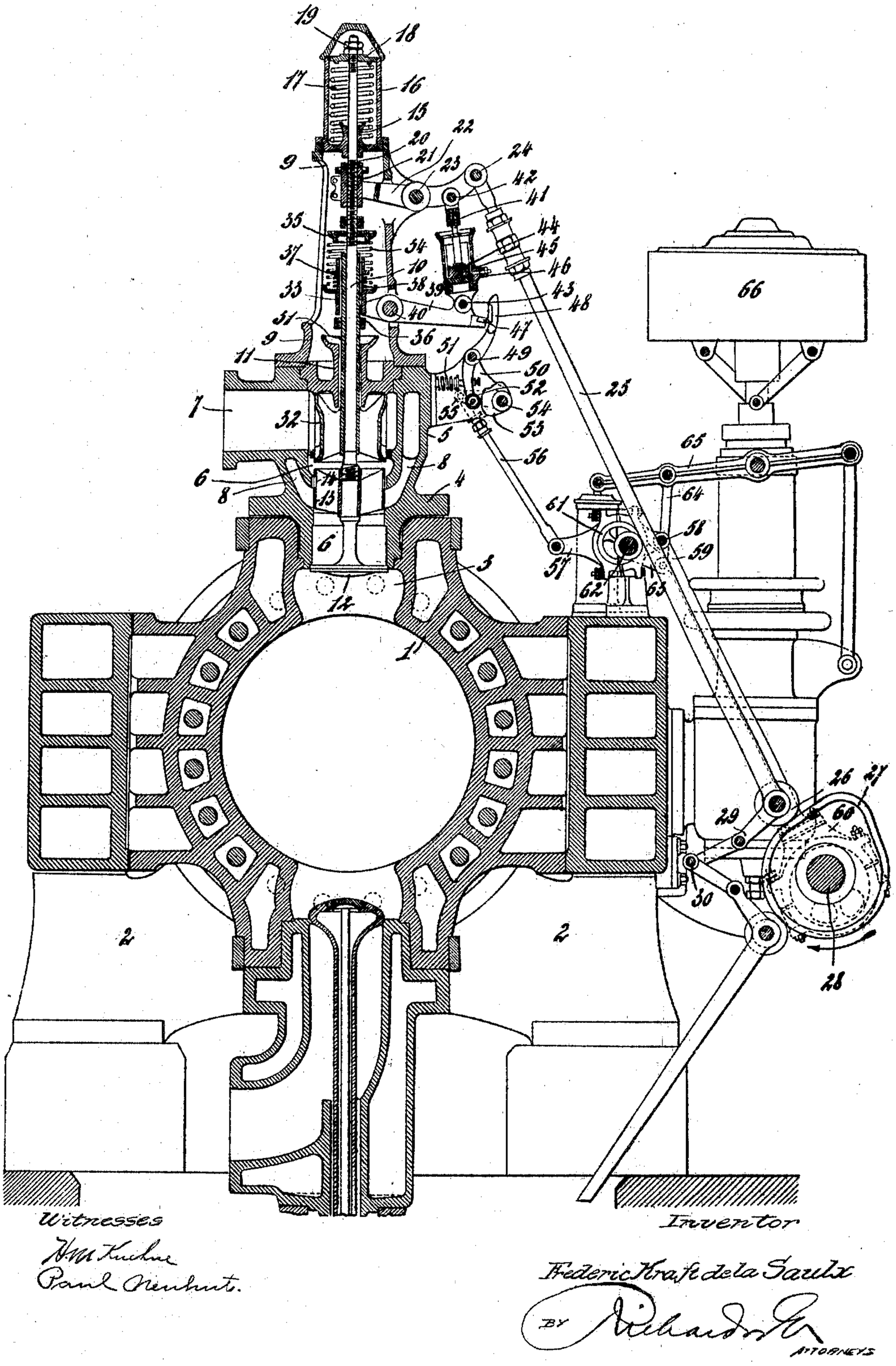
No. 817,193. PATENTED APR. 10. 1906.

