J. LANGTEIG.

ROTARY INTERNAL COMBUSTION ENGINE.

APPLICATION FILED AUG. 30, 1916.

1,247,973.

Patented Nov. 27, 1917.

4 SHEETS—SHEET 1.

Fig. 1.

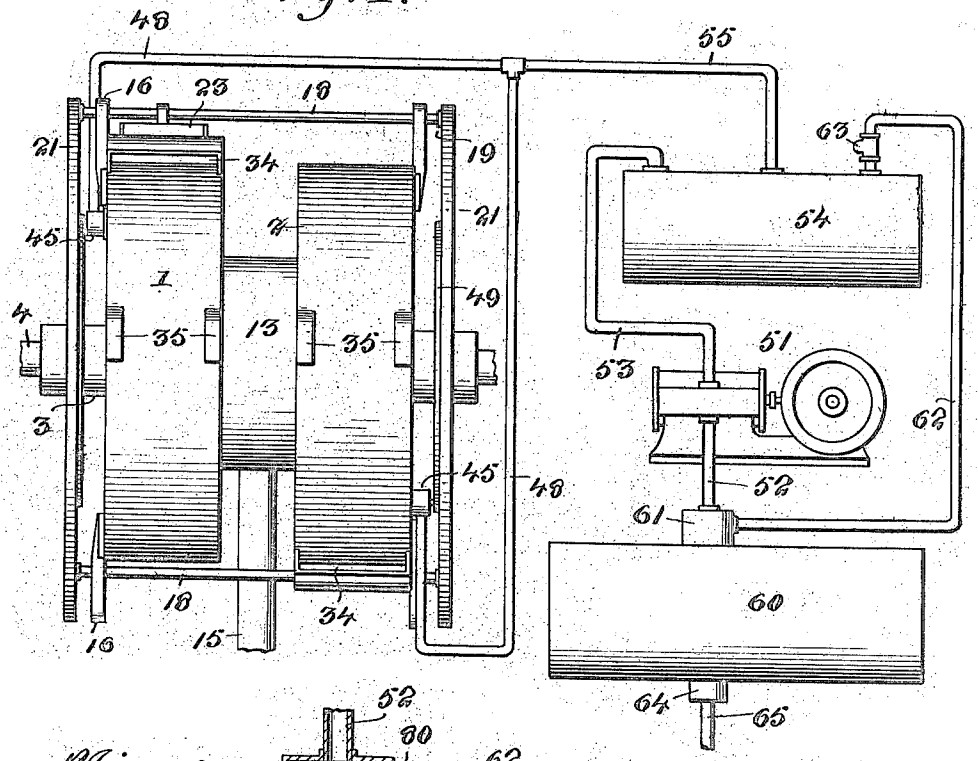


Fig. 10.

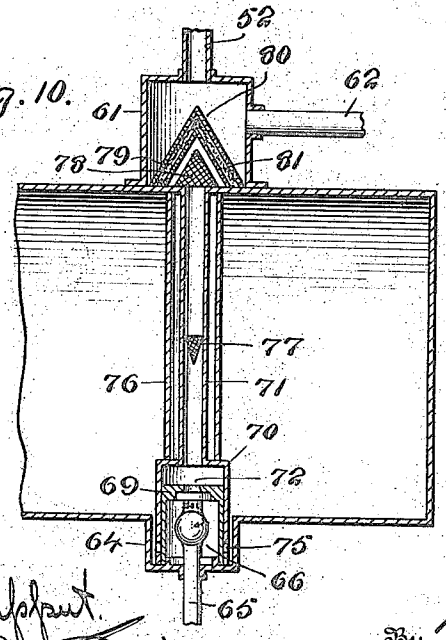
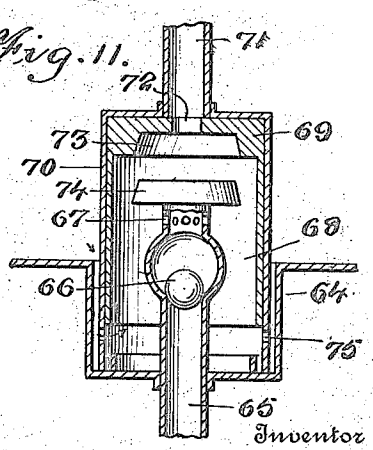


Fig. 11.



