N. S. SEELEY.

ENGINE VALVE MECHANISM.

APPLICATION FILED FEB. 12, 1910.

1,030,927. Patented July 2, 1912.

3 SHEETS—SHEET 1.

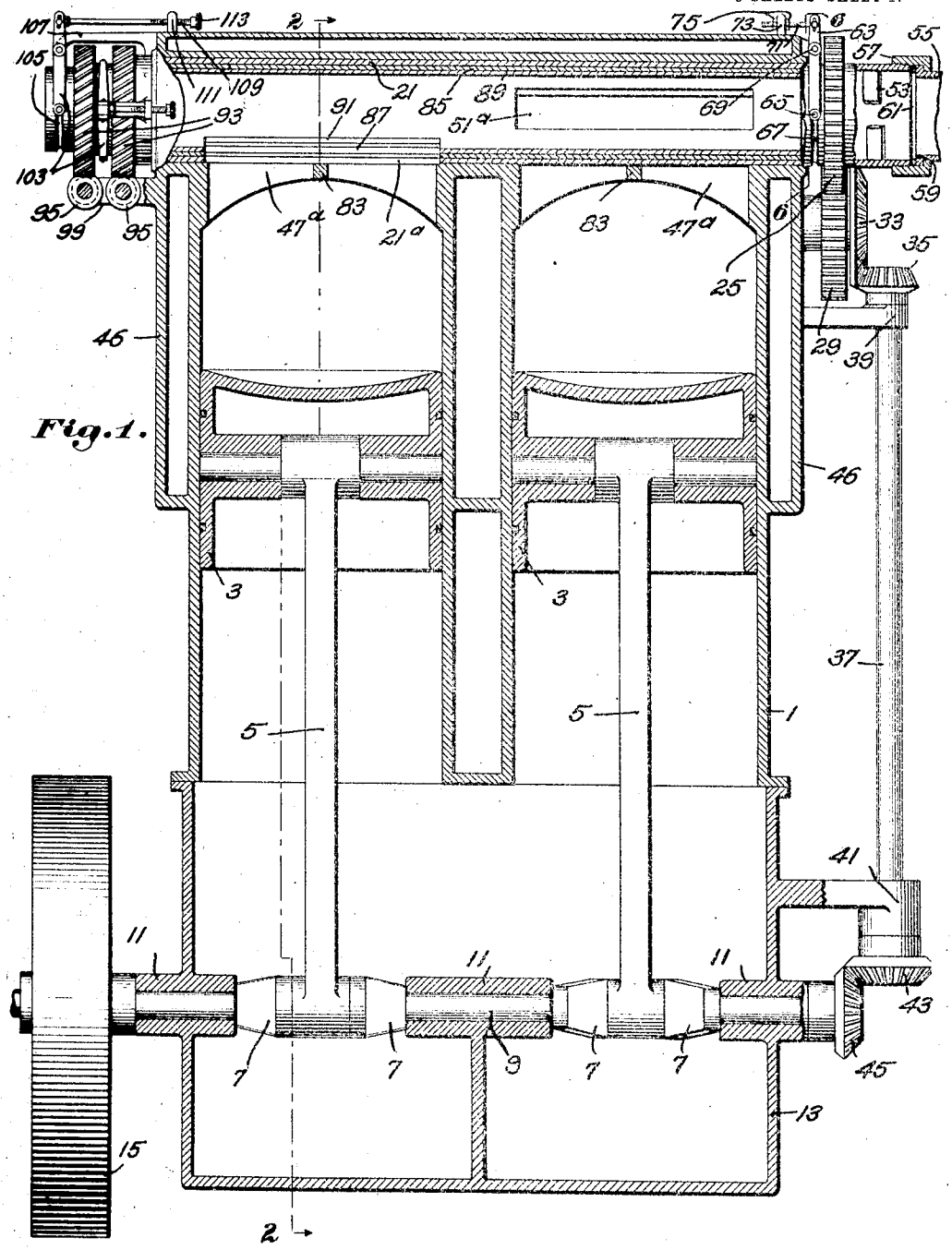

Fig. 1.

