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C. E. BONNIER
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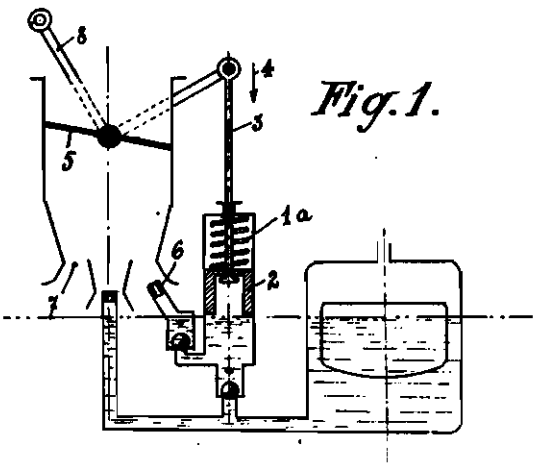

Fig. 1.

Fig. 3

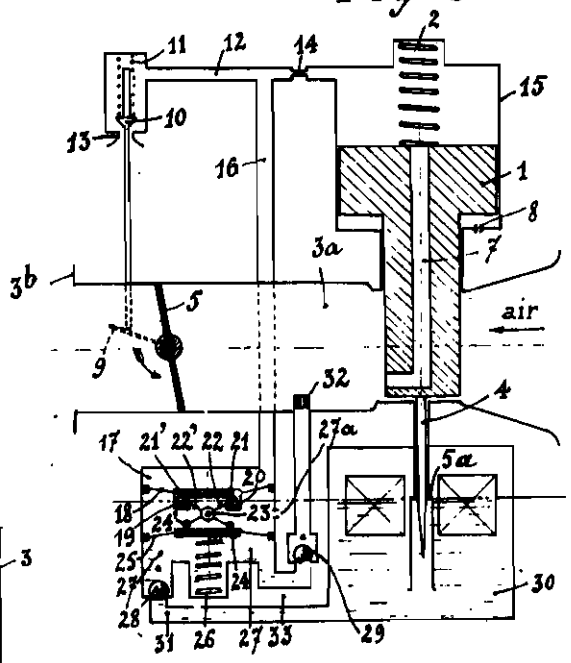

Fig. 2.

