W. McDONALD.

ROTARY ENGINE.

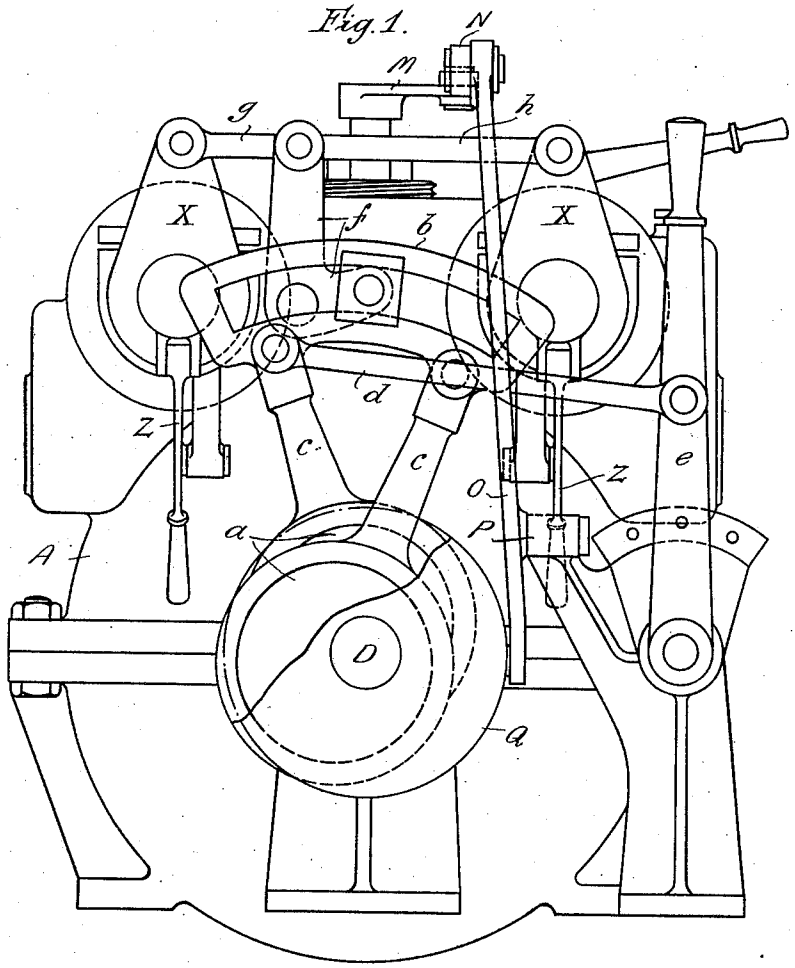
APPLICATION FILED FEB. 7, 1912.

1,034,133.

Patented July 30, 1912.

4 SHEETS—SHEET 1.

Fig. 1.



