

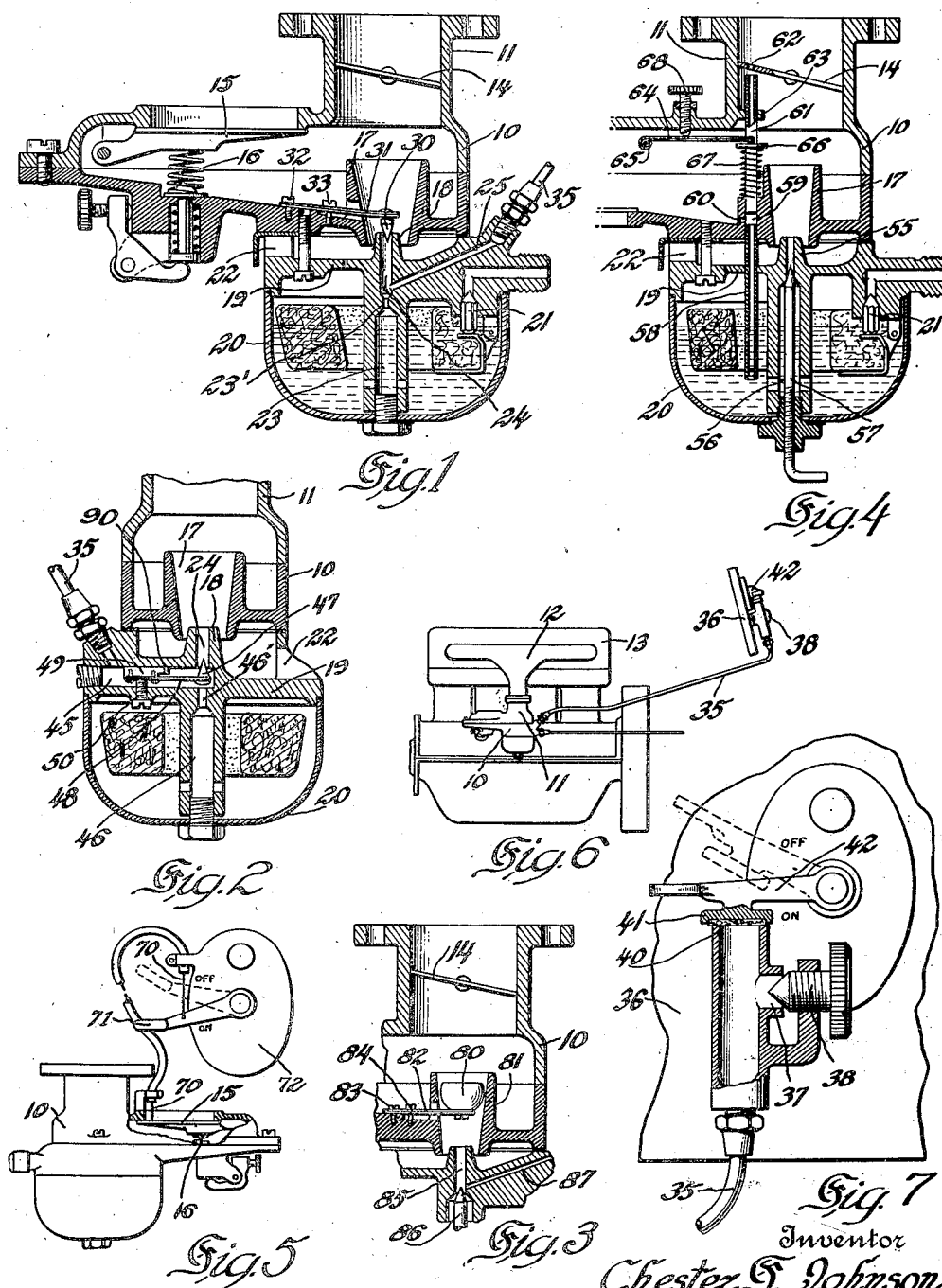
July 14, 1931.

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1,814,601

CARBURETOR

Filed March 24, 1923



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CARBURETOR

Application filed March 24, 1923. Serial No. 627,468.

The invention relates to mechanism for controlling the flow of fluids and, while in some respects of more generic application, is especially applicable to carburetors of the type designed for supplying an explosive mixture to internal combustion engines.

One object of the invention is to provide improved means for varying the flow of a fluid or for varying the proportions of the constituents of a mixture of fluids, particularly in response to variations in temperature.

Another object is to provide improved carburetting means including temperature-responsive control devices operative upon a rich mixture of gas and liquid and, by varying the quantity thereof, effective to vary the quality of a final mixture of which said rich mixture is a constituent.

