Jan. 6, 1942. J. LICHTENSTEIN 2,269,275

CARBURETOR

Original Filed Feb. 5, 1936

Fig. 1

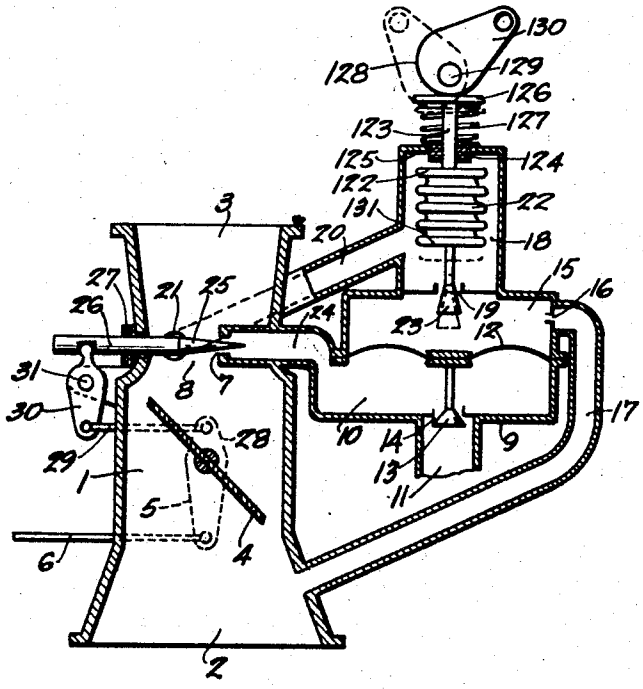
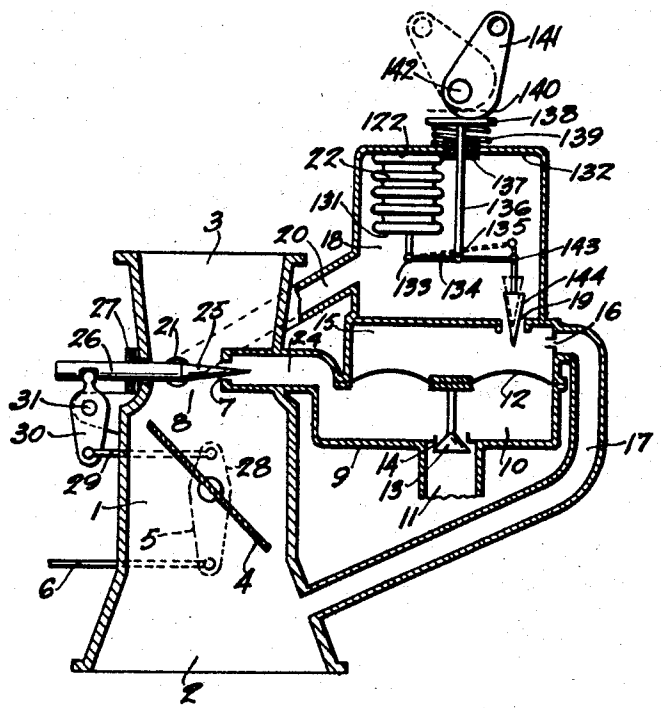


Fig. 2



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2,269,275

CARBURETOR

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Original application February 5, 1936, Serial No. 62,499. Divided and this application January 5, 1940, Serial No. 312,613. 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 804,028; 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 division of my copending application, Serial No. 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 pressure at which liquid fuel is supplied to the fuel 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. In the preferred embodiment, a second regulating device influencing the discharge of fuel delivered by the fuel nozzle 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. Many ways of realizing the invention will be apparent to those skilled in the art from the following description taken in connection with the appended drawing in which:

Figure 1 is a diagrammatic view showing one form of the invention; and

Figure 2 is a diagrammatic view showing a modified form of the invention.

