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CARBURETOR

Original Filed Feb. 5, 1936

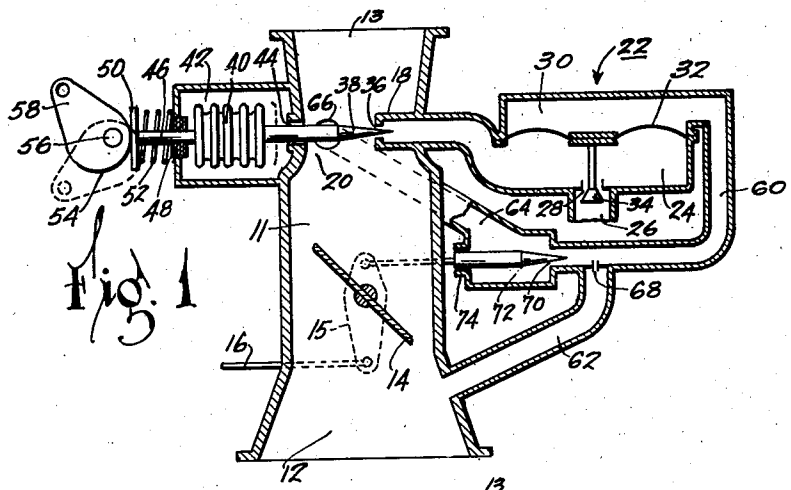


Fig. 1

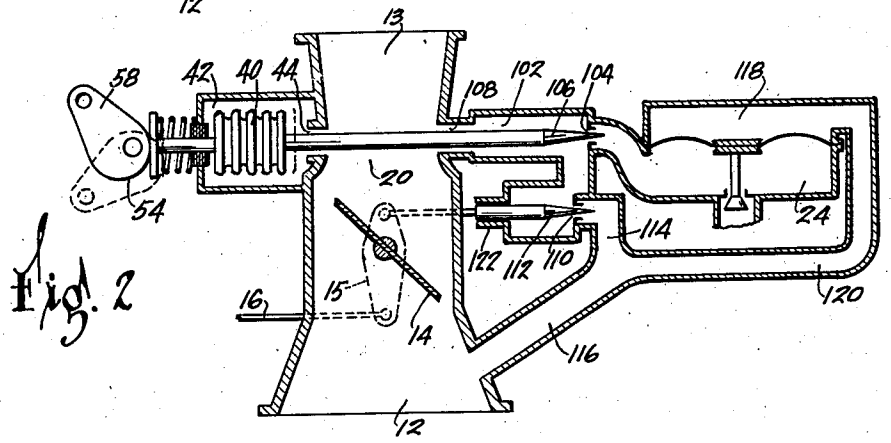


Fig. 2

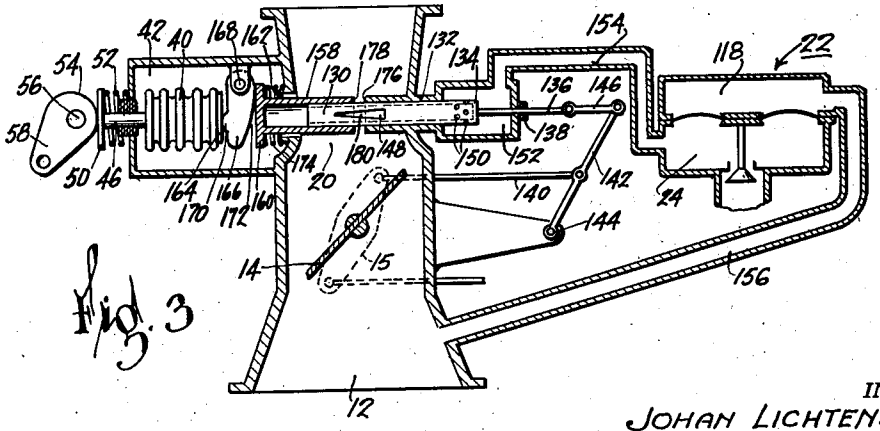


Fig. 3

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CARBURETOR

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Original application February 5, 1936, Serial No. 62,499. Divided and this application January 5, 1940, Serial No. 312,615. In Belgium February 8, 1935

3 Claims. (Cl. 261—69)

I have applied for patent in: Belgium, February 8, 1935, now issued as Belgian Patent No. 407,771; Germany, application for patent of addition filed on February 8, 1936; Great Britain, February 10, 1936, now issued as British Patent of Addition 474,975; France, February 7, 1936, now issued as French Patent 804,023; Italy, February 3, 1936, now issued as Italian Patent 339,760; Poland, application for patent of addition filed on February 5, 1936; and Czechoslovakia, application for patent of addition filed on February 4, 1936.

