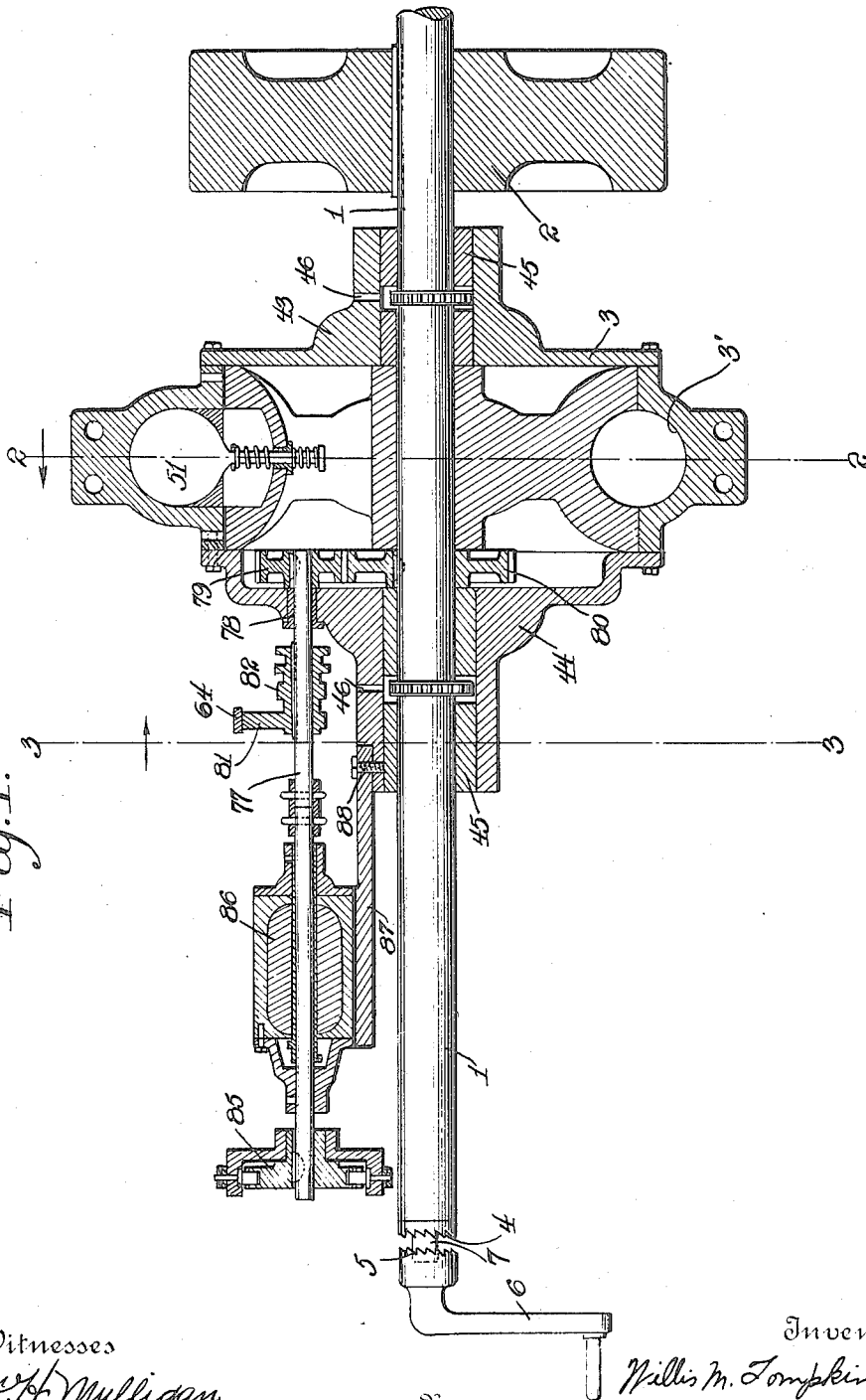


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Fig. 1.



