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DE LOS N. HICOK ET AL

CARBURETOR FUEL CONTROL DEVICE

Filed March 11, 1921

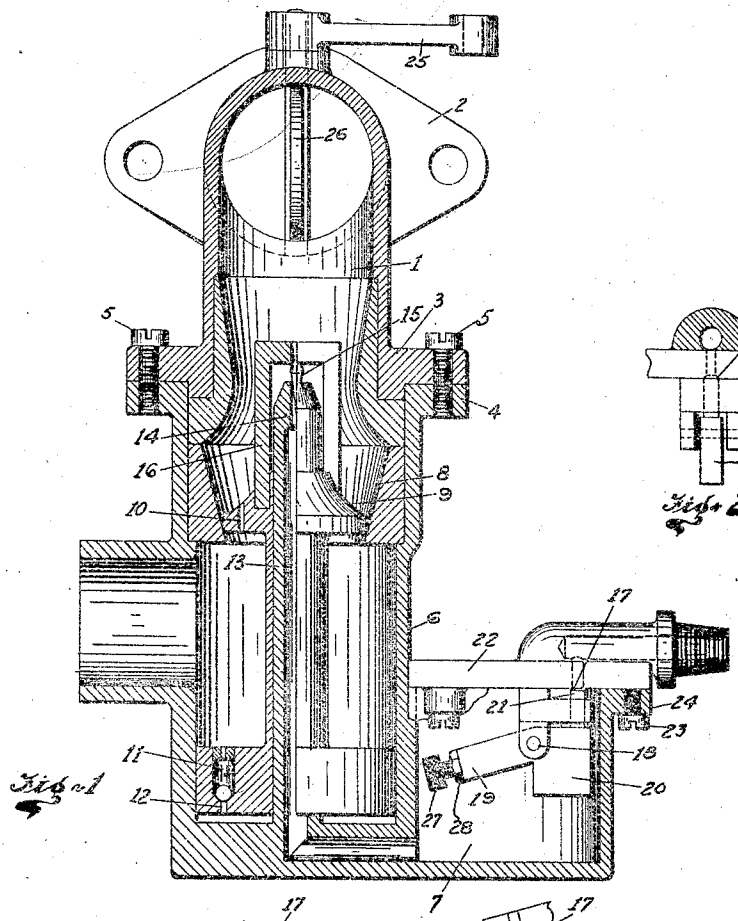

Fig. 1

Fig. 2

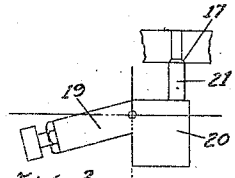

Fig. 3

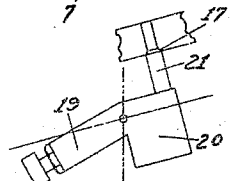

Fig. 4

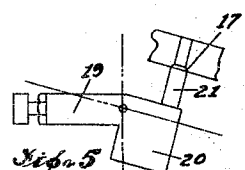

Fig. 5

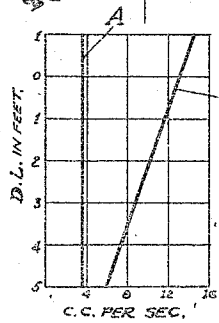

Fig. 6

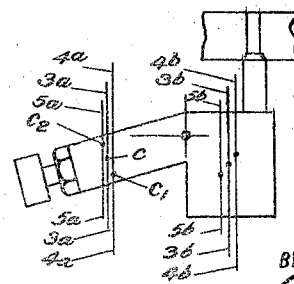

Fig. 7.

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UNITED STATES PATENT OFFICE.

DE LOS N. HICOK, OF NEWARK, AND EDWARD L. AIKEN, OF EAST ORANGE, NEW JERSEY, ASSIGNORS TO SPLITDORF ELECTRICAL COMPANY, OF NEWARK, NEW JERSEY.

CARBURETOR-FUEL-CONTROL DEVICE.

Application filed March 11, 1921. Serial No. 451,639.

To all whom it may concern:

Be it known that we, DE LOS N. HICOK, a citizen of the United States, residing at Newark, in the county of Essex, State of New Jersey, and EDWARD L. AIKEN, a citizen of the United States, residing at East Orange, in the county of Essex, State of New Jersey, have invented certain new and useful Improvements in Carburetor-Fuel-Control Devices, of which the following is a description, reference being had to the accompanying drawing and to the figures of reference marked thereon.

This invention relates to vacuum feed mechanism for internal combustion engines.

In a large number of automotive vehicles the fuel reservoir is located at a lower level on the vehicle than the carburetor and in most instances at opposite ends of the vehicle and the suction of the engine is depended upon to draw the fuel up to the carburetor. As a result when the vehicle is traveling along the road and different grades are encountered, while the suction of the engine may be constant, the force required to lift the fuel from the lower level of the reservoir to the carburetor varies. The flow of fuel therefore into the carburetor is variable and therefore the feeding of fuel into the carburetor directly is rendered impracticable. For this reason in actual practice, some mechanical device is interposed between the carburetor and the fuel reservoir to maintain a head of fuel above that of the carburetor, and the carburetor is provided with a float to prevent flooding of the same.

