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C. E. BONNIER

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CARBURETOR

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FIG. 1

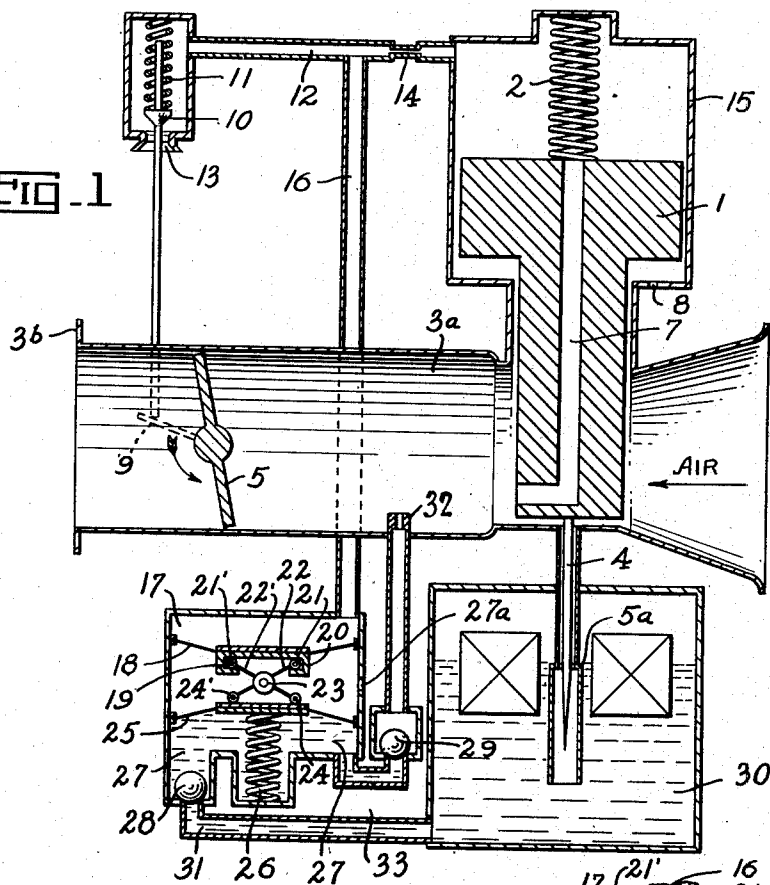


FIG. 3

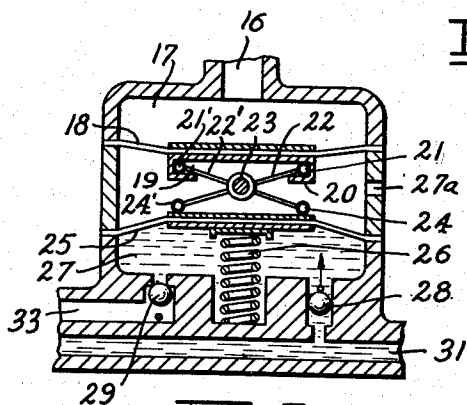
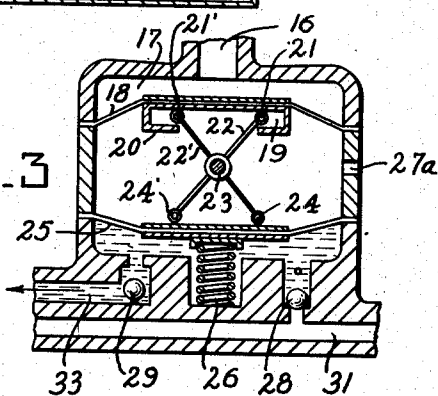


FIG. 2

INVENTOR

Claude Etienne Bonnier

By *A. M. H. H. H.*

ATTORNEY.

UNITED STATES PATENT OFFICE

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CARBURETOR

Claude Etienne Bonnier, Neuilly-sur-Seine,
France; vested in the Alien Property Custodian

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3 Claims. (Cl. 261—34)

The present invention relates to carburetors adapted for injecting into the carburetion chamber or into the admission piping a determined volume of fuel with a view to suitably changing the proportions of the carbureted mixture when a variation occurs in the working condition of engines or motors.

An object of this invention is the provision of means for automatically controlling the injection of carbureted fuel as a supplementary injection to the fuel supplied by present day carburetors, the supplementary injection being effected in such a manner that the volume of fuel injected and the time of each injection may be automatically controlled. Particularly the supplying of supplementary carbureted fuel while the engine is inoperative is avoided.

In this device, the injection is produced by the direct effect of the partial vacuum existing either behind or ahead of the gas throttle and this in opposition to a mechanical effort which prevents or stops the injection when the partial vacuum has, or assumes, too low a value.

