United States Patent

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[33] **France**
[31] **165165**

[54] **CARBURETORS FOR INTERNAL COMBUSTION ENGINES**
1 Claim, 9 Drawing Figs.

[52] **U.S. Cl.** ..... **123/198 DB,** 123/DIG. 11, 261/69 R
[51] **Int. Cl.** **F02b 77/08,** F02m 3/02
[50] **Field of Search** ..... 123/119, 198, 198 D, 198 DA, 198 DB, 198 DC, 142, DIG. 11; 261/67, 69, 71

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ABSTRACT: Carburetors for internal combustion engines are provided with means which, on stopping of the engine, obturate the fuel path from the float chamber to the inlet manifold, and thus prevent the passage of fuel from the float chamber while the engine is standing. Restarting of the engine is thereby facilitated.

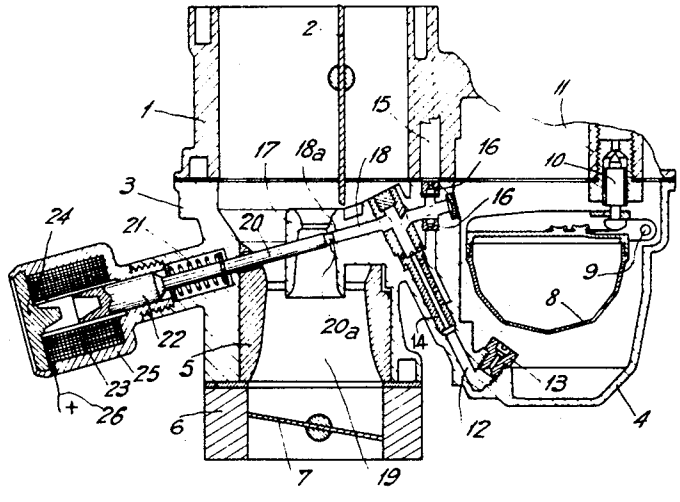
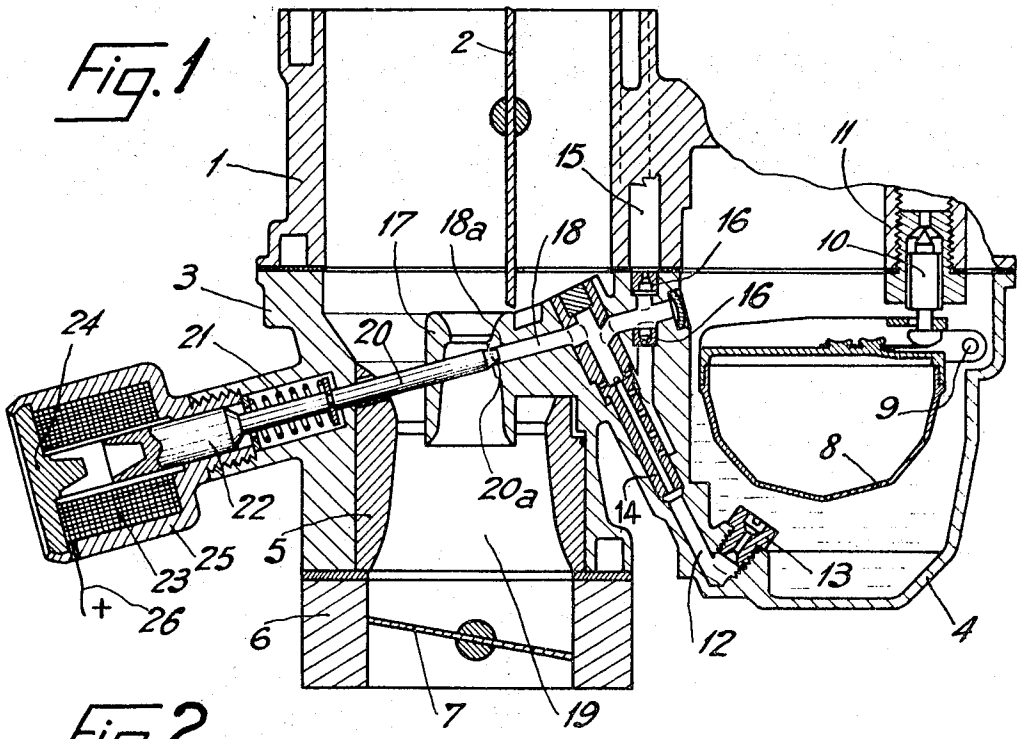


