(No Model.) 2 Sheets—Sheet 1.

J. M. McIVER.

ROTARY STEAM ENGINE.

No. 490,813. Patented Jan. 31, 1893.

Fig. 1.

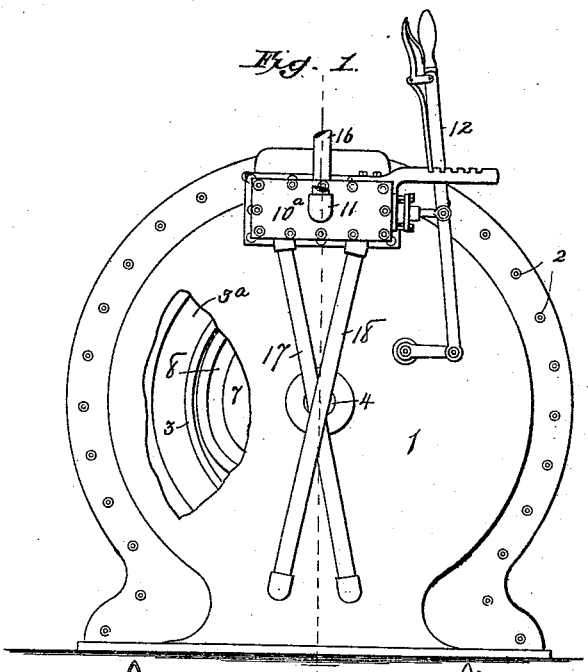


Fig. 2.

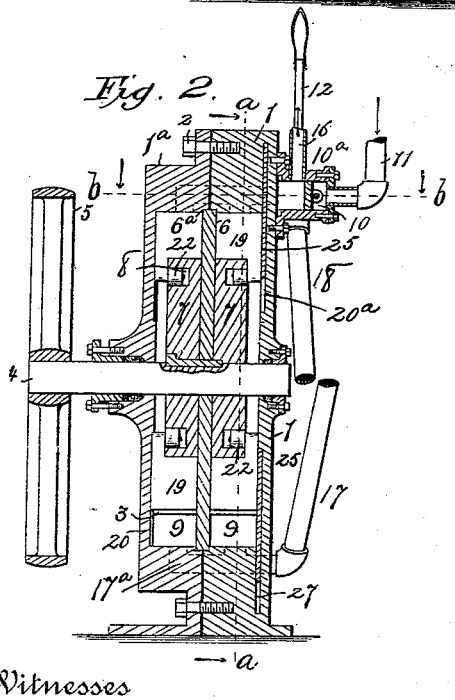
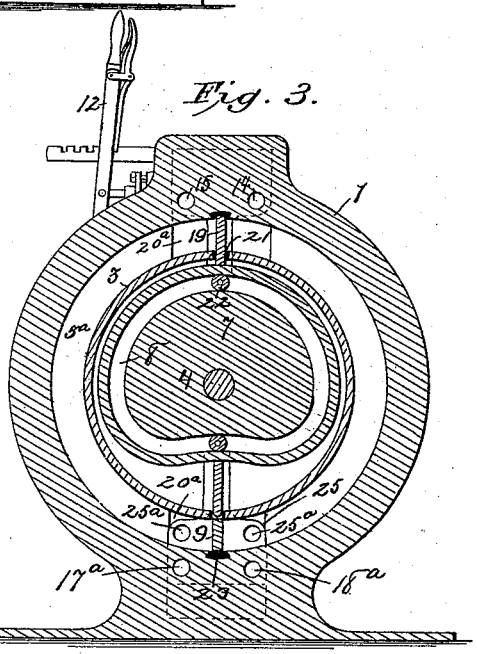


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

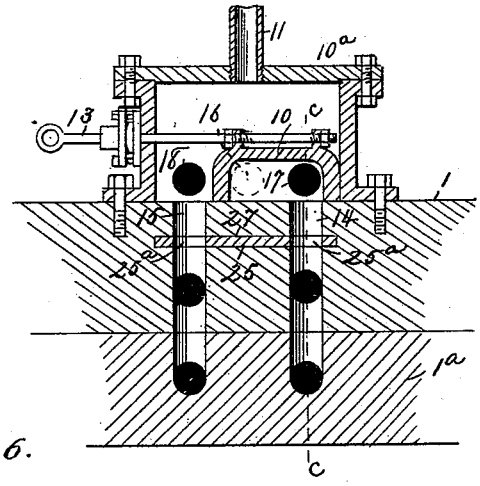


Fig. 6.

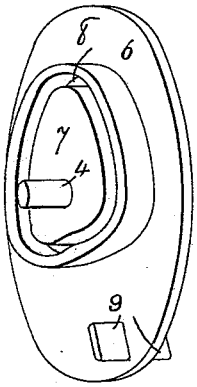


Fig. 5.