A further object is to provide means in connection with a carburetor of the air bled nozzle type for varying the supply of a rich mixture of air and liquid to the main mixing chamber thereof in accordance with temperature changes.

A further object is to provide heat-responsive means for qualifying the mixture supplied by a carburetor particularly upon starting or at low or idling engine speed.

A further object is to provide, in connection with a carburetor, means operable manually from a distant point, as from the driver's station of a motor vehicle, rendering the engine suction ineffective to draw liquid fuel from the fuel reservoir of the carburetor.

A further object is to provide, in combination with the ignition controlling means of an engine, means operative to prevent supply of explosive mixture to the engine when the said controlling means is placed in the "off" position.

The above and other objects and advantages will appear more fully from the following description taken in connection with the accompanying drawings showing various features of the invention as applied, by way of illustrative embodiment, to a carburetor of well known type adapted for use in a motor vehicle power plant. Such illustration of the invention, however, and its specific description

herein as applied to the formation from liquid fuel and air of an explosive mixture for use in the internal combustion engine of a motor vehicle is not intended as in any way a limitation to such use except as required by the language of the appended claims since it will be understood that the invention in its broader aspects may be applied to controlling the quality or proportions of a mixture of fluids whether liquid or gaseous and for use as fuel or otherwise.

In the drawings, Fig. 1 is a central vertical section through a carburetor showing features of the invention;

Figs. 2 and 3 are similar views of a portion of a carburetor illustrating different locations of thermostatic control devices;

Fig. 4 is a similar view showing a modified form of carburetor in which the invention may be embodied;

Fig. 5 is a diagrammatic view, partly in section, showing another embodiment of one feature of the invention;

Fig. 6 is an elevation showing the application of the invention to a motor vehicle power plant; and

Fig. 7 is an enlarged view, partly in section, showing a detail of a controlling device used with the invention.

Referring to the drawings, Fig. 1 shows a carburetor having a body portion or casing 10 enclosing a mixing chamber. The body portion is provided with an extension 11 adapted to be connected to the intake manifold 12 of an engine 13 (Fig. 6), and within which may be mounted the throttle valve 14. Any usual or desired form of air valve indicated at 15 may be provided to admit auxiliary air to the mixing chamber in response, preferably, to sub-atmospheric conditions therein. A spring 16 may be utilized to control the opening of the valve 15.

In the bottom of the casing is a strangle tube 17 into the lower end of which the nozzle 18 projects. A fuel reservoir is provided comprising a cover or diaphragm 19 and a bowl 20, liquid fuel in which may be maintained at the desired approximately constant level by any usual or suitable control means, as by a float valve 21. The nozzle may be

formed, as shown, integral with the diaphragm or cover 19 and air supply apertures 22 are provided to admit air to the lower end of the strangle tube whence it may flow upwardly past the nozzle into the main mixing chamber or supply passage of the carburetor.

A fuel passage 23 connects the interior of the reservoir or float bowl 20 to the nozzle, the passage being formed preferably with a constriction as at 23'. Opening into this passage in the upper portion 24 thereof above the constriction 23' and preferably above the normal level of the liquid in the reservoir is an air vent passage 25 adapted to admit air into the fuel column flowing through the chamber or mixing tube 24 under the influence of sub-atmospheric conditions in the main mixing chamber or, in general, of pressure differences between the source of fuel and the passages leading to the mixture utilizing devices. The use of an air passage leading to the liquid supply passage anterior to the nozzle but above the normal level of liquid as a means for desirably varying the quality of the mixture within certain ranges of the effective suction, as, for example, in accordance with variations in speed of an engine to which the mixture may be supplied, is well known in the carburetor art. In such devices the flow of liquid toward the nozzle is accompanied, of course, by a flow of air through the air passage, the relative proportions varying slightly with variations in suction, and hence the fuel issues from the nozzle in the form of an aerated column or a partially atomized but normally very rich mixture of fuel with air.

