H. J. GAUTHIER.

ROTARY GAS ENGINE.

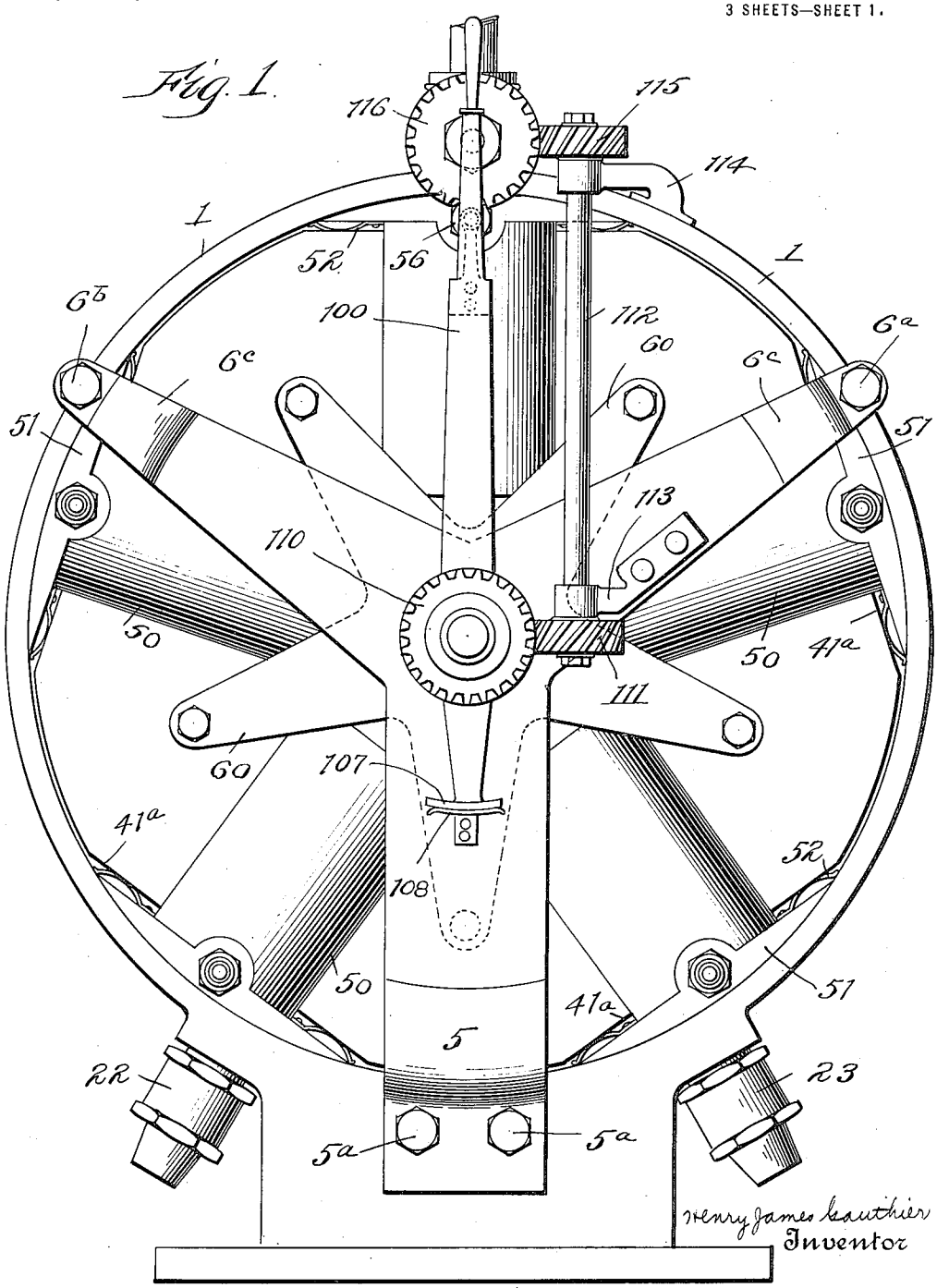
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1,268,561.

Patented June 4, 1918.

3 SHEETS—SHEET 1.

Fig. 1.



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Inventor

By his Attorneys

Knight Bros.