The carburetor shown in Figure 1 comprises a mixture passage 1 having an air inlet 2 and a mixture outlet 3 connected to the motor. The effective cross section of the mixture passage 1 is controlled by a throttle 4 actuated by means of lever 5 and rod 6.

The fuel nozzle 7 discharges into venturi 8 posterior to the throttle 4. The cross section of the fuel jet is controlled by a tapered needle 25 the shank 26 of which passes through a bushing 27 carried by the body of the carburetor. Needle 25—26 is controlled by the throttle 4 through the intermediary of the arm 28 of lever 5, link 29 and lever 30 turning about the axis 31.

The fuel nozzle 7 is supplied with liquid fuel by a pressure regulator designated as a whole by the numeral 9. The pressure regulator 9 includes a fuel chamber 10 supplied with fuel under pressure through the conduit 11 and the orifice 14. The fuel chamber 10 is closed by a flexible membrane 12 connected to a movable valve member 13 controlling the inflow of fuel to the fuel chamber 10 through the orifice 14, the arrangement being such that any increase in pressure

within the fuel chamber 10 or any decrease in pressure within the adjoining chamber 15 tends to move membrane 12 upwardly and close the valve 13, 14.

The membrane 12 separates the fuel chamber 10 from a depression chamber 15, which communicates with the air inlet 2 located at the entrance of the carburetor through a calibrated orifice 16 and a conduit 17. Orifice 16 could equally well be open directly to the atmosphere. Chamber 15 communicates also with a chamber 18 through a calibrated orifice 19. Chamber 18 communicates freely with the venturi through a conduit 20. The conduit 20 opens into the venturi 8 at 21 in the vicinity of the fuel nozzle 7, that is to say at a point in the venturi where the pressure is approximately the same as at the fuel nozzle 7. The pressure which obtains in the chamber 18 is therefore approximately the same as the pressure which obtains at the fuel nozzle 7. In the chamber 18 is disposed a closed manometric bellows 22 of the aneroid capsule type, the length of which varies in accordance with the pressure obtaining in the chamber 18, to which it is exposed. One end 122 of capsule 22 is fixed to a rod 123 which extends through a bushing 124 mounted in the top 125 of the chamber 18. The rod 123 terminates in a plate 126 which is yieldingly urged by a spring 127 into contact with a cam 128 rotatable about an axis 129 and actuated by lever 130. Cam 128 constitutes that which has been referred to as the supplemental adjusting member. The other end 131 of the capsule carries a tapered valve member 23 which controls the orifice 19.

For any given position of lever 130, capsule 22 is more extended the lower the absolute pressure in the chamber 18, and consequently, in the venturi 8; consequently the cross section of orifice 19 is greater the lower the pressure in the venturi 8. The depression transmitted to chamber 15 increases as the pressure in the venturi 8 decreases. The pressure in the fuel chamber 10 follows the same fluctuations as the pressure in the chamber 15, so that the discharge of fuel delivered through the fuel nozzle 7 is smaller the more orifice 19 is opened. The shapes of the tapered valve member 23 and the needle 25 are so predetermined that the richness of the mixture delivered by the carburetor varies as a function of the opening of the throttle. Following the usual practice, the regulation is such that the mixture will have a uniform composition for all intermediate openings of the throttle, and will be richer for small and for great openings.

When the lever 130 is in the position shown in full lines in Figure 1 the opening at orifice 19 will be relatively small and the mixture delivered may be considered as that corresponding to normal operation. If lever 130 is brought to the position represented in dotted lines in Figure 1, the capsule is lowered; the effective cross section of passage 19 is enlarged, whatever the throttle opening may be; the discharge of fuel is diminished, and the mixture is made leaner. This second position of the lever 130 may be considered as corresponding to lean or 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 that 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 arrangement shown in Figure 2, the end 122 of capsule 22 is fixed to the end 132 of the chamber 18, whereas its other end 131 is connected to the end 133 of lever 134. The lever 134 is connected at a point 135 to a rod 136 which passes through a bushing 137 mounted at the end 132 of the chamber 18, and terminates in a plate 138. The spring 139 presses the plate 138 against the cam 140 carried by a lever 141 turning about an axis 142. Finally, the lever 134 is connected at 143 to a tapered needle 144 which controls the effective cross section of the orifice 19 as a function of the elongation of the capsule 22, similar to the member 23 of the carburetor shown in Figure 1. If the lever 141 is moved to the position shown in broken lines, the cross section of the orifice 19 is enlarged and the richness of the mixture is modified in the same manner as through the movement of the lever 130 in the device shown in Figure 1.

