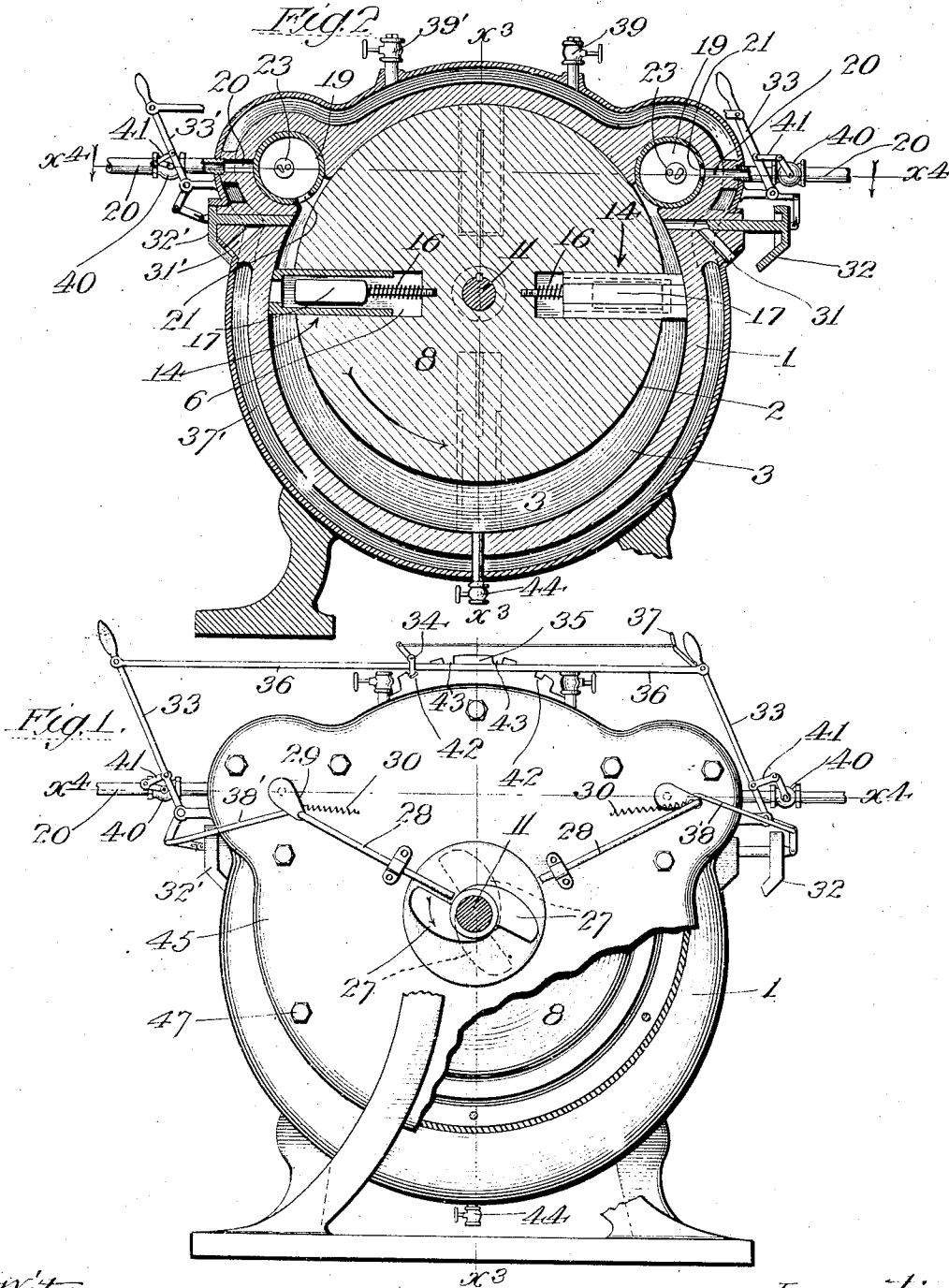


F. W. GOYETTE.
 ROTARY INTERNAL COMBUSTION ENGINE.
 APPLICATION FILED JULY 26, 1907.

932,463.

Patented Aug. 31, 1909.

3 SHEETS—SHEET 1.



Witnesses:
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Inventor:
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 By James R. Townsend
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Fig. 3.