Witnesses

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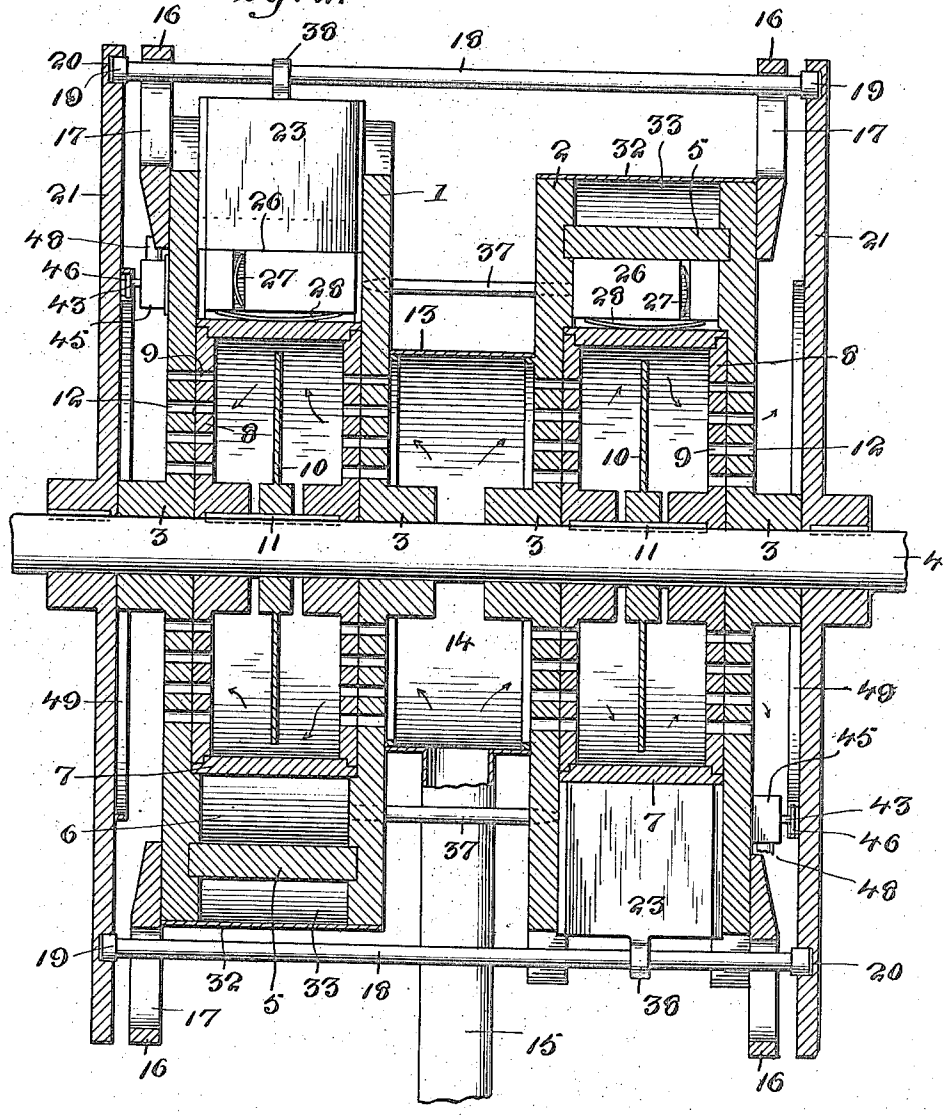
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4 SHEETS—SHEET 2.

Fig. 2.



Witnesses

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4 SHEETS—SHEET 3.

Fig. 3.

