(No Model.) 2 Sheets—Sheet 1.

J. C. WALKER.

ROTARY ENGINE.

No. 495,283. Patented Apr. 11, 1893.

Fig. 1.

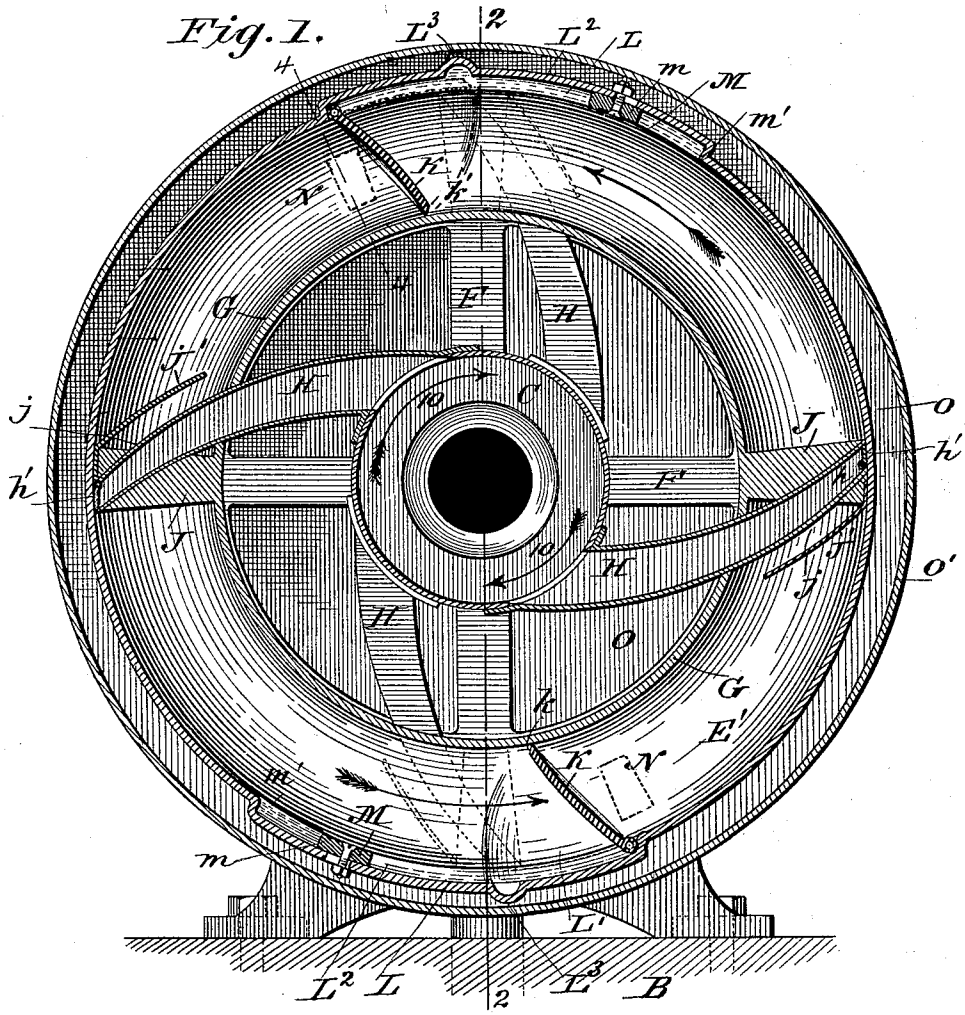
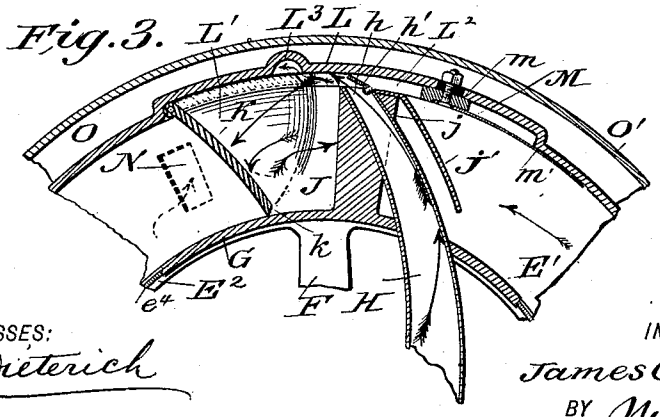


Fig. 3.



WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

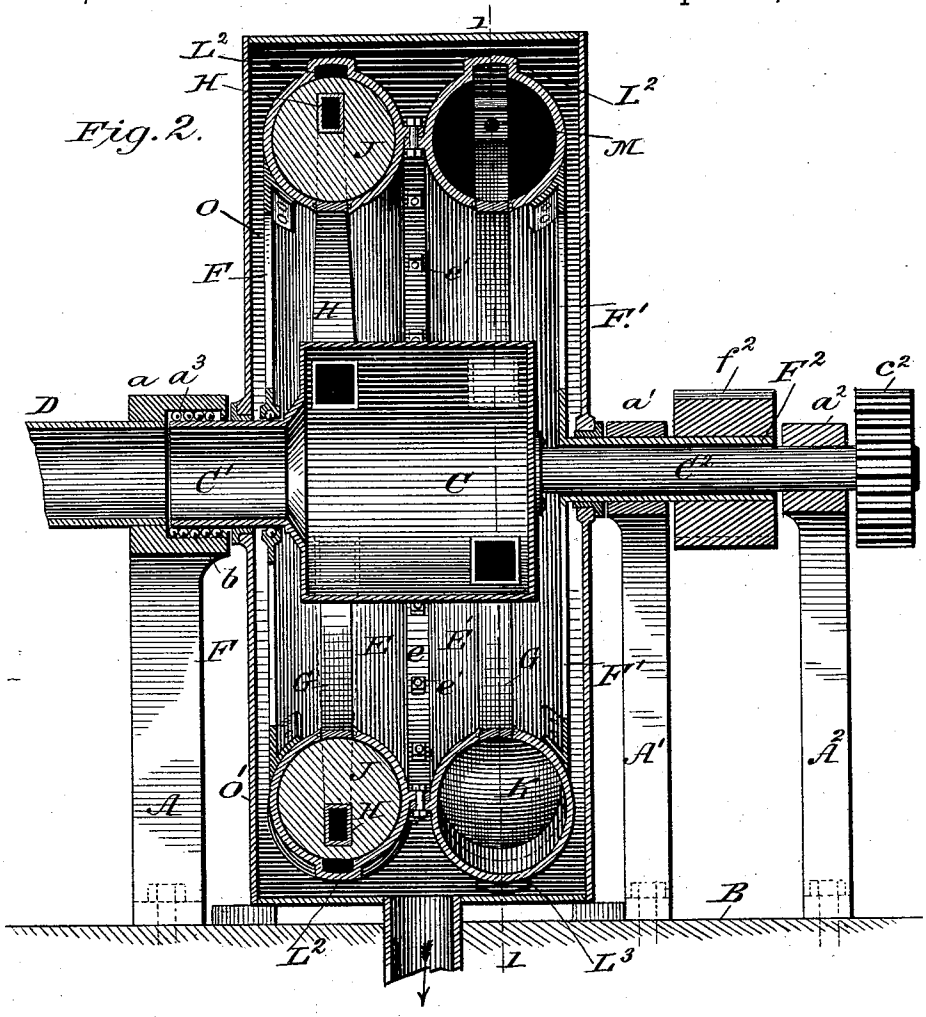
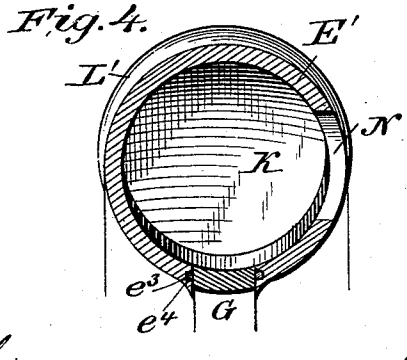


Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES C. WALKER, OF WACO, TEXAS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 495,283, dated April 11, 1893.

