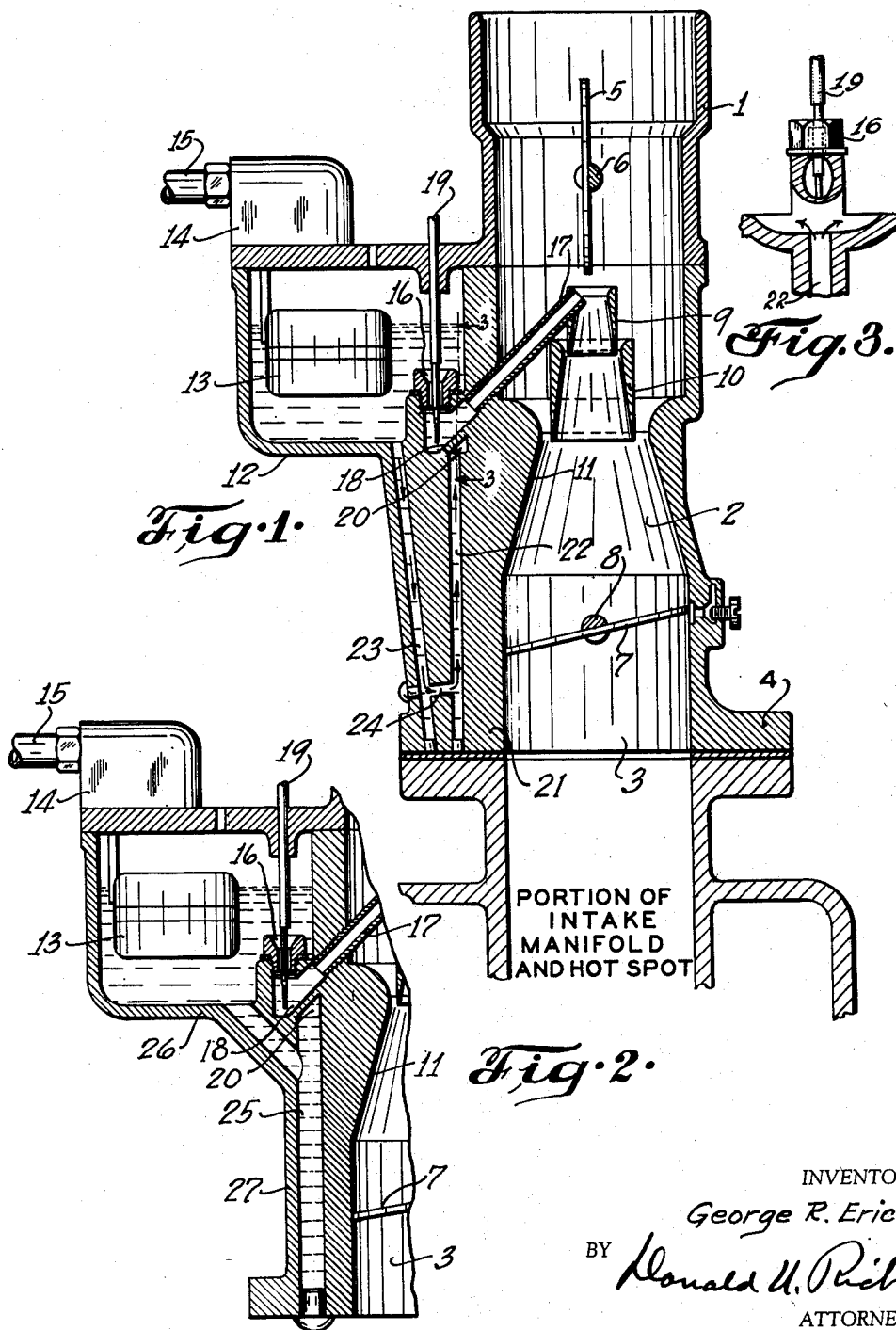


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**CARBURETOR STRUCTURE**  
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## UNITED STATES PATENT OFFICE

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## CARBURETOR STRUCTURE

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16 Claims. (Cl. 261—15)

This invention relates to carburetors for internal combustion engines and consists particularly in novel means for decreasing or preventing ebullition or so-called "percolation" through the carburetor nozzle.

After an automobile engine has been operating for a substantial period, and particularly during warm weather, the manifolds become heated to a high degree, and this heat is readily transferred to the carburetor mounted on the intake manifold. Fuel in the carburetor constant level chamber is thus heated substantially, and immediately after the engine is stopped, the temperature of the bowl and the fuel discharge passages may rise above the boiling point of the fuel. Where a downdraft carburetor is used, the fuel caused to boil in this manner may bubble out through the main fuel nozzle and drop into the intake system, thereby preventing restarting of the engine until the manifold is cleaned out.

