June 1, 1926 1,586,683

F. C. MOCK

CARBURETOR

Original Filed March 12, 1917

Fig. 1

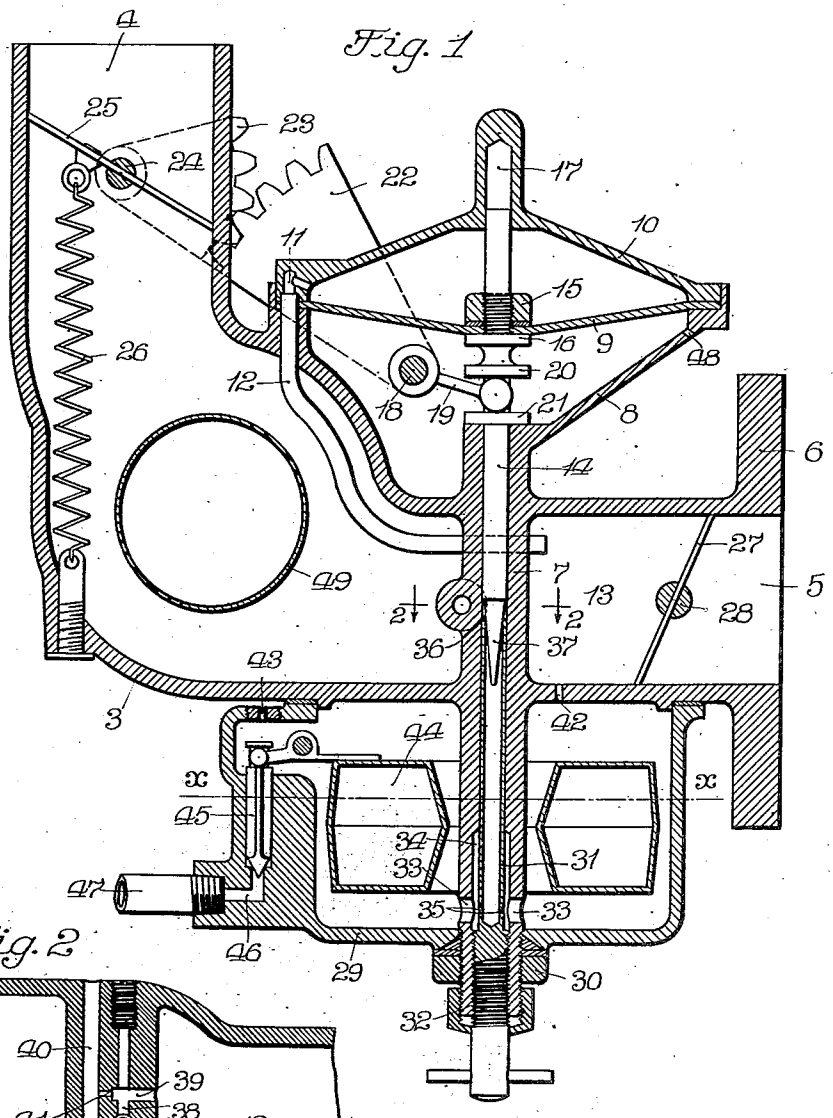
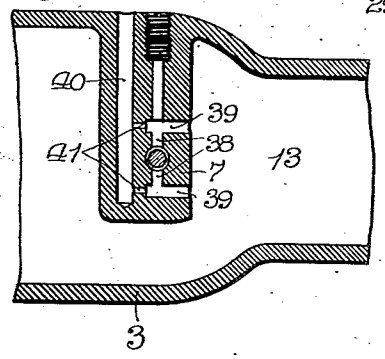


Fig. 2



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UNITED STATES PATENT OFFICE.

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CARBURETOR.

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My invention relates to carburetors for internal combustion engines and is concerned primarily with improved control of the vacuum in the carbureting chamber to the end of improved, more delicate and more sensitive control of the influences which determine the proportioning of the air and fuel throughout the range of desired engine speeds. The range of engine speeds through which proper control may effectively be had is considerably enlarged by my invention and, moreover, this extended control is placed upon a set automatic basis. Because of this effective control of the vacuum in the carbureting chamber, my invention is particularly and peculiarly related to what has become known as "suction feed", as distinguished from gravity feed—that is, the liquid fuel, a hydro-carbon, such as gasoline, for instance, is carried from the main supply tank to a float chamber, which in turn feeds the nozzle or nozzles, regardless of the respective levels of the tank and the chamber, by means of the suction in the carbureting chamber, and it is important in this respect that because of the manner in which I control the vacuum in the carbureting chamber I am enabled to make this feeding effort continuous, thus eliminating the so-called "reserve supply" now and heretofore necessary to suction feed systems.

