

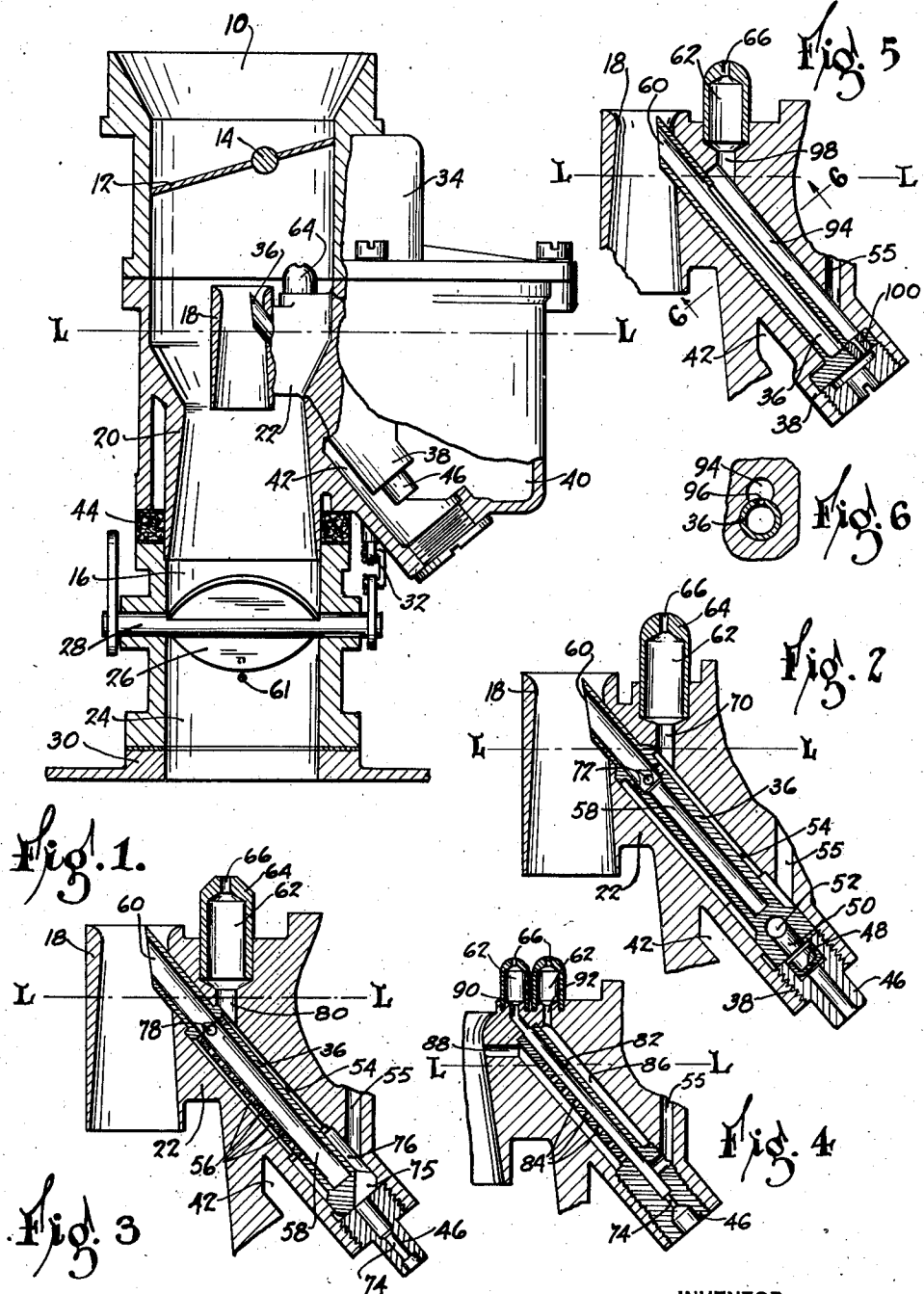
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F. C. MOCK

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CARBURETOR

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INVENTOR.
FRANK C. MOCK
BY *Q. R. M. Orady*
ATTORNEY.