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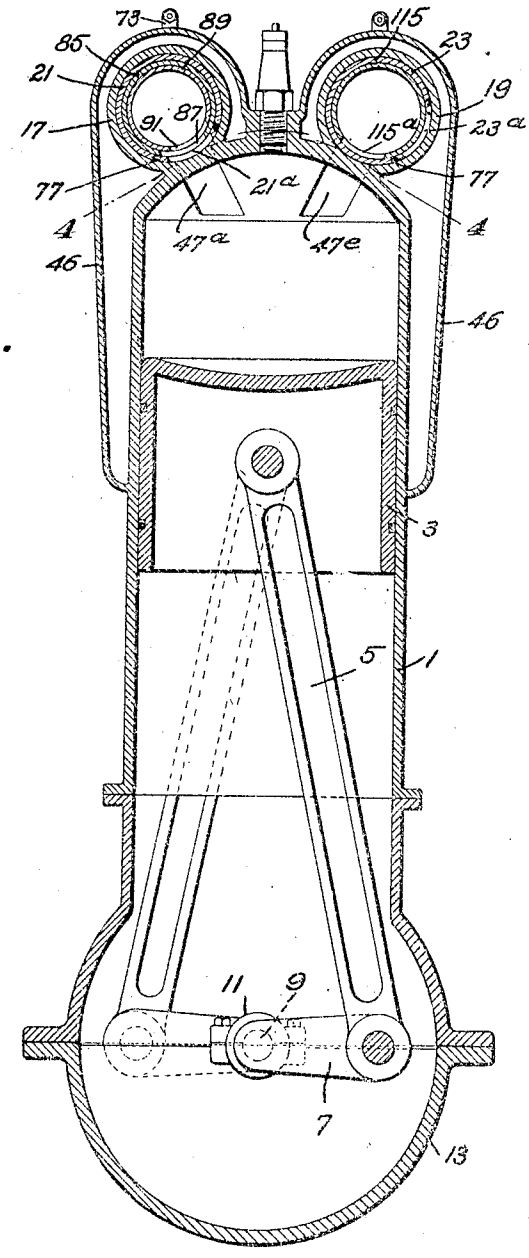
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

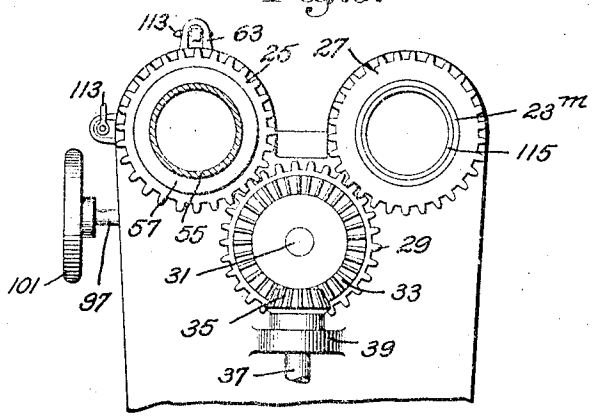


Fig. 5.

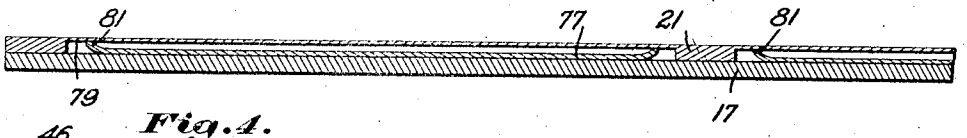


Fig. 4.

