

May 27, 1958

R. VOLCHER
CARBURETOR

2,836,403

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2 Sheets-Sheet 1

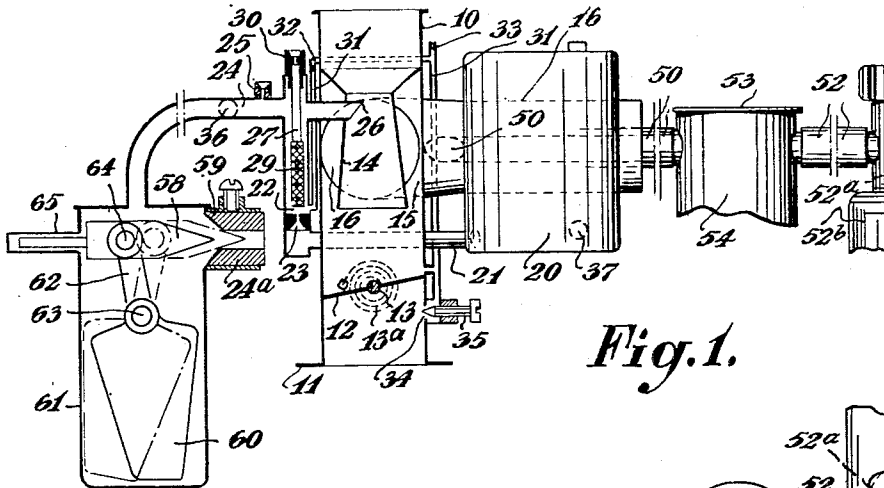


Fig. 1.

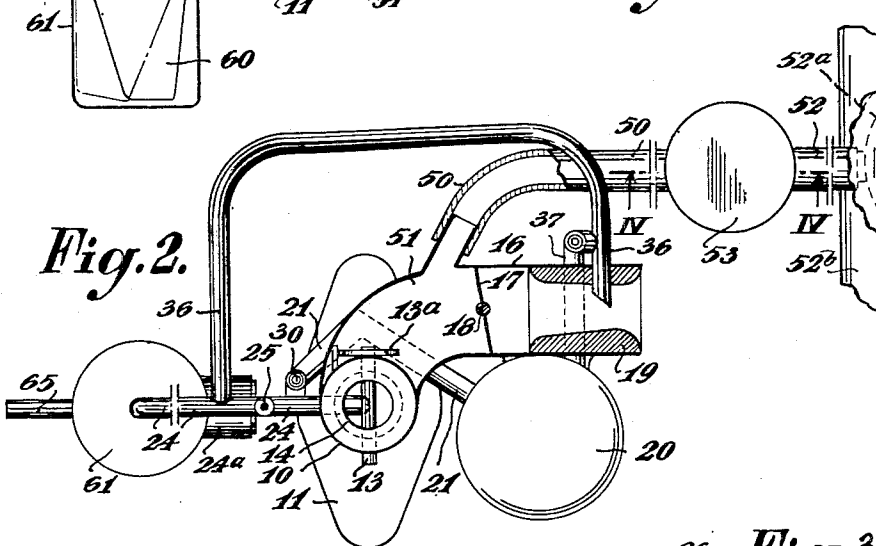


Fig. 2.

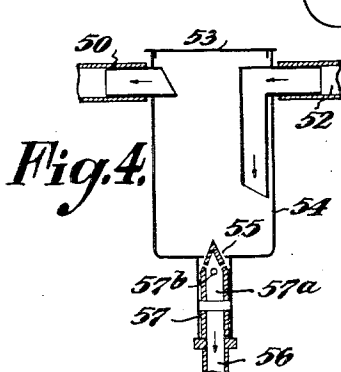


Fig. 4.

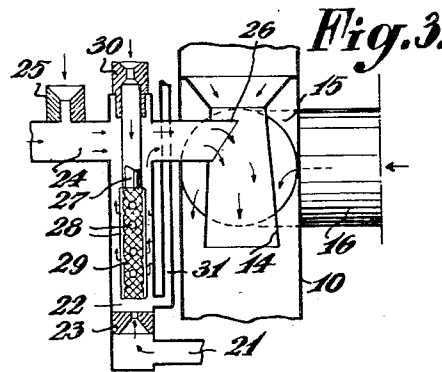


Fig. 3.

