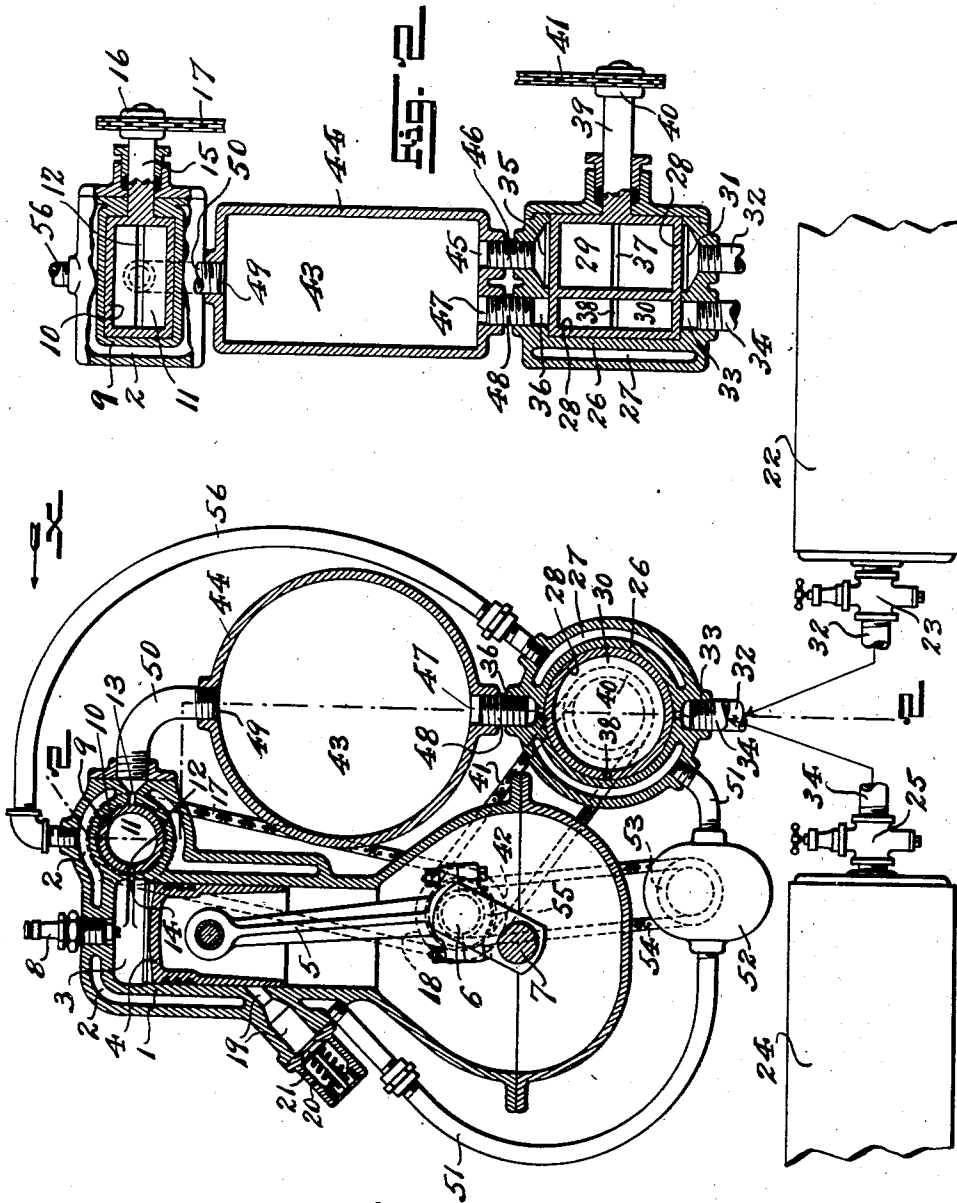


J. M. SEYMOUR, JR.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED APR. 28, 1917.

1,275,481.

Patented Aug. 13, 1918.



