G. B. PETSCHE.

GAS ENGINE ADMISSION VALVE.

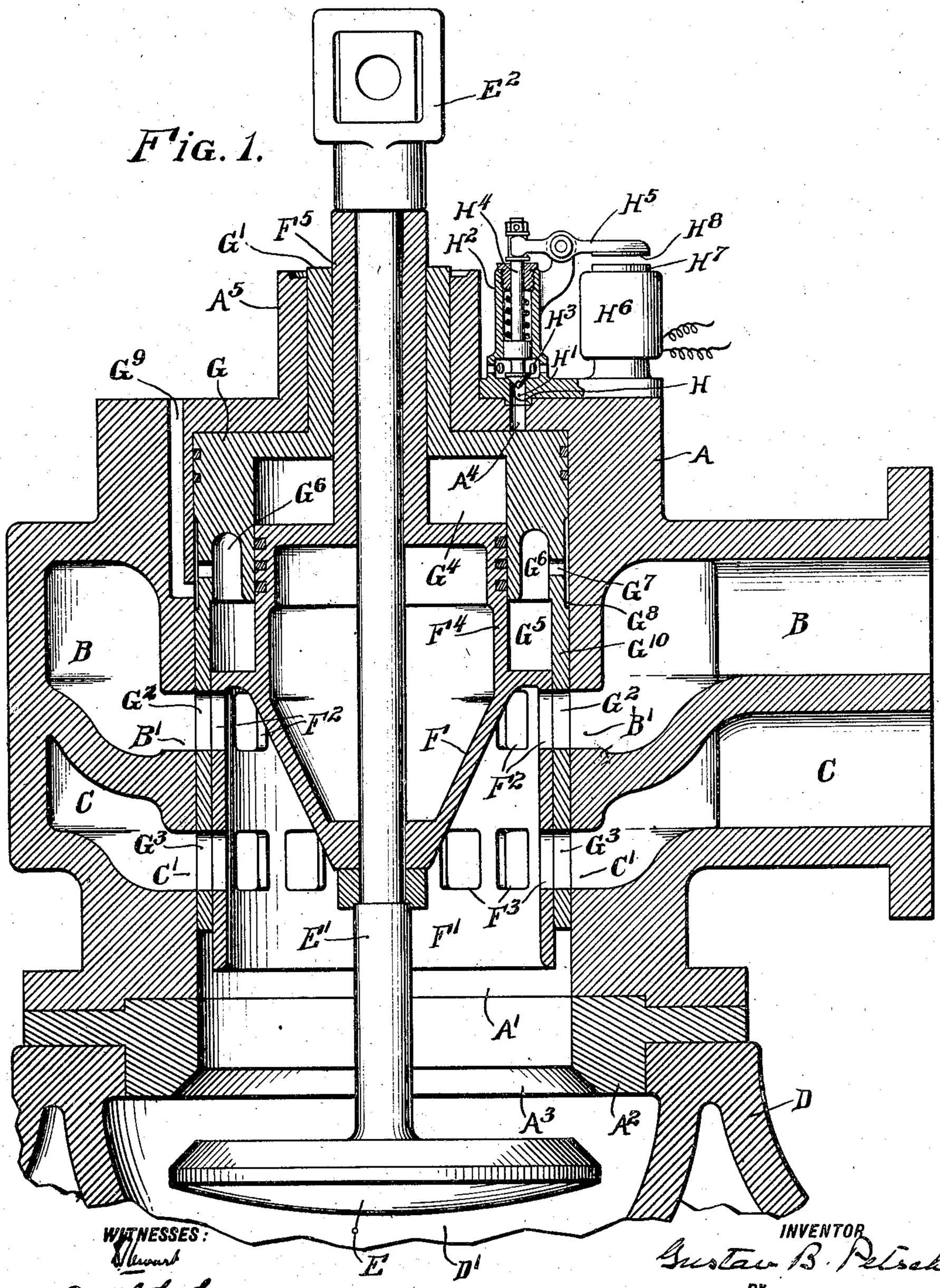
APPLICATION FILED OCT. 26, 1907.

935,323.

Patented Sept. 28, 1909.

2 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:

D. Webster, Jr.

INVENTOR

Gustave B. Petsche

BY

Francis D. Chamberlain

his ATTORNEY.

G. B. PETSCHE.

GAS ENGINE ADMISSION VALVE.

APPLICATION FILED OCT. 26, 1907.

935,323.

Patented Sept. 28, 1909.

