July 16, 1929. F. MONIER 1,720,916

CARBURETOR FOR INTERNAL COMBUSTION ENGINES

Original Filed Oct. 31, 1922 2 Sheets-Sheet 1

Fig. 1

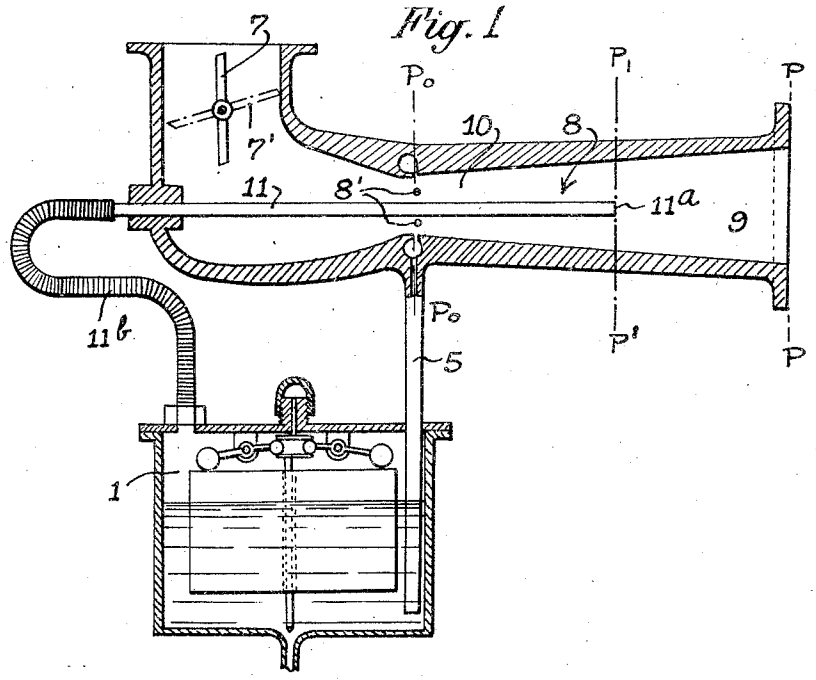
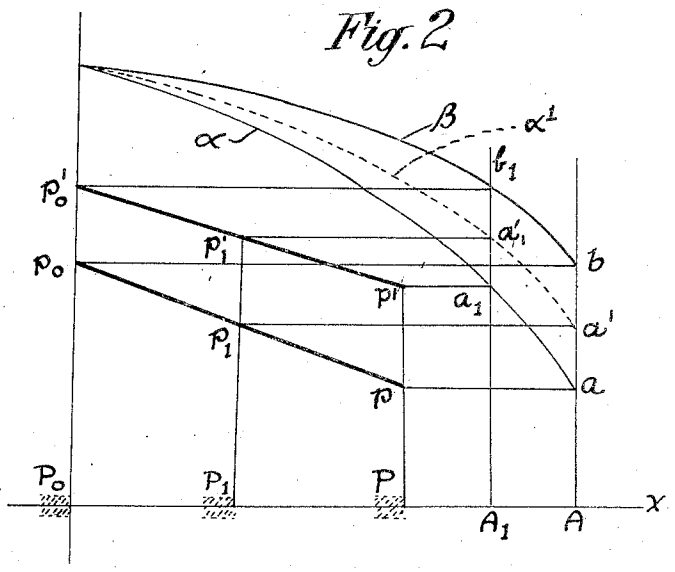