Fig. 1


2
1
15
11
17
18a
18
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3
16
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21
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20a
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Fig. 2

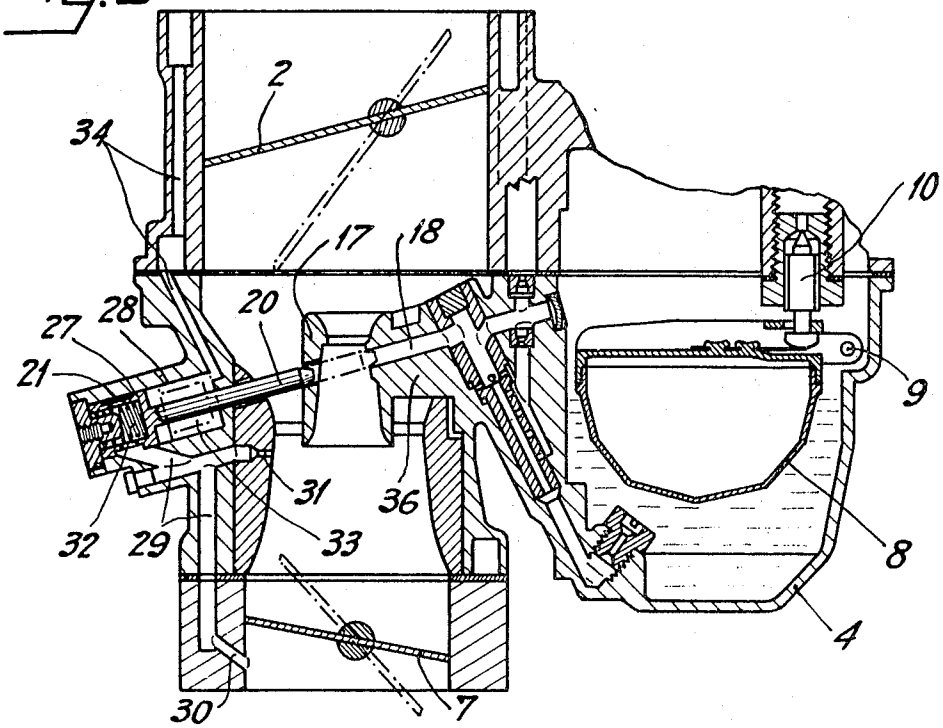
2
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Fig. 3