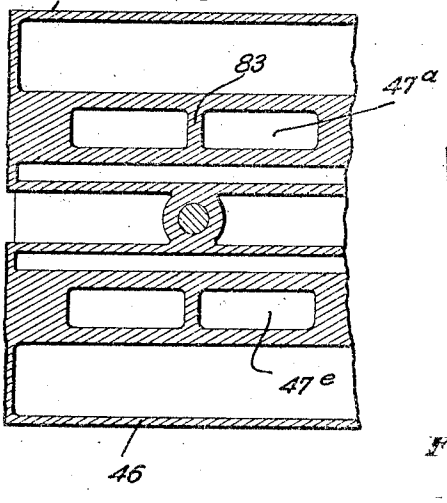


Fig. 7.

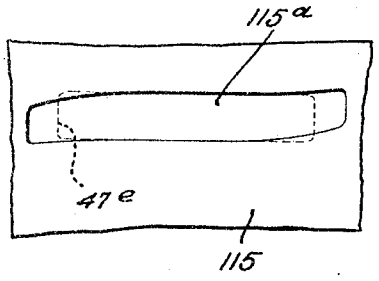
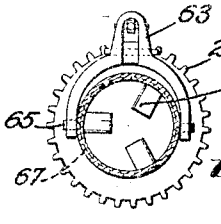


Fig. 6.



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UNITED STATES PATENT OFFICE.

NATHANIEL S. SEELEY, OF FLUSHING, NEW YORK.

ENGINE VALVE MECHANISM.

1,030,927. Specification of Letters Patent. Patented July 2, 1912.

Application filed February 12, 1910. Serial No. 543,434.

To all whom it may concern:

Be it known that I, NATHANIEL S. SEELEY, a citizen of the United States, and a resident of Flushing, in the county of Queens and State of New York, have invented an Improvement in Engine Valve Mechanisms, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to engines and more particularly to internal combustion engines and the like, and among other objects aims to provide a very effective and simple valve mechanism whereby the inlet of the fuel mixture and the exhaust of the burned gases may be completely controlled as desired.

The character of the invention may be best understood by reference to the following description of an illustrative embodiment thereof shown in the accompanying drawings wherein:

Figure 1 is a vertical section through the cylinders of an engine equipped with a valve mechanism embodying my invention; Fig. 2 is a vertical section taken on the irregular line 2—2 of Fig. 1; Fig. 3 is a side elevation of the upper portion of Fig. 1 looking toward the left of said figure; Fig. 4 is a section taken on the curved line 4—4 of Fig. 2; Fig. 5 on an enlarged scale shows a packing strip; Fig. 6 is a section taken on line 6—6 of Fig. 1; and Fig. 7 is a view showing a plan development of a port shown in Fig. 2.

Referring to the drawings the illustrative engine selected herein as embodying the invention comprises (Figs. 1 and 2) a plurality of cylinders 1 herein for purposes of illustration two cylinders only being shown, it being understood that any number may be used as desired. Each of these cylinders preferably has a domed or partially spherical head and is provided with a piston 3 which is cupped or hollowed out oppositely to said dome to provide a minimum amount of wall space for a given volume thereby reducing radiation losses and permitting a maximum effective pressure on the piston head. Connected to said piston 3 is a connecting rod 5 pivoted at one end to said piston and at the other end to a crank 7 secured to a crank shaft 9 journaled in boss bearings 11 (Fig. 1) in a crank case 13. To one end of this crank shaft is secured a fly wheel 15.

The parts described above are of usual construction and are selected herein to be used in connection with the valve mechanism embodying my invention and which will now be described. Mounted on the tops of the cylinders 1 and herein integral therewith is a cylindrical inlet valve housing 17 and a similar exhaust valve housing 19, said housings extending along the tops of said cylinders. These housings contain rotary barrel valves 21 and 23 respectively. These barrels may be rotated from the crank shaft 9 by spur gears 25, 27, which are mounted fast on outwardly projecting ends of said barrels and are driven in the same direction by a common gear 29, journaled on a stud shaft 31 projecting from the engine casing, said stud shaft also carrying a bevel gear 33 fast thereon and adapted to be driven by a bevel pinion 35 fast on the end of a vertical shaft 37 journaled in upper and lower bearings 39 and 41 projecting laterally from the engine casing. The lower end of said vertical shaft 37 has a beveled pinion 43 fast thereon meshing with a bevel pinion 45 fast on an end of the crank shaft 9.