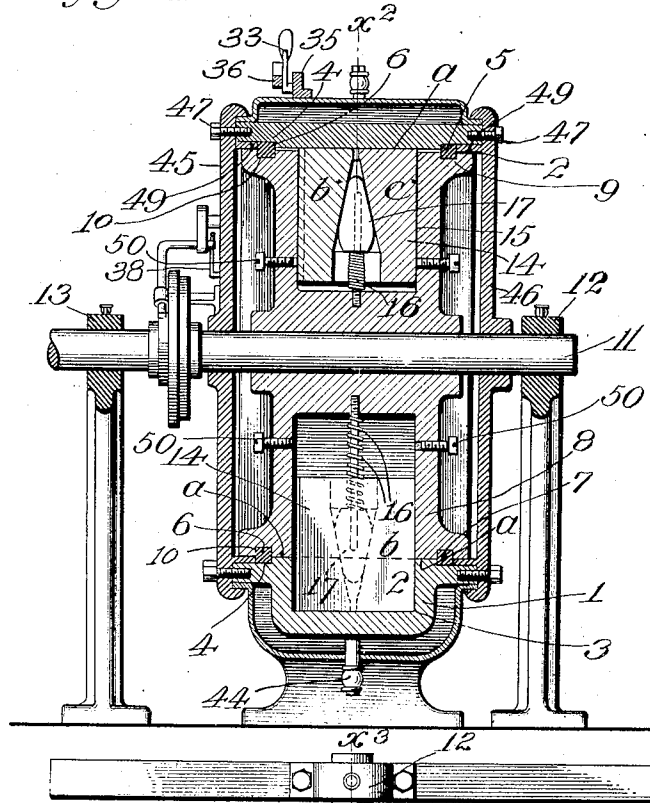
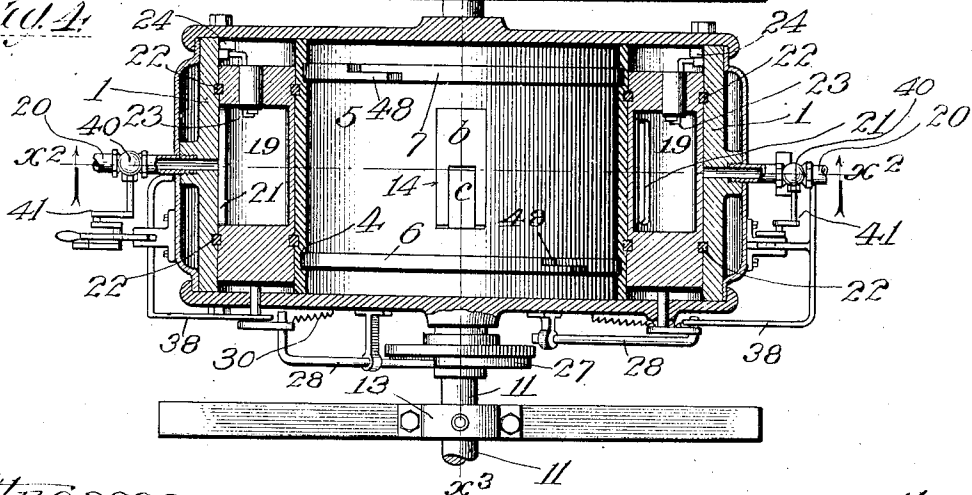


Fig. 4.



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3 SHEETS—SHEET 3.