The description which will follow, with reference to the appended drawing, given by way of nonlimitative example, will allow a thorough understanding of how the invention can be embodied.

Figure 1 is a diagrammatical sectional view representing the utilisation of the injection device according to the invention in conjunction with a carburetor of the so-called "variable air" type.

Figures 2 and 3 represent in diagram form and on a larger scale, detail elements constituting a part of the invention.

In the case illustrated in Figure 1 my improved automatic injector control has been represented acting in conjunction, by way of example, with a known type of carburetor in which a piston 1, mounted or not with a spring 2, controls by its displacements, both the cross section of the passageway for the air into the conduit 3a connected at 3b to the admission piping of the engine, and by the needle valve 4 the discharge of fuel through the nozzle 5a in order to produce the carbureted mixture distributed by the throttle 5.

The partial vacuum prevailing in the conduit 3a ahead of the throttle 5 is transmitted by a conduit 7 to the upper surface of the piston 1, the opposite surface of which is subjected to the atmospheric pressure established by means of an orifice 8.

Moreover the throttle 5 is provided with a lever 9 which maintains a needle valve 10 open against the expansion of a spring 11 when the said throttle 5 is in its closed position.

A conduit 12 communicates on the one hand with the atmospheric air through the seat 13 of the valve 10 and on the other hand through the calibrated orifice 14 with the inside of the cylinder 15 above the piston 1, finally by a conduit 16 with a chamber 17 closed by a diaphragm 18.

The opposite side of the diaphragm 18 carries a groove 19 provided in a metallic reinforcing plate 20 centrally secured onto the diaphragm. In the groove 19 rollers 21, 21', can slide, said rollers being mounted on the levers 22 and 22' which are pivoted to each other at a point 23. At the other extremity of the levers 22 and 22', rollers 24 and 24' rest on the upper surface of a diaphragm 25 continually pushed upwardly by a spring 26 which rests on the lower wall of a receptacle 27. (This diaphragm lever device is represented on a larger scale on Figures 5 and 6.) The space between the two diaphragms communicates with the atmosphere by a hole 27a.

Check-valves 28 and 29 allow the receptacle 27 to communicate with the constant level float-chamber 30 of the carburetor by means of the canal 31 and with the additional injection nozzle 32 by the conduit 33.

The whole system operates as follows:

In the position of the throttle 5 shown on Figure 1 and which corresponds to a no-load, low-speed operation of the engine, the valve 10 is lifted and the admission of air through 13 destroys the partial vacuum behind the choke 14 in the conduit 16 and in the vessel 17. The spring 26, exerting pressure upon the levers 22, 22', forces the diaphragms 18 and 25 to approach each other, thereby drawing fuel into the chamber 27 through the canal 31 and the then-open check valve 28. The position of the various members will remain unchanged if the engine stops and there will be no injection through the additional nozzle 32.

In like manner while the engine is inoperative, the absence of a partial vacuum in conduit 3a will leave the above described system inert and there will be no injection, whatever be the operation of the throttle 5.

While the engine is operating and when the throttle 5 opens, the needle valve 10 will close the air admission port 13 after sufficient rotary movement of the lever 9. The partial vacuum (created by the engine) which is transmitted to the cylinder 15 by the conduit 7 will be trans-

mitted by the choke 14 and the conduit 16 to the chamber 17. This partial vacuum will draw the diaphragm 18 in an upward direction (on the drawing) and by means of the levers 22, 22' this upward movement will bring about a downward movement of the diaphragm 25, in opposition to the action of the spring 26 as best shown on the Figure 3, thereby effecting the injection of fuel into the conduit 3a.

It becomes apparent that in this device, the diaphragm 25 with the receptacle 27 and the check valves 28 and 29 constitute a suction and compression pump the suction valve 28 of which is connected to the constant level float-chamber 30 which constitutes a fuel reservoir and the compression check valve 29 of which communicates with the additional carburetion jet nozzle 32. The spring 26 constitutes an elastic means which automatically brings about the suction stroke of the diaphragm 25 for the filling up and charging of the pump. As for the diaphragm 18 and the chamber 17, these constitute a vacuum motive unit, which is connected by means of the conduit 16 to the admission piping of the engine and the function of which is to bring about the compression stroke of the diaphragm 25 in order to drive the fuel towards the additional jet nozzle 32 when the partial vacuum acts in the chamber 17.