This ebullition which is so objectionable, is due to the fact that the gasoline contains a certain percentage of "light ends" which boil at a comparatively low temperature, say approximately 105 degrees Fahrenheit. Moreover, the fuel contained in the nozzle is confined in a very small space so that the surface of metal in contact with the gasoline is large in proportion to the gasoline which it contains. The metal is the heat conducting medium which transmits the heat to the gasoline so that the fuel contained in the nozzle is heated very quickly to a point to which the light ends begin to boil out. This results in a reduction in the weight of the column of fuel in the nozzle so that the level therein tends to rise and this action is, of course, assisted by the rising of the bubbles through the gasoline in the nozzle so that a flow of gasoline out of the nozzle is soon started. Additional gasoline is drawn in to the nozzle at the bottom and the boiling action may continue for ten or fifteen minutes in some cases, completely emptying the float bowl into the manifold.

If this boiling could be made to occur at some point other than in the nozzle the light ends would soon be driven off.

According to my invention I form a passageway which extends downwardly on the carburetor body to a point much closer to the source of heat and arrange this passageway in such a manner as to set up a thermo-syphon action. In order to do this, one end of the passageway is located much closer to the source of heat than the other, both ends being connected to the float bowl so that heat transmitted to one side of the passage-

way heats the gasoline therein and starts a thermo-syphon action before the other side can be heated. This results in the flow of gasoline from the float chamber into the heat passageway and back into the float chamber. By this means a boiling action is soon set up which will dispose of the light ends of the gasoline before they can cause ebullition in the nozzle. It will be understood that the boiling action and the circulation of the gasoline in the thermo-syphon passage has a cooling action which will prevent the heat from being transmitted so rapidly to the fuel nozzle. The cooling action above mentioned is effected by reason of the fact that the fuel will boil and take up its latent heat of vaporization whenever the temperature tends to exceed the boiling point. The liquid is of course under substantially atmospheric pressure and its initial boiling point is in the neighborhood of 105° F. for average present day fuels. As the light ends are driven off the boiling point naturally increases due to the fact that motor fuels are a mixture of different hydrocarbons having different boiling points, some of which are as high as 400° F. or more.

The carburetor construction according to my invention has two separate and distinct functions operating both independently and in cooperation with each other to accomplish the final result of eliminating percolation. First the flow of heat to the points at which percolation occurs (usually in the fuel nozzle) is interrupted or interfered with by locating a fuel boiling apparatus or passageway between the source of the objectionable heat and the fuel nozzle. Thus, by limiting the temperature at that point in its path, the transfer of the heat to the fuel nozzle is retarded. The second function of the device lies in the fact that the boiling of the fuel incident to the accomplishment of the first function causes the formation of bubbles comprising the lighter ends of the fuel in a gaseous condition. These bubbles rise to the surface of the vented float chamber and escape to the atmosphere, leaving the heavier ends of the fuel, that is the high boiling constituents in the bowl so that while the bowl may eventually become heated to a very high temperature, the character of the fuel remaining in the bowl at that time will be so heavy that percolation will not occur.

It is desirable that the discharge end of the thermo-syphon passage be arranged to discharge adjacent or slightly beneath the fuel intake to the nozzle so that the fuel which is discharged from the thermo-syphon passage will be drawn into the nozzle, and having been relieved of a part

of its light ends, will not boil as readily as the portion of the fuel which has not passed through the thermo-syphon.

A modified form of my device may be constructed by merely having a pocket of the fuel chamber extend downwardly along the side of the carburetor in the direction to meet the flow of heat through the casting so that boiling would occur in the pocket before it would occur in the nozzle.

These objects and other more detailed objects hereafter appearing are attained substantially by the structure illustrated in the accompanying drawing, in which:

Figure 1 is a diagrammatic sectional view of a carburetor embodying the invention.

Figure 2 is a partial sectional view showing a modification.

Figure 3 is a section on line 3—3 of Fig. 1.

The carburetor shown comprises a barrel forming a downdraft mixture passage including air inlet horn 1, mixing chamber 2, and outlet portion 3, flanged as at 4 for attachment to the intake manifold (not shown) of an associated engine. A choke valve 5 is pivoted on shaft 6 in the air inlet horn, and a throttle valve 7 is pivoted on shaft 8 adjacent the outlet portion. Venturis 9, 10, and 11 are located within the mixture conduit, the last-mentioned being formed on the inner wall thereof.

A fuel bowl 12 is located adjacent the mixture conduit, in the present instance, being formed integral with the body thereof, and fuel within the bowl is maintained at a substantially constant level by a float 13 and a needle valve assembly (not shown) within apertured boss 14 having a connection 15 with a remote fuel tank. Fuel is supplied to the mixture chamber through calibrated metering orifice 16 and main fuel nozzle 17 discharging within the throat of the smallest or primary venturi 9. Nozzle 17 communicates at its lower end with chambered structure 18 formed in the lower portion of bowl 12 which, in turn, communicates with metering orifice or jet 16. Structure 18 receives orifice member 16 and is substantially surrounded by liquid fuel in the bowl. A stepped metering rod 19 cooperates with jet 16. A portion 20 of the fuel space within bowl 12 extends beneath the element 18.

