Feb. 9, 1932. F. E. ASELTINE 1,844,738

CHARGE FORMING DEVICE

Filed Dec. 20, 1929 2 Sheets-Sheet 1

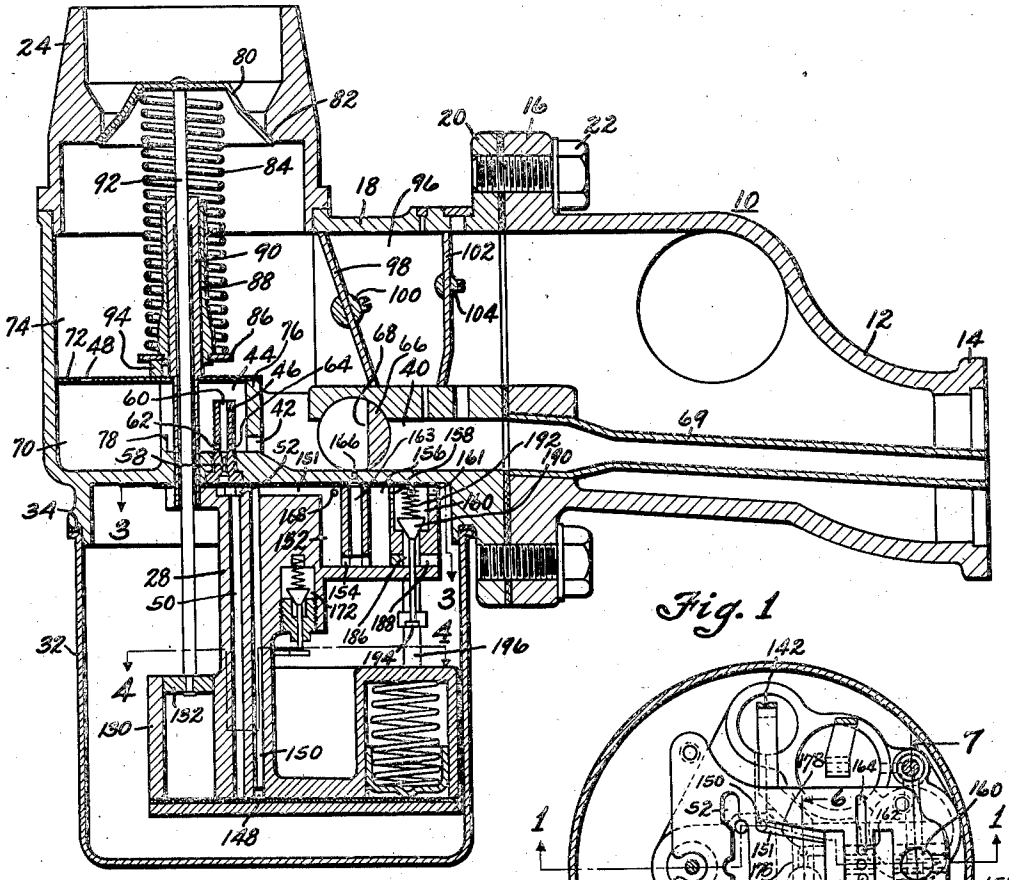


Fig. 1

Fig. 3

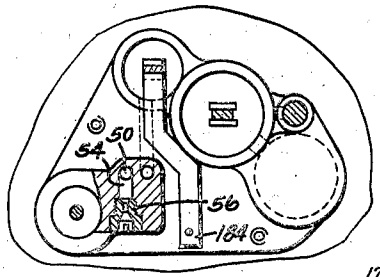


Fig. 4

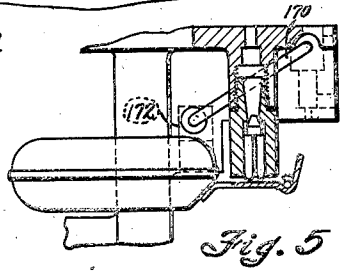


Fig. 5

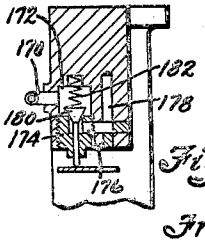


Fig. 6

Inventor

Fred E. Aseltine

Spencer, Hardman and Fisher

His Attorneys

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CHARGE FORMING DEVICE

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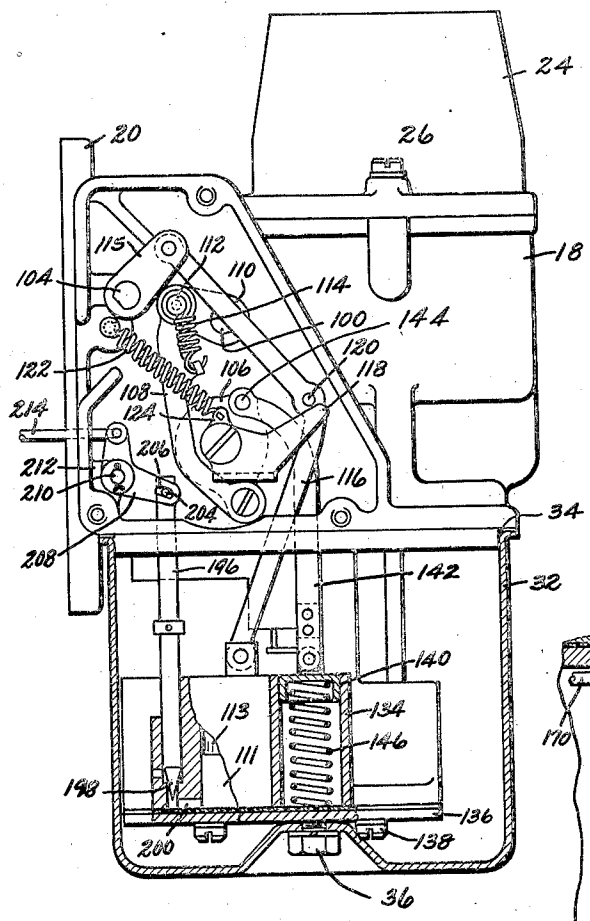


Fig. 2

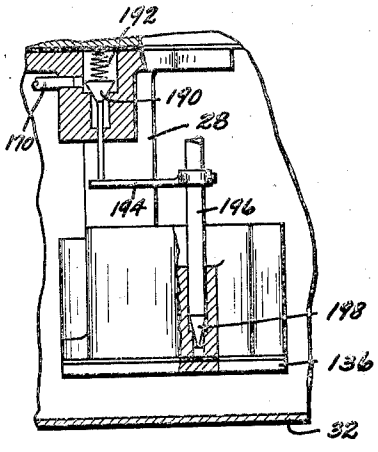


Fig. 7

Inventor
Fred E. Aseltine

By Spencer, Hardman & Fehr
His Attorneys

Patented Feb. 9, 1932

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UNITED STATES PATENT OFFICE

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

CHARGE FORMING DEVICE

Application filed December 20, 1929. Serial No. 415,516.

This invention relates to charge forming devices for internal combustion engines, and most particularly to that type of charge forming device which comprises a plurality of primary carburetors, each of which is adapted to deliver a primary mixture of fuel and air to one of a plurality of secondary carburetors located adjacent the engine intake ports and in which additional air is mixed with the primary mixture before the latter enters the engine cylinders under certain operating conditions.

Examples of devices of this character are disclosed in the applications of Fred E. Aseltine, Wilford H. Teeter, Carl H. Kindl and Frederick D. Funston, Serial No. 370,179, filed May 13, 1929, and Fred E. Aseltine, Serial No. 403,323, filed November 2, 1929, the present invention being an improvement on the device disclosed in the last mentioned of these applications.

It is the general object of the present invention to provide means for enriching the mixture during the acceleration period accompanying an opening movement of the throttle and more particularly, to provide means for varying the effect of said enriching means when the throttle is opened under certain specific operating conditions so as to always secure the exact amount of enrichment desired to most satisfactorily operate the engine during acceleration under any operating condition.