The starting of the injection as well as the quantity injected may be easily determined by an adjustment of several factors such as, for example: the moment at which the needle valve 10 will close, the resistance of the spring 26, the braking effect (by the calibration of orifice 8) on the up-stroke of the piston 1, which by controlling the admission of the air into conduit 3a, thereby controls the partial vacuum prevailing therein; that is to say the partial vacuum motive unit actuating the diaphragms 18 and 25. It can readily be understood that the retarding action on the opening movement of the piston 1 will result in momentarily increasing the partial vacuum acting on the diaphragms and thereby automatically the power with which the fuel is injected.

It will be apparent that the embodiment of the invention herein disclosed by way of example can be modified and changed in construction and can be applied to other types of carburetors.

What I claim is:

1. In a carburetion device comprising a jet nozzle for the fuel, a connection piping to the engine for the passage of the carbureted air and a fuel reservoir; a casing comprising two diaphragms the edges of which are fixed into this casing and which divide the volume of the said casing into three chambers, one of the diaphragms constituting together with the corresponding end chamber a suction and compression pump the suction side of which is connected to the said reservoir and the compression side of which is connected to the jet nozzle, resilient means arranged to press said diaphragm toward the intermediate chamber for automatically bringing about the suction stroke of the said diaphragm whenever not overpowered by action of the second diaphragm, the intermediate chamber between the two diaphragms being connected to the atmosphere and the second diaphragm to the other end chamber of the casing constituting a partial-vacuum motive unit, connection means for transmitting to the said partial-vacuum motive unit the partial vacuum created by the engine in the said piping when an increase in load occurs, a fixed pivot in the said intermediate

chamber, two two-armed levers fulcrummed intermediate their ends to this fixed pivot, an annular groove on that face of the second diaphragm which is located in the said intermediate chamber, one of the ends of each lever slidably fitting into the said groove whereas the other ends of these levers rest upon the first diaphragm.

2. In a carburetion device comprising a connection piping to the engine for the passage of the carbureted air, a fuel jet nozzle opening into the said piping and a fuel reservoir for supplying this jet nozzle with fuel, a throttle for controlling the passage of the carbureted air towards the engine, a valve for controlling the quantity of atmospheric air entering into the said piping, a piston integral with the said valve, a cylinder in which the said piston moves in opposition to a spring, a canal in the body of the valve for allowing the said cylinder to communicate with the said piping between the said throttle and the said valve so that the partial vacuum prevailing in the said piping is communicated through the said canal to the said cylinder in order to open the air admission port, an additional jet nozzle opening into the said piping, a suction and compression pump the suction end of which is connected to the said reservoir and the compression end of which is connected to the said additional jet nozzle, elastic means for automatically bringing about the suction stroke of this pump, a partial-vacuum motive unit for bringing about the compression stroke of the said pump in opposition to the said elastic means, a connection conduit for transmitting to the said partial-vacuum motive unit the partial vacuum created by the engine in the said cylinder, an orifice for allowing an intermediary point of this conduit to communicate with the atmospheric air, a check-valve for regulating the passage of the air in the said orifice and mechanical connection means between the said throttle and the said check-valve so as to open the said check-valve when the said throttle is closed and to close it when the said throttle is open.

3. In a carburetion device comprising a connection piping to the engine for the passage of the carbureted air, a fuel jet nozzle opening into the said piping and a fuel reservoir for supplying this jet nozzle with fuel, a throttle for controlling the passage of the carbureted air towards the engine, a valve for controlling the quantity of atmospheric air entering into the said piping, a piston integral with the said valve, a cylinder in which the said piston moves in opposition to a spring, a canal in the body of the valve for allowing the cylinder to communicate with the said piping between the said throttle and the said valve, so that the partial vacuum prevailing in the said piping is communicated through the said canal to the said cylinder in order to open the air admission port, an additional jet nozzle opening into the said piping, a casing comprising two diaphragms the edges of which are fixed into this casing and which divide the volume of the said casing into three chambers, one of the diaphragms constituting together with the corresponding end chamber a suction and compression pump the suction end of which is connected to the said reservoir and the compression end of which is connected to the said additional jet nozzle and being connected to elastic means for automatically bringing about the suction stroke of the said diaphragm, the intermediate chamber between the two diaphragms being connected to

the atmosphere and the second diaphragm to the other end chamber of the casing constituting a partial-vacuum motive unit, connection means for transmitting to the said partial-vacuum motive unit the partial-vacuum created by the engine in the said piping when an increase in load occurs and mechanical connection means between the two diaphragms, arranged in the intermediate chamber so that the pump diaphragm

5 is pushed away in opposition to the said elastic means thereby driving the fuel towards the additional jet nozzle when the diaphragm of the partial-vacuum motive unit is sucked in, a connection conduit for transmitting to the said partial-vacuum motive unit the partial vacuum created by the engine in the said cylinder.

CLAUDE ETIENNE BONNIER.