April 25, 1933. E. E. GALYEAN 1,905,847

ROTARY ENGINE

Filed Aug. 24, 1931 2 Sheets-Sheet 1

Fig. 1.

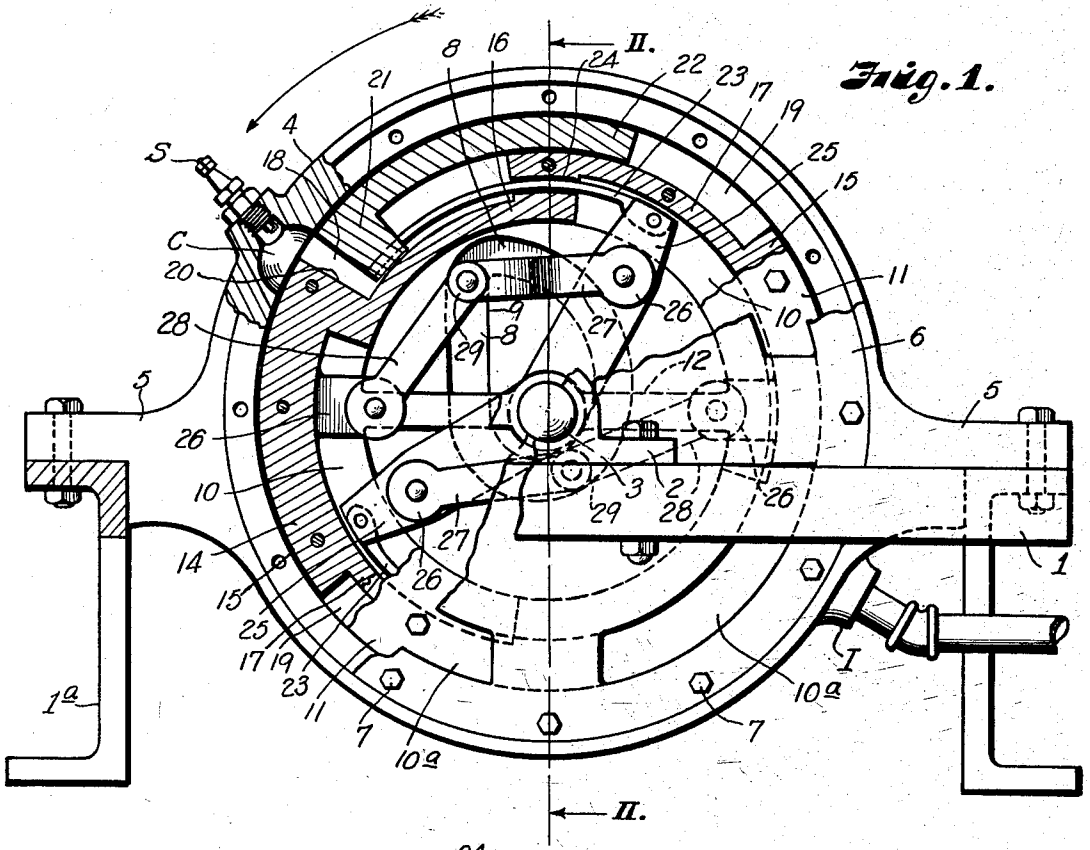
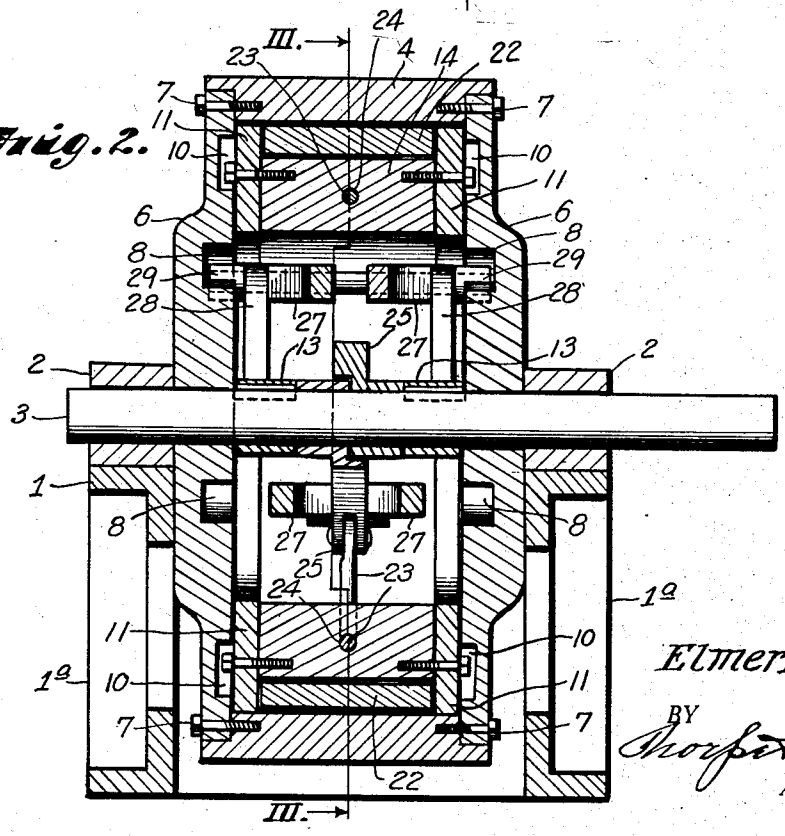


Fig. 2.



