T. J. FAY & J. M. ELLSWORTH.

CARBURETER.

APPLICATION FILED NOV. 15, 1906.

960,080.

Patented May 31, 1910.

Fig. 2.

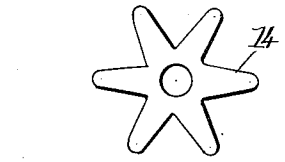

Fig. 1.

WITNESSES

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THOMAS J. FAY, OF NEW YORK, N. Y., AND JOHN MAGEE ELLSWORTH, OF BERNARDSVILLE, NEW JERSEY.

CARBURETER.

960,080. Specification of Letters Patent. Patented May 31, 1910.

Application filed November 15, 1906. Serial No. 343,505.

To all whom it may concern:

Be it known that we, THOMAS J. FAY, a resident of the city of New York, borough of Brooklyn, in the county of Kings, State of New York, and JOHN MAGEE ELLSWORTH, a resident of Bernardsville, in the county of Somerset and State of New Jersey, and both citizens of the United States, have invented a new and Improved Carbureter, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in charge-forming devices for use in connection with internal combustion engines, and having means for producing a combustible mixture from a liquid fuel, and relates more particularly to automatically-acting means dependent for its operation upon an alteration in the speed of the engine with which the device is used, said means acting to automatically admit more or less air suiting speed changes of the engine, with a view to producing the highest attainable average efficiency.

The object of the invention is to produce a device for forming an explosive or combustible mixture in which the proportion of air and fuel will be substantially suited to all speeds of the engine. This is accomplished by counteracting the effect of a variable supply of fuel, due to variable conditions produced by the more or less rapid flow of air through the charge-forming device at different speeds of the engine, by admitting at such times a suited quantity of air to the charge-forming device, thereby varying the proportion of fuel and air in the mixture.

A further object of the invention is to provide a device adapted to automatically control the supply of charge to the engine until said engine acquires a definite predetermined speed, at which time the device automatically admits additional air and automatically increases the quantity of said air as the speed of the engine increases above the predetermined limit.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in both the figures, in which—

Figure 1 is a longitudinal section through one form of our improved device; and Fig. 2 is a detail showing a plan view of a portion of the charge inlet port.

The specific embodiment of our invention which we have illustrated in the drawings, comprises a casing 1 having a charge inlet port 2, an air inlet port 3, an outlet port 4 adapted to be placed in communication with the inlet valve of the engine, and means within said casing for controlling the inlet ports above referred to. Connected to the charge inlet port is a suitable pipe 5, connected to the device for charging the air with the liquid fuel to form the explosive mixture, and this means may be of any form desired. Preferably, the explosive charge is formed in said pipe by the delivery of the liquid fuel through a smaller branch pipe 6 connected to a nozzle 7 terminating within the pipe 5 and having a small discharge outlet passage 8. The nozzle 7 may be secured within the wall of the pipe in any suitable manner, as, for instance, by means of screw threads, as shown, and may be locked in place by a lock-nut 9, if desired. The pipe 6 is preferably connected to the nozzle 7 by means of a coupling 10, whereby the two may be readily disconnected.

Within the casing and directly over the charge inlet port 2, is placed means for controlling said port, which means preferably comprises a conical coil spring 11 resting upon the base of the casing around the charge inlet port, and having means in engagement with the opposite or smaller end of the coil for controlling the expansion thereof. This means, in the form illustrated, comprises a rod 12 extending through a suitable bearing 13 in the wall of the casing, and carrying at its inner end a spider 14 in engagement with the end of the coil and rigidly secured to the valve rod 12 by means of a nut 15. The rod 12 is moved longitudinally to permit the expansion of the spring, but the rod is provided preferably at its outer end with a stop or enlarged head 16, whereby the movement of the spring may be limited. The outlet port 4 from the casing connects with the inlet valve of the engine as above stated, and as the engine is started the suction decreases the pressure within the casing and causes the coil spring 11 to expand and permit the passage of the explosive charge between the separate layers of wire forming the coil. As the speed

