

(No Model.)

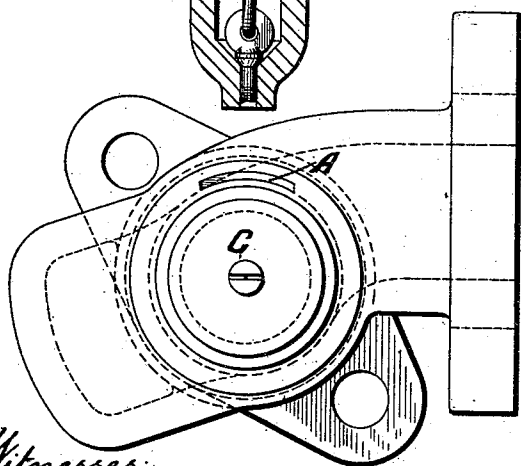
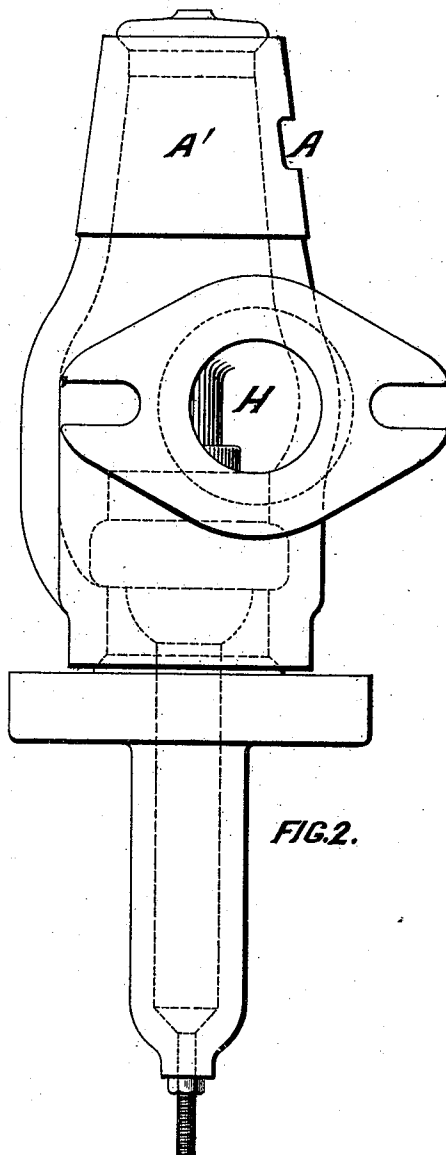
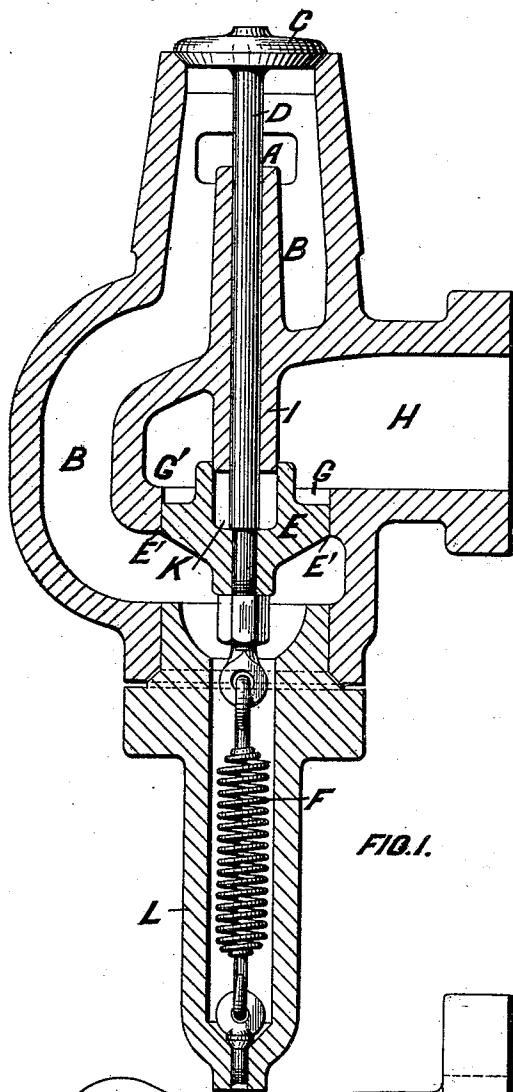
F. W. LANCHESTER.

3 Sheets—Sheet 1.

GAS MOTOR ENGINE.