In accordance with the present invention I further modify the quality of the mixture by means responsive to temperature changes. This means may take various forms but is shown in Fig. 1 as comprising a valve-like member or obturating device 30 arranged to obstruct to a greater or less extent the flow of the air-liquid mixture from the mixing tube or nozzle 18. The device is carried upon the free end of, or otherwise arranged to be moved by, a thermostatic element, as 31, which, in the form illustrated, may be a bi-metallic bar or blade of a well known type. The blade may be secured at the fixed end by a screw 32 and initially adjusted by an additional screw 33. The thermostatic element is designed to be so mounted that lowering of the environment temperature will result in increased flow through the mixture forming passage 24, whereby a richer mixture will be formed in the main mixing chamber. By this means the necessity for seasonal adjustments of the carburetor is eliminated as the heat-responsive control device may be so designed as to compensate automatically for seasonal or other changes in environment temperature, enriching the mixture to the desired extent for operation in the cold and rendering the mixture leaner for economical and satisfac-

tory operation as the temperature rises. It will be noted that the thermostatic device is so positioned as to be affected by the entering mixture of external air and fuel, and is therefore adapted to vary the flow in accordance with the temperature of the mixture itself.

Additional means may be provided to vary at will the relative proportions of the constituents of the mixture by adjustment of the capacity of the air passage 25. This is effected preferably by extending the air conduit 35, leading to the air passage 25 to a point convenient for access by the operator, as to the dash or instrument board 36 of a motor vehicle. At this point I provide the atmospheric inlet 37 controlled by the valve or screw 38. By adjustment of the screw the operator may vary the initial effect of the air bleed orifice and the resulting quality of the mixture through all ranges of speed.

In addition to the manually adjustable control devices just described I provide an orifice 40 in the conduit which may be covered at times by the closure 41. The capacity of this orifice is such that, when it is opened, free flow of air is permitted through the conduit and passage 35 to such an extent as to reduce the suction in the fuel passage below that required to lift fuel from the float bowl. The flow of fuel is therefore suspended so long as the orifice remains open. By manipulation of the closure 41 therefore, the operator may entirely interrupt the flow of fuel.

Preferably the closure 41 is operatively associated with the ignition switch as by the actuation of both by a single lever 42, so arranged that the orifice 40 will be opened when the switch is in the "off" position, as shown in broken lines in Fig. 7, and closed when the switch is in position to supply current to the ignition mechanism of the engine. As a result of this arrangement the feeding of fuel from the carburetor is automatically suspended when the ignition circuit is broken. This effects material economy in use of fuel particularly in hilly sections where it is customary, and is in fact recommended by authorities, to throw the ignition switch to "off" position when using the engine for braking while descending hills.

With the usual arrangement of carbureting apparatus the interruption of ignition when the engine is being used as a brake results in the pumping of explosive mixture through the engine and wastes a considerable amount of fuel besides being followed frequently by annoying and sometimes damaging explosions in the exhaust system when the ignition current is again turned on. These difficulties are entirely eliminated by the present invention.

In the embodiment of the invention illustrated in Fig. 2 a chamber 45 is formed in the fuel supply passage 46 leading to the primary mixing tube 24 in the nozzle 18

above the constriction 46'. This chamber communicates with air conduit 35 which may be extended, as in the form shown in Fig. 1, to a point convenient of access from the driver's station, in order to provide manual and automatic control devices for the air inlet. Within the chamber 45 is mounted the obturating device 47 adapted to restrict the flow of commingled air and fuel through the discharge orifice. The device 47 is carried by the thermostatic blade 48 which may be supported upon the block 49 held in position by a screw 50. In this form the thermostat is influenced chiefly, when the mixture is being delivered, by the temperature of air or other gas flowing through the conduit 35 into chamber 45. The air or other mixture constituent supplied through the conduit 35 may be derived from any suitable source depending upon the application of the invention. The chamber 45 and delivery passage therefrom operate as a mixing chamber for forming, when the constituents comprise air and liquid fuel, a very rich mixture which is delivered to the main mixing chamber within the casing 10 through the secondary mixing tube 17. The thermostat is arranged, as in the form first described, to cause a reduction in the flow of rich or primary mixture as the temperature rises.

In the form shown in Fig. 3, the obturating device 80 is positioned in the mixing tube 81 and is carried by the thermostatic element 82 fixedly secured as by screw 83 and adjustable as by screw 84. A mixture, which may be a rich or primary mixture if it is desired to add a further constituent or diluent beyond the tube 81, is formed within the tube 81 or may be supplied thereto, as from a mixing passage 85 to which fuel flows past needle valve 86 and air through passage 87. The tube 81, which may correspond to the strangle tube 17 of the forms elsewhere shown, is tapered, and the movement of the obturating device 80 operates to obstruct to a greater or less extent the flow of mixture from the mixing tube as the temperature varies. This device may be, as shown, of approximately hemispherical form to maintain the width of the passage between it and the tube as nearly uniform as possible on all sides in any given position of adjustment notwithstanding the tilting that occurs as the device moves upwardly or downwardly. For controlling the flow of explosive mixture to an engine the thermostatic actuating means will be arranged, of course, as in the forms previously described, to reduce the flow as the temperature rises.