F. K. DE LA SAULX.

SUPPLY CONTROLLING MECHANISM FOR GAS ENGINES.

APPLICATION FILED MAY 17, 1904.



Witnesses

W. A. Kuehne

Paul Nienhuis.

Inventor

Frederic Krafft de la Saulx

By Richards & Co

Attorneys

UNITED STATES PATENT OFFICE.

FREDERIC KRAFT DE LA SAULX, OF SERAING, NEAR LIEGE, BELGIUM.

SUPPLY-CONTROLLING MECHANISM FOR GAS-ENGINES.

No. 817,193. Specification of Letters Patent. Patented April 10, 1906.

Application filed May 17, 1904. Serial No. 208,424.

To all whom it may concern:

Be it known that I, FREDERIC KRAFT DE LA SAULX, engineer, a subject of the King of Belgium, residing at Seraing, near Liege, in the Kingdom of Belgium, have invented certain new and useful Improvements in Supply-Controlling Mechanism for Gas-Engines, of which the following is a specification.

This invention relates to means for admitting the air-and-gas mixture and controlling the gas-supply in gas-engines working with a variable charge of explosive mixture and with constant compression.

The purpose of the invention is to provide means for admitting to the cylinder of a "four-cycle explosive-engine" at first air only from the beginning of the suction-stroke to a variable point of said stroke and then an explosive mixture of constant composition from said point to the end of said stroke, so as to maintain the best mixture on the igniters located in the cover of the cylinder, and thus providing for a good ignition of the smallest charges.

The invention essentially consists in the combination of a gas-valve arranged concentrically with a mixture-inlet valve with means for controlling the opening of the gas-valve by the governor of the engine, the extent of opening of the gas-inlet valve being limited by the extent of opening of the mixture-inlet valve by aid of a suitable connection between the two valves in such a manner that whatever may be the point of the suction-stroke at which the opening of the gas-valve takes place the composition of the mixture admitted to the cylinder remains the same.

The invention further consists in the special combinations of parts as hereinafter fully described, and pointed out in the appended claims.

The annexed drawing gives a section through the cylinder of a gas-engine, said figure showing the special arrangement of supply mechanism according to the invention.

The engine may be of any suitable construction. Therefore all the parts which are not directly concerned by the invention have been suppressed or are not shown, said construction being well known to those skilled in the art.

In the drawing, 1 is the cylinder of the engine, suitably mounted on a frame 2. Said cylinder is provided with an inlet-opening 3. Above said inlet-opening a valve-case 5 is fixed on the cylinder by aid of a flange 4. Said valve-case is provided with a central duct 6, communicating with a connection 7, to which the gas-pipe (not shown) is suitably connected. The valve-case 5, further, is provided with a chamber 8, concentrically arranged with regard to the central duct 6 and connected in any appropriate manner to an air-pipe or air-inlet. (Not shown.)

On the valve-case 5 is mounted a pillar 9, through which a rod 10 is guided, said rod passing through a guide 11 and being provided at its lower end with a valve 12, adapted to close the inlet 3 in the cylinder. A cylindrical valve 13 is also fixed on the rod 10, and consequently rigidly connected with valve 12, and is adapted to close the annular opening of the chamber 8 in the central duct 6. Said cylindrical valve 13 is fitted with ports 14, adapted to establish the communication between the air-chamber 8 and the central duct 6 when the cylindrical valve 13 is in a lowered position. The rod 10, carrying the two valves 12 and 13, is guided at its upper end in the bottom 15 of a box 16, carried on the pillar 9. A spring 17 is placed in said box, one end of said spring bearing on the bottom 15 of the box 16 and the other end against a plate 18, fixed on the rod 10 by nuts 19. The spring 17 holds normally the valves 12 and 13 in the closed position, as shown on the drawing. The rod 10 is provided with a screw-threaded portion 20, carrying a sleeve 21, which may be acted upon by the end of a swing-lever 22, rocking on a pivot 23, suitably supported on the pillar 9. The second end of the swing-lever 22 is connected by a pivot 24 to a rod 25, fitted at its end with a roller 26, resting against a cam 27, keyed on a shaft 28. Said shaft is rotated, as usual, from the main shaft of the engine at half the speed of the main shaft. The end of the rod 25 is held in position with regard to the cam 27 by aid of a jointed lever 29, rocking on a pin 30, suitably supported on the frame of the engine. As it will be seen, the roller 26 is consequently held against the cam 27 by aid of the spring 17. At the moment that the cam 27 acts upon the roller 26 and lifts the same the swing-lever 22 is acted upon by the rod 25, thus causing the rod 10 to effect a downward movement and opening simultaneously the valves 12 and 13.

