

June 24, 1930.

M. GOUDARD

1,768,051

CARBURETOR

Filed Dec. 8, 1924

2 Sheets-Sheet 1

Fig. 1.

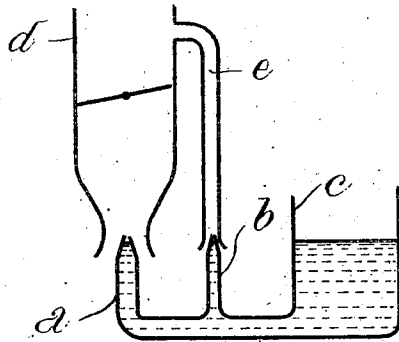


Fig. 2.

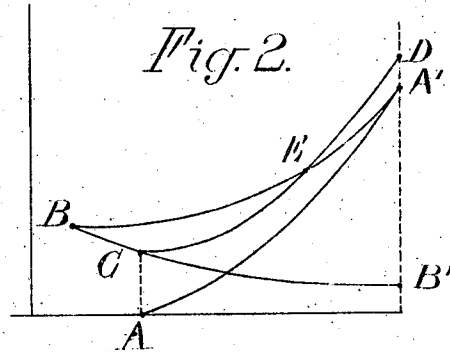


Fig. 3.

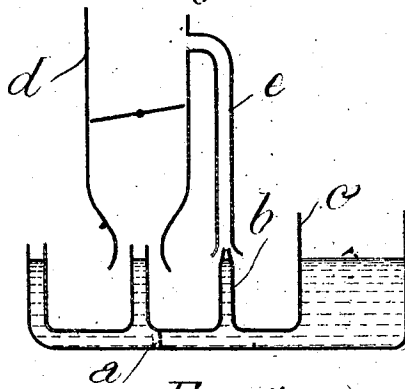


Fig. 4.

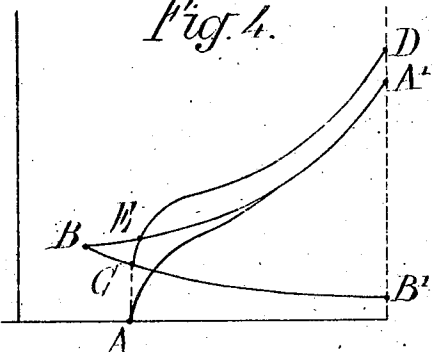


Fig. 5.

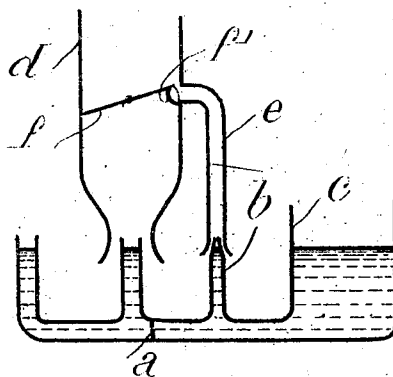
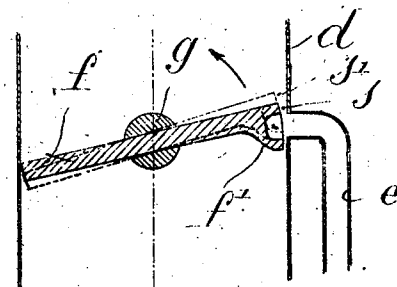


Fig. 6.



