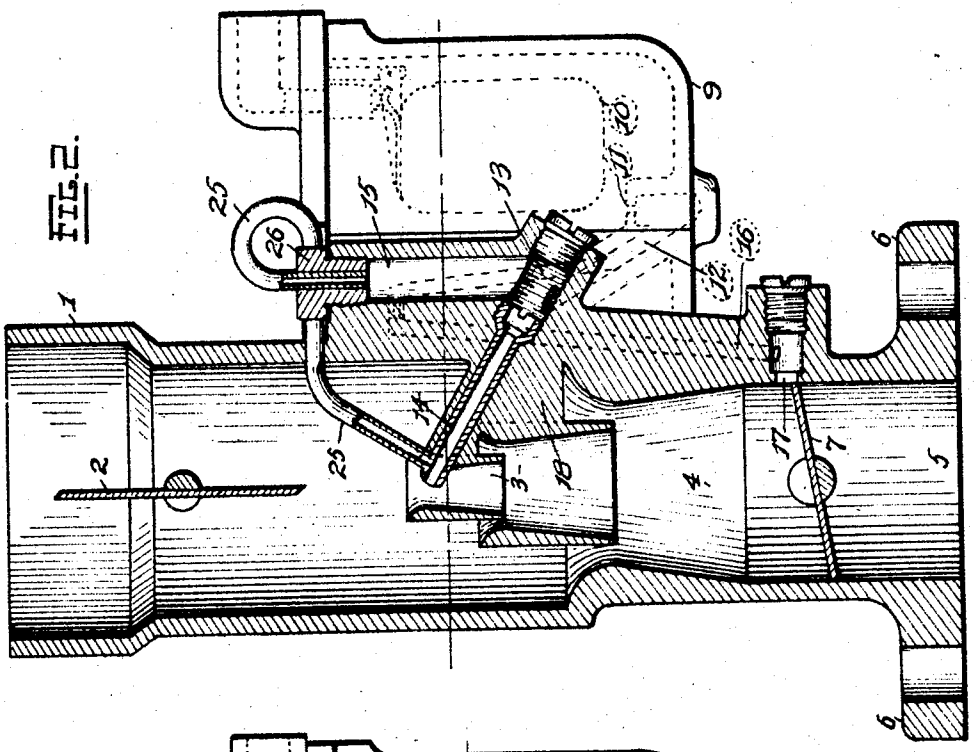
May 13, 1941. H. A. CARLSON 2,241,655

CARBURETOR

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FIG. 2.