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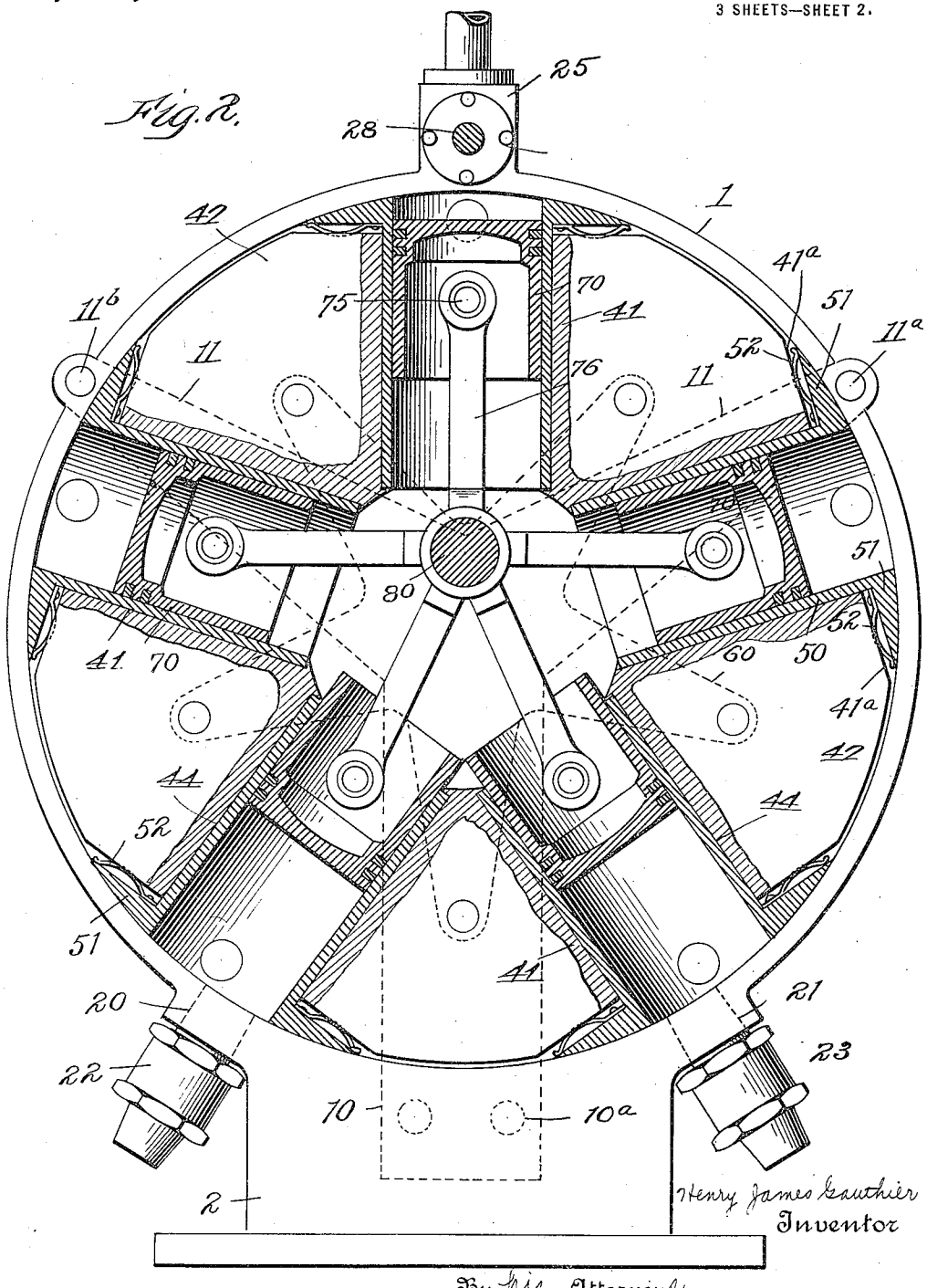
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3 SHEETS—SHEET 2.

Fig. 2.