This invention relates to improvements in carburetors for internal combustion motors, of the type described in Belgian Patent 406,646, of December 5, 1934, in the name of Societe Generale des Carburateurs Zenith, for improvements in Carburetors. The present application is a divisional of my copending application Serial Number 62,499, filed February 5, 1936.

In said Belgian patent, there is described a carburetor comprising a mixture passage having an air inlet and a mixture outlet connected to the motor, a throttle controlling the effective cross section of said passage, and a fuel outlet discharging into said passage posterior to the throttle. The carburetor is characterized essentially by a movable control member which controls the effective area of the fuel discharge nozzle, the position of said control member being a function of the absolute pressure obtaining in the mixing chamber of the carburetor posterior to the throttle and preferably of the absolute pressure which obtains in said mixture passage in the vicinity of the fuel nozzle. This control member will be referred to hereinafter as the "manometric control member" to facilitate the description. A second regulating device influencing the discharge of fuel delivered by the nozzle is provided and is controlled by the throttle. The manometric control member is arranged in such manner as to provide automatic functioning of the carburetor; that is to say, in such manner that the carburetor will deliver to the motor a mixture of the correct composition under all conditions of operation, and, when applied to an aircraft carburetor, is furthermore arranged in such manner as to provide an altimetric correction, that is to say, in such manner as to modify the discharge of fuel in the degree required by variations in altitude.

It is known that the composition of the combustible mixture supplied to an internal combustion engine need not be an absolutely fixed one, but that this composition may on the contrary vary within certain limits. As a general rule, if the richness of the mixture is increased, the motor is enabled to develop greater power, but the specific consumption is higher in such case. It is of advantage, chiefly in aviation carburetors, to provide means for modifying the richness of the mixture delivered, so as either to get maximum engine power or to diminish the specific consumption. In general, this modification of the richness is made at the will of the pilot.

The present invention has for its object an arrangement permitting the richness of the combustible mixture to be varied in carburetors of the type described in said Belgian patent.

According to the present invention, the influence of the manometric control member on the discharge of fuel may be varied by a supplemental adjusting member. This adjusting member will generally be manually controlled, but it will obviously be possible to control it automatically the same as other organs of the carburetor.

The description which follows, taken in connection with the appended drawing, will give, by way of example, a ready understanding of several ways of realizing the invention.

Figures 1 to 3 are schematic views, in longitudinal section, of several forms of the invention.

The carburetor shown in Figure 1 comprises a mixture passage 11 having an air inlet 12 and a mixture outlet 13 connected to the motor. The effective cross section of the mixture passage 11 is controlled by a throttle 14 actuated by means of lever 15 and rod 16.

A fuel nozzle 18, discharging into a venturi 20 posterior to the throttle 14, is supplied with liquid fuel by a pressure regulator designated as a whole by the numeral 22. The pressure regulator 22 includes a fuel chamber 24 supplied with fuel under pressure through the conduit 26 and orifice 28. The fuel chamber 24 and an adjacent depression chamber 30 are separated by a flexible membrane 32 which is connected to a movable valve member 34 controlling the orifice 28, the arrangement being such that any increase in the pressure within the fuel chamber 24 or any decrease in the pressure within the adjoining chamber 30 tends to move the membrane 32 upwardly and close the valve 28, 34.

A calibrated orifice 36 in the outlet of fuel nozzle 18 is controlled by a tapered needle 38 attached to one end of an enclosed manometric capsule 40. Capsule 40 is located in a chamber 42 outside the carburetor body which communi-

cates with the venturi 20 through annular passage 44 formed in the wall of the body around the needle 38. The section of the nozzle outlet 36 is in this way regulated, dependent on the absolute pressure in venturi 20. The other end of the capsule is fixed to a rod 46 which extends through a bushing 48 mounted in the wall of the chamber 42. The rod 46 terminates in a plate 50 which is yieldingly urged by a spring 52 into contact with a cam 54 rotatable about an axis 56 and actuated by lever 58. Cam 54 constitutes that which has been referred to as the supplemental adjusting member. The operation of lever 58 causes a displacement of needle 38 which controls the fuel outlet 36 and consequently permits the mixture proportions to be varied.