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CARBURETOR

Frank C. Mock, South Bend, Ind., assignor, by
mesne assignments, to Bendix Aviation Corpo-
ration, South Bend, Ind., a corporation of Del-
aware

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This invention relates to carburetors, and more particularly to fuel nozzles for use in carburetors, an object of the invention being to improve the construction and operation of carburetor fuel jets or nozzles.

A further object of the invention is to provide a carburetor wherein deleterious boiling of fuel out of the fuel nozzles is avoided.

A further object of the invention is to provide a carburetor having provision for the free escape of fuel vapors when the engine to which the carburetor is attached is hot.

Further objects and advantages of the invention will be apparent from the following description, taken in connection with the appended drawings, in which:

Figure 1 is a vertical section of a carburetor embodying the invention;

Figure 2 is an enlarged sectional view of the nozzle arrangement shown in Figure 1;

Figures 3, 4 and 5 are views corresponding to Figure 2, but showing modified forms of nozzle arrangement; and

Figure 6 is a sectional view taken on the line 6—6 of Figure 5.

In carburetors as at present constructed, it frequently happens that after the engine has been operated for a time and is then slowed down or stopped, the carburetor body reaches a temperature high enough to cause boiling of the gasoline or other fuel in the carburetor. This involves the formation of bubbles of fuel vapor below the fuel level, in and around the main fuel nozzle, and these bubbles tend to rise and escape out of the nozzle, carrying with them quantities of liquid fuel which are discharged into the induction passage. This phenomenon is commonly referred to as "percolation." In updraft carburetors this liquid fuel may be allowed to flow out of the air inlet, merely causing fuel waste and fire hazard; but in downdraft carburetors such liquid fuel flows by gravity into the intake manifold and engine cylinders, where it may cause a running engine to stall, or prevent a stopped engine from starting.

The instant invention avoids these difficulties, by minimizing the flow of heat to the main nozzle and other parts subject to "percolation," and by providing an outlet for the fuel vapors other than the main nozzle.

Referring more particularly to the drawing, there is shown therein a downdraft carburetor, although it will be understood that the invention is applicable to other types of carburetors as well. The carburetor comprises an air inlet 10, con-

trolled by an unbalanced choke valve 12 mounted on shaft 14. The air inlet communicates with the mixing chamber 16 of the carburetor through a small venturi 18 and a large venturi 20, formed integral with each other, as by die-casting, and joined through an integral fin 22. The mixture outlet 24 of the carburetor is controlled by a throttle 26 mounted on a shaft 28, and leads to the intake manifold 30 of the engine. The throttle and choke valves may be controlled in any suitable manner, manual or automatic, and the carburetor may be provided with the usual acceleration pump, as indicated at 32 and 34, as well as other known parts and accessories.

The main fuel nozzle 36 extends through a bore in the fin 22 and is seated in a boss 38 extending into the lower portion of the fuel reservoir 40. The boss 38 is practically surrounded by a cored-out recess 42 which when filled with fuel acts to insulate the boss from heat which is conducted upwardly from the manifold 30. The recess 42 is so shaped as to deflect upwardly into float chamber 40 any fuel vapor bubbles which may be formed adjacent the boss 38. A heat-insulating gasket 44, positioned between the throttle body 45 and the main body of the carburetor, also tends to obstruct the flow of heat to the main body of the carburetor.

Referring more particularly to Figure 2, it will be noted that the fuel nozzle 36 comprises an inclined tube which is held in place by a plug 46 screwed into the bore of boss 38. Plug 46 is provided with a calibrated metering orifice 48 formed in a stamping which seats in a recess in the plug. A communicating recess 50 is provided with a port 52 which leads to a fuel well 54 formed between the nozzle 36 and the inner wall of the bore in boss 38 which receives the nozzle. A series of ports 72 extend through the upper portion of nozzle 36 to permit fuel to flow into the bore 58 of the nozzle to be discharged at the outlet end 60 thereof. A passage 55 also leads from well 54, through passages not shown, to an idling jet 61 discharging adjacent the throttle 26.

