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CARBURETOR FUEL CHAMBER VENT

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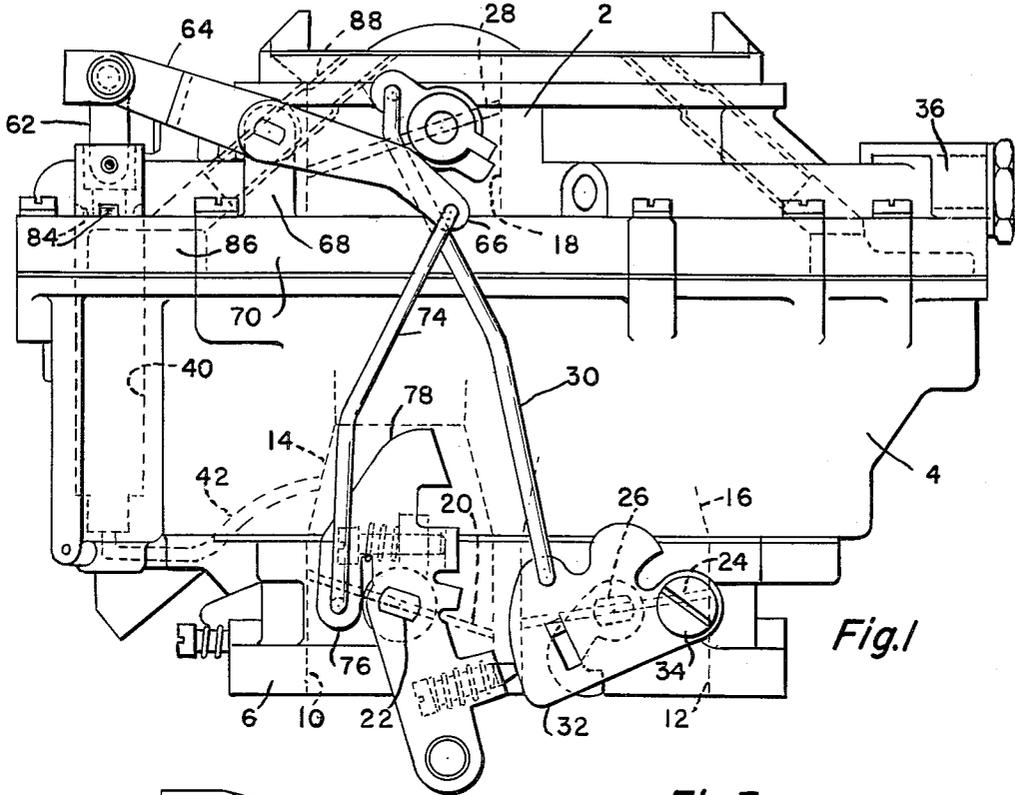


Fig. 1

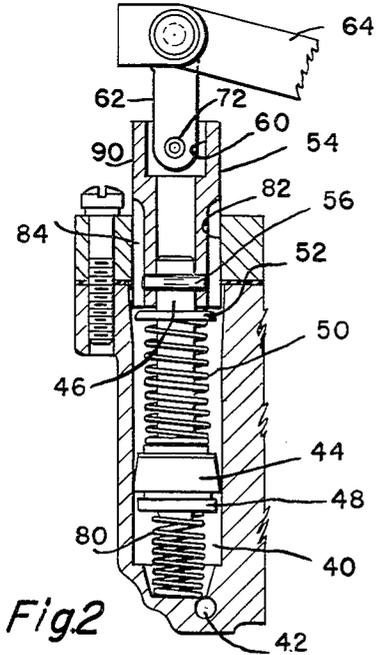


Fig. 2

Fig. 3

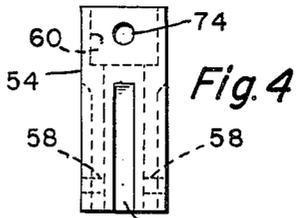
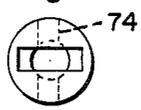


Fig. 4

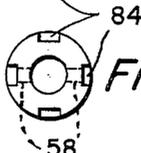


Fig. 5

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CARBURETOR FUEL CHAMBER VENT

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14 Claims. (Cl. 261—23)

The invention relates to carburetors for internal combustion engines, and, more particularly, for engines designed for use on automotive vehicles.