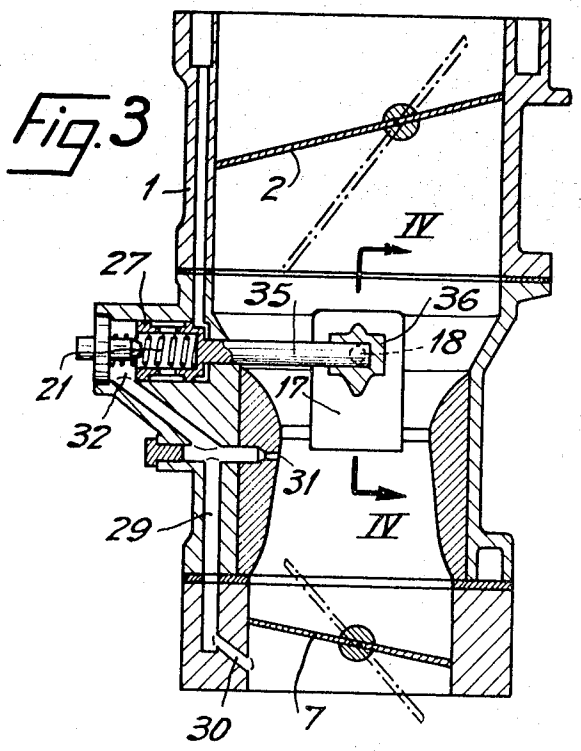


Fig. 4

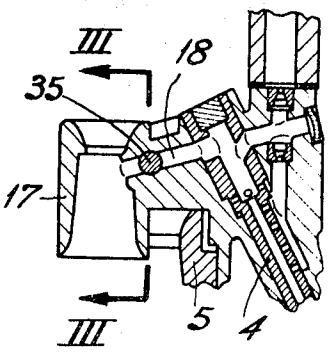


Fig. 5

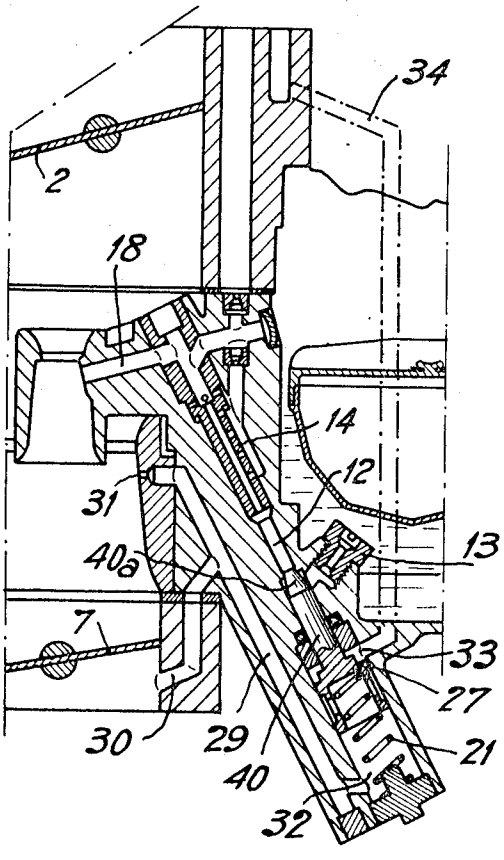


Fig.6

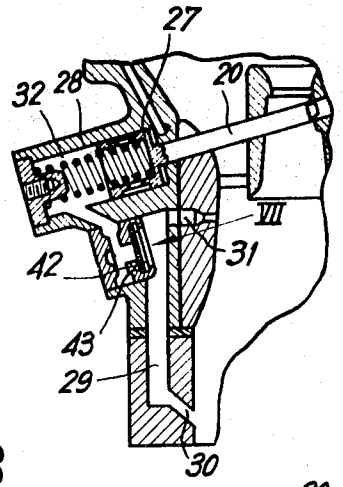


Fig.7

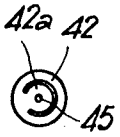


Fig.8

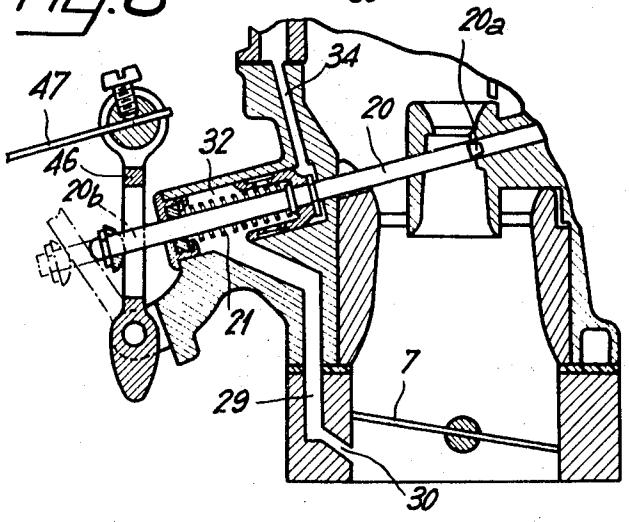
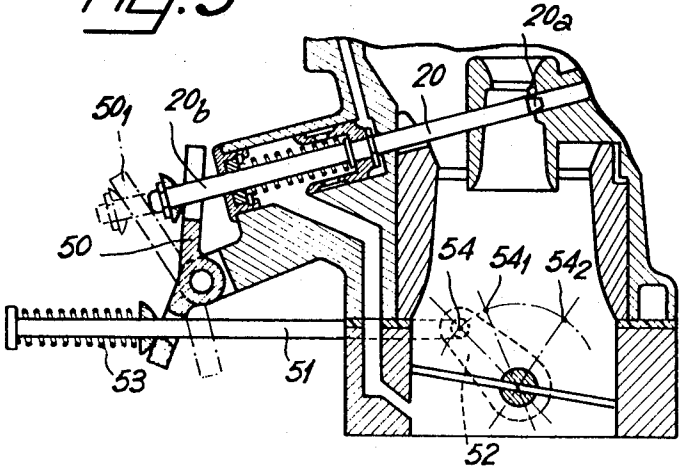


