Nov. 24, 1931. F. E. ASELTINE 1,833,196

CHARGE FORMING DEVICE

Filed June 20, 1928

Fig. 1.

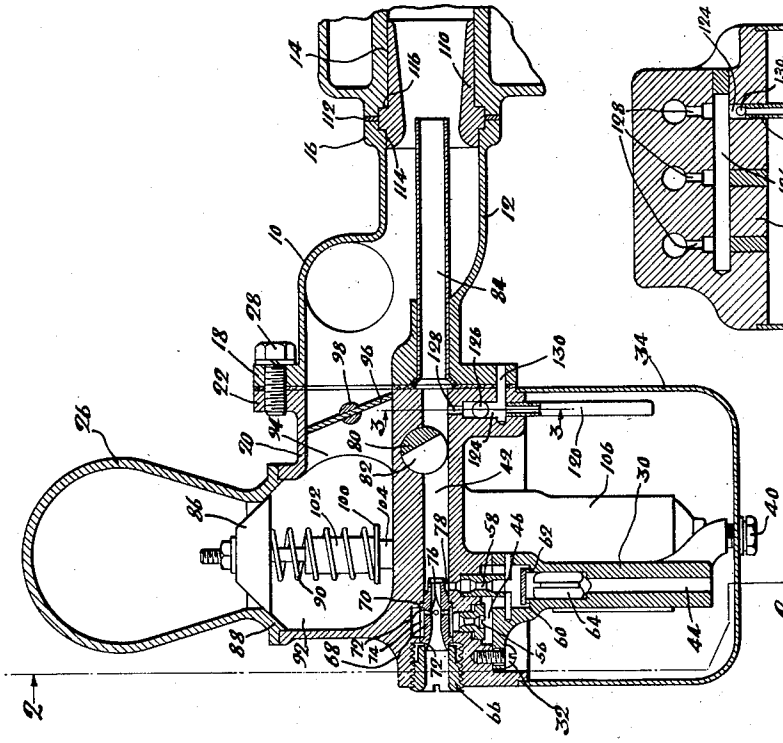
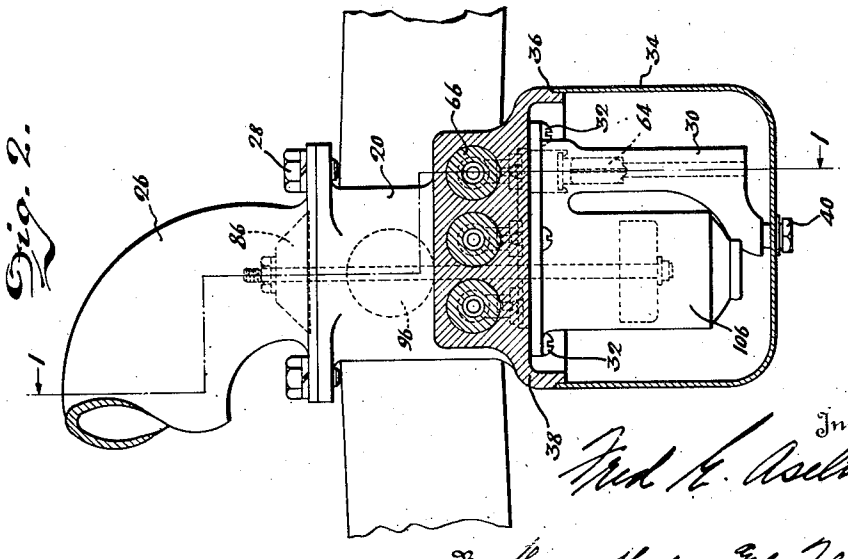


Fig. 3.

Fig. 2.



Inventor

Fred E. Aseltine

By Spencer, Hardman and Fehr

Attorney

Patented Nov. 24, 1931 1,833,196

UNITED STATES PATENT OFFICE

FRED E. ASELTINE, OF DAYTON, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO DELCO PRODUCTS CORPORATION, OF DAYTON, OHIO, A CORPORATION OF DELAWARE

CHARGE FORMING DEVICE

Application filed June 20, 1928. Serial No. 286,977.

This invention relates to charge forming devices for internal combustion engines and more particularly to the type of charge forming device comprising a plurality of primary fuel mixing chambers, one for each engine intake port and cooperating respectively with a plurality of secondary mixing chambers, each located adjacent an engine intake port and receiving fuel air mixture from a pipe connected with one of the primary mixing chambers and receiving air, when required, through one branch of an air manifold which supplies air to all of the secondary mixing chambers, the quantity of fluid flowing through the secondary mixing chambers being controlled primarily by a single main air throttle. Fuel is conveyed to the primary mixing chambers through a single fuel duct leading from a common float bowl.