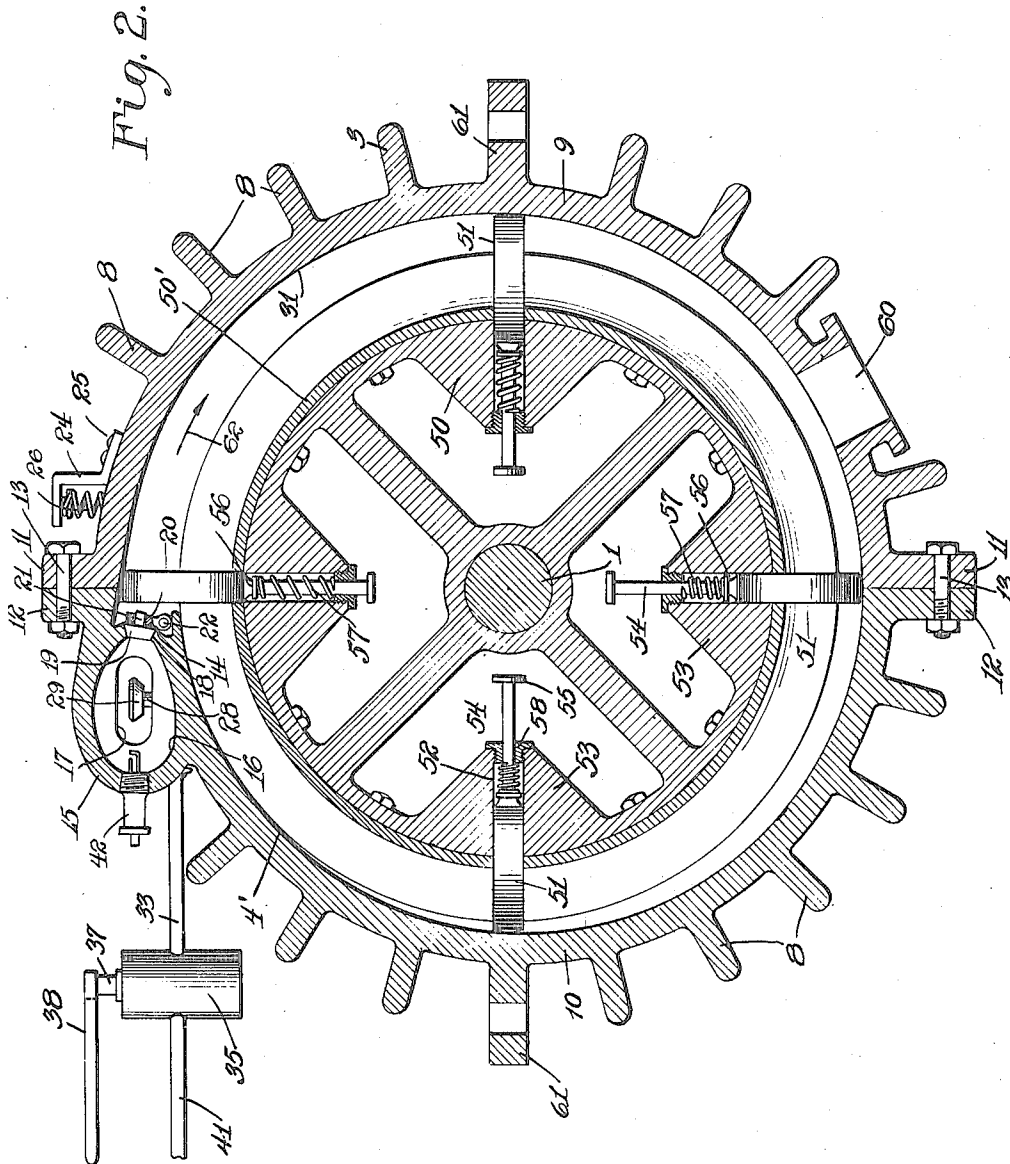
Witnesses
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his Attorney

W. M. TOMPKINS.
 ROTARY INTERNAL COMBUSTION ENGINE.
 APPLICATION FILED NOV. 14, 1913.

1,207,666.

Patented Dec. 5, 1916.
 5 SHEETS—SHEET 2.



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5 SHEETS—SHEET 3.