The upper portion of fin 22 is recessed to form a chamber 62 which is closed by a dome 64 having a calibrated port 66 at its top. At its lower portion, chamber 62 communicates through a passage 70 with well 54 and also through ports 72 with the upper portion of bore 58.

Operation: The normal level of fuel in the carburetor when the engine is not running is indicated by the line L—L. If now the engine is started and the throttle valve opened sufficiently to draw fuel from the outlet 60, the fuel level in

passage 70 will be lowered until air is bled into the bore 58 through port 66, chamber 62, passage 70 and ports 72, to form with the fuel an emulsion in the known manner.

If the engine is allowed to stand while hot, or is run at such speed and temperature conditions as would otherwise cause "percolation," vapor bubbles which form in well 54 can enter the bore 58 only by passing through the relatively small ports 72, which surface tension prevents their doing. Instead, they will gravitate toward the highest point in well 54, at which point a vent is provided in the form of passage 70. The bubbles moving upwardly through this passage will carry some liquid fuel upwardly with them; but upon reaching the chamber 62 the vapor will separate itself from the liquid fuel and escape through port 66. The chamber 62 is of sufficient cross section and capacity to permit a considerable quantity of fuel to collect therein without being forced out of the port 66, and hydrostatic pressure will at all times tend to cause a return flow of liquid fuel through passage 70, to the fuel nozzle. The boiling or "percolating" of liquid fuel out of outlet 60 is therefore prevented.

The passage 70 preferably extends but slightly above the fuel level, and the port 66 is situated sufficiently above the fuel level that, even when the fuel is boiling, it will not be sealed by a film of fuel formed by the bubbles in chamber 62. The upper surface of dome 64 is preferably shaped as shown so as to drain away from port 66 any small amounts of liquid which may be expelled therefrom, so that they will not seal the port.

In the embodiment shown in Figure 3, the parts are the same, and are designated by the same reference numerals, except as hereinafter noted. The fuel enters the nozzle through a calibrated orifice 74 formed in plug 46, and thence passes through a slot 75 in the lower end of nozzle 36 to a well 76 communicating with well 54, which in turn communicates with the bore 58 of the nozzle through a series of ports 56 formed in the lower side of nozzle 36, the ports being of such size that they will not pass vapor bubbles. At its upper end, nozzle 36 communicates, through a plurality of ports 78, with a passage 80 which leads to chamber 62. Except as indicated, the device of Figure 3 operates in substantially the same manner as the device of Figures 1 and 2.

In the embodiment shown in Figure 4, the fuel enters through a plug 46, flows upwardly through an inclined nozzle 82, thence through a plurality of small ports 84 in the lower side of the nozzle to a well 86 surrounding the nozzle, and thence through a passage 88 to the venturi 18. In this and in the other embodiments, the aggregate capacity of the ports connecting the well and nozzle is greater than the capacity of the metering orifice, such as 48 and 74, so that the flow is controlled by the cross sectional area of the restriction rather than by the ports.

The well 86 and the nozzle 82 are, in this embodiment, each separately vented by means of chambers 62, connected respectively by vertical passageways 90 and 92. However, the vent 90 and its chamber may be dispensed with in many installations, since the nozzle 82 is insulated by well 86 from outside heat, so that but little vapor will be generated in the nozzle. The venting arrangements act as air bleeds during nor-

mal operation of the carburetor, as in the other embodiments.

Figures 5 and 6 disclose a further embodiment of the invention, wherein the well and nozzle are disposed alongside of each other, rather than being concentric. As will be seen in Figure 6, the well 94 is formed by drilling an inclined bore in such relation to the bore which receives the main nozzle 36 that the two overlap somewhat over a considerable portion of their lengths. The main nozzle is provided with a narrow slot 96 which permits the flow of fuel between the well and nozzle, but does not permit the passage of vapor bubbles. A passage 98 leads from the uppermost portion of the well to a chamber 62, similar to that previously described. Fuel is supplied to the well through a calibrated plug 100.