No. 465,480.

Patented Dec. 22, 1891.



Witnesses:

C. P. Bees
Walter Allen

Inventor.
F. W. Lanchester
by Herbert W. Jenner
Attorney

(No Model.)

F. W. LANCHESTER.

3 Sheets—Sheet 2.

GAS MOTOR ENGINE.

No. 465,480.

Patented Dec. 22, 1891.

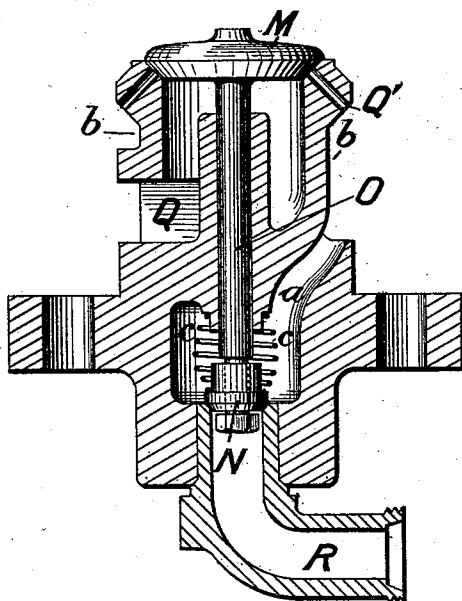


FIG. 4.

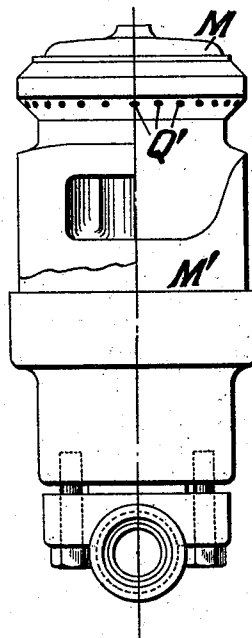


FIG. 5.

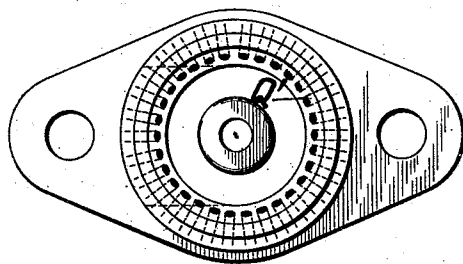


FIG. 6.

Witnesses:

G. I. Bell

Walter Allen

Inventor.

F. W. Lanchester.

by Herbert H. Jenner.

Attorney.

(No Model.)

F. W. LANCHESTER.

3 Sheets—Sheet 3.

GAS MOTOR ENGINE.

No. 465,480.

Patented Dec. 22, 1891.

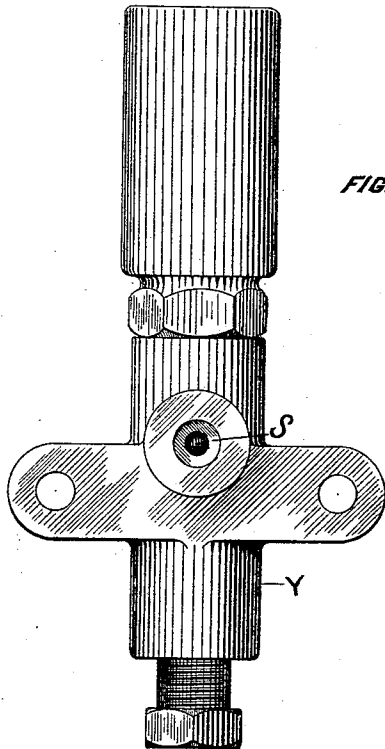


FIG. 8.

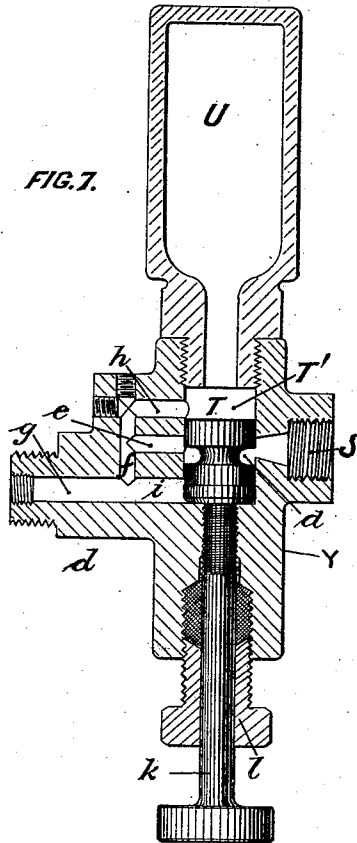


FIG. 7.