In the above mentioned application of Fred E. Aseltine, a device is provided which is effective to supply fuel in addition to that supplied by the main fuel inlets to the mixture passages on closing movements of the throttle, so that such fuel will be immediately available to be carried into the engine cylinders on any opening of the throttle which takes place substantially immediately following a closing movement. It has been found that under some conditions, such, for example, as when the engine is relatively cold, it is desirable to supply a greater amount of fuel to the mixture passages during the closing of the throttle than under other operating conditions, as for instance, when the engine has been running and is hot. One of the features, therefore, of this invention is the provision of means which are operable at will by the operator to reduce or increase the amount of additional fuel supplied by the means above referred to, so as to supply the exact amount desired to suit any given operating condition.

A further object of the invention is to provide means for simultaneously varying the restriction of the air supplied to the carburetor as the supply of additional fuel is varied.

According to this invention, these objects are accomplished by the provision of a well for supplying fuel to the mixture passages during the closing of the throttle in combination with manually operable means for varying the amount of fuel supplied to said well and at the same time operating to vary the resistance offered by the dashpot controlling the movement of the auxiliary air valve.

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 one form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a vertical, longitudinal section through a charge forming device embodying the present invention.

Fig. 2 is a side elevation of the carburetor unit forming part of said charge forming device partly broken away to show certain parts in section and having a cover plate removed to show the valve operating mechanism.

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

Fig. 4 is a fragmentary, horizontal section on the line 4—4 of Fig. 1.

Fig. 5 is a fragmentary section on the line 5—5 of Fig. 3, the float being shown in elevation.

Fig. 6 is a fragmentary section on the line 6—6 of Fig. 3.

Fig. 7 is a fragmentary section on the line 7—7 of Fig. 3.

The device comprises a main air manifold 10 having three outlet branches, the middle

branch 12, being shown herein. Each of these branches communicates with one of the ports of a multicylinder engine and each is provided with an attaching flange 14, which is adapted to be secured to the engine block in the usual way, while adjacent the inlet of the manifold is a flange 16 to which the main carburetor unit, hereinafter described, is adapted to be secured, as shown in Fig. 1.

The main carburetor unit comprises a main housing 18 in the form of a single casting having a flange 20 adapted to be secured to the flange 16 by screws 22. A valve controlled air inlet coupling 24 is secured in position in an opening in the top of the housing 18 by screws 26, or in any other suitable manner. A casting 28, having certain fuel passages formed therein, is secured by screws to the bottom of the main housing and a sheet metal fuel bowl 32 is held tight against an annular shoulder 34 on the bottom of the main housing by a screw 36, screwed into the casting 28, suitable gaskets being provided wherever necessary to prevent leakage of the fuel. A fuel conduit, which is not shown herein, supplies fuel to the fuel bowl and a float 38 operates to maintain a substantially constant level of fuel in the bowl in the usual manner.

A plurality of angular primary mixture passages, indicated in their entirety by the reference character 40 and hereinafter more fully described, are provided in the lower part of the main housing. Communicating with the vertical portion of these mixture passages through orifices 42 are three chambers 44, which, for convenience, are designated fuel supply chambers. Fuel is admitted directly to these chambers by nozzles 46 and is mixed therein with a small quantity of air admitted thereto by a slot 48, formed in a partition separating the fuel supply chambers from a main air chamber to be more fully described later. This mixture of fuel and air flows from the fuel supply chambers through the orifices 42 to the primary mixture passages.

Fuel is supplied to the nozzles 46 through a vertical fuel passage 50, formed in the casting 28 and communicating at its upper end with a horizontal channel 52 which communicates directly with all of the nozzles 46, while at its lower end the passage 50 connects with a horizontal passage 54 which, in turn, communicates with the interior of the float bowl 32 and is provided with a calibrated metering plug 56 having a fixed orifice therein, as shown in Fig. 4. Each of the fuel nozzles 46 is provided with a restricted metering orifice 58 as illustrated in Fig. 1.

Each nozzle is provided with a main fuel outlet 60 in its top and a secondary fuel outlet comprising two orifices 62 and 64 formed in the vertical wall of the nozzle adjacent the bottom of the fuel supply chamber. At relatively high speeds, the suction within the fuel supply chambers is sufficient to effect a flow of fuel from the main orifice 60 in the top of each of the nozzles, but during idling, or low speed operation under load, the suction communicated to the nozzles is sufficient to lift the fuel only to some point intermediate the main fuel inlet 60 and the secondary fuel feeding orifices 62 and 64, at which time the fuel will flow from the latter by the action of gravity.

