A. M. LOW.

INTERNAL COMBUSTION ENGINE USING LIQUID FUEL.

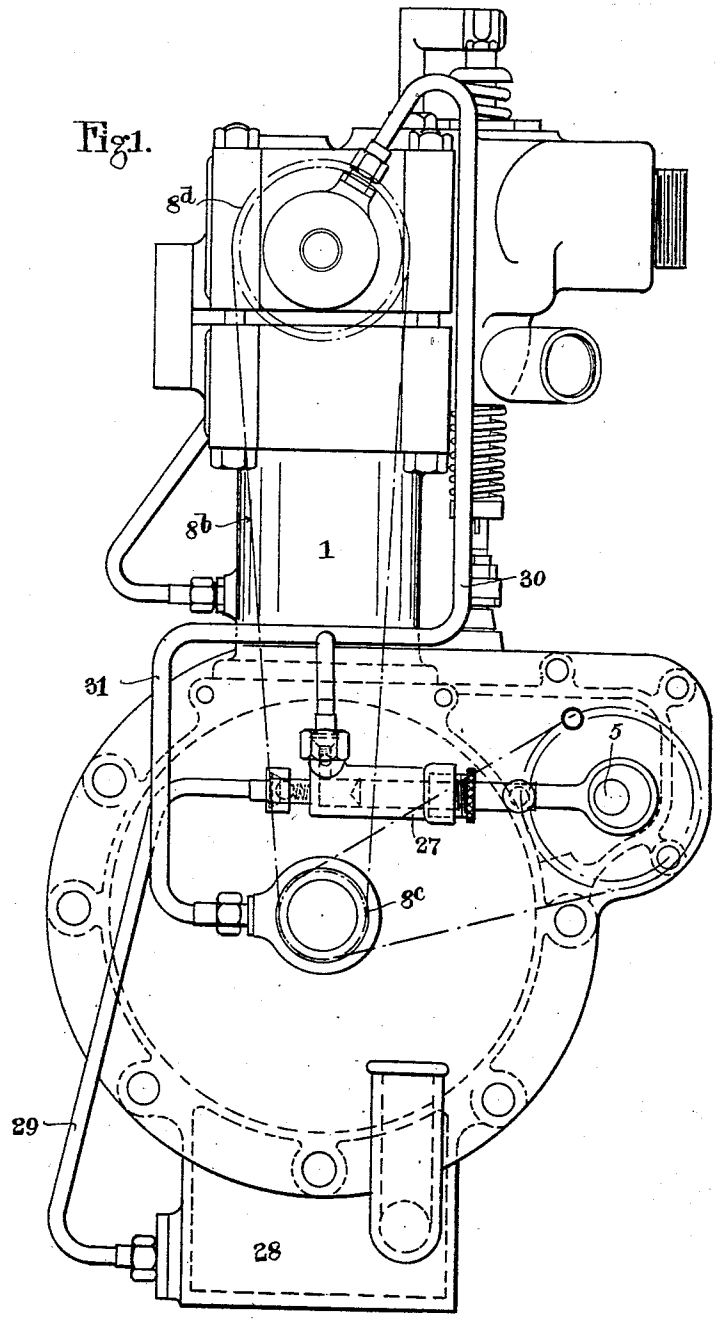
APPLICATION FILED JAN. 9, 1913.

1,124,157.

Patented Jan. 5, 1915.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
C. Van Sant
H. L. Norris