2 SHEETS—SHEET 2.

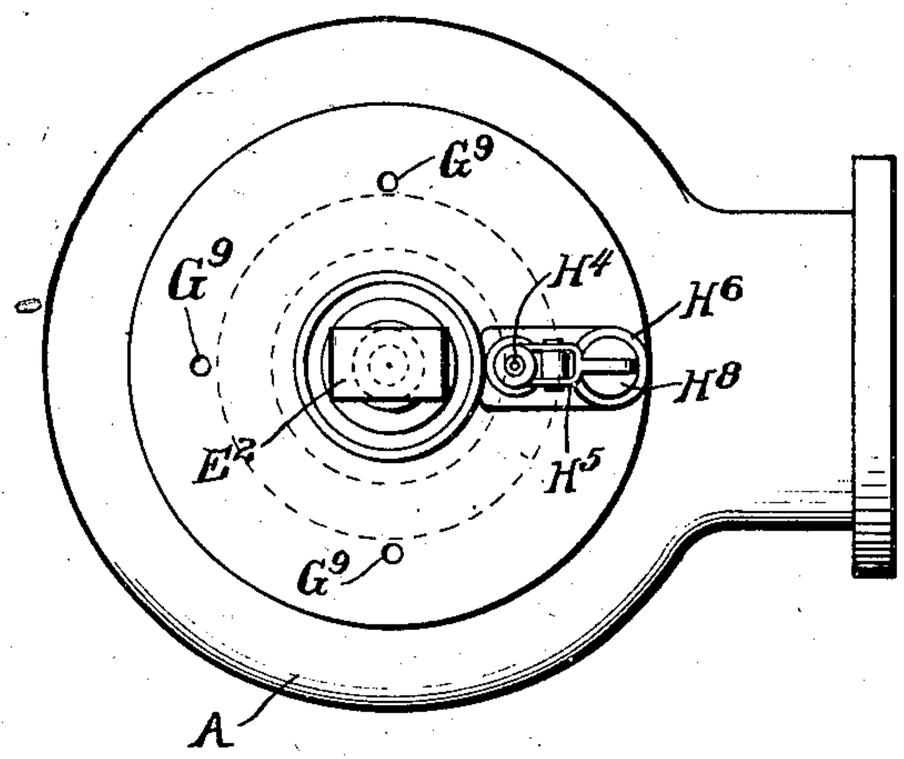
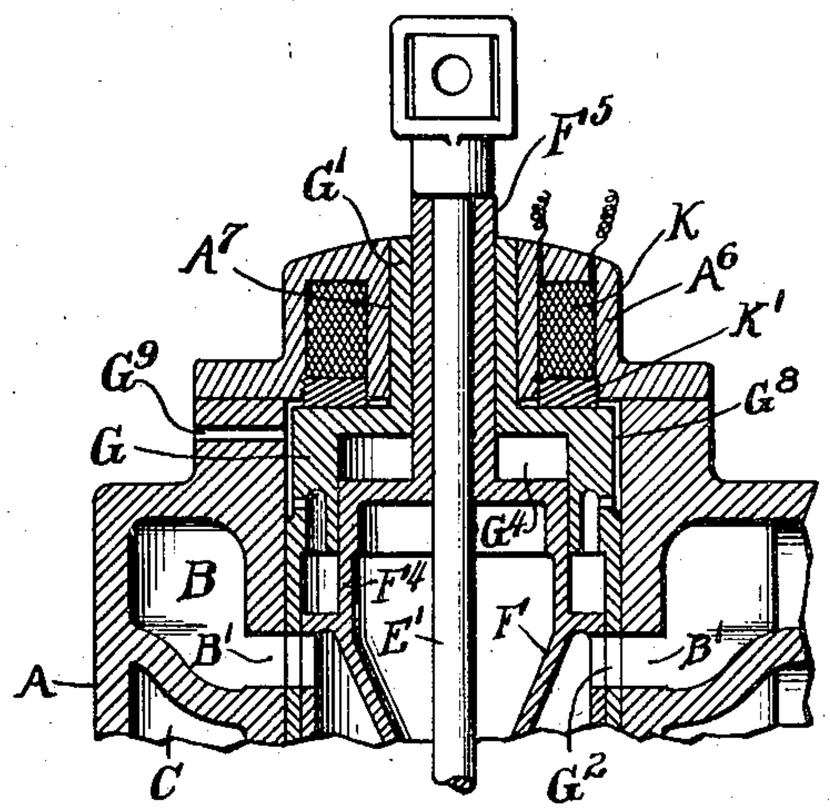


FIG. 2.

FIG. 3.