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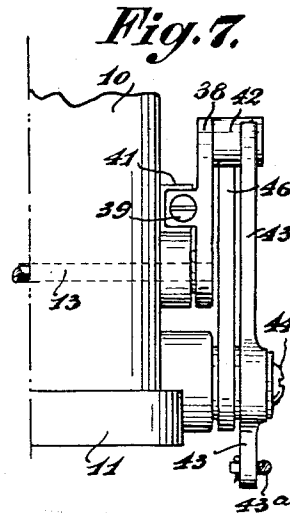
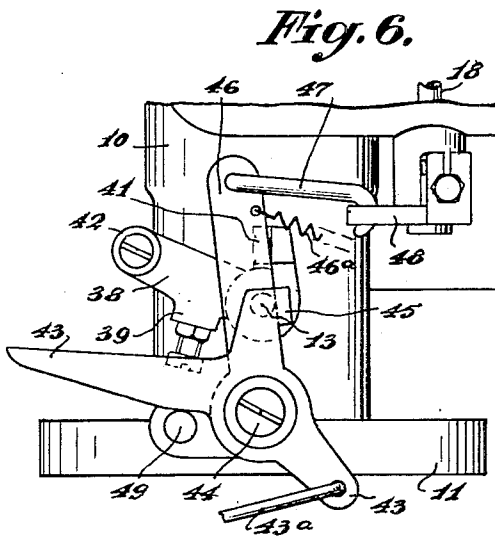
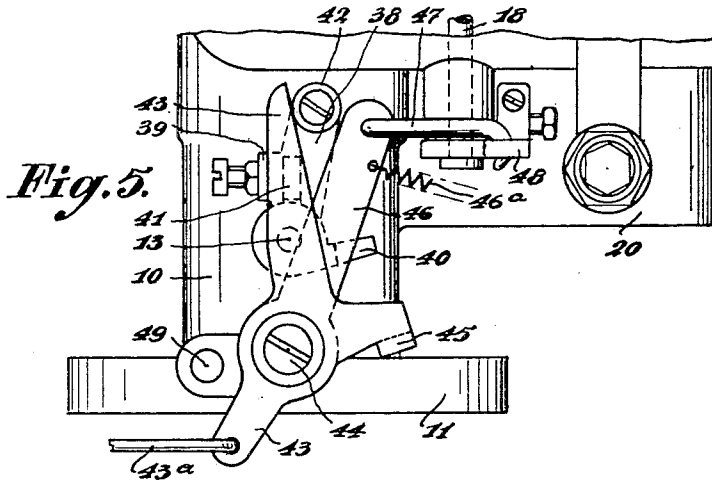
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CARBURETOR

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3 Claims. (Cl. 261—13)

The invention relates to an improved carburetor, especially for a combustion engine for an automotive vehicle.

The invention has for its object to provide a carburetor which makes it possible to achieve a material saving of fuel owing to a more rational operation to the combustion engine of the vehicle, due to such engine being supplied with fuel in a fractionated manner by means of two combined carburetor devices which complete each other and which are actuated successively during operation of the engine, with the first of the said carburetor devices providing the power required for normal speeds of the vehicle on the flat, while the other device is effective as an additional component, to secure the supply of fuel for the engine at high speeds of the latter, the said carburetor further including a device for automatically adjusting the rate of flow of the carburating liquid in accordance with the sense of grade (whether down or up) and the degree of slope of the road followed by the vehicle, and means for introducing water vapour drawn off from the radiator of the engine into the carbureted gas.

One way of carrying the invention into effect will be hereinafter disclosed simply by way of example with reference to the accompanying drawings, wherein:

Fig. 1 is a diagrammatical partly sectional view of the carburetor carried out according to the invention;

Fig. 2 is a similar top view of the carburetor;

Fig. 3 is a sectional view, to a larger scale, of certain details of the carburetor;

Fig. 4 is a sectional view along the line IV—IV of Fig. 2;

Figs. 5 and 6 are detail views, to a larger scale, of the actuating system for the throttle valves of the carburetor, shown in different positions; and

Fig. 7 is a view of the said actuating system, shifted at 90° with respect to Fig. 5.