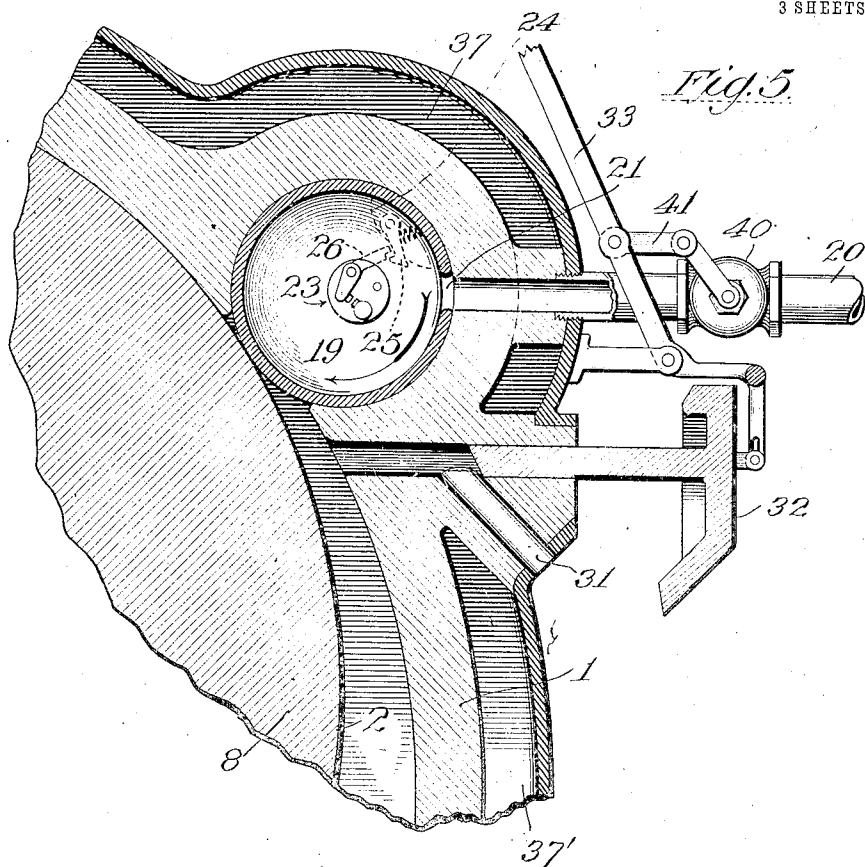
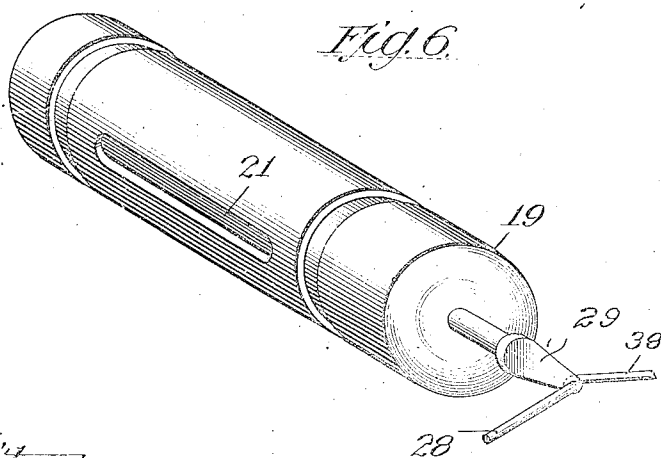


Fig. 6.



Witnesses:

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UNITED STATES PATENT OFFICE.

FREDERICK WILFRED GOYETTE, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF ONE-THIRD TO HARRY ERWIN AND ONE-THIRD TO ARMEDAS VINCENT, OF LOS ANGELES, CALIFORNIA.

ROTARY INTERNAL-COMBUSTION ENGINE.

932,463.

Specification of Letters Patent.

Patented Aug. 31, 1909.

Application filed July 26, 1907. Serial No. 385,755.

To all whom it may concern:

Be it known that I, FREDERICK WILFRED GOYETTE, a citizen of Canada, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Rotary Internal-Combustion Engine, of which the following is a specification.

It is of the objects of this invention to provide an improved practical internal combustion engine in which the expansive force is applied to immediately impel a rotary element, and in which full advantage of the expansion may be taken; to guard against leakage of the expanding medium; to provide for ready reversal of the engine; to make provision for ready stopping and starting of the engine, and also to provide for impeding the engine with cushion means for the purpose of holding back automobiles and like vehicles on hills, without recourse to a brake.

This engine is designed to be supplied with compressed explosive gas, and such gas may be supplied by any form of compressor either driven directly by the engine or by separate motive power, or in some instances the engine may be operated by compressed gas fed from a holder in which it may be contained for transportation or storage.

An object of the invention is to provide for the delivery from the compressed-gas-supplying device to the explosion chamber, of appropriate charges of gas, and to cause the same to explode at the proper time to drive the rotary element, which for convenience I shall hereinafter term the piston.

It will be apparent that some features of the invention may be employed in rotary engines driven by expansive media other than explosive mixtures, and I may employ the same in rotary steam engines.

I do not limit the invention to the exact form shown, nor to the character of expansive medium employed.

The accompanying drawings illustrate the invention.

Figure 1 is a side elevation of an engine embodying this invention in one of the forms in which it may be applied. Fig. 2 is a section of the same on line indicated by x^2-x^2 , Figs. 3 and 4. Fig. 3 is a section on line indicated by x^3-x^3 , Figs. 1, 2 and 4.