Formed within a rib or other structure 21 extending beneath bowl 12 and downwardly along the mixture conduit is a U-shaped passage having an inner leg 22 opening into the fuel space immediately adjacent element 18 and a second leg 23 spaced substantially outwardly of leg 22 and opening into another portion of the fuel bowl. An inclined duct 24 connects legs 22 and 23 and forms therewith a U-shaped, thermo-syphonic, passage opening into spaced parts of the fuel bowl.

In operation of the carburetor with an associated engine, heat is transmitted from the intake manifold upwardly along the flanged mixture conduit and to the fuel bowl, the inner portions of which receive heat first and are, therefore, heated to a higher degree than the outer portions thereof. More specifically, the fuel within chambered structure 18 and the lower and inner portions of thermo-syphonic passage 23, 24, 25, will ordinarily be heated to a slightly higher degree than the main body of fuel in the bowl into which leg 23 of the U-shaped passage opens. This difference of temperature may be substantially greater immediately after the engine is stopped and the cooling effect of the fan and

water pump circulation is eliminated. In such cases, the lighter ends of the fuel in the syphonic passage will vaporize and fuel in the bottom of the U-shaped passage and in leg 22 will tend to rise, causing circulation in the passage whereupon cooler fluid is drawn through passage leg 23. This action, in turn, produces agitation or circulation of fuel within the constant level chamber and, particularly, at the base of the nozzle. The fuel emerging from the thermo-syphonic passage, from which the light ends have been removed by vaporization, flows upwardly past and around the base of the nozzle and feeds jet 16. Thus substantially less boiling can occur in the nozzle itself than were these light ends are drawn thereinto. Furthermore, more fuel will be vaporized in the syphonic passages than would be the case in the chamber at the base of the nozzle if the U-shaped passage were omitted and, consequently, more heat will be extracted from the surrounding metal. Thus, the metal at the base of the nozzle will be cooler where the syphonic device is used.

In Fig. 2, a pocket 25 extends from the fuel bowl adjacent metering jet 16 downwardly through rib 27. Fuel in the free or unrestricted pocket boils sooner than the larger body of liquid in the main part of the constant level chamber so as to drive off the lighter ends of the gasoline and this retards or prevents ebullition in the main nozzle 28 as in the first form. There will also be thermo-syphonic circulation in pocket 25.

The size and shape of the thermo-syphonic passage and also the relative positions of the openings thereof into the fuel chamber may be substantially varied. Various features of the carburetor itself are merely illustrative, and these may be modified in various ways. The exclusive use of all modifications as come within the scope of the appended claims is contemplated.

I claim:

1. In a downdraft carburetor for an internal combustion engine, a fuel chamber, a barrel forming a mixture conduit and including structure connecting said chamber with an associated engine manifold, a suction operated fuel nozzle leading from said fuel chamber into said barrel, said chamber having a portion of relatively small cross-sectional area compared to the main part of the chamber and extending downwardly along said barrel towards said attached manifold, whereby boiling of the fuel will be initiated in said extension of the fuel chamber before it can occur in said fuel nozzle.

2. In a carburetor, a fuel bowl, a mixture conducting barrel constituting heat conducting means for connecting said bowl with an associated engine, and a passage extending from said bowl downwardly along said barrel, spaced portions of said passage receiving heat from said connecting means at different rates during operation of the carburetor whereby said passage functions by thermo-syphonic action to agitate fuel in said bowl.

3. In a carburetor, a fuel bowl, a mixture conducting barrel constituting means for connecting said bowl with an associated engine, and forming heat conducting means therebetween, and a fuel pocket extending downwardly from the fuel bowl in the wall of the barrel for intercepting the heat conducted from the engine to the fuel bowl.

4. In a carburetor, a fuel bowl, a mixture conducting barrel constituting means for supporting said bowl upon an associated engine, a passage extending from said bowl downwardly along said

barrel, portions of said passage receiving conducted heat from said connecting means at different rates whereby circulation of fuel in said passage to and from said bowl is produced by thermo-syphonic action.

5. In a carburetor, a fuel bowl, a mixture conducting barrel constituting means for supporting said bowl upon an associated engine and forming heat conducting means therebetween, a fuel pocket extending downwardly from the fuel bowl into the zone of heat conduction formed by said barrel to subject portions of said fuel to vaporization and simultaneously permit the escape of a portion of the conducted heat in the form of latent heat of vaporization.