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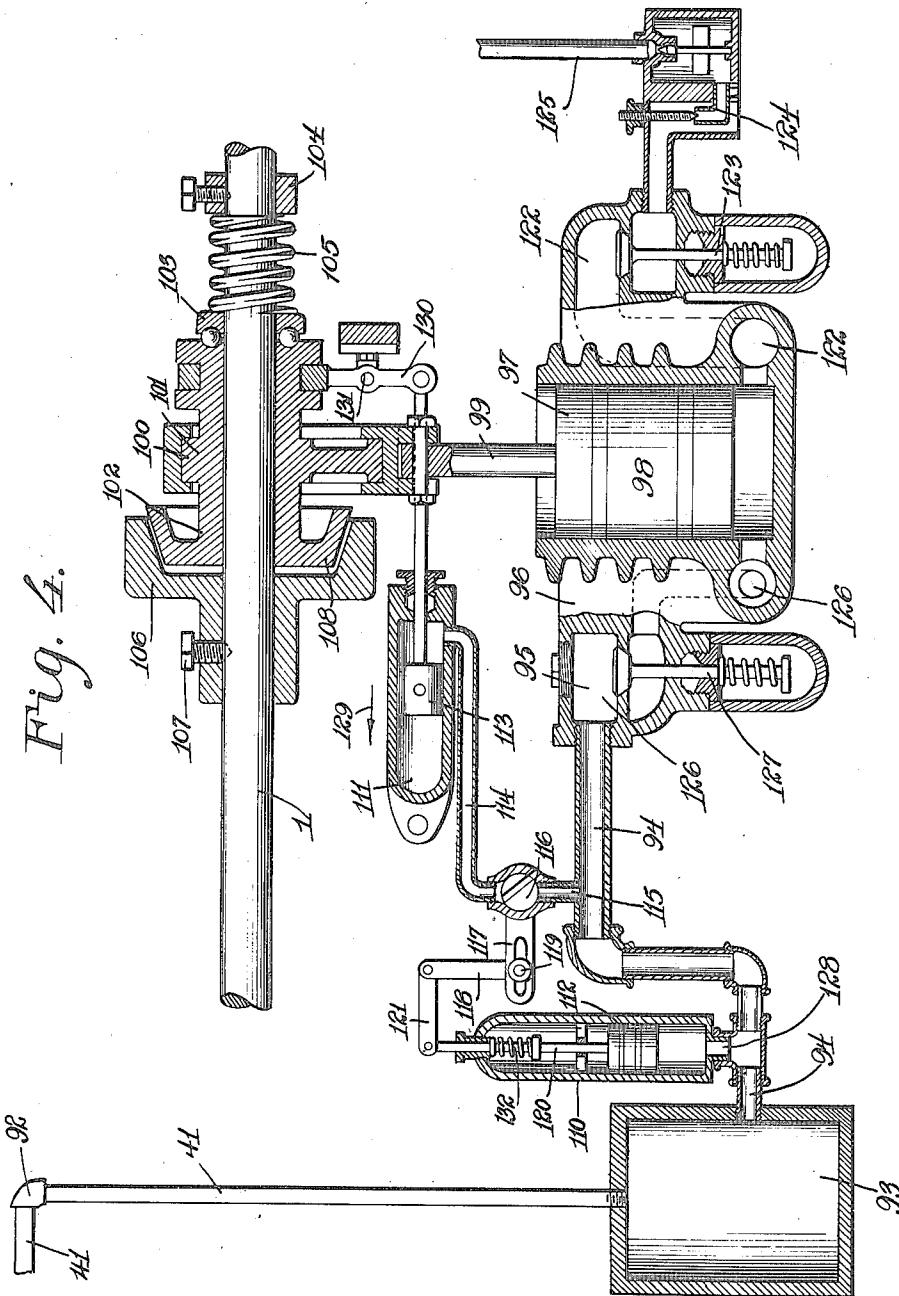


Fig. 4.

Witnesses

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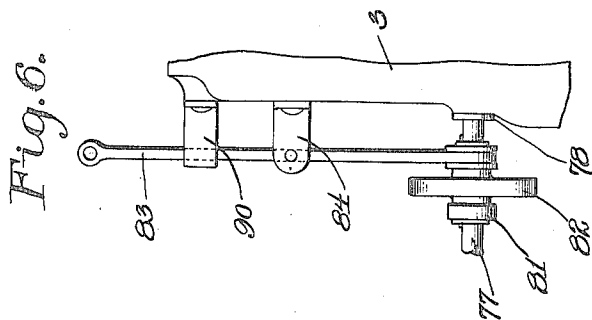
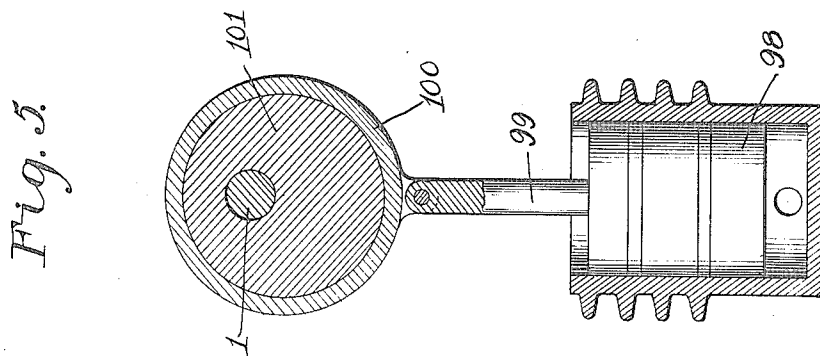
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UNITED STATES PATENT OFFICE.

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ROTARY INTERNAL-COMBUSTION ENGINE.

1,207,666.

Specification of Letters Patent.

Patented Dec. 5, 1916.

Application filed November 14, 1913. Serial No. 801,078.

To all whom it may concern:

Be it known that I, WILLIS M. TOMPKINS, a citizen of the United States, residing at Lonoak, in the county of Monterey and State of California, have invented certain new and useful Improvements in Rotary Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines and more particularly to that type of engine in which the piston is rotatably mounted within the engine casing and which are known as rotary engines.