Fig. 2



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Fig. 3

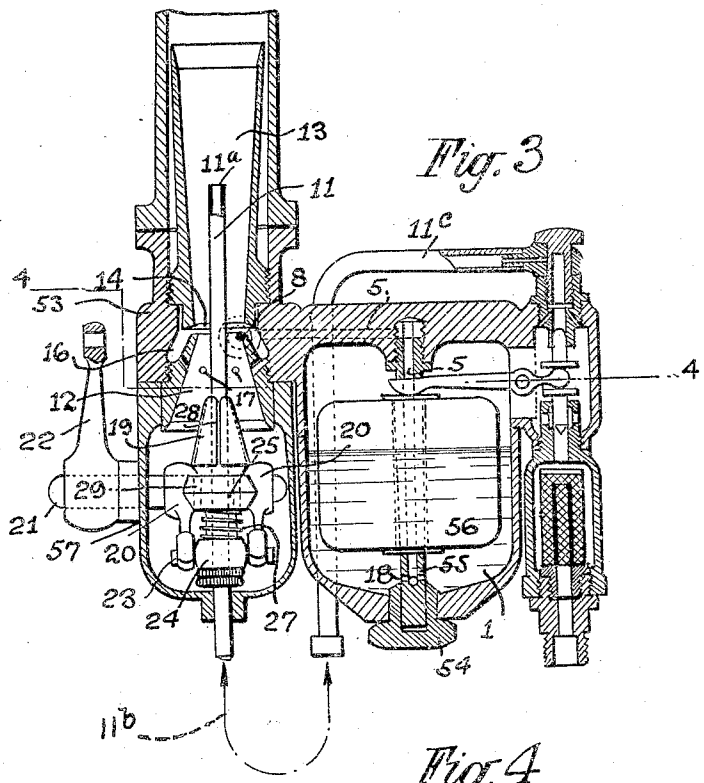
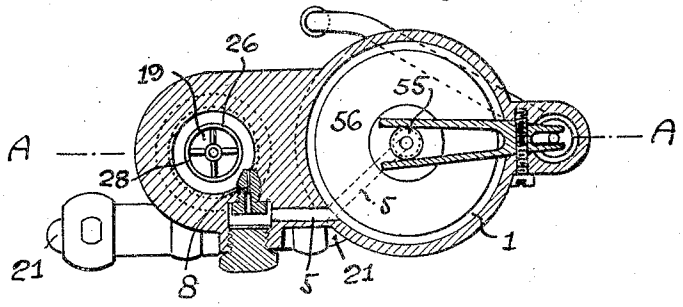


Fig. 4



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UNITED STATES PATENT OFFICE.

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CARBURETOR FOR INTERNAL-COMBUSTION ENGINES.

Original application filed October 31, 1922, Serial No. 598,084, and in France November 5, 1921. Divided and this application filed October 15, 1924. Serial No. 743,648.

My invention relates to carburetors and a method of regulating or correcting the action of the same described in my application for patent filed October 31, 1922, Serial No. 598,084, of which the present application is a division. In said prior application I have described a carburetor in which the amount of fuel, such as liquid hydrocarbon, fed through a suitable orifice or spray nozzle for mixture with air, depends upon differences of depression or suction at two nozzles or outlets opening into the suction tube or Venturi tube of the carburetor, one of said outlets being the spray nozzle and connected as usual with the body of the fuel held at constant level in a suitable sealed container, and the other opening at a different point or position in the said suction tube and connected with the closed space above the level of the liquid, said difference of depression or suction at said outlets being affected by or dependent upon the amount of suction exerted by the engine according to differences in the opening of the throttle and said difference of depression or suction increasing as the air flow or suction of the engine increases and vice versa.

The object of the present invention is to provide an adjustment or correction for different conditions affecting the carburation, such as temperature of air, quality of fuel and the like, to which end my invention consists essentially in adjusting the relative position of the two outlets or depression elements whose differences of depression affect the feed, this being preferably accomplished by changing the position in the Venturi tube of the outlet connected to the air space of the reservoir with relation to the position of the spray nozzle or outlet to affect the primary difference of depression existing in the two depression elements, thereby varying the amount of fuel fed for any given suction of the engine.

My invention relates also to details of construction embodying a depression element consisting of an adjustable tube connected with a space above the fuel surface and adjustable axially in the suction or Venturi tube of the carburetor to vary the position of the tube's outlet therein; a throttle valve through which said axially adjustable tube passes, said throttle valve being itself adjustable axially, and a construction of the valve itself whereby a greater depression or suction on the fuel or spray nozzle is maintained at all times or in all positions of closure of the throttle valve.

In the accompanying drawings:

Fig. 1 is a diagrammatic longitudinal section of a carburetor provided with a correction or adjustment operating according to my invention and Fig. 2 is a diagram of the effects of the operation or adjustment of said correcting device.

Fig. 3 is a vertical section on the line A—A Fig. 4 of a carburetor of the preferred form or construction embodying a correcting device operating according to the principles illustrated in Figs. 1 and 2 and having other features of improvement hereinafter described.

Fig. 4 is a horizontal cross-section through the carburetor illustrated in Fig. 3 taken on the line 4—4 of Fig. 3.

Referring to Fig. 1, a tank or reservoir containing the liquid fuel, such for instance as gasolene, of any type in which a substantially constant level of liquid may be maintained, is indicated at 1. Said tank is entirely closed and is fed or supplied with the liquid in any desired manner, as for instance by a float feed action. A throttle valve of typical form is indicated at 7. In the actual construction of apparatus according to the preferred form of the invention, this throttle valve is modified in form as will be presently described.