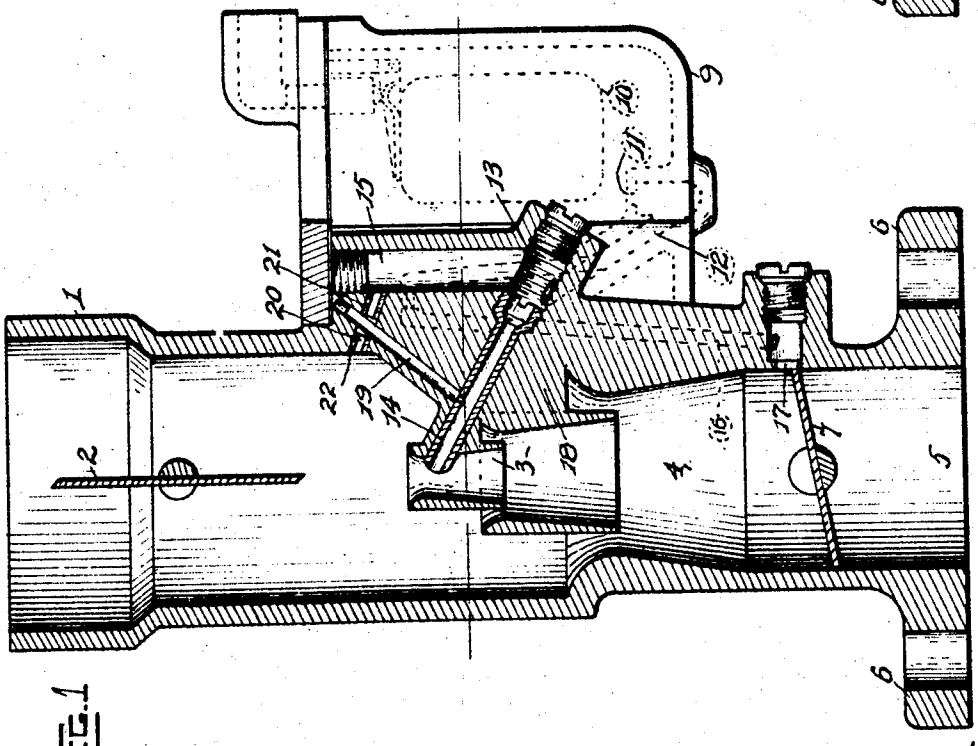


FIG. 1.

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FIG. 4.

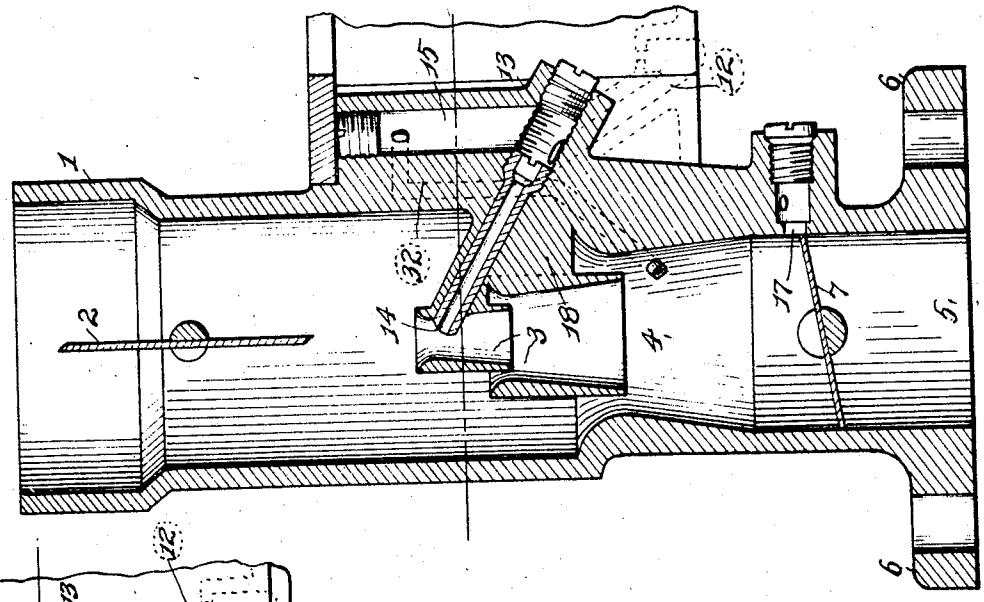


FIG. 5.