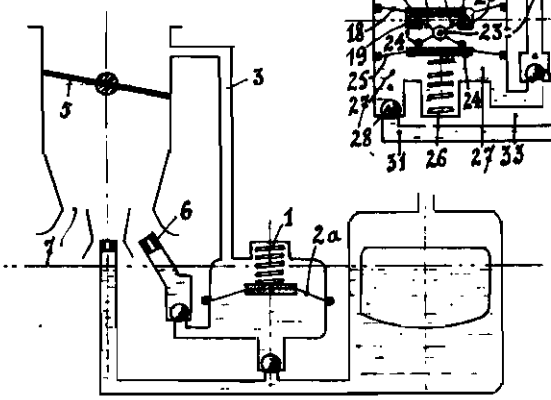

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Fig. 4

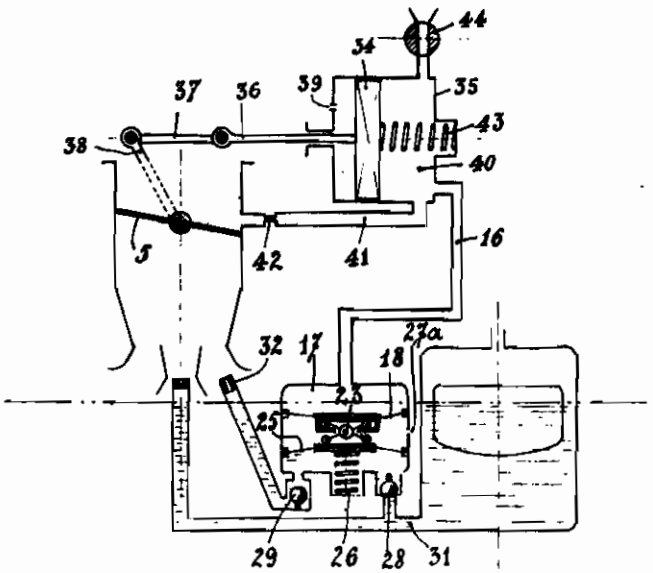


Fig. 5

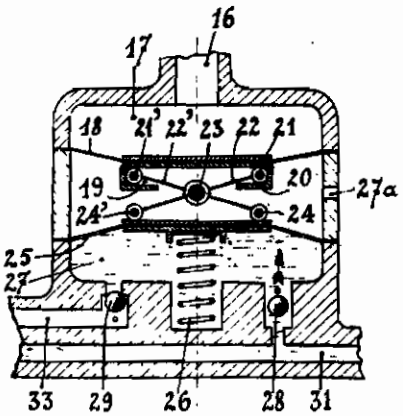
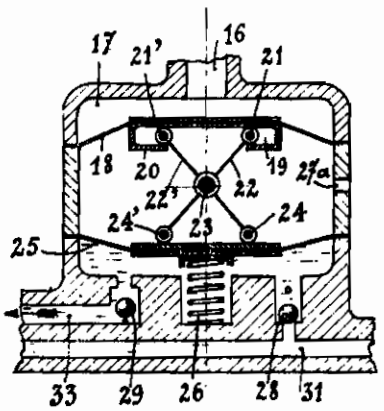


Fig. 6



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ALIEN PROPERTY CUSTODIAN

CARBURETTORS

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

Application filed May 5, 1942

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

The object of the said invention is a device whieh allows to effect this injection in such a maner that it can be obtained in the best "volume" and "time" conditions and, also, that it can be automatically avoided when it is not indispensable and, in particular at the "stopping" moment and "while" the motor is stopped.

In this device, the injeetion 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 injeetion when the partial vacuum has, or assumes, too low a value.

The description whieh will follow, with refereene to the appended drawing, given by way of nonlimitative example, will allow a thorough understanding of how the invention can be embodied, those peculiarities which appear in the drawing as well as in the text constituting of course a part of the said invention.

Figures 1 and 2 are diagrammatical sectional views showing well known injection devices.

Figure 3 is a diagrammatieal sectional view representing the utilisation of the injeetion device according to the invention in conjunction with a carburetor of the so-called "variable air" type.

Figure 4 shows in diagram form the utilization of the injection device object of the invention in conjunction with a carburetor of the so-called "constant air" type, the said carburetor eomprising those special arrangements whieh are described in my application for U. S. Patent corresponding to my French patent filed on April 1st, 1941.

The said special arrangements relate, in Figure 4 of the present application, to the actuating and controlling of the throttle by a manometric relay.

Figures 5 and 6 represent in diagram form and, in order to render the drawing clearer, on a larger scale, detail elements eonstituting a part of the invention.

In the known device represented on Figure 1, the injection is effected by the expansion of the spring *1a* which pushes the piston **2** when the rod **3** is actuated in the direction shown by the arrow **4** when the gas throttle **5** is opened.

At this moment the special injection nozzle **6** discharges the fuel under pressure into the main diffuser **7** of the carburetor.

An inconvenience of this method lies in the fact that if the lever **8** of the throttle **5** is operated while the engine is stopped, the said operation determines at the same time the discharge of the jet nozzle **6**. In the case of a vertical carburetor of the type shown in Figure 1, the fuel is then spread out under the diffuser **7** which condition leads to fire risks in case of back-firing.

In the case of a horizontal carburetor and better still in a carburetor of the so-called "inverted" type, the admission piping is then "flooded", that is to say super-carburetted by the injected fuel, which condition leads to serious difficulties when it is desired to set the engine going again and the latter is hot.

In an other known device represented on Figure 2, the injection is obtained by the expansion of the spring **1** when the partial vacuum transmitted above the membrane *2a* by the conduct **3** conneeted to the gas admission piping ahead of the throttle **5** is insuffieient to balance the stress of the said spring **1**.

The operation of the membrane *2a* is, in this case mechanically independent of the movements of the lever actuating the throttle **5** and the drawbacks of the deviee shown in Figure 1 do not occur while the motor is stopped.

But they are to be experienced again, in an identical fashion, each time the motor stops so that if, for example, several successive efforts for setting the engine going are made and are, for any reason, fruitless, they determine a repeated spraying by the injector nozzle **6**, which condition results in aggravating the drawbacks already explained.

In the case illustrated in Figure 3 the device objeet of the invention has been represented acting in conjunction, by way of example, with a known type of earburetor in whieh a piston **1**, mounted or not with a spring **2**, controls by its displacements, both the cross section of the passage way for the air into the conduct *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 carburetted mixture distributed by the throttle **5**.

The partial vaeuum prevailing ahead of the throttle **5** is transmitted by a eonduct **7** to the upper surface of the piston **1**, the opposite surfaee of which is subjected to the atmospheric pressure established by means of an orifice **8**.

Moreover the throttle **5** is provided with a compression 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 conduct **12** communicates on the one hand with the atmospherie 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 conduct **16** with a vessel **17** closed by a membrane **18**.