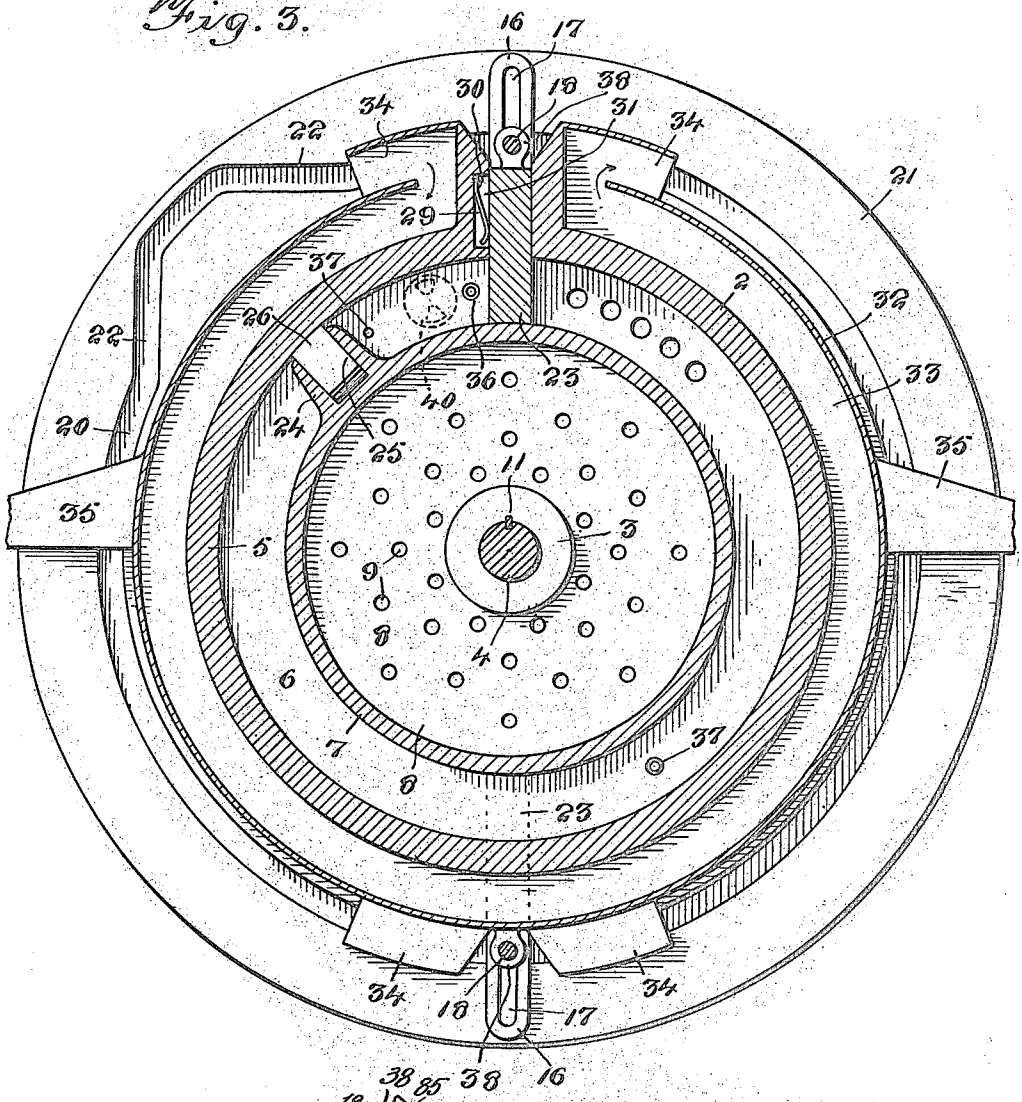
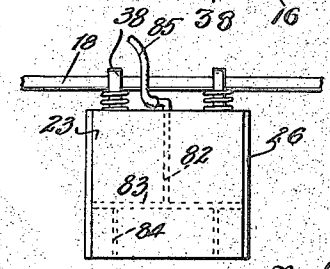


Fig. 12.



Witnesses

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4 SHEETS—SHEET 4.

Fig. 4.