The rod 10 is passed through a hollow rod 31, adapted to slide freely upon the rod 10 and fitted at its lower end with a valve 32,

which in the position shown on the drawing cuts off the communication between the gas-duct 7 and the central duct 6. The hollow rod 31 is provided with a sliding sleeve 33, against which rests the end of a spring 34, the other end of which rests against a plate 35, fixed on the screw-threaded portion of the rod 10. The downward movement of the sleeve 33 on the hollow rod 31 is prevented by a nut 36 in such a manner that at the moment the swing-lever 22 causes the downward movement of the rod 10 the spring 34 will be compressed by the plate 35. Said spring pressing against the sleeve 33 tends to cause a downward movement of the hollow rod 31, and consequently the valve 32 should be moved away from its seat if it was free to do so, which is not the case, as will appear hereinafter. The hollow rod 31 is further provided at its upper end with a sleeve 37, firmly attached thereto, between which and the sleeve 33 a second spring 38 is placed, the special function of which will be later explained.

The sleeve 33 may be acted upon by a swing-lever 39, rocking on a pin 40, suitably supported on the pillar 9. The said swing-lever is connected to the swing-lever 22, already described, by aid of an adjustable device 41, adapted to be lengthened or shortened and pivoted at 42 on the swing-lever 39. The said adjustable device 41 is composed of a rod 41, a piston 44, and a dash-pot cylinder 45, in which moves the piston 44. The dash-pot cylinder is fitted with a small adjustable outlet-opening 46 for air. The end 47 of the swing-lever 39 may be caught under a hook 48, pivoted at 49 on a support 50. The said hook 48 is acted upon by a spring 51, which holds the lower arm of the hook in contact through a roller 52 with a cam 53, mounted on a pin 54, provided with an arm 55, to which is pivoted a rod 56, connected to one end of a swing-lever 57, the second end of which is pivoted at 58 to the rod 59 of an eccentric 60 on shaft 28.

The swing-lever 57 is mounted on an eccentric 61 on a little shaft 62, rigidly connected to a lever 63, which is connected, through a rod 64, to the lever 65 of the governor 66 of the engine.