It is an object of this invention to dispense with any mechanisms to maintain a head of fuel for the carburetor.

It is a further object of this invention to so simplify the construction of a carburetor as to dispense with any float mechanisms.

It is a still further object of this invention to provide a means for regulating the supply of fuel to a carburetor mounted on a vehicle so that the rate of flow thereinto is unaffected by the angle of inclination of the vehicle to the horizontal or the height of the fuel reservoir relative to the carburetor.

According to our invention, the suction or partial vacuum created in the atomizing chamber of the carburetor by the movement of the pistons in the engine is utilized to suck up fuel which flows through an opening into an auxiliary fuel chamber, the opening being controlled by a valve responsive to gravitational forces which operate to put more or less pressure in the valve dependent upon the angle of inclination of the chamber to the horizontal, or what amounts to the same thing, upon the angle of inclination of the vehicle carrying the carburetor and chamber to the horizontal.

In the accompanying drawings in which is shown one form of our invention,—

Figure 1 is a view partly in section and partly in elevation of a complete carburetor with a fuel chamber integral therewith.

Figure 2 is an end view of the valve controlling mechanism.

Figure 3 illustrates diagrammatically the position of the valve mechanism when the vehicle is on a level.

Figure 4 illustrates in a similar manner the position of the valve mechanism when the vehicle is travelling up hill.

Figure 5 similarly illustrates the position of the same mechanism when the vehicle is travelling down hill.

Figure 6 is a graph illustrating the operation of the invention, and

Figure 7 illustrates diagramatically on a larger scale than shown in Figs. 3, 4, and 5, the position of the valve mechanism as illustrated in Fig. 3, but with the addition of the relative positions of the center of gravity of the two portions of the valve mechanism when in the positions shown in Figs. 4 and 5.

Now referring to the figures more in detail, 1 illustrates the mixing chamber of the carburetor, supported at its upper end by means of a flange 2 which may be attached to the intake manifold of the engine. At its lower end the chamber is provided with a flange 3 to which is attached by means of a cooperating flange 4 and screws 5 a chamber 6. Preferably integral with this chamber, although not necessarily so, is a fuel chamber 7 into which is fed the fuel from a supply tank or reservoir, which reservoir is at times above and at other times below the level of the inlet into the fuel chamber, depending upon the grade of the road.

The carburetor is of the vacuum feed type wherein fuel is sucked up from a lower level

into a reservoir adjacent the carburetor. The carburetor comprises a two-part tube 8 resting partly in the mixing chamber 1 and partly in the chamber 6, the lower part of the tube being closed by a suction controlled valve 9, the shape of the valve and the interior bore of the lower portion of the tube being such that the higher the valve rises in the tube the greater the volume of air that is permitted to be passed therethrough, and a small passageway 10 is provided to permit air in small quantities to pass through the valve without lifting the same. To prevent the valve from rising too suddenly as when there is a momentary acceleration of the engine, a dash pot of common construction is attached to the stem of the valve and comprises in general a plate 11 provided with a ball valve 12. The stem of the valve 9 is hollow and is slidable on a tube 13, which latter connects at one end with the fuel chamber 7 and at its other end with the atomizing chamber 1. The end of the tube terminating in the atomizing chamber is restricted so as to form a spray nozzle 14, and controlling the opening in the spray nozzle is a tapered needle valve 15 embedded in a bridge 16, said bridge itself being embedded in the valve head 9, the needle valve in its lowest position leaving a small opening for the admission of fuel. The usual throttle lever 25 operating the butterfly valve 26 controls the inlet of the atomized mixture to the engine cylinders. It is now apparent that when the engine speeds up, thereby creating a greater vacuum in the chamber 1, the valve head 9 rises a distance sufficient to admit enough air to reestablish the normal pressure maintained in the atomizing chamber. At the same time the needle valve is opened to admit a quantity of fuel to mix in proper proportion with the increased amount of air admitted to the atomizing chamber.

Due to the action of this valve 9 there is thus a constant pressure maintained in the chamber 1, which pressure while the engine is running, is always less than atmospheric pressure by a constant amount. This difference of pressure is the force utilized to compel the fuel in the reservoir to flow into the fuel chamber of our carburetor. With an unrestricted opening into the chamber the rate of flow would be variable with different horizontal levels of the fuel reservoir with respect to the fuel chamber; that is to say, the rate of flow would vary substantially inversely to the difference in level between the carburetor and the reservoir as represented by line B of Figure 6 in which the ordinates designate the difference in level of the reservoir with respect to the fuel chamber, and the abscissæ represent the rate of flow of fuel into the fuel chamber. If the level of the reservoir due to the inclination of the road be above that of the fuel chamber, then without the valve, the chamber would become flooded. To keep the flow of fuel into the chamber 7 only at a rate equal to the rate of withdrawal therefrom by the engine, we have controlled the port 17, opening into the same, by means of a lever valve, the closing force of which varies in accordance with the angle with respect to the horizontal assumed thereby.