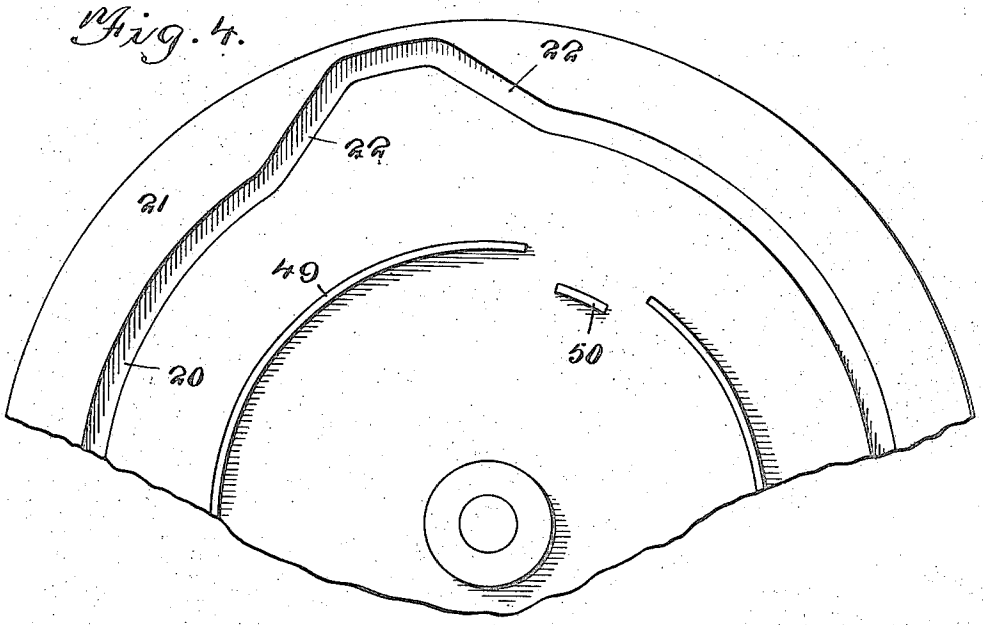


Fig. 5.

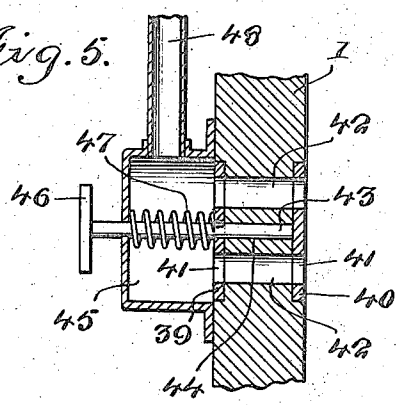


Fig. 6.

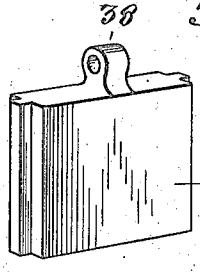


Fig. 7.

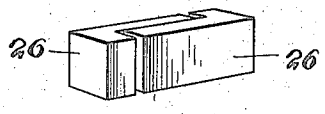


Fig. 8.

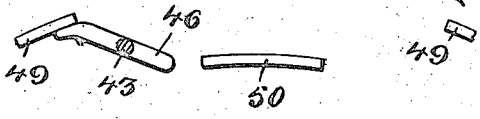
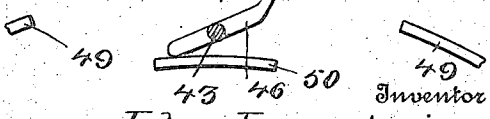


Fig. 9.



Witnesses

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UNITED STATES PATENT OFFICE.

JOHN LANGTEIG, OF CENTERVILLE, SOUTH DAKOTA.

ROTARY INTERNAL-COMBUSTION ENGINE.

1,247,973. Specification of Letters Patent. Patented Nov. 27, 1917.

Application filed August 30, 1916. Serial No. 117,754.

To all whom it may concern:

Be it known that I, JOHN LANGTEIG, a citizen of the United States, residing at Centerville, in the county of Turner and State of South Dakota, have invented new and useful Improvements in Rotary Internal-Combustion Engines, of which the following is a specification.

This invention relates to rotary internal combustion engines the object in view being to provide in an engine of the character referred to, a complete equipment for a power plant, the invention residing particularly in a novel arrangement and combination of rotors and rotor chambers; a novel arrangement of cut-offs or sliding abutments; a novel operating mechanism for said cut-offs or sliding abutments; and a novel arrangement of admission or inlet valves together with the operating means therefor.

With the above and other objects in view, the invention consists in the novel construction, combination and arrangement, herein fully described, illustrated and claimed.

In the accompanying drawings:

Figure 1 is a view in elevation of the improved engine, showing the entire equipment used in conjunction therewith.

Fig. 2 is an enlarged diametrical section through the engine.

Fig. 3 is a vertical longitudinal section through the engine, taken through one of the rotors and its chamber.

Fig. 4 is a fragmentary inside face view of one of the cam disks.

Fig. 5 is a fragmentary section through one of the valves showing a portion of the operating mechanism therefor.