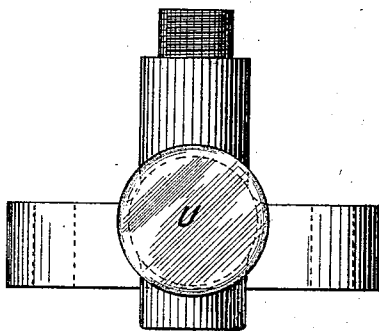


FIG. 9.

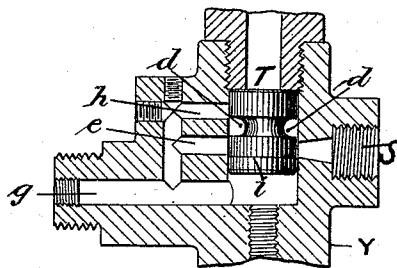


FIG. 10.

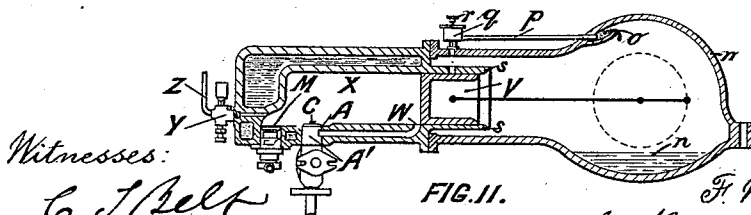


FIG. 11.

Witnesses:

C. J. Belt
Walter Allen

Inventor.

F. W. Lanchester.

by Herbert W. T. Jenner
Attorney.

UNITED STATES PATENT OFFICE.

FREDERICK WILLIAM LANCHESTER, OF LONDON, ENGLAND.

GAS-MOTOR ENGINE.

SPECIFICATION forming part of Letters Patent No. 465,480, dated December 22, 1891.

Application filed May 14, 1891. Serial No. 392,663. (No model.) Patented in England December 10, 1889, No. 19,868; in Germany October 7, 1890, No. 17,280; in France October 7, 1890, No. 208,699; in Belgium October 8, 1890, No. 7,218, and in Switzerland November 22, 1890, No. 3,195.

To all whom it may concern:

Be it known that I, FREDERICK WILLIAM LANCHESTER, a citizen of Great Britain, residing at London, in the county of Middlesex and Kingdom of Great Britain, have invented certain new and useful Improvements in Gas-Motor 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.

Patents have been obtained for this invention in the following countries: in Great Britain, No. 19,868, dated December 10, 1889; in Belgium, No. 7,218, dated October 8, 1890; in Germany, No. 17,280, dated October 7, 1890; in France, No. 208,699, dated October 7, 1890, and in Switzerland, No. 3,195, dated November 22, 1890.

This invention relates to gas-engines; and it consists in the novel construction and combination of the parts hereinafter fully described and claimed.

In the drawings, Figure 1 is a vertical section through the exhaust-valve; and Figs. 2 and 3 are respectively an end and a plan view of the exhaust-valve casing. Fig. 4 is a vertical section through the admission-valve, and Figs. 5 and 6 are respectively an end and a plan view of the admission-valve casing. Fig. 7 is a vertical section through the ignition-regulator, and Figs. 8 and 9 are respectively an end and a plan view of the ignition-regulator. Fig. 10 is a vertical section through the lower part of the regulator, showing the regulator-valve closed. Fig. 11 is a longitudinal section through a gas-engine, showing the position of the exhaust and admission valves and the ignition-regulator.

Referring to Fig. 11, X is a water-jacketed cylinder, and Y is the piston. C is the exhaust-valve, and W is the exhaust-port. M is the admission-valve, and Y is the ignition-regulator. The connecting-rod is inclosed within the casing *m*, and the bottom of this casing forms a reservoir *n* for oil. The end of the connecting-rod dips into the oil and splashes it upon the sides of the casing. A portion of the oil drains into the pocket *o* at the upper part of the casing and is conducted down the

pipe *p* into the oil-cup *q*, which is supported over the cylinder. The oil drops from the cup *q* through a hole in the cylinder and keeps the piston lubricated. The cup *q* is provided with an adjustable valve *r*, which prevents the oil from dropping too fast, and the surplus oil falls back in drops into the reservoir *n* from the edge of the pocket *o*.