Application filed November 22, 1892. Serial No. 452,868. (No model.)

To all whom it may concern:

Be it known that I, JAMES C. WALKER, of Waco, in the county of McLennan and State of Texas, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

My invention relates to certain improvements in rotary engines, and it has for its object to provide an engine of this kind, simple in its construction and effective and positive for its desired purpose.

It also has for its object to provide an engine in which the full effect of the steam can be attained, in which the discharge of such steam is automatically controlled to economize its use, and from which two distinct rotary motions in reverse directions are obtained at the same time.

With other minor objects in view all of which will hereinafter be apparent, my invention consists in a steam drum, adapted to be rotated by the impact of the steam as it passes therein and out through steam arms or outlets formed thereon which arms project and discharge into annular steam chambers, held to rotate about the steam drum in a reverse direction, which chambers and drum are surrounded by a suitable exhaust chamber or casing.

It also consists in combining with such steam arms, pistons secured to the ends thereof, (which fit and travel in the annular chambers—and with the annular steam drum,) suitably arranged valves held in such chambers, and steam spaces adjacent such valves, whereby the live steam will be deflected and caused to impart a rotary motion to such annular chambers, as it discharges from the steam drum.

It further consists in certain peculiarly arranged adjustable cut off devices which are engaged by the pistons and valves on the steam arms, to close off the live steam, at predetermined points, whereby to allow for a partial rotation of such annular chambers and the steam drum, by the expansion of the steam held between the rear face of the valves in such annular chambers and the front face of the pistons.

Finally my invention consists in certain details of mechanism and peculiar combination of parts all of which will hereinafter be fully described in the specification and pointed out in the claims, reference being had to the accompanying drawings in which

Figure 1 is a vertical longitudinal section of my improved rotary engine taken on the line 1—1 Fig. 2. Fig. 2 is a transverse section of the same taken on the line 2—2 Fig. 1. Fig. 3 is a detail sectional view hereinafter specifically referred to, and Fig. 4 is a detail cross section taken on the line 4—4 Fig. 2.

Referring to the accompanying drawings A, A′ and A^2 indicate standards projected up from a foundation B, and in bearings a a^2 formed in the upper ends of such standards is journaled the opposite shaft sections C′ C^2 which form the journals for a revolving steam drum C. These shaft sections and drum are constructed in the manner most clearly shown in Fig. 2, by reference to which it will be seen that, the section C′ is in the nature of a hollow shaft, the outer end of which seats on roller bearings b in a socket a^3 in the bearing a, and projected into such bearings a is the supply pipe D which registers with the open end of the tubular section C′, which section opens into the drum C as shown. The opposite shaft section C^2 extends beyond the bearing a^2 and is provided with a drive pinion c^2.

E E′ indicate a pair of annular chambers, which encircle the steam drum, and which are joined together to move in unison, by the flanges and bolts e e' (see Fig. 2), and such annular chambers are held for independent rotation about the steam drum journals, they being supported by the frame sections F F′, one of which F has a ball bearing f upon the hollow shaft C′, while the other F′ has a tubular extension F^2 which fits over the solid shaft section C^2, passes through the bearing a', and is provided with a pinion f^2. The under face of each annular chamber, has a continuous slot E^2 the side walls of which have annular recesses e^3 in which are fitted packing rings e^4, (see Fig. 4,) and within such slots, are held steam tight rings G secured to steam arms H projected from the steam drum C.

It will be noticed by reference to Fig. 2, that a pair of steam arms H is projected in opposite directions from opposite sides of the drum, and each set alternates, that is projects

at right angles to the other set, for a purpose presently explained. It will also be seen that each steam arm projects tangentially from the drum, is curved inward, reduces in transverse area from its base to the mouth, and projects up through the slot E^2, (it being secured to the ring G) its outer end being open as at *h*, which end is normally held closed by a flap valve *h'*, such end projecting up against the upper face of the annular chamber as shown.