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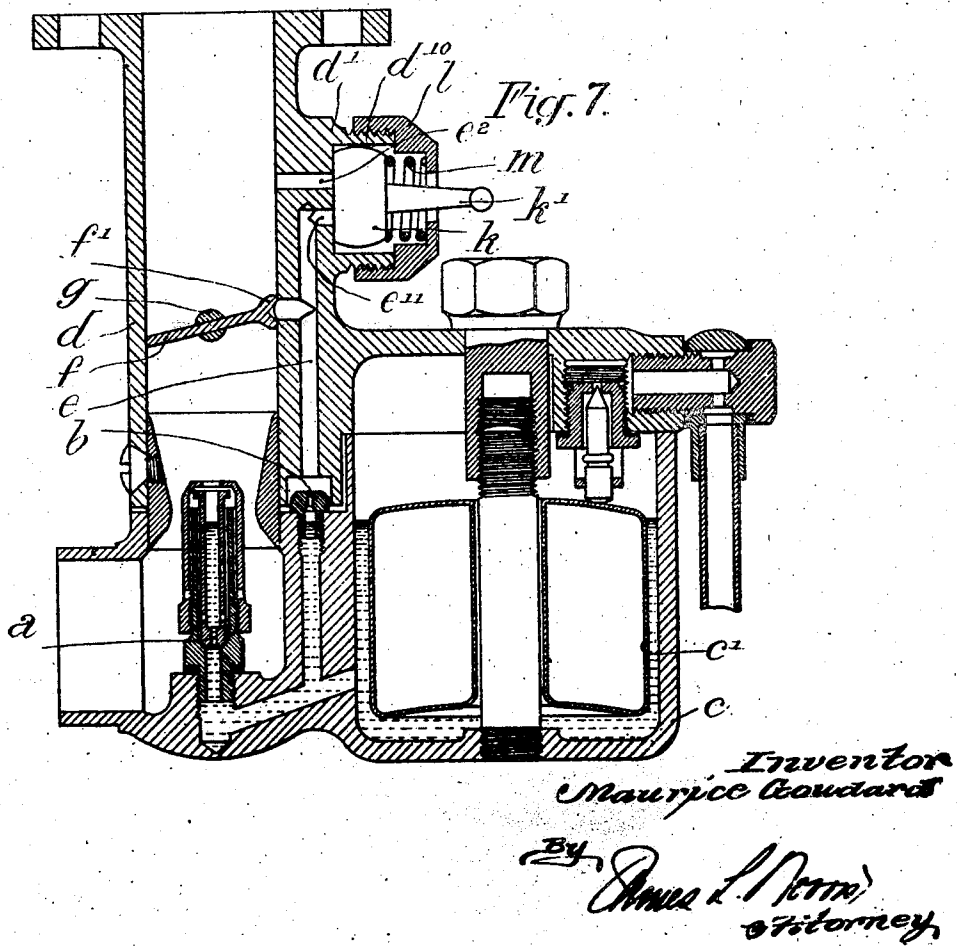
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

MAURICE GOUDARD, OF NEUILLY SUR SEINE, FRANCE

CARBURETOR

Application filed December 8, 1924, Serial No. 754,622, and in Belgium December 19, 1923.

This invention relates to carburetors having a plurality of nozzles, and especially to such a carburetor which gives a constantly increasing feed throughout the opening movement of the valve.

Most of the carburetors at present in use which have more than one nozzle operate in such a manner that at the opening of the throttle there is a scarcity of fuel, while at the full open position there is an excess of fuel. The reason for this is that the usual auxiliary nozzle gives a flow which decreases progressively as the valve is opened, yet the flow never becomes low enough to prevent giving an excess at full working speed.

The primary object of the present invention is to provide a carburetor in which the flow of fuel increases progressively with the opening of the butterfly valve. A second object is to provide a carburetor having main and auxiliary nozzles, in which the flow from the auxiliary nozzle increases rapidly at first and then decreases. Another object is to provide a carburetor which will give proper amounts of fuel at all times. A further object is to provide a carburetor which will make the starting of a cold engine easier. Further objects and advantages will appear below.

The construction and operation of the invention will become apparent from the following description when taken in connection with the accompanying drawings which form a part thereof.

In the drawings:

Fig. 1 is a diagrammatic illustration of a usual type of carburetor.

Fig. 2 is a graphical representation of the feed curves of the carburetor shown in Fig. 1.

