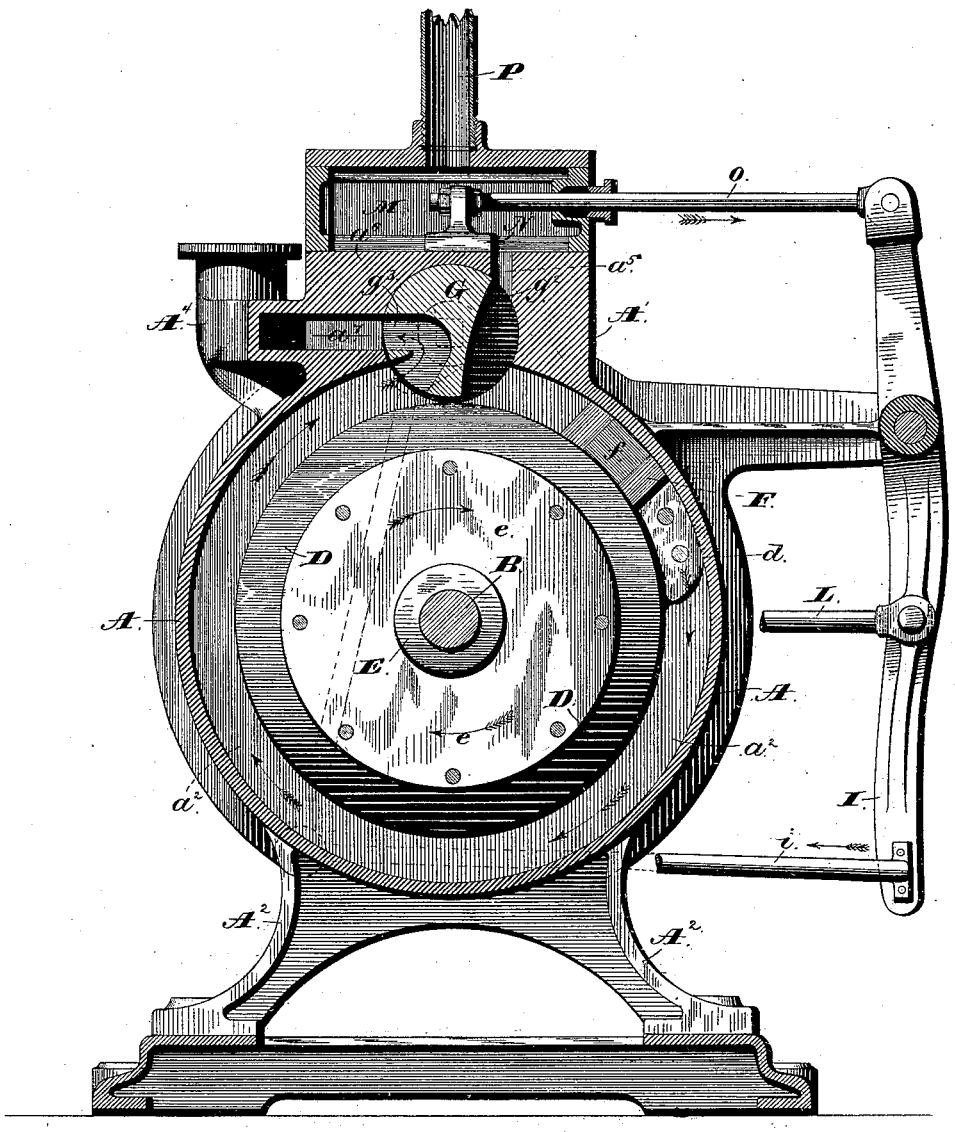

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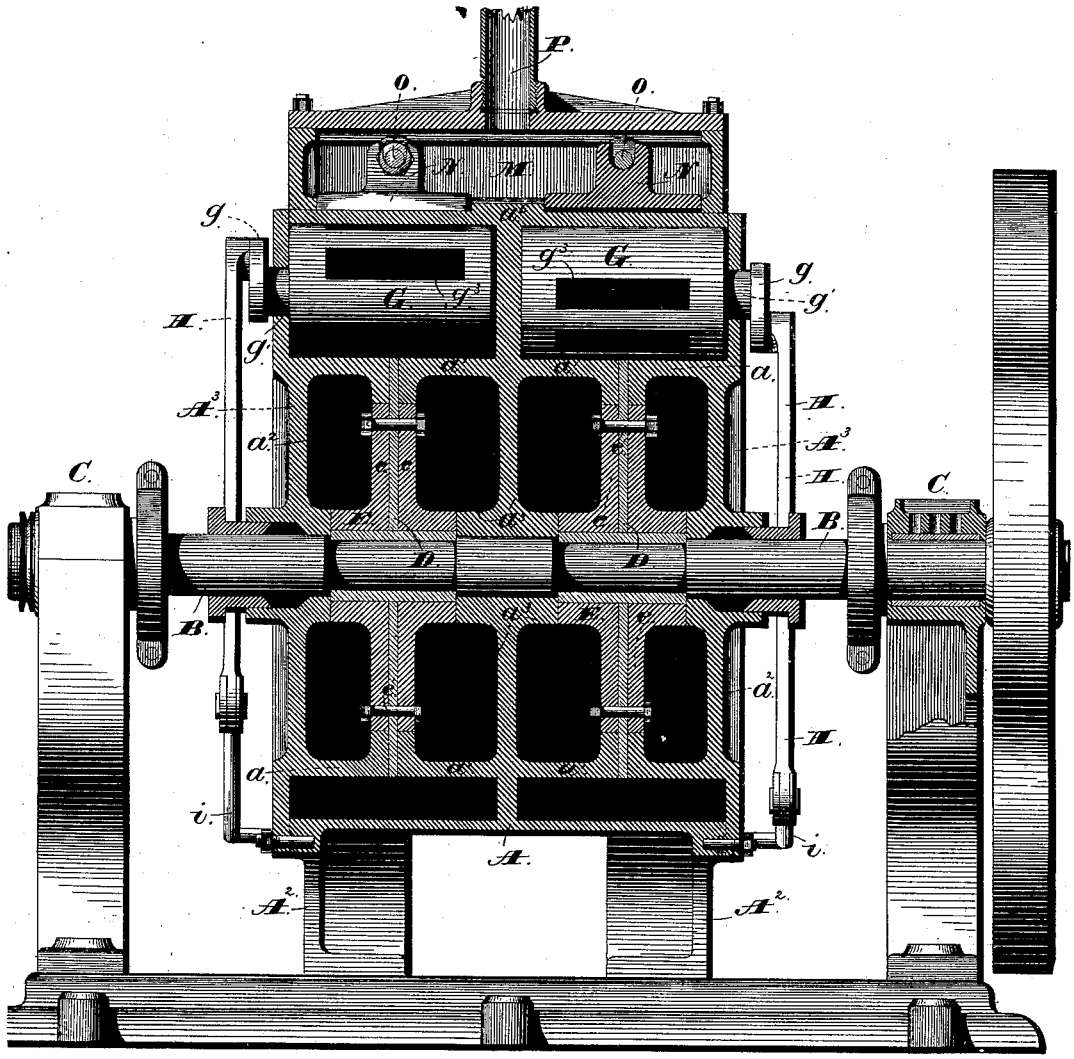
Fig. 5.



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ROTARY ENGINE.

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Fig. 6.