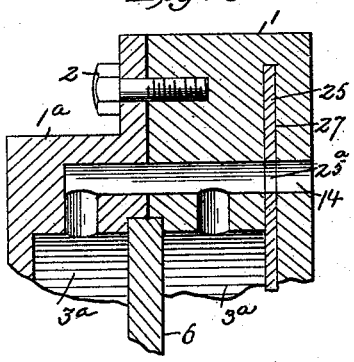
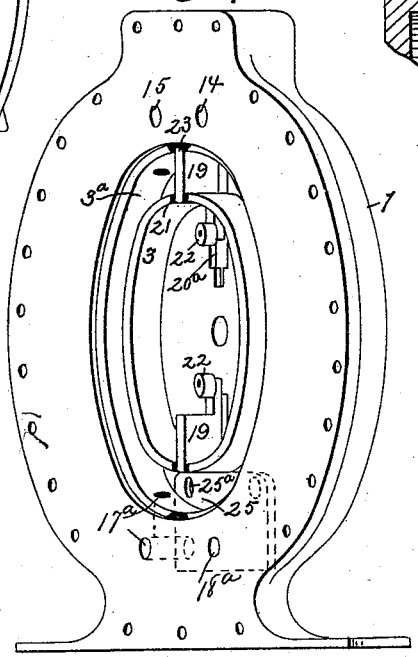


Fig. 7.



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UNITED STATES PATENT OFFICE.

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ROTARY STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 490,813, dated January 31, 1893.

Application filed January 30, 1892. Serial No. 419,785. (No model.)

To all whom it may concern:

Be it known that I, JAMES M. McIVER, a citizen of the United States, residing at Winchester, in the county of Franklin and State of Tennessee, have invented certain new and useful Improvements in Rotary Steam-Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention consists in a new and improved rotary steam engine in which the steam is applied to both sides of the revolving piston-disk, thus equalizing the pressure on the same and causing it to require the minimum of power to revolve it, as it revolves with the minimum degree of friction: the ports being so constructed that a single movement of the reversing valve will reverse the entire engine: my invention comprising many original and valuable features, which will be hereinafter fully described and claimed.

Referring to the accompanying drawings; Figure 1 is a side elevation of my rotary engine, a part of the side plate nearest the eye being broken away to reveal certain inner features from that point of view; Fig. 2 is a central longitudinal vertical section taken through the engine; Fig. 3 is a transverse sectional view taken on the plane indicated by line *a*—*a* on Fig. 2, looking in the direction indicated by the arrow; Fig. 4 is a sectional detail view, on an enlarged scale, taken on the plane indicated by line *b*—*b*, Fig. 2, looking downward; Fig. 5 is a sectional detail view taken on the plane indicated by line *c*—*c*, Fig. 4; Fig. 6 illustrates in detail the revolving piston; Fig. 7 illustrates the inner side of one half of the body or casing of the engine.

Referring to the several parts by their designating numerals; 1, 1^a, indicate the two halves of the circular casing of my rotary engine, which may be firmly secured together by the bolts 2; each half of the casing being formed with an annular flange 3, extending inward as shown. Through the center of the casing passes the shaft 4, upon the outer part of which a suitable band or drive-wheel, 5, is secured, to convey the power from the engine.

Fitting within the casing, and keyed upon the shaft 4, is the circular piston-disk, 6, the circumferential edge of which fits and revolves in an annular groove, 6^a, formed in the two halves of the casing, 1, 1^a, where they meet, thus serving for a guide groove for the outer edge of the revolving piston. Upon each side of the piston-disk are formed or secured the cam-plates 7, 7, the outer face of each being formed with the eccentric groove 8; while the piston-disk on that side nearest the narrow side of the cam-plates, is provided with the piston-heads, 9, 9, which extend at right-angles to the body of the piston, fitting and traveling in the annular steam spaces 3^a, 3^a, on each side of the piston; these steam-spaces being formed, as shown, by the annular flanges 3.

10^a indicates a valve-chest which is secured to the outside of the casing at the point shown, the steam from a suitable boiler entering this chest through a feed-pipe 11. Within this valve-chest 10^a is arranged an ordinary slide-valve, 10, which can be moved in either direction by means of a hand-lever, 12, and connecting rod 13, in order to connect either one of the main ports, 14, 15, with the exhaust port, 16, while leaving the other main port open for the reception of the live steam, as shown. The main port 15 is so constructed, as shown, that it communicates directly with both sides of the piston-disk, that is to say, it opens into both of the steam spaces 3^a, 3^a, at the upper end of the engine; while an auxiliary steam-tube, 18, leads from the main port 15 to the lower end of the engine-casing where it communicates with the port 18^a, which opens, as shown, into both of the steam-spaces 3^a, on both sides of the piston-disk. The main port 14 in like manner opens directly from the steam-chest into both the steam-spaces 3^a at the upper end of the engine, and has an auxiliary steam-tube, 17, leading from it to the lower end of the engine, where it communicates with the port 17^a, which opens into both of the steam-spaces 3^a.