An object of this invention is the provision of a novel means for controlling the inlet and outlet of the gas into or out of the firing chamber of the engine, which means is controlled by the action of the piston of the engine.

Another object of this invention is the provision of means whereby the cycles of operation of the engine may be changed, altering the number of explosions to each revolution of the piston when the duty of the engine varies so that more or less power is needed respectively, without in any manner altering the construction of the engine.

A still further object of this invention is the provision of means for regulating the pressure of the gas when the same enters the firing chamber of the engine.

With the foregoing and other objects in view, this invention consists in such novel features of construction, combination and arrangement of parts as will be hereinafter more fully described, illustrated in the accompanying drawings and claimed.

In describing the invention in detail, reference will be had to the accompanying drawings wherein like characters of reference designate like or corresponding parts throughout the several views, and in which,

Figure 1 is a longitudinal sectional view through the engine; Fig. 2 is a cross-sectional view taken on the line 2—2 of Fig. 1; Fig. 3 is a cross-sectional view taken on the line 3—3 of Fig. 1; Fig. 4 is a longitudinal sectional view through the means for supplying the engine with the necessary fuel and through the pressure-equalizing means; Fig. 5 is a cross-sectional view through a portion of the means for supplying the engine with the necessary fuel; and, Fig. 6 is a side elevation of the means for altering the cycle of operation of the engine

and changing the number of explosions per revolution of the piston.

Referring to the drawings by numeral, 1 designates the drive shaft of the engine which has a fly wheel 2 keyed thereupon adjacent one side of the engine casing 3 and which has a clutch arrangement 4 formed upon its outer end. In Fig. 1 of the drawings the clutch arrangement 4 is shown as being a plurality of serrations formed upon the outer end of the shaft which are engaged by serrations 5 formed upon a portion of the crank handle 6, when it is desired to start the engine or crank of the same. The crank handle 6 is slidably mounted upon a stub shaft 7 which extends outwardly from the end of the shaft 1.

The engine casing 3 is shown as having a plurality of lugs or fingers 8 formed integral with and extending outwardly from the outer surface of the same. These fingers 8 serve a purpose for aiding in efficiently cooling the engine by air as is commonly known in the art of cooling internal combustion engines by air. The casing 3 is constructed of two substantially semicircular sections 9 and 10 which are securely connected by means of lugs 11 and 12 formed thereupon and bolts 13 which pass through apertures in the lugs. The engine casing 3 has a spiral recess 3' formed in the interior of the same which recess communicates with the hollow portion or the interior of the crank casing and starting at a point 4' which is a short distance from the point of connection of the two sections 9 and 10 of the casing and upon the upper edge of the same, gradually increases in size in a radial direction and opposite the direction of rotation nearly to the point of origin being substantially semicircular in shape at the point where it terminates in a shoulder 14. An enlargement 15 is formed upon the section 10 of the casing 3 and extends outwardly from the shoulder 14. This projection 15 is provided with a recess 16 formed therein, which recess has the inlet port 17 communicating therewith. The recess 16 further has a small opening 18 communicating therewith and with the engine casing. The opening 18 has a valve 19 mounted therein, which valve 19 is connected to an arm 20 by means of a lug 21 formed thereupon, which lug extends through the arm 20. The arm 20 is rigidly mounted

upon a shaft 22 which is journaled in the engine casing 3 and extends outwardly therefrom having a finger or lever 23 rigidly mounted upon the end thereof which protrudes through the engine casing. The purpose of the finger 23 will be hereinafter more fully described. A bracket 24 is secured to the crank casing by any suitable means as is shown at 25 and has a contracting coil spring 26 secured thereto and to the finger 23 at a point near the outer end of the same. The outer end of the finger 23 is cut slanting as is clearly shown in Fig. 3 of the drawings.

The projection 15 has a valve casing 27 secured to one side thereof, which valve casing has a valve stem 28 mounted therein and extending through the lower end of the same. The valve stem 28 is removably held within the valve casing 27 by means of an ordinary packing washer 28'. A removable cap 27' is mounted in an opening in the upper end of the valve casing 27 and provides a means for reaching the interior of the valve casing for cleaning the same, for replacing the valve head or for any other reason which might be necessary to gain access to the interior of the valve casing. A valve head 29 is mounted upon the upper end of the valve stem 28 and is adapted to be seated in the valve seat 30, which is formed in a partition 31 which extends laterally through the valve casing 27, when the inlet port 17 of the engine is closed and when the inlet port is open the valve head 29 is in a position as is shown in Fig. 3 of the drawings. The valve casing 27 is divided into two compartments by the partition 31, and the valve seat 30 forms a means of communication between the two compartments. The upper of the compartments formed in the valve casing 27 communicates directly with the recess 16 in the projection 15 while the lower compartment 32 has a pipe 33 communicating therewith. The pipe 33 has its end 34 entering a cylindrical casing 35, and secured thereto by means of screw threads formed within the pipe 33 and upon an opening extending through the casing. The casing 35 has a cylindrical valve member 36 revolvably mounted therein. The valve member 36 has a pin 37 formed integral with its upper end and extending upwardly and through the casing 35 having a handle 38 mounted thereupon. The valve member 36 is hollow and has two openings 39 and 40 formed directly opposite each other in the sides thereof. The opening 39 communicates with the pipe 33 while the opening 40 communicates with a second pipe 41 which is also securely connected to the casing 35 and to the means for supplying fuel to the engine which means will be hereinafter more fully described. The valve member 36 forms a means for regulating the amount of gas