The operation is as follows: If the engine is running normally at the beginning of the suction-stroke, when the cam 27 acts upon the roller 26 the hook 48 is engaged with the end of the swing-lever 39. Consequently during the time that said cam 27 lifts the rod 25 and rocks the swing-lever 22 the latter causes the downward movement of the rod 10; thus causing only the opening of valves 12 and 13. Air is consequently sucked into the cylinder. As a consequence of the rocking of the swing-lever 22 the spring 34, acting on the sleeve 33, is compressed, as above described, and the rod 41 moves the piston 44 in the dash-pot cylinder 45. At the momet that the gas supply must take place the cam 53 is actuated through lever 55, rod 56, and the swing-lever 57 under the action of the eccentric 60. The cam 53, acting on the roller 52, causes the hook 48 to be disengaged from the end 47 of the swing-lever. The swing-lever 39 being released may be oscillated under the pressure of the spring 34 acting on the sleeve 33 in such a manner that said sleeve causes the downward movement of the hollow rod 31 and the opening of the gas valve 32, while the adjustable device 41 44 45 returns to its normal length on account of the lifting of the corresponding end of the swing-lever 39. The amount of opening of the valve 32 consequently varies with the displacement to which the piston 44 has been subjected in the dash-pot cylinder 45 at the moment of oscillation of the swing-lever 22. As the proportions of the arms of the swing-levers 22 and 39 are such that the openings of the valves 32 and 12 are in the proper ratio for giving a suitable gas mixture when the length of the device 41 44 45 is minimum, it will be obvious that whatever may be the moment at which the hook 48 is released the valve 32 will always open exactly the desired amount to obtain the same composition of mixture. The action of the governor on the gas-valve 32 is effected by the eccentric 61. The rising or falling of the governor causes the shaft 62 to be partially rotated through the rod 64 and the lever 63. The said rotation causes a displacement of the eccentric 61, which produces a slight variation in the position of the center of oscillation of the swing-lever 57. This variation of position has the same effect as a modification in the length of the rod 56 in such a manner that the moment at which the hook 47 is acted upon by the cam 53 takes place sooner or later, according to the action of the governor. At the end of the suction-stroke when the supply is to be cut off the roller 26 follows the cam 27 and the spring 17 lifts the rod 10, closing the valves 12 and 13. The movement of the rod 10 is transmitted, through the swing-lever 22, the adjustable rod 41, and the dash-pot 44 45, to the swing-lever 39, which acts upon the hollow rod 31, closing simultaneously the gas-valve 32.

It will be observed that the swing-lever 39 does not act directly on the hollow rod 31, but only by aid of the sleeve 33 and spring 38, interposed between said sleeve and sleeve 37, mounted at the end of the hollow rod 31. This arrangement has the special purpose of preventing the valve 12 from being incompletely closed in case the valve 32 should be brought back upon its seat before the said valve 12 had reached its own seat. Should this occur, owing to the interposition of the spring 38 between the sleeves 33 and 37, at the moment when valve 32 closes, the spring

17 should easily compress the spring 38, thus allowing the slight additional movement of the swing-lever 39 required in order that the valve 12 may be brought back upon its seat. It will further be observed that the amount of opening of the valve 32 depends upon the amplitude of movement of the hollow rod 31, which movement is given by the distance comprised between the piston 44 and the bottom of the cylinder 45 of the dash-pot at the moment that the hook 48 is disengaged from the end of the swing-lever. The air contained in the dash-pot is expelled at this moment through the adjustable opening 46 and acts as a buffer to soften the impact of the pieces.

What I claim is—

1. In a supply-controlling mechanism for gas-engines the combination with the cylinder, of an inlet-opening in said cylinder, a mixture-inlet valve closing said inlet-opening, an air-supply valve rigidly connected to the mixture-inlet valve, a gas-valve arranged concentrically with the mixture-inlet valve, a governor, means for controlling the moment of opening of the gas-valve by the governor and a connection between the gas-valve and the mixture-inlet valve so as to limit the amount of opening of the gas-valve according to the amount of opening of the mixture-inlet valve, substantially as described and for the purpose set forth.

2. In a supply-controlling mechanism for gas-engines, the combination with the cylinder of an inlet-opening in said cylinder, a mixture-inlet valve closing said inlet-opening, an air-supply valve rigidly connected to the mixture-inlet valve, a gas-valve arranged concentrically with the mixture-inlet valve, a governor, means for controlling the moment of opening of the gas-valve by the governor, and a device connecting the gas-valve and the mixture-inlet valve in such a manner that the said valves may be opened independently and closed simultaneously the amount of opening of the gas-valve being limited by the amount of opening of the mixture-inlet valve, substantially as described and for the purpose set forth.

