Oct. 16, 1962 H. L. RUTH 3,058,728

THROTTLE-OPERATED INSIDE CARBURETOR VENTS

Filed July 20, 1959 4 Sheets-Sheet 1

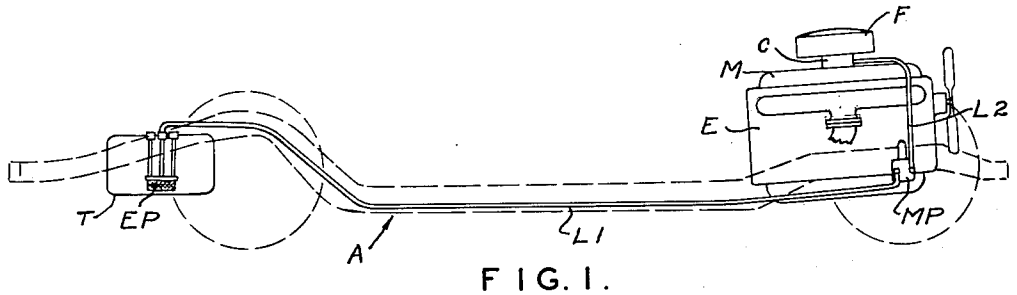


FIG. 1.

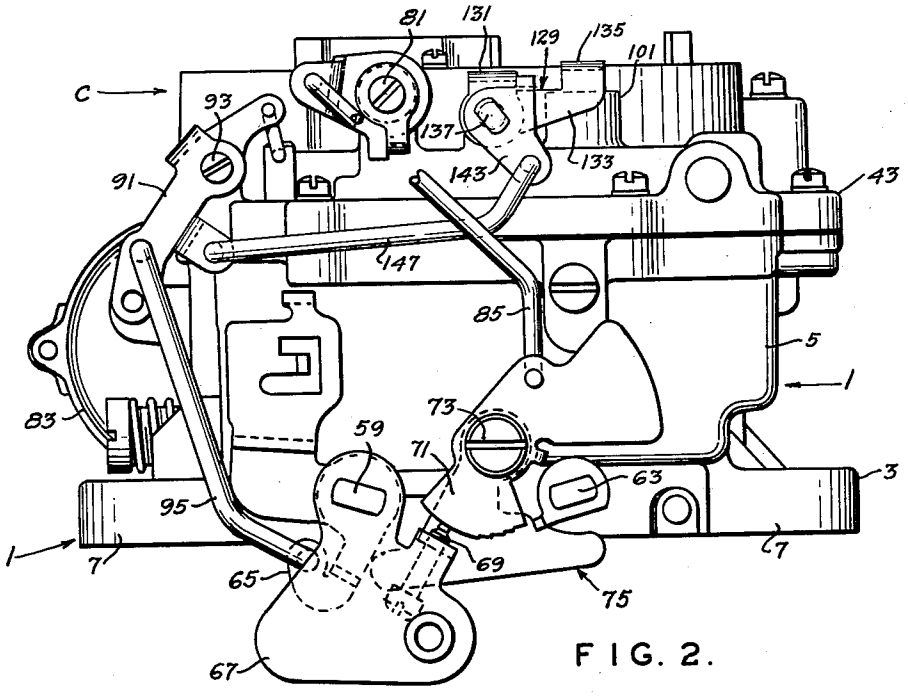


FIG. 2.