admitted into the inlet port or valve of the engine and is commonly known as a throttle in that by the rotating of the valve member 36 by means of the handle 38 the size of the openings of communication between the two pipes 33 and 41 may be regulated.

The recess 16 which is formed within the projection 15 forms the firing chamber for the engine and has any type of igniting means, which as shown in the drawings has a spark plug 42 communicating therewith.

The engine casing 3 has bearings 43 and 44 formed upon the opposite sides of the same which bearings have collars 45 of any suitable anti-friction material mounted therein and have small openings 46 extending there-through which form a means for lubricating the bearings of the shaft within the washers 45. Any specific type of lubricating means may be employed, the same forming no portion of this invention.

Rigidly mounted upon the shaft 1 and upon the interior of the engine casing 3 is a rotary piston 50 which has a plurality of plungers 51 carried thereby. The interior of the piston 50 is cut-away and has brace arms extending diagonally across the same. The cutting-away of the interior of the piston 50 decreases the weight of the same. The piston 50 is reinforced by a metallic band 50' which encompasses the outer circumference of the same.

The plungers 51 are shaped so as to form a complete closure for the recess 3' and are slidably mounted in recesses 52 which are formed in projections 53 formed upon the piston 50 and extend inwardly into the hollow portion of the same. The plungers 51 have rods 54 formed integrally therewith and extending through the recesses 52 which have enlarged head portions 55 formed upon their outer ends and washers 56 mounted thereupon adjacent the inner end of the plungers 51. Coil springs 57 are mounted about the rods 54 and the outer ends thereof engage the washers 56 while the other ends engage the interior end of packing washers 58 which are employed for preventing the plungers 51 from passing entirely through the recesses 52.

An exhaust port 60 is formed in the engine casing 3 and forms a means for the exit of the dead or used gases.

Lugs 61 are formed upon the two sections 9 and 10 of the engine casing and provide a means for mounting the same in any desired position.

The gas entering the firing chamber formed by the recess 16 is exploded therein by means of the igniting means 42 and the concussion of the explosion of the gas forces the valve 19 outwardly and allows the pressure of the gases to be exerted upon one of the plungers 51 which is, at the time of the explosion, placed adjacent the shoulder 14.

The pressure upon the plunger 51 forces the same in the direction indicated by the arrow of Fig. 2 and consequently rotates the piston 50 and the shaft 1. By continued explosions within the recess 16 the piston may be forced about any number of times and at any desired speed owing to the number of explosions per minute. The plungers 51 being forced around within the recess 3' will, because of the spiral shape of the recess, be gradually forced inwardly as is clearly shown in Fig. 3 of the drawings, assuming their limit of inward movement to be at the point of origin 4' of the recess 3'. After the plungers 51 have assumed their innermost positions the further movement of the piston causes them to pass the shoulder 14 and spring outwardly forming a partition within the recess 3' and also a compartment between the inner surface of the plunger at its point of greatest area and the shoulder 14, which compartment receives the gas as the same is exploded and forced outwardly through the communicating opening which is controlled by the valve 19.

The portion of the valve stem 28 which projects out of the valve casing 27 has a head 62 formed upon its extreme outer end and a coil spring 63 disposed about the same, one end of which engages the head 62 and the other end engages the lower portion of the packing washer 28'. The head 62 which is formed upon the valve stem 28 contacts with the upper surface of a lever 64 near one end of the same. The lever 64 is pivotally mounted upon a pin 65 which is seated in the engine casing 3 and has a catch member 66 pivotally connected to the upper side of the same by means of the upstanding ears 67 and a pin 68. The catch member 66 has a coil spring 69 connected thereto and to the engine casing as at 70. A second catch member 71 is pivotally mounted upon a pin 72 which is secured to the engine casing 3 and has a cut-out portion 73 formed in one side thereof near the upper end of the same. The upper end of the catch 71 is cut-away or beveled as is clearly shown at 74 in Fig. 3 of the drawings terminating in a point. An expanding coil spring 75 is disposed between a lug 76, which is mounted upon the engine casing and one side of the catch 71 and tends to hold the same in contact with the catch member 66 at all times. A shaft 77 extends through the engine casing 3 as is shown at 78 and has a gear wheel 79 mounted upon its inner end, which gear wheel 79 meshes with the second gear wheel 80 mounted upon the power shaft 1. By means of this set of gears the shaft 77 is caused to rotate twice with each rotation of the power shaft 1. Mounted upon the shaft 77 at a short distance from the end of the same and in a position so as to engage the under surface of the lever 64 are two sets of cams 81 and 82. The cam