WITNESSES:

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UNITED STATES PATENT OFFICE.

JAMES M. SEYMOUR, JR., OF NEWARK, NEW JERSEY.

INTERNAL-COMBUSTION ENGINE.

1,275,481.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JAMES M. SEYMOUR, Jr., a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Internal-Combustion Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

The present invention relates, generally, to a novel construction of internal combustion engine; and the invention has reference, more particularly, to a construction of internal combustion engine adapted to be operated by fuel gases delivered thereto under pressure, or in measured quantities for compression directly in the engine cylinders.

The invention has for its principal object to provide a novel construction of internal combustion engine provided with a rotary inlet valve operated in timed relation to the engine piston, and constructed to admit to the engine cylinder a measured quantity of fuel gas.

Another object of the present invention is to provide an internal combustion engine having means for measuring and intermixing the elements of a fuel gas while under pressure, and the delivering measured quantities of the resultant fuel mixture within the engine cylinder in timed relation to the engine piston.

Other objects of this invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

With the various objects of my present invention in view, the same consists, primarily, in the novel construction of internal combustion engine hereinafter set forth; and the invention consists, furthermore, in the novel arrangements and combinations of the several devices and parts, as well as in the details of the construction of the same, all of which will be hereinafter more fully described and then finally embodied in the claims appended hereto.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figure 1 is a vertical longitudinal section of the novel internal combustion engine

made according to and embodying the principles of my present invention; and Fig. 2 is a detail transverse longitudinal section of the same, taken on line 2—2 in said Fig. 1, looking in the direction of the arrow *a*.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

The novel construction of internal combustion engine is particularly designed and constructed to be operated by means of an explosive fuel which does not require the use of atmospheric air to support its combustion, such, for example, as a fuel formed from two parts of hydrogen gas and one part oxygen gas, as described in my previous application for Letters-Patent of the United States, filed April 12th, 1917, Serial Number 161,555, and I will therefore describe the novel construction of the present invention when used with such a fuel as illustrative of its use and operation, although I do not wish to be understood as limiting in any way the construction or use of my novel engine in connection with such a fuel, as there are other combinations of gases which may be capable of use as the fuel for operating my said novel engine.

Referring now to the said drawings, 1 is the engine cylinder, which is preferably provided with the water-jacket 2, and has at the top a combustion chamber 3; 4 is the piston, to which is attached the connecting rod 5. This connecting rod is attached to the crank 6, which is carried by the shaft 7. Entering the combustion chamber 2 is the spark-plug 8 supplied by any well known system of electrical ignition. All of this is of the ordinary and usual construction of internal combustion engines.

Connected with the engine cylinder 1 is a suitable housing 9 in which is rotatably mounted a revolving admission valve, comprising a valve drum 10 providing a valve chamber 11 communicating with which, through the wall of said drum, is a valve-port 12. Said housing 9 is provided at its outer end with an inlet-port 13, and at its inner end with an outlet-port 14 which communicates with the combustion chamber 3. Connected with said valve drum 10 is a shaft 15, which projects exteriorly of said housing 9, and upon which is arranged a sprocket 16 driven by the chain 17 from a sprocket 18 mounted on the engine shaft 7, so that said rotary admission valve mech-

anism is properly timed in its operations relative to the movement of the piston 4. Connected with the side of said cylinder 1 is an exhaust valve, comprising an exhaust 5 port 19 formed in the walls of said cylinder and properly positioned, relative to the piston movement, so as to communicate with the combustion chamber 3. Connected with 10 said cylinder and registered with said exhaust port 19 is a valve housing 20 in which is arranged a spring closed exhaust valve 21 normally closing said exhaust port 19.

The reference character 22 indicates a tank adapted to contain a supply of hydrogen gas stored under pressure, preferably 15 of about four thousand pounds to the square inch. Connected with the outlet of this hydrogen supply tank is a reducing valve 23, which permits the flow of hydrogen gas 20 from said tank at a reduced pressure of preferably about one hundred and fifty pounds to the square inch.