Inventor:
Archibald Montgomery Low.
by Watson & Boyden
Attorneys

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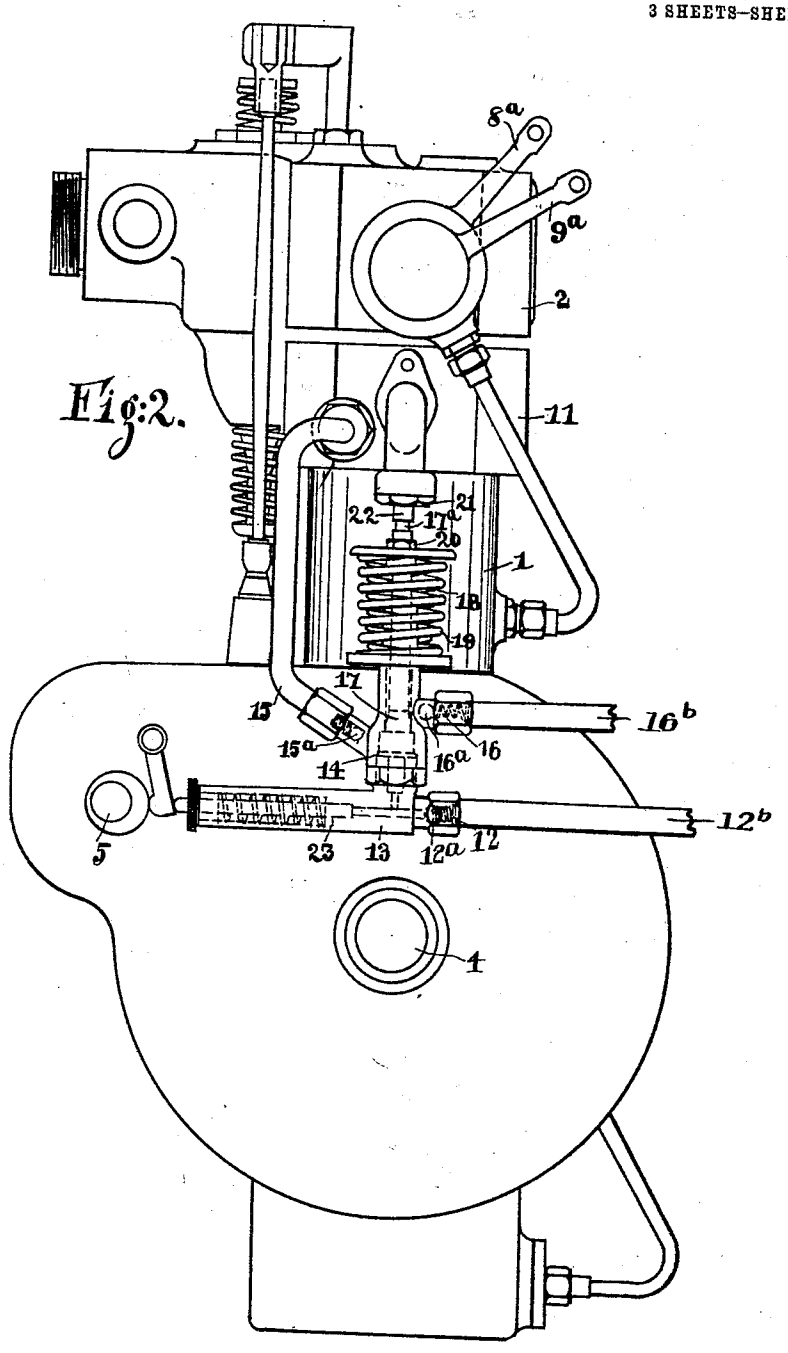
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3 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
C. Van Sant
E. H. McMorris

Inventor:
Archibald Montgomery Low.
By Watson & Boyden
Attorneys.