The fuel feed outlet or spray nozzle is indicated at 8 as consisting of an annular chamber opening into the restricted or narrow part 10 of the suction conduit or Venturi tube of the carburetor, which tube is connected with the engine in the usual manner. The spray nozzle 8 connects by pipe 5 or other means with the body of liquid in the tank so that the fuel will be fed through the openings 8′ by the suction or depression existing at the narrow part of the diffuser or suction tube. A depression is caused to act on the surface of the fuel in the float feed tank 1 through the flexible tube 11^b joined to a tube 11 having its open end located at 11^a in the diffuser or Venturi tube through which air is sucked by the action of the engine to produce the explosive mixture. The tube 11 is axially adjustable in the suction conduit so that the outlet 11^a thereof may be made to take any position desired between the position P^o which is the

narrowest part of the suction tube or point where the suction and depression is at a maximum, and a position P corresponding to the end of the Venturi tube or a cross-section therethrough which is wider than the narrow section.

By means of the tube 11 opening at 11^a depression is exerted upon the space above the liquid fuel and, as will be obvious, effective suction at the spray nozzle will depend upon the difference of the two depressions exerted respectively at the position P^o and in the position of the outlet 11^a. Hence, by adjusting the position of the outlet 11^a, the difference between the depressions effective to produce the feed of the fuel, can be varied from a maximum to zero for any given opening of the throttle valve. This permits the correction to be introduced into the carburation which provides for a perfect regulation of the latter without altering the automatic action of the carburetor at different speeds of the engine.

When the end 11^a of the tube 11 is situated at P P, the difference between the depressions acting upon the fuel is a maximum; when the end 11^a of tube 11 is brought near P^o P^o, this difference diminishes, and when at P^o P^o it is null. This will afford a means for varying at will the resultant depression which causes the gasolene to flow out through the nozzle 8 from a maximum to zero. On the other hand, by varying the position of the throttle valve 7 from the closing position 7′ to the opening position, one obtains, as is well known, a variation in the reduction of pressure at the nozzle 8 which may be represented by the curve β, Fig. 2, wherein the abscissæ are the flow sections corresponding to the positions of the valve and the ordinates the depression in the nozzle. The corresponding variations of the depression at P P are shown by the curve α. The depression at the point P P decreases as the throttle is opened. This condition is indicated by the gradual downward curve α. Likewise the depression at the nozzle 8 decreases as the throttle is opened as indicated by the β curve. The differences between the ordinates of β and α are the differential depressions causing the liquid to issue from the holes of the nozzle and which provide for the automatic action of the carburetor; the end 11^a of suction tube 11 is here supposed to be at P P.

The positions of 11^a have been represented on the axis of X at P_o for 11^a situated at the part P_o P_o of Fig. 1 and at P for 11^a situated at P P, Fig. 1. The depression at 11^a for position P is $P_p = Aa$; the depression at 11^a for position P_o is P_o $p_o = Ab$. The variations of the depressions at 11^a proceeding from P to P_o is shown by the straight line $p—p_o$: for example for a position P_1 the depression is P_1 p_1. If therefore the valve 7 is fully opened (position A of Fig. 2) with 11^a at P, the depression at the nozzle 8 being Ab, and one moves 11^a from P to P_1, the depression at the nozzle remains the same, but the depression at 9 will now be P_1 $p_1 = Aa'$, which is therefore of less value. If 11^a remains in the position P_1 and the throttle is operated, the depression at 11^a will vary according to a new curve α', which gives for all positions of the valve 7, resulting differential depressions which are smaller than when 11^a is at P, so that the apparatus will still have an automatic action but employing different proportions of fuel and air.