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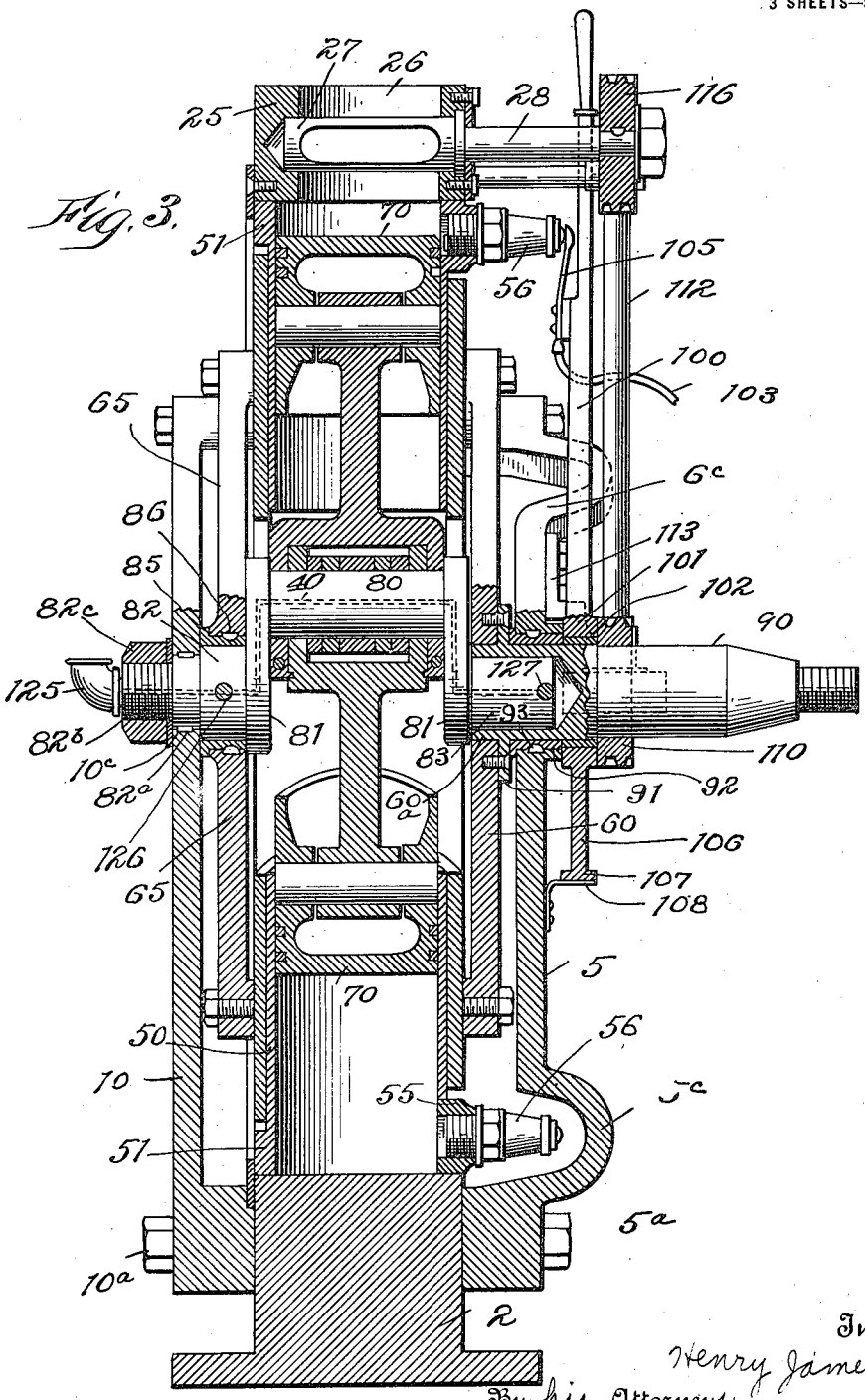
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3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

HENRY JAMES GAUTHIER, OF PLAINFIELD, NEW JERSEY, ASSIGNOR TO GAUTHIER AND CLARKE, A COPARTNERSHIP CONSISTING OF SAID GAUTHIER AND FRANK B. CLARKE, OF PLAINFIELD, NEW JERSEY.

ROTARY GAS-ENGINE.

1,268,561. Specification of Letters Patent. Patented June 4, 1918.

Application filed December 12, 1916. Serial No. 136,439.

To all whom it may concern:

Be it known that I, HENRY JAMES GAUTHIER, a citizen of the United States, residing at Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Rotary Gas-Engines, of which the following is a full and clear specification.

The present invention relates to improvements in rotary internal combustion engines of the type in which a series of an uneven number of engine cylinders with their operating pistons rotate within a stationary cylindrical shell or casing provided with exhaust and intake ports and an adjustable spark timer common to all the cylinders. The present invention contemplates a rotary explosive engine of the four cycle type in which each cylinder of the series is exploded, exhausted and re-charged once for every two revolutions of the engine. The several pistons operating in the radial cylinders of the rotating series are connected through their pitmen with a common crank held in stationary position, eccentric to the center of rotation of the series of cylinders.