As shown in the drawings, the body of the carburetor includes a vertical carburation passageway 10 provided with a flange 11 intended to be secured to the gas intake manifold of the engine. The free area of the passageway 10 is controlled by means of a throttle valve 12 actuated by means of a transverse spindle 13 arranged downstream with respect to a mixing cone 14 supported in the passageway 10. A lateral carburation passageway 16, which extends in a horizontal plane, opens into a chamber 15 formed between the outer cylindrical surface of the mixing cone 14 and the inner cylindrical surface of the passageway 10. The free area of the passageway 16 is controlled by means of throttle valve 17 actuated through a shaft 18 and arranged downstream with respect to a mixing cone 19 secured in the said passageway 16.

A constant level bowl 20, made rigid with the passageway 16, communicates through a duct 21 with a passage 22 having mounted therein a jet 23 which controls the free area for the flow of fuel arriving from the bowl 20. The passage 22 communicates with a duct 24 (see par-

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ticularly Fig. 3), which will be called hereinafter "atomizer duct," with an air nozzle 25 opening into the latter. The free area of the said duct is automatically controlled by means of a device to be described further. The outlet of the duct 24 lies substantially on the axis of the mixing cone 14, where it terminates in a feather edge at 26. A plunger tube 27, supported by the wall of the atomizer duct 24, extends in the passage 22. The tube 27 has a sealed bottom end and is formed over a portion of its length with small apertures 28 opening into a sleeve 29 made from thin metal fabric, which encircles the tube 27 and forms an emulsifier. The upper end of the tube 27 is provided with an air nozzle 30. The sleeve 29, which is made from thin metal fabric, is intended to produce a perfect comminution of the fuel drawn in through the duct 24 and entrained by the air entering through the air nozzle 30 and escaping through the apertures 28 across the sleeve 29 and through the fuel entering the passage 22.

Into the passage 22 there is projecting a tube 31 through which the fuel is supplied when the engine is idling. In the tube 31 there is interposed a low speed jet 32, the rate of fuel flow being controlled by an air nozzle 33. The idle tube 31 protrudes beyond the point in the carburetor where the throttle valve 12 closes the passageway 10, and opens into the said passageway through an orifice 34 the free area of which is controlled by a screw-threaded needle valve 35.

Into the mixing cone 19 of the horizontal passageway 16 of the carburetor opens axially a duct 36 communicating with the constant level bowl 20 through a duct 37 having interposed therein a fuel atomizing system identical to the one described with reference to Fig. 3 and shown therein and intended to introduce atomized fuel into the mixing cone 14 of the vertical supply passageway 10 of the carburetor, except that it is not provided with an idle tube.

The horizontal passageway 16 of the carburetor is intended to supply the engine with an additional charge after the throttle 12, which is provided in the vertical passageway 10 of the carburetor, has been fully opened.

The mechanism for actuating the throttle valves 12 and 17 successively during the operation of the engine is constructed as follows: The spindle 13 of the throttle valve 12 is subjected to the action of a return spring 13a, a spiral spring for example, which constantly tends to maintain the throttle valve 12 in its opened position. The spindle 13 is provided with an actuating bell crank lever 38 the arms of which are furnished with abutments 39 and 40 (Figs. 5 and 6) which cooperate with a fixed stop member 41 rigid with the body of the carburetor. At the end of the lever 38 there is provided a roller 42 against which comes to rest the end of a second lever 43 pivotally connected to a pivot pin 44 supported on the body of the carburetor. The lever 43 is connected to the accelerator pedal (not shown) of the vehicle engine, for instance through the medium of the rod 43a. During the angular displacements of the lever 43, as performed under the control of the said accelerator pedal, the lever 38 is displaced simultaneously in the same direction under the action of its return spring, thereby causing the throttle valve 12 to open. When the latter has attained its position of maximum opening, the abutment 40 of the lever 38 comes into contact with the fixed stop member 41, thus bringing the latter lever to a stop, while at the same time a projection 45, provided on the lever 43, comes into contact with a third lever 46, which is subjected to the action of a return spring 46a, so that the latter lever will be carried along while the lever 43 continues its angular movement. The lever 46 is pivotally mounted on the pivot pin 44 and, through

the medium of a rod 47, actuates a lever 48 secured on the spindle 18 of the throttle valve 17 arranged in the passageway 16 of the carburetor and which is normally in a position whereby to close the latter passageway. As a result, when the lever 43 is displaced angularly, the throttle valves 12 and 17 of the carburetor are actuated in succession. A fixed stop member 49 limits the maximum angular displacement of the lever 43.