To the end of each arm H, is secured a piston J, which is of a transverse shape to snugly fit the annular chamber, its rear face *j* having a yielding contact member J' for a purpose hereinafter specified.

Referring now more particularly to Fig. 1 of the drawings, it will be observed that in each annular chamber, a pair of pistons and steam arms operate, and such chamber is divided into two sections by the pivoted valves K, such valves in cross section being also of the circular contour of the chamber, and of a length somewhat longer, whereby they will be disposed diagonally to form fixed abutments when in their down or closed position.

At the points where the valves K are pivoted, the annular chambers have circumferential enlargements L, the front portion L' of which extends almost semi-circularly around such chamber to accommodate the valves K when they are pushed up, while their rear portions are reduced to form steam ways L^2, which ways extend some distance from the valve receiving section L', additional steam pockets L^3 being also formed near the rear end of the section L' for a purpose presently referred to.

M indicates adjustable cut offs, disposed in the steam ways L^2, such cut offs comprising heads *m*, snugly fitting the ways L^2, and adjustable to or from the valves K, such head having a thin leaf spring extension *m'* which covers the rear portion of the way L^2 as shown.

N indicates the exhaust ports, which are arranged near the front faces of the valves K, and which discharge into an exhaust chamber O formed by the casing O' which surrounds the steam drum and annular chambers, as clearly shown.

The manner in which my improved engine operates is as follows, it being understood that the steam arms are arranged alternately, so that as one set of pistons are receiving live steam—the other set are at one-third to one-half expansion steam (one-third to one-half expansion according to the set of the cut offs M), all of such pistons operating to revolve the steam drum in the same direction, but in opposite directions to that of the annular chambers. Steam as it enters the drum C under full head, passes out into the steam arms H and owing to the curvature of such arms the impact force of the steam will force them and the drum in the direction indicated by arrows 10, the decreasing area of such arms serving to increase the density and force of the steam. As such arms rotate in the direction indicated, the pistons J will engage the hinged valves K (the valves *h'* in the upper end of the arms H being held closed by the upper wall of the chambers) and lift them, until they become seated in the space L' arranged to receive them, their outer ends *k* fitting over the small steam pocket L^3 but not entirely closing same see Fig. 3. Just as soon as the piston passes beyond the end of the valve K, and at the time it will have reached the narrowed steam way L^2, (see Fig. 3) the valve *h'* will open, and live steam under a full head will then discharge, first into pocket L^3 to force valve K down, and then into the annular chamber, and as the valve K is thus started on its downward movement, it is manifest, that the impulse of live steam into such annular chamber will be against the rear face of such valve, which then (after it closes) forms an abutment to receive the live steam against it, it being obvious however that the reaction of such live steam in the space between rear face of valve K and the front face of the piston, will also act against the piston J and assist in forcing it in a direction reversely to the moving abutment or valve K. After the piston and the valves and chambers have been started on their reverse motions by the impact of live steam the piston head and valve *h'* will engage the adjustable cut off M to close off the discharge of steam from the arms H, which then allows the expansion of the steam in the space of bottom of cylinder before mentioned, to force such pistons and valves apart until they meet again, when the same operation is repeated, the steam exhausting from the space between the rear of the piston and the front of the valves K. By causing the annular chambers and the pistons to rotate in reverse directions, it is manifest that a double feed is produced, that is while two arms and pistons are used for each chamber, steam will be fed and exhausted four times at each revolution of the chambers. By providing the adjustable cut offs in the steam spaces L^2 they can be set to lengthen or shorten the "stroke" or live steam impact, and by providing yielding contacts for the piston, the shocks and jumping noise usually incident to the movable abutments or valves in this kind of engines are avoided.

While I have shown two sets of arms projected from the steam drum and two annular chambers with which they connect, it is manifest, that a less or greater number of arms and annular chambers may be employed if desired.