81 is what is known as a one-point cam or a cam which has only one point thereof which will contact with the under surface of the lever 64 while the cam 82 has two points which will contact with the under surface of the lever 64 and operate the same. These cams 81 and 82 are formed integral with each other and feathered or slidably mounted upon the shaft 77, the action of the cams being controlled by a lever 83 which is pivotally mounted in a bearing 84. The cams 81 and 82 are disposed in angular relation to each other so that when the contacting point upon the cam 81 is in a position to engage the lever 64 the contacting points of the cam 82 are disposed at right angles to the cam 81 as is clearly shown in Fig. 3 of the drawings. The cams 81, and 82 form a means for raising the lever 64 and consequently the valve stem 28 and the valve head 29 which is mounted thereupon and control the inlet of the gas into the firing chamber 16 of the engine. When the cam 81 is in a position to operate the lever 64, the inlet valve will be operated twice upon one complete revolution of the piston 50 and when it is desired to have a greater amount of power or more explosions per revolution of the piston 50 the cams 81 and 82 are shifted upon the shaft 77 so that the cam 82 will operate the lever 64. This will cause the inlet valve to be operated four times during a single revolution of the piston 50. The lever 83 by means of which the cams 81 and 82 are shifted also has a means of communication with the magneto which furnishes the igniting means for the gas and with the timer 85 by which the sparking or the timing of the igniting spark is regulated. The timer 85 is shown in Fig. 1 of the drawings as being mounted upon the outer end of the shaft 77 while the magneto 86 is mounted upon a platform 87 which is secured to the engine casing as at 88 and which is operated by means of the shaft 77.

The means by which the timer is regulated so as to operate and cause the igniting means to explode the gas in the chamber in accordance with the cam 82 consists of a knife switch arrangement 90 which is also mounted upon the engine casing 3 and which has electric conducting means 91 connecting the two separate sides of the knife switch 90 and forms a means for closing the circuit between the poles of the magneto as is clearly shown in Figs. 3 and 6 of the drawings.

The pipe 41 which extends from the throttle casing 35 is bent downwardly substantially at right angles as is shown at 92 and enters a gas tank 93 from the upper portion of the same. The gas tank 93 has a pipe 94 leading out of one side of the same which pipe passes about and communicates with an opening 95 formed in the casing 96 which surrounds the gas pump 97.

The casing 96 of the gas pump 97 has a

cylinder 98 mounted within the bore of the same. The piston 98 has a connecting rod 99 connected thereto and to a metallic band 100 which is mounted about the outer surface of the portion 101 of the friction clutch mechanism 102. The portion 101 of the clutch mechanism 102 is eccentrically formed so that upon rotation of the clutch mechanism it will impart reciprocatory movement to the piston 98 within the casing 96. The clutch mechanism 102 is loosely mounted upon the power shaft 1 and has interposed between the end 103 thereof and a collar 104 which is rigidly mounted upon the shaft 1, a coil spring 105. The coil spring 105 tends to hold the clutch mechanism 102 within the recessed portion of the member 106. The member 106 is mounted upon the power shaft 1 and securely held thereupon and caused to rotate therewith by means of a set screw 107. When the angle portion of the clutch pulley 108 of the clutch mechanism 102 engages the sides of the recess in the member 106 the clutch mechanism will rotate with the power shaft 1 and operate the piston 98 of the gas pump 97.

A pressure equalizing means is connected to the pipe 94 and consists of two casings 110 and 111 which have reciprocating pistons 112 and 113 mounted therein. The reciprocating piston 113 controls the operation of the clutch mechanism 102 as will be hereinafter more fully described. A pipe 114 is connected to the cylinder 111 and to the pipe 94 as is shown at 115 and has a valve 116 mounted therein. An arm 117 is secured to the valve 116 and has a second arm 118 adjustably connected thereto as is shown at 119. The arm 118 is connected to the piston rod 120 which is connected to the piston 112 by means of a bar 121.