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THROTTLE-OPERATED INSIDE CARBURETOR VENTS

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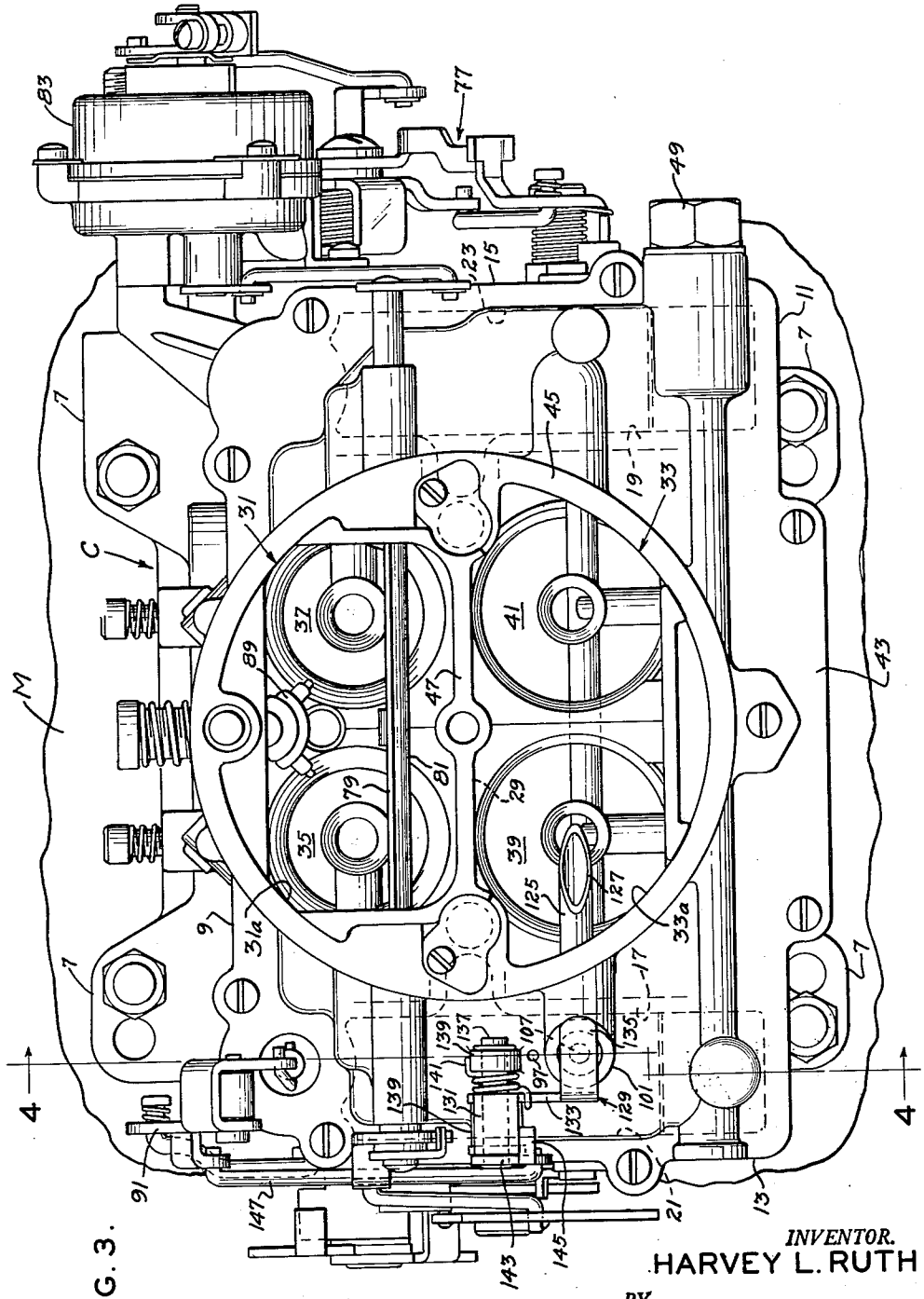


FIG. 3.