Examples of charge forming devices of this character are disclosed in the applications of Wilford H. Teeter, Serial No. 221,372, filed September 22, 1927, and Fred E. Aseltine, Serial No. 288,684, filed June 27, 1928.

In the devices disclosed in the above mentioned applications various means are provided to control the proportions of fuel and air in the mixture, and in the second of these applications, each primary mixture passage is provided with two fuel jets of different capacities, the smaller of which is designed to supply fuel for idling and low speed operations under load, while the larger jet is rendered effective on higher engine speeds to supply the proper amount of fuel to the mixture when the capacity of the smaller jet is no longer sufficient to supply the fuel necessary to form a mixture of properly combustible proportions. Both of these fuel jets are anterior to the throttle and the arrangement has not produced altogether satisfactory results. The proportions of fuel and air in the mixture formed for idling and low speed operation under load are not entirely correct during both of these operations.

It is, therefore, the principal object of the present invention to provide a charge forming device having means for forming a mixture of the desired proportions when the engine is idling, and under all operating conditions and all speeds when the engine is operating under load.

A more specific object of the invention is to provide novel means for supplying a fuel mixture during idling, and more particularly to provide such means in a device having a plurality of successively operated low and high speed jets, so constructed that the fuel supply means supplying fuel for idling will not interfere with nor disturb the mixture proportions in the mixture formed when the engine is under load.

These objects are accomplished according to the present invention, by the provision of a third fuel jet in each primary mixture passage communicating with said passage at a point posterior to the throttle. This fuel jet is vented to atmosphere so that it supplies a fuel mixture of proper proportions for idling when the throttle is closed. As the throttle is opened for operation under load the suction at the idling jet is reduced, the percentage of fuel in the mixture is reduced and by properly proportioning the size of the fuel and air passages leading to the idling jet, said jet can be made to cease functioning entirely when the other jets in the primary mixture passages begin to function.

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 form of embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a section through the carburetor unit and the middle outlet branch of the manifold associated therewith, on the line 1—1 of Fig. 2.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a section on the line 3—3 of Fig. 1.

The device disclosed herein comprises a main air manifold indicated in its entirety by the reference numeral 10, and having three outlet branches, the middle one of which 12 is shown herein. Each of these branches communicates with one of the intake ports 14

of an internal combustion engine, each of which serves two adjacent cylinders as disclosed in the copending applications above referred to. Each of the manifold branches is provided with an attaching flange 16 for attaching the manifold to the engine block in the usual way, and a flange 18, to which the carburetor unit may be secured is provided adjacent the manifold inlet.

The carburetor unit comprises a main housing 20 having an attaching flange 22 secured by screws 24 to the flange 18. An air inlet horn 26 is secured by screws 28 to the main housing and communicates with an opening in the top wall of said housing. A casting 30 having certain fuel passages and a dash-pot cylinder formed therein is secured by screws 32 to the bottom of the main housing, and a sheet metal fuel bowl 34 is held tight against an annular shoulder 36 formed on a skirt 38 depending from the main housing, by a screw 40 screwed into the casting 30, a suitable gasket being provided to prevent leakage around the screw.

Fuel is conducted from a main source of supply to the fuel bowl and the flow is controlled by a float, (not shown) in the usual manner to maintain a constant level in the bowl. To convey fuel from the bowl to a plurality of primary mixture passages 42 hereinafter more fully described, a vertical fuel passage 44 is provided in the casting 30. The passage 44 connects, at its upper end, with a horizontal fuel canal 46, and said canal communicates with three pairs of calibrated low and high speed jets or plugs 56 and 58 respectively, each of these pairs of jets being adapted to convey fuel to one of the mixture passages 42 in a manner later described.

Fuel is lifted from the fuel bowl to the primary mixture passages by the suction therein. When the throttle is moved toward closed position to reduce the engine speed, this suction may be reduced sufficiently to allow the fuel column between the bowl and the jets to drop enough to temporarily starve the engine unless means were provided to prevent this action. To prevent this action, a check valve 60 is provided, which is normally lifted above an annular rim 62, surrounding the outlet of passage 44, by the suction, but on reduction of suction immediately seats on said rim preventing downward flow through the passage 44. A two stage metering valve 64 of the type shown in the above mentioned applications, and operating in the same way, is provided in the passage 44.