W is the exhaust-port in the cylinder, which is uncovered when the piston reaches the end of the forward stroke and permits the products of combustion to pass through the port A into the chamber B inside the exhaust-valve casing A'. The valve C opens into the cylinder, so that when the port W is uncovered the valve C is placed in equilibrium.

The valve C, Figs. 1, 2, and 3, is provided with a spindle D, which slides in the guide I and has a piston E secured to its lower end. The piston E slides in the cylinder G and closes the communication between the chamber B and the discharge-pipe H, which pipe is always in free communication with the atmosphere.

F is a spring secured to the end of the valve-spindle D and to the lower end of the case L. This spring has its tension adjusted so that the engine will have a small predetermined back-pressure. When the return motion of the piston causes the pressure in the chamber B to rise, the piston E rises in the cylinder G and the valve C is opened to its full extent. When the lower edge E' of the piston E passes the upper edge G' of the cylinder G, the exhaust escapes from the chamber B into the discharge-pipe H. The distance between the edges E' and G' determines the amount of lift given to the valve C before the exhaust is permitted to escape to the discharge-pipe and insures the valve C being lifted to such an extent as to avoid any closing effect which the rush of exhaust from the cylinder into the chamber B' might have upon the valve. When the piston has completed its return stroke, the spring F closes the exhaust-valve C.

To prevent the piston E from forcibly striking the guide when the valve is opened suddenly, a dash-pot K is formed in the piston E. The end of the guide I slides freely in this dash-pot and the partial compression of the

air prevents the too sudden movement of the piston.

The admission-valve M is shown in detail in Figs. 4, 5, and 6.

5 N is the gas-valve, which slides on the lower end of the valve-spindle O, and is provided with the spring *c*, adapted to press it on its seat and to assist in closing the valve M. The valve N moves slightly on its spindle gas-
10 pressure tight, so that the valves M and N may seat themselves independently. R is the gas-admission pipe. When the engine-piston commences its outstroke, it raises the valve M and draws in air through the passage Q.
15 The gas passes through the valve N and through the spaces *a* and *b* and the holes Q' and mingles with the air as it enters the cylinder.

The ignition-regulator Y governs the speed
20 of the engine, and is shown in section in Fig. 7.

S is the passage which leads to the engine-cylinder, and *g* is the passage which leads into the ordinary ignition-tube Z. (Shown in Fig. 11.)

25 T is a piston-valve which slides vertically in the cylinder T', and is provided with a deep groove *d* and a shallow groove *i*.

U is a chamber above the cylinder T' for holding a supply of compressed inflammable
30 mixture. A vertical passage *f* and a horizontal passage *h* connect the upper part of the cylinder with the passage *g*, and *e* is a passage which connects the passage *g* with the groove *d* in the valve when the valve is in its
35 lower position.

K is a screwed spindle under the valve T, which passes through the stuffing-box *l* and serves to regulate the lowest position of the valve.

40 The engine-piston compresses an inflammable mixture into the chamber U and into the igniting-tube Z during the return stroke of the piston. The mixture is ignited in the tube Z in the ordinary manner, and the flame
45 passes through the passages *f e* and the groove *d* and passage S into the cylinder, these said passages being formed of sufficient area to permit the flame to pass up them. When, however, the speed of the engine becomes excessive, the rapidity of compression becomes
50 very great. The mixture then passes more rapidly into the passage *g* through the grooves *d* and *i* than through the passages *e, f*, and *h* to the upper end of the cylinder and the
55 chamber U. The pressure below the valve T becomes greater than the pressure above it and the valve rises from the position shown in Fig. 7 to the position shown in Fig. 10. This motion of the valve cuts off the communication between the deep groove *d* and the
60 passage S and brings the shallow groove *i* in front of the said passage. This groove *i* permits the mixture to pass through it into the igniter-tube, where it is ignited in the usual
65 manner; but the area of the groove *i* is too small to permit the flame to pass through it into the cylinder. No ignition in the cylinder

der occurs, therefore, until the speed decreases sufficiently to permit the valve T to resume its lower position.

70 The engine draws in a charge at its first outstroke, compresses the charge during its first return stroke, ignites the charge during its second outstroke, and exhausts the products of combustion during the second
75 return stroke. The exhaust-valve remains closed during the compressing-stroke, as no pressure can be applied to open it unless the gases in the cylinder have a pressure greater than that of the atmosphere when the piston
80 is full out. If the valve T is raised by the spindle *k* so as to nearly close the passage *h*, then very little compressed mixture can find its way to the upper part of the cylinder T', so that a slight increase of speed above the
85 normal will effect the raising of the valve T. The spindle *k* is therefore adapted to regulate the working speed of the engine within certain limits by raising the valve, and thereby
90 partially closing the opening from the passage *h* into the cylinder T', and the same result may be obtained by any other approved means for partially closing the said passage *h*.