The carburetor according to the invention is provided with means whereby water vapour from the cooling radiator of the engine of the vehicle is admitted into the gaseous mixture. To this end the carburetor is provided with a duct 50, one end of which opens into the horizontal passageway 16, viz. into a chamber 51 formed down-stream with respect to the throttle valve 17 provided in the latter passageway. The other end 52 of the duct 50 opens into a fluid-tight chamber 52a formed above water level in the radiator 52b of the vehicle. In order to prevent water of condensation from the water vapour from being carried into the carburetor, a steam drier 53 is interposed into the circuit of the duct 50. The steam drier 53 includes a bowl 54 having its bottom provided with an opening 55 which is in communication with a pipe 56 having arranged therein for axial movement, with limited play, a needle-valve 57 showing an inner hollow space 57a and made from light weight metal or from plastic material. When the carburetor is in operation, the needle-valve 57 will be attracted under the effect of the vacuum existing in the chamber 51 of the carburetor, as well as in the duct 50 and the bowl 54 and will seal the opening 55 in the latter. Apertures 57b, in communication with the inner hollow space 57a of the needle-valve, are provided at the base of the conus terminating the said needle-valve. The apertures 57b allow for the withdrawal of the water of condensation collected in the bowl 54 whenever, as a result of the carburetor being not in operation, the vacuum ceases to act within the bowl 54, with the needle-valve 57 becoming disengaged from the opening 55 of the said bowl. Such water of condensation will then flow out through the apertures 57b and into the inner hollow-space 57a of the needle-valve and hence into the pipe 56.

According to the invention, the carburetor is further provided with a device which is influenced by the sense of the grade of the track followed by the vehicle and which is intended to correct automatically the richness of the fuel-air mixture supplied by the carburetor. The correcting device essentially includes a needle-valve 58 cooperating with a nozzle 59 provided in an extension 24a of the atomizer duct 24 and adapted to control the free area for the air flow in the latter duct. The displacements of the needle valve 58 with respect of the nozzle 59 are operated from a pendulum comprising a weight 60 suspended in a fixed fluid-tight bowl 61 containing a liquid, thick oil for instance, intended to damp the oscillations of the weight. The weight 60 is rigid with a lever 62 pivotally connected to a horizontal shaft 63 secured in the bowl 61 and extending in a transverse direction with respect of the longitudinal vertical plane of the vehicle. The upper end of the lever 62 is pivotally connected, at 64, to the said needle valve 58, which is guided axially in a guide-way 65 formed in the wall of the said bowl 61.

It will be easily understood that the bowl 61 will assume an inclined position with respect to the horizontal depending upon the sense of the grade and the gradient of the track followed by the vehicle, while the weight 61 will remain directed according to a vertical line, with the result that the position of the needle valve with respect to the nozzle 59 will be modified, thus causing a modification of the free area for the flow of air at the entrance of the duct 24a, depending upon the sense of the grade and upon the gradient of the path.

The carburetor according to the invention operates as follows:

When the engine is started from cold, operation of an

air choke (not shown) adapted to seal the entrance of of the vertical passageway 10 of the carburetor causes a high vacuum to be built up in the said passageway 10, whereby a very rich gaseous mixture produced by the emulsifier 27—29 and metered by the jet 23 and the nozzle 30 is supplied into the mixing tube 14, at the outlet 25 of the atomizer tube 24. After the engine has been started and the said air choke valve released and left in its open position, the speed of the engine will be controlled by the degree of opening of the throttle valve 12. The idling speed of the engine is controlled by means of the screw needle valve 35 and the air nozzle 34.