The primary mixture passages 42 to which the pairs of jets 56 and 58 deliver fuel are bored horizontally through the central part of the main housing 20, are parallel to each other and relatively close together, as indicated in the drawings. Air is admitted to each of the primary mixture passages through an air inlet bushing 66 screwed into the outer end of the primary mixture passage. Immediately posterior to said bushings, a small Venturi tube 68 is received in an enlargement 70 of the primary mixture passage. Each of the Venturi tubes is provided with two external ribs 72 arranged circumferentially of the tube and fitting tightly in the enlargement 70. These ribs form between them a fuel channel 74 with which the low speed jet 56 communicates, and a series of orifices 76 are provided in the Venturi tube to connect the interior of the tube with the said channel.

The Venturi tube 68 is reduced in size at its inner end and is spaced from the wall of the mixture passage, as shown in Fig. 1. This space 78 is substantially a dead air space in which the suction or partial vacuum is substantially the same as that maintained in the mixture passage between the end of the Venturi tube and the throttle, which controls flow through the mixture passage and is more fully described hereinafter. Each main fuel nozzle 58 terminates in the wall of the mixture passage 42 with which it is associated at a point opposite the reduced inner end of the venturi so that fuel flows therefrom into the space 78 and the suction in said space controls the flow of fuel. It will be clear that the suction within the Venturi tube 68, which is effective to cause a flow of fuel through the low speed jet 56 and orifices 76 communicating therewith, is greater than that effective to cause a flow through the jet 58. Hence each jet 56 is effective to supply fuel to its associated mixture passage at low speed when the suction in the mixture passage is relatively low, while the main or high speed jet supplies no fuel until a higher engine speed has been reached. The jets 56, therefore, are effective to supply fuel to the mixture passages at all speeds and under all operating conditions when the primary throttle, later described, is open, supplying all of the fuel for the low speed operation and a part of the fuel at all other times, while the main or high speed jets are not effective to supply any fuel to the mixture passages until the engine is running at a speed corresponding substantially to a vehicular speed of 20–25 miles per hour. The operation and construction of the fuel jets is more fully described in my copending application Serial No. 288,684, filed June 27, 1928, in which such structure is claimed.

The flow of the primary mixture through the passages 42 is controlled by a single throttle valve 80, which extends across all of the passages 42 and has grooves 82 therein which register with said passages. The means for operating this throttle forms no part of the present invention, but is fully disclosed in the application of W. H. Teeter referred to herein. Each primary mixture passage communicates with a pipe associated with each

branch of the manifold for conveying the primary mixture to the secondary mixing chambers. The pipe 84 associated with the middle outlet branch 12 of the manifold is shown herein and those which convey primary mixture to the other branches of the manifold are fully shown and described in the above mentioned applications, such structure forming no part of the present invention.

All of the air which is mixed with the primary mixture in the secondary carburetors is admitted through the air horn 26, the flow being controlled by an air valve 86, normally held against a seat 88 by a spring 90. Air passing the valve flows first into an air chamber 92 and thence through a secondary air passage 94 communicating with the inlet end of the air manifold and provided with a throttle valve 96 secured to a shaft 98 journalled in the housing 20, and operated in a manner briefly described hereinafter to regulate the flow of air to the secondary mixing chambers.

The spring 90 is received between the air valve and a flange 100 projecting from a sleeve 102, slidable on a guide sleeve 104 which guides the air valve stem in the manner described in the above mentioned application of W. H. Teeter. The choke mechanism, which is not shown herein, is adapted to be operated to lift the flange fully to bring sleeve 102 into engagement with the air valve to hold said valve closed to facilitate starting, or partially to increase the tension of the spring holding the air valve closed. To prevent sufficient opening of the air valve to cause leaning of the mixture and to prevent fluttering of said valve, a dash-pot 106 is provided which may be of the form shown in either of the copending cases referred to, or may be of any conventional or desired design.

The throttle operating mechanism forms no part of this invention and is not shown herein, but for the purpose of facilitating understanding of the operation of the whole device, the mode of operation of the throttles 80 and 96 will be very briefly described. During operation at all speeds up to a vehicular speed of 20–25 miles per hour, it is desirable that the primary mixture passages supply all the combustible mixture to the engine cylinders, and at speeds higher than that, to admit air to the secondary mixing chambers through the passage 94. To secure this result, the two throttles 80 and 96 are provided with a common operating mechanism so arranged that the primary throttle 80 is given a predetermined movement before the throttle 96 begins to open and after said throttle 96 begins to open both throttles move together to wide open position.