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THROTTLE-OPERATED INSIDE CARBURETOR VENTS

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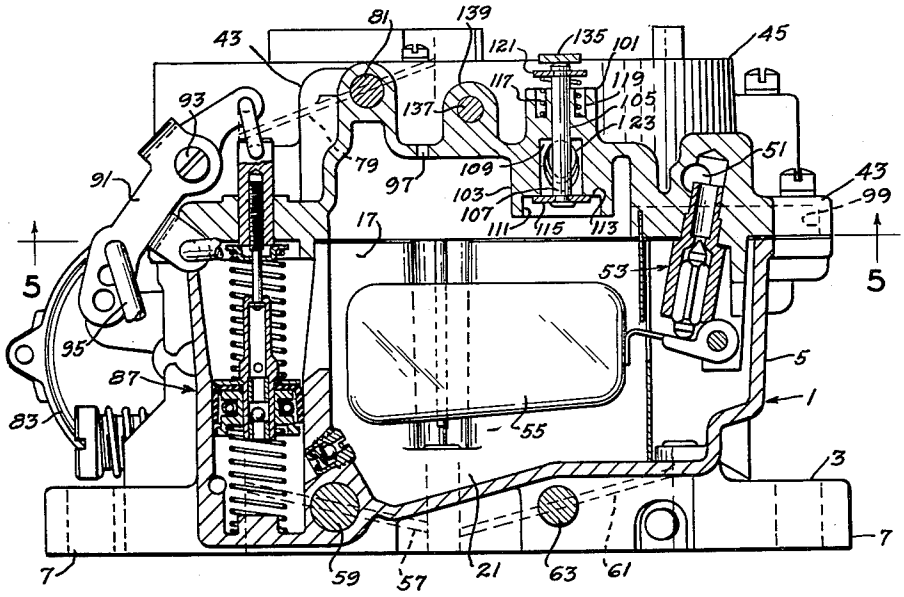


FIG. 4.

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THROTTLE-OPERATED INSIDE CARBURETOR VENTS

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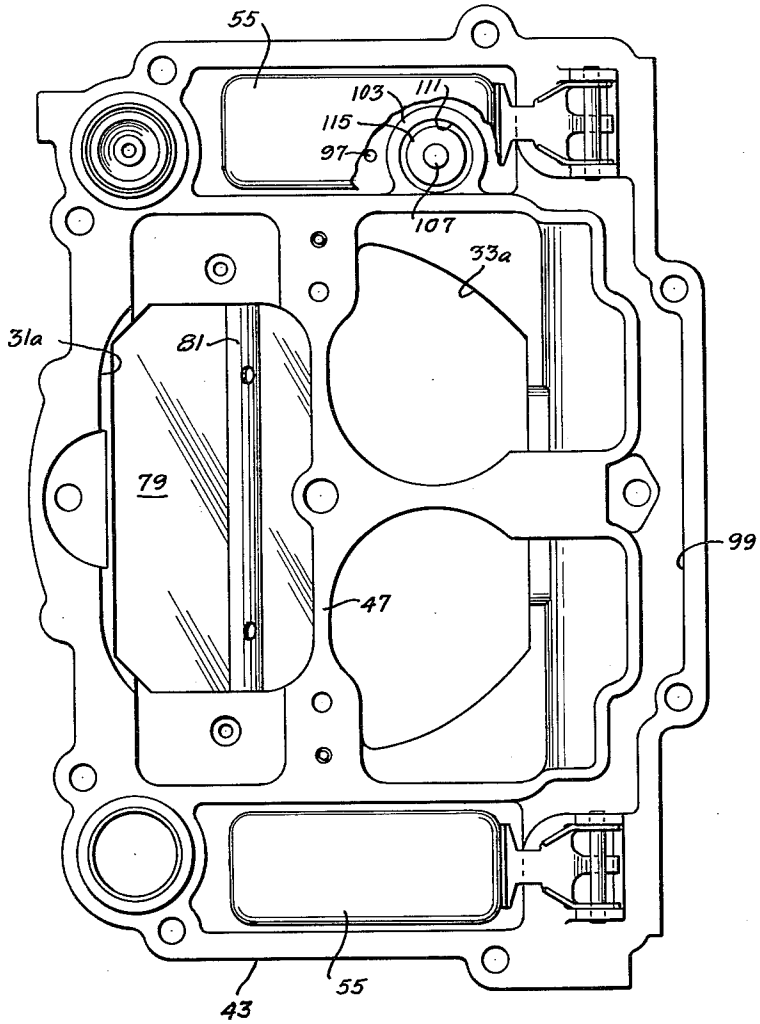


FIG. 5.