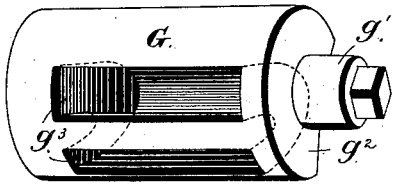
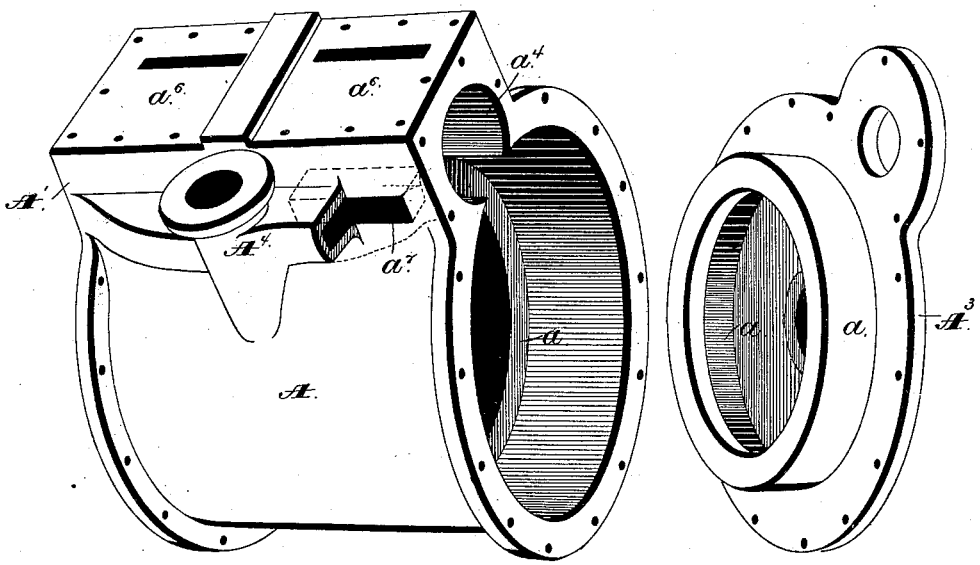


Fig. 7.



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UNITED STATES PATENT OFFICE.

JOHN H. DARRAGH, OF SAN FRANCISCO, CALIFORNIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 343,441, dated June 8, 1886.

Application filed January 2, 1886. Serial No. 187,447. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. DARRAGH, of San Francisco, in the county of San Francisco and in the State of California, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of my improved engine as arranged for use. Fig. 2 is a plan view of the upper side of the same with the top of the valve-casing removed. Figs. 3 and 4 are vertical sections upon line *x x* of Fig. 2, and show the valves and piston in different positions. Fig. 5 is a like view of the same upon line *z z* of Fig. 2. Fig. 6 is a perspective view of the valve separated from its casing; and Fig. 7 is a like view of the combined cylinder and valve-casing, together with one of its heads.

Letters of like name and kind refer to like parts in each of the figures.

The object of my invention is to increase the efficiency and to render more certain the operations of rotary steam-engines, to which end said invention consists, principally, as an improvement in rotary engines, in combining with the annular piston-chamber of a steam-cylinder a rotary valve which is journaled within one side of said chamber, and by a partial rotation, is adapted to divide the same transversely at such point, and positive mechanism for rotating the valve in both directions, substantially as and for the purpose hereinafter specified.

It consists, further, as an improvement in rotary engines, in combining with the annular piston-chamber of a steam-cylinder a rotary valve which is journaled within one side of said chamber, and by a partial rotation in one direction is adapted to divide said chamber transversely at such point, and by a partial rotation in an opposite direction to open said chamber and to form a continuation of its outer side, and means for positively rotating the valve in both directions, substantially as and for the purpose hereinafter shown.

It consists, further, as an improvement in rotary engines, in combining with the annular piston-chamber of a steam-cylinder a rotary valve which is adapted by movement upon its axis to divide said chamber transversely at such point and at the same time to open communication between a steam-supply and said chamber at one side of said valve, and positive means for rocking the valve in both directions, substantially as and for the purpose hereinafter set forth.

It consists, further, as an improvement in rotary steam-engines, in the annular piston-chamber, in combination with the piston adapted to be moved through the same, the rotary valve adapted to close or divide the annular chamber, provided with a recess in one side adapted to form a continuation of the side of the annular chamber when the valve is turned in one direction, and when turned in the other direction to form a port connecting the annular chamber with a source of supply of steam, and means for rotating the valve, substantially as and for the purpose hereinafter described.