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

1. A rotary engine comprising a steam drum, an independently journaled annular chamber having a continuous slot in its under surface, a plurality of steam arms projected from the drum into the steam chamber, an annular ring, secured to the said arms, adapted to close the slot in the steam chamber, pistons fixed

to the steam arms, said arms arranged to discharge at the upper face of the pistons, hinged abutment valves in the chamber and reduced steam spaces at the upper face of the steam chamber, and the exhausts in advance of the abutment valves all arranged substantially as shown and for the purposes described.

2. The combination with a main axle forming a steam inlet, the steam drum C secured thereto, and the annular steam chamber, having an annular slot in its bottom face, independently journaled on the main axle and formed with peripheral steam channels, hinged valves at one end of such channels and adjustable stops in the other end, and the exhausts N, of the steam arms projected from the drum C, and into the steam chamber, their upper ends having hinged valves normally held closed by the upper peripheral edge of the said chamber, and adapted to open outward as they pass under the peripheral steam channels in the steam chamber, pistons secured to the arms at such ends, and an annular ring carried by the said arms adapted to travel in the continuous slot in the bottom of the steam chamber, all arranged substantially as shown and for the purposes described.

3. In a rotary engine substantially as described, the combination with the supporting frame, the steam drum C journaled therein, the annular chambers E E′ independently journaled, the valves K, steam spaces L and exhausts N, of the steam arms H projected from the drum, extended into the annular chamber and carrying pistons J at their upper end, such end opening against the outer wall of the annular chamber, said arms being gradually reduced in their transverse area from the base to the point and the casing O, substantially as and for the purpose described.

4. In a rotary engine the combination of the standards, the drum C journaled thereon, the annular chambers E E′ journaled on the drum shafts, and standards a' such chambers having peripheral steam spaces L, each formed with a valve receiving portion L′, exhausts N and a contracted space L^2 the pivoted abutment valves K, the adjustable cut offs in the space L^2, the steam arms H, projected into the chambers E E′, having valved openings h normally held closed by the outer face of the chambers, and pistons held on such arms H held to travel in the said chambers and the casing O all substantially as and for the purpose described.

5. In a rotary engine substantially as described, in combination, the standards, the steam drum, having a hollow shaft portion C′ opening into the drum, journaled in one of such standards, the steam supply D held to register therewith, a shaft section C^2 projected from the opposite side of the drum, and carrying a drive pinion, the chambers E E′ encircling the drum having a continuous slot in their under wall, said chambers journaled for independent movement on the drum shafts and having a tubular extension fitting over the shaft section C^2, and provided with a drive pinion f^2, said chambers having exhausts N, pivoted valves K, and steam spaces L, arranged substantially as shown, the steam arms H projected from the steam drum, their discharge ends having pistons held to travel in such chambers, and the rings G, carried by the said arms fitting the slots in the lower walls of the said chambers all substantially as and for the purpose described.

6. A rotary engine comprising the casing O, a steam drum, formed with a feed opening, and held for rotation, steam arms projected tangentially from such drum, an annular steam chamber, having one or more peripheral steam spaces, abutment valves pivoted at the front end of such spaces, exhausts in such chamber in front of said valves, said steam arms projected into the chambers, and having valved outlets at their upper end, adapted to open as they pass the peripheral steam spaces, pistons carried on such ends, of the arms, all arranged substantially as shown whereby the abutment valves with the annular chamber, the pistons and the steam drum will be forced in opposite directions by the live steam during the passing of the pistons over the peripheral steam spaces, and then by steam expansion, as the valves on the arms H are closed, substantially as and for the purpose described.

7. In a rotary engine the combination with a slotted rotating annular chamber, having pivoted abutment valves, pockets to receive same when swung open, steam spaces adjacent such pockets and exhausts in front of such valves, of a steam drum, having steam arms projected tangentially therefrom and gradually reduced in transverse area from their base outward, such arms projected into the annular chamber, and formed with piston heads and having discharge mouth provided with valves adapted to open as the steam spaces in the annular chamber pass over such valved ends, as and for the purposes described.

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Witnesses:
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FRED G. DIETERICH.