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THROTTLE-OPERATED INSIDE CARBURETOR VENTS

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14 Claims. (Cl. 261—39)

This invention relates to carburetors for internal combustion engines, and more particularly to throttle-operated inside carburetor fuel bowl vents.

It will be understood that a carburetor may have so-called outside bowl vents providing for communication between the fuel bowl (or bowls) of the carburetor and the outside atmosphere and so-called inside bowl vents providing communication between the fuel bowl and the air inlet (the air horn) of the carburetor. Such vents are provided to allow air to enter or leave the fuel bowl as the level of fuel in the bowl changes and to vent fuel vapors from the bowl. When the engine is in operation, there is a draft of air through the bowl, this air entering the bowl through the outside vents and passing from the bowl through the inside vents to the air horn, carrying fuel vapors with it to the intake manifold of the engine. Under some circumstances, inside venting occurring during idling of the engine may result in the air/fuel mixture supplied to the engine being excessively rich, causing rough idling.

Accordingly, an object of this invention is the provision of an improved bowl venting means adapted to provide inside venting only at engine speeds above idle, inside venting being cut off at idle, bowl venting then being provided by means of the outside bowl vents which are effective at idle speed as well as speeds above idle.

In general, the bowl venting means of this invention comprises valve means including an inside vent valve, more particularly a reciprocating valve, biased toward a closed position in which it blocks communication through an inside vent passage from the fuel bowl to the mixture conduit of the carburetor, and means responsive to movement of the throttle of the carburetor off idle for moving the valve to open position against the closing bias on the valve when the throttle is opened a predetermined amount from idle and holding the valve in open position throughout the remainder of the range of movement of the throttle. For example, the throttle-responsive means may act to effect full opening of the inside vent valve when the throttle is opened five to ten degrees from idle and to hold the inside vent valve fully open in all throttle positions beyond this initial range of movement.

The invention is particularly applicable to a multi-stage carburetor, such as a four-barrel carburetor having a body formed to provide a fuel bowl at one end and a fuel bowl at the other end, primary mixture conduits located side-by-side between the bowls, primary throttles for the primary conduits, secondary mixture conduits located side-by-side between the bowls, secondary throttles for the secondary conduits, a cover for the bowls formed to provide an air horn, and outside vents for the bowls. The carburetor is formed to provide for communication between the upper parts of the two bowls (for example, the bowl cover may be formed to provide a passage interconnecting the bowls), and both bowls are vented to the air horn by an inside vent passage with which there is associated a valve means such as above described controlled by the primary throttles.

Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions

hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

FIG. 1 is a view in elevation illustrating a carburetor in which this invention is incorporated mounted on the engine of an automotive vehicle;

FIG. 2 is a view in elevation of the left end of the carburetor;

FIG. 3 is a plan view of the carburetor;

FIG. 4 is a vertical section taken on line 4—4 of FIG. 3; and,

FIG. 5 is a bottom plan view of the bowl cover per se of the carburetor, as it appears when removed, and as viewed in effect on line 5—5 of FIG. 4.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, there is indicated at A in FIG. 1 an automotive vehicle having an engine E on which is a carburetor C. Fuel is supplied to the carburetor C from the fuel tank T of the vehicle. As shown there is an electric pump EP in the fuel tank for pumping fuel from the tank through a line L1 to a mechanical fuel pump MP on the engine. Pump MP is operated by the engine and is adapted to pump fuel to the carburetor through a line L2. As appears in FIG. 3, the carburetor C is of the type having two primary mixture conduits or barrels and two secondary mixture conduits or barrels, referred to as a four-barrel carburetor. It is mounted on the intake manifold M of the engine with the two primary barrels toward the front and the two secondary barrels toward the rear. An air filter F is mounted on the air horn of the carburetor.