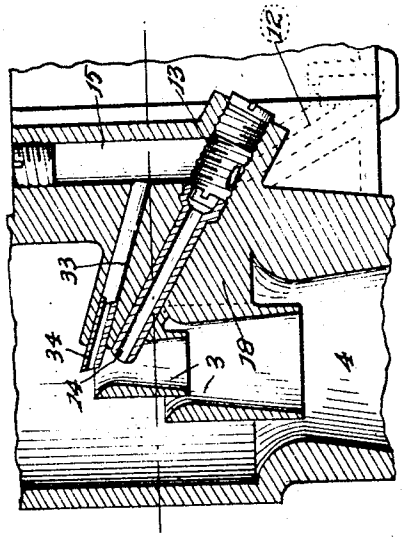
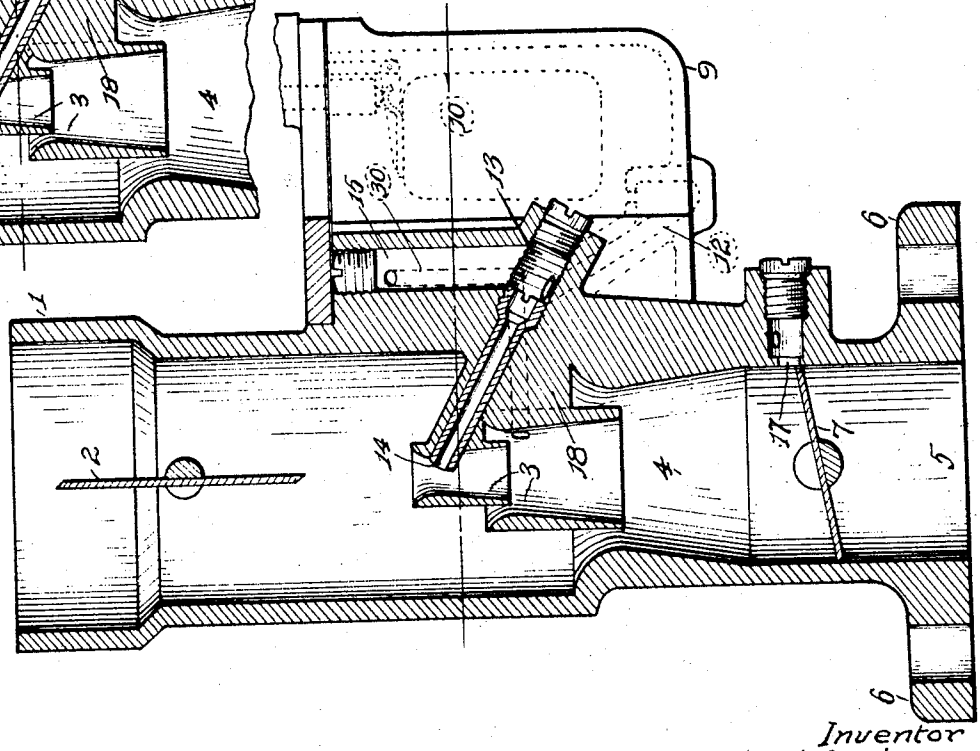


FIG. 3.



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UNITED STATES PATENT OFFICE

2,241,655

CARBURETOR

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Application November 3, 1938, Serial No. 238,602

7 Claims. (Cl. 261—41)

This invention relates to carburetors for internal combustion engines and consists, particularly, in novel means for preventing gaseous bubbles formed in the main fuel passage or discharge nozzle from traveling upwardly through the nozzle and carrying unvaporized fuel into the mixture conduit.

Internal combustion engine carburetors are frequently exposed to such high temperatures that the fuel in restricted spaces near the base of their fuel nozzles gasifies, forming bubbles which, when they have reached sufficient size, break loose from the surrounding metal and pass upwardly through the fuel. Such bubbles formed during operation of the carburetor and passing outwardly through the main nozzle result in uneven operation and excessive leanness, a condition known in the art as "surging." After the engine has stopped, the heat thereof may rise sufficiently, due to stopping of the fan and water circulation, to cause similar gasification and boiling or so-called "percolation," in the carburetor fuel passages and carrying of liquid fuel over the edge of the main nozzle. This action frequently continues until the bowl has been run dry.

It has been suggested that percolation can be greatly restricted or stopped by the provision of a relatively large passage extending vertically upwardly from the base of the main nozzle to the atmosphere and provided with a valve at its outlet end arranged to open when the carburetor throttle valve is closed to release gases collected in the top of the passage. The throttle controlled valve has been found necessary in order to prevent air from bleeding into the nozzle and to stabilize the fuel discharge from the nozzle. The valve has not proved wholly satisfactory, since it is difficult to prevent it from leaking and it increases the cost of the carburetor.

An object of the present invention is to provide an "anti-percolator" device which eliminates control valves, as described above.

Another object is to provide means for restricting or preventing surging in carburetors.

Another object is to provide an "anti-percolator" device which is adapted also to function as an "anti-surge" device.

These objects and other more detailed objects hereafter appearing are attained substantially by the structures illustrated in the accompanying drawings, in which

Figs. 1, 2, 3 and 4 are vertical transverse sectional views illustrating carburetors embodying different forms of the invention.

Fig. 5 is a similar view showing a portion of a carburetor embodying still another modification.