3. In a supply-controlling mechanism for gas-engines, the combination with the cylinder of an inlet-opening in said cylinder, a mixture-inlet valve closing said inlet-opening, a rod carrying said mixture-inlet valve, an air-supply valve mounted on said rod, a swing-lever actuating the rod, means for oscillating the said swing-lever, a spring holding normally the valve in its closed position, a gas-valve, a spring adapted to move said gas-valve rod downward when the mixture-inlet valve is moved downward, a swing-lever acting on the gas-valve rod, a governor, means acted upon by the governor and acting on the said swing-lever to prevent the downward movement of the gas-valve when the mixture-inlet valve is moved downward and a connection between the two swing-levers whereby the mixture-inlet valve and the gas-valve may be opened separately and independently but are closed simultaneously when the mixture-inlet valve closes, substantially as described and for the purpose set forth.

4. In a supply-controlling mechanism for gas-engines, the combination with the cylinder of an inlet-opening in said cylinder, a mixture-inlet valve closing said inlet-opening, a rod carrying said mixture-inlet valve, an air-supply valve mounted on said rod, a swing-lever actuating the mixture-valve rod, a spring holding normally the mixture-inlet valve in its closed position, means acting on the swing-lever and adapted to open the mixture-inlet valve, a gas-valve arranged concentrically with the mixture-inlet valve, a hollow rod through which passes the rod of the mixture-inlet valve, a spring acting on said hollow rod and adapted to be compressed when the mixture-inlet-valve rod is moved downward, a second swing-lever acting on the said hollow rod, a hook adapted to hold the second swing-lever in a given position, a governor, a transmitting device between the governor and the hook to disengage the hook from the swing-lever under the action of the governor, a rod pivoted to the swing-lever actuating the mixture-inlet valve, a piston carried by the said rod and a dash-pot cylinder pivoted on the swing-lever actuating the gas-valve substantially as described and for the purpose set forth.

5. In a supply-controlling mechanism for gas-engines, the combination with the cylinder of an inlet-opening in said cylinder, a mixture-inlet valve closing said opening, an air-supply valve moved simultaneously with the mixture-inlet valve, a gas-valve adapted to be opened independently but closed simultaneously with the mixture-inlet valve, means whereby the amount of opening of the gas-valve is limited by the amount of opening of the mixture-inlet valve, actuating means for the mixture-inlet valve, a governor and means controlled by the governor for varying the moment of opening of the gas-valve substantially as described and for the purpose set forth.

6. In a supply-controlling mechanism for gas-engines, the combination with the cylinder of an inlet-opening in said cylinder, a mixture-inlet valve, closing said opening, an air-supply valve moved simultaneously with the mixture-inlet valve, a gas-valve adapted to be opened independently but closed simultaneously with the mixture-inlet valve, means whereby the amount of opening of the gas-valve is limited by the amount of opening of the mixture-inlet valve, means actuating the mixture-inlet valve so as to hold said valve in its open position during the whole of the suction-stroke, a transmitting device acting on

the gas-valve to open said valve at a given moment of the suction-stroke, a governor and means controlled by said governor and acting on the said transmitting device in order to cause the opening of the gas-valve to take place sooner or later according to the action of the governor, substantially as described and for the purpose set forth.

7. In a supply-controlling mechanism for gas-engines, the combination with the cylinder of an inlet-opening in said cylinder, a mixture-inlet valve closing said inlet-opening, an air-supply valve moved simultaneously with the mixture-inlet valve, a gas-valve adapted to be opened independently but closed simultaneously with the mixture-inlet valve, means whereby the amount of opening of the gas-valve is controlled by the amount of opening of the mixture-inlet valve, a swing-lever acting on the gas-valve to hold said valve upon its seat, a hook adapted to engage with the said swing-lever, a cam acting on the said hook to disengage the same from the swing-lever, a shaft carrying the said cam, a lever adapted to partially rotate the cam-shaft, a rod connected at one end to the said lever, a swing-lever connected to the said rod, means actuating the swing-lever, an eccentric on which the said swing-lever is mounted, a governor and means controlled by the governor, to vary the position of the eccentric so as to cause a variation in the position of the center of oscillation of the swing-lever, substantially as described and for the purpose set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

FREDERIC KRAFT DE LA SAULX.

Witnesses:
H. SAVAGE,
PAUL DE SCHEUPIER.