One of the gates is intact, and the piston is in the dotted position of Fig. 2. Fig. 4 is a plan section on line indicated by x^4-x^4 , Figs. 1 and 2, leaving the impeller intact and showing the same in position indicated by dotted lines in Fig. 2. Fig. 5 is an enlarged sectional detail of one of the inlet and exhaust mechanisms shown in Fig. 2. Fig. 6 is a perspective view of the rotary valve detached.

1 is an annular shell provided with a cylindrical bore 2 that extends entirely through the shell and provided in the wall of the bore with a channel 3 that is eccentric to the bore and forms a crescent-shaped cavity extending therearound approximately 300 degrees more or less, leaving an arched portion of the wall of the bore straight, smooth and uninterrupted from end to end of the shell. The bore 2 has parallel walls a , as clearly seen in Fig. 3, that are unbroken except by the channel 3 and by two annular channels 4, 5, which are arranged to receive packing-rings 6, 7, to make a tight joint between the rotary head or piston 8 and the annular shell 1 to prevent escape of the expansive medium along the face of the piston. Said piston 8 is cylindrical and is constructed to form a close running fit with the walls a of the opening 2 of the shell, and is provided with annular channels 9, 10, registering with the channels 4, 5, of the shell, to receive in conjunction therewith spring packing rings 6, 7, thus to make a gas-tight joint between the piston and the shell.

The piston 8 is fixed on the power shaft 11 which is journaled in journal boxes 12, 13. The piston is provided with one or more yieldingly expansible radial gates 14 which serve as impellers to receive the force of the explosion and transmit it to the piston 8 which is provided with one or more radial ways 15, a radial way being provided for each of the gates. The periphery of the rotary piston is smooth, solid and unbroken except at the mouths of such radial way or ways, each of which extends along the piston face a distance corresponding to the width of the crescent-shaped channel 3 into which each gate is adapted to project when the rotation of the piston brings it to that side of the shell. The gates are duplicates, and the description of one applies to both.

16 designates a spring to project the gate outward to engage the shell and to form a barrier across the crescent-shaped channel. The gate comprises two relatively movable sections *b* and *c*, and a wedge-shaped head 17 whereby the gate may expand to take up looseness or wear. Said spring 16 operates upon the wedge-shaped head 17 to force it outwardly to act upon the loose sections *b*, *c*, of the gate 14 to press said sections toward the lateral walls of the channel at the same time the gate presses against the peripheral wall thereof to tightly close the passage-way along the channel as the gates move therein.

19 designates a rotary valve at one edge of the smooth, uninterrupted arched wall and at one end or tip of the channel 3, and 20 designates a pipe to deliver compressed gas or explosive mixture to the rotary valve 19 which is provided with a port 21 through which to receive the gas, and through which to deliver the same or the products thereof, or both, to the tip of the channel as the rotary valve 19 is turned on its axis for that purpose. 22 designates packing rings for said rotary valve.

23 designates a spring-actuated igniter in said rotary valve, the same being arranged in any well-known manner to produce a spark inside the cavity of the valve at an appropriate time when the port 21 is closed to the supply-pipe 20, and is open or about to become open to the channel 3 behind one of the gates 14.

24 is an adjustable block mounted on the shell 1 and carrying a tripper 25 for the dog 26 of the igniter.

The valve 19 may be rotated by any suitable contrivance driven by the rotation of the piston. In the drawings I have shown a cam 27 to which motion is imparted by the shaft 11, and which cam engages a rod 28 that actuates a crank 29 against the force of spring 30, the tendency of which is to normally hold the valve with its port 21 open to the channel.

31 designates an exhaust-port opening from the end of the channel 3. 32 is a valve to close said exhaust-port. For the purpose of reversing the engine, the same is provided at each end of the crescent channel with like gas supply, ignition and exhaust devices, the same being arranged at opposite edges of said arched, smooth, uninterrupted portion of the wall of the bore. Some of such parts are in commission when the engine is running in one direction, and are out of commission when the engine is running in the other direction. Parts that are shown inactive or out of commission are indicated by characters like those indicating similar parts that are in commission, an exponent being added to the characters of the inactive parts to distinguish them from the active parts.