While the invention may be adapted to either a two cycle or four cycle engine, as shown herein it is used in a four cycle engine and by the gear connections just described the barrel valve will make one rotation for every two rotations of the crank shaft 9 in order that a fuel charge may be delivered to each cylinder on alternate down strokes of the piston. To cool the cylinders and the valves there may be provided a suitable water jacket 46.

To permit the admission of the fuel charge to the cylinders, and the exhaust therefrom, as more fully hereinafter described, the upper end of each of the cylinders is provided with a pair of elongated ports 47^a and 47^e (Fig. 1). The rotary barrel valve 21 for controlling the admission may be provided with one or more elongated or other inlet openings 21^a. Where one opening is used as herein, by the arrangement of gearing described, the opening will be brought into registration with the cylinder port 47^a once for every two revolutions of the crank shaft 9. Of course, if

two openings were used in said barrel 21, the latter would be rotated at one-fourth of the speed of the crank shaft. The rotary exhaust valve may be provided similarly with one or more openings 23^a.

When two cylinders are used, as herein, a second admission opening 51^a is provided in said barrel valve 21 and located 90° from the inlet opening 21^a for the first cylinder referred to. By this arrangement the crank shaft 9 will receive a power stroke from the piston in one cylinder for one revolution of said shaft 9 and will receive a power stroke from the piston in the other cylinder for the next revolution of said shaft so that the shaft will receive one power stroke for every revolution. It will be apparent that if four cylinders were used the openings 21^a and 51^a instead of being 90° apart would be 180° apart.

By the barrel valve shown herein the fuel mixture is adapted to be lead axially through said valve. To maintain said valve always filled with a fuel mixture in readiness to be introduced into the cylinders whenever the barrel inlet openings are brought into registration with the ports of the cylinders a fluid pressure means may be provided. This means herein comprises a fan or a plurality of vanes 53 secured to the interior of said barrel, said vanes projecting radially toward the center thereof. Preferably the vanes are offset one from another to prevent obstructing said barrel materially. The fuel is delivered to the barrel through a duct 55 connected at one end to a carbureter (not shown) of any suitable construction and at its opposite end to the barrel valve 21 by a flanged coupling 57 threaded on the end of said barrel valve and receiving an end flange 59 on said duct 55, a suitable washer 61 being interposed between the abutting ends of the rotary barrel valve and the duct 55. The continuous rotation of the barrel valve during the operation of the engine will also rotate the vanes 53 and force the fuel mixture from the carbureter axially through the barrel valve.

To prevent leakage and take up wear between said barrel and its housing said parts preferably, are tapered, the barrel being adapted to be adjusted longitudinally of its housing by a rocking yoke 63 having studs 65 received by a peripheral groove 67 in said barrel, said yoke being fulcrumed on a bracket 69 on the engine casing. This yoke may be rocked by an adjusting screw 71 pivoted and swiveled at one end to the upper end of said yoke and threaded into a lug 73 on the engine casing, said screw 71 being held in its positions of adjustment by suitable nuts 75 threaded on said screw at opposite sides of said lug 73. It will be apparent that when said adjusting screw 71 is turned the yoke 63 will be rocked and the rotary valve barrel 21 will be adjusted longitudinally to take up wear or for other purposes as desired.

To prevent leakage around the openings of the inlet and exhaust barrels 21 and 23 said barrels may be provided with packing strips 77 (Figs. 2 and 5) preferably of resilient material. These strips are seated in longitudinal grooves 79 in said barrels on opposite sides of their openings and herein have bent ends 81 engaging the bases of said grooves. As a result they will press outwardly from said barrel and against the inner periphery of their cylindrical housings. It will be apparent that since said packing strips occupy grooves in said rotary barrels they will be carried around with said barrels and to prevent said strips from springing outwardly to interfere with the rotation of said barrels when said strips are passing the cylinder ports 47^a and 47^c, said ports may be provided with suitable bridges 83 (Fig. 1) which will be engaged by said packing strips when said valves are rotated and effectually prevent said strips from objectionably springing out of their grooves.