It is customary at the present time to provide means for venting the fuel chamber of carburetors designed for automotive use so as to maintain a pressure in the space above the fuel therein which is nearly the same as atmospheric pressure by means of what is termed an "inside vent." This is a tube which connects the space above the fuel in the fuel chamber with the intake passage of the carburetor at a point close to the intake end thereof. When the engine is running, this tube produces in the fuel chamber a pressure which is very slightly sub-atmospheric due to the restriction on air flow imposed by the conventional air cleaner, but, of course, when the engine is not running, the pressure in both the intake and the fuel chamber is atmospheric.

With use of the highly volatile fuels of the present day, there may be considerable vaporization of fuel in the fuel chamber after the engine stops, particularly in hot weather, and this fuel vapor can pass into the intake passage through the inside vent tube. It is not desirable to limit the introduction of this vapor to the intake passage because it will tend to increase the danger of flooding when starting. Therefore, in copending application S. N. 264,136 filed December 29, 1951, there was provided a vent in addition to the usual inside vent which communicated directly with the atmosphere. This vent was normally closed during engine operation, but when the engine was stopped and the throttle returned to its normal closed position, such vent was opened to permit escape of fuel vapor from the space above the fuel in the fuel chamber directly into the atmosphere and in this way, the amount of fuel vapor entering the intake passage of the carburetor was materially reduced.

The present invention relates to the same general type of outside vent for the fuel chamber which is disclosed in the afore-mentioned application and the object thereof is to provide an improved and simplified structure in which the desired function is accomplished without the necessity of providing additional moving parts, which is positive in action and can be produced at minimum cost.

According to the present invention, this object is accomplished by the provision of axial grooves in the surface of the actuating rod for the accelerator pump piston which are so positioned that when the throttle which operates such pump is closed, the grooves extend through an opening at the top of the fuel chamber so as to communicate with the atmosphere at their upper ends and with the fuel chamber at the lower ends. As the throttle is opened, the actuating rod moves downwardly so that the grooves no longer communicate with the atmosphere and the opening through the top of the fuel chamber is blocked by a surface on the rod above such grooves. No special valves or extra openings into the fuel chamber are necessary in the device disclosed

and its provision adds substantially nothing to the cost of the carburetor.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Figure 1 is a side elevation of a compound carburetor in which the present invention is embodied;

Figure 2 is a vertical section through the accelerator pump cylinder with certain parts shown in elevation;

Figure 3 is a plan view of a coupling member forming part of the pump piston rod;

Figure 4 is a side elevation of the same coupling element; and

Figure 5 is a view of the same element as seen from the bottom.

The invention, for convenience of illustration, has been shown as embodied in a compound carburetor of the construction illustrated in the afore-mentioned application S. N. 264,136, but it will be understood that the invention is applicable to any form of carburetor, whether of the compound type or a carburetor having a single mixture passage only. Also in illustrating the invention, the interior construction of the carburetor has not been shown as such specific construction is in no way material, so far as the present invention is concerned.

As shown, the carburetor body is formed of three castings, an air inlet casting 2, in which two air inlet passages are formed which supply air to four mixture passages, two of which are indicated in dotted lines and will be later described briefly. The casting 4 contains two fuel chambers which may be designated primary and secondary fuel chambers, and which supply fuel, through passages not shown, to primary and secondary mixtures passages, respectively. A third casting 6 is positioned below the casting 4 and forms the outlet casting, which is sometimes termed the "throttle body" casting, and is provided with a flange 8 which is adapted to be connected to a corresponding flange on the intake manifold of the engine in the usual way.

The casting 6 has four outlets two of which, 10 and 12, are shown in Fig. 1 and connecting with these outlets are mixture passages which extend through the fuel chamber casting and receive air from the two air inlets previously referred to. Two of these mixture passages 14 and 16 are indicated in dotted lines and the air inlet supplying air to the passage 14 is indicated at 18. The passage 14 is a primary mixture passage which is operative at all engine speeds, while the passage 16 is a secondary mixture passage which is operative only at relatively high speeds. There are two passages 14 and two passages 16, the two passages 14 being termed primary mixture passages and the passages 16 secondary mixture passages. The passages 14 are controlled by two similar primary throttle valves 20, one of which is shown in Fig. 1 and both of which are secured to a common operating shaft, suitably journaled for rotation in the casting 8, while passages 16 are controlled by two similar secondary throttle valves 24 both of which are secured to a common operating shaft 26 rotatably mounted in the casting 8. The shafts 22 and 26 are manually operated through the medium of connections which are not shown but which are so arranged that the secondary throttles do not start to open until the primary throttles have opened to a considerable extent, 40° for example.