Fig.9



CARBURETORS FOR INTERNAL COMBUSTION ENGINES

The starting of internal combustion engines which are fed by a carburetor when hot is sometimes made difficult by the phenomenon known as percolation, which shows itself as follows:

After stopping the engine, the temperature of the feeding devices, and in particular that of the carburetor, rises, since these devices are no longer cooled as is the case during running by the arrival of fresh air and combustible gases. When the heat supplied is sufficient, the fuel contained in the carburetor begins to boil at one or more points, and the pressure produced is sufficient to force liquid fuel through the principal spray outlet of the carburetor. The liquid fuel thus driven out generally remains on the accelerator control butterfly, then in the closed position. When the motor is finally restarted, the liquid fuel passes into the inlet manifold and into the cylinders entraining an excessively rich mixture which will not ignite. It is thus necessary, in order to start the engine, to keep the butterfly wide open and, on an automobile vehicle, to turn over the engine with the starter for a few seconds.

The phenomenon is of maximum effect about 10 minutes after stopping the motor. For a shorter time, the fuel expelled from the carburetor is in very small quantity, so the mixture formed, less rich, is more easily inflammable; for a longer time, the motor has started to cool, and as a result the vaporization of the liquid fuel in the inlet manifold is slower, from which a similarly less rich mixture results.

The object of the invention is to avoid the disadvantages generated by the boiling of the fuel in the carburetor by stopping the liquid fuel from being projected onto the butterfly when the motor is stopped.

According therefore to the present invention there is provided a carburetor comprising an exit orifice for fuel into the inlet manifold for normal running, fed by a constant level chamber, which does not supply fuel when the motor is stopped, characterized by a device for avoiding the escape of liquid fuel by percolation into the inlet manifold, this device comprising, on the liquid path leading from the constant level chamber to the exit orifice in normal running in the inlet manifold, an obturator for this path, and means enabling, on starting of the motor, the opening of this obturator, and means for closing it on stopping thereof.

The obturator is preferably formed by a rod axially displaceable by the said opening and closure means, so as to act either axially in the manner of a valve in the linking channel from the chamber to the inlet manifold, or transversely to this channel in the fashion of a slide valve.

The control means for the rod can be a manually operable linkage.

The rod can also be moved axially against a spring which tends to keep the obturator shut by means of a solenoid energized at the same time as the ignition coil of the motor, i.e. actuated by the ignition key switch.

The movement of the obturator against a spring which keeps it closed can also be obtained automatically by the effect of the reduced pressure which is present in the inlet manifold during running. For this purpose there can be used a piston or membrane closing a chamber which is put under reduced pressure by its connection to a suitably chosen portion of the inlet manifold.

The action of the reduced pressure alone may be insufficient, for it is known that the reduction in pressure in the inlet manifold becomes negligible when, for example, as the engine picks up, a wide opening of the butterfly is associated with low running of the motor.

One can then advantageously combine the reduced pressure as a control method, with other methods, for example, a manual control or, preferably, a control by a linkage associated with the accelerator linkage in such a fashion that, when the butterfly is open, the obturator also will be held positively open.

Finally, to minimize the effect of variations of reduced pressure in the inlet manifold, the chamber under reduced pressure may communicate with the inlet manifold via an automatic valve. The said chamber is thus kept at the maximum reduced pressure despite variations of pressure in the manifold.

It is noted that it is well known, in carburetors having no constant level chamber, to obturate the orifice of the jet itself in the carburetor on stopping; in this case, however, no risk of percolation arises.

It is known also, for avoiding the inspiration, without combustion, of a certain quantity of liquid fuel, when the ignition is cut off when the motor is stopped, to seal the orifice of the slow-running jet at the moment of cutting off the ignition. Such a known device does not prevent the percolation produced via the principal jet serving for normal running.

The description which follows, with reference to the accompanying drawings, and which is given as a nonlimitative example, will illustrate better how the invention may be practiced. The details which are included both in the description and the drawings form part of the invention.

In the drawings:

FIG. 1 shows a carburetor in section according to the invention, which uses an electromagnetic force to operate the obturator.