The efficiency and effectiveness of a gas engine depend to a large extent upon the proper control of the supply of the fuel charge to the cylinders. Two factors in this control are the timing of the admission of said charge and the varying of the volume of said charge. One of the important features of my invention contemplates the provision of means whereby the charge may be completely controlled and varied as desired. To this end the inlet barrel valve 21 is provided with an adjusting valve, herein in the form of a sleeve 85, located within said rotary barrel valve and provided with an opening 87 which may or may not be of the same shape and size as the opening in the barrel valve 21 referred to. For additional control a second adjusting valve or sleeve 89 is provided herein contained within and contiguous to the first adjusting sleeve 85 referred to. Said sleeve 89 is provided with an opening 91 which may or may not be of a size and shape similar to the opening in the adjusting sleeve 85. It will be apparent that when these adjusting valves are moved more or less relatively to or out of registration with the cylinder port 47^a they may cut off or vary the opening thereto more or less and the amount or volume of the charge which may be introduced through said cylinder port 47^a will be varied. The adjustment of these sleeves will also vary the timing of the introduction of the fuel charge so that the latter event may occur sooner or later as desired, in accordance to the demands upon the engine. These adjusting sleeves 85 and 89 may be adjusted by any suitable means either rotatively or longitudinally as desired. To adjust said sleeves rotatively,

herein each may be provided with a worm-wheel 93 (Fig. 1) splined thereon and in mesh with a worm 95, journaled in bearing brackets 99 on the engine casing, said worm being adapted to be turned by a suitable hand-wheel 101 (Fig. 3). By turning said hand-wheel the sleeves may be readily rotated more or less and by the worm and worm-wheel control will be locked from further movement when once adjusted. To adjust said sleeves longitudinally each of the latter may be provided with a rocking yoke 103 (Fig. 1) having opposed studs occupying a peripheral groove 105 in the sleeve, said yoke being fulcrumed in an arm 107 projecting laterally from the engine casing. These yokes may be rocked by an adjusting screw 109 having a pivoted and swiveled connection with the upper end of said yoke, said adjusting screw being threaded into a lug 111 on the engine casing and provided with a hand-wheel 113. It will be apparent that by turning said hand-wheel the yoke will be rocked and the sleeves adjusted longitudinally as desired.

For controlling the admission of the charge to the second cylinder or other cylinders, the adjusting sleeves 85 and 89 may be provided with other openings similar to the openings 87 and 91. The left hand end of the sleeve (Fig. 1) will be closed, but its opposite end may be open to receive the fuel from the carbureter.

For purposes of discussion it may be supposed that the openings in the rotary barrel valve and the adjusting sleeves are in registration with the admission port 47^a of one of the cylinders. When the openings are in this position and the rotary valve 21 is rotated as in the ordinary running of the engine it will be apparent that the fuel mixture drawn axially through said rotary valve will be introduced into the cylinder when the opening of the rotary valve is in registration with the port 47^a. Now, for example, if both of the adjusting sleeves 85 and 89 (Fig. 2) are adjusted together more or less in a contra-clockwise direction and the rotary valve 21 is turning in a clockwise direction, it will be apparent that the admission of the fuel mixture to the cylinder will be caused to occur earlier than when the openings 98 and 91 of said adjusting sleeves are turned somewhat in a clockwise direction to partially cover the cylinder port opening 47^a. If, now, the adjusting sleeve 85 alone is adjusted back somewhat or in a clockwise direction the effective admission opening of the valve will be reduced and consequently the amount of fuel admitted therethrough in a given time will be reduced. This movement will, also, vary the timing. It will be apparent that by rotatively or otherwise adjusting said sleeves a very wide range of control may be effected.