The pressure of the air in the chamber U
95 forms an elastic cushion or spring, which prevents the valve T from rising too rapidly, and metallic springs may be used to assist its upward or downward movements in addition, if
100 desired.

What I claim is—

1. The combination, with a gas-engine cylinder, of an exhaust-valve adapted to be opened by the terminal pressure of the burned
105 charge, an admission-valve for gas and air operated by the pressure of the atmosphere, and an ignition device provided with a regulator operated by the pressure of the charge in the cylinder, whereby the engine may be wholly operated and controlled by the said
110 automatic valves and without any valve-gearing intervening between its crank-shaft and the exhaust and admission valves and ignitor, substantially as set forth.

2. The combination, with a gas-engine cylinder provided with an exhaust-port adapted
115 to be uncovered by the engine-piston, of an exhaust-valve opening into the said cylinder, a chamber below the valve and connected with the said exhaust-port, and a piston adapted to open the exhaust-valve when the
120 motion of the engine-piston admits the burned gases from the cylinder into the said chamber, substantially as set forth.

3. The combination, with an exhaust-valve opening into the gas-engine cylinder, of a
125 chamber arranged below the valve and also connected with the said cylinder, a piston connected to the valve-spindle and normally closing the outlet from the said chamber, and a
130 spring for closing the exhaust-valve, substantially as and for the purpose set forth.

4. In a gas-engine, the combination, with an exhaust-valve opening into the engine-cyl-

inder, of a chamber arranged below the valve and also connected with the said cylinder, a piston connected to the valve-spindle and normally closing the outlet from the said chamber, and a dash-pot for preventing the too sudden movement of the valve, substantially as and for the purpose set forth.

5. In a gas-engine, the combination, with the exhaust-valve casing provided with the port A, the chamber B, the guide I, the cylinder G, and the outlet H, of the exhaust-valve provided with a spindle sliding in the said guide, and a piston secured on the valve-spindle and sliding in the cylinder G and provided with a dash-pot cylinder inclosing the end of the said guide, substantially as and for the purpose set forth.

6. In a gas-engine, the combination, with the admission-valve, of the gas-valve sliding on the end of the admission-valve spindle, the valve-seat provided with the air-passage Q, the gas-passages *a*, *b*, and *Q'*, the gas-inlet pipe R, and the spring *c*, substantially as and for the purpose set forth.

7. The combination, with a gas-engine cylinder, of an ignition-tube operatively connected to the cylinder, and an automatic ignition-regulating valve interposed between the said cylinder and tube and adapted to prevent the passage of the igniting-flame from the tube to the cylinder when the speed of the engine becomes too great, substantially as set forth.

8. The combination, with a gas-engine cylinder, of an ignition-tube operatively connected to the said cylinder, a valve-cylinder interposed between the said engine cylinder and tube and provided with passages, substantially as set forth, and an automatic piston-

valve sliding in the valve-cylinder and provided with grooves and adapted to prevent the passage of the igniting-flame to the cylinder when the speed of the engine becomes too great, substantially as set forth.

9. The combination, with the valve-cylinder T', provided with passages, substantially as set forth, of a grooved piston-valve sliding in the cylinder, and means for varying the area of the passage leading to the upper end of the cylinder, whereby the valve may be caused to rise automatically and cut off the passage for flame at various speeds of the engine, substantially as set forth.

10. The combination, with the valve-cylinder T', provided with passages, substantially as set forth, of the automatic piston-valve provided with a deep groove *d* and a shallow groove *i* and adapted to cut off the passage of flame from the ignitor to the engine-cylinder and to permit the passage of gas when the speed of the engine exceeds a certain limit, substantially as set forth.

11. The combination, with the valve-cylinder T', provided with passages, substantially as set forth, of the grooved piston-valve sliding in the said cylinder and adapted to prevent the passage of the igniting-flame into the cylinder when raised by the pressure under it, and the screwed spindle for raising the valve in the cylinder and thereby adapting it to be operated by various pressures of gas underneath it, substantially as set forth.

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

FREDERICK WILLIAM LANCHESTER.

Witnesses:

DUGALD CLERK,
WILLIAM EVANS.