It consists, further, as an improvement in rotary steam-engines, in combining with the annular piston-chamber and the piston moving therein a valve-casing having an inlet and an outlet port, the rotary valve dividing the annular chamber, cut away on one side, so as to permit communication between the inlet-port and the piston-chamber when the valve is turned in one direction, and to leave the chamber open when the valve is turned in the other direction, and having the port or passage adapted to establish communication between the chamber and the rear side of the valve when the valve is turned to divide the chamber and admit steam thereto, all substantially as hereinafter described.

It consists, further, as an improvement in rotary engines, in a steam-cylinder provided with an annular piston-chamber, and a piston adapted to be moved through the same, a rotary valve which by a movement upon its axis may be caused to divide said chamber transversely at such point and to simultaneously open communication between said chamber and a steam-passage, in combination with a second valve, which operates to control the admission of steam to said passage, and means, substantially as described, for positively operating both such valves, substantially as and

for the purpose hereinafter shown and described.

It consists, further, as an improvement in rotary engines, in the steam-cylinder provided with an annular chamber, the piston connected with a centrally-journaled shaft and adapted to be moved through said chamber, the rotary valve, which by a movement upon its axis is capable of dividing said chamber transversely and opening communication between one end of the same and a steam inlet passage, and of simultaneously opening communication between the opposite end of said chamber and an exhaust-passage, in combination with a lever operated positively by suitable connection with the piston-shaft, and a link connected with the lever and an arm on the valve-shaft, all substantially as and for the purpose hereinafter specified.

It consists, further, in combining with the annular piston-chamber the piston traveling therein, the central shaft with which the piston is connected, the rotary valve extending across the chamber at one point, cut away on one side and provided with an exhaust-passage on the other, the valve-casing, the inlet and exhaust ports, the slide-valve for opening and closing the inlet-port, an eccentric on the piston-shaft, an eccentric-rod, the eccentric-strap thereon, and a lever connected by suitable connecting means with the slide-valve and the shaft of the rotary valve, substantially as and for the purpose hereinafter described.

It consists, finally, as an improvement in rotary engines, in the steam-cylinder provided with an annular chamber, the piston connected with a centrally-journaled shaft and adapted to be moved through said chamber, the rotary valve which by a movement upon its axis is capable of dividing said chamber transversely and opening communication between one end of the same and a steam-inlet passage, and of simultaneosuly opening communication between the opposite end of said chamber and an exhaust-passage, and a slide-valve which operates to control the admission of steam to said cylinder, in combination with each other and with mechanism, substantially as shown, whereby said valves are caused to operate, substantially as and for the purpose hereinafter set forth.

In the carrying of my invention into practice I preferably make a double engine, and in such event construct the cylinders A and their valve boxes or casings A′ from one piece of metal, said cylinders having the same axis and being joined together at their inner ends, and at their lower sides provided with suitable supporting-legs, A^2. The outer end of each cylinder A is inclosed by means of a head, A^3, which is provided with an annular flange, a, that projects inward nearly to the longitudinal center of the same and coincides with a similar flange, a', which projects outward from the rear end of said cylinder. Said flanges separate the interior of said cylinder into an exterior and an interior annular chamber, a^2 and a^3, respectively, which communicate through a narrow radial opening which is left between the inner ends of the flanges.

Passing axially through the cylinders A and their heads A^3 is a shaft, B, which, at or near its ends, rests within and is supported by suitable journal-boxes, C. Upon said shaft, within each cylinder, is a disk, D, that closely fills the space between the inner ends of the flanges or partitions a and a', and has its outer end flush with or slightly below the peripheries of said partitions. Said disk is connected with said shaft by means of two collars, E, one of which is keyed or otherwise secured to the latter at each side of the former, and is provided with a radial flange, e, that extends to the adjacent partitions a or a', and in connection with the opposite flange e is rigidly attached to said disk by means of bolts e', which pass transversely through the same. At one point upon the disk D its edge is extended radially outward to or near the inner periphery of the cylinder A, and to such extension or lug d is secured a piston, F, which has a rectangular form in plan view and closely fills the outer chamber, a^2, radially and transversely. Said piston is provided with packing-plates f, that are arranged to break joints like the ordinary piston-packing rings, and operate to produce a steam-tight joint between said piston and the contiguous sides and ends of said chamber a^2, while permitting the former to have free circumferential movement within the latter.