Referring now to the exhaust valve 23, herein the latter is provided with an adjusting valve or sleeve 115 having an opening 115^a which may or may not be of the same size as the opening 23^a in the rotary valve 23, said sleeve being adapted to be adjusted rotatively and longitudinally by a worm, worm-wheel and yoke adjusting mechanism (not shown) similar to that described above for the valves 85 and 89. By this adjusting sleeve the opening of the exhaust port may be timed and varied so that the exhaust valve may be opened at the completion of the power stroke of the piston or otherwise, as desired. Herein one of the ends of the rotary valve 23 is closed and its opposite end 23^m may be open to the atmosphere or connected to a suitable muffler as desired.

To vary the effective openings and the time of uncovering of the exhaust port 47^e with a nicety of adjustment the opening 115^a in the adjusting sleeve 115 may be shaped somewhat sinuously (Fig. 7) or otherwise, so that when said sleeve is adjusted axially over the port 47^e the effective opening of the latter may be gradually cut off or enlarged as desired. Such a shaped opening, also, is well adapted for varying the port opening by the rotative adjustment of said sleeve. It will be understood that the openings in the sleeves 85 and 89 may be similarly shaped if desired.

One of the important advantages of the adjusting sleeves is their effectiveness in preventing leakage. During the events of compression and explosion there is the greatest tendency for leakage. When compression is occurring the opening of the rotary exhaust valve 23 will be diametrically opposite to the cylinder exhaust port 47^e and the port 115^a of the exhaust adjusting sleeve 115. It will be apparent that for any escape of gases or leakage from the cylinder to the exhaust barrel valve at that time, it will be necessary for the gases to creep around between the interior of the cylinder housing 19 and the exterior of the rotary barrel valve 23 and thence back between the interior of said rotary barrel valve 23 and the exterior of the adjusting sleeve 115 to reach the opening in the latter. It will be obvious that for any gases to escape through such a circuitous route during the short time elapsing between the opening and closing of the exhaust port would practically be impossible. During the events of compression and explosion the opening in the rotary inlet valve 85 will also be at a position remote from the cylinder port 47^a and there will be an opposition to leakage similar to that described for the exhaust valve.

By my invention the timing and varying of the valves for controlling the inlet and exhaust may be controlled at any time whatever, thereby increasing the range of speed

and also providing a great flexibility of operation with a maximum power or torque at every speed. Where the work on the engine is constantly varying as, for example, in automobile engines, the ability to adjust the valves while the engine is running will be of great value in adding to the efficiency and effectiveness of the engine and will reduce the necessity of frequently changing the transmission gears. Where the engine is called upon to perform one class of work for a period and then it is desired to use the same engine for a different class of work, it is merely necessary to adjust the valves until the engine is running with greatest efficiency. It will be observed that thus the field of usefulness of the engine is greatly increased and that it is not necessary to design the engine for a special class of work but, on the contrary, the engine may be quickly and readily adjusted to meet varying conditions as desired and without the necessity of change or replacement of parts.

Another important function of an adjusting sleeve or sleeves such as described herein is the braking or cushioning action which may be had thereby. When it is desired to stop the engine, one or more of said sleeves may be adjusted to close either or both of the ports 47ª and 47ᵉ partially or entirely as desired, thereby confining or restricting the gas contained in one or both of the cylinders. As a result the pistons in compressing this gas will be impeded and will act as a brake to arrest the engine. It will be apparent that the sleeves also may be used for opening and closing the ports to admit or cut off the fuel supply to start or stop the engine. By the fan in the rotary inlet valve a supply of fuel is always maintained at the entrance of the inlet ports of the cylinders so that full fuel charges may be quickly introduced into the cylinders under the control of the rotary valve and adjusting valves.

Having described one embodiment of my invention without limiting myself thereto what I claim as new and desire to secure by Letters Patent is:

1. An engine comprising, in combination, a cylinder and its piston; a port for said cylinder; a valve; and sleeves over said port adjustable relatively to one another and relatively to said port for controlling the entrance to said port.