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Fig. 3.

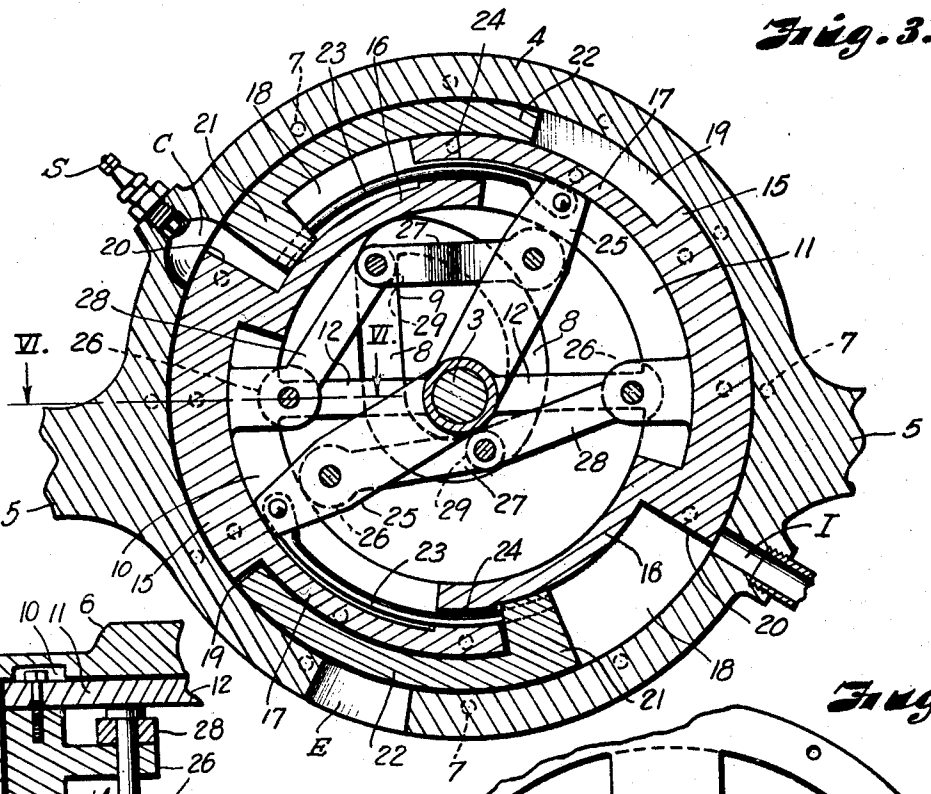
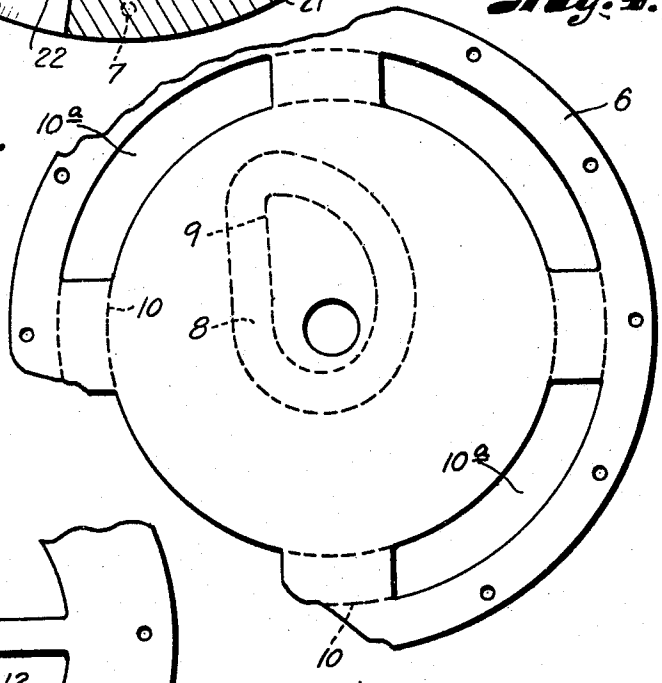


Fig. 4.