The various features of the several embodiments may be interchanged and combined in various obvious ways.

Although the invention has been described in connection with certain specific embodiments thereof, it may be embodied in other forms, and is not limited except by the terms of the following claims.

I claim:

1. In a carburetor, a section designed to be attached to a part of the engine, a second section separated from the first mentioned section by heat insulation and including a fuel reservoir and a boss projecting therein, a bore in said boss, a fuel nozzle mounted in the bore of said boss and spaced from the walls thereof to form a well, means for supplying fuel from the reservoir directly to said well, ports connecting the well to the nozzle adjacent the midsection of the latter, and venting means at the uppermost portion of said well of sufficiently large cross-section to permit the escape of fuel bubbles therethrough.

2. The invention defined in claim 1, wherein the vent extends upwardly to a point above the normal fuel level in the carburetor and terminates in an enlarged chamber having a calibrated opening to atmosphere adapted to act as an air bleed as well as to permit the escape of vapors.

3. In a downdraft carburetor, walls forming an induction conduit, two concentric inclined fuel passages formed in one of said walls, a fuel reservoir connected to one of said passages through a calibrated restriction, a venting passage having a lower portion of relatively great cross-section and an upper portion of relatively restricted cross-section connecting the same passage to atmosphere above the normal fuel level of the carburetor, a series of small ports of an aggregate capacity greater than that of the said restriction connecting the two fuel passages, and means connecting the other passage to the induction conduit.

4. In a carburetor, walls forming an induction conduit, two inclined fuel passages formed in one of said walls, a fuel reservoir connected to one of said passages through a calibrated restriction, venting means connecting the same passage to atmosphere above the normal fuel level of the carburetor, radial connecting means between the passages of greater fuel-flow capacity than the said restriction but of such shape and size as to prevent the passage of vapor bubbles therethrough, and a jet leading from the other passage to the induction conduit.

5. In a carburetor, walls forming an induction passage, a fuel reservoir, a bore extending

through a wall of the induction passage, an inclined fuel tube in said bore spaced from the walls thereof over a substantial portion of its length to form a fuel well and provided with a plurality of apertures communicating with said well, an orifice connecting the reservoir and well independently of the fuel tube, a passage leading upwardly from said well and of greater cross-section than any of said communicating apertures, a chamber communicating with said passage and of sufficiently large cross-section to permit the separation of fuel vapor bubbles from liquid fuel therein, and a restricted vent in said chamber adapted to permit the escape of fuel vapors and to meter the inflow of air to said well.

6. A downdraft carburetor comprising body sections forming a mixture passageway and a venturi therein, a throttle valve posterior to said venturi, a fuel reservoir, an inclined bore extending through one of the body sections from the fuel reservoir to the mixture passageway, an inclined fuel tube in said bore spaced from the walls thereof over a substantial portion of its length to form a fuel well and communicating with said well through one or more apertures of such restricted dimensions as to obstruct the passage of vapor bubbles therethrough, said fuel tube having its outlet in said venturi, an orifice connecting the reservoir and well independently of the fuel tube, a passage leading upwardly from said well and of greater cross section than any of said communicating apertures, a chamber communicating with said passage and extending above the level of the fuel tube outlet, said chamber being of sufficiently large cross section to permit the separation of fuel vapor bubbles from liquid fuel therein, and a restricted vent in said chamber adapted to permit the escape of fuel vapors and to meter the inflow of air to said well.

7. The invention defined in claim 6, wherein the chamber and vent are located in the mixture passageway.

8. In a downdraft carburetor, walls forming an induction conduit, two concentric inclined fuel passages formed in one of said walls, a fuel reservoir connected to one of said passages through a calibrated restriction, a venting passage having a lower portion of relatively great cross-section and an upper portion of relatively restricted cross-section connecting the same passage to atmosphere above the normal fuel level of the carburetor, a series of small ports of an aggregate capacity greater than that of the said restriction connecting the two fuel passages, means connecting the other passage to the induction conduit, and calibrated venting means connecting said other passage to atmosphere above the normal fuel level of the carburetor.