The primary air inlet 18 which supplies air to both primary mixture passages 14 is controlled by an automatic choke valve 28 which is automatically positioned in response to variations in temperature and engine suction, in order to provide a rich mixture for starting and

to provide a mixture of proper proportions during the warm-up period before the engine reaches normal operating temperature. This control mechanism for the valve 23 is not shown because it has no relation to the present invention. Also, the choke valve is connected by a link 30 to a member 32 pivoted on a stud 34 screwed into the casting 3 and this member determines the closed or idle position of the primary throttle in accordance with the position of the choke valve so as to vary the idle speed of the engine as the temperature varies. Fuel is delivered to the primary and secondary fuel chambers through a passage 36 indicated in dotted lines and controlled by mechanism, not shown, but which may be of any conventional form, to maintain a constant fuel level in said chambers.

Coming now to the instant invention which is associated with the accelerator pump, such pump, as shown herein, may be of substantially the same construction in most particulars as that shown in the afore-mentioned pending application and includes a cylinder 40 formed in the casting 4, which receives fuel from the primary fuel chamber through passage which is not shown, but is provided with means to prevent a reverse flow of fuel therethrough when the pump is operative. A fuel delivery passage 42 extends from the cylinder 40 to the mixture passage 14, as indicated diagrammatically in Fig. 1. A piston 44 is slidable in the cylinder 40 and also on the piston rod 46, being positioned on said rod between a fixed flange 48 extending therefrom and a spring 50, while a washer 52, through which the rod extends, is positioned between the upper end of spring 50 and a coupling element 54 in the form of a sleeve into the lower end of which the rod 46 projects. The rod 46 is connected to the coupling member 54 by a pin 56 which extends through an opening in the rod near the upper end thereof and openings 58 in the coupling member. The pin fits relatively tightly in these openings and is prevented from sliding therein, in any suitable way. It will be understood that there are two delivery passages 42 which deliver fuel from a single pump to both primary mixing chambers.

The coupling member 54, at the upper end, has a recess 60 into which extends the lower end of a link 62 pivotally connected at its upper end to an operating arm 64, which is secured to one end of a short shaft 66 rotatably mounted in any suitable way in a supporting bracket 68 integral with and extending upwardly from the upper surface of a flange 70, which forms part of the casting 2 and serves as a cover for the fuel chambers. The link 62 is pivotally connected to a cross-pin 72 suitably secured in holes 74 formed in the upper end of the coupling member 54.

Suitably secured to the opposite end of the short shaft 66 so as to effect rotation of such shaft is an actuating arm 74 which is pivotally connected at its other end to a link 76, the other end of which is pivotally connected to an arm 78, secured to the shaft 22 on which the primary throttles are mounted. Through the medium of these operating connections any movement of the primary throttles toward open position will effect a downward movement of the pump piston rod and closing of the primary throttles will effect an upward movement of said rod. A spring 80 received in the cylinder 40 below the piston 44 normally holds the parts in the position shown in Fig. 2.

The pump mechanism described above is substantially the same as that of the earlier application above referred to except for the specific construction of the piston rod and the function is the same. If the throttle is opened fast, the spring 50 will be collapsed and will subsequently expand, gradually forcing the piston down and bringing about a sort of delayed action, so that fuel is supplied by the pump after the movement of the throttle stops. If the opening movement of the throttle is sufficiently slow, the piston will simply be moved downward with the rod 46 and the spring 50 will not collapse, but the

throttle is seldom moved slowly enough for this to take place. The function of the pump is much the same as that of accelerator pumps in all conventional carburetors at the present time.