33, 33' designate the reversing levers held

by the latch 34 engaging segment 35 and connected with the levers 33, 33' by connecting rod 36, and controlled by the grip lever 37. Said levers are connected with the valves 32, 32', respectively, which alternately close and open the exhaust ports, closing one at the same operation that opens the other. Said levers 33 are also connected with latch-rods 38, 38', which are adapted to alternately hold out of commission the crank 29 or 29', as the case may be, of the rotary valve which is to be closed, and also holds said rotary valve closed, at the same time allowing the other rotary valve to play freely, and allowing the spring 30 to hold the cam-rod 28 thereof in position to be engaged by the cams 27.

In practical operation, the levers 33 will be thrown into the position indicated in the drawings, when it is desired to drive the piston in the direction indicated by the large arrow in Fig. 2. Then the engine will be started into operation by turning the power shaft 11 in any well-known way, thus causing the different parts to operate in a manner obvious from inspection of the drawings; that is to say, the cam 27 acting on the rod 28 will move the crank 29, thereby throwing the valve 19 into position with the port 21 adjacent the port or pipe 20 through which the compressed gas or other explosive medium will be admitted to the valve.

As the piston rotates, the cam 27 passes the crank-rod 28, thus allowing the spring 30 to suddenly return the valve 19 into position where its port 21 will open into the tip of the channel 3. At the same instant, or a moment prior thereto, the igniter will be caused to operate to produce a spark, thereby igniting the charge, whereupon the expansive medium produced by the combustion of the gas will enter the tip of the channel 3 just after the gate 14 has passed the port 21 so that the gate receives the impulse of the expansive force, thereby causing the piston to rotate.

The spring 16 forces the gate outward to fill the channel 3, and as the exhaust port 31 is opened to the atmosphere, the contents of the channel 3, in advance of the gate 14, will be expelled through the exhaust port 31. As the gate 14 advances, the rod 28 and its crank 29 are again operated by cam 27 to turn the rotary-valve 19 into position to receive another charge of compressed gas which will be delivered to the channel 3 in the manner just above described, immediately after the succeeding gate 14 has entered the channel and is ready to receive the impulse, whereupon the operation just described will be repeated, and so on.

37' designates a water-jacket through which water is circulated by the valved pipes 39, 39'.

40 designates valves to throttle or cut off

the compressed gas supply. The levers 33 are preferably connected by rods 41 with the valves 40 to open the one and close the other valve, and vice versa as the levers are thrown into one or the other position for driving or reversing the engine. The segment 35 is provided with a plurality of notches, as 42, 43, the former being designed to hold the latch 34 in position for opening one of the gas throttling valves, and the other notches 43 being provided to simultaneously close both of the gas valves 40, and either one or both of the exhaust valves, as may be deemed advisable by the constructor.

Referring to Fig. 1, if the levers 33 are thrown to the right sufficiently to bring the latch 34 into the right-hand notch 43, the exhaust valve 32 will be closed, and assuming that the piston is still rotating in the direction indicated by the large arrow in Fig. 2, the contents of the channel 3 will be retained in said channel and will act as a cushion to retard or prevent the advance of the gate 14. It is evident that the extent to which the retardation takes place will depend largely upon the extent to which the exhaust port 31 is closed. The operator having control of the levers 33 may adjust them so as to throttle the exhaust to any extent required, but such throttling only takes place when the gas valves 40 have both been closed, and in any instance, when either of the gas valves 40 is open, the appropriate opposite exhaust-valve will likewise be opened to allow free egress of the contents of the channel 3 in advance of the gate against which the expansion is occurring.

44 is a pet cock to draw off any accumulations that may occur in the channel 3.

45 and 46 designate heads for the shell removably secured by bolts 47.

The piston projects laterally beyond the sides of the channel 3 to form seats for a plurality of spring packing-rings, as shown, in order to make a gas-tight joint. Any number of such rings may be employed as may be found necessary or advisable.

The rings 6 and 7 are open, as shown at 48 in Fig. 4, and are compressible into the channels 9 and 10 therefor in the shell so as to allow the piston to be withdrawn from the shell. In order to give access to the rings for contracting the same, each of the heads 45, 46, is provided with a collar 49, and the shell is recessed to allow said collars to extend inward sufficiently to form the outer walls of the channels 4, 5, respectively.

50 designates set-screws in the piston adapted to be screwed in to clamp the gates when the same are compressed into the piston by the wall of the shell opposite the channel 3. When the gates have thus been clamped in the piston and the rings have been contracted as stated, then the piston may be withdrawn and replaced as desired

for repairs. After replacing the piston the set-screws will be loosened, thus to allow the gates to freely move in their ways as the piston revolves.