The present invention contemplates certain improvements in the general construction and operation of the type of four cycle rotary explosive engine referred to, with a view to increasing the efficiency of this type of engine.

In order that the invention may be fully understood it will first be described with reference to the accompanying drawings and afterward pointed out more particularly in the annexed claims.

In said drawings,

Figure 1 is a side elevation of a rotary four cycle explosive engine, embodying my invention;

Fig. 2 is a vertical central transverse sectional view of the same;

Fig. 3 is a vertical central longitudinal sectional view of the same.

1 is the main circular or cylindrical casing of the engine formed integral with the flanged base 2, and braced upon its opposite faces by the heavy frame spiders 5 and 10, which are bolted to the opposite faces of the shell 1 and base 2 by means of bolts or set screws 5^a, 10^a, taking into the base 2 and 6^a, 6^b, and 11^a, 11^b, passing through arms 6 and 11 of the main spiders into the perforated thickened parts 1^a of the shell 1. These spiders 5 and 10 afford supports at opposite sides for the rotary shaft and stationary crank arm as hereinafter explained, the spider arms 5, 6, being formed with outwardly curved portions at 5^c and 6^c to afford clearance for the laterally projecting ends of the spark plugs carried by the rotating series of cylinders, as hereinafter explained.

The casing 1 is provided upon opposite sides of the base 2 with the main exhaust port 20 and the intake port 21. An outwardly opening check valve 22 leads from the exhaust port 20, while an inwardly opening check valve 23 communicates with the intake port 21. The usual gas supplying carbureter (not shown) is suitably connected with the check valve 23 of intake 21.

The casing 1 is formed at its upper edge opposite to base 2 with an integral valve casing 25, forming an auxiliary exhaust port 26 in which operates a two-way rotary valve plug 27 mounted upon a valve stem 28 which is operated from the rotary shaft of the engine in the manner hereinafter explained.

A series of an uneven number of radially arranged cylinders forms the rotor of the engine. This rotor may be made in any approved manner, but preferably comprises a metal casting having the desired number of radially extending cylindrical enlargements into which radial cylindrical cavities are bored to receive the shells or linings constituting the explosion cylinders. In the drawings the integral engine rotor comprises a series of radial enlargements 41 joined by the intervening web 42 located in the central transverse plane of the engine. Each of these enlargements 41 has a radial cylindrical bore 44 in which is fitted the cylindrical lining shell 50. These shells 50 constitute the engine cylinders. Each shell 50 is formed at its outer end with the oppositely projecting segmental flanges 51 which rest in the segmental cutaway portions 41^a of the engine rotor. Suitable springs, such as shown at 52, are mounted upon the flanges 51 to engage the cutaway surfaces of the supporting body to maintain the flanged lining members 50 pressed outwardly with the segmental portions 51 in working contact with the inner cylindrical surface of the shell or casing 1.

Each of the shell cylinders 50 is formed upon one side near its outer flanged end with a circular boss 55 formed with a threaded opening to receive an ordinary spark plug, such as shown at 56. The rotor is properly cut away to receive the threaded lateral bosses 55. The spark plugs 56 project laterally from the series of engine cylinders and in the rotation of the cylinders said plugs pass beneath the curved offsets 5^c and 6^c, above referred to.

The rotary series of cylinders constructed as described are mounted between and carried by two supporting spiders shown at 60 and 65, which rotate upon suitable central bearings as will be hereinafter described. These spiders are formed with radial arms which are bolted to the rotary series of cylinders preferably in the web portion connecting the cylinders proper. The arms may be formed with inwardly presented bosses at their outer ends or they may be otherwise properly shaped to be fitted to the rotary series of cylinders in a satisfactory manner.

Operating in each of the shell cylinders 50 is a reciprocating piston 70 of ordinary construction, the piston being preferably provided with packing rings to maintain compression. Each piston 70 has pivotally connected with it upon a wrist pin 75, a pitman 76, whose opposite end is formed with a yoke 77 that is freely journaled upon the crank pin 80. The several pitmen 76 have their yokes of different widths, to enable them to be nested or straddled one over another upon the crank 80.