In the arrangement shown in Figure 2, the same as in the arrangement shown in Figure 1, movement of the supplemental adjusting member is added to the elongation of the capsule to cause displacement of the manometric control member (tapered valve member 23, Figure 1; or 144, Figure 2). One can readily conceive of various other arrangements equivalent to those shown in Figures 1 and 2, without making it necessary to multiply examples.

Although the invention has been described with particular reference to specific embodiments thereof, it is not limited to such use, and may be embodied in other forms within the scope of the appended claims.

I claim:

1. In a carburetor having an induction passage, a throttle controlling the passage, a fuel nozzle discharging into said induction passage, a fuel chamber supplying fuel to said nozzle and having an inlet, a valve in the inlet, a suction chamber, diaphragm means forming movable walls of said chambers and operatively connected to said valve, and means for varying the suction in said suction chamber to thereby vary the pressure in the fuel chamber comprising conduits connecting the suction chamber with the induction passage respectively anterior and posterior to the throttle, and means including a manometric capsule responsive to variations in the pressure in the induction passage for automatically varying the relative effective cross sections of said conduits: in combination therewith of an independently operable manual means for further varying the relative effective cross sections of said conduits comprising a spring urging the capsule as a unit in one direction, and a pivotally mounted cam having a control lever connected thereto and operable at the will of the operator from a point remote from the engine during substantially all operating conditions for moving said capsule as a unit in opposition to said spring.

2. A charge forming device for an internal combustion engine comprising an air supply passage, a throttle therein, a fuel conduit discharging in said passage posterior to the thottle, a throttle controlled variable restriction in said conduit, a fuel chamber supplying fuel to said conduit and having an inlet, a movable wall in said fuel chamber, a valve in the inlet connected to said wall, a variable pressure air chamber having a movable wall connected to said valve, a suction conduit and an air conduit connecting the air chamber with the air passage respectively posterior and anterior to the throttle, a valve for controlling the relatively effective areas of said suction and air

conduits, and means for varying the position of said valve comprising an expansible member responsive to variations in the pressure in the air passage posterior to the throttle connected to the valve, and manual means independently operable under substantially all engine operating conditions from a point remote from the engine for varying the position of the valve for a given condition of expansion of the expansible member, said manual means comprising a cam having an operating lever adapted for remote control and means interconnecting the cam and valve whereby movement of the cam varies the position of the valve.

3. A charge forming device for an internal combustion engine, including an air supply passage, a throttle therein, a fuel chamber, a variable pressure air chamber, diaphragm means forming movable walls of said chambers, means for discharging the fuel from the fuel chamber into the passage, valve means operatively connected to said diaphragm means for controlling the admission of fuel to the fuel chamber, conduits connecting the air chamber respectively to regions of relatively low and high pressures in the air supply passage, and means for varying the pressure in the air chamber to thereby vary the pressure in the fuel chamber comprising a valve for controlling the relative effective cross sectional areas of said conduits, a manometric capsule for varying the position of said valve in response to variations in pressure in the air passage posterior to the throttle, and a manual control operable at the will of the pilot from a point remote from the device and without corresponding movement of the throttle for independently varying the position of said valve, said manual control comprising a pivotally mounted eccentric member operable without corresponding movement of the throttle and means interconnecting said member and valve for varying the position of the valve upon movement of the said member.

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