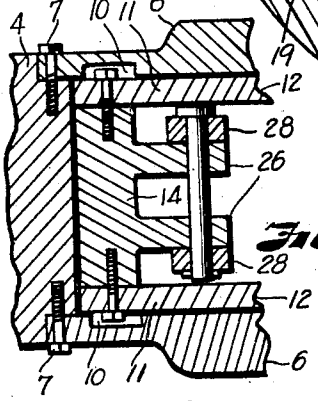
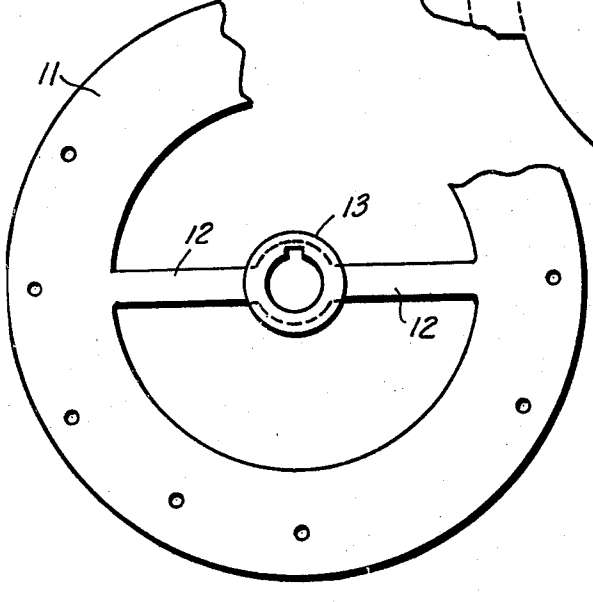


Fig. 6.

Fig. 5.



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Patented Apr. 25, 1933 1,905,847

UNITED STATES PATENT OFFICE

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ROTARY ENGINE

Application filed August 24, 1931. Serial No. 558,863.

This invention relates to internal combustion rotary engines, and has for its object to produce an efficient engine of the class mentioned in which provision is made for developing a plurality of power impulses in each revolution, and which is of simple, compact and economical construction.

With the general object named in view and others as will hereinafter appear, the invention consists in certain novel and useful features of construction and combinations of parts as hereinafter described and claimed; and in order that it may be fully understood, reference is to be had to the accompanying drawings, in which:—

Figure 1 is a view partly in side elevation and partly in central vertical section.

Figure 2 is a vertical cross-section of a rotary engine embodying the invention on the line II—II of Figure 1.

Figure 3 is an irregular vertical section on the line III—III of Figure 2.

Figure 4 is a fragmentary exterior side view of one of the sides of the engine casing.

Figure 5 is a broken side view of the rotary piston of the engine.

Figure 6 is a fragmentary section on the line VI—VI of Figure 3.

Referring to the drawings in detail, 1 indicates a horizontal rectangular frame provided with corner supporting standards 1*a*, and equipped with side bearings 2 for the shaft 3 for the transfer of power by conventional mechanism, such as a pulley and belt, not shown, or an equivalent thereof.

The casing of the engine comprising a cylinder 4 having opposite arms 5 fitted within and upon the frame 1 and bolted or otherwise secured thereto, and a pair of circular sides or heads 6 bolted as at 7 to the cylinder. The latter has a combustion chamber C into which projects a spark-plug S or equivalent ignition device. It also has a gas intake port I and an exhaust port E. The sides or heads of the casing have like internal cam grooves 8 of generally elliptic form flattened at one side to provide thrust shoulders 9, the grooves extending around the axis of the cylinder, and said grooves coincide with slots 10*a* provided for cooling purposes.

The rotor or piston is constructed as follows: 11 are similar ring-shaped sides or heads provided with diametric cross-bars 12 centrally pierced to fit on the shaft and be keyed or splined thereon, there being hubs 13 at the inner sides to provide a strong and serviceable connection with the shaft. Concentrically of the shaft and between and bolted firmly to the heads 11 is the cylindrical body-portion 14 of the rotor or double piston. Peripherally it is of double-stepped form to provide diametrically opposite outer segments 15 of diameter to closely fit the inner wall of the cylinder 4, diametrically-opposite inner segments 16, and diametrically opposite intermediate segments 17, the inner and intermediate segments conjointly spanning the spaces between the outer segments, and providing connected external deep chambers 18 and shallow chambers 19, the front walls of the chamber 18 constituting the piston faces 20 against which the forces of explosion are successively applied in each revolution. Followers or abutments for effecting compression of the charges of combustible mixture and serving as rigid or unyielding abutments or resistances at the moments of explosion, comprise heads 21 fitting in chambers 18, tails 22 fitting in chambers 19, and push rods 23 projecting rearwardly from the heads 21 and extending through guide openings 24 in the rotor at the junctions or connections of segments 16 and 17. The rear ends of the rods are connected to the outer ends of crank-arms 25 pivotally mounted on the shaft.