Fig. 3 is a diagrammatic illustration of a second usual type of carburetor.

Fig. 4 is a graphical representation of the feed curves of the carburetor shown in Fig. 3.

Fig. 5 is a diagrammatic illustration of one form of the present invention.

Fig. 6 is a detail view of the valve of Fig. 5, the valve being shown in cross section.

Fig. 7 is a cross section of another modification of the device.

If a carburetor having a non-flooding nozzle, such as that shown in Fig. 1, is provided with a principal nozzle *a* and a slow speed nozzle *b* operating at all speeds of the engine, and if the output curves of the two nozzles are plotted as a function of the speed of the engine or the opening of the throttle valve, curves are obtained of the forms represented in Fig. 2. If the carburetor is provided with a flooding nozzle, as shown diagrammatically in Fig. 3, the curves will be of the form shown in Fig. 4. The curves *A A₁* represent the output of the principal nozzle *a*, and the curves *B B₁* represent the output of the slow speed nozzle. The sum of the output of the two nozzles gives the total output of the carburetor and is represented by the curve *B C D*.

In this curve, the ordinate of the point *B* represents the total output of combustible liquid at extreme slow speed; that of the point *C* the total output at the end of the period of slow working. This latter output is usually insufficient, and it is at this point that there is the "gap in carburation." The ordinate of the point *D* represents the output at the moment of full working, an output which is usually excessive. If the auxiliary or slow speed nozzle is so regulated or proportioned as to secure good working at the extreme slow speed, and the principal nozzle is so regulated as to obtain satisfactory working at the maximum speed, the ideal curve for fuel supply of a satisfactory character at all speeds of the engine must take the form of the curve *B E A₁*. It will be seen from an examination of Figs. 2 and 4 that as compared with the ideal output, the practical output of fuel from the carburetor at slow speed is insufficient, as measured by the difference between the ordinates of the curve *B E* and the curve *B C E*, and at high speed is excessive as measured by the difference in the ordinates between the curve *E D* and the curve *E A₁*.

The insufficient output at the point *C* (the gap in carburation at the end of the slow period) is due to the fact that the strong suction on the slow speed nozzle when the throttle valve is nearly closed is reduced too quickly on the slightest opening of the valve.

If, on the other hand, an arrangement can be obtained in which the slow speed nozzles supply fuel for too long a time for fast working, this unfavorable result is due in part to the fact that the opening of the passage from the slow speed nozzle into the passage of the main nozzle is constantly in the zone of suction due to the almost open position of the valve.

In the present invention, the outlet opening of the slow speed nozzle is located in a known manner in the neighborhood of the periphery of the throttle valve when in its position of maximum throttling, and the invention essentially consists in so locating the opening of the slow speed nozzle with respect to the throttle and in so constructing the passage and the said throttle that a correct output from the slow speed nozzle is obtained during the slow speed working, after which the output is maintained at a definite rate during the whole time of the said working.

The drawings, as previously stated, illustrate a carburetor having two nozzles and show the application of the invention for obtaining a more favorable output than has hitherto been the case, the construction being substantially as follows.

The elements of the carburetor, other than the regulating parts are constructed in the ordinary manner. The construction may for instance comprise the following parts.

c (Fig. 5) is a constant level chamber, d is the body of the carburetor. a is the principal nozzle located in the axis of and at the base of the body d . e is a passage leading to the slow speed nozzle and communicating with the body d through a horizontal passage. b is the auxiliary nozzle located in the axis of and at the base of the passage e .