The gas pump 97 has an inlet port 122 formed therein which is controlled by an ordinary puppet valve mechanism 123 and which communicates with a carbureter 124. The carbureter 124 may be of any desired make now upon the market and is connected to the gasoline tank (not shown) or the fuel-supplying tank by means of a pipe 125. The outlet 126 of the gas pump 97 is also controlled by an ordinary puppet valve mechanism 127. The gasoline or other liquid fuel entering the carbureter 124 is formed into gases and passing through the means of communication between the carbureter and the inlet valve 122 of the gas pump 97 is forced by the gas pump outwardly through the outlet 126 and into the gas tank 93, thence up through the pipes 41 and 34 into the firing chamber of the engine. Should the pressure of the gas entering the gas tank 93 pass through the pipe 94 be too great the same will be forced upwardly through the opening 128 into the cylinder 110 and force the piston 112 upward. This forcing

upward of the piston 112 will operate the various arms 121, 118 and 117 and also the valve 116, opening the communication between the pipe 114 and the pipe 94, allowing the gas to pass through the pipe 114 into the cylinder 111. The gas entering the cylinder 111 will force the piston 113 in the direction of the arrow 129 and will accordingly operate the lever 130 which is pivotally mounted upon the pin 131 and force the friction pulley 108 out of engagement with the member 106, thus stopping the motion or the operation of the pump 97. Immediately after pressure of the gas is reduced the piston 112, will, by means of a coil spring 132, be forced downwardly in its normal position and incidentally the valve 116 will be operated and close the opening of communication between the pipes 114 and 94 and allow the spring 105 to force the clutch mechanism 102 into engagement with the member 106 and operate the pump 97. In this manner the pressure with which the gas is forced into the firing chamber of the engine will be equalized or maintained uniform at all times.

In practical fields, certain minor features of construction, combination and arrangement of parts may necessitate alterations to which the patentee is entitled, provided such alterations are comprehended within the scope of what is claimed.

What is claimed is:—

1. In a rotary internal combustion engine, a casing, a power shaft extending there-through, said casing provided with a spiral recess formed therein, said recess having its origin at a definite point within said casing and gradually increasing in size radially and in a direction opposite that of rotation until it terminates abruptly in a shoulder, a projection formed upon said casing adjacent said shoulder, said projection provided with a recess formed therein, said recess communicating with said first named recess by means of an opening extending through said casing, a flap valve forming a closure for said opening, an inlet port for the gas or fuel by which the engine is operated communicating with said second named recess, an inlet valve for said port, a second shaft paralleling said power shaft, cams mounted upon said second shaft and pivoted means interposed in the path of said cams for operating said valves.

2. In a rotary internal combustion engine, a casing, a power shaft extending through said casing, a rotary piston mounted upon said shaft and disposed within said casing, a plurality of spring-pressed plungers carried by said piston, said casing provided with a spiral recess formed therein having its origin at a definite point upon the casing and gradually increases in size radially and in a direction opposite that of rotation

until it terminates abruptly in a shoulder, a projection formed upon said casing adjacent said shoulder, said projection provided with a recess formed therein, said recess communicating with said first-named recess by means of an opening extending through said casing, a flap valve forming a closure for said opening, an inlet port for the gas or fuel by which the engine is operated communicating with said second named recess, an inlet valve for said port, a second shaft paralleling said power shaft, driving connections between said shafts, and cam means carried by said second shaft to operate said valves.

3. In a rotary internal combustion engine, a casing, a power shaft extending through said casing, a rotary piston mounted upon said shaft and disposed within said casing, a plurality of spring-pressed plungers carried by said piston, said casing provided with a spiral recess formed therein which begins at a definite point of origin upon the casing and gradually increases in size radially and in a direction opposite that of rotation until it terminates abruptly in a shoulder, a projection formed upon said casing adjacent said shoulder, said projection provided with a recess formed therein, said recess communicating with said first-named recess by means of an opening extending through said casing, a flap valve forming a closure for said opening, an inlet port for the gas or fuel by which the engine is operated communicating with said second named recess, an inlet valve for said port, a second shaft paralleling said power shaft, driving connections between said shafts, cam means carried by said second shaft to operate said valves through a pivoted member, and means for regulating the inflow of gas into said second named recess.

4. In a rotary internal combustion engine, a casing, a power shaft extending through said casing, a rotary piston mounted upon said shaft and disposed within said casing, a plurality of spring-pressed plungers carried by said piston, said casing provided with a spiral recess formed therein which begins at a definite point of origin upon the casing and gradually increases in size radially and in a direction opposite that of rotation until it terminates abruptly in a shoulder, a projection formed upon said casing adjacent said shoulder, said projection provided with a recess formed therein, said recess communicating with said first named recess by means of an opening extending through said casing, a flap valve forming a closure for said opening, an inlet port for the gas or fuel by which the engine is operated communicating with said second named recess, an inlet valve for said port, a second shaft paralleling said power shaft, driving connections between said shafts, a pivoted member contacting with said valve, and cam means carried by said second shaft to alternately contact with said pivoted member in regulating the number of movements of said valve to one revolution of said piston.