As will be seen, the carburetor according to the invention is two-sectional and operates in two stages. The first stage is concerned with the operation of the vertical section of the carburetor, which is of the down-draught type and includes the supply passageway 10, while the second stage is concerned with the operation of the carburetor section comprising the horizontal supply passageway 16 and operating in exactly the same manner as the passageway 10, since it includes identical supply means with the exception of the idling device, which is provided in the passageway 10 alone.

During the first stage of operation of the carburetor, that is to say, while the accelerator pedal moves through the first portion of its travel and the throttle-valve 12 is opened, charging the engine through the vertical passageway 10 of the carburetor provides for an economical operation of the vehicle at medium speed with good pick-up and high flexibility of engine running.

During the second stage of the operation of the carburetor, that is to say, while the accelerator pedal moves through the second portion of its travel and the throttle valve 17 is progressively opened, the gaseous mixture formed in the horizontal passageway 16 of the carburetor makes it possible to supply the cylinders of the engine with the complement of charge required at high vehicle speeds.

When the engine operates at medium speed and the throttle valve 17 of the horizontal passageway 16 is closed, a high vacuum will be set up in the chamber 51 of the carburetor, which will increase in proportion as the speed of the engine increases such vacuum, which builds up through the medium of the duct 50 in the fluid-tight chamber formed above water-level in the cooling radiator of the engine, is used to produce accelerated vaporisation of such water and, consequently, to reduce the temperature of the latter. The water vapour entrained into the duct 50 and entering the chamber 51 of the carburetor is not only promoting carburetion, but, moreover, when the engine is at a suitable temperature and is operating at high speed, such water vapour also reduces the amount of air drawn into the mixing tube 14, and, therefore, the rate of fuel delivery. This results in a substantial saving in fuel consumption.

A further contribution towards fuel-saving in the carburetor according to the invention is the provision of the fuel discharge corrector device shown in Fig. 1 whereby the free area of air-flow in the atomizer duct 24 is modified. The corrector device is adjusted so as to provide for a normal and economical supply of fuel when the vehicle operates on the flat, such supply being automatically increased when the vehicle is driven up-hill, the engine then requiring a richer charge. On the contrary, when the vehicle is operating down-hill the fuel supply will be greatly lessened.

What I claim is:

1. A carburetor for an internal combustion engine comprising in combination with a source of moisture and a constant level bowl for fuel a first suction pipe for connection to the engine; a throttle valve in said suction pipe; a mixing tube in said suction pipe; a circular chamber disposed around said mixing tube between the outer wall of the latter and the inner wall of the aforesaid suction pipe, the chamber opening into said suction pipe

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downstream with respect to the mixing tube; a second suction pipe communicating laterally with the first suction pipe and opening into the aforesaid circular chamber; a mixing tube and a throttle valve in the second suction pipe; means for producing a mixture of air and atomized fuel, said means operatively communicating with ducts opening axially in each of said mixing tubes for introducing air and atomized fuel into the mixing tubes; a duct connecting the source of moisture to said second suction pipe at a point downstream from the throttle valve therein; and means for operating the throttle valves in succession whereby the throttle valve in the second suction pipe is opened after the total opening of the throttle valve in the first suction pipe.

2. Apparatus according to claim 1 in which the means for producing the mixture of air and atomized fuel comprises a cylindrical chamber operatively connected adjacent its upper portion to the ducts for introducing air and atomized fuel into the mixing tubes; a tubular member disposed axially within said cylindrical chamber, said tubular member having a plurality of apertures disposed about its periphery and communicating at one end with the atmosphere; a sleeve of fine mesh metal fabric disposed peripherally about the outside surface of said tubu-

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lar member; and means connecting the lower portion of the cylindrical chamber with the constant level bowl whereby fuel enters the lower portion of the chamber and is atomized by air escaping through the fine metal mesh.

3. Apparatus according to claim 1 in which the means for producing a mixture of air and atomized fuel comprises a duct opening to the atmosphere; a movable valve element for controlling the free cross-sectional area of said duct; and valve actuating means disposed to sense deviation from a horizontal plane and to progressively close said valve in response to increasing elevation above the horizontal and to progressively open the valve in response to increasing declination below the horizontal.

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