The inlet port 21 at one side and the exhaust port 31 at the other side are spaced apart in one direction about two-thirds, and in the other direction about one-third of the circumference of the internal chamber of the shell, so that the time during which the charge of hot gases is held between the two gates is reduced to the minimum, and the straight, smooth space between said ports opposite the channel 3 is of maximum length to pack against escape of the gases in the wrong direction.

I claim:

1. A rotary engine comprising a shell provided with a cylindrical bore, and an eccentric channel, and channels on opposite sides of said eccentric channel to receive packing rings, said channels extending to the ends of said bore respectively, a piston provided with one or more gates to fit said eccentric channel and provided with annular channels to receive packing rings, packing rings in said channels, and heads for said shell each provided with a collar to close the packing-ring channels, and means for securing the heads to the shell.

2. In a rotary engine comprising a shell provided with a cylindrical bore and an eccentric channel, a piston provided with a movable gate for said channel, and set-screws to temporarily hold said gate in said piston.

3. In a rotary engine, a shell provided with a cylindrical bore and with an eccentric channel between the ends of the bore, the diameter of the channel being greater than the diameter of the bore and the axis of the channel being offset relative to the axis of the bore; so that a portion of the bore is not touched by the channel, and there being annular packing-ring seats in the bore upon each side of the eccentric channel; heads secured to the shell, packing-rings in said packing-ring seats and held in place by the heads, a shaft extending through the heads, a rotary piston fitting within the bore and having packing-ring seats engaging said packing-rings, and gates carried by the rotary piston and operating in the eccentric channel.

4. In a rotary gas engine, a shell having a cylindrical bore and an eccentric channel between the ends of the bore, approximately one-third of the circumference of the bore being uninterrupted by the channel and the outer ends of the bore being enlarged to form packing-ring seats, packing-rings in the packing-ring seats, heads secured to the shell and holding the packing-rings in place, a cylindrical piston in the cylindrical bore and having seats engaging the packing-rings, and two-part extensible and expansi-

ble spring wedge actuated radial gates carried by the rotary piston and operating in the eccentric channel.

5 In a rotary engine, a shell provided with a cylindrical bore and with an eccentric channel between the ends of the bore, the diameter of the channel being greater than the diameter of the bore and the axis of the channel being offset relative to the axis of
10 the bore; so that a portion of the bore is not touched by the channel, and there being annular packing-ring seats in the bore upon each side of the eccentric channel; a water-jacket encircling the shell, heads secured to
15 the shell and holding the water-jacket in place, packing-rings in said packing-ring seats and held in place by the heads, a shaft extending through the heads, a rotary piston fitting within the bore and having packing-
20 ring seats engaging said packing-rings, and gates carried by the rotary piston and operating in the eccentric channel.

6. In a rotary gas engine, a shell provided with a cylindrical bore and an eccentric chan-
25 nel and provided with exhaust ports leading from the ends of the eccentric channel, a piston in the cylindrical bore, gates carried by the piston and operating in the eccentric channel, a shaft extending through the ro-
30 tary piston, rotary valves in the shell one at each end of the eccentric channel, fuel pipes leading to the rotary valves, throttles in the fuel pipes, valves for controlling the exhaust
35 ports, a cam upon the shaft, cranks upon the rotary valves, and sliding rods connected to the cranks and in position to be operated by the cams for operating the rotary valves.

7. In a rotary gas engine, a shell provided with a cylindrical bore and an eccentric chan-
40 nel and provided with exhaust ports leading from the ends of the eccentric channel, a piston in the cylindrical bore, gates carried by the piston and operating in the eccentric channel, a shaft extending through the ro-
45 tary piston, rotary valves in the shell one at each end of the eccentric channel, fuel pipes leading to the rotary valves, throttles in the fuel pipes, valves for controlling the exhaust
50 ports, connections between the throttles and the exhaust port valves; so that the exhaust ports are opened when the valves are closed, and vice versa; a cam upon the shaft, cranks
55 upon the rotary valves, and sliding rods connected to the cranks and in position to be operated by the cams for operating the rotary valves.