19 indicates the radially sliding valves, which fit in guide-grooves, 20, formed in the inner

side of the casing-valves, and slide through openings, 21, formed in the flanges 3, the inner reduced ends of these valves having pivotally mounted on them the small rollers 22, which fit and run in the eccentric grooves 8 of the cam-plates 7, 7. These valves are of such length that when slid out they will extend completely across the steam-spaces 3^a, their outer ends being received in recesses 23 in the casing.

25, 25, indicate the cut-off valves, which are secured to the outer side of the two sliding-valves 19, 19, on that side of the engine, and fit and slide in the guide-grooves 20^a, their outer ends playing or moving in the guide-slots 27 formed in the casing. These guide-slots intersect the main ports 14, 15, near their outer ends, and the lower ports 17^a, 18^a, as shown; and the flat cut-off valves are formed each with the two ports 25^a, 25^a, adapted to register with the ports across which the cut-off valves slide.

The operation of the engine is as follows: The valve 10 standing in the position shown in the drawings, the live steam enters the port 15, thus entering the steam-spaces 3^a on both sides of the piston-disk at the upper end of the casing, and pressing against the piston heads 9 of the piston, revolves the piston to the right; and it will be seen that the eccentrically-grooved cam disks or plates 7 will draw the valves 19 in out of the way of the piston heads 9, 9, as the piston-disk revolves, and will slide them out after the heads 9 have passed the valves, to close the steam-spaces 3^a behind the piston-heads. It will be seen that as the sliding-valves 19 are thus moved in and out by the revolution of the piston they will carry with them the cut-off valves 25 which are secured to them; and as soon as the piston-heads 9 have passed the lower end of the tube 18 the lower valves 19 will be slid out, closing the steam-spaces 3^a behind the heads 9 and this movement of the sliding-valves will bring the ports 25^a of the lower cut-off to register with the ports 18^a, and 17^a; at the same time the upper cut-off closes the main ports 14 and 15; so that the steam which formerly entered the engine through the port 15 now passes down through the tube 18 and enters the lower end of the engine through the port 18^a, thus revolving the piston for the latter half of its revolution. At the same time the steam which first entered through the upper port 15, and revolved the piston for the first half of its revolution, now exhausts through the port 17^a, tube 17, and out through the exhaust 16. When the piston-heads pass the port 15 the upper sliding-valve 19 closes behind them, thus moving the upper cut-off valve to open the ports 15 and 14, while the inwardly-moving lower cut-off closed the lower ports 17^a and 18^a; the live steam then enters through the port 15, while the steam which previously entered the steam-spaces through 18^a exhausts through the port 14 and exhaust-port 16. When it is desired to reverse the engine it is only necessary to move the valve 10 to open the main port 14 for the entrance of live steam, which then enters the engine through the said port, and through the tube 17, as the piston-disk revolves, while it exhausts through the tube 18 and the main port 15, the port 15 then communicating with the exhaust-port 16.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a rotary engine, the combination of the casing having annular steam spaces in each head, a piston disk located between and closing the open sides of said annular steam spaces, and having piston heads to work in said annular spaces, valves 19 located at diametrically opposite points in the casing and adapted to slide radially, provisions for operating said valves from the piston disk, and means for simultaneously admitting and exhausting the steam from the said annular steam spaces on opposite sides of the said piston disk, substantially as described.

2. In a rotary engine, the combination of the casing having annular steam spaces in each head, a piston disk located between and closing the open sides of said annular steam spaces, and having piston heads to work in said annular spaces, means for admitting and exhausting steam from said annular steam spaces simultaneously on opposite sides of the said piston disk and at diametrically opposite points, cut off valves for controlling the ports through which the steam is admitted and exhausted, and valves 19 connected with the said cut off valves and adapted to be actuated from the said piston disk, substantially as set forth.

3. The combination, of the outer casing having the inwardly-extending annular flanges, forming the annular steam spaces, 3^a, 3^a, the central revolving shaft, the central piston-disk, secured on said shaft, and having on each of its sides the eccentrically grooved cam-disks 7, 7, and the outwardly extending piston-heads 9, 9, the radial sliding valves 19 having the small rollers at their inner ends fitting in the grooves of the cam-disks 7, the valve-chest having the exhaust, the main-ports 14 and 15, communicating with the valve-chest and with the top of the steam-spaces 3^a on both sides of the piston, the steam-tubes 17 and 18, and ports 17^a and 18^a, leading from the main ports 14 and 15 to the lower ends of the steam-spaces 3^a on both sides of the piston-disk, the cut-off valves 25, arranged and operated as specified, and the reversing valve 10; substantially as set forth.

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

JAMES M. McIVER.

Witnesses:
F. A. PATTIE,
FELIX D. LYNCH.