March 18, 1941. G. M. BICKNELL 2,234,946

CARBURETOR

Filed May 3, 1940

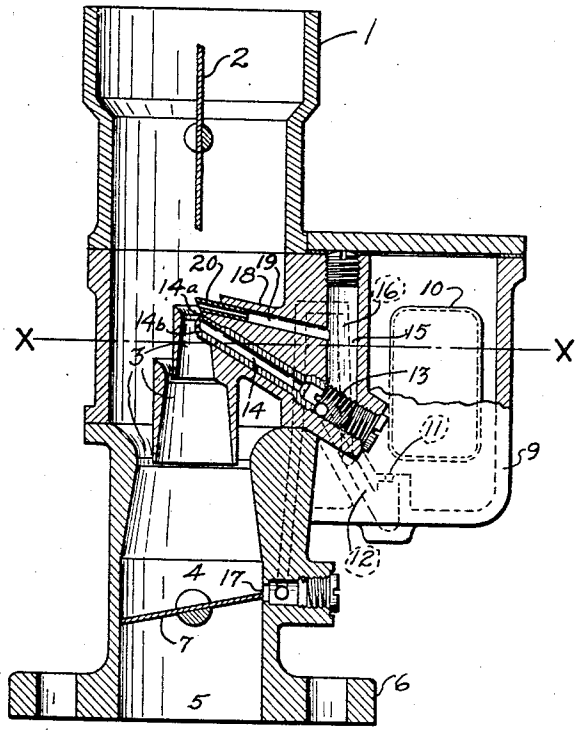


FIG. 1.

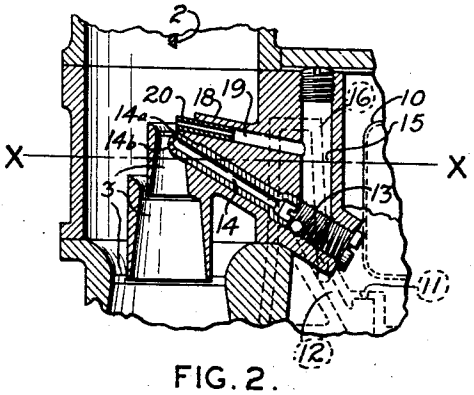


FIG. 2.

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CARBURETOR

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4 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 supply passage or discharge nozzle from traveling upwardly through the nozzle and carrying unvaporized fuel into the mixture conduit. The application is a continuation in part of copending application, Serial No. 255,674, filed February 10, 1939.

An internal combustion engine carburetor is frequently exposed to such high temperatures that the fuel gasifies in the main nozzle and passages leading thereto, forming bubbles which, when they have reached sufficient size, break loose from the surrounding metal and pass upwardly through the fuel. Where the main nozzle passage extends upwardly at an angle from the fuel metering orifice, such bubbles formed during operation of the carburetor may pass outwardly through the main nozzle and 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 may continue 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 passage 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 upper part 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 and, moreover, such an arrangement does not completely avoid surging.

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 structure illustrated in the accompanying drawing in which Fig. 1 is a vertical sectional view of a carburetor embodying the invention.

Fig. 2 is a detail section, but showing a slight modification.

The carburetor shown 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 or reservoir 9 within which fuel is maintained at a substantially constant level x—x by the usual needle valve mechanism (not shown) controlled by float 10. Fuel is supplied from the bowl to the barrel or mixture conduit through a calibrated metering orifice member 11, passage 12 opening into a normally submerged chamber 13, and main nozzle 14 extending upwardly at an angle from chamber 13 and opening into the interior of the upper, smallest venturi 3. Nozzle 14 has an air hole 14a facing against the air stream and a fuel outlet 14b in the tip portion thereof. Fuel for idling is supplied through passage 16 extending from main fuel passage 12 to port 17 adjacent the edge of the throttle when closed.

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. The upper two venturis 3 are supported from the wall of the mixture conduit by rib structure 18.

A passage 19 extends from well 15 above chamber 13 and terminates in a tube 20 having an outlet tip spaced slightly above or anterior to the outlet end of main nozzle 14. This tip may be slightly undercut, as shown in Fig. 1, or may extend axially of the mixture conduit, as in Fig. 2.