9. In a downdraft carburetor having a body portion forming a mixture passageway provided with a venturi, a throttle valve posterior to said venturi, an inclined fuel well formed in a side wall of said body portion and having its upper end communicating with said venturi, a fuel tube within said well having its lower end closed and its upper end open and projecting into said venturi, said tube having its upper portion closely fitting the upper end of the well to close off communication between the latter and the venturi and having a substantial portion of its length spaced from the wall of the well to define an elongated annular fuel chamber, a fuel reservoir, means including a calibrated restriction connect-

ing said reservoir and the lower portion of said annular chamber, means for conducting fuel from said chamber to said tube and for preventing passage of vapor bubbles formed in said chamber comprising a plurality of openings spaced along the length of said tube, and means for venting vapor bubbles from said chamber comprising an enlarged chamber communicating with the uppermost portion of said annular chamber, said enlarged chamber being of sufficiently large cross-section to allow bursting of the vapor bubbles and consequent separation of the vapor and entrained liquid, and a calibrated vent connecting the enlarged chamber with the mixture passageway.

10. In a downdraft carburetor provided with a body portion forming a mixture passageway and having a venturi positioned therein, a fuel nozzle having an open outlet projecting into said venturi, means including a fuel reservoir for conducting fuel to said nozzle, and means for preventing percolation of fuel from said nozzle comprising an annular fuel well surrounding said nozzle throughout a major portion of its length to effectively insulate the fuel in the nozzle from heat flow from said body portion, means including a calibrated restriction connecting the reservoir and well, means for separating vapor and entrained liquid fuel from vapor bubbles formed in said well comprising an enlarged chamber connected with the top of said well and of such large cross-section as to allow bursting of said vapor bubbles to cause said separation, calibrated venting means connecting said enlarged chamber and the mixture passageway, and means for conducting fuel from the well to said nozzle and for preventing passage of vapor bubbles from said well to the nozzle comprising a plurality of relatively small openings spaced along the length of the nozzle.

11. In a downdraft carburetor provided with a body portion forming a mixture passageway and having a venturi positioned therein, a fuel nozzle having an open outlet projecting into said venturi, means including a fuel reservoir for conducting fuel to said nozzle, and means for preventing percolation of fuel from said nozzle comprising an annular fuel well surrounding said nozzle throughout a major portion of its length to effectively insulate the fuel in the nozzle from heat flow from said body portion, means including a calibrated restriction connecting the reservoir and well, means for separating vapor and entrained liquid fuel from vapor bubbles formed in said well comprising an enlarged chamber connected with the uppermost portion of said well and of such large cross-section as to allow bursting of said vapor bubbles to effect said separation, calibrated venting means for said enlarged chamber to vent the separated vapor, and means for conducting fuel from the well to said nozzle and for preventing passage of vapor bubbles from said well to the nozzle comprising a plurality of relatively small spaced-apart openings in the wall of the nozzle.

12. In a downdraft carburetor having a body portion forming a mixture passageway provided with a venturi, a throttle valve posterior to said venturi, an inclined fuel well formed in a side wall of said body portion and having its upper end communicating with said venturi, a fuel tube within said well having its lower end closed and its upper end open and projecting into said venturi, said tube having its upper portion closely fitting the upper end of the well to close off com-

munication between the latter and the venturi and having a substantial portion of its length spaced from the wall of the well to define an elongated annular fuel chamber, a fuel reservoir, means including a calibrated restriction connecting said reservoir and the lower portion of said annular chamber, means for conducting fuel from said chamber to said tube and for preventing passage of vapor bubbles formed in said chamber comprising a plurality of relatively small openings spaced apart in the wall of the nozzle, and means for venting vapor bubbles formed in said chamber comprising a bubble chamber connected with the uppermost portion of said annular chamber and having a cross-section of sufficient size as to allow bursting of the vapor bubbles and separation of the vapor and entrained liquid, and a calibrated vent for said bubble chamber for venting the separated vapor.