Carburetor C comprises a main body casting 1 which is formed to provide a throttle body section 3 and a fuel bowl section 5 on the throttle body section. The latter has lugs 7 for attachment to the intake manifold of the engine on which the carburetor is used. The bowl section 5 is generally of rectangular shape in plan, its front and back walls being designated 9 and 11, and its left and right end walls being designated 13 and 15. Partitions 17 and 19 extend between the front and back walls adjacent the end walls 13 and 15 to define two fuel bowls 21 and 23, one at each end of bowl section 5. A partition 29 extends between the bowls dividing the space bounded by the front and back walls 9 and 11 and partitions 17 and 19 into a primary section 31 and a secondary section 33. The primary section is formed to provide two side-by-side primary mixture conduits or barrels 35 and 37, and the secondary section is formed to provide two side-by-side secondary mixture conduits or barrels 39 and 41. Secured to the top of the fuel bowl section is a bowl cover 43 formed to provide a circular air horn 45. The horn has a diametrical partition 47 coplanar with partition 29 dividing the horn into a primary air inlet 31*a* above section 31 and a secondary air inlet 33*a* above section 33.

The cover 43 has a fuel inlet 49 and an inlet passage 51 connecting the inlet to the two fuel bowls 21 and 23. Entry of fuel to the bowls from passage 51 is controlled by two float valves 53, one for each bowl (see FIG. 4). Each of these valves is controlled by a float 55 in the respective bowl. The valves and floats may be of any suitable construction, their details not being critical so far as this invention is concerned. The left-hand bowl 21 supplies fuel to the left-hand primary barrel 35 via a low speed (idling) system and a high speed system and supplies fuel to the left-hand secondary barrel 39 via a secondary fuel system. The right-hand bowl 23 supplies fuel to the right-hand primary barrel 37 via a low-speed (idling) system and a high speed system and supplies

fuel to the right-hand secondary barrel 41 via a secondary fuel system. These systems may be of any suitable known character so far as this invention is concerned. Reference may be made, for example, to the copending coassigned application of Dwight M. Gordon, Serial No. 752,979, filed August 4, 1958 for details.

Each of the primary barrels 35 and 37 has a primary throttle valve 57 at its lower end, the two primary throttle valves being fixed on a primary throttle shaft 59 journalled in the throttle body section 3 of the carburetor body 1. Each of the secondary barrels 39 and 41 has a secondary throttle valve 61 at its lower end, the two secondary throttle valves being fixed on a secondary throttle shaft 63 journalled in the throttle body section 3. Fixed on the left end of the primary throttle shaft are inner and outer primary throttle arms 65 and 67. The outer arms 67 carries a fast idle adjusting screw 69 engageable with the fast idle cam 71 pivoted at 73 on the left end wall 13. At 75 is indicated the secondary throttle lockout mechanism for maintaining the secondary throttle valves 61 closed until the engine has warmed up and the fast idle cam backs off from its fast idle position to its normal idle position.

At 77 in FIG. 3 is indicated the mechanism for operating the secondary throttle shafts 63 from the primary throttle shaft 59. In the primary air inlet 31*a* of the air horn 45 is the choke valve 79 on choke shaft 81. The automatic choke control is indicated at 83. At 85 is indicated the connection between the choke shaft 81 and the fast idle cam 71. At 87 is indicated the accelerator pump for supplying fuel to the primary barrels 35 and 37 in response to opening of the primary throttles via a pump discharge jet cluster 89 (see FIG. 3). The pump is operated by a rocker arm 91 pivoted at 93 on the bowl cover 43 adjacent its left end, a link 95 being provided between the inner primary throttle arm 65 and the rocker arm 91.