Fig. 6 is a detail perspective view of one of the cut-offs or sliding abutments.

Fig. 7 is a detail perspective view of the packing used in conjunction with the abutment of each rotor.

Figs. 8 and 9 are diagrammatic views illustrating the valve operating means.

Fig. 10 is an enlarged fragmentary section through the fuel reservoir illustrating the air and hydro-carbon mixing apparatus.

Fig. 11 is an enlarged fragmentary section through the valve and mixing chambers, illustrating the operation of the throttle valve.

Fig. 12 is a detail view of one of the abutments.

The engine contemplated in this invention, in the preferred embodiment thereof, comprises a pair of rotor casings 1 and 2 both of which are stationary and formed with bearings 3 for a centrally arranged rotary engine shaft 4. Each of the rotor casings 1 and 2 comprises a concentric wall 5 within which is contained an annular expansion chamber 6 the inner wall of which is formed by the peripheral wall 7 of a rotor which comprises in addition to the wall 7 oppositely arranged heads 8 located in spaced relation to each other and formed with air vents 9. About midway between the heads 8 of each rotor is a deflecting disk 10 which revolves with the rotor, the rotor and its deflecting disk 10 being fastened to the shaft 4 by means of a key 11 or the equivalent thereof. At its outer edge the deflecting disk 10 terminates short of the inner surface of the rotor wall 7 in order that the air may circulate from one side to the other of said disk.

The heads of the rotor casings are also formed with air ports 12 adapted to register with the air ports 9 of the rotors, thereby enabling a cooling current of air to pass through each rotor during the operations of the engine.

Arranged between the rotor casings 1 and 2 is a concentric shell 13 which forms an air distributing chamber 14 supplied with air through an air inlet 15 shown in the form of a pipe. The air admitted through the inlet 15 into the chamber 14 is distributed through the air ports 9 and 12, moving from the central air distributing chamber laterally in both directions through the rotor casing and rotors to the outer atmosphere.

Extending radially outward from the rotor casings 1 and 2 are guides 16 having slotted guideways 17 disposed radially in relation to the shaft 4. These guides are arranged in pairs, the guides of each pair being in transverse alinement with each other so as to receive and guide a pair of cut-off operating rods 18 having at their extremities anti-friction rollers 19 which traverse guide-ways 20 in a pair of cam disks 21 located at opposite sides of the engine as shown in Figs. 1 and 2. The camway 20 of each cam disk 21 is formed with an eccentric portion 22 acting upon the rollers 19 to thrust the rods 18 outwardly in order to shift a pair of cut-offs or sliding

abutments 23 in a corresponding direction in order to allow the abutments of the rotors to pass by said cut-offs. The inner concentric portions of the camways hold the cut-offs 23 at the inner limit of their movement throughout the remainder of their cycle of operation during the expansion of the exploding mixture.

Each rotor is provided with a radially extending abutment 24 which is recessed as shown at 25 forming a transversely extending cavity in which is placed a sectional packing strip illustrated in detail in Fig. 7, said packing strip comprising two L-shaped sections 26 bearing an over-lapping relation to each other as clearly shown in said figure. A spring 27 serves to spread the sections 26 apart as shown in Fig. 2 so that the opposite ends thereof will work in close contact with the side walls of the expansion chamber and another spring 28 is placed under the packing so as to maintain the outer edge or face thereof in working contact with the inner face of the peripheral wall 5 of the rotor casing. In connection with each cut-off 23, I also employ a spring 29 set into a recess 30 in the casing 1 and serving to hold the sliding abutment or cut-off 23 in fluid tight contact with one of the walls of the opening 31 through which the cut-off is slidable as shown in Fig. 3.

32 designates an outer concentrical shell surrounding each of the rotor casings 1 and 2 as best illustrated in Fig. 3, said shell being arranged in spaced and concentric relation to the wall 5 of the casing so as to provide an air cooling space 33 extending nearly all the way around the rotor casing and having an inlet or outlet 34 as the case may be so that air may circulate freely around the wall 5 of the casing which latter wall is subjected to the greatest heat. 35 designates supporting lugs to enable the engine to be mounted upon a suitable supporting base. 36 designates a spark plug or igniter which is used initially in starting the engine, one of such igniters being employed in connection with each rotor casing and being located at a suitable point as shown in Fig. 3 to ignite the mixture between the cut-off 23 and the rotor abutment 24 after the latter has passed beyond the inlet or admission valve and after the latter has closed, the ignited mixture then expanding between said cut-off and abutment.