The carburetor shown in each of the figures is is of the downdraft type including an air inlet horn 1, choke valve 2 therein, venturis 3, mixing chamber 4 and outlet portion 5 flanged as at 6 for attachment to an associated internal combustion engine (not shown). A throttle valve 7 is mounted between the mixture chamber and outlet portion. Adjacent the carburetor barrel is a bowl 9 within which fuel is maintained at a substantially constant level by the usual needle valve mechanism controlled by float 10. Fuel is supplied from the bowl to the barrel or mixture conduit through a calibrated metering orifice member 11, and passage 12 opening into a normally submerged chamber 13 which forms the lower part of main nozzle 14 extending upwardly at an angle and opening into the throat of the upper, smallest venturi 3. A relatively large passage or well 15 extends more sharply upwardly from chamber 13 than the main nozzle, in the present case, vertically, above the normal fuel level. Fuel for idling is supplied through passage 16 communicating at one end with passage 12 and at its lower end with port 17 adjacent and partly posterior to the edge of the throttle valve, when closed. The upper two venturis 3 are supported from the wall of the mixture conduit by rib structure 18.

In Fig. 1, a passage or duct 19 opens into main nozzle 14 slightly above the fuel level and extends upwardly and outwardly through rib 18 and the wall of the mixture conduit. A cross passage 20 connects passage 19 with well 15 and also with the mixture conduit. Calibrated restrictions 21 and 22 are provided in the cross passage. In other words, the outlet portion of both the main nozzle and venting passages are co-extensive whereby both passages communicate with the same suction zone in the mixture conduit.

In operation, passage 19 and main nozzle 14 will be exposed to substantially identical pressure conditions, but the height of cross passage 20 above the fuel level and the relative sizes of the nozzle and restrictions 21 and 22 in the cross passage are proportioned so that normally the pressure at the top and base of well 15 will approach a balanced condition and little or no fuel will be drawn into the mixture conduit through passage 19. Gaseous bubbles forming in chamber 13 at the base of the main nozzle tend to take the easiest passage upwardly through well 15 instead of through the sloping, relatively small main nozzle. Well 15 is large enough to

permit the release of bubbles formed therein and in chamber 13 without substantially raising the level of fuel in the chamber. Gases collected in the top of the well may pass out through passage 19 and the main nozzle into the mixture conduit. Passage 19 is a factor which must be considered in calibrating the carburetor and for this purpose the movable restrictions 21 and 22 may be adjusted as required.

The form in Fig. 2 is, in general, similar to that in Fig. 1 except that the "anti-percolating" and "anti-surge" passage is formed by means of a tube 25 secured in plug 26 at the top of well 15, extends through the wall of the mixture conduit, and terminates at the outlet tip of the main nozzle. No air bleed is provided in well 15 or tube 25, the height of cross passage 20 above the fuel level and restriction of passage tube 25 being relied upon to minimize the quantity of fuel drawn into the mixture conduit through the tube.

In Fig. 3, well 15 communicates with the middle of second venturi 3 by means of a passage 30 opening into the well above the normal fuel level therein. The outlet end of passage 30 is in a relatively high suction zone, though at times, exposed to slightly higher pressure during operation of the carburetor than the outlet tip of the main nozzle and, consequently, there may be a tendency for air to bleed into the main nozzle through the passage and well, particularly when the rate of flow is relatively low. This bleeding may be controlled or eliminated by calibrated restrictions, as at 21 and 22 in Fig. 1, and by proper positioning and shaping the outlet end of the passage relative to the direction of flow through the mixture conduit and the inlet of the conduit. At high flows the suction conditions at the outlet ends of nozzle 14 and passage 30 will approach balance due to the blocking of the smallest venturi by fuel emerging from the nozzle and consequent reduction of suction in this venturi.

In Fig. 4, well 15 communicates with the lowest or main venturi 3 by means of passage 32. This passage may also function, in some cases, as an air bleed which may be controlled by suitable calibrated restrictions, (not shown) and by the inclination of the end of the passage opening in the mixture conduit, as in the previous form. As shown, this end is undercut or, in other words, faces in the direction of flow in the conduit which would tend to decrease the pressure in the passage from that in the portion of the mixture conduit surrounding this opening.