The depression chamber 30 of the regulator 22 connects through passages 60 and 62 with the carburetor air inlet 12 and through passages 60 and 64 with the venturi 20. Passage 64 opens in venturi 20 at a point 66 where the pressure closely approximates that at the fuel outlet 36. The connection between chamber 30 and the air inlet 12 is controlled by a calibrated orifice 68 while the connection between chamber 30 and venturi 20 is controlled by calibrated orifice 70. The effective cross section of orifice 70 is regulated by a tapered needle 72 passing through guide bearing 74 and connected mechanically to operating lever 15 of the throttle valve 14. The depression transmitted to chamber 30 and consequently the pressure in fuel chamber 24 are thereby regulated in accordance with the opening of the throttle valve.

For any given position of lever 58, capsule 40 is more extended the lower the absolute pressure at the venturi 20, and consequently in chamber 42; consequently the cross section of orifice 36 is smaller the lower the pressure in the venturi 20. The needle 72 is withdrawn from the orifice 70 as the throttle is closed. The orifice 70 therefore has the largest effective opening when the throttle is closed, at which time a high depression exists posterior to the throttle and consequently at point 66 the entrance to passage 64. The pressure in chamber 30 and hence the fuel pressure in chamber 24 therefore increase as the throttle is opened. The shapes of the tapered needle 38 and the needle 72 are so predetermined that the richness of the mixture delivered by the carburetor is correct for all positions of the throttle and for operation at various altitudes.

When the lever 58 is in the position shown in solid lines in Figure 1 the mixture delivered may be considered as corresponding to normal operation. If lever 58 is brought to the position represented in dotted lines in Figure 1 the needle 38 is moved toward the orifice 36 and consequently decreases the effective cross section thereof and diminishes the discharge of fuel. The second position of lever 58, shown in broken lines in Figure 1, may be considered as corresponding to lean operation, which means economical operation. Obviously, the expressions "normal mixture" and "lean mixture" have here only a relative significance; they simply mean that in one case the mixture contains a proportion of fuel greater than in the other case, without signifying the absolute value of the ratio of the quantity of fuel to the quantity of air in the mixture.

In the embodiment shown in Figure 2 intermediate chamber 102 receives fuel from the fuel chamber 24 through orifice 104 the section of which is regulated by a tapered needle 106. The intermediate chamber 102 communicates with the venturi 20 by annular space 108 surrounding the shaft of needle 106. The intermediate chamber 102 communicates also with the carburetor air inlet 12 through orifice 110 regulated by needle 112 and passages 114 and 116. An air chamber 118 positioned adjacent the fuel chamber 24 and separated therefrom communicates with the air inlet 12 through passages 120 and 116. Needle 112 passes through guide bearing 122 and is controlled mechanically by lever 15 secured to the shaft of the throttle valve 14. The air passing through orifice 110 enters the chamber 102 and emulsifies the liquid fuel delivered by orifice 104. The emulsified fuel enters the venturi 20 through the passage 108. Needle 106 is attached to capsule 40 located in chamber 42. Chamber 42 connects with the venturi 20 through the annular space 44 provided around the needle 106. Capsule 40 elongates or contracts depending on the variation of pressure in venturi 20 and its variations in length cause the displacement of needle 106 which regulates the fuel orifice 104.

Capsule 40 may also be displaced by means of lever 58 and cam 54 to adjust the position of needle 106 and vary the richness of the mixture as previously explained in connection with Figure 1.

In the embodiment shown in Figure 3 the fuel is delivered to the venturi 20 by tube 130 sliding in a guide 132 fixed in the carburetor body. The end 134 of tube 130 receives a shaft 136 which passes through an air tight packing 138. The movements of tube 130 are controlled by the throttle valve 14 by means of throttle lever 15, link 140, and lever 142 pivoted on axis 144, link 146 and shaft 136. Tube 130 is pierced by a specially shaped slot 148 and has in addition in the vicinity of end 134 holes 150 having a sufficiently large section to permit tube 130 to be freely supplied with fuel. The portion of the tube 130 having the holes 150 is located in a chamber 152 connected through passage 154 to the fuel chamber 24 of the pressure regulator 22, the air chamber 118 of which communicates freely with the air inlet 12 through passage 156. Slot 148 of tube 130 is in this way supplied with fuel by the pressure regulator by means of passage 154, chamber 152, holes 150 and tube 130 itself.