FIG. 4.



WITNESSES:

E. Howard

D. W. Webster, Jr.

INVENTOR

Gustav B. Petsche

BY

Francis D. Chambers

his ATTORNEY.

UNITED STATES PATENT OFFICE.

GUSTAV B. PETSCHE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO SOUTHWARK FOUNDRY AND MACHINE COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

GAS-ENGINE ADMISSION-VALVE.

935,323. Specification of Letters Patent. Patented Sept. 28, 1909.

Application filed October 26, 1907. Serial No. 399,286.

To all whom it may concern:

Be it known that I, GUSTAV B. PETSCHE, a subject of the Emperor of Germany, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Gas-Engine Admission-Valves, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

The present invention relates to the admission valves of gas engines, and particularly to that type of admission valve in which the admission valve structure is provided with a mixing chamber having air and gas inlet ports and an outlet port communicating with the inlet port proper of the corresponding combustion chamber, and in which the outlet port from the mixing chamber is controlled by a main valve and the admission of air and gas to the mixing chamber is controlled by a distribution valve.

The object of the present invention is to provide simple and effective mechanism by which the movement of the main valve into and out of the open position tends to give corresponding movements to the distribution valve, and the provision of reliable and easily regulated means for controlling the movements of the distribution valve.

In carrying out the invention I provide a structure in which the main and distribution valves are connected by a piston carried by the one and a cylinder having a closed end carried by the other into which the piston extends, whereby a vacuum is formed in the cylinder when the main valve is moved without a corresponding movement of the distribution valve. In addition, I also provide means adapted for ready governor control for governing the movement of the distribution valve when the main valve opens. By preference, the last mentioned mechanism includes means by which the distribution valve is locked or held in the initial position until the time at which it is proper for the distribution valve to move, and is then allowed to move freely to the extent of its movement.

The locking or holding means may be constructed in various ways. In one form of the invention, which in some respects I regard as the preferable one, the locking means comprises a closed cylinder end formed in the valve structure or a piston formed on the distribution valve and entering said chamber and a governor controlled pilot valve for admitting air at the proper time to the closed cylinder end. The pilot valve or other locking means may well be electrically controlled, as by the means disclosed and claimed in my copending application, Serial No. 399,285, filed of even date herewith, but I do not regard my invention as being limited in all of its aspects to any particular form of pilot valve controlling means.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of my invention, however, reference may be had to the accompanying drawings and descriptive matter in which I have illustrated and described various forms in which the invention may be embodied.

In the drawings, Figure 1 is a sectional elevation of one form of my invention. Fig. 2 is a plan view on a smaller scale of the valve shown in Fig. 1. Fig. 3 is a view similar to Fig. 1, showing a modified construction, and Fig. 4 is a partial view taken similarly to Fig. 1, showing a third form of the invention.

In the drawings, and referring first to the construction shown in Figs. 1 and 2, A represents the valve casing which is connected to the engine structure D through an annular seat member A^2. The admission valve casing A is formed with a cylindrical chamber A′ the lower portion of which forms a mixing chamber which communicates at the lower end of the valve seat member with the main inlet port D′ of the corresponding combustion chamber. The valve casing is provided with gas and air inlet passages B and C respectively which extend around the mixing chamber and communicate through B′ and C′ with the mixing chamber. Communication between the mixing chamber A′ and the inlet passage D′ is controlled by the main valve E adapted to seat on the seat A^3 of the valve seat member A^2. The stem E′ of the main valve is provided at its upper end with suitable connections E^2 by which it may be connected to the engine valve gear. The stem E′ has

secured on it a member F provided with a cylindrical portion F′ having ports F^2 and F^3 adapted to be brought into and out of register with the ports B′ and C′ as the valve E is in the open position shown in Fig. 1 or is in the closed position. The member F is provided above the portion F′ with a reduced piston portion F^4, and, in the form shown, has a guiding extension F^5 projecting upward from the upper end of the piston F^4.