Immediately above the cylinder 40 there is an opening 82 formed in the flange 70 of the casting 2. The piston rod extends through this opening and the coupling member 54 has a sliding fit therewith. Formed in the periphery of the coupling member 54 are a plurality of axial grooves 84. These grooves are long enough to extend above the flange 70 when the throttle is closed, as indicated in Fig. 2, and four of such grooves are shown in the drawings, but it will be understood that the specific number of such grooves is not material. When in the position shown in Fig. 2, the upper ends of grooves 84 communicate with the atmosphere while the lower ends of such grooves are in communication with a channel 86 formed in the casting 2 which communicates with the space above the fuel in the primary fuel chamber. A tube 88 which terminates in the air intake anterior to the choke valve 23 also connects with the space 86 and through such space with the primary fuel chamber. Therefore, with the parts in the position shown in the drawings, any fuel vapor which may form in the fuel chamber can pass out through the passages 84 into the atmosphere as well as through the vent tube 88. However, it is not desirable to have these passages effective during normal operation of the engine under load and to accomplish this purpose the grooves 84 are so positioned that when the throttle is closed, the grooves terminate just above the upper surface of the flange 70. After a very small movement of the throttle toward open position the grooves are moved below the top of the flange 70 and that part 90 of coupling member 54 which lies between the grooves and the top end of said member enters the opening 84 and blocks communication between the atmosphere and the fuel chamber. Therefore, this outside vent is effective only when the engine is inoperative or when the engine is idling with the throttle in its closed or idle position.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A charge forming device for an internal combustion engine having in combination a mixture passage adapted to supply a combustible mixture of fuel and air to the engine intake, an air inlet for supplying air to said mixture passage, a fuel chamber from which fuel is adapted to be supplied to said mixture passage to mix with the air admitted thereto so as to form a combustible mixture in said passage, a throttle valve movable to different positions to control the quantity of mixture supplied to the engine, an accelerator pump operable by the throttle for supplying additional fuel to the mixture passage on opening movements of the throttle, said pump having a piston, an actuating rod connected to said piston and operatively connected to the throttle for movement therewith, and a vent for said fuel chamber controlled by the position of said piston rod.

2. A charge forming device for an internal combustion engine having in combination a mixture passage adapted to supply a combustible mixture of fuel and air to the engine intake, an air inlet for supplying air to said mixture passage, a fuel chamber from which fuel is adapted to be supplied to said mixture passage to mix with the air admitted thereto so as to form a combustible mixture in said passage, a throttle valve movable to different positions to control the quantity of mixture supplied to the engine, an accelerator pump operable by the throttle for supplying additional fuel to the mixture passage on opening movements of the throttle, said pump having a piston, an actuating rod connected to said piston and operatively connected to the throttle for movement therewith, and a vent for said fuel chamber controlled by the position of said piston rod, said vent being rendered inopera-

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tive by movement of said piston rod as the throttle is moved toward open position.

3. A charge forming device for an internal combustion engine having in combination a mixture passage adapted to supply a combustible mixture of fuel and air to the engine intake, an air inlet for supplying air to said mixture passage, a fuel chamber from which fuel is adapted to be supplied to said mixture passage to mix with the air admitted thereto so as to form a combustible mixture in said passage, a throttle valve movable to different positions to control the quantity of mixture supplied to the engine, an accelerator pump operable by the throttle for supplying additional fuel to the mixture passage on opening movements of the throttle, said pump having a piston, an actuating rod connected to said piston and operatively connected to the throttle for movement therewith, a normally open vent passage connecting the fuel chamber with the atmosphere, and means for blocking the connection of said passage with the atmosphere upon movement of the piston rod as the throttle is moved toward open position.

4. A charge forming device for an internal combustion engine having in combination a mixture passage adapted to supply a combustible mixture of fuel and air to the engine intake, an air inlet for supplying air to said mixture passage, a fuel chamber from which fuel is adapted to be supplied to said mixture passage to mix with the air admitted thereto so as to form a combustible mixture in said passage, a throttle valve movable to different positions to control the quantity of mixture supplied to the engine, an accelerator pump operable by the throttle for supplying additional fuel to the mixture passage on opening movements of the throttle, said pump having a piston, an actuating rod connected to said piston and operatively connected to the throttle for movement therewith, a groove formed in said piston rod and normally communicating with the atmosphere at one end and with the fuel chamber at the other, when the engine is inoperative, said rod being movable upon opening movement of the throttle to a position where one end of the groove is blocked and communication between the fuel chamber and the atmosphere is interrupted.

5. A charge forming device for an internal combustion engine having in combination a mixture passage adapted to supply a combustible mixture of fuel and air to the engine intake, an air inlet for supplying air to said mixture passage, a fuel chamber from which fuel is adapted to be supplied to said mixture passage to mix with the air admitted thereto so as to form a combustible mixture in said passage, a throttle valve movable to different positions to control the quantity of mixture supplied to the engine, an accelerator pump operable by the throttle for supplying additional fuel to the mixture passage on opening movements of the throttle, said pump having a piston, an actuating rod connected to said piston and operatively connected to the throttle for movement therewith, a vent passage for connecting the fuel chamber with the atmosphere when the throttle is in closed or idle position, and means rendered effective by movement of said piston rod to block said passage and prevent communication between the fuel chamber and atmosphere as the piston rod is moved upon movement of the throttle toward open position.