A. M. LOW.

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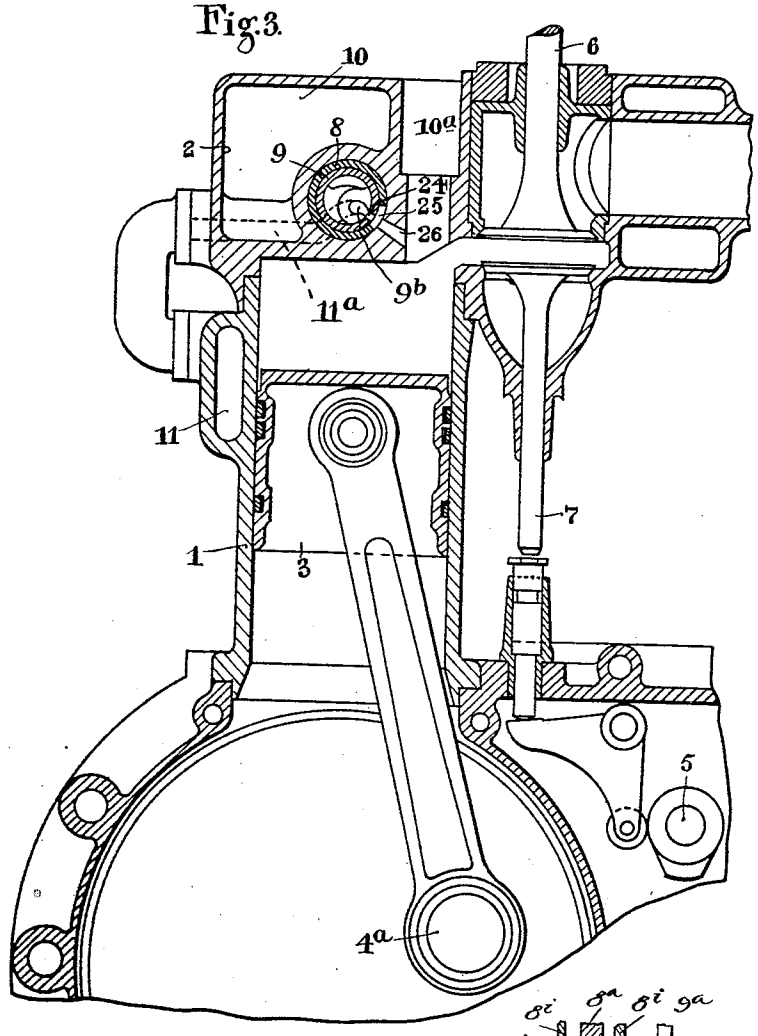
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3 SHEETS—SHEET 3.

Fig. 3.



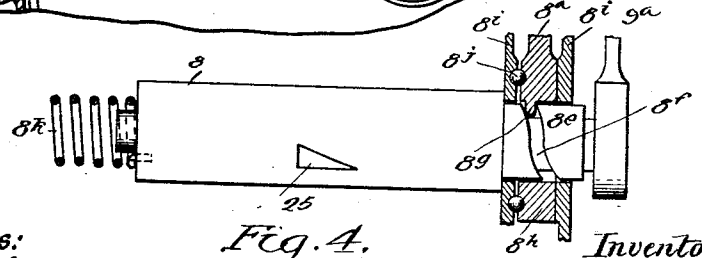


Fig. 4.

Witnesses:
C. Van Sant
E. H. L. Morris

Inventor:
Archibald Montgomery Low.
by Watson & Boyden
Attorneys.

UNITED STATES PATENT OFFICE.

ARCHIBALD MONTGOMERY LOW, OF GREENFORD PARK, ENGLAND.

INTERNAL-COMBUSTION ENGINE USING LIQUID FUEL.

1,124,157. Specification of Letters Patent. Patented Jan. 5, 1915.

Application filed January 9, 1913. Serial No. 740,935.

To all whom it may concern:

Be it known that I, ARCHIBALD MONTGOMERY LOW, a subject of the King of England, residing at Greenford Park, Middlesex, in England, have invented certain new and useful Improvements in Internal-Combustion Engines Using Liquid Fuel, of which the following is a specification.

This invention relates to the use of volatile oils or hydrocarbons in internal combustion engines and is based on the known principle of the use of the engine's own heat for vaporizing the fuel in a chamber into which the liquid is introduced against the pressure therein and the vapor generated introduced into the engine by its own pressure while the pressure in said chamber remains constant, or substantially so.

The pressure in the vaporizing chamber is used to regulate the supply of liquid fuel thereto, this being accomplished according to the present invention by controlling a by-pass cooperating with a pump which pumps the liquid fuel into the vaporizing chamber, which may form a jacket to the working cylinder, the surplus of liquid fuel not needed for vaporization being delivered through said by-pass.