While in all of the applications of thermostatic control devices above described the fluid whose flow is controlled is a fluid mixture resulting from the commingling of a gas and a liquid it will be understood that the invention is not limited to such use. Either or

both fluids may be gaseous or liquid or a single homogeneous fluid may be controlled and the flow past the obturating device may be the result of pressure differences affecting one or a plurality of conduits. When one constituent of a mixture, for example, a fuel, is of substantially uniform temperature and the other, for example, air, is subject to variation, as from atmospheric conditions or from the heating effect due to combustion of the final mixture, then the thermostat will be affected chiefly by the variable constituent and may operate to control flow in accordance with heating effects directly responsive to or proportionately affected by the fluid whose flow is controlled.

Where the invention is applied, as in a carburetor, to the control of flow of a rich or primary mixture, it affords a means for attaining a more accurate control of the quality of a final mixture than would be possible by varying the flow of liquid, inasmuch as the quantity of material passing through the controlled orifice is much greater than if it were liquid fuel only, hence a much greater range of movement of the obturating device is available and slight variations in viscosity or other properties, or irregularities in manufacture and adjustment, exert much less disturbing effect.

In the carburetor shown in Fig. 4, two fuel supply devices are provided. One of these, illustrated as a common form of jet nozzle 55 to which fuel may be supplied in any usual or desired manner as from the bowl 20 through fuel passage 56 controlled by needle valve 57, serves to supply fuel to the mixing tube 17 within casing 10. Flow of fuel through this device however, is very much reduced when the throttle valve 14 is closed or nearly closed, since at that time suction tending to cause flow from the fuel reservoir is relatively low. A second device is provided to supply fuel when the throttle is at or near its closed position. This device may comprise a tube 58 fixed in the base of casing 10 and having its open or perforated lower end below the normal level of fuel in reservoir 20. The upper end of the tube communicates with a passage 59 in casing 10 to which passage air may be supplied by orifice 60. A mixture tube 61, slidably mounted in the upper end of passage 59 and in a guide lug 62, extends to a point near the throttle 14. The latter is provided with an aperture 62 immediately above the open upper end of tube 61 when the throttle is closed. Under low speed or closed throttle conditions the greatly reduced pressure above the valve induces flow of fuel through tube 58 to passage 59 where the fuel mingles with air entering through the air bleeding orifice 60 and the resulting mixture is supplied to the passages above the throttle through the aperture

62, thereafter being mixed with any air which may flow past the throttle valve.

The flow of mixture through the low speed supply device just described may be controlled by heat-responsive means as in the forms previously described. One form of such means may comprise a bimetallic thermostat blade 64 supported at one end, as by pivotal connection to casing 10 at 65, and resting at the opposite end upon a collar 66 fixed to tube 61. A spring 67 arranged under compression between the base of casing 10 and the lower side of collar 66 tends to force the tube upwardly to bring its discharge end into proximity to the aperture 62. A screw 68 engaging the thermostat intermediate its ends provides an adjustable abutment whereby the thermostat serves to hold the spring in compression and determines the extent of upward movement of the tube 61. The thermostat is so positioned that its bending movement under the influence of increased temperature carries the tube downward thereby increasing its distance from aperture 62 and correspondingly reducing the suction effect upon the supply passages and the resultant flow of fuel mixture. It will be seen therefore that the supply of rich primary mixture for starting or idling conditions is varied in response to temperature changes, a greater quantity and a proportionately richer final mixture being provided when the environment temperature is low.

When, in a carburetor, the thermostatic element is equally free to move in both directions from its normal or average position, the adjustment being such as to give a proper mixture for average temperature conditions and its range of movement under reduced temperature being such as to desirably enrich the mixture for cold weather, I have found that the movement in the direction resulting in reduced flow may be too rapid and the mixture "leaning" effect too pronounced. To obviate this difficulty I may provide means to reduce the rate of movement in response to increase of temperature above the average or normal point. One form of such means is shown in Fig. 2 where an abutment 90 is provided on the block 49 in position to contact with the blade 48 after the latter has moved to a predetermined extent in the flow-reducing direction. By this means the effective length of the blade is reduced and its further deflection in response to continued increments of temperature increase is correspondingly lessened.