The primary mixture passages are controlled by a single throttle valve 66, which extends across all of the passages, is provided with grooves 68 which register with said passages, and is operated by means more fully described later. The primary mixture passages register with conduits for conveying the primary mixture to the secondary mixing chambers, when the device is assembled. These conduits comprise tubes cast in position in the manifold during the casting of the latter as fully shown and described in the above copending application. Only the tube 69 for conveying primary mixture to the secondary mixing chamber formed in the middle branch of the manifold is shown herein, since these tubes, of themselves, form no part of the present invention and their specific construction is entirely immaterial thereto.

All of the fuel supply chambers 44 communicate with a chamber 70, which may be termed a primary air chamber. The chamber 70 and all of the chambers 44 are separated by the partition plate 72, hereinbefore referred to, from a main air chamber 74, and the fuel supply chambers are separated from the vertical portions of the primary mixture passages by a vertical partition 76, which is formed as an integral part of the main housing and on which the partition 72 is supported. The fuel supply chambers 44 are separated from each other by vertical partitions 78, which are also integral with the main housing.

All of the air supplied to the carburetor is admitted through the air inlet coupling 24 and is controlled by a valve 80, normally held against its seat 82 by a spring 84 received between the valve and a flange 86 projecting from a sleeve 88 slidably mounted on a fixed sleeve 90 which guides the stem 92 to which the air valve is secured. Under normal operating conditions the sleeve 88 occupies the position shown in Fig. 1, but may be lifted by the choke lever 94 until it engages the valve 80 to hold said valve closed for the purpose of aiding in starting the engine. The choke mechanism forms no part of the present invention and will not be more fully described herein, but is completely described in the above mentioned earlier application.

The valve 80 admits air directly to the main air chamber 74, which supplies air to the primary air chamber as above set forth, and also

to the secondary mixing chambers in the manifold by means of a secondary air passage 96, controlled by a manually operable valve 98, secured to a shaft 100 rotatably mounted in the main housing, and a suction operated valve 102, secured to a shaft 104, which is also rotatably mounted in the housing 18. The operating mechanism for these valves will be described hereinafter. In addition to the air supplied to the chamber 70 and that supplied to the secondary mixing chambers as above disclosed, the main air chamber also communicates directly with the vertical portions of the primary mixture passage and supplies air thereto.

The slot 48 admitting air to the fuel supply chambers is considerably larger than the total area of the three orifices 42, which connect the fuel chambers with the primary mixture passages. Because of this difference in area of the air inlet and outlet to the fuel supply chambers, it is obvious that the flow of air through these chambers must necessarily be at low velocity under all operating conditions and at all engine speeds. For this reason there is substantially no velocity head created in the fuel nozzles under any operating conditions, the reason being more fully set forth in the earlier applications above referred to, and the suction which is effective to cause a flow of fuel from the nozzles is substantially the static suction of the air chamber 74, as determined by the main air valve spring.

During operation at all engine speeds below a certain predetermined speed, for example, that corresponding to a vehicular speed of 20–25 miles per hour on the level, the mixture conveyed through the primary mixture conduits is sufficient to provide the proper quantity of fuel charge and is conveyed to the engine without mixture with additional air in the secondary mixing chambers. At higher engine speeds than this, however, the valves controlling the secondary air passage are opened to increase the quantity of mixture supplied to the engine.

The manually operable valve 98 is operated by the primary throttle after the primary throttle has made a certain amount of independent movement and the valve 102 is opened by the engine suction substantially simultaneously with the opening of the valve 98. To operate these valves an operating plate 106 is secured to one end of the throttle, in the manner disclosed in the above application, and is pivotally connected by a link 108 to an arm 110, which is secured to the shaft 100 of the valve 98. The parts are normally held in the position shown in Fig. 2 with the valve 98 closed and during the first part of the opening movement of the throttle the point of connection of the link 108 with the plate 106 moves in the arc of a circle, the center of which is the point of connection between the link 108 and the arm 110, so that the arm 110 remains stationary. After this amount of movement of the primary throttle, further movement thereof will move the arm 110 and open the valve 98. Because of a slight tendency of the parts to bind, the link 108 is connected to the arm 110 by means of a pin 112 projecting from said arm and extending through a short slot (not shown) in the link. The pin is normally held in one end of the slot by means of a spring 114, as fully described in the earlier application.