In operation, any gaseous bubbles forming in chamber 13 at the base of the main nozzle tend to take the easiest path upwardly, which is through well 15 instead of through the sloping, relatively small main nozzle.

The relative positioning and angular disposition of the outlet opening of the main nozzle and tube 20 are adjusted to insure, as nearly as possible, a balanced condition in the top of the well so that tube 20 will not function as an air bleed or a mere duplicate fuel nozzle. The well must be exposed to substantially greater suction than the main nozzle before fuel will be raised through tube 20 which extends higher than the nozzle. Thus, there is little or no tendency of either liq-

uid fuel or air being drawn in either direction through tube 20 during operation, but if fuel should pass through tube 20 at high suctions, the total discharge would not be affected, substantially, since both the tube and the main nozzle communicate with the fuel reservoir only through restriction 11, which meters the liquid fuel delivered to the carburetor. The outlet opening of tube 20 should face in a direction making an angle of 90° or less with the direction of air flow to prevent air bleeding therethrough into the main nozzle during operation. In Fig. 1, this angle is less than 90°, the tube being undercut, and in Fig. 2 the angle is 90°.

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 chamber 15 may pass out through passage 19 into the mixture conduit, but there is little or no possibility of liquid or unvaporized fuel being carried through this passage. Tube 20 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 its tendency to increase the fuel drawn from the main nozzle at periods of low suction when the throttle valve is substantially opened. Any function which the "anti-percolation" and "anti-surge" passage exerts upon the proportioning of the mixture during normal operation may be controlled, as desired, by means of metering orifices, bleeds, and other calibration expedients well known, and by varying the positioning and shaping of tube 20, without loss of the primary function of this passage.

Various features of the carburetor shown are not essential and these may be modified 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, a mixture conduit including a venturi, a fuel reservoir, a chamber adjacent the wall of said conduit and normally submerged in said reservoir and communicating therewith, a main fuel nozzle communicating with said reservoir through a metering restriction and extending from said chamber upwardly at an angle and discharging substantially at the throat of said venturi, and a passage extending from said chamber posterior to said restriction more sharply upwardly than said nozzle and having an opening slightly anterior to and in line with the nozzle opening, said passage being of ample size for releasing bubbles from said chamber.

2. In a downdraft carburetor, a mixture conduit including a venturi, a constant level fuel reservoir, a main fuel nozzle communicating with said reservoir through a metering restriction and having a portion posterior to said restriction extending upwardly at an angle from below the fuel level, said nozzle having an opening discharging substantially at the throat of said venturi, and a passage extending from the lower part of said nozzle portion posterior to said restriction more sharply upwardly than said nozzle portion to above the fuel level and thence into said mixture conduit, said passage being of ample size for releasing bubbles from said nozzle portion and having an opening immediately adjacent the mouth of said venturi and facing transversely of said conduit so as to prevent bleeding of air into said passage during operation.

3. In a carburetor, a downdraft mixture conduit including a venturi, a main fuel nozzle having a metering restriction and a portion posterior to said restriction extending upwardly at an angle into said conduit and discharging into the throat of said venturi, and an unrestricted bubble releasing passage extending from the lower part of said nozzle portion posterior to said restriction more sharply upwardly and to a higher level than said nozzle, said passage having an opening positioned immediately adjacent to and in line with the mouth of said venturi and facing in a direction making an angle of 90° or less with the direction of air flow through said conduit so as to prevent air bleeding into said passage during operation.

4. In a carburetor, a barrel forming a downdraft mixture conduit including a venturi and a portion of greater cross section, a constant level fuel reservoir, a main fuel nozzle communicating with said reservoir through a metering restriction and having an upwardly inclined part with an opening into said venturi, and a bubble releasing passage extending from said nozzle posterior to said restriction and below the fuel level more sharply upwardly and to a higher level than said nozzle, said passage having an opening into said larger portion of said barrel immediately anterior to and directly in line with said nozzle opening and said passage opening facing in a direction making an angle of 90° or less with the normal direction of air flow through said barrel.

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