In Fig. 5 is shown a modified form of device for placing the flow of fuel from the fuel reservoir of a motor vehicle carburetor under the control of the operator. In this form means is provided for forcing the auxiliary air valve 15 to a more open position against the influence of its spring 16, thereby reducing suction in the mixing chamber of

the carburetor to such an extent as to interrupt the flow of fuel from the fuel reservoir. In the embodiment illustrated this means comprises a flexible connection, as a Bowden wire 70, one end of which is so positioned in proximity to the air valve as to permit, in one position, complete closure of the valve. The other end of the member 70 is connected to a suitable actuating device, as lever 71 located conveniently for actuation by the driver and so arranged that by movement of the lever the wire may be caused to push the valve 16 toward open position. Preferably the lever 71 is associated with the ignition control means 72 as in the forms shown in Figs. 6 and 7 so that the throwing of the ignition switch lever to "off" position will automatically effect the opening of the air valve. While, in this form of the invention, the auxiliary air valve is utilized to effect control of flow of fuel it will be understood that other means capable of interrupting the fuel flow may be similarly utilized.

Various other modifications and variations in details of construction and in the application of the invention may be made, of course, without departing from the spirit and scope of the invention and therefore I do not wish to be restricted by the illustrative embodiment herein set forth except as required by the language of the appended claims in view of the prior art.

I claim:

1. A carburetor comprising a receptacle for liquid fuel adapted to maintain fuel therein at substantially a constant level, a mixing chamber, a passage through which fuel is discharged from said receptacle into said mixing chamber under the influence of suction in the chamber, and means for reducing the suction applied to said fuel including a passage for supplying air to said fuel passage above the normal level of liquid in said receptacle and thermostatic means including a thermostat positioned in said air passage for controlling the discharge into the chamber of the air and fuel supplied to said fuel passage.

2. A carburetor comprising a mixing chamber, a fuel receptacle, a fuel passage for supplying fuel from said receptacle to said chamber, means for supplying air to said chamber, the discharge orifice of said passage positioned to be subject to suction existing in said chamber whereby such suction operates to withdraw fuel from said passage, means for supplying air to said passage anterior to said orifice to reduce thereby the suction exerted on the fuel and thermostatic means positioned in the path of flow of said fuel and air for controlling discharge from said orifice.

3. Structure as set forth in claim 2 including means for varying the flow of air through said last-named air supplying means.

4. A carburetor comprising a mixing chamber and means for supplying air thereto, a fuel reservoir, a fuel passage leading from the reservoir and discharging into said chamber, an air passage supplying air to said fuel passage anterior to its point of discharge, a thermostat comprising a bimetallic blade located in said air passage, and a valve controlled by said thermostat and controlling flow to said mixing chamber.

5. A carburetor comprising a fuel reservoir, a mixing chamber, a passage arranged to supply fuel from said reservoir to said mixing chamber, a passage for supplying air to said first named passage, a thermostat in said air passage, and a valve controlled by said thermostat and operative to control flow of fuel to said mixing chamber.

6. Structure as set forth in claim 5, including means for varying the rate of movement of said thermostat over a portion of its range.

7. A carburetor comprising a fuel reservoir, a mixing chamber, means for supplying fuel and air to said mixing chamber comprising a nozzle, thermostatic means located in the air passage leading to the nozzle for controlling the relative proportions of fuel and air, and means for reducing, as the temperature rises, the rate of movement of said thermostatic means over a portion only of its range of movement in a direction to reduce the relative quantity of fuel.

8. A carburetor comprising a mixing chamber, a strangle tube leading thereto, means for supplying primary air to the inlet end of said tube and auxiliary air beyond the tube, a fuel reservoir, a passage for supplying fuel from said reservoir to said strangle tube, an air passage communicating with said fuel passage between said reservoir and said tube and slightly above the level of fuel in said reservoir and a thermostatic valve arranged to control flow to said strangle tube.

9. A carburetor comprising a mixing chamber having an auxiliary air valve and a strangle tube leading thereto, a float bowl below said chamber, a cover for said bowl having therein a fuel passage leading from said bowl to said tube and an air passage communicating with said fuel passage, and a thermostatic valve arranged to control flow to said tube.

10. Structure as set forth in claim 9, the thermostat controlling said valve being positioned in said air passage.

11. A carburetor comprising a fuel reservoir, a main mixing chamber, means for supplying auxiliary air thereto, a strangle tube leading to said chamber, means for supplying air and a rich fuel mixture to said tube, said fuel mixture supplying means comprising a passage leading from said fuel reservoir and subject to the suction in said strangle tube and a passage through which air is sup-

plied to said first named passage, a thermostat in said air supply passage and a valve actuated thereby and arranged to control discharge to said strangle tube.

In testimony whereof I affix my signature.
CHESTER F. JOHNSON.

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