Second, but none the less important, is my purpose to insure that under all operating conditions the liquid fuel will be delivered into the carbureting chamber in a very finely divided state, this feature, as will be seen, co-operating effectively with and being enhanced by the vacuum control referred to.

While the broader features of my invention are covered by the above statements, I attach importance to certain specific features which will be referred to hereinafter, and which are made the subject matter of the more specific of the appended claims chief among which specific features is the needle control of the liquid fuel flow according to the volume of entering air.

My invention will be more clearly understood by reference to the accompanying drawing in which—

Figure 1 is a central, longitudinal sectional view of my carburetor; and

Figure 2 is an isolated cross-sectional view taken on the plane of the line 2—2 of Fig. 1, and looking in the direction indicated by the arrows.

It will be seen that the structure comprises primarily a generally tubular casing 3, of L-shaped form for structural convenience. One end of this casing is open to the atmosphere at 4, thus providing the air inlet, and the other end of this casing has the mixture outlet 5 surrounded by a flange 6 to facilitate attachment to the manifold of an internal combustion engine. The carburetor shown may be said to be of the horizontal type. Extending transversely through the horizontal portion of the L-shaped casing is a cross tube 7 which extends upwardly and downwardly beyond the casing, as illustrated. Above the cross tube there is formed a diaphragm chamber 8, this diaphragm chamber, the cross tube and the main casing being preferably made in one integral casting. A diaphragm 9 is clamped in the diaphragm chamber 8 by means of a cover 10, suitably secured in place, thus forming an opposing diaphragm chamber. The upper diaphragm chamber is connected by means of a passage-way 11 and a tube 12 with the carbureting chamber 13.

A stem 14 reciprocates in the cross tube 7 and is secured to the diaphragm by means of a nut 15 between which and the collar 16 on the stem, the diaphragm is clamped. The upper end of the stem 14 is guided in a pocket 17 formed in the cover 10.

A stub shaft 18 extends through the diaphragm casing wall and on the inside of the lower diaphragm chamber is provided with an arm 19 secured thereto and having its end lying between collars 20 and 21, on the stem 14. On the outside of the diaphragm casing a gear segment 22 is secured to the stub shaft 18 and this gear segment meshes with the gear segment 23 mounted upon a shaft 24, extending diametrically across the air inlet 4. In the air inlet 4 the shaft 24 is provided with a butterfly valve 25, this valve being normally held closed by a spring 26 connected between one side of the valve and a convenient point on the inside of the main casing. The spring 26 is light and exerts only a limited effort toward closing the valve.

The connection between the carbureting chamber and the engine is controlled by a throttle valve 27 mounted upon the shaft

28, extending diametrically across the mixture outlet.

A float chamber 29 is secured to the underside of the main casing in concentric relation to the cross tube 7, being slipped thereover and held in place by a clamping nut 30 threaded upon the lower end of the cross tube. An inner tube 31 fits snugly in the cross tube 7 below the stem 14, extending upwardly from an adjustable screw plug 32, the interior of the inner tube 31 being connected with the interior of the float chamber by means of passage-ways 33—33, annular chamber 34 and passage-ways 35—35. The top of the inner tube 31 terminates at about the axial plane of the horizontal portion of the L-shaped casing and forms the valve seat 36 for co-operation with a needle valve 37, extending downwardly from the stem 14. This construction is particularly illustrated in Figure 2, where it will be seen that the annular space surrounding the top of the needle valve 37 is connected by means of ports 38—38 with the nozzle outlets 39—39, directed toward the throttle valve, these nozzles being formed in an enlargement of the cross tube 7 and this enlargement forming a bridge extending to one of the side walls of the main casing. Through this bridge an air venting passage-way 40 extends from the outside atmosphere to air venting holes 41—41 leading into the nozzles 39—39.

A restricted opening 42 connects the carbureting chamber 13 with the interior of the float chamber which, in turn, has the restricted opening 43 to the atmosphere. The float chamber is provided with a float 44 which operates the entry valve 45 controlling the entry passage-way 46 with which the supply pipe 47 leading from the main supply tank connects. The liquid fuel level in the float chamber is indicated by the dot and dash line *x*—*x*.