Whenever the valve 98 is opened, the engine suction opens the valve 102 and the opening movement of this valve is retarded by a dashpot comprising a cylinder 111 and cooperating piston 113, shown herein in Fig. 2, and which is connected by a link 116 to an arm 115 secured to one end of the shaft 104. On closing movements of the valve 98, the suction operated valve 102 is closed by an arm 118 pivotally mounted on the operating plate 106. This arm engages a pin 120 projecting from link 116 and the arm is moved to effect return of the suction operated valve to normal position by the spring 122, one end of which is connected to an ear 124, projecting from the arm 118, while the other end is secured to the main housing, as shown in Fig. 2. This valve operating mechanism constitutes no part of the present invention, and for a more detailed description thereof reference may be had to the application herein referred to in which the valve operating mechanism is the same as disclosed herein.

On opening movement of the throttle, suction in the main air chamber is increased and the main air valve 80 is opened to permit an increased flow of air past the valve. It has been found necessary to retard the opening movement of this valve to prevent fluttering of the valve and to prevent the admission of sufficient air to temporarily lean the mixture in the primary mixture passages before the valve comes to rest. A dashpot comprising the cylinder 130 formed in the casting 28 and a piston 132 secured to the lower end of the valve stem 92 is provided for this purpose. The dashpot shown is adapted to be filled with fuel by leakage around the piston and the dashpot may be of any conventional form so far as the present invention is concerned.

On opening of the throttle, it has also been found necessary to provide temporarily, a somewhat enriched mixture in order to properly operate the engine during the acceleration period for reasons which are well known to those skilled in this art. For this purpose a fuel pump has been provided which is operated by the primary throttle and comprises a cylinder 134 formed in the casting 28 and closed at its lower end by a plate 136, secured by screws 138 to the bottom of said casting. A pump piston 140 is received within the

cylinder and is pivotally connected to an operating link or rod 142, pivotally connected by a pin 144 to the operating plate 106, which is secured as hereinbefore described to the primary throttle. On opening movements of the throttle, the member 106 is moved in a clockwise direction and the piston 140 is depressed, while on closing movements of the throttle the piston is returned to the position shown in Fig. 2 by a spring 146, received in the cylinder 134 between the piston and the plate 138.

The fuel delivery passage from the pump comprises a horizontal passage 148, which communicates with a vertical passage 150 connecting with a passage 151 which leads to a fuel well 152 formed in the upper part of the casting 28. A plurality of horizontal passages 154 connect the bottom of this well with an overflow chamber 156, which is connected at its upper end by an orifice 158 with an auxiliary fuel reservoir 160, the function of which is more fully described later and which is provided with a vent 161 so as to admit air thereto. The two outer passages 154 communicate with vertical passages 162, formed in the casting 28, which communicate at their upper ends with horizontal channels 164, formed in the top of the casting 28 and communicating at their outer ends with vertical passages 163 formed in the main housing and leading to the two outer primary mixture passages 40. The middle passage 154 communicates directly with a passage 163 in casting 128, which communicates in turn with the middle passage 163. Restrictions 166 are provided in the outlet ends of all of the passages 163.

It will be obvious that on downward movement of the pump piston accompanying any opening movement of the throttle, fuel will be forced into the well 152, will pass through the above described passages into the primary mixture passages to enrich the mixture temporarily during the acceleration period and will be forced into the well 156 and the overflow chamber 160 filling these chambers. As will be described later, the fuel will be drawn from the well 152 and chamber 156 into the primary mixture passages by the suction therein.

A small passage 168 admits air to the top of the well 152 and with the vent 161, serves the double purpose of venting the well 152 and reservoir 156 and of supplying air to the fuel which passes into the primary mixture passages so that an emulsion of fuel and air is delivered thereto. By admitting air in this manner, the suction communicated to the fuel delivery passages is never sufficient to draw fuel from the pump cylinder and no fuel is supplied to the mixture passages except on the downward stroke of the pump piston.