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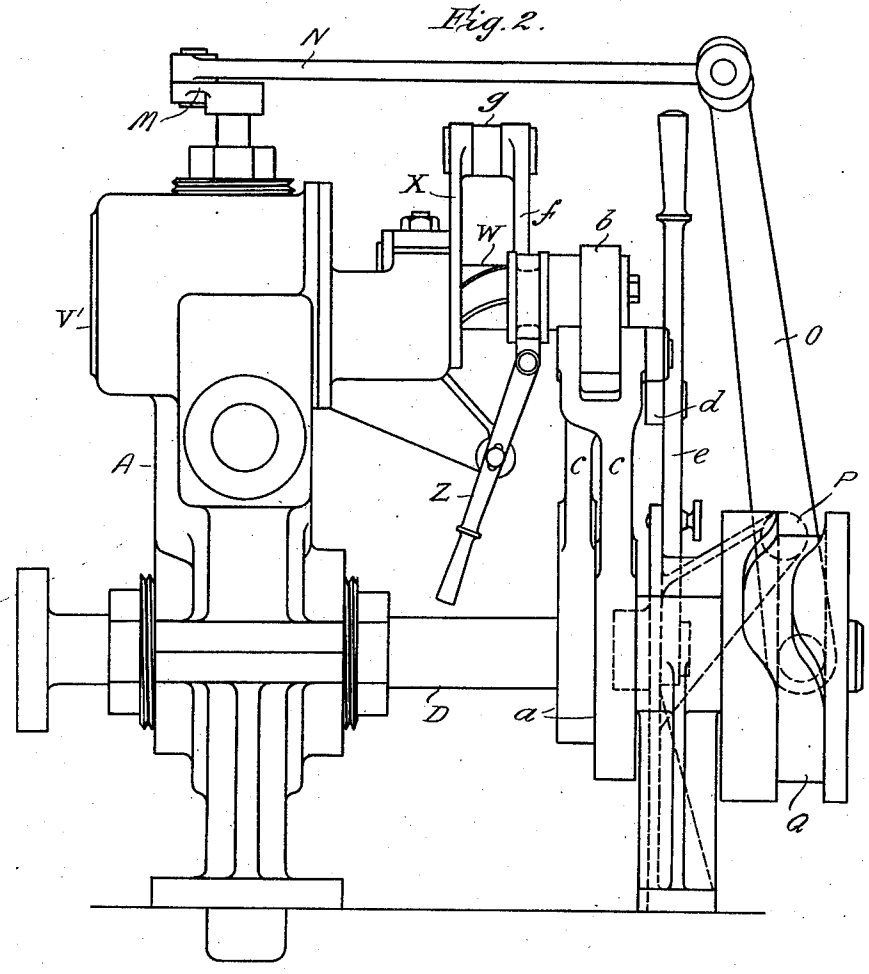
4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 7.

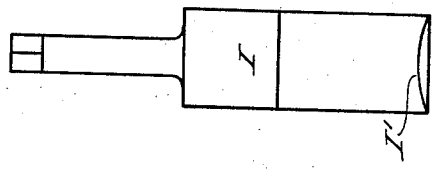


Fig. 6.

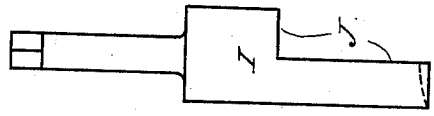


Fig. 9.

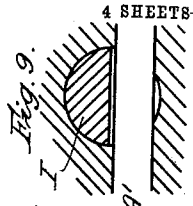


Fig. 8.

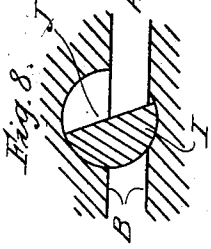
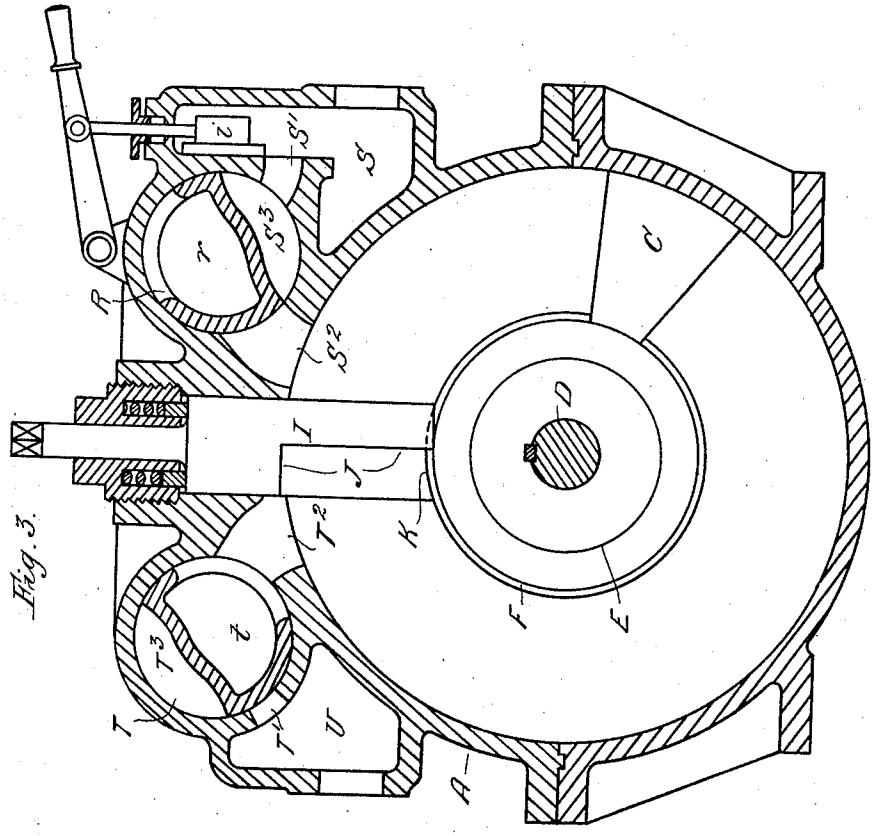