The opposite side of the membrane **18** carries a groove provided in a metallic organ **20** secured

onto the membrane. In the groove 19 rollers 21, 21', can slide, said rollers being mounted on the levers 22 and 22' which are jointed at a fixed point 23. At the other extremity of the levers 22 and 22', rollers 24 and 24' rest on the upper surface of a membrane 25 continually pushed away by a spring 26 which rests on the lower wall of a receptacle 27. (This membrane and lever device is represented on a larger scale on Figures 5 and 6). The space between the two membranes communicates with the atmosphere by a hole 27a.

Clap-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 injection nozzle 32 by the conduit 33.

The whole system operates as follows:

In the position of the throttle 5 shown on Figure 3 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 conduct 16 and in the vessel 17. The spring 26, pushing on the levers 22 and 22' brings about, by means of these levers, a drawing together of the membranes 18 and 25. The membrane 25 thus causes a filling up of the receptacle 27 by means of the clap-valve 28 and the canal 31. The position of the various organs will remain unchanged if the engine stops and there will be no injection through the special nozzle 32.

In like manner "during the stop" of the engine, the absence of a partial vacuum in 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 an adjustable displacement of the push-lever 9. The partial vacuum (created by the engine) which is transmitted to the cylinder 15 by the conduct 7 will be transmitted by the choke 14 and the conduct 16 to the vessel 17. This partial vacuum will draw the membrane 18 in an upward direction (on the drawing) and by means of the levers 22, 22' this membrane will bring about a downward movement of the membrane 25, in opposition to the action of the spring 26 as shown on the Figure 6, thereby effecting the injection of fuel into the carburation chamber 3a.

It becomes apparent that in this device, the membrane 25 with the receptacle 27 and the clap 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 clap valve 29 of which communicates with the additional carburation jet nozzle 32. The spring 26 constitutes an elastic means which automatically brings about the suction stroke of the membrane 25 for the filling up and charging of the pump. As for the membrane 18 and the vessel 17, these constitute a vacuum motive unit, which is connected by means of the conduct 16 to the admission piping of the engine and the function of which is to bring about the compression stroke of the membrane 25 in order to drive the fuel towards the additional jet nozzle 32 when the partial vacuum acts in the vessel 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 8) on the up-stroke of the piston 1, which by controlling the admission of the air into 3a, thereby controls the partial vacuum prevailing therein, that is to say the motive partial vacuum actuating the membranes 18 and 25. It can readily be understood that the retarding action on the opening of the piston 1 will result in momentarily increasing the partial vacuum acting on the membranes and thereby automatically the power with which the fuel is injected.

In the case shown in Figure 4, the displacements of the throttle 5 are not positively controlled but by means of a manometric relay; this relay comprises, as has been described in the aforementioned application for patent, a piston 34 sliding in a cylinder 35 and rigidly connected to the throttle 5 by the spindle 36, the rod 37 and the lever 38.

The piston 34 is subjected on one of its faces to the atmospheric pressure by means of the calibrated orifice 39, and on its opposite face, to the effect of the partial vacuum transmitted to the air-tight part 40 of the cylinder 35 by a conduct 41 and a calibrated orifice 42 opening into the admission piping of the engine after the throttle 5. A spring 43 continually pushes the piston 34 away towards the closed position of the throttle 5.

Finally, the movements of the piston 34 which result in the control of the admission of the carburetted gases by means of the throttle 5 are determined by the positive operation of an air admission valve 44 which causes the partial vacuum in 40 to vary so as to counterbalance the resistance of the spring 43.

Besides, the conduct 16 connects the vessel 40 of the manometric relay to the vessel 17 of the injection device, the constitutive elements of which are identical to those of Figures 3, 5 and 6 already described.

It is readily understood that "while the engine is stopped" and at the moment when the engine stops, the partial vacuum prevailing in 40 will be insufficient for bringing about the displacement of the membrane 18; there will consequently be no injection through the special nozzle 32.

On the contrary however, when the engine will be operating, the injection will occur each time that the partial vacuum in 40, transmitted to 17 by the conduct 16 will counterbalance or exceed the resistance of the spring 26.

As in the example shown in Figure 3, the time at which the injection will start as the quantity thereof can be controlled by the adjustment of several factors such as, for example: the relative stress of the springs 43 and 26 taking into consideration the ratio of the surfaces of the piston 34 and of the membrane 18, the deflection of the spring 26 and finally the braking effect which the calibration 39 has on the displacements of the piston 34.

It is quite obvious that the embodiments which have just been described are only examples limiting in no way the scope of the invention which comprises, on the contrary, all diversified forms of embodiment. In particular, the invention may be applied to carburetors other than those described.

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