The overflow chamber 160 is adapted to supply fuel to ancther chamber from which fuel is supplied to the mixture passages during closing movements of the throttle. For this purpose a fuel delivery passage 170 is provided which is connected at one end to the overflow chamber 160 and at its other end with an auxiliary fuel well 172, as shown in Figs. 1, 5 and 6. The auxiliary fuel well 172 is closed at the lower end by a plug 174 screwed into the casting 28, said plug being provided with an angular outlet passage 176, as shown in Fig. 6, which communicates with an angular passage 178, formed in the casting 28 and communicating at one end with the fuel well 152. The passage 176 is normally closed by a valve 180 normally held in closed position by a spring 182, received between the valve and the casting 28, as shown in Fig. 6. The auxiliary fuel well, therefore, may be filled with fuel from the overflow chamber 160 when the throttle is opened. This fuel is retained in the well until the valve 180 is opened, when it is permitted to flow into the fuel well 152. In order to open the valve 180, the link 142 which operates the pump piston has secured thereto in any desirable manner, an arm 184, which projects therefrom to a position underlying the stem of valve 180 and on the return stroke of the pump piston when the throttle is closed, engages the valve to open it and permit the fuel to flow from the auxiliary well 172 into the well 152, as previously described.

The above described mechanism is in general similar in construction and function to that described in the application of Fred E. Aseltine, above referred to, and is adapted to supply fuel to the mixture passages during deceleration for the purposes set forth therein. It has been found, however, that under certain operating conditions, it is not necessary to supply as much fuel to the mixture passages in this manner as under certain operating conditions. For instance, when the engine is relatively cold, it is necessary to supply more fuel than when the engine is relatively hot. Therefore, according to the present invention, means have been provided for controlling the supply of fuel from the auxiliary well 172 to the well 152 and this is accomplished indirectly by controlling the amount of fuel which is permitted to pass from the overflow chamber to the auxiliary well. For this purpose the overflow chamber has an outlet passage 186 in its bottom, which communicates with a restricted outlet 188 leading into the upper part of the main fuel reservoir. This outlet passage is normally closed by a valve 190 which is held in closed position by a spring 192, received between the valve and the bottom of the main housing when the device is assembled. This valve is adapted to be operated manually to control the passage of fuel from the overflow chamber as desired by means of an arm 194, which

is adjustably secured in any desirable manner to a valve stem 196, as shown in Figs. 2 and 7. This valve stem is provided at its lower end with a tapered valve 198, which controls an outlet passage 200 communicating with the lower end of a cylinder 111, which forms part of the dashpot controlling movement of the auxiliary air valve 102. The valve stem, at its upper end, is provided with a pin 204, which is received in a slot 206, formed in one end of a bell crank lever 208, pivoted on a pin 210, fixed in a lug 212 projecting from the main housing, the other arm of the bell crank lever 208 being connected to an operating connection 214, which extends to some point convenient to the operator of the vehicle.

When the above described operating connection is operated to lift the valve stem 196, it performs two functions—first it permits a flow of fuel from the auxiliary valve dashpot through the passage 200 to reduce the resistance of the dashpot to opening movements of said auxiliary valve, and second, lifts the valve 190 to permit a part of the fuel in the overflow chamber 160 to run into the main fuel reservoir, thus reducing the amount of fuel supplied to the auxiliary reservoir 172, and thus reducing the amount of fuel supplied to the primary mixture passages during deceleration. Inversely, lowering of the valve stem 196 will increase the amount of fuel supplied to the mixture passages during deceleration and simultaneously will increase the resistance to opening movement of the auxiliary air valve.

The valve stem 196 is adapted to be lowered by the operator when the engine is relatively cold or under other operating conditions that will require a relatively large amount of additional fuel to secure proper engine acceleration, and to be lifted under whatever other operating conditions may be met which require a less amount of additional fuel for satisfactory acceleration.

It will also be obvious that the relative size of the passages 170 and 188 may be changed as desired to suit whatever specific conditions may be met in any particular engine, and since the device is operable at will by the operator, it is effective to vary the amount of mixture enrichment during the accelerations period under any operating conditions which may be met, and at any time.