Fig. 3.



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4 SHEETS—SHEET 4.

Fig. 11.

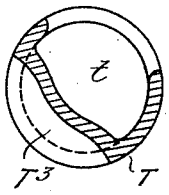


Fig. 10.

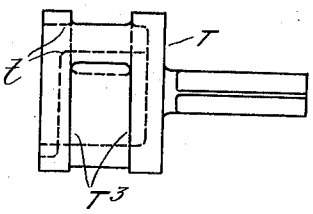


Fig. 4.

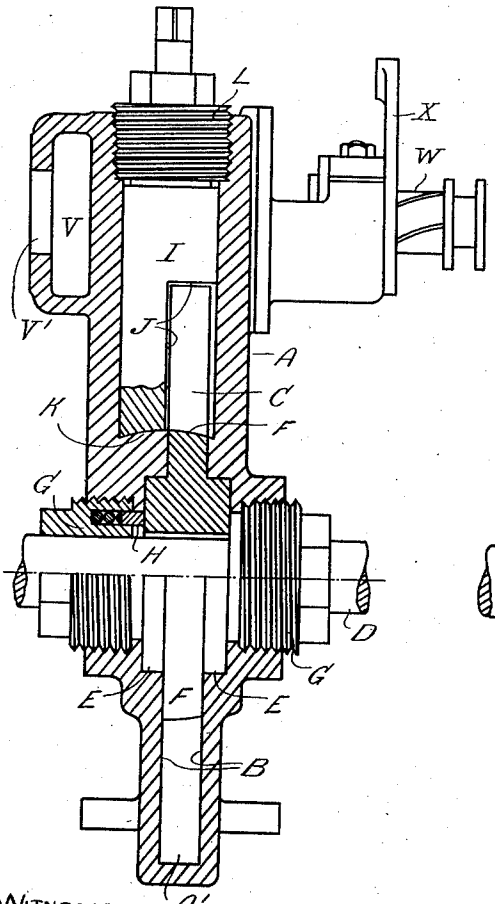
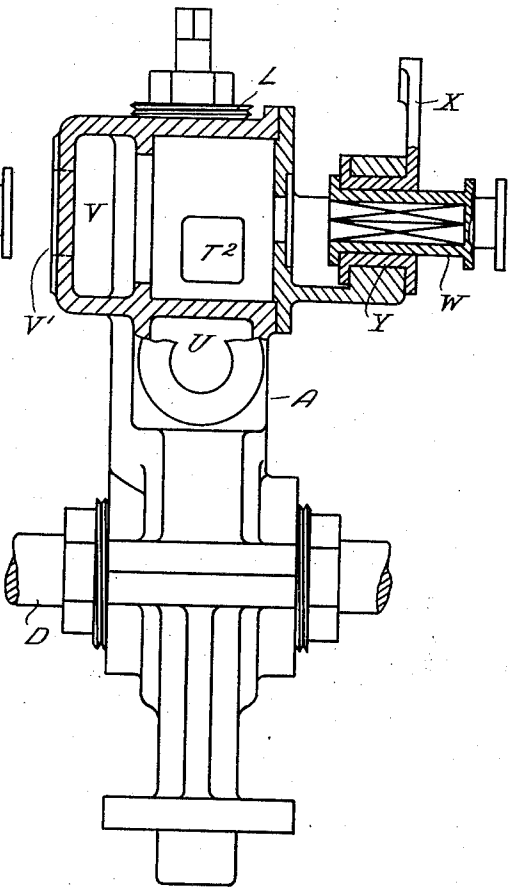


Fig. 5.