13. A downdraft carburetor comprising body sections forming a mixture passageway and a venturi therein, a throttle valve posterior to said venturi, a fuel reservoir, an inclined chamber extending through one of the body sections from the mixture passageway to the reservoir and including a calibrated restriction at its lower end, an inclined fuel tube arranged concentrically within said chamber and spaced from the walls thereof over a substantial portion of its length to form an annular fuel chamber, said fuel tube being closed at its bottom and communicating with said chamber through a plurality of small openings provided in the wall of the tube, such openings being of such restricted area as to prevent passage of vapor bubbles from the chamber to the tube, the upper end of said tube extending into said venturi, a passage leading upwardly from the uppermost portion of said chamber, an enlarged bubble chamber communicating with the upper end of said passage and extending above the level of the upper end of the tube to allow expansion and bursting of vapor bubbles rising to said bubble chamber from the inclined chamber, and a restricted vent to allow escape of vapor separated from liquid fuel during bursting of said vapor bubbles, and to meter the inflow of air to the inclined chamber.

14. In a downdraft carburetor, an induction pipe, a fuel reservoir, a pair of upwardly extending fuel passages, one of said passages communicating with the fuel reservoir through a calibrated restriction to receive fuel therefrom, the other of said passages communicating with the induction pipe to deliver fuel thereto, connecting means between said fuel passages of greater fuel flow capacity than said restriction but of such shape and size as to resist the passage of vapor bubbles therethrough, and vapor venting means comprising a duct communicating with said one passage and having a lower portion of sufficiently large cross-sectional area to permit separation of vapor bubbles from the liquid fuel and a relatively restricted portion above the level of the fuel in the carburetor for venting the vapor so separated.

15. In a downdraft carburetor, walls forming an induction conduit, two concentric inclined fuel passages in one of said walls, a fuel reservoir con-

nected to one of said passages through a metering restriction, a venting passage having a lower portion of relatively great cross-section and an upper portion of relatively restricted cross-section connecting the same passage to the induction passage above the normal fuel level of the carburetor, means connecting the two fuel passages of greater fuel flow capacity than the said restriction but of such shape and size as to prevent the passage of vapor bubbles therethrough, and means connecting the other passage to the induction conduit.

16. In a carburetor, an induction conduit, a fuel chamber, two upwardly extending fuel passages, means for supplying fuel from the chamber to one of said passages, venting means comprising a vent passage having a lower portion extending above the normal fuel level of the carburetor and of sufficiently great cross-section to provide a free liquid surface permitting vapor bubbles to burst therethrough, and an upper portion of relatively restricted cross-section connecting said vent passage to the induction conduit above the normal fuel level of the carburetor, communicating means between the fuel passages of such size and position as to permit the flow of liquid fuel therethrough but to resist the passage of vapor bubbles therethrough, and a jet leading from the other fuel passage to the induction conduit.

17. The invention defined in claim 16, in which the said communicating means comprises a narrow slot.

18. In a carburetor, an induction pipe, a fuel reservoir, an upwardly extending passage communicating with the reservoir through a calibrated restriction and including a venting passage having a lower portion extending above the normal fuel level of the carburetor of sufficiently great cross-section to provide a free liquid surface permitting vapor bubbles to burst therethrough and having a restricted portion above the normal fuel level of the carburetor, and a second upwardly extending passage having an outlet in the induction passage for discharging fuel therein and having a communication with the first upwardly extending passage of such position and size as to resist the entrance therein of vapor bubbles while permitting the flow of liquid fuel therein.

19. In a carburetor, walls forming an induction conduit, a fuel reservoir, a fuel passage in one of said walls receiving fuel from the reservoir and having an upwardly extending vent leading to a point above the fuel level of the carburetor, said vent having a lower portion of sufficiently large cross-sectional area to provide a free liquid surface permitting bubbles to separate from the liquid fuel and having a restricted portion above the normal carburetor fuel level, a second fuel passage having an outlet in the induction conduit for discharging fuel therein, and communicating means between the fuel passages of such position and size as to prevent the passage of vapor bubbles therethrough while permitting the flow of liquid fuel therethrough.

FRANK C. MOCK.