The reference character 24 indicates a tank adapted to contain a supply of oxygen 25 gas stored under pressure, preferably of about four thousand pounds to the square inch. Connected with the outlet of this oxygen supply tank is a reducing valve 25, which permits the flow of oxygen gas from 30 said tank at a reduced pressure of, preferably, about one hundred and fifty pounds to the square inch.

The reference character 26 indicates a measuring valve casing, preferably, provided with a water jacket 27. Rotatably 35 mounted in said valve casing is a revolving measuring valve, comprising a valve-drum 28, the interior of which is divided into two separate measuring chambers, to wit, a hydrogen measuring chamber 29 and an oxygen 40 measuring chamber 30. The volume of the hydrogen measuring chamber 29 is twice that of the oxygen measuring chamber 30. Said valve casing 26 is provided with a 45 hydrogen inlet port 31 connected by suitable piping or conduits 32 with the reducing valve of the hydrogen supply tank; and said valve casing is further provided with an oxygen inlet port 33 connected by suitable 50 piping or conduits 34 with the reducing valve of the oxygen supply tank. In like manner said valve casing is provided with a hydrogen outlet port 35, and an oxygen outlet port 36. Said revolving valve is provided 55 in its circumferential walls with a hydrogen valve port 37 communicating with said hydrogen measuring chamber 29, and successively registering with the respective hydrogen inlet port and outlet port of the 60 valve casing, as said valve drum is rotated; and, said revolving valve is further provided in its circumferential walls with an oxygen valve port 38 communicating with said oxygen measuring chamber 30, and successively 65 registering with the respective

oxygen inlet port and outlet port of the valve casing, as said valve drum is rotated. Connected with said measuring valve drum 28 is a shaft 39, which projects exteriorly 70 of said valve casing 26, and upon which is arranged a sprocket 40 driven by a chain 41 from a sprocket 42 mounted on the engine shaft 7, so that the rotary measuring valve mechanism is properly timed in its operation relative to the engine operation. 75

43 indicates a mixing retort or chamber, the casing 44 of which is provided with a hydrogen inlet 45 connected with said hydrogen port 35 of said measuring valve casing by suitable piping or conduit connections 46, and further provided with an 80 oxygen inlet 47 connected with said oxygen outlet port 36 of said measuring valve casing by suitable piping or conduit connections 48. The casing 44 of said mixing 85 retort or chamber 43 is also provided with a gas or fuel outlet 49, which communicates through suitable piping or conduit 50 with the inlet port 13 of the housing 9 of said revolving admission valve connected with 90 the engine cylinder 1.

The water from the engine cylinder water-jacket 2 is preferably discharged through piping 51 connected with the latter. Connected in the line of said piping 51 is 95 a circulation pump 52, driven by a sprocket 53 and chain 54 from a sprocket 55 mounted on the engine shaft 7. Said piping 51 is preferably connected with said water jacket 27 of said measuring valve casing 26 100 into which it discharges, and the water jacket 27 of said measuring valve casing 26 discharges through return piping 56 back to the engine cylinder water-jacket 2, with which the discharge end of said return 105 piping 56 is connected.

The novel construction of internal combustion engine, as thus above described, when driven by an explosive fuel mixture comprised of hydrogen and oxygen, operates 110 as follows:—

A supply of hydrogen gas is stored or confined in the tank 22, under pressure, preferably, of about four thousand pounds. A supply of oxygen gas is stored or confined in 115 the tank 24, under pressure, preferably, of about four thousand pounds. The reducing valves 23 and 25 are set to liberate the gases from their respective tanks at a reduced pressure of about one hundred and fifty 120 pounds. The gases thus liberated are conducted to the inlet ports of the measuring valve. Said measuring valve drum 28 being driven directly from the engine shaft, rotates in properly timed relation to the piston 125 movement of the engine, consequently the same operates to measure the fuel elements in proper time and quantity to provide a constant supply of fuel gas for delivery to the engine cylinder according to the needs 130