The means for controlling the passage of vaporized fuel from the vaporizing chamber to the cylinder comprises a manually adjusted rotary valve of such a character that the fuel while being introduced into the engine may have its quantity regulated and the period during which the fuel is introduced may also be regulated so that the time (in relation to the stroke) at which the entrance commences may be separately varied at will at all times during the running of the engine. The portion of the stroke or period at which firing takes place and the average pressure of the explosion may be varied. The controlling means employed also insure cooling of the vaporized fuel to such an extent that self-ignition will not take place.

A construction of engine according to this invention is illustrated in the accompanying drawings, the liquid fuel being vaporized in a jacket around or partially around the cylinder, and the admission of the vapor to the cylinder being controlled by an adjustable valve of rotary type.

Figures 1 and 2 are elevations of the one and other side of the engine respectively, and Fig. 3 is a section perpendicular to the axis of the crank shaft, and Fig. 4 is a side view of a valve structure for manually controlling the vapor flow from the vaporizing chamber to the engine cylinder.

1 represents the cylinder, 2 the cylinder head, 3 the piston, 4 the crank-shaft and 4^a the crank-pin; 6 is the air admission valve, 7 the exhaust-valve, 5 the half-time shaft for operating said valves, 8 the exterior sleeve and 9 the interior sleeve of the manually controlled vapor admission valve, the sleeve 9 being operated from the crank-shaft 4 to give the inlet and cut off of vapor at the proper times in relation to the piston stroke by means of sprocket wheels 8^c, 8^d and chain 8^b.

10 is a water jacket for the cylinder head and 10^a designates the aperture in the cylinder head for the usual ignition plug.

11 is a jacket partially surrounding the cylinder 1 and intended for vaporizing the volatile oil under pressure.

Oil is supplied from the tank (not shown) through pipe 12^b to a union 12 in communication with the pump barrel 13 containing plunger 23 whence a chamber 14 leads by pipe 15 to the jacket 11 and by a passage 16, acting as a by-pass, back to the tank through pipe 16^b. The by-pass 16 is controlled by a valve 17 in chamber 14, said valve being held on its seat by springs 18 and 19, coiled about the valve stem 17^a, the pressure of said springs being adjustable by means of the nut 20.

A plunger 22 operated by the pressure prevailing in the jacket 11 abuts on the end of the stem 17^a of valve 17. When the pressure in chamber 11 reaches such a point that the pressure on the plunger 22 is sufficient to overcome the counter-pressure of the springs 18 and 19, the valve 17 will be capable of opening, and, assuming that there is no counter-pressure exerted upwardly on the underside of valve 17, as will be the case during the suction stroke of the pump plunger 23, the valve 17 will leave its seat and upon the next force stroke of the said plunger the fuel will be delivered past the valve 17 to the by-pass 16 leading back to the tank. This condition will continue until the pressure in chamber 11 has fallen sufficiently to permit the springs 18, 19 to close the valve 17, whereupon the fuel will be forced into the jacket 11 against the pressure prevailing

therein and be vaporized by the heat derived from the cylinder 1.

To prevent back-pressure in chamber 14 from jacket 11 an anti-return valve 15^a is provided in pipe 15 and anti-return valves 12^a and 16^a are provided in the union 12 and by-pass 16 respectively.

The manual control of the vapor under pressure is effected by a retard or advance given to one valve sleeve and by adjustment given to the other valve sleeve. Thus the vapor under pressure in the chamber 11 is permitted to enter the cylinder through the valve sleeves 8, 9, in accordance with the movements given to said sleeves and the manual adjustment thereof by means of the levers 8^a, 9^a which may be operated from any convenient point, one of said sleeves being angularly adjustable and the other longitudinally, thus for example the vapor enters the interior of the sleeve 9 through a port 9^b which coacts with a channel 11^a and passes out through so much of the length of the slot 24 therein as the longitudinal adjustment of the sleeve 8 on the sleeve 9 permits to be open into the slot 25 in said sleeve 8, whence it passes through port 26 into the combustion chamber of the engine.