of the engine increases, the coil automatically expands to a greater extent until limited by the stop 16. When the engine acquires a speed greater than a certain limit, it is found that if the inlet valve be opened to a still greater extent, the mixture supplied to the engine is too rich in liquid fuel and the maximum efficiency cannot be attained. It is then desirable to admit additional air, and it is further desirable to automatically admit this air when the engine has attained a predetermined speed, and to automatically control the admission of the air as the speed of the engine increases. To accomplish this, we provide the additional air inlet port 3 formed in the wall of the casing, and provide means for controlling said air inlet port. In the specific device illustrated, a collar 17 is secured in a screw-threaded opening in the wall of the casing, and this collar is provided with openings, the central one of which constitutes the support for a valve rod. Supported upon the collar 17 and surrounding the openings therein, is a conical coil spring 18, similar in construction to the coil spring 11, but having its inner end in engagement with a solid plate 19 instead of an open spider 14. This plate fits the end of the spring as closely as possible and serves normally to completely close the air inlet port. The plate 19 is carried by a valve rod 20 extending through a bearing 21 on the collar 17, and means are provided for holding the spring 18 and the plate 19 in the position shown in the drawings until the suction within the casing exceeds a predetermined limit, said limit depending upon the speed of the engine. In order to control the spring and plate, which will be noted constitute a valve, and to permit of said valve being opened when the engine has attained a predetermined speed, we provide a second coil spring 22 having one end thereof in engagement with a collar 23 carried by the valve rod 20, and having its opposite end in engagement with the wall of the casing or with the bearing 21 carried thereby. The size and strength of the spring 22 is so proportioned that said spring normally tends to keep the spring 18 in a collapsed position and thus effectually close the air inlet port; but the spring 22 permits of the expansion, and, therefore, opening of the spring 18 when the suction within the casing and engine exceeds a certain predetermined limit. After the engine has attained such a speed that further increase results in the admission of too rich an explosive mixture and the consequent decreasing of the efficiency of the engine, the coil spring 11 has by this time been opened to the maximum position determined by the relative location of the stop 16. At this time it is desirable to admit additional air to dilute the mixture, and the expansion power of the spring 18 plus the suction within the casing is now sufficient to overcome the action of the spring 22, and the spring 18 expands slightly to admit the desired amount of additional air. As the speed of the engine increases to a still greater amount, the spring 18 becomes still further expanded and a larger quantity of air is admitted to dilute the mixture. It will thus be noted that the quantity of the charge is automatically controlled until the percentage composition of said charge is at variance with the theoretically perfect conditions and air is automatically admitted in exactly the proper quantity to restore the mixture to the proper proportion. By varying the size and strength of the various springs, and varying the location of the stop 16, a mixture may be produced and admitted to the engine, which mixture would vary as the speed of the engine increased, and the composition of said mixture be at all times that best suited to attain the maximum efficiency.

The parts may be so proportioned that no attention whatever is required, and the valve operates automatically to produce at all times a mixture of the desired composition, but as the composition of the mixture may vary with the humidity of the air and its temperature and upon the quality of the liquid fuel, as well as upon various other local conditions, we may provide means for manually controlling the extent to which the spring 11 may be expanded and control the tension of the spring 22, and, therefore, the time at which the air inlet valve will be opened. This means may be of any suitable form desired, and when the invention above described is used in connection with the engine of a motor vehicle, this controlling means may be attached to the operating parts upon the steering post or within the reach of the chauffeur. In the specific form of the invention illustrated, this means comprises a bell-crank lever 24 pivoted to a bracket 25 upon the side of the casing and having a yoke 26 surrounding the valve rod 12 adjacent the stop 16, and a bell-crank lever 27 pivoted to a bracket 28 and having a yoke 29 surrounding the valve rod 20 and adjacent a plate 30, against which the spring 22 abuts. The two bell-crank levers 24 and 27 are preferably provided with operating rods 31 and 32, whereby they may be operated, and by means of said rods the yoke 26 may be brought nearer to or farther from the stop 16 to limit the extent to which the charge inlet valve may be opened, and the yoke 29 may be moved to increase or decrease the tension of the spring 22 and thus determine the speed of the engine and the suction and pressure required to open the additional air inlet port.

Various changes may be made in the con-

struction of our improved device, as, for instance, the regulating spring 22 may be placed within the casing and abut against the inner surface of the plate 19, or located within the casing and within the conical spring 18. All that is essential is that the device be so constructed that the air inlet valve does not open until the engine has acquired a definite predetermined speed, and that further opening of said valve be directly dependent upon the further increase in speed.

Having thus described our invention, we claim as new and desire to secure by Letters Patent:

1. A casing having an air inlet port, an explosive charge inlet port, and an exhaust port, a coil spring surrounding said explosive charge inlet port, a valve rod, a stop on said valve rod for limiting the expansion of said spring, a second coil spring surrounding the air inlet port, a third spring for preventing the expansion of the second mentioned spring until a definite suction pressure exists within the casing, means for varying the tension of the last mentioned spring, and means for varying the position of the stop.

2. A carbureter having a port, an expansible member constituting a valve controlling said port, a valve rod, a coil spring surrounding said rod for retarding the opening of said valve until a definite suction pressure exists within the carbureter, a lever terminating adjacent one end of said spring, and means for operating said lever to vary the tension of the spring.

3. A carbureter having a plurality of ports, valves controlling said ports, each of said valves comprising an expansible member subjected to the suction pressure of the engine and expanding to permit the passage of fluid through the walls thereof when its predetermined suction pressure is attained, the suction pressure required to open one of said valves being greater than the suction pressure required to open another one of said valves, means for varying the extent of the opening movement of one of said valves, and means for varying the suction pressure required to open another of said valves.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

THOMAS J. FAY.
JOHN MAGEE ELLSWORTH.

Witnesses:
JNO. M. RITTER,
CLAIR W. FAIRBANK.