FIG. 2 is a similar view of a variant which uses the reduced pressure for this purpose.

FIGS. 3 and 4, which are at least in part sections of one another along the lines III—III and IV—IV of FIGS. 4 and 3, show a variant which uses the reduced pressure.

FIG. 5 is a partial section of a variant also using the reduced pressure.

FIG. 6 shows, again in section, a constructional variant in which the reduced pressure alone is used, but with preservation thereof by a valve.

FIG. 7 is a detail of FIG. 6 according to arrow VII.

FIG. 8 shows in section an embodiment in which a manual control is associated with the effect of the reduced pressure.

FIG. 9 shows in similar view an embodiment in which the reduced pressure control is linked to the accelerator control.

In the constructions shown in the FIGS., and in particular in FIG. 1, the carburetor itself is of the type normally called inverted. Only the parts necessary for understanding the invention have been shown, in particular the feed apparatus for slow running has not been illustrated.

This carburetor comprises an air arrival body **1** in which pivots a shutter **2**, a central body **3** which comprises the constant level chamber **4** and the inlet venturi **5**, and last the connection to the inlet manifold with the pivoting mixture volume shutter or fuel butterfly **7**.

The constant level chamber **4** contains in classic fashion the float **8** rocking about the axis **9** and bearing on the needle **10** which shuts off more or less the flow of combustible liquid **11**.

The chamber **4** communicates with the inlet manifold via a channel **12**, the supply to which is fixed by the normal running jet **13**, and which contains the mixer tube **14** for mixing the combustible liquid with the air led through channel **15** and arriving at this mixer apparatus across one or more air bores **16**.

Finally, this channel opens into the primary venturi **17** within the secondary venturi **5** via the bored conduit **18**. This air and combustible material reach the mixing chamber formed by the downstream part of venturi **5**.

According to the invention, an obturator closes the linking channel from the chamber to the primary venturi **17** between the jet **13** and the orifice **18***a* of conduit **18**.

In the embodiment shown in FIG. **1**, this obturator is a rod **20** ending in a point **20***a* which fits axially into the orifice **18***a* which is terminated by a suitable seating for the point.

This rod is biased by a spring **21** and it is integral with a plunger core **22** moveable axially in a coil **23** carried in the magnetic cavity formed by base **24** and casing **25**. This latter is connected to the central body **3** of the carburetor by screwing.

In the stopped position (illustrated) the point 20*a* of the rod 20, biased by spring 21, closes the exit of conduit 18 so that combustible liquid can in no case fall on the butterfly 7 and into the inlet manifold.

When the motor is to be put to use, the coil 23 is energized via wire 26 at the same time as the ignition coil, by means of the usual key switch. The core 22 is drawn in and it keeps the point 20*a* separated from orifice 18*a*. The boring of the passage of the rod 20 across the wall of the primary venturi 17 ensures the guidance of this rod during its axial motion.

In the construction shown in FIG. 2 where the carburetor itself is similar to that shown in FIG. 1, the rod 20 is integral with a piston 27 moveable in a bore 28, which toward the rear, communicates via bored channels 29 with the orifice 30 situated below the butterfly 7 and with the orifice 31 situated at the mouth of the primary venturi 17 in the neck of the secondary venturi 5.

The piston 27 forms in the bore 28 a chamber 32 under reduced pressure communicating with the channels 29, and a space 33 connected to the atmosphere via channels 34.

When stopped, as before, the spring 21 keeps the rod 20 in closure position (shown in dotted lines) in orifice 18*a*.

On putting to use, the reduced pressure acts, created in the inlet manifold by the inspiration of the cylinders.

In low conditions when the fuel butterfly is closed or almost closed, the reduced pressure arises in chamber 32 via orifice 30. In high conditions in which a rapid current of air passes through the venturis, the reduced pressure is generated by orifice 31, since the position chosen for this orifice corresponds to the maximum reduction in pressure in the venturi 5. However the diameter of the orifice 31 should be substantially smaller than that of orifice 30 in order that when the butterfly is closed, the entry of air via orifice 31 does not cancel out the effect of the reduced pressure acting via orifice 30.

Thus when the motor is put to use, the obturator is opened and it is kept open by the same working of the motor.