On the other hand, if the valve 7 is placed in an intermediate position A_1, producing in the narrow part of the diffuser a depression A_1 b_1, one will have at 11^a, when it is at P, a depression P $p' = A_1$ a_1; when 11^a is brought to P_o one will have at 9 a depression P_o $p_o' = A_1$ b_1, and if in this case 11^a is placed in an intermediate position P_1, the depression at 11^a will be P_1 $p_1' = A_1$ a_1, the variation of the depressions at 11^a from position P to position P_o being represented by the straight line p' p_o'. This not only provides for the automatic action of the carburetor at different engine speeds, but also affords a means for making required corrections for the nature of the fuel and variations of temperature or of hygrometric state of the air, that is, for any given conditions of operating. In fact, if one gives such proportions of the carburetor that for a mean temperature of the air, a mean hygrometric state and a combustible of mean composition, a good carburation is obtained for a given position of the end 11^a of tube 11 situated between P_o P_o and P P, for example at P_1 p_1, Fig. 2, the end 11^a can be moved so as to make all corrections for variations of the said carburation factors. If the air is colder or more moist, and if the fuel is heavier, one moves 11^a towards P_o P_o sufficiently to again provide for the best carburation; this movement will reduce the depression upon the free surface of the liquid on any open throttle conditions and will thus increase the amount of gasolene as compared with the air, but without making any change in the automatic action of the carburetor. But should the air be warmer or less moist, or the fuel be lighter, 11^a is moved towards P_o P_o so as to return to the best point of carburation; this movement will increase the depression upon the free surface of the liquid and will thus reduce the amount of liquid fuel as compared with the air, but again without change in the automatic action of the device.

By reason of its motion, the tube 11 will act as a correcting element but without admission of air into the fuel mixture; due to

the position of the throttle valve outside the nozzle, a special slow-speed device will not be required, and the liquid fuel can be directly withdrawn from a reservoir placed at a lower level, as stated. By placing the end 11^a at P_o P_o and fully opening the valve 7, this will stop all flow of carburant from the nozzle, the depression being the same in the correcting element 11^a and nozzle 8. The engine will receiye only fresh air, thus affording ventilation for the engine, for example on the descent of slopes, without consuming fuel, and it will not be required to cut off the ignition nor to close the fuel feed cock.

In Figs. 3 and 4 are illustrated one of the preferred constructions of carburetor embodying my invention and whereby the same may be practiced. The diffuser or suction tube for the carburetor is here shown as comprising a diverging cone or funnel 13 whose smaller lower end is opposite the upper smaller end of a converging cone 12. The parts 12, 13, of the diffuser or suction tube are fitted upon the body 53 of the carburetor in a manner to allow a thin or narrow annular space 14 between their smaller ends, said annular opening affording a spray nozzle or outlet which communicates with an annular fuel chamber 16 in the body 53. Into the chamber 16 an outlet 8 for the fuel feed pipe connected to the body of liquid in the reservoir 1 opens.

The cone 12 is provided with small holes 17 communicating with chamber 16 and the nozzle 8 is supplied, through the duct 5, communicating at 18 with the bottom of the fuel reservoir or other feed device 1 through a hollow rod 55 which serves as a guide for the float 56. A nut 54 engaging the threaded end of rod 55 serves to secure the float chamber to the body.

The correcting element composed of the tube 11 with the open end 11^a communicates by means of the flexible connection, shown diagrammatically at 11^b, and a tube 11^c, with the free surface of carburant in the float feed device 1. The throttle valve is formed by a core 19 forming a conical closing element movable axially of and co-operating with the narrow part of the diffuser cones 12, 13. The valve 19 is preferably movable along the correcting tube 11 by means of the arms 20 mounted on shaft 21, from which handle 22 projects. Nibs 23 disposed upon the lower extension 24 of the core 19 are engaged by the arms. Upon the extension of the core or valve 19 is slidable an annular closing member 25 whose outer surface 26 corresponds to the inner surface of the cone 12 and is adapted to fit into the same and to close the outlets 17. The said closing member 25 is provided with vertical air passages 29 as shown in dotted lines. The member 25 rests upon a spring 27 interposed between the same and a shoulder carried by the stem of the element 19. The device is so arranged that upon raising the core 19 the said closing member 25 is first brought into contact with the cone 12 so as to close the holes 17, and it is only after the holes are closed that the core 19 or throttle valve fits into the diffuser, thereby closing the annular orifice or fuel feed outlet or spray nozzle 14; this closing is not complete, for the core 19 is provided with the grooves 28 on its surfaces which allow passage of air.

The valve and the closing member with their operating parts work in the air inlet casing 57 having the usual openings to the atmosphere and suspended from the body 53 of the carburetor. When the valve 19 is closed, that is, when the element 25, 26 closes the holes 17 and the core 19 fits into the diffuser, the air required for the extreme slow speed will enter through the holes 29 and grooves 28, and the annular space 16 becomes filled with carburant. By opening the said valve by lowering the core 19 together with the closing element 25, 26, air will be admitted, but at the same time the holes 17 are uncovered, and when the air enters through the holes the liquid fuel in the annular space 16 is drawn into the diffuser, thus producing momentarily a richer mixture so that the return to speed is facilitated.