of the engine. Upon rotation, the valve drum 28 alines the valve ports 37 and 38 with the respective ports 31 and 33, whereupon the hydrogen gas flows into the hydrogen measuring chamber 29, and the oxygen gas flows into the oxygen measuring chamber 30. When using the elements hydrogen gas and oxygen gas in combined or intermixed form to provide the explosive fuel, it is necessary to use two parts of hydrogen gas to one part of oxygen gas, consequently the measuring chambers 29 and 30 are respectively sized to measure the separate gases in such respective proportions. Since, then, the chamber 29 is twice the size of the chamber 30, the measured volume of hydrogen gas will always be twice that of the measured volume of oxygen gas, while the pressure of the separate volumes is maintained in equality. The measuring valve being loaded, its continued rotation carries the valve ports 37 and 38 into alinement with the outlet ports 35 and 36, thereby releasing the respective measured volumes of hydrogen and oxygen gases into the mixing retort or chamber 43, wherein the separate gases are permitted to come inle or intermix to provide the resultant explosive fuel. The outlet 49 of the mixing retort or chamber 43 is connected by means of the conduit 50 with the rotary gas admission valve mechanism connected with the engine. The valve drum 10 being driven directly from the engine shaft, rotates in properly timed relation to the piston movement of the engine, consequently the same operates to receive and then liberate into the engine cylinder, in timed intervals relative to the piston operation of the engine, measured quantities of the fuel mixture, therein to be ignited to produce the force for driving the engine. When the valve port 12 of the valve drum 10 registers with the gas inlet 13 of the housing 9, the fuel mixture passes therethrough and into the drum 10. The continued rotation of the drum 10 presents its valve port 12 in registration with the gas outlet 14, communicating with the engine cylinder combustion chamber, thereupon releasing the fuel mixture so that the same flows into said combustion chamber ready to be ignited. As the piston passes slightly the top of its stroke the fuel mixture is ignited with explosive force which is directly applied to the piston to produce the power stroke of the latter. The combustion of the fuel mixture, comprised of hydrogen and oxygen, results in the conversion of the mixture into water and steam, which is exhausted from the cylinder when the exhaust port 19 is uncovered by the downwardly moving piston through the exhaust valve devices 20 and 21.

Since the drawing off of the component gases hydrogen and oxygen from the stored sources at reduced pressure greatly lowers

the temperature thereof, and since the efficiency and ready expansion of the gases for fuel purposes and use in the engine is greatly increased by raising the temperature, I provide the measuring valve with a water-jacket 27, into which the hot water, discharged from the engine water-jacket 2 through the conduit 51, is introduced, and then circulated through the water-jacket 27 back to the engine water-jacket 2 through the conduit 56. A pump 52 driven from the engine shaft, and placed in the line of said conduit 51 serves to continue such circulation of the hot-water. The hot-water thus introduced about the measuring valve gives off its heat units, so that the same may be absorbed by the fuel gas elements contained in the measuring valve, and thus raises the temperature of said gases, at the same time lowering the temperature of the water, which may then be returned to the engine water-jacket 2 to prevent over-heating of the engine cylinder.

Of course it will be understood that my invention is adapted for application to multiple cylinder engines, as well as single cylinder engines, and that the principles of the same may be readily applied to both two cycle and four cycle engines.

I am aware that some changes may be made in the arrangements and combinations of the various devices and parts, as well as in the details of the construction of the same, without departing from the scope of the present invention as set forth in the foregoing specification, and as defined in the claims appended hereto. Hence, I do not limit my invention to the exact arrangements and combinations of the several devices and parts as described in the foregoing specification, nor do I confine myself to the exact details of the construction of the said parts as illustrated in the accompanying drawings.