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 mixture passage, means for normally supplying fuel to said passage, means for supplying air thereto, a throttle, separate means for simultaneously supplying fuel to the mixture passage on closing movements of the throttle in addition to the normal fuel supply and means for rendering said means for supplying additional fuel ineffective.

2. A charge forming device for internal combustion engines, comprising a mixture passage, means for supplying fuel and air thereto, a throttle, means for supplying additional fuel to the mixture passage on closing movements of the throttle, an air valve for controlling the admission of air to said mixture passage, means for retarding the opening of said valve and means for simultaneously rendering said retarding means and the means for supplying additional fuel ineffective.

3. A charge forming device for internal combustion engines, comprising a mixture passage, means for supplying fuel and air thereto, a throttle, means operated by the throttle for supplying additional fuel to the mixture passage on closing movements of the throttle, and means for rendering said last mentioned means ineffective.

4. A charge forming device for internal combustion engines comprising a mixture passage, an air inlet therefor, a main fuel inlet therefor, a secondary fuel inlet therefor, a throttle, means operated by the throttle for causing a flow of fuel through said secondary fuel inlet on closing movements of the throttle, and means for rendering said throttle operated means ineffective.

5. A charge forming device for internal combustion engines comprising a mixture passage, an air inlet therefor, a main fuel inlet therefor, a secondary fuel inlet therefor ineffective under all operating conditions when the throttle is stationary, means operated by the throttle for rendering said secondary fuel inlet effective to supply fuel to the mixture passage on opening and closing movements of the throttle, and means for preventing said secondary fuel inlet becoming ineffective to supply fuel on closing movements of the throttle.

6. A charge forming device for internal combustion engines comprising a mixture passage, an air inlet therefor, a main fuel inlet therefor, a secondary fuel inlet therefor ineffective under all operating conditions when the throttle is stationary, means operated by the throttle for rendering said secondary fuel inlet effective to supply fuel to the mixture passage on opening and closing movements of the throttle, and manually operable means for preventing said secondary fuel inlet becoming effective to supply fuel on closing movements of the throttle, if desired.

7. A charge forming device for internal combustion engines comprising a mixture passage, fuel and air inlets therefor, a throttle, a pump operable on opening movements

to supply additional fuel to the mixture passage during the acceleration period, means operated by the pump on closing movements of the throttle to supply additional fuel during deceleration, and means for rendering said last mentioned means inoperative.

8. A charge forming device for internal combustion engines comprising a mixture passage, fuel and air inlets therefor, a throttle, a pump operable on opening movements to supply additional fuel to the mixture passage during the acceleration period, an air valve controlling the admission of air to the mixture passage and adapted to open on opening movements of the throttle, means for retarding the opening of the air valve to temporarily restrict the admission of air, means operated by the pump on closing movements of the throttle to supply additional fuel during deceleration, and means for rendering said last mentioned means and said retarding means inoperative.

9. A charge forming device for internal combustion engines comprising a mixture passage, fuel and air inlets therefor, a throttle, a pump operable on opening movements to supply additional fuel to the mixture passage during the acceleration period, an air valve controlling the admission of air to the mixture passage and adapted to open, on opening movements of the throttle, means for retarding the opening of the air valve to temporarily restrict the admission of air, means operated by the pump on closing movements of the throttle to supply additional fuel during deceleration, and a single means for simultaneously rendering said last mentioned means and said retarding means inoperative.

10. A charge forming device for internal combustion engines comprising a mixture passage, fuel and air inlets therefor, a throttle, a pump operable on opening movements to supply additional fuel to the mixture passage during the acceleration period, an air valve controlling the admission of air to the mixture passage and adapted to open on opening movements of the throttle, a dashpot for retarding the opening of said valve to temporarily restrict the admission of air, a valve for relieving said dashpot, means operated by the pump on closing movements of the throttle to supply additional fuel during deceleration, a device for rendering said last mentioned means inoperative, and common means for operating said device and said relief valve.