The bowl cover 43 is provided with outside vents 97 for venting each of the fuel bowls 21 and 23 to atmosphere (outside the air horn 45). In accordance with this invention, the carburetor is also provided with means for venting both bowls to the air horn only at engine speeds above idle, this inside venting being cut off at idle, and bowl venting them being provided by the outside vents. Referring to FIG. 5, the bowl cover 43 is shown as being formed with a groove 99 in the bottom thereof which provides a passage for communication between the upper parts of bowls 21 and 23. In the portion thereof which covers the left-hand bowl 21, the bowl cover 43 is formed with an upwardly extending boss 101 and a coaxial downwardly extending boss 103 (see FIGS. 2, 3 and 4). The upwardly extending boss 101 has a vertical hole 105 bored therein (see FIG. 4). A valve stem 107 is vertically slidable in this hole, and extends upward above the boss 101. The downwardly extending boss 103 has a first counterbore providing a recess 109 of larger diameter than hole 105 at the lower end of hole 105, and a second counterbore at its lower end providing a recess 111 of larger diameter than recess 109, with an annular, flat, downwardly facing shoulder 113 at the upper end of recess 111. This shoulder constitutes a valve seat for a reciprocating valve 115 secured on the lower end of the valve step 107. The stem 107 and valve 115 are biased upward toward closed position in which valve 115 engages valve seat 113 by a coil compression spring 117 accommodated in an annular groove 119 surrounding bore 105 in the upper end of the upwardly extending boss 101 acting against a collar 121 on stem 107 adjacent its upper end. An inclined passage 123 is provided in the bowl cover 43 extending from recess 109 (above the valve seat 113) to the secondary air inlet portion 33*a* of the air horn 45, and in this passage is press-fitted an inside vent tube 125 having an upwardly opening upper mitered end 127.

At 129 is indicated a tappet for actuating the valve stem 107. As shown, this tappet is a sheet metal stamping formed to have a hub 131 of inverted U-shape, an arm 133 extending from one side of the inverted U-shape hub, and a lateral finger 135 at the end of the arm. The tappet is pivoted for rocking movement on a horizontal axis on the bowl cover 43 by means of a pivot pin 137 extending horizontally from a boss 139 on the cover through holes in the sides of the inverted U-shape hub 131. Finger 135 is engageable with the upper end of valve stem 107. A torsion spring 141 biases the tappet to swing downward with a force greater than the upward spring bias of spring 117 on the valve stem 107. A lifter 143 for the tappet is pivoted on the pin 137 along with the tappet. As shown, this lifter comprises a flat sheet metal arm mounted on the pin 137 outward of the other side of hub 131 from tappet arm 133 having a lateral finger 145 projecting in front of hub 131. Finger 145 terminates short of tappet arm 133 (see FIG. 3).

A link 147 connects the pump rocker arm 91 and the lifter 143, the arrangement being such that when the screw 69 is engaged with the fast idle cam 71, the lifter 143 occupies a position such as shown in FIG. 2, and when the fast idle cam backs off to permit the primary throttles 57 to assume their normal idle position, lifter 143 will then occupy a fully retracted position slightly counterclockwise from its FIG. 2 position in which finger 145 on the lifter holds the tappet 129 in a fully raised retracted position slightly above its FIG. 2 position. With the tappet in the stated retracted position, valve 115 is held in closed position in engagement with valve seat 113 by spring 117 (see FIG. 4) to block communication from bowl 21 (and bowl 23) to the air horn 45. As the primary throttles 57 are opened from idle, lifter 143 swings clockwise as viewed in FIG. 2, carrying lifter finger 145 away from hub 131 of the tappet 129. This releases the tappet to swing downward under the bias of spring 141 to drive valve stem 107 downward and open the valve 115. The linkage interconnecting the primary throttles and the lifter 143, this linkage comprising the inner throttle arm 65, link 95, pump rocker arm 91 and link 147, is so proportioned that valve 115 is fully opened when the primary throttles are opened, for example, from five to ten degrees off idle. Downward movement of the valve 115 and the tappet 129 is limited by engagement of collar 121 on the valve stem 107 with the upper end of boss 101. Thereafter, upon further opening of the primary throttles, lifter finger 145 simply swings away from the hub 131 of the tappet 129.