I claim:—

1. The combination with an engine cylinder having a piston mounted to reciprocate therein of a rotary admission valve comprising a housing connected with said engine cylinder, a valve drum rotatably mounted in said housing, transmission means for driving said valve-drum in timed relation to the engine piston movements, said housing having an inlet port and an outlet port, the latter communicating with the interior of said cylinder, said valve drum having a valve port alternately registering with said inlet and outlet ports of said housing, a measuring mechanism for simultaneously and proportionally measuring a plurality of fuel elements, a mixing retort communicating with the outlets of said measuring mechanism, and means of communication between the outlet of said mixing retort and the inlet port of the housing of said rotary admission valve.

2. The combination with an engine cylinder—

der having a piston mounted to reciprocate therein of a rotary admission valve comprising a housing connected with said engine cylinder; a valve drum rotatably mounted in said housing, transmission means for driving said valve-drum in timed relation to the engine piston movements, said housing having an inlet port and an outlet port, the latter communicating with the interior of said cylinder, said valve drum having a valve port alternately registering with said inlet and outlet ports of said housing, a rotary measuring valve for simultaneously and proportionally measuring a plurality of fuel elements, comprising a valve-casing having inlet ports and outlet ports, a rotary measuring drum having a plurality of compartments each provided with a valve-port for communication with an inlet and outlet port of said valve-casing, transmission means for driving said rotary measuring drum in timed relation to the engine piston movements, a mixing retort communicating with the outlet ports of said valve-casing, and means of communication between the outlet of said mixing retort and the inlet port of the housing of said rotary admission valve.

3. The combination with an engine cylinder of a water-jacket enveloping said cylinder, a piston mounted to reciprocate in said cylinder, a crank-shaft with which said piston is connected, an exhaust valve mechanism in communication with the interior of said cylinder; a rotary admission valve comprising a housing, a rotary valve drum mounted within said housing, a driving shaft connected with said valve drum and projecting exteriorly from said housing, transmission means between said valve driving shaft and said crank shaft, said housing having an inlet port and an outlet port, the latter communicating with the interior of said cylinder, said valve drum having a valve port alternately registering with said inlet and outlet ports of said housing, a water jacketed measuring mechanism for simultaneously and proportionally measuring a plurality of fuel gas elements, means interconnecting said engine cylinder water-jacket with the water-jacket of said measuring mechanism, a pump for circulating the water through said water-jackets, a mixing retort

communicating with the outlets of said measuring mechanism, and means of communication between the outlet of said mixing retort and the inlet port of the housing of said rotary admission valve.

4. The combination with an engine cylinder of a water-jacket enveloping said cylinder, a piston mounted to reciprocate in said cylinder, a crank-shaft with which said piston is connected, an exhaust valve mechanism in communication with the interior of said cylinder, a rotary admission valve comprising a housing, a rotary valve drum mounted within said housing, a driving shaft connected with said valve drum and projecting exteriorly from said housing, transmission means between said valve driving shaft and said crank shaft, said housing having an inlet port and an outlet port, the latter communicating with the interior of said cylinder, said valve drum having a valve port alternately registering with said inlet and outlet ports of said housing, a rotary measuring valve for simultaneously and proportionally measuring a plurality of fuel elements, comprising a water-jacketed valve-casing having gas inlet ports and outlet ports, means interconnecting said engine cylinder water-jacket with the water-jacket of said valve-casing, a pump for circulating the water through said water-jackets, a rotary measuring drum having a plurality of compartments each provided with a valve-port for communication with an inlet and outlet port of said valve-casing, a driving shaft connected with said measuring drum and projecting exteriorly of said valve-casing, transmission means said measuring drum shaft and said engine crank shaft, a mixing retort communicating with the outlet ports of said valve-casing, and means of communication between the outlet of said mixing retort and the inlet port of the housing of said rotary admission valve.

In testimony that I claim the invention set forth above I have hereunto set my hand this 26th day of April, 1917.

JAMES M. SEYMOUR, Jr.

Witnesses:

FRED'K C. FRAENTZEL,

FRED'K H. W. FRAENTZEL.