Each crank arm is pivotally engaged by the rear end of a toggle and the front end of the toggle is pivotally connected to a pair

of ears 26 projecting inwardly from the rotor, the links 27 and 28 of the toggle being equipped at their pivotal points with rollers 29 engaging the cam grooves of the heads of the casing.

The rotor is adapted for operation in a counter-clockwise direction, and when one follower or abutment has been caused by the shortening of its toggle connection to closely approach its opposing piston face to compress a charge of combustible mixture therein, the other toggle has been expanded to relatively withdraw its follower or abutment. As the parts attain the positions mentioned and clearly shown by Figure 3, the rollers of the shortened toggle are engaging the shoulders 9 of the cam grooves, and at the same time a spark is adapted to be produced within the combustion chamber by the spark plug. The resulting explosion expends its force on the piston face to drive the rotor as the reaction force on the follower or abutment meets unyielding resistance because of the engagement of the respective rollers with the shoulders 9. At the same time the other chamber 18 is in communication with the intake port as the corresponding or respective follower or abutment remains practically fully withdrawn and due to the position of its toggle rollers in the cam grooves, the chamber is fully charged with combustible mixture preferably supplied by the intake port under pressure in any conventional manner. The continued operation of the rotor brings the chamber where the explosion occurred into communication with the exhaust port E for the expulsion of the dead gases and at the same time a relative withdrawal of the respective follower disposes it in its chamber for receiving a charge of fresh combustible mixture as it passes the intake port, the other follower at the same time being accelerated in motion due to the cam grooves and toggle, to effect compression of the charge in its respective chamber and at the end of a half revolution of the motor attain the firing position as the other chamber 18 begins its recharging operation.

It will thus be seen that there are two explosions in each revolution of the shaft, and that the reaction in each case is against an unyielding resistance so that the full force of the explosion minus loss from frictional resistance, is expended in the operation of the rotor.

It is to be understood, of course, that packing rings or the like will be employed to guard against loss of power by leakage, but as the necessity for packings to seal the combustion chambers is obvious and can be supplied without invention, they have been omitted from the drawings.

From the above description it will be apparent that I have produced a construction embodying all of the features of advantage set forth as desirable, and while I have described and claimed the preferred embodiment of the invention, I reserve the right to make all changes properly falling within the spirit and scope of the appended claims.

I claim:—

1. A rotary engine, comprising a stationary casing providing a circular chamber and having gas-intake and exhaust ports and continuous cam grooves in the inner faces of the side walls, a shaft journaled in the side walls coaxially thereof and eccentrically of said grooves, a rotor of cylinder shape and open at its sides, mounted on the shaft within the said chamber and engaging the circumferential and side walls thereof and having opposite external peripheral chambers providing piston faces at their front ends, the bottoms of said peripheral chambers being of step form to divide the chambers into front and rear portions of different depth, the front portions being deeper than the rear portions and constituting follower chambers, the risers of the said stepped portions having passages opening from the front parts of said rotor chambers into the casing chamber, independent arms pivotally mounted at their inner ends on the shaft, followers snugly engaging the front parts of the rotor chambers and provided with tail pieces extending into the shallow rear chambers, rods projecting rearwardly from the followers and through the said passages and secured to said arms, toggle connections between said arms respectively and the rotor, and rollers on and at opposite sides of the jointed parts of the toggles and engaging the said cam grooves.

2. A rotary engine, comprising a stationary casing providing a circular chamber and having gas-intake and exhaust ports and continuous cam grooves in the inner faces of the side walls, a shaft journaled in the side walls coaxially thereof and eccentrically of said grooves, a rotor of cylinder shape and open at its sides, mounted on the shaft within the said chamber and engaging the circumferential and side walls thereof and having opposite external peripheral chambers providing piston faces at their front ends, the bottoms of said peripheral chambers being of step form to divide the chambers into front and rear portions of different depth, the front portions being deeper than the rear portions and constituting follower chambers, the risers of the said stepped portions having passages opening from the front parts of said rotor chambers into the casing chamber, independent arms pivotally mounted at their inner ends on the shaft, followers snugly engaging the front parts of the rotor chambers and provided with tail pieces extending into the shallow rear chambers, rods projecting rearwardly from the followers and through the said passages and secured to the arms, toggle connections between said arms

respectively and the rotor, and rollers on and at opposite sides of the jointed parts of the toggles and engaging the said cam grooves, the cam grooves including straight forwardly-facing portions engaged by said rollers respectively, when the toggles are contracted with the respective follower in full mixture-compressing position.

In testimony whereof I affix my signature.

ELMER E. GALYEAN.