The throttle valve, which is located in the body d , is so constructed that, when it is in its closing position, a portion of its periphery is adapted to cover the horizontal passage leading from the slow speed passage e . With this end in view, the said device may comprise with advantage, and by way of example, a butterfly valve f mounted on a spindle g (Fig. 6) at a right angle to the body of the carburetor and located substantially in a plane at a right angle to the axis of the said carburetor and passing through the lower edge of the horizontal passage leading from the slow speed passage. The butterfly valve f is accordingly provided, on the side towards the slow speed passage, with an enlarged portion f^1 (Figs. 5 and 6) which is adapted, when the butterfly valve f is moved into its closed position, to cover and to close the horizontal passage leading to the passage e . Moreover, when the butterfly valve f is in this position, the lower portion of the said enlarged portion f^1 is at a level below the axis of rotation of the butterfly valve, as shown in Fig. 5.

When an internal combustion engine provided with such a carburetor is working at a slow speed and the butterfly valve f is opened to a small extent in the direction of the arrow (Fig. 6), the space s between the before mentioned enlargement f^1 and the body of the carburetor through which the suction is transmitted to the slow speed nozzle b is widened and reaches an amount s^1 . The result of this widening of such space is to cause the output of the slow speed nozzle to increase progressively during this period and to overcome the insufficiency of output of fuel, as measured by the difference of the ordinates between the curve $B E$ and the curve $B C E$. At high speeds of the engine the enlarged portion f^1 of the valve, passing freely from the horizontal passage leading to the slow speed nozzle, serves to relieve the auxiliary nozzle b from the strong suction created by the enlargement s^1 in the current of air and to leave it exposed only to the weaker suction which is being exerted on the principal nozzle, so that the output from the slow speed nozzle undergoes variations substantially proportional to those of the output from the principal nozzle, and the relative excess of output, measured by the difference of the ordinates between the curve $E D$ and the curve $E A_1$ is reduced, if the proper care has been taken to proportion the principal nozzle so that the sum of its output and that of the auxiliary nozzle is represented by the output curve $E A^1$, that is to say the ideal curve.

A complete carburetor is shown in Fig. 7. In this form, the valve f and the general structure are substantially similar to that of Figs. 5 and 6. The remainder of the carburetor includes the usual float c' controlling the inlet valve of the constant level chamber c . A boss d' is formed on the body of the carburetor d and in which is formed a cylindrical housing d^{10} with its axis perpendicular to the axis of the said body. e^2 is a passage between said housing d^{10} and the interior of the body of the carburetor and opening into the said body above the valve f . e^{11} is a small channel connecting the lower portion of the housing d^{10} with the channel e . k is a valve comprising a body of a diameter somewhat less than the internal diameter of the housing d^{10} and having a plane face adapted to rest at the bottom of the said housing so as to cover the orifices of the channels e^2 and e^{11} . The body k is provided with a tail k^1 having a ball at its free end so that it can be operated in all directions by means of an operating rod or cable.

l is a cap screwed on to the boss d^1 and having a central orifice through which the tail k^1 of the valve extends and within which it has free play in all directions. m is a spring between the interior of the said cap l and the valve k and serving to move the

valve k in a direction to cover the channels e^2 and e^{11} .

In this way a carburetor is obtained having the same advantages as that previously described as regards the output of the auxiliary nozzle and wherein, when the engine is started in the cold state, the necessary excess of spirit may be obtained by moving the tail k^1 in any direction, so as to uncover the orifices of the passages e^2 and e^{11} and put the said passages into communication, at the same time moving the body k against the cap l in such a way as to press against the cap at all points and to close effectively the orifice in the cap, so that there is a direct suction on the nozzle b . This must be done while the valve f is closed. Therefore, the valve f must be made with an elliptical periphery in order that the position it assumes when its enlarged portion f^1 completely closes the orifice to the slow speed nozzle, may be the extreme position which it assumes in its movement in a direction opposite to the arrow in Fig. 6, as shown in Fig. 7.

It is clear that the valve shown in Fig. 7 will operate in the same way as that shown in Fig. 6 as far as the effect on the feed curve in ordinary use is concerned.