6. A charge forming device for an internal combustion engine having in combination a mixture passage adapted to supply a combustible mixture of fuel and air to the engine intake, an air inlet for supplying air to said mixture passage, a fuel chamber from which fuel is adapted to be supplied to said mixture passage to mix with the air admitted thereto so as to form a combustible mixture in said passage, a throttle valve movable to different positions to control the quantity of mixture supplied to the engine, an accelerator pump operable by the throttle for supplying additional fuel to the mixture passage on opening movements of the throttle, said pump

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having a piston, an actuating rod connected to said piston and operatively connected to the throttle for movement therewith, a plurality of grooves formed in the outer surface of said piston rod and extending axially thereof, said grooves being so positioned as to communicate with the atmosphere and with the fuel chamber when the throttle is in closed position, and means rendered effective by movement of said piston rod as the throttle is moved toward open position to block communication between the fuel chamber and atmosphere through all of said grooves when the throttle is opened to a certain extent.

7. A charge forming device for an internal combustion engine having in combination a mixture passage adapted to supply a combustible mixture of fuel and air to the engine intake, an air inlet for supplying air to said mixture passage, a fuel chamber from which fuel is adapted to be supplied to said mixture passage to mix with the air admitted thereto so as to form a combustible mixture in said passage, a throttle valve movable to different positions to control the quantity of mixture supplied to the engine, an accelerator pump operable by the throttle for supplying additional fuel to the mixture passage on opening movements of the throttle, said pump having a piston, an actuating rod connected to said piston and operatively connected to the throttle for movement therewith, a plurality of grooves formed in the outer surface of said piston rod and extending axially thereof, said grooves being so positioned as to communicate with the atmosphere and with the fuel chamber when the throttle is in closed position, means rendered effective by movement of said piston rod as the throttle is moved toward open position to block communication between the fuel chamber and atmosphere through all of said grooves when the throttle is opened to a certain extent, and a second vent connecting the fuel chamber with the atmosphere at all positions of the throttle, so that said fuel chamber is in communication with the atmosphere when all of said grooves are blocked.

8. A charge forming device for an internal combustion engine having in combination a mixture passage adapted to supply a combustible mixture of fuel and air to the engine intake, an air inlet for supplying air to said mixture passage, a fuel chamber from which fuel is adapted to be supplied to said mixture passage to mix with the air admitted thereto so as to form a combustible mixture in said passage, a throttle valve movable to different positions to control the quantity of mixture supplied to the engine, an accelerator pump operable by the throttle for supplying additional fuel to the mixture passage on opening movements of the throttle, said pump having a piston, an actuating rod connected to said piston and operatively connected to the throttle for movement therewith, a vent passage for said fuel chamber controlled by the position of the piston rod and rendered inoperative during movement of the throttle toward open position, and a second vent passage for said fuel chamber which is maintained open in all positions of the throttle.

9. A charge forming device for an internal combustion engine having in combination primary and second mixture passages adapted to supply a combustible mixture of fuel and air to an internal combustion engine, air inlets for supplying air to said mixture passages, primary and secondary fuel chambers adapted to supply fuel to the primary and secondary mixture passages, respectively, primary and secondary throttles for controlling the quantity of fuel mixture supplied to the engine by the primary and secondary mixture passages, respectively, an accelerator pump for supplying additional fuel to the primary mixture passage upon opening movements of the primary throttle and comprising a piston slidable in a cylinder and operatively connected by a piston rod to said primary throttle for operation thereby, a vent passage for con-

necting the primary fuel chamber only to the atmosphere when the primary throttle is in closed position, and means rendered effective by movement of said piston rod to block said vent passage upon movement of the primary throttle toward open position.