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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

1,034,133. Specification of Letters Patent. Patented July 30, 1912.

Application filed February 7, 1912. Serial No. 676,140.

To all whom it may concern:

Be it known that I, WILLIAM McDONALD, a subject of the King of the United Kingdom of Great Britain and Ireland, and resident of Swansea, Glamorgan, England, have invented a certain new and useful Improvement in Rotary Engines, of which the following is a specification.

This invention relates to rotary engines of the kind including an annular chamber or series of chambers in which the actuating fluid works expansively and within which or each of which a vane is fitted to rotate, said vane coöperating with an oscillatory division member or abutment which serves to separate the actuating fluid from the exhaust fluid and which is adapted to permit the vane to pass when required.

The invention consists in certain features of construction hereinafter described and pointed out in the claims.

In the accompanying drawings Figure 1 and 2 are elevations at right angles to each other showing, by way of example, a single chamber rotary engine constructed in accordance with the invention: Fig. 3 is a vertical section through the chamber; Fig. 4 is a vertical section through the center of the casing at right angles to Fig. 3, and Fig. 5 is a part elevation part vertical section through the valve seating at right angles to Fig. 3. Figs. 6 to 11 show details hereinafter referred to.

For the sake of clearness in the following description I have described a rotary engine having a single chamber and one division member.

Referring to the drawings, the engine shown comprises a casing A including an annular chamber A^1 between the walls B of which are inclosed a blade or vane C and the collar of the rotor on which said vane is mounted, said rotor being keyed on a shaft D and consisting of a body E having a collar F (see Fig. 3). Glands G may be fitted around the shaft D where it extends through the ends of the casing A. As shown, the glands G are each fitted with a spring-pressed packing ring H for maintaining a fluid-tight joint with the end of the rotor.

Extending radially within the chamber A^1 and mounted in a recess in the casing A is an oscillatory member I, see particularly Figs. 6 and 7, which member is preferably formed from a cylindrically shaped spindle and is of a diameter rather more than twice the width of the chamber A^1, the axis of said member coinciding approximately with one of the walls B of the chamber A^1.

The member I is cut away, as at J, so that, when in closed position, (see Fig. 8), it completely divides the chamber A^1 into two compartments, one on each side of the vane C, and when said member is oscillated through a certain angle from said position, (see Fig. 9), the vane C is permitted to pass freely. In order to form a fluid-tight joint between the collar F of the rotor and the inner end I^1 of the member I, the periphery of the collar F of the rotor is so shaped as to form part of a spherical surface, the axis of which coincides with the axis of the division member I, the inner end of said member being correspondingly shaped. The inner end K of the recess on which the member I operates is also of corresponding spherical formation. The upper portion of the member I passes through a gland L on the casing A, and connected to it is a crank M adapted to be actuated, for example, by means of a link N and lever O, which is pivoted at P, from a cam Q, or the like mounted on or driven by the main shaft D, the cam Q being so designed as to impart movement to the member I in such manner as to cause the member I to occupy the open position indicated at Fig. 9, as late as possible before the approaching vane C, and so that the member I occupies the closed position indicated at Fig. 8 immediately after the vane C has passed said member.

The member I may be disconnected and locked in the position indicated in Fig. 9 when the corresponding chamber is not being utilized. The said member is adapted to operate in conjunction with valves for regulating the action of the working fluid, said valves being preferably cylindrical as shown particularly in Figs. 10 and 11.

Two valves are provided and are so shaped and actuated that each may control either the actuating fluid or exhaust fluid, as hereinafter described.

When it is required to cause the engine to rotate in the ahead direction, the valve R is used to control the fluid passing to the

ahead side of the division member I from the receiver S by way of the ports S^1, S^2 and of the cavity S^3 in the valve R while the valve T receives the fluid from the other side of the oscillating member and allows it to pass to the exhaust receiver U by way of the port T^2 through the passage *t* in the valve T.