As shown in Fig. 6, for example, the valve is preferably elliptical and is so located that a plane through its axis perpendicular to the axis of the main mixing chamber cuts the walls on the side of the auxiliary passage nearest the main nozzle. This valve then can be opened in only one direction, namely, that shown by the arrow in Fig. 6. It is plain that with the construction shown the flow from the auxiliary nozzle will increase at first, without flow from the main nozzle, but as the main nozzle comes into action the flow from the auxiliary nozzle will decrease and the ideal fuel feed curve will be obtained.

It will be understood, as has already been stated that the invention is not limited in any way to the methods of application or to the constructional embodiments which have been more fully described. It includes all modifications coming within a fair interpretation of the claims.

What I claim and desire to secure by Letters Patent of the United States of America is:—

1. A carburetor comprising in combination main and auxiliary jets, a main mixing chamber, said main chamber having walls which are rectilinear in the direction of its longitudinal axis, an auxiliary mixing chamber having a terminal orifice in said main mixing chamber, a butterfly valve having a surface for controlling the main mixing chamber and a second surface for controlling the auxiliary mixing chamber, said second surface having a depression therein, said depression being so positioned as to lie in line with the terminal orifice of the auxiliary

mixing chamber when the valve is in the position of maximum throttling said valve being limited so that in its opening movement said second surface moves away from the jet end of the main mixing chamber.

2. A carburetor comprising in combination main and auxiliary nozzles, a main mixing chamber having a circular cross section, an auxiliary mixing chamber communicating through a terminal orifice with said main mixing chamber, a butterfly valve of elliptical form arranged to control simultaneously said main and auxiliary mixing chambers at their point of communication, said valve, when in closed position, sloping from the terminal orifice of the auxiliary mixing chamber toward the nozzle end of the main mixing chamber and engaging the walls of the main chamber on both sides of said orifice.

3. A carburetor comprising in combination main and auxiliary nozzles, a main mixing chamber coacting with the main nozzle, an auxiliary chamber coacting with the auxiliary nozzle, said auxiliary mixing chamber having a terminal orifice in the main mixing chamber, said main mixing chamber having rectilinear walls parallel to its longitudinal axis at those portions thereof adjacent said terminal orifice, and an elliptical butterfly valve positioned so that a plane containing its axis and perpendicular to the longitudinal axis of the main mixing chamber cuts the rectilinear wall of the latter adjacent the side of said terminal orifice nearest said main nozzle, said butterfly valve, when in closed position, simultaneously covering the terminal orifice of the auxiliary mixing chamber and the bore of the main mixing chamber.

4. A carburetor comprising in combination main and auxiliary nozzles, a main mixing chamber having a circular cross section, an auxiliary mixing chamber communicating through a terminal orifice with said main mixing chamber, a butterfly valve of elliptical form arranged to control simultaneously said main and auxiliary mixing chambers at their point of communication, said valve, when in closed position, sloping from the terminal orifice of the auxiliary mixing chamber toward the nozzle end of the main mixing chamber and engaging the walls of the main chamber on both sides of said orifice, the portion of said valve which controls said orifice having a depression therein.

5. A carburetor comprising in combination main and auxiliary nozzles, a main mixing chamber coacting with the main nozzle, an auxiliary chamber coacting with the auxiliary nozzle, said auxiliary mixing chamber having a terminal orifice in the main mixing chamber, said main mixing chamber having rectilinear walls parallel to its longitudinal axis at those portions thereof adjacent said terminal orifice, and an elliptical

butterfly valve positioned so that a plane containing its axis and perpendicular to the longitudinal axis of the main mixing chamber cuts the rectilinear wall of the latter adjacent the side of said terminal orifice nearest said main nozzle, said butterfly valve, when in closed position, simultaneously covering the terminal orifice of the auxiliary mixing chamber and the bore of the main mixing chamber, the portion of said valve which covers said terminal orifice having a depression therein.

In testimony whereof I have hereunto set my hand.

MAURICE GOUDARD.