5. In a rotary internal combustion engine, a casing, a power shaft extending through said casing, a rotary piston mounted upon said shaft and disposed within said casing, a plurality of spring-pressed plungers carried by said piston, said casing provided with a spiral recess formed therein which begins at a definite point of origin upon the casing and gradually increases in size radially and in a direction opposite that of rotation until it terminates abruptly in a shoulder, a projection formed upon said casing adjacent said shoulder, said projection provided with a recess formed therein, said recess communicating with said first named recess by means of an opening extending through said casing, a flap valve forming a closure for said opening, an inlet port for the gas or fuel by which the engine is operated communicating with said second named recess, an inlet for said port, a second shaft paralleling said power shaft, a pivoted member therebetween and in contact with said valve, and double cam means oppositely positioned on said second shaft to determine alternately the fixed number of movements of said valve for each revolution of said piston according to a desired number of explosions and change in power of the engine.

6. The combination with a rotary internal combustion engine comprising a casing, a power shaft extending through said casing, a rotary piston mounted upon said shaft and disposed within said casing, a plurality of spring-pressed plungers carried by said piston, said casing provided with a spiral recess formed therein which begins at a definite point of origin upon the casing and gradually increases in size radially and in a direction opposite that of rotation until it terminates abruptly in a shoulder, a projection formed upon said casing adjacent said shoulder, said projection provided with a recess formed therein, said recess communicating with said first named recess by means of an opening extending through said casing, a flap valve forming a closure for said opening, an inlet port for the gas or fuel by which the engine is operated communicating with said second named recess, an inlet valve for said port, a second shaft paralleling said power shaft, a pivoted member interposed between said second shaft and said valve to contact with the latter, cam members slidably mounted upon said second shaft to independently contact with said member, pivoted means to control the movement of said cam upon said second shaft to manually regulate contact therebetween and said

pivoted member in varying the number of explosions and the power of said engine.

7. The combination with a rotary internal combustion engine comprising a casing, a power shaft extending through said casing, a rotary piston mounted upon said shaft and disposed within said casing, a plurality of spring-pressed plungers carried by said piston, said casing provided with a spiral recess formed therein which begins at a definite point of origin upon the casing and gradually increases in size radially and in a direction opposite that of rotation until it terminates abruptly in a shoulder, a projection formed upon said casing adjacent said shoulder, said projection provided with a recess formed therein, said recess communicating with said first named recess by means of an opening extending through said casing, a flap valve forming a closure for said opening, an inlet port for the gas or fuel by which the engine is operated communicating with said second named recess, an inlet valve for said port, a second shaft paralleling said power shaft, a pivoted member to contact with said inlet valve, cams mounted on said second shaft to operate said pivoted member, a wedge member carried by said pivoted member, a finger operable with said flap valve, and catch means engageable by said wedge member to permit resilient movement of said flap valve.

8. The combination with a rotary internal combustion engine comprising a casing, a power shaft extending through said casing, a rotary piston mounted upon said shaft and disposed within said casing, a plurality of spring-pressed plungers carried by said piston, said casing provided with a spiral recess formed therein which begins at a definite point of origin upon the casing and gradually increases in size radially and in a direction opposite that of rotation until it terminates abruptly in a shoulder, a projection formed upon said casing adjacent said shoulder, said projection provided with a recess formed therein, said recess communicating with said first named recess by means of an opening extending through said casing, a flap valve forming a closure for said

opening, an inlet port for the gas or fuel by which the engine is operated communicating with said second named recess, an inlet valve for said port, a pivoted member contacting with said inlet valve, a finger resiliently mounted to control movement of said flap valve, a catch intermittently engaging said finger, a wedge member carried by said pivoted member to intermittently actuate said catch, an interchangeable cam means mounted to contact alternately with said pivoted member in varying the movement of said valves according to the desired number of explosions and change of power of the engine.

9. In a rotary internal combustion engine, a casing, a power shaft extending through said casing, a rotary piston mounted upon said shaft and within said casing, spring-pressed plungers carried by said piston, said casing being provided with a recess formed to accommodate said plungers and gradually decreasing in size to terminate abruptly in a shoulder, in the direction of rotation, a projection formed upon said casing adjacent said shoulder, an explosion chamber provided in said projection, said chamber communicating with said recess by means of a suitable opening, a flap valve acting as a closure for said opening, an inlet port in communication with said chamber for the fuel to operate said engine, an inlet valve for said port, a second shaft paralleling said power shaft, means driving said second shaft from said power shaft at a predetermined ratio, interchangeable cam means carried on said second shaft to operate said valves according to a changeable engine cycle, a pressure equalizing means for determining admission of said fuel through said inlet valve, and friction clutch means mounted upon said power shaft to determine automatic operation of said means of pressure equalization.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIS M. TOMPKINS.

Witnesses:

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R. C. FALKENBERG.