The fixed crank 80 is mounted upon the supporting side arms 81 carrying oppositely projecting stub shafts 82, 83. The stub shaft 82 passes through a central opening 10^c of the spider frame 10 and is keyed in said opening by keys 82^a and has a threaded outer portion 82^b upon which is mounted a lock nut 82^c. Freely journaled upon the stub shaft 82 is a bearing sleeve 85 upon which is keyed, by one or more keys 86, the spider 65 supporting the rotary series of cylinders at one side.

The arm 81 of crank pin 80 at the opposite side of the engine carries the stub shaft 83, upon which is journaled the hollowed out inner end of a power transmitting stub or shaft section 90. This shaft section 90 bears upon the stub shaft 83 and carries a circular flange 91 which is rigidly secured by means of set screws to the spider 60, the spider having a central opening at 60^a to receive the inner end of the hollow shaft section 90. The shaft section 90 is freely journaled in the bearing sleeve 92, which is keyed to the frame spider 5 by means of one or more keys 93.

The crank pin 80 supported in the manner explained is eccentric to the center of rotation of the engine rotor. With this fixed crank pin 80 in this position it will be understood that the pitmen 76 all of equal length will assume different angular positions within the engine rotor, thereby maintaining the several pistons in the working cylinders in varying positions depending upon the angular relation of the respective cylinders to the crank pin 80, above or below said crank pin.

100 is a controller arm formed with a bearing hub 101 which is journaled upon a bearing sleeve 102, mounted upon the shaft section 90. This controller arm 100 carries an electric contact arm or brush 105 supported in the path of the circular series of spark plugs 56, which rotate with the engine cylinders. This brush arm 105 is adapted to make contact with the exposed terminal of each spark plug for creating the charge exploding spark in the cylinder at the proper moment. An electric wire 103 extends from the brush 105 to a suitable source of electric current, the return line of the circuit being through the machine in a manner well understood. Projecting beneath the hub 101 of the controller 100 is an arm 106 formed with a segment 107, which is frictionally engaged by a spring arm 108 secured to the spider frame 5. This device is for the purpose of retaining the controller arm 100 in the desired adjusted position. By moving the arm more or less the timing of the engine can be regulated.

Keyed to shaft section 90 is a worm gear 110 meshing with a smaller worm gear 111 keyed to the lower end of a vertical shaft 112 suitably journaled in the bracket bearings 113 and 114 secured respectively upon the spider frame 6 and cylindrical casing 1. Keyed to the upper end of the shaft 112 is a worm gear 115 meshing with a similar gear 116 keyed to the outer end of the stem 28 of auxiliary exhaust valve 27. By this gearing the exhaust valve 27 is alternately opened and closed in proper time to open up communication between every alternate cylinder and the outer air and to close up this communication with the intervening cylinders to retain the compressed charge at the moment of ignition.

It will be observed particularly with reference to Fig. 3 of the drawings that an elbow 125 of an oil supply device (not shown) leads into an axial oil opening 126 of the stud shaft 82 of the crank. From this opening 126 oil passage 40 leads through the arms 81, crank 80, to axial opening 127 of stud shaft 83. From these main oil channels suitable branch oiling ports extend to the various parts to be oiled.

The operation of the improved engine will be clear from the following brief explanation:

Starting with the assumption that one of the cylinders has taken in a charge of gas

through the inlet port 21 it will be understood that this particular cylinder passes up to a point beneath the auxiliary exhaust 27, compressing the charge because of the movement of the piston outwardly in the particular cylinder referred to. As this charged cylinder reaches the desired position beneath the exhaust valve 27, said valve will be closed and the sparking device, being active, will ignite the compressed charge as the cylinder referred to passes over the dead center. The expansion of the exploded charge tends to force the piston inwardly in its cylinder and since this action is exerted against a rigid crank pin 80 the resultant force gives the rotor an impulse forward in its casing 1. The explosive force continues to act until the cylinder referred to reaches the main exhaust 20 at which time the main port of the burnt partially expanded gas is exhausted through the port 20. The exploded cylinder then passes on over the intake port 21, but at this moment there is still retained in the cylinder sufficient burned gases to avoid the intake of a new charge at this time. The unexpelled remainder of the exploded charge is then further compressed up to the point of communicating with the auxiliary exhaust 27, at which time said valve 27 is opened to permit the complete exhaustion of the cylinder. Following this complete scavenging of the cylinder referred to, it will be understood that it then proceeds past the main exhaust to the intake port, where there is sufficient vacuum or suction to insure the taking in of a new charge of gas and the cycle is repeated, as just explained. In the operation of the engine it will be observed that every alternate cylinder that passes the sparking defice is exploded while the intervening cylinders are exhausted. With an unequal number of cylinders arranged as explained in the engine rotor, it will be understood that by charging, compressing and exploding alternate cylinders of the rotating series all of the cylinders are called into play in two revolutions of the engine, the cylinders operating on the four cycle principle, as above explained. The segmental flanges 51 upon opposite sides of the cylindrical bores of shell cylinders 50 are of greater width circumferentially than the casing ports so that they will effectively close the engine cylinders against leakage while they are moving into and out of registry with the ports and particularly the auxiliary exhaust port when the valve 27 is closed and a compressed charge is exploded.