From the above, it will be apparent that the fuel bowls 21 and 23 are always vented to the outside by the outside vents 97. When the primary throttles 57 are in idle position, communication between the bowls and the air horn 45 is blocked by valve 115, which is then held in closed position against its seat 113 by spring 117. When the primary throttles start to open off idle, tappet 129 is released to start swing downward and to start opening valve 115. The valve attains its fully open position when the primary throttles are opened from five to ten degrees off idle, for example. Thereafter, valve 115 remains fully open throughout the remainder of the range of movement of the primary throttles for venting both bowls to the air horn. It will be understood that, with valve 115 open, bowl 21 is directly vented through the inside vent tube 125, and that bowl 23 is vented via the groove or passage 99 in bowl cover 43, bowl 21 and tube 125. It will be further understood that the inside vent valve means including valve 115 may be located in other positions on the bowl cover 43 than the position shown. For example, it could be located centrally of the length of the groove or passage 99 in the cover 43. In such case, the location of the pivot pin 137 for the tappet 129 and tappet lifter 143 may remain as shown, and the tappet would be provided with a long arm extending over the upper end of the valve stem of the valve means.

In view of the above, it will be seen that the several

objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A carburetor comprising a fuel bowl, an outside vent for said fuel bowl, a mixture conduit, a throttle mounted in said mixture conduit for movement from an idle position to an open position, means forming a venting passage from said fuel bowl to said mixture conduit, a valve movably mounted adjacent to said venting passage, means biasing said valve to a position closing said venting passage, means for holding said throttle in a slightly open fast-idle position, and means connected to said throttle in said fast-idle position to hold said valve open against said biasing means.

2. A carburetor comprising a fuel bowl, an outside vent for said fuel bowl, a mixture conduit, a throttle mounted in said mixture conduit for movement from an idle position to an open position, means forming a venting passage from said fuel bowl to said mixture conduit, a valve movably mounted adjacent to said venting passage, means biasing said valve to a position closing said venting passage, means for holding said throttle in a slightly open fast-idle position, and means connected to said throttle in said fast-idle position to hold said valve open against said biasing means, said valve holding means including structure for releasing said valve upon movement of said throttle from fast-idle to said idle position.

3. A carburetor comprising a fuel bowl, an outside vent for said fuel bowl, a mixture conduit, a throttle mounted in said mixture conduit for movement from an idle position to an open position, means forming a venting passage from said fuel bowl to said mixture conduit, a valve movably mounted adjacent to said venting passage, means biasing said valve to a position closing said venting passage, means including a throttle stop structure for holding said throttle in a slightly open fast-idle position, and means responsive to said throttle in said fast-idle position to hold said valve open against said biasing means.

4. A carburetor comprising a fuel bowl, an outside vent for said fuel bowl, a mixture conduit, a throttle mounted in said mixture conduit for movement from an idle position to an open position, means forming a venting passage from said fuel bowl to said mixture conduit, a valve movably mounted adjacent to said venting passage, means biasing said valve to a position closing said venting passage, a throttle stop structure mounted on said carburetor for movement to a plurality of positions for holding said throttle in a corresponding plurality of open positions between said idle position and a fast-idle position, a thermostatic control unit connected to said stop structure for operating said stop structure, and means responsive to one of said positions of said stop structure to open said valve against said biasing means.

5. A carburetor comprising a fuel bowl, an outside vent for said fuel bowl, a mixture conduit, a throttle mounted in said mixture conduit for movement from an idle position to an open position, a throttle stop structure for holding said throttle in said idle position, means forming a venting passage from said fuel bowl to said mixture conduit, a valve movably mounted adjacent to said venting passage, means biasing said valve to a position closing said venting passage, a spring biased means to move said valve to an open position against said biasing means, a linkage connected between said throttle stop structure and said spring biased means to prevent operation of said spring biased means when said throttle is in said idle position.

6. A carburetor comprising a fuel bowl, an outside vent for said fuel bowl, a mixture conduit, a throttle mounted in said mixture conduit for movement from an idle position to an open position, means forming a venting passage from said fuel bowl to said mixture conduit, a valve movably mounted adjacent to said venting passage, means biasing said valve to a position closing said venting passage, a spring biased means to move said valve to an open position against said biasing means, and a linkage connected between said throttle and said spring biased means to prevent operation of said spring biased means when said throttle is in said idle position, said linkage including stop structure for holding said linkage in a fast-idle position to release said spring biased means to open said valve.