There are three secondary mixing chambers of identical construction, each of which comprises a Venturi tube 110 secured in an outlet branch of the manifold in such position that its point of greatest depression is immediately adjacent the outlet end of the primary mixture pipe associated with that particular manifold branch, as shown in Fig. 1. Each venturi is provided with an external circumferential rib 112 which, when the device is assembled, is adapted to be clamped between shoulders 114 and 116 on the manifold and engine block respectively. The Venturi tubes cause the air passing the ends of the primary mixture delivery pipes to move at high velocity creating in each tube a high suction during all operating conditions.

The above described mechanism is all old in my copending application above referred to, but in that application the primary throttle operating mechanism is designed to be slightly open at idling and the low speed jets 56 supply the idling fuel, while according to the present invention, the primary throttle is designed to be substantially closed at idling and means have been added to the structure above described to supply fuel for idling. This means comprises a tube 120 adapted to be secured in a recess 122 in the wall of the main housing in any suitable manner. This tube is long enough to extend below the level of the fuel in the bowl 34 and communicates at its upper end with a passage 124 drilled in the housing wall and of the same diameter as the inside of tube 120. The passage 124 connects with a horizontal passage 126 of greater diameter which is connected with all of the primary mixture passage 42 by means of three identical vertical passages 128 forming idling jets, as shown in Fig. 3. Air is admitted to the passage 124 from the atmosphere by means of a passage 130 which extends through the attaching flanges 18 and 22. The air admitted through this passage forms an emulsion or very rich mixture of fuel and air which is drawn into the primary mixture passages by the high suction therein when the throttle is closed. Any opening movement of the throttle which will bring either of the jets 56 or 58 into action may either reduce the flow of fuel from the idling jets or cause such flow to cease entirely, depending on the relative sizes of the passages 124 and 130. It will be clear that the suction effective on the fuel tubes 120 is highest at closed throttle and such suction is reduced by the admission of air through the passage 130, the larger the passage 130 the greater the reduction in suction. The parts may be so proportioned that the suction effective on the fuel tube 120 is just enough, when the throttle 80 is closed, to lift fuel from said tube into the air stream flowing inwardly through passages 130 and 124, so that, on any opening movement of the throttle the suction effective on the fuel tube becomes too low to lift the fuel from the bowl

to the top of tube 120 and the jets 128 cease to function.

On the other hand, the parts may be so proportioned that insufficient air is admitted through passage 130 to reduce the suction effective on the tube 120 to a point where such suction will fail to lift fuel from the bowl into the stream of air flowing inwardly through the passage 130. If the parts are so proportioned the supply of rich mixture through the jets 128 will never cease, but will be gradually reduced as the throttle is opened. Either of these constructions, which differ only in the proportioning of the parts may be provided without departing from the spirit of this invention.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A charge forming device for internal combustion engines comprising a secondary mixing chamber, a primary mixing chamber for supplying fuel mixture thereto, a main air passage supplying air to said secondary mixing chamber, a throttle controlling the primary mixture passage, a normally closed valve controlling the flow of air through the main air passage and adapted to be opened during the opening movement of said throttle, means for supplying fuel to the primary mixture passage comprising an idling jet effective to supply fuel before opening of the primary throttle, a low speed jet adapted to supply fuel subsequent to the opening of the primary throttle, and a high speed jet adapted to supply fuel after the opening of the air throttle.

2. A charge forming device for internal combustion engines comprising a plurality of primary carburetors adapted to supply fuel air mixture to a plurality of secondary mixing chambers, one of which is associated with each engine intake port, means for admitting air and fuel to each primary carburetor, a throttle regulating the flow therethrough, a plurality of idling jets each of which supplies fuel to one of said primary carburetors, and a common fuel supply passage leading to all said idling jets.

3. A charge forming device for internal combustion engines comprising a plurality of primary carburetors adapted to supply fuel air mixture to a plurality of secondary mixing chambers one of which is associated with each engine intake port, means for admitting air and fuel to each primary carburetor, a throttle regulating the flow therethrough, a plurality of idling jets, each of which supplies fuel to one of said primary carburetors, a common fuel supply passage leading to all of said idling jets and means admitting air to said supply passage.

4. A charge forming device for internal combustion engines comprising a plurality of primary carburetors adapted to supply fuel air mixture to a plurality of secondary mixing chambers one of which is associated with each engine intake port, means for admitting air and fuel to each primary carburetor, a single throttle extending across all of said primary carburetors to control the flow of mixture therethrough, an idling jet communicating with each of said primary carburetors in advance of the throttle, a common fuel supply passage supplying all of said idling jets and means for mixing air with the idling fuel before it issues from said jets.

In testimony whereof I hereto affix my signature.

FRED E. ASELTINE.