On the other end of tube 130 slides a sleeve 158 provided with cover 160. Sleeve 158 passes through opening 162 in the wall of the carburetor body and there exists between the sleeve 158 and opening 162 an annular space which permits a free connection between venturi 20 and a chamber 42 situated outside of the body.

In chamber 42 is mounted a sealed manometric capsule 40. The capsule 40 carries at one end a rod 46 which passes through a guide fixed at one end of chamber 42 and which has on its end a plate 50 held against cam 54 by spring 52. Cam 54 is operated by means of lever 58 pivoting around axis 56.

The movements of end 164 of capsule 40 which are caused by the variation of pressure in chamber 42 are transmitted to sleeve 158 by means of lever 166 pivoted upon an axis 168. Lever 166 contacts through a projection 170 with end 164 of capsule 40 and with cover 160 of sleeve 158 through cam surface 172. A compression spring 174 maintains the cover of the sleeve, the lever, and the capsule in contact with each other. The

fixed guide 132 terminates in a circular edge 176, while the moving sleeve 158 terminates in a circular edge 178. The two edges 176 and 178 limit the section of slot 148 which remains uncovered in such a manner that the fuel outlet 180 is in the form of a trapézium, the two parallel sides of which are the circular edges 176 and 178 while the non-parallel sides are the edges of slot 148.

In operating lever 58 the whole capsule 40 is displaced and these movements are transmitted to sleeve 158. In this manner the size of the slot formed between the edge 178 of sleeve 158 and the edge 176 of guide 132, and consequently the section of fuel outlet 180, are varied. The operation of lever 58 thus permits the changing of the mixture proportions.

Although the invention has been described with particular reference to several specific embodiments it is to be understood that the invention is not to be limited thereto, nor otherwise except in accordance with the appended claims.

I claim:

1. In a carburetor for an aircraft engine, an air supply passage, a throttle therein, a fuel conduit discharging in the passage posterior to the throttle, a fuel chamber supplying fuel to the conduit, means including a movable member for varying the effective cross section of the fuel conduit, automatic means for controlling the richness of the mixture comprising a sealed manometric capsule subjected to pressures derived from the induction passage posterior to the throttle for operating said movable member, and manual means operable independently of the throttle from a point remote from the carburetor during substantially all conditions of engine operation for moving the sealed capsule as a unit to thereby vary at the will of the pilot during periods of operation the richness of the mixture determined by the automatic means comprising a pivotally mounted cam having an operating lever connected thereto and adapted to be actuated from a point remote from the engine, a member connected to said bellows and engaging said cam, and a spring urging said member into engagement with said cam.

2. The invention defined in claim 1 together with means for varying the pressure of the fuel in the fuel chamber comprising a variable pressure chamber, connections from the variable pressure chamber to the air supply passage respectively anterior and posterior to the throttle, throttle operated means for varying the relative effective cross sections of said connections to thereby vary the pressure in the variable pressure chamber, and means responsive to the pressure in the variable pressure chamber for controlling the inflow of fuel to the fuel chamber.

3. A charge forming device comprising an induction pipe, flow restricting means including a throttle in said pipe, a fuel chamber having a fuel inlet, an air chamber, a connection from said air chamber to the induction pipe anterior to said flow restricting means, means responsive to the pressures in the air and fuel chambers for variably restricting the fuel inlet, a fuel conduit leading from said fuel chamber and discharging in the induction pipe in a region of depression created by said flow restricting means, automatic means for controlling the richness of the mixture including a valve for varying the effective cross sectional area of said fuel conduit and an expansible member responsive to the pressure in said region of depression for actuating said valve, and manual means for varying at will the richness of the mixture determined by said automatic means comprising an eccentric member having a manual control lever operable independently of the throttle from a point remote from the device under substantially all conditions of operation, and means interconnecting the eccentric and expansible members varying the position of said expansible member as a unit upon movement of said control lever.

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