As will be seen, when the valve 19 is closed or nearly closed by entering the restricted Venturi or suction tube, it will cause an increased or stronger draft of air to pass the spray nozzle or annular opening 14. This compensates for the diminution of the effective depression at the spray nozzle due to the diminution of suction when the flow of air through the Venturi tube is nearly shut off, the tendency then being towards a close equalization of the depressions and little difference of depression effective in sucking the fuel. When however the throttle valve is open, the depression at 14 is necessarily larger than at 11^a because the draft of air is stronger in the restricted part of the venturi than in the diverging part.

What I claim as my invention is:—

1. In a carburetor of the type described, an annular chamber located in the pipe leading to the motor at about the point where the reduction of pressure is maximum, an aperture between the said annular chamber and the said pipe, a closed fuel reservoir, means for leading the liquid fuel from the closed reservoir into the said annular chamber, a valve controlling the suction or flow of air past said aperture, a second aperture leading from the said annular chamber into

the pipe at a point in front of the first-named aperture, and means carried by the valve for closing the said second aperture when the aforesaid pipe is nearly closed by the closure movement of the said valve.

2. In a carburetor of the type described, an annular chamber located around the suction pipe or conduit leading to the motor at about the point where the reduction of pressure is maximum, an annular aperture between the said annular chamber and the said pipe, a closed fuel reservoir, means for leading in liquid fuel from the closed reservoir into the said annular chamber, a second aperture leading from the said annular chamber into the said pipe in front of the first-named aperture, a valve controlling the flow of air in said suction conduit, an annular member slidably mounted on the valve and adapted to close the second aperture before the valve closes the pipe leading to the motor and provided with inside channels allowing of the air to pass through the said annular member in the direction of the motor into the aforesaid pipe, and grooves provided at the surface of the valve to allow air to flow in the direction of the motor when the valve is in its closure position.

3. In a carburetor of the type described, an annular chamber located around the suction pipe or conduit leading to the motor at about the point where the reduction of pressure is maximum, an annular aperture between the said annular chamber and the said pipe, a closed fuel reservoir, means for leading in liquid fuel from the closed reservoir into the said annular chamber, a second aperture leading from the said annular chamber into the said pipe in front of the first above said aperture, a valve adapted to close said pipe or conduit to the flow of air, an annular member slidably mounted on the valve and adapted to close the second aperture before the valve closes the pipe leading to the motor and provided with inside channels allowing of the air to pass through the said annular member in the direction of the motor into the aforesaid pipe, and grooves provided at the surface of the valve to allow air to flow in the direction of the motor when the valve is in its closure position, a spring interposed between the said member and the head of the valve, and means for moving the member forward towards the motor and backwards from the motor.

4. In a carburetor of the type described, a closed fuel reservoir, a tube leading from the body of liquid fuel in said reservoir, a suction pipe or conduit connected with the engine and provided with an annular chamber surrounding said conduit and connected with said fuel tube, a plurality of outlet openings connected with said annular chamber and opening respectively into points of greater and less suction in said conduit, and a throttle for diminishing or increasing the free suction of said conduit.

5. In a carburetor provided with a fuel reservoir and an intake pipe having a restricted portion, a supplemental fuel chamber communicating with said reservoir, the upper portion thereof communicating with the restricted portion of said intake pipe and a lower portion thereof communicating with said intake pipe at a point spaced from the most restricted portion thereof, a throttle valve movable relatively to said intake pipe and adapted to close said last-mentioned point of communication when said throttle valve is substantially closed.

6. In a carburetor, a pipe leading to the motor, means for creating a reduction of pressure in the pipe, an annular chamber located at about the point where the reduction of pressure is maximum, an aperture between the said annular chamber and the said pipe, a valve controlling the suction or flow of air past said aperture, a second aperture leading from the said annular chamber into the pipe at a point in front of the first-named aperture, and means carried by the valve for closing the said second aperture when the aforesaid pipe is nearly closed by the closure movement of the said valve.

7. In a carburetor, the combination of a conical suction tube, a conical closing element co-operating therewith to regulate the suction, a spray nozzle having openings in the conical suction tube and a closing member co-operating with said openings and movably connected with the conical valve so as to close said openings when the valve is operated to diminish the flow of air produced by the suction of the engine.

8. In a carburetor, the combination of a conical suction tube, a closing element co-operating therewith to restrict the flow of air, fuel outlets in said conical tube and a closing member co-operating with said outlets and adapted to close the same, and means permitting air to pass said closing member when said outlets have been closed.

Signed at Paris, France, this 3rd day of October, A. D. 1924.

FRANCIS MONIER.