The cylindrical portion F′ of the member F is separated from the wall of the mixing chamber by the cylindrical shell portion G^{10} of the distribution or fuel supply regulating valve G which is provided at its upper end with the tubular extension G′ surrounding the extension F^5 and fitting in the valve casing A^5. The upper end of the distribution valve forms a piston portion which is slidingly fitted in the piston chamber formed by the upper end of the chamber A′. The member G has formed in it a chamber G^4 in which the piston F^4 is slidingly fitted. The cylindrical shell G^{10} is provided with ports G^2 and G^3 which, when the parts are in the position shown in Fig. 1, with the main valve open and the distribution valve in the closed position, are in register with the ports B′, F^2, and the ports C′ and F^3, respectively. For the purpose of avoiding alternate compression and expansion in the chamber G^5 located above the portion F′ of the member F and surrounding the piston F^4, a communicating annular passage G^6 is formed in the member G, and radial ports G^7 lead from the passage G^6 to an annular passage G^8 formed in the periphery of the member G. Air is freely admitted to the passage G^8 through one or more ports G^9 formed in the valve casing A. The admission of air to the piston chamber formed by the upper portion of the chamber A′ is controlled by means of the pilot valve member H^4 adapted to close the port H′ formed in the pilot valve H, and in register with the port A^4 leading through the upper wall of the valve casing into the upper end of the chamber A′. The pilot valve H^4, in the form shown in Fig. 1, is slidingly supported in the frame extension H^2, and is lifted at the proper time through the lever H^5 carrying at one end the armature H^8 which is attracted toward the core H^7 when the electrical winding H^6 is supplied with current.

The operation of the structure shown in Fig. 1 is as follows: The inlet valve E is alternately moved away from and back to the seat A^3 by the regular engine valve gear, so that the valve opens at one predetermined stage in the engine movement and closes at another predetermined stage in the engine movement. It will be understood by those skilled in the art that suitable means may be provided for adjusting the points in the engine piston movement at which the main valve opens and closes. The movement of the main valve from the open to the closed position does not move the distribution valve so long as the valve H^4 remains on its seat on account of the excess in area of the upper end of the valve G over the area of the corresponding end of the piston F^4. When, however, the winding H^6 is energized and the armature H^8 attracted with corresponding opening of the pilot valve, air enters the upper end of the chamber A′ and the valve G is immediately moved inward on account of the vacuum which has been formed in the chamber G^4 by the previously occurring inward movement of the piston F^4. Although in speaking of a vacuum in the chamber G^4, it will be understood that this expression is used relatively. By preference I allow a slight leakage of air into the chamber G^4 sufficient to cushion the movement of the distribution valve. By preference, the ports A^4 and H′ are large enough in cross-section so that practically no wire drawing takes place through them and therefore the valve G is entirely free to move as soon as the valve H^4 lifts. When the valve G drops it cuts off communication between the ports F^2 and B′. When the valve E is thereafter returned to the closed position the distribution valve G is returned with it. The pilot valve H^4 then serves as a check valve permitting the air in the chamber A′ above the valve G to flow out, the winding H^6 being deënergized by this time. As atmospheric air can pass freely into and out of the chamber G^5 through ports G^7, G^8 and G^9 there is no tendency to suck the fuel mixture into the space G^5 when the main valve opens. This is of importance, particularly as it avoids any fouling by the fuel mixture of the sliding contact surfaces of the upper ends of members G and F, and thereby facilitates proper lubrication of the contact surfaces.

The valve of Fig. 3 differs from that of Figs. 1 and 2 primarily in the fact that in the construction of Fig. 3 the distribution valve is held in its initial position by a sliding bolt J which is mounted in a slideway formed in the upper end of the valve casing and has its inner end shaped to enter a groove G^{12} formed in the stem G′ of the valve G and thereby latch the latter in the initial position. The bolt J may be operated in any suitable manner. For instance, as shown, it may have attached to its outer end an armature J′ normally spring pressed inward by the spring J^4, but moved outward at the proper time by the pull of the electrical winding J^2 when the latter is energized. The winding J^2 is supported in a casing J^3, which may be attached to the valve casing. The upper end of the distribution valve G in this form of my inven-

tion does not make a close fit in the upper end of the mixing chamber of the valve, and there is no air lock action holding the member G in the initial upper position. In this form of my invention, also, the operation of the distribution valve is as follows: When the valve G is held in the initial position air can pass freely from the air inlet passage C to the combustion chamber of the engine, and at this time communication is cut off between the mixing chamber and the gas inlet passage B. When the distribution valve is permitted to move out of the initial position, the bolt J being withdrawn, the admission of air into the mixing chamber from the passage G^9 is throttled, and gas is permitted to flow from the passage B into the mixing chamber through the ports G^2. In this form of my invention also, the ported portion F′ of the member F of Fig. 1 is omitted. On this account, no ports G^8 are provided in the member G, as in the construction of Fig. 1.