In Fig. 4 I have illustrated as an example, means for producing the longitudinal adjustment of the valve sleeve 8. One end of the sleeve is provided with a boss 8^e which is provided in its circumference with a quick turn helical thread 8^f with which engages a pin or equivalent 8^g on a collar 8^h encircling said boss and operable by the hand lever 8^a so that by axially rotating said collar through a small angle a corresponding amount of longitudinal displacement of the sleeve is produced.

The collar is mounted between abutments 8^i, a ball bearing 8^j being preferably interposed between the collar and one of said abutments and a spring 8^k is provided bearing against the opposite end of the sleeve.

The timing of the admission in relation to the stroke is regulated by angular adjustment of the sleeve 9, and the variation of timing of opening is given by causing said sleeve 9 to lag behind or pass in advance respectively of its position normally imparted thereto by the transmission gear 8^b, 8^c, 8^d, above referred to.

The commencement of the admission may correspond with the spark timing of an ordinary engine.

On the other side of the engine is shown an oil-pump having plunger 27 for drawing lubricating oil from the crank case 28 by pipe 29 and supplying it by pipes 30, 31 to the valve 8, 9, and the crank shaft bearings respectively.

The pump plungers 27 and 23 are operated from the half-time shaft 5.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In an internal combustion engine, a vaporizing chamber heated by the engine and having an outlet to the engine cylinder, means for feeding liquid fuel into said chamber, and means controlled by the pressure in said chamber for regulating the feed of liquid fuel into said chamber.

2. In an internal combustion engine, a vaporizing chamber heated by the engine and having an outlet to the engine cylinder, means for feeding liquid fuel into said chamber, manually adjustable means for regulating the quantity and time of admission of vapor from said chamber into the cylinder, and means controlled by the pressure in said chamber for regulating the feed of liquid fuel into said chamber.

3. In an internal combustion engine, a vaporizing chamber adapted to be heated by the engine, and having an outlet leading to the cylinder, means for delivering liquid fuel to said chamber from a source of supply, a return conduit for returning liquid fuel to the source, and means controlled by the vapor pressure in said chamber for causing the liquid fuel supplied in excess of the engine requirements to flow through said return conduit.

4. In an internal combustion engine, the combination of a vaporizing chamber heated by the heat of the engine and having outlet to the cylinder thereof, a pump for supply of liquid hydrocarbon to said vaporizing chamber, a by-pass in communication with said source of supply and a spring loaded valve actuated by excess of pressure in the vaporizing chamber to open communication between the pump and by-pass for return of surplus hydrocarbon not needed for vaporization to said source of supply.

5. In an internal combustion engine, the combination of a vaporizing chamber heated by the heat of the engine, means for supply of liquid hydrocarbon to said chamber from a source of supply, means acted on by excessive pressure in the vaporizing chamber for insuring return of surplus hydrocarbon not needed for vaporization to said source of supply, and a manually adjustable valve communicating with said vaporizing chamber for separately and independently controlling the quantity and time of introduction of vaporized hydrocarbon to the engine.

6. In an internal combustion engine the combination of a vaporizing chamber heated by the heat of the engine and having outlet to the cylinder thereof, means for supply of liquid hydrocarbon to said chamber from a source of supply, a valve acted on by excessive pressure in the vaporizing chamber, a by-pass controlled by said valve

for return of surplus hydrocarbon not needed for vaporization to said source of supply, and a valve structure located between the vaporizing chamber and cylinder and capable of manual adjustment to separately and independently control the quantity and time of introduction of vaporized fuel from the vaporizing chamber to the cylinder.

7. In an internal combustion engine the combination of a vaporizing chamber heated by the heat of the engine and having outlet to the cylinder thereof, a pump for supply of liquid hydrocarbon to said vaporizing chamber, a by-pass in communication with said source of supply, a spring loaded valve actuated by excess of pressure in the vaporizing chamber to open communication between the pump and by-pass for return of surplus hydrocarbon not needed for vaporization to said source of supply, and a valve comprising elements each capable of independent manual adjustment to separately control the quantity and time of introduction of vaporized fuel to the cylinder.

In witness whereof I have signed this specification in the presence of two witnesses.

ARCHIBALD MONTGOMERY LOW.

Witnesses:
H. D. JAMESON,
O. J. WORTH.