The valve comprises a lever of the first class having an intermediate pivot 18 and two lever arms 19 and 20, the lever arm 19 in a horizontal position of the carburetor, as illustrated in Figure 3, normally overbalancing the arm 20 to force the valve 21 to close the port 17 with a force dependent upon the angle of inclination of the vehicle to the horizontal. As the carburetor tilts toward the position shown in Figure 4, the center of gravity of the arm 19 approaches the vertical line passing through the pivot while that of the arm 20 recedes therefrom.

This is illustrated in Fig. 7 by the lines 4^a 4^a and 4^b 4^b showing how the center of gravity has moved from the point C to the point C′ on the arm 19 and to a point in the line 4^b 4^b in the arm 20. In the position shown in Fig. 5, which is that of a vehicle going down hill, the center of gravity C will move to the position C^2 in the line 5^a 5^a with respect to the arm 19 and to a position within the line 5^b 5^b on the arm 20. As a consequence the turning moment of the lever lessens the pressure of the valve against the port 17 until finally the turning moment of the arm 20 becomes equal to that of arm 19. The lever arm 19 is provided with an adjustable thumbscrew 27 and a lock nut 28 for adjusting the moment of the arm 19 and thereby the pressure of the valve on the port.

In practice, the valve is mounted so that the heavier lever arm 19 extends toward the fuel reservoir and substantially parallel to the longitudinal axis of the vehicle. The valve is so constructed that on a 30% upgrade, which we will assume to be the maximum grade, the lever 19 overbalances arm 20 only sufficiently to overcome the momentum of the fuel passing through the port 17. On a lesser up-grade and on a down-grade the lever arm 19 will exert a greater force on the valve 21 to maintain the port 17 closed, as is shown in Figure 5. When the reservoir is above the level of the carburetor, the valve pressure is sufficient to close the port 17 to prevent flooding of the carburetor. As a result the differences in pressure of the fuel flowing by the port 17 is compensated for by the lever so that for all inclinations of the carburetor the flow of fuel into the fuel chamber is only in exact amounts to that withdrawn therefrom. When using our invention, the flow of fuel through the port

with constant fuel consumption and with different levels of the reservoir is indicated by the line A in Figure 6.

The port opening into the fuel chamber and the lever controlled valve mechanism is conveniently mounted on a cover plate 22 secured in air tight relation to the chamber 7 by screws 23 passing through a flange 24 integral with the wall of the chamber 7.

It will be noted that the fuel passing through port 17 when a sufficient vacuum has been produced will flow freely until tube 13 is completely filled and until sufficient fuel enters chamber 7 to balance the pressure in the atomizing chamber and the fuel chamber, and that the fuel will then flow only in the exact amount that is drawn from chamber 7 into chamber 1. Chamber 7 cannot fill up with fuel as the air contained in it is under a tension which together with the pressure of the valve is exactly sufficient to lift the column of fuel from the reservoir to the level of the chamber. As fuel however is withdrawn from the chamber, the tension therein is increased and a sufficient amount of fuel flows into the chamber to fill the void.

By the mechanism above described we have obtained a simple means for feeding fuel to a carburetor in amounts equal to that withdrawn therefrom irrespective of the level of the fuel reservoir with respect to the carburetor.

We have furthermore dispensed with float mechanisms to restrict the flow of fuel, and have made it unnecessary to furnish an extra supply tank for the carburetor at a level above the same for insuring a flow of fuel to the carburetor under all conditions. By the simple expedient of a gravity controlled lever controlling the flow of fuel through a feed pipe, we have been able to dispense with the auxiliary devices referred to above. It will be understood that our invention is susceptible of many modifications and we do not wish to be limited to the form shown and described herein.

Having thus described our invention what we claim is:

1. In a carburetor having an air inlet, a fuel inlet and a mixture outlet, a fuel chamber adjacent the carburetor, and means within the fuel chamber comprising only a valve having a part for controlling the fuel supply, said valve having arms of different weights and being responsive to the force of gravity as and for the purposes described.

2. In a carburetor having an air inlet, a fuel inlet and a mixture outlet, a fuel chamber adapted to be connected to a fuel reservoir subject to changes in level with respect to the carburetor, a valve within the fuel chamber controlling the flow of fuel from the reservoir to said fuel chamber, said valve having two lever arms of different weights with a fulcrum between said arms and the heavier of said arms preferably extending toward the fuel reservoir.

3. In a carburetor having an air inlet, a fuel inlet and a mixture outlet, a fuel chamber adjacent the carburetor and means within the fuel chamber comprising only a valve having a part controlling the fuel supply, and a counter balanced lever within the fuel chamber pressing against said valve, said lever varying the pressure on the valve with different inclinations assumed thereby.

In testimony whereof, we have hereunto affixed our signatures.

DE LOS N. HICOK.
EDWARD L. AIKEN.