11. A charge forming device for internal combustion engines comprising a mixture passage, fuel and air inlets therefor, a main fuel reservoir, a throttle, an auxiliary fuel reservoir for supplying additional fuel to the mixture passage and adapted to be filled with fuel on opening movements of the throttle, means operable on closing movements of the throttle for rendering said reservoir effective to supply fuel to the mixture passage, and means for preventing said reservoir becoming effective whereby the supply of additional fuel on closing of the throttle may be prevented, if desired.

12. A charge forming device for internal combustion engines comprising a mixture passage, fuel and air inlets therefor, a main fuel reservoir, a throttle, an auxiliary fuel reservoir for supplying additional fuel to the mixture passage and adapted to be filled with fuel on opening movements of the throttle, means operable on closing movements of the throttle for rendering said reservoir effective to supply fuel to the mixture passage, and means for preventing the filling of said reservoir with fuel, whereby the supply of additional fuel to the mixture passage may be prevented if desired.

13. A charge forming device for internal combustion engines comprising a mixture passage, fuel and air inlets therefor, a main fuel reservoir, a throttle, an auxiliary fuel reservoir for supplying additional fuel to the mixture passage, a supplemental reservoir adapted to supply fuel to said auxiliary reservoir under certain operating conditions, means operable on closing movements of the throttle for rendering said auxiliary reservoir effective to supply fuel to the mixture passage, and means for rendering said supplemental reservoir ineffective to supply fuel to the auxiliary reservoir.

14. A charge forming device for internal combustion engines comprising a mixture passage, fuel and air inlets therefor, a main fuel reservoir, a throttle, an auxiliary fuel reservoir for supplying additional fuel to the mixture passage, a supplemental reservoir adapted to supply fuel to said auxiliary reservoir on opening movements of the throttle, means operable on closing movements of the throttle for rendering said auxiliary reservoir effective to supply fuel to the mixture passage, and means for rendering said supplemental reservoir ineffective to supply fuel to the auxiliary reservoir.

15. A charge forming device for internal combustion engines comprising a mixture passage, fuel and air inlets therefor, a main fuel reservoir, a throttle, an auxiliary fuel reservoir for supplying additional fuel to the mixture passage, a supplemental reservoir, a passage for conducting fuel from said supplemental reservoir to the auxiliary reservoir, a by-pass for permitting fuel to flow from said supplemental reservoir, and means for opening said by-pass whereby the supplemental reservoir is rendered ineffective to supply fuel to the auxiliary reservoir.

16. A charge forming device for internal combustion engines comprising a mixture passage, fuel and air inlets therefor, a main fuel reservoir, a throttle, an auxiliary fuel reservoir for supplying additional fuel to the mixture passage, a supplemental reservoir, a

passage for conducting fuel from said supplemental reservoir to the auxiliary reservoir, means operable on closing movements of the throttle for rendering said reservoir effective to supply fuel to the mixture passage, a by-pass for permitting fuel to flow from said supplemental reservoir, and means operable under any operating conditions to open said by-pass, whereby the auxiliary reservoir is rendered ineffective to supply fuel to the mixture passage.

17. A charge forming device for internal combustion engines comprising a primary mixture passage, a secondary mixing chamber into which said primary mixture passage delivers a primary mixture of fuel and air, fuel and air inlets therefor, a primary throttle controlling the flow through said primary mixture passage, means operated by the primary throttle for supplying additional fuel to the primary mixture passage on opening movements of said throttle, means operated on closing movements of said throttle to supply additional fuel to the primary mixture passage during deceleration and means for rendering said last mentioned means ineffective.

18. A charge forming device for multi-cylinder internal combustion engines comprising a plurality of secondary mixing chambers, a plurality of primary mixture passages delivering a primary mixture of fuel and air to said secondary mixing chambers, means for supplying fuel and air to each of said primary mixture passages, a fuel pump operative on opening movements of the throttle to supply additional fuel to all of said mixture passages to enrich the mixture during the acceleration period, an air passage supplying air to all of said secondary mixing chambers, a valve in said passage adapted to open as the throttle is opened, means for retarding the opening of said valve to enrich the mixture, means operative on closing of the throttle to supply additional fuel to the primary mixture passages and means for rendering said last mentioned means and said retarding means ineffective.

In testimony whereof I hereunto affix my signature.

FRED E. ASELTINE.