In Fig. 5, well 15 communicates with the mixture conduit by means of a passage 33 and tube 34 having an under-cut tip spaced slightly above the outlet end of the main nozzle. Tube 34 functions to release gases in well 15, as in the previous forms, and also forms a shield for the main nozzle which has a tendency to increase the suction applied thereto. An advantage of this arrangement lies in a tendency to increase the fuel drawn from the main nozzle at periods of low suction when the throttle valve is substantially opened.

In each form of the invention, any effect which the "anti-percolation" passage exerts upon the proportioning of the mixture may be controlled without loss of its primary function. Preferably, the pressure conditions in the well will be substantially balanced and it is particularly important that fuel be prevented from draining from the well or "dumped" so that no air can bleed into the chamber 13 therethrough. It is desirable that the vapor venting passage or duct extend to a higher level than the main nozzle, though not absolutely essential since all fuel passing to the main nozzle is effectively metered through the metering jet in the fuel bowl. Various features of the carburetor shown are not essential and these may be modified in such respects as will occur to those skilled in the art without departing from the spirit of the invention. The exclusive use of all modifications as come within the scope of the appended claims is contemplated.

I claim:

1. In a downdraft carburetor, induction conduit means, a constant level fuel bowl, a chamber normally submerged in said bowl and communicating therewith through a metered orifice, a fuel nozzle extending from said chamber to a portion of said conduit slightly above the normal level in said bowl, a relatively large venting passage extending from said chamber more directly upwardly than said nozzle and substantially higher than said nozzle, and a duct extending from the upper portion of said venting passage into said nozzle above the fuel level therein.

2. In a downdraft carburetor, a mixture conduit including a venturi tube, a constant level chamber, a main fuel passage communicating with said chamber through a metering orifice and extending upwardly into said conduit, and a vapor venting passage having a part extending from the lower portion of said fuel passage posterior to said metering orifice substantially more directly upwardly than said fuel passage, both of said passages leading into the throat of said venturi so as to be subjected to substantially identical suction conditions during operation, said vapor venting passage extending to a higher level than said fuel passage whereby the drawing of fuel through said venting passage is minimized.

3. In a downdraft carburetor, an induction conduit having a high suction zone, an atmospheric constant level bowl, a main fuel passage communicating with said bowl through a metering orifice and extending upwardly into said high suction zone, and a vapor venting duct for said passage, said duct including a relatively large portion extending from said fuel passage posterior to said metering orifice more directly upwardly than said passage, a vapor collecting portion above the fuel level, and a pressure balancing portion leading into said conduit, said duct extending to a higher level than said fuel passage and opening into said high suction zone.

4. A carburetor as specified in claim 3 further including an air bleed in said venting duct above the fuel level and assisting in reducing the suction applied to the fuel therein.

5. A carburetor as specified in claim 3 in which the portion of said venting duct below the fuel level is in the form of a vertical well of substantially larger effective cross section than said fuel passage.

6. In a downdraft carburetor, means forming a mixture conduit having a high suction zone, a constant level fuel chamber, a main aspirating fuel passage communicating with said chamber through a metering orifice leading upwardly at an angle into said conduit, and a vapor venting duct for said passage, said duct including a relatively large portion extending from the lower part of said fuel passage posterior to said metering orifice more directly upwardly than the immediately adjacent portion of said main fuel passage and a balancing portion leading into said mixture

conduit, said main fuel passage and said balancing portion having outlet structure located substantially in said high suction zone and disposed relative to the air flow in said conduit whereby said duct is exposed to at least substantially as high suction as said fuel passage during operation.

7. In a downdraft carburetor, a mixture conduit having a high suction zone, a constant level chamber, a main fuel passage extending upwardly at an angle from the lower part of said chamber into said conduit, there being a metering orifice in said passage, and a vapor venting duct communicating with the lower part of said passage posterior to said orifice, said duct including a relatively large vapor releasing portion extending from said passage more sharply upwardly and to a substantially-higher level than said passage and a balancing duct connecting said mixture conduit and the upper part of said vapor releasing portion, both said main fuel passage and said duct leading into said high suction zone and being disposed relative to the direction of air flow in said conduit so as to be subjected to substantially identical suction conditions during operation.

HAROLD A. CARLSON.