2. In an engine, the combination with a cylinder and its piston, of a port leading into said cylinder, a valve coöperating with said port, and sleeves having openings therein adjustable relatively to one another for varying control of the fuel charge to said port.

3. In an engine, the combination with a cylinder and its piston, of a valve housing; a port leading from said housing to said cylinder; a rotary valve in said housing having an opening adapted periodically to uncover said port, and an adjusting sleeve having an opening therein and adapted to be adjusted rotatively or axially to vary the effective opening in said port.

4. In an engine, the combination with a cylinder and its piston, of a port for said cylinder; a valve housing; a rotary barrel valve therein and a timing valve coöperating with said barrel valve and adjustable in the direction of the axis of the latter and relatively to said port.

5. An engine comprising, in combination, a cylinder, its piston, a port for said cylinder, a valve housing; a rotary valve in the latter and a timing sleeve coöperating with said rotary valve and adjustable in the direction of the axis of the latter and relatively to said port.

6. An engine comprising, in combination, a cylinder, a piston therein; a rotary valve and a sleeve having a sinuously formed port and adapted to be adjusted relatively to said valve.

7. In an engine, the combination of a cylinder and its piston, with a valve housing; a port leading from said housing to said cylinder; a rotary valve mounted in said housing and having an opening adapted periodically to uncover said port and resilient packing strips extending longitudinally of and occupying recesses in said rotary valve and tending to spring outwardly therefrom for preventing leakage around said port.

8. In an engine, the combination of a cylinder and its piston, with a valve housing; a port leading from said housing to said cylinder; a rotary valve in said housing having an opening adapted periodically to uncover said port; and sleeves within said rotary valve said sleeves being adjustable relatively to one another and relatively to said port for controlling the timing and volume of the fuel charge.

9. In an engine, the combination of a cylinder and its piston, with a valve housing; a port leading from said housing to said cylinder; a rotary valve in said housing; a carbureter duct leading to said rotary valve and a fan within said rotary valve for drawing the fuel mixture axially into said rotary valve.

10. In an engine, the combination of a cylinder and its piston, with a valve housing; a rotary barrel valve therein; a carbureter duct leading to said barrel valve and vanes projecting radially within said rotary barrel valve for forcing the fuel mixture axially into said barrel valve.

11. In a gas engine, the combination of a cylinder and its piston, a rotary valve for said cylinder, means to conduct fuel to said valve and means contained in the latter to force fuel into said cylinder.

12. In a gas engine, the combination of a cylinder, its piston and crank shaft, with valve housings on the top of said cylinders; an inlet port leading from one of said housings to said cylinder; an exhaust port leading from said other housing to said cylinder; rotary barrel valves in said housings having openings adapted to be periodically brought into registration with said inlet and exhaust ports; gears secured to said barrel valves; gear connections from said gears to said crank shaft, and adjustable sleeves within said rotary barrel valves, said sleeves being adjustable relatively to one another and relatively to said ports.

13. In a gas engine, the combination of a cylinder and its piston, with a valve housing; a port leading from the latter to said cylinder; a rotary valve in said housing having an opening adapted periodically to register with said port and a pair of sleeves within said rotary valve each having an opening therein, said sleeves being relatively adjustable for controlling the admission of the fuel charge to said cylinder.

14. An engine comprising, in combination, a cylinder; a piston therein; a valve housing; a rotary barrel exhaust valve having a lateral opening therein; and adjusting means for said opening.

15. An engine comprising, in combination, a cylinder, a piston therein; a rotary barrel exhaust valve having a lateral opening therein and an adjusting sleeve for said opening.

16. An engine comprising, in combination, a cylinder; a piston therein; a valve therefor; and means independent of the latter for opening or closing the fuel supply to said cylinder.

17. An engine comprising, in combination, a cylinder; a piston; a barrel valve therefor and a fan in the latter for forcing fuel therein.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

NATHANIEL S. SEELEY.

Witnesses:
EVERETT S. EMERY,
HENRY T. WILLIAMS.