When the engine is not running the liquid fuel stands in the float chamber at the level indicated, and the valve 25 is closed. When the engine is turned over the throttle valve 27, being somewhat open, the suction produced in the carbureting chamber will communicate through the tube 12 and passage-way 11 to the upper diaphragm chamber. Air under atmospheric pressure being admitted to the lower diaphragm chamber by way of the restricted passage-way 48, the diaphragm 9 will rise and this movement will be transferred through the gear sectors 22 and 23 to open the valve 25 slightly. The tendency for the spring 26 to close the valve 25, set to an adjustment by the screw 26′, will maintain the desired amount of vacuum in the carbureting chamber, say approximately 1⅕ pounds. When there is a tendency to increase the degree of suction in the carbureting chamber by opening the throttle or increasing the speed of the engine, the diaphragm 9 will rise farther so as to open the valve 25 farther, thus maintaining the degree of suction in the carbureting chamber constant. The result is a greater amount of air for substantially the same suction. In order, then, to maintain the proper mixture proportion the feed of liquid fuel is increased by the rise of the needle valve 37. The orifice controlled by the needle valve is adjusted by turning the plug 32 in one direction or the other to raise or lower the valve seat 36, with obvious results.

The passage-ways 42 and 43 are so determined as to gauge the vacuum in the float chamber at a lesser point than in the carbureting chamber, say ⅕ of a pound less, thus providing an influence of ⅕ of a pound or 7½ inches gasoline head for causing the liquid fuel to discharge from the nozzles. The jet of air admitted from the outside atmosphere through the passageway 40 is made to discharge directly across the points at which the liquid fuel issues from the needle valve orifice, and unobstructedly toward the mixture outlet so as to avoid to a large degree condensation of the fuel spray on obstructions as will be evident from Figure 2. As this air jet discharges into a suction of 1⅕ lbs. the desired atomizing effect is secured.

It will be understood by those skilled in the art that the figures which I have given may be departed from without departing from the spirit and scope of my invention. The requirements are that the values of relative suctions shall not fall below the minimum necessary to lift the gasoline nor rise above the maximum, of say, about two pounds, which would limit the maximum power.

It is clear from what has been said that a suction is continuously maintained in the float chamber and the result is that as the liquid fuel becomes used, the float drops to raise the valve 45 to admit liquid fuel from the source of supply under this suction. Since the suction in the float chamber is continuous and always sufficient, it is every ready upon demand and there is no need, therefore, for a reserve supply to take care of intervals when there is no suction or insufficient suction, as in the case of the prior art. If liquid fuel is ready to enter the float chamber through the passageway 46 at a pressure in excess of the pressure within the float chamber, there need be no further concern about the supply to the float chamber.

A sufficient suction is maintained in the float chamber and a different and greater suction is maintained in the carbureting chamber, thus maintaining the head for liquid fuel flow, and the regulating orifices for the liquid fuel supply into the carburet-

ing chamber are automatically accommodated to the amount of air entering the carburetor.

Quick opening of the throttle might cause fluttering of the air responsive apparatus, but this is counteracted by the restriction of the atmospheric inlet to the lower diaphragm chamber whereby a dash-pot action is secured. I mount a cylindrical baffle 49 in the air inlet at the right angle turn in the same, so as to eliminate, as far as possible, undesirable eddy currents which usually exist in an air column which is forced to suddenly turn at right angles.

I claim:

In a carburetor, the combination of a carbureting chamber having a single air inlet at one end, and a mixture outlet at the other end, a throttle valve in said mixture outlet, a butterfly valve in said air inlet, a constant level float controlled fuel chamber, a fuel port opening into said carbureting chamber and communicating with the lower part of said fuel chamber, a fuel regulating valve controlling the discharge from said fuel port, a second continuously open passage extending from said carbureting chamber to the upper part of said fuel chamber for maintaining a vacuum in the upper part of said fuel chamber, a diaphragm responsive to the pressures in said carbureting chamber, a pair of meshing segmental gears connecting said diaphragm with said butterfly valve for controlling the admission of air through said air inlet, and means connecting said diaphragm with said fuel regulating valve.

In witness whereof, I hereunto subscribe my name this 9th day of March, A. D. 1917.

FRANK C. MOCK.