6. In a carburetor for attachment to the heated manifold of an internal combustion engine, a carburetor barrel forming a mixing conduit, said barrel comprising a main path of heat transfer from the manifold to the carburetor, said carburetor having a constant level fuel chamber mounted on said barrel at a point substantially spaced from the point of attachment of the barrel to the engine, a fuel nozzle for delivering fuel from said bowl to the mixing conduit in said barrel, a fuel boiling means comprising a well extending into the barrel constructed and arranged to receive fuel from said bowl and heat from said engine and to cause the boiling of said fuel more quickly than such boiling can occur in the fuel nozzle, and means permitting the escape for the light end of such boiled fuel in the form of vapor to the atmosphere.

7. In a carburetor, a fuel bowl, a mixture conducting barrel constituting means for connecting said bowl with an associated engine and forming heat conducting means therebetween, a well extending downwardly from the fuel bowl into the wall of said barrel to a point intermediate the bowl and the connection with the engine, whereby the heat from the engine conducted by the barrel will cause a boiling off of the lighter ends of the fuel contained within said well before such heat is effective upon the fuel in the bowl.

8. In a carburetor, a fuel bowl, a mixture conducting barrel constituting means for connecting said bowl with an associated engine and forming heat conducting means therebetween, a fuel pocket extending downwardly from the fuel bowl into said barrel to a point intermediate the bowl and the connection with the engine whereby the heat from the engine conducted by the barrel will cause a boiling off of the lighter ends of fuel in the fuel pocket before such heat is effective upon the fuel in the bowl.

9. The substance of claim 8 characterized in that a second fuel pocket is provided which is connected at its lower portion to the other pocket to permit a flow of fuel therethrough from the fuel bowl by thermo-syphonic action upon variation of temperature therebetween.

10. In a carburetor, a fuel bowl, a mixture conducting barrel constituting means for connecting said bowl with an associated engine and forming heat conducting means therebetween, and means extending through a portion of the barrel for subjecting a small portion of the fuel from the bowl to the heat of the engine being conducted by said barrel to cause the lighter ends of such small portion of said fuel to be rapidly dissipated before the fuel in the bowl is subjected to the maximum temperatures of the conducted heat.

11. In a carburetor, a fuel bowl, a mixture con-

ducting barrel constituting means for connecting said bowl with an associated engine and forming heat conducting means therebetween, a fuel passageway extending downwardly from the fuel bowl into said barrel to a point intermediate the bowl and the connection with the engine, portions of said passageway being formed and arranged to receive a greater portion of the conducted heat from the engine than other portions, whereby a syphonic flow of the fuel in the passageway is produced and the lighter ends are boiled off and escape through the fuel bowl.

12. In a carburetor, a fuel bowl, a mixture conducting barrel constituting means for connecting said bowl with an associated engine and forming heat conducting means therebetween, a fuel passageway extending downwardly from the fuel bowl into the wall of the conducting barrel to intercept the heat conducted by the barrel from the engine, and permit vapors generated in the passageway by the conducted heat to escape through the fuel in the bowl.

13. In a carburetor, a fuel bowl, a mixture conducting barrel constituting means for supporting said bowl upon an associated engine intake manifold, and forming heat conducting means therebetween, and means circulating a portion of the fuel from the fuel bowl into the path of travel of the heat conducted by the walls of the mixing barrel from the intake manifold, whereby such fuel is subjected to rapid vaporization and a portion of the conducted heat is caused to escape in the form of latent heat of vaporization.

14. In a carburetor, a barrel forming a mixing conduit, a constant level fuel bowl mounted on and supported by said barrel, a fuel nozzle having an inlet below the fuel level in said bowl and having an outlet in said mixing conduit above said fuel level, and a pocket extending downwardly from said bowl, said pocket being constructed and arranged to cause the boiling of fuel therein due to heat transmitted thereto by conduction through said barrel only when the engine is not in operation, said barrel being cooled by the vaporizing action in said mixing conduit when the engine is operating.

15. In a carburetor, a barrel forming a mixing conduit, a constant level fuel bowl mounted on and supported by said barrel, a fuel nozzle having an inlet below the fuel level in said bowl and having an outlet in said mixing conduit above said fuel level, and a pocket extending downwardly from said bowl, said pocket being constructed and arranged to cause the boiling of fuel therein due to heat transmitted thereto by conduction through said barrel only when the engine is not in operation, said barrel being cooled by the vaporizing action in said mixing conduit when the engine is operating, the connection between said pocket and said bowl being directly below the inlet of said fuel nozzle.

16. In a carburetor, a barrel forming a mixing conduit, a fuel bowl mounted on and supported by said barrel, a fuel nozzle extending from a point in the lower part of said bowl and having a discharge outlet in said barrel, and a fuel boiling pocket directly below the base of said nozzle, said pocket being constructed and arranged to cause the boiling of fuel therein and the discharge of vapor bubbles upwardly around the inlet of said nozzle.

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