It is intended that the joints between the sides of the disk D and the ends of the partitions a and a' shall be practically steam-tight; but in order to prevent the leakage of steam through any defects in the joints at such points the shaft B is packed within each cylinder-head A^3 by means of an ordinary stuffing box and gland.

At the upper side of each cylinder A, within the casing A′, is provided a cylindrical chamber, a^4, which is arranged with its axis in a line with the axis of said cylinder and has, preferably, about one-fourth the diameter of the outer chamber, a^2. The lower portion of said chamber a^4 and the upper portion of said chamber a^2 open into each other, and if the lines of the former were completed its lower side would just intersect the upper side of the latter at such point.

Within the chamber a^4 is placed a cylindrical valve, G, which substantially fills the same and is adapted to be partially rotated therein by means of a radial arm, g, that is secured upon the outer end of stem g', which projects axially from the outer end of said valve, a connecting-rod, H, that is pivoted upon and extends between said arm and an arm, i, of a rock-shaft, I, and an eccentric or cam, K, which is placed upon the shaft B and is connected with said rock-shaft by a rod, L, the

arrangement being such that at each revolution of said shaft said valve will be partially rotated in each direction.

From the upper front side of the valve-chamber a^4 an inlet steam-passage, a^5, extends upward through a valve-seat, a^6, which is formed at the upper side of the casing A', while from the rear side of said chamber an outlet steam-passage, a^7, extends rearward and connects with an exhaust-pipe, A^4, that is common to both engines.

The valve G is provided within one side with a recess or port, g^2, which, when said valve is turned to the limit of its motion in one direction, coincides with and restores the outer line of the chamber a^2 at such point; but when said valve is turned to the opposite limit of its motion opens communication between the inlet-port a^5 and the interior of said chamber, a second port, g^3, having substantially a V shape in end elevation is provided within the rear side of said valve, and operates to connect the rear side of said chamber a^2 with the exhaust-port a^7, when said valve is turned to permit steam to enter the front side of said chamber.

The valve-seat a^6 is inclosed by means of an ordinary steam-chest, M, and within the same for each engine is placed a slide-valve, N, of usual form, which, by means of a valve-rod, O, that is connected with the same and with the rock-shaft I, operates to open and close the port a^5, so as to admit steam to the cylinder at the proper time.

A pipe, P, connecting the steam-chest M with a steam-supply, completes the engine, which operates as follows, viz: The valve-actuating mechanism is so adjusted as to cause the rotary valve G to occupy the position shown in Fig. 3, when the piston F is passing through the upper part of the cylinder, so as thereby to afford free passage for said piston beneath said valve. While said valve is in such position the slide-valve N is in position to close the steam-port a^5 and cut off communication between the steam-supply and the cylinder. Immediately after the piston has passed the rotary valve the latter is turned to the position seen in Fig. 4, and the slide-valve is simultaneously moved from over the inlet-port, by which means steam is freely admitted to the cylinder in rear of said piston and in front of said rotary valve, where by pressure and expansion it operates to move said piston forward within its annular chamber. At the instant when the rotary valve moves to position to permit steam to enter the cylinder it also opens communication between the said cylinder in front of the piston and the exhaust-port, and thereby the steam within such space is permitted to freely escape.

If desired, the valve-connection with the exhaust may be dispensed with and an open passage left between the cylinder and exhaust, through which steam may freely escape.

It will be readily seen that by use of ordinary reversing mechanism the motion of the engines can be reversed.

I do not claim herein as my invention a rotary engine having an annular steam-chamber, a piston moving therein, and a rotary valve and abutment having a passage through it for the admission of steam to the chamber, in combination with positive means for rotating the valve in one direction and a spring to turn it in the other.