The construction shown in Fig. 4 differs from that of Fig. 1 merely in the means employed for locking the distribution valve in the initial outer position. In this form of the invention, as in that of Fig. 2, the upper end of the member G does not fit tightly in the upper end of the mixing chamber but is held in the initial position when desired by magnetic action. The upper end of the valve casing proper is closed by a cap A^6 having located in it an annular winding K which surrounds a central boss A^7 projecting downward from the upper end of the member A^6, the boss surrounding the reduced outer end G′ of the member G. The winding K is retained in place by an annular member K′ of non-magnetic material, which is threaded into the cap member A^6. In this form of the invention, the upper end of the member G forms in effect the armature of an electro-magnet, and is attracted and held in the position shown in Fig. 4 so long as the winding K remains energized. When the winding K is deënergized the distribution valve member G is free to move downward under the action of the piston F^4 and vacuum chamber G^4 connection, as in the other constructions.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In combination in an admission valve structure for gas engines formed with main and distribution valve controlled ports, a main valve, a distribution valve, means tending to move the distribution valve away from an initial position when the main valve is open, said means comprising a piston carried by one of said valves which enters a piston chamber formed in the other valve, the piston and piston chamber being so arranged that when the main valve is moved to the open position and the distribution valve remains stationary, a vacuum is formed in said chamber, and means for releasably holding the distribution valve in said initial position.

2. In combination in an admission valve structure for gas engines formed with main and distribution valve controlled ports, a main valve, a distribution valve, means tending to move the distribution valve away from its initial position when the main valve is open, said means comprising a piston carried by one of said valves which enters a piston chamber formed in the other valve, the piston and piston chamber being so arranged that when the main valve is moved into the open position and the distribution valve remains stationary, a vacuum is formed in said chamber, and electrically controlled means for releasably holding the distribution valve in the initial position.

3. In combination in an admission valve structure for gas engines formed with main and distribution valve controlled ports, a main valve, a distribution valve, means tending to move the distribution valve away from its initial position when the main valve is open, said means comprising a piston carried by one of said valves which enters a piston chamber formed in the other valve, the piston and piston chamber being so arranged that when the main valve is moved into the open position and the distribution valve remains stationary, a vacuum is formed in said chamber, and means for releasably holding the distribution valve in its initial position, said valves being provided with surfaces which engage when the main valve is off its seat and the distribution valve is out of its initial position, whereby when the main valve is returned to its seat the distribution valve is returned to its initial position.

4. In combination an admission valve structure for gas engines formed with main and distribution valve controlled ports and with a piston chamber having a port leading into it, a main valve, a distribution valve, means tending to move the distribution valve away from the initial position when the main valve is moved off its seat, said means comprising a piston carried by one of said valves which enters the piston chamber formed in the other valve, the piston and piston chamber being so arranged that when the main valve is moved off its seat and the distribution valve remains stationary a vacuum is formed in said chamber, and means for releasably holding the distribution valve in the initial position, said means comprising a piston portion carried by the distribution valve which enters the first mentioned piston chamber, and a valve controlling the admission of air through the port leading to said first mentioned piston chamber.

5. In combination in an admission valve structure for gas engines formed with a mixing chamber and with inlet ports leading into said chamber and outlet ports leading away from the chamber, and formed also with a piston chamber and with a port leading to said piston chamber from the atmosphere, a main valve controlling the outlet port and a distribution valve controlling the inlet ports, one of said valves being provided with a piston chamber, means tending to move the distribution valve away from the initial position when the main valve is moved off its seat, said means comprising a piston carried by the other of said valves which enters the piston chamber formed in said one valve, the piston and chamber being so arranged that when the main valve is moved off its seat and the distribution valve remains stationary a vacuum is formed in said chamber, and means for releasably holding the distribution valve in its initial position, said means comprising a valve controlling the port leading to the first mentioned piston chamber and arranged to serve as a non-return valve normally preventing the admission of air to said chamber but allowing it to escape freely therefrom, and means for opening said valve to allow air to enter said chamber.

6. In combination, an admission valve structure for gas engines formed with main and distribution valve controlled ports, a main valve E having secured to it a member F formed with a piston portion F^4, and a cylindrical ported portion F′ of larger diameter than the piston portion F^4 at one end of the piston portion F^4, a distribution valve G provided with a cylindrical ported portion G^{10} surrounding said cylindrical portion F′ and formed with a piston chamber G^4 closed at one end and into the other end of which the piston F^4 extends and is fitted, said valve structure and member G being provided with ports at all times freely admitting air into the space in the member G surrounding the member F^4 and at the adjacent end of the cylindrical portion F′.

GUSTAV B. PETSCHE.

Witnesses:
ARNOLD KATZ,
S. STEWART.