The rotor of connected cylinders serves the purpose of a fly wheel. Power can be taken from the driven shaft section by belt pulley or gear (not shown) in the usual manner. The pistons and cylinders are properly lubricated from the central oiling system above described, the oil being carried to these parts by centrifugal force.

I claim:

1. A rotary internal combustion engine of the four cycle type comprising a stationary cylindrical casing having an inlet and two exhaust ports, a rotor of connected open-ended cylinders operating in said casing, independent spark plugs carried by said cylinders and traveling in a common path, pistons operating in said cylinders, a stationary crank pin mounted eccentrically of the center of rotation of said cylinders, pitmen connecting the several pistons with said crank pin, and an igniting controlling contact brush supported in the path of the spark plugs.

2. A rotary internal combustion engine of the four cycle type comprising a stationary cylindrical casing having a gas inlet port and main and auxiliary exhaust ports, a series of an odd number of open-ended cylinders operating in said casing, spark plugs carried by and projecting laterally from said cylinder, pistons operating in said cylinders, a stationary crank pin mounted eccentrically of the center of rotation of said cylinders, pitmen connecting the several pistons with said crank pin, an adjustable controller arm supporting a contact brush in the path of said spark plugs and a valve controlling the auxiliary exhaust port.

3. A rotary internal combustion engine of the four cycle type comprising a stationary cylindrical casing having a gas inlet port and main and auxiliary exhaust ports, a series of an odd number of open-ended cylinders operating in said casing, spark plugs carried by said cylinders, pistons operating in said cylinders, a stationary crank pin mounted eccentrically of the center of rotation of said cylinders, pitmen connecting the several pistons with said crank pin, an ignition controlling device, a rotary valve controlling the auxiliary exhaust and means for operating said valve to alternately open and close the valve as the cylinders successively pass said auxiliary exhaust.

4. In a rotary explosive engine of the four cycle type, the combination of a cylindrical casing formed with circumferentially disposed gas inlet and main and auxiliary exhaust ports, check valves controlling the gas inlet and main exhaust ports, a controlling valve in the auxiliary exhaust ports, operating mechanism for said controlling valve for alternately opening and closing it, a rotary series of an uneven number of open-ended cylinders operating within said casing, piston operating in said cylinders, an eccentrically mounted crank pin, pitmen connecting said pistons with said crank pin, and suitable ignition devices.

5. In a rotary explosive engine of the four cycle type, the combination of a cylin-

drical casing formed with circumferentially disposed gas inlet and main and auxiliary exhaust ports, check valves controlling the gas inlet and main exhaust ports, a controlling valve in the auxiliary exhaust port operating mechanism for said controlling valve, for alternately opening and closing it, a rotary series of an uneven number of open ended cylinders operating within said casing, pistons operating in said cylinders, a crank pin formed with supporting crank arms and stub shafts, the stub shafts of which are mounted in the axis of rotation of said cylinders, means for securing said crank pin in the desired position, pitmen connecting said pistons with said crank pin and suitable ignition devices.

6. In a rotary explosive engine of the four cycle type, the combination of a cylindrical casing formed with circumferentially disposed gas inlet and main and auxiliary exhaust ports, check valves controlling the gas inlet and main exhaust ports, a rotary controlling valve in the auxiliary exhaust, a rotary series of an uneven number of open-ended cylinders operating within said casing, pistons operating in said cylinders, an eccentrically mounted crank pin, pitmen connecting said pistons with said crank pin, a shaft connected with and driven by said rotary series of cylinders, gearing between said shaft and said controlling valve, and suitable ignition devices.