8. In a rotary gas engine, a shell provided with a cylindrical bore and an eccentric
60 channel and provided with exhaust ports leading from the ends of the eccentric channel, a piston in the cylindrical bore, gates carried by the piston and operating in the eccentric channel, a shaft extending through the
65 rotary piston, rotary valves in the shell one at each end of the eccentric channel, fuel

pipes leading to the rotary valves, throttles in the fuel pipes, valves for controlling the exhaust ports, valves for controlling the
70 throttles and the exhaust port valves; so that the exhaust ports are opened when the valves are closed, and vice versa; a cam upon the shaft, cranks upon the rotary valves, sliding rods connected to the cranks and in position
75 to be operated by the cams for operating the rotary valves, said valves being operated one way by springs, and connections between the cranks of the rotary valves and the throttles so that when the throttles are closed the
80 springs are resisted and the rotary valves held inoperative.

9. In a rotary gas engine, a shell provided with a cylindrical bore and an eccentric chan-
85 nel and provided with exhaust ports leading from the ends of the eccentric channel, a piston in the cylindrical bore, gates carried by the piston and operating in the eccentric channel, a shaft extending through the ro-
90 tary piston, rotary valves in the shell one at each end of the eccentric channel, fuel pipes leading to the rotary valves, throttles in the fuel pipes, valves for controlling the exhaust
95 ports; hand levers; said throttle valves and said exhaust port valves being connected to the hand levers, and the hand levers being connected together; so that when one throttle
100 is opened the other throttle is closed, and so that when one throttle is opened the corresponding exhaust port is closed, a cam upon the shaft, cranks upon the rotary valves, and sliding rods connected to the cranks and in
105 position to be operated by the cams for operating the rotary valves.

10. In a rotary gas engine, a shell provided with a cylindrical bore and an eccentric
105 channel and provided with exhaust ports leading from the ends of the eccentric channel, a piston in the cylindrical bore, gates carried by the piston and operating in the eccentric channel, a shaft extending through the
110 rotary piston, rotary valves in the shell one at each end of the eccentric channel, fuel pipes leading to the rotary valves, throttles in the fuel pipes, valves for controlling the exhaust
115 ports; hand levers; said throttle valves and said exhaust port valves being connected to the hand levers, and the hand levers being connected together; so that when one throttle is opened the other throttle is
120 closed, and so that when one throttle is opened the corresponding exhaust port is closed, a cam upon the shaft, cranks upon the rotary valves, sliding rods connected to the cranks and in position to be operated by
125 the cams for operating the rotary valves, said rotary valves being operated one way by springs; and connections between the hand levers and the rotary valves; so that when a throttle is closed the corresponding
130 rotary valve is held against the tension of the spring and inactive.

11. In a rotary gas engine, a shell provided with a cylindrical bore and an eccentric channel and provided with exhaust ports leading from the ends of the eccentric channel, a rotary piston in the cylindrical bore, gates carried by the piston and operating in the eccentric channel, there being cylindrical ports forming valve-casings in the shell parallel with the main cylindrical bore, rotary valves in the valve-casings, said rotary valves being hollow and each having a port communicating with the eccentric channel, sparkers carried by the rotary valves, and adjustable trips in the valve-casings outside of the valves for said sparkers; a shaft extending through the rotary piston, fuel pipes leading to the rotary valves, and cams upon the shaft for operating the rotary valves.

12. In a rotary gas engine, a shell provided with a cylindrical bore and an eccentric channel and provided with exhaust ports leading from the ends of the eccentric channel, a piston in the cylindrical bore, gates carried by the piston and operating in the eccentric channel, a shaft extending through the rotary piston, rotary valves in the shell one at each end of the eccentric channel, fuel

pipes leading to the rotary valves, throttles in the fuel pipes, valves for controlling the exhaust ports, connections between the throttles and the exhaust port valves; so that the exhaust ports are opened when the valves are closed, and vice versa; a cam upon the shaft, cranks upon the rotary valves, sliding rods connected to the cranks and in position to be operated by the cams for operating the rotary valves, said valves being operated one way by springs, sparkers carried by the rotary valves, trips in the valve-casings outside of the valves for the sparkers; so that the sparkers are operated by the rotation of the valves; and connections between the cranks of the rotary valves and the throttles, so that when the throttles are closed the springs are resisted and the rotary valves and sparkers held inoperative.

In testimony whereof, I have hereunto set my hand at Los Angeles California this 20th day of July 1907.

FREDERICK WILFRED GOYETTE.

In presence of—

JAMES R. TOWNSEND,
M. BEULAH TOWNSEND.