10. A charge forming device for an internal combustion engine having in combination primary and secondary mixture passages adapted to supply a combustible mixture of fuel and air to an internal combustion engine, air inlets for supplying air to said mixture passages, primary and secondary fuel chambers adapted to supply fuel to the primary and secondary mixture passages, respectively, primary and secondary throttles for controlling the quantity of fuel mixture supplied to the engine by the primary and secondary mixture passages, respectively, an accelerator pump for supplying additional fuel to the primary mixture passage upon opening movements of the primary throttle and comprising a piston slidable in a cylinder and operatively connected by a piston rod to said primary throttle for operation thereby, a vent passage for connecting the primary fuel chamber only to the atmosphere when the primary throttle is in closed position, means rendered effective by movement of said piston rod to block said vent passage upon movement of the primary throttle toward open position, and a second vent passage for said primary fuel chamber which is maintained open in all positions of the primary throttle.

11. A charge forming device for an internal combustion engine having in combination primary and secondary mixture passages adapted to supply a combustible mixture of fuel and air to an internal combustion engine, air inlets for supplying air to said mixture passages, primary and secondary fuel chambers adapted to supply fuel to the primary and secondary mixture passages, respectively, primary and secondary throttles for controlling the quantity of fuel mixture supplied to the engine by the primary and secondary mixture passages, respectively, an accelerator pump for supplying additional fuel to the primary mixture passage upon opening movements of the primary throttle and comprising a piston slidable in a cylinder and operatively connected by a piston rod to said primary throttle for operation thereby, a vent passage for connecting the primary fuel chamber only with the outside air when the primary throttle is in closed position, means rendered effective by movement of said piston rod to block said vent passage upon movement of the primary throttle toward open position, and a second vent passage connecting the primary fuel chamber with the mixture passage adjacent the air inlet thereto, and which is maintained open in all positions of said primary throttle.

12. A charge forming device for an internal combustion engine having in combination a mixture passage adapted to supply a combustible mixture of fuel and air to the engine intake, an air inlet for supplying air to said mixture passage, a fuel chamber from which fuel is adapted to be supplied to said mixture passage to mix with the air admitted thereto so as to form a combustible mixture in said passage, a throttle valve movable to different positions to control the quantity of mixture supplied to the engine, an accelerator pump operable by the throttle for supplying additional fuel to the mixture passage on opening movements of the throttle, said pump having a fuel receiving cylinder, a piston slidable therein, an actuating rod connected to said piston and extending through an opening in the top of the fuel chamber, means

operatively connecting the upper end of said rod with said throttle for movement therewith, a plurality of axial grooves in the surface of said piston rod, said grooves being positioned within said opening when the throttle is in closed position so as to connect the fuel chamber with the atmosphere, and a surface on said rod movable into said opening upon opening of the throttle and effective to block said opening when said surface is positioned therein.

13. A charge forming device for an internal combustion engine having in combination a mixture passage adapted to supply a combustible mixture of fuel and air to the engine intake, an air inlet for supplying air to said mixture passage, a fuel chamber from which fuel is adapted to be supplied to said mixture passage to mix with the air admitted thereto so as to form a combustible mixture in said passage, a throttle valve movable to different positions to control the quantity of mixture supplied to the engine, an accelerator pump operable by the throttle for supplying additional fuel to the mixture passage on opening movements of the throttle, said pump having a piston, an actuating rod connected to said piston and operatively connected to the throttle for movement therewith, a cylinder in which said piston is slidable, a passage connecting said cylinder with the fuel chamber above the level of fuel therein, a vent passage connecting said pump cylinder with the atmosphere so as to vent said fuel chamber through said first-named passage, and means whereby the effectiveness of said vent passage is controlled by the position of said piston rod.

14. A charge forming device for an internal combustion engine having in combination a mixture passage adapted to supply a combustible mixture of fuel and air to the engine intake, an air inlet for supplying air to said mixture passage, a fuel chamber from which fuel is adapted to be supplied to said mixture passage to mix with the air admitted thereto so as to form a combustible mixture in said passage, a throttle valve movable to different positions to control the quantity of mixture supplied to the engine, an accelerator pump operable by the throttle for supplying additional fuel to the mixture passage on opening movements of the throttle, said pump having a piston, an actuating rod connected to said piston and operatively connected to the throttle for movement therewith, a cylinder in which said piston is slidable, a passage connecting said cylinder with the fuel chamber above the level of fuel therein, a vent passage connecting said pump cylinder with the atmosphere so as to vent said fuel chamber through said first-named passage, means whereby the effectiveness of said vent passage is controlled by the position of said piston rod, and a second vent passage connecting said first-named passage with the atmosphere at all positions of the pump piston rod so that the second vent passage will be effective when the first vent passage is ineffective.

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