After the engine has been started, a portion of the exploding mixture which is then in the form of a flame, is transmitted from the combustion chamber of one casing into the adjacent chamber of the other casing by means of a firing nozzle 37, there being two of such nozzles as indicated in Fig. 2. Each of the cut-offs 23 is shown as provided with an eye 38 through which the respective cut-off controlling rod 18 passes, thus forming a working connection between each cut-off and its controlling rod.

The inlet valve which is illustrated in the detail section in Fig. 5 is of the oscillatory type, the same comprising oppositely located heads or disk shaped members 39 and 40, the same being let into the recesses in the adjacent head of the casing as shown in Fig. 5, and provided with ports 41 which register at the proper time with other ports 42 in the casing. Connected fixedly to the head 40 is a stem 43 which extends through a bearing opening 44 in the casing and has the other head 39 keyed thereto so that both heads 39 and 40 rotate with the stem 43. The stem 43 extends through a compressed mixture chamber 45 on the outside of the adjacent wall of the rotor casing and said stem 43 is provided exteriorly of said chamber 45 with a tripping head 46. An expansion spring 47 surrounds the stem 43 within the chamber 45 and serves to hold the heads 39 and 40 in good working contact with the adjacent faces of the head of the rotor casing. In Fig. 5, 48 designates one of a pair of pipes or connections leading from the compressed mixture reservoir to the respective chamber 45, both of said pipes or connections being shown in Fig. 1.

The means for opening and closing the oscillatory inlet valve is best illustrated in Figs. 4, 8 and 9 wherein each of the cam disks 21 is shown as comprising an interrupted concentric valve closing flange 49 and a comparatively short concentric valve opening flange 50. The tripping head 46 is normally held by means of the spring 47 against the flange 49 as shown in Fig. 8. As soon as the tripping head 46 passes out of engagement with one extremity of the flange 49 it strikes against the adjacent extremity of the flange 50, causing the inlet valve to be oscillated to a position to bring the ports 40 and 42 into registry. Upon moving out of engagement with the flange 50, the head 46 strikes against the other extremity of the flange 49, causing the inlet valve to be oscillated in the opposite direction thereby closing the ports 41 and 42. The operation of this feature of the invention is clearly illustrated in the diagrammatic views of Figs. 8 and 9.

Referring now to Fig. 1, 51 designates a compressor for compressing the mixture which is led to said compressor through a pipe 52 and forced by the compressor through a pipe 53 into a compressed mixture reservoir 54 from which a pipe 55 leads to the pipes 48 hereinabove referred to, the latter leading to the compressed mixture chambers or valve chambers hereinabove described. 60 designates a fuel reservoir having at the top thereof a dome 61 to which

the pipe 52 is connected and to which is also connected a return pipe 62 leading from the reservoir 54 and provided with a pressure relief valve 63 so that when the pressure in the reservoir 54 becomes excessive, the over-pressure is returned to the dome 61.

The fuel reservoir 60 is provided at the bottom thereof with a depression or basin 64 and entering the bottom of said basin is an air inlet pipe 65 provided with a back pressure check valve 66 and also provided beyond said check valve with ports 67 which admit the air into a mixing chamber 68 formed within and by a piston valve 69 forming the throttle valve of the engine. The valve 69 is adapted to reciprocate within a valve casing 70 from which leads off an outlet pipe 71 extending through the top of the fuel reservoir 60 and discharging into the dome 61. The valve 69 is formed in the head thereof with an outlet port 72 which intersects a cavity or recess 73 also formed in the head of the valve and designed to receive a stopper or plug 74 fast on the end of the air inlet pipe 65. The casing or valve chamber 70 is provided with inlet ports 75 to admit the fuel in the reservoir 60 to the interior of the casing 70 and into the mixing chamber 68 which is open at the bottom as shown. As illustrated in Fig. 11, when the valve 69 moves downwardly, it closes the fuel inlet ports 75 and it also closes the outlet port 72 of the valve and thereby prevents the mixture of hydro-carbon and air from entering the pipe 71 hereinabove referred to. When the valve 69 moves in the opposite direction, the port 72 is opened and also the ports 75, air and hydro-carbon are both admitted to the mixing chamber 68 where they pass around the stopper 74 and onward through the pipe 71. A protecting shell 76 extends around the pipe 71 as shown in Fig. 10. Within the pipe 71 is an atomizer and strainer 77 shown in the form of an inverted gauze cone. At the discharge end of the pipe 71 and within the dome 61 is arranged another atomizing and straining cone 78. Surrounding the last named cone is a conical filter comprising a small inside cone 79 and a relatively large outside cone 80 between which is arranged filtering material 81. The mixture is thus atomized and filtered between the primary mixing chamber 68 and the dome 61 before it is admitted to the pipe 52 leading to the compressor.