It is not necessary that the obturation take place at the orifice 18*a* of the linking channel; FIGS. 3 and 4 on the one hand, and FIG. 5 on the other, show two examples of obturation at different points on the channel.

In FIGS. 3 and 4 the obturator is a rod 35 forming a slide valve which runs transversely in a bore in arm 36 bearing the venturi 17, which arm is axially traversed by conduit 18. Pressed by spring 21, the rod 35 obturates the channel 18; it frees it when the reduced pressure acting in chamber 32 displaces the piston 27 to the left as seen in FIG. 3.

In the embodiment shown in FIG. 5, the end point 40*a* of the rod 40 closes the channel 12 at the exit of jet 13. The quantity of fuel trapped in the tube 14 which, by percolation, could escape via the tube 18, is considered negligible.

When the reduced pressure alone is put to use to keep the obturator open, an unreliability of working can result when, for example as the engine picks up, the butterfly 7 is opened sharply while the motor is still at low speed.

The construction of FIG. 6 tends to remove this disadvantage. The channels 29 communicate with the chamber 32 via a valve 42 formed of a disc of flexible material of rubbery type, in which is incompletely detached (FIG. 7) a central disc 42*a*. This central disc is of diameter slightly larger than the seat 43 of the flap valve so constructed. Thus, via channels 29, the air can only exit from chamber 32 without returning thereto. Such a device has the advantage of keeping chamber 32 at the maximum reduced pressure, and not at the average pressure in the inlet manifold; this is of especial value in the case of motors with only few cylinders (two, for example).

On stopping, air enters chamber 32 via the play of cylinder 27 in the bore 28. If this play is insufficient or if, in place of a piston, there is used a membrane for controlling the rod 20, the flapping valve can have a small hole 45 at its center.

FIGS. 8 and 9 show constructions in which the risks attendant on a drop in the reduction of pressure in the chamber 32 are even more positively alleviated.

In the case of FIG. 8, the prolongation 20*b* of the rod 20 is engaged in a lever 46 joined to a cable or a thin rod moveable by a manually operable pull.

After starting the motor which, by reduced pressure, opens the obturator 20*a*, an action on rod 47, by the manual pull which can be held in place, stops this obturator closing again. The pull should of course be pushed back on stopping.

To avoid this latter task, as shown in FIG. 9, the obturator is preferably linked to the accelerator linkage.

To this end, the lever 50 acting on the projection 20*b* is, on the opposite side with respect to its fulcrum, joined by the rod 51 to the crank 52 of the butterfly control 7 (or to any other point on the accelerator linkage).

The compression spring 53 allows an extra displacement of the rod 51*a* when the lever 50 has already reached the position 50, of total opening of the obturator 20*a*.

Thus, starting from the stopping position illustrated, the reduced pressure serves on starting to open the obturator 20*a* after which, when one presses on the accelerator, the pressure exercised thereon is associated with the reduced pressure to keep the obturator open.

Thus, when the pivot 54 of the crank 52 reaches the position 54, the obturator is completely open, but this does not prevent moving the pivot as far as 54_2 (complete opening of the fuel butterfly) to allow the motor to develop full power.

When one stops, there is no longer any action on the accelerator, and since the reduced pressure has disappeared, the obturator 20*a* closes.

Rod 51 and spring 53 can be replaced, for example, by a cam of suitable shape fixed to rotate about axis 52 (or a parallel axis) which on the starting of rotation of axis 52 rocks the lever 50 completely and then maintains it in this position. Other mechanisms ensuring this result can be used.

It is clear that modifications may be made to the embodiment just described, notably by the substitution of equivalent technical means, without for that reason departing from the scope of the present invention.

I claim as my invention:

1. In a carburetor for an internal combustion engine having an ignition coil and a key switch for controlling the circuit of said ignition coil, said carburetor including an exit orifice for fuel located on one side with respect to an inlet manifold to which said fuel is delivered for normal running, constant level chamber for feeding said orifice with fuel through a liquid path, the improvement consisting in an obturator in the form of a rod on said liquid path and having a pointed end which engages said orifice, which rod transversely passes through said manifold and, outside thereof, is urged in direction of said orifice by a coaxial coil spring and in opposite direction by a coaxial electromagnet coil, the coil of said electromagnet being fed by the same circuit as the ignition coil.

* * * * *