When it is desired to run the engine in the direction opposite to that above mentioned, the valve R is revolved by mechanism hereinafter described until it occupies a position which will permit the exhaust to pass from the ahead side of the oscillating member by way of the port S^2 through the passage *r* in the valve R, to the receiver V, and the valve T is revolved into a position in which it will control the passage of the fluid from the receiver U to the astern side of the oscillating member I by way of the ports T^1, T^2 and of the cavity T^3 in the valve T. This rotary movement of the valves is effected through the intermediary of transmitting bushes W interposed between the valve spindles and the operating cranks X, which cranks are preferably connected to bushes or sleeves Y through which the bushes W pass, said bushes being fitted in such manner that by movement of the bushes W parallel to the axes of the valves, a rotary movement of the valves relatively to their respective operating cranks X, or sleeves connected thereto, is obtained. The bushes W are actuated by means of forked pivoted levers Z or the like.

Two eccentrics *a* are keyed on the main shaft D at such an angle relatively to the vane C as to give the necessary opening for the fluid to pass behind the vane directly after the division member I has moved into the closed position shown in Fig. 8, and also to give the extreme cut off required for driving ahead and astern. The link motion comprises a quadrant *b* to which are coupled the two ends of the eccentric rods *c* so that either of said rods may be brought into gear. The quadrant *b* is so shaped that on either eccentric rod *c* being brought into gear or partially into gear and on the cut off being altered correspondingly, the admission of fluid in all cases occurs as soon as the division member I has closed. A drag link *d* is connected to the quadrant *b* and to a pivoted lever *e* in known manner to permit either of the rods *c* to be brought into gear. A lever or levers and links, *e. g.*, a bell crank lever *f* and links *g* and *h* or similar intermediate gear, receive motion from the valve gear and transmit it to the valve operating levers X, with the necessary multiplication, so as to obtain the required amount of movement of the valves R and T.

The driving levers X are connected by means of links *g* and *h* in such manner that the astern valve, *i. e.*, the valve T, may be thrown out of action when the engine is set ahead for a considerable run, as then its only duty is to exhaust. As shown, by way of example, in Fig. 3, the fluid supply to the valve R is controlled by a manually operated slide valve *i*.

As will be well understood, the invention may be applied to engines using a working fluid under pressure which in the case of steam may be employed expansively in one or more chambers in conjunction with a condenser or otherwise. The invention may also be applied to engines using gas, oil, water, or the like under pressure. The invention may also be applied to air, water or other pumps.

What I claim is:—

1. A rotary engine comprising a cylindrical casing; a rotor therein; a radial vane fixed on said rotor; an oscillatory division member adapted to oscillate on a stationary axis of oscillation perpendicular to the axis of rotation of the rotor, and having one end adapted to press against the rotor, said member being cut away at one side, whereby passage is furnished for the vane when the member is oscillated; and means for oscillating the member.

2. A rotary engine comprising a cylindrical casing; a rotor in said casing coaxial therewith and forming therewith an annular chamber; a radial vane fixed on said rotor and fitting in said chamber; an oscillating division member adapted to oscillate on a stationary axis of oscillation perpendicular to the axis of rotation of the rotor and offset from the central plane of rotation of the rotor, said member having the shape of a segment of a cylinder whose axis is coincident with said axis of oscillation, the cut away part of the member furnishing space for the passage of the vane when the member is in one position of oscillation; and means for oscillating the member.

3. A rotary engine comprising a cylindrical casing; a rotor in said casing; a radial vane fixed on said rotor; an oscillatory division member having its axis of oscillation radial to said rotor and having one end adapted to press against the rotor, said member being cut-away at one side, whereby passage is furnished for the vane when the member is oscillated; and means for oscillating the member.

4. A rotary engine comprising a cylindrical casing; a rotor in said casing and having a circular cross-section and a curved longitudinal section; radial vanes fixed on the rotor; a division member having its axis of oscillation radial to the rotor, and having a concaved inner end adapted to be placed in close contact with the face of the rotor, said member being cut away at one

side to form substantially a segment of a cylinder and adapted to oscillate on its axis to form a passage for the vane and to close said passage after the vane has passed; means for oscillating the division member; and means for yieldably pressing the member against the rotor.

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

WILLIAM McDONALD.

Witnesses:

WILLIAM D. REES,

D. H. THOMAS, Jr.