From the foregoing description taken in connection with the accompanying drawings the operation of the engine will now be understood. The rotor casings 1 and 2 being stationary, and the cam disks 21 being rotary, as the mixture is ignited and exploded between the cut-offs 23 and the abutments 24, the rotors are driven and thereby motion is imparted to the shaft 4. The engine is primarily started with the aid of the igniters 36 and thereafter the mixture is ignited in the combustion chambers by means of the flame directed from one of the casings 1 and 2 into the other casing through the respective firing nozzle 37. The cam disks 21 in revolving, move the cut-offs 23 outwardly and inwardly so as to permit the abutments 24 to pass by the same. Said cam disks also control, at the proper periods, the oscillatory inlet valves, thereby admitting the explosion mixture to the combustion chamber at the proper times. Each valve closes just before the spark is generated, after which the exploding mixture expands between the cut-off 23 and the abutment 34 thereby driving the rotor. Under the arrangement shown and described, there are two explosions and impulses in each complete revolution of the engine shaft. The engine is not only compact but highly efficient and powerful in that the full force of each explosion is directed against the rotor abutment at a considerable distance from the center of the engine shaft. Not only is each of the casings cooled by the air circulating around the same but each of the rotors is also cooled by the air passing therethrough. The timing of the operation of the cut-offs and the inlet valves is accurate and unchanging thereby insuring the full efficiency of the engine.

In Fig. 12, which shows one of the cut-offs, the latter is shown as provided with pressure passages 82, 83 and 84 fed by a flexible tube 85 for the purpose of pressing the packings 26 outwardly to form a fluid tight contact between the abutment and the walls of the combustion chamber.

What is claimed is:

1. In a rotary internal combustion engine, the combination of a rotor casing, a central shaft, a rotor in said casing fast on said shaft, a sliding cut-off, cut off actuating means, an oscillatory inlet valve for the rotor casing, a valve stem extending from said valve, a tripping head on said valve stem, a rotary cam disk fast on said shaft, and valve opening and closing flanges on said cam disk coöperating with said tripping head.

2. In a rotary internal combustion engine, the combination of a pair of stationary concentric rotor casings, a rotary shaft passing centrally therethrough, a rotor in each of said casings fast on said shaft, a sliding cut-off for each explosion chamber slidable in relation to the respective rotor casing, cut-off actuating means, abutments on said rotors, an oscillatory inlet valve for each rotor casing, a valve stem extending from said valve, a tripping head on said valve stem, rotary cam disks fast on said shaft at opposite sides of the engine, and valve opening and closing flanges on said cam disks co-

operating with said tripping head for the purpose of opening and closing said oscillatory inlet valves.

3. In a rotary internal combustion engine, the combination of a pair of stationary concentric rotor casings, an engine shaft passing centrally therethrough, a rotor in each of said casings fast on said shaft, an air distributing chamber located between said casings, and an air supply leading to said air distributing chamber, the adjacent walls of the rotors and rotor casings being ported at both sides to admit of the passage of air from said distributing chamber through the rotors and casings.

4. In a rotary internal combustion engine, the combination of a pair of stationary concentric rotor casings, an engine shaft passing centrally therethrough, a rotor in each of said casings fast on said shaft, an air distributing chamber located between said casings, and an air supply leading to said air distributing chamber, the adjacent walls of the rotors and rotor casings being ported at both sides to admit of the passage of air from said distributing chamber through the rotors and casings, and an air deflecting disk interposed between the side walls of each rotor and terminating at its periphery short of the inner face of the concentric wall of the rotor.

In testimony whereof I affix my signature.

JOHN LANGTEIG.