7. A carburetor comprising a fuel bowl, an outside vent for said fuel bowl, a mixture conduit, a throttle mounted in said mixture conduit for movement from an idle position to an open position, means forming a venting passage from said fuel bowl to said mixture conduit, a valve movably mounted adjacent to said venting passage, means biasing said valve to a position closing said venting passage, a spring biased means to move said valve to an open position against said biasing means, and a linkage connected between said throttle and said spring biased means to prevent operation of said spring biased means when said throttle is in said idle position, said linkage including stop structure for holding said linkage in a fast-idle position to release said spring biased to open said valve, said stop structure including a thermostatic control unit responsive to engine temperature to move said stop structure to said linkage holding position.

8. A carburetor comprising a fuel bowl, an outside vent for said fuel bowl, a mixture conduit, a trottle mounted in said mixture conduit for movement from an idle position to an open position, a throttle stop structure mounted for movement to a plurality of positions for holding said throttle in a corresponding plurality of open positions from said idle position, means forming a venting passage from said fuel bowl to said mixture conduit, a valve movably mounted adjacent to said venting passage, means biasing said valve to a position closing said venting passage, and a linkage connected between said throttle stop structure and said valve to open said valve when said stop structure is in one of said plurality of positions thereof.

9. A carburetor comprising a fuel bowl, an outside vent for said fuel bowl, a mixture conduit, a throttle mounted in said mixture conduit for movement from an idle position to an open position, a throttle stop structure mounted for movement to a fast-idle position for holding said throttle in a corresponding open position from said idle position, means forming a venting passage from said fuel bowl to said mixture conduit, a valve movably mounted adjacent to said venting passage, means biasing said valve to a position closing said venting passage, a linkage connected between said throttle stop structure and said valve to open said valve when said stop structure is in said fast-idle position, and a thermostatic control unit connected to stop structure to position said stop structure in said fast-idle position in response to predetermined temperature.

10. An air and fuel mixing device comprising a fuel bowl, a fuel and air mixing conduit, means for forming a venting passage from said fuel bowl to said mixing conduit, operative means including a valve movably mounted within said venting passage for opening and closing said passage, and temperature responsive means for preventing said operative means from opening said passage below a predetermined temperature.

11. An air and fuel mixing device comprising a fuel bowl, a fuel and air mixing conduit, means forming a venting passage from said fuel bowl to said mixing conduit, means including a valve movably mounted within said venting passage for opening and closing said passage,

and temperature responsive means for preventing the closing of said valve below a predetermined temperature.

12. An air and fuel mixing device comprising a fuel bowl, a fuel and air mixing conduit, means forming a venting passage from said fuel bowl to said mixing conduit, means including a valve movably mounted within said venting passage for opening and closing said passage, and temperature responsive means for preventing the closing of said valve below a predetermined temperature, said last means including a movable stop member and a thermostatic element connected to said stop member for moving said stop member in response to ambient temperature above said predetermined temperature.

13. An air and fuel mixing device comprising a fuel bowl, a fuel and air mixing conduit, means forming a venting passage from said fuel bowl to said mixing conduit, means including a valve movably mounted within said venting passage for opening and closing said passage, and temperature responsive means for preventing the closing of said valve below a predetermined temperature, said last means including a movable stop in an operative position, a movable element positioned for movement into abutment with said stop, a thermostatic spring connected to said stop for moving said stop out of said operative position in response to ambient temperature above said predetermined temperature, and a linkage between said element and said valve.

14. An air and fuel mixing device comprising a fuel bowl, a fuel and air mixing conduit, means forming a venting passage from said fuel bowl to said mixing conduit, means including a valve movably mounted within said venting passage for opening and closing said passage, and temperature responsive means for preventing the closing of said valve below a predetermined temperature, said last means including a cam mounted for movement to several positions, a movable member positioned for abutment with different portions of said cam in said several positions, a thermostatic spring connected to said cam for moving said cam in response to ambient temperature above said predetermined temperature, and an adjustable linkage between said movable member and said valve.

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