Having thus described my invention, what I claim is—

1. As an improvement in rotary engines, in combination with the annular piston-chamber of a steam-cylinder, a rotary valve which is journaled within one side of said chamber, and by a partial rotation is adapted to divide the same transversely at such point, and positive automatic mechanism for turning the valve first one way and then the other, substantially as and for the purpose specified.

2. As an improvement in rotary engines, in combination with the annular piston-chamber of a steam-cylinder, a rotary valve which is journaled within one side of said chamber, and by a partial rotation in one direction is adapted to divide said chamber transversely at such point, and by a partial rotation in an opposite direction to open said chamber, and to form a continuation of its outer side, and automatic positive mechanism for rocking the valve in both directions, substantially as and for the purpose described.

3. As an improvement in rotary engines, in combination with the annular piston-chamber of a steam-cylinder, a rotary valve which is adapted by movement upon its axis to divide said chamber transversely at such point, and at the same time to open communication between a steam-supply and said chamber at one side of said valve, and positive means for rocking the valve in both directions, substantially as and for the purpose set forth.

4. As an improvement in rotary steam-engines, the annular piston-chamber, in combination with the piston adapted to be moved through the same, the rotary valve adapted to close or divide the annular chamber, provided with a recess in one side adapted to form a continuation of the side of the annular chamber when the valve is turned in one direction, and when turned in the other direction to form a port connecting the annular chamber with a source of supply of steam, and means for rotating the valve, substantially as and for the purpose described.

5. As an improvement in rotary steam-engines, in combination with the annular piston-chamber and the piston moving therein, a valve-casing having an inlet and an outlet port, the rotary valve dividing the annular chamber cut away on one side, so as to permit communication between the inlet-port and the piston-chamber when the valve is turned in one direction, and to form a continuation of the chamber when the valve is turned in the

other direction, and having the port or passage adapted to establish communication between the chamber on the rear side of the valve and the exhaust or outlet port when the valve is turned to divide the chamber and admit steam thereto, all substantially as described.

6. As an improvement in rotary engines, a steam-cylinder provided with an annular piston-chamber and a piston adapted to be moved through the same, a rotary valve which, by a movement upon its axis, may be caused to divide said chamber transversely at such point, and to simultaneously open communication between said chamber and an inlet steam-passage, in combination with a second valve which operates to control the admission of steam to said passage, and positive automatic mechanism for operating both said valves in both directions, substantially as and for the purpose described.

7. As an improvement in rotary engines, the steam-cylinder provided with an annular chamber, the piston connected with a centrally-journaled shaft and adapted to be moved through said chamber, the rotary valve which, by a movement upon its axis, is capable of dividing said chamber transversely and opening communication between one end of the same and a steam-inlet passage, and of simultaneously opening communication between the opposite end of said chamber and an exhaust-passage, in combination with a lever operated positively by suitable connection with the piston-shaft, and a link connected with the lever and an arm on the valve-shaft, all substantially as and for the purpose specified.

8. In combination with the annular piston-chamber, the piston traveling therein, the central shaft with which the piston is connected, the rotary valve extending across the chamber, at one point cut away on one side and provided with an exhaust-passage on the other, the valve-casing having the inlet and exhaust ports, the slide-valve for opening and closing the inlet-port, an eccentric on the piston-shaft, an eccentric-rod, the eccentric-strap thereon, and a lever connected by suitable connecting means with the slide-valve and the shaft of the rotary valve, substantially as and for the purpose described.

9. As an improvement in rotary engines, the steam-cylinder provided with an annular chamber, the piston connected with a centrally-journaled shaft and adapted to be moved through said chamber, the rotary valve which by a movement upon its axis is capable of dividing said chamber transversely and opening communication between one end of the same and a steam-inlet passage, and of simultaneously opening communication between the opposite end of said chamber and an exhaust-passage, and a slide-valve which operates to control the admission of steam to said cylinder, in combination with each other and with automatic mechanism for operating both of such valves, substantially as and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 7th day of October, A. D. 1885.

JOHN H. DARRAGH.

Witnesses:
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WM. C. MACKINTOSH.