7. In a rotary explosive engine of the four cycle type, the combination of a cylindrical casing having gas inlet and main and auxiliary exhaust ports, a rotary series of open-ended cylinders operating in said casing, pistons operating in said cylinders, a stationary eccentrically mounted crank pin, pitmen connecting said pistons with said crank pin, a series of spark plugs carried by said cylinders, a controlling valve in said auxiliary exhaust and an ignition controlling brush supported adjacent to said controlling valve in position to electrically contact with the successive spark plugs, substantially as described.

8. In a rotary explosive engine of the four cycle type, the combination of a cylindrical casing having gas inlet and main and auxiliary exhaust ports, a rotor having an uneven number of radially extending cylindrical openings, cylindrical shells mounted in said radial openings and formed with open outer ends and oppositely projecting segmental flanges which contact with the inner cylindrical surface of said casing, pistons operating in said shell cylinders, a stationary crank pin, pitmen connecting said pistons with said crank pin, and suitable ignition devices.

9. In a rotary explosive engine of the four cycle type, the combination of a cylindrical casing having gas inlet and main and auxiliary exhaust ports, a rotor having an uneven number of radially extending cylindrical openings, cylindrical shells mounted in said radial openings and formed with open outer ends and oppositely projecting segmental flanges which contact with the inner cylindrical surface of said casing, springs between said flanges and the rotor body, pistons operating in said shell cylinders, a stationary crank pin, pitmen connecting said pistons with said crank pin, a series of spark plugs carried by said cylinders, and suitable ignition controlling devices.

10. In a rotary explosive engine of the four cycle type, the combination of a cylindrical casing having gas inlet and main and auxiliary exhaust ports, a rotor having an uneven number of radially extending cylindrical openings, cylindrical shells mounted in said radial openings and formed with open outer ends and oppositely projecting segmental flanges which contact with the inner cylindrical surface of said casing, springs between said flanges and the rotor body, pistons operating in said shell cylinders, a stationary crank pin, pitmen connecting said pistons with said crank pin, a series of spark plugs carried by said cylinders, a controlling valve in said auxiliary exhaust, and an ignition controlling brush supported adjacent to said controlling valve in position to electrically contact with the successive spark plugs.

11. In a rotary explosive engine of the four cycle type, the combination of a cylindrical casing having gas inlet and main and auxiliary exhaust ports, frames secured upon opposite faces of said cylindrical casing and formed with central bearings, a rotor comprising an uneven number of open ended cylinders, side frames secure upon opposite faces of said rotor and formed with central bearing openings, an adjustable U-shaped crank formed with oppositely projecting stub shafts which are mounted in the bearings of casing frames, the side frames of the rotor being journaled upon the stub shafts of said cranks, pistons operating in said cylinders, pitmen connecting said pistons with said crank, a driven shaft, means of connecting said driven shaft with said rotor, and suitable ignition devices.

12. In a rotary explosive engine of the four cycle type, the combination of a cylindrical casing having gas inlet and main and auxiliary exhaust ports, frames secured upon opposite faces of said cylindrical casing and formed with central bearings, an adjustable U-shaped crank formed with oppositely projecting stub shafts which are mounted in the bearings of said casing frames, a rotor comprising an uneven number of open-ended cylinders, journaled upon the stub shafts of said crank, pistons op-

erating in said cylinders, pitmen connecting said pistons with said crank, a driven shaft connected with said rotor, and suitable ignition devices.

13. In a rotary explosive engine of the four cycle type, the combination of a cylindrical casing having gas inlet and main and auxiliary exhaust ports, frames secured upon opposite faces of said cylindrical casing and formed with central bearings, an adjustable U-shaped crank formed with oppositely projecting stub shafts which are mounted in the bearings of said side frames, the skeleton frames of the rotor comprising an uneven number of open-ended cylinders journaled upon the stub shafts of said crank, pistons operating in said cylinders, pitmen connecting said pistons with said crank, a driven shaft connected with said rotor and suitable ignition devices, said crank and stub shafts being formed with communication oil passage ways leading to surfaces to be lubricated.

14. In a rotary explosive engine of the four cycle type, the combination of a cylindrical casing having gas inlet and main and auxiliary exhaust ports, a rotary series of open-ended cylinders operating in said casing, oppositely projecting segmental flanges carried by the outer ends of said cylinders in working engagement with said casing, said flanges being of greater width circumferentially than the casing ports, pistons operating in said cylinders, a stationary crank pin, pitmen connecting said pistons with said crank pin and suitable ignition devices.

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