

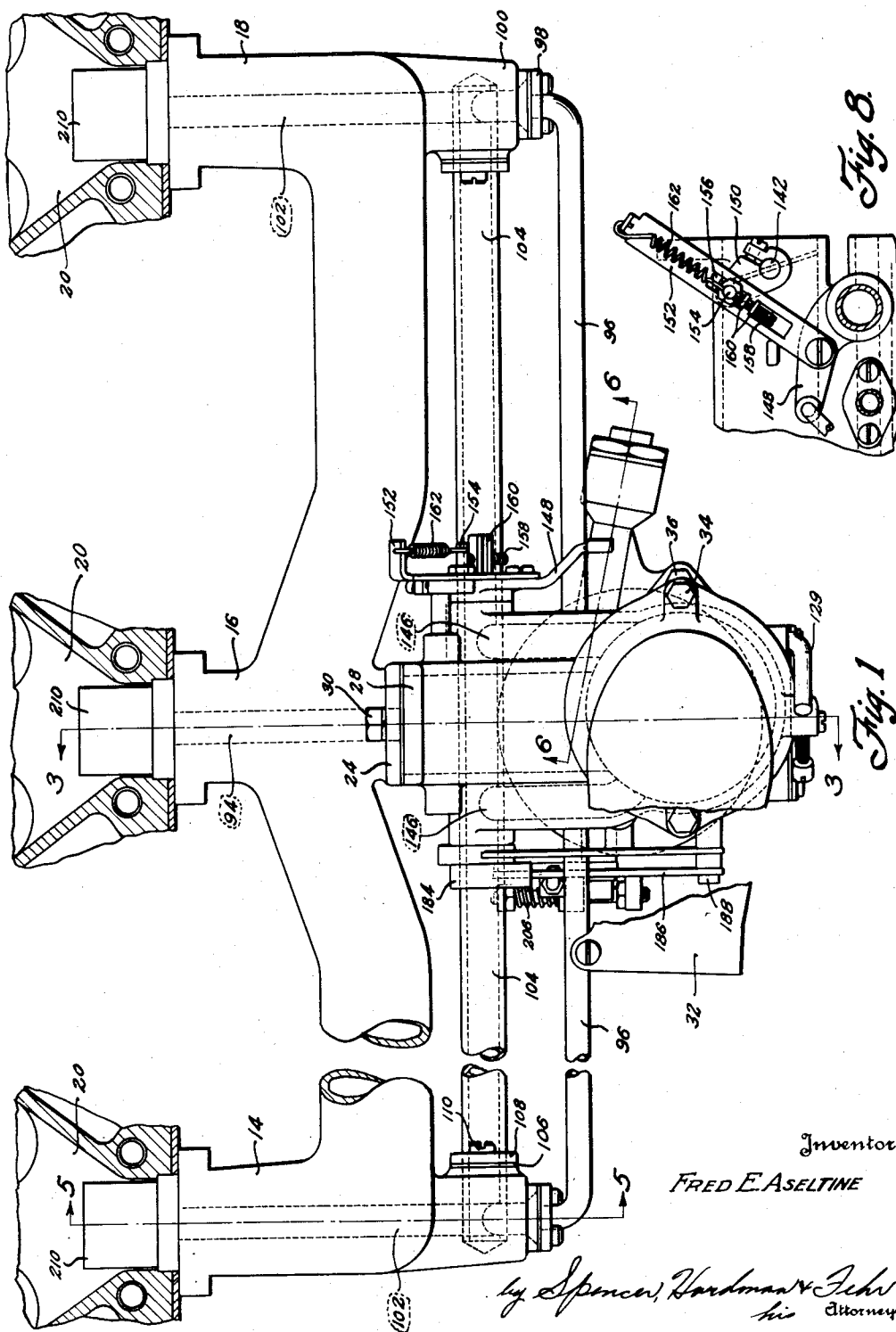
July 10, 1934.

F. E. ASELTINE
CHARGE FORMING DEVICE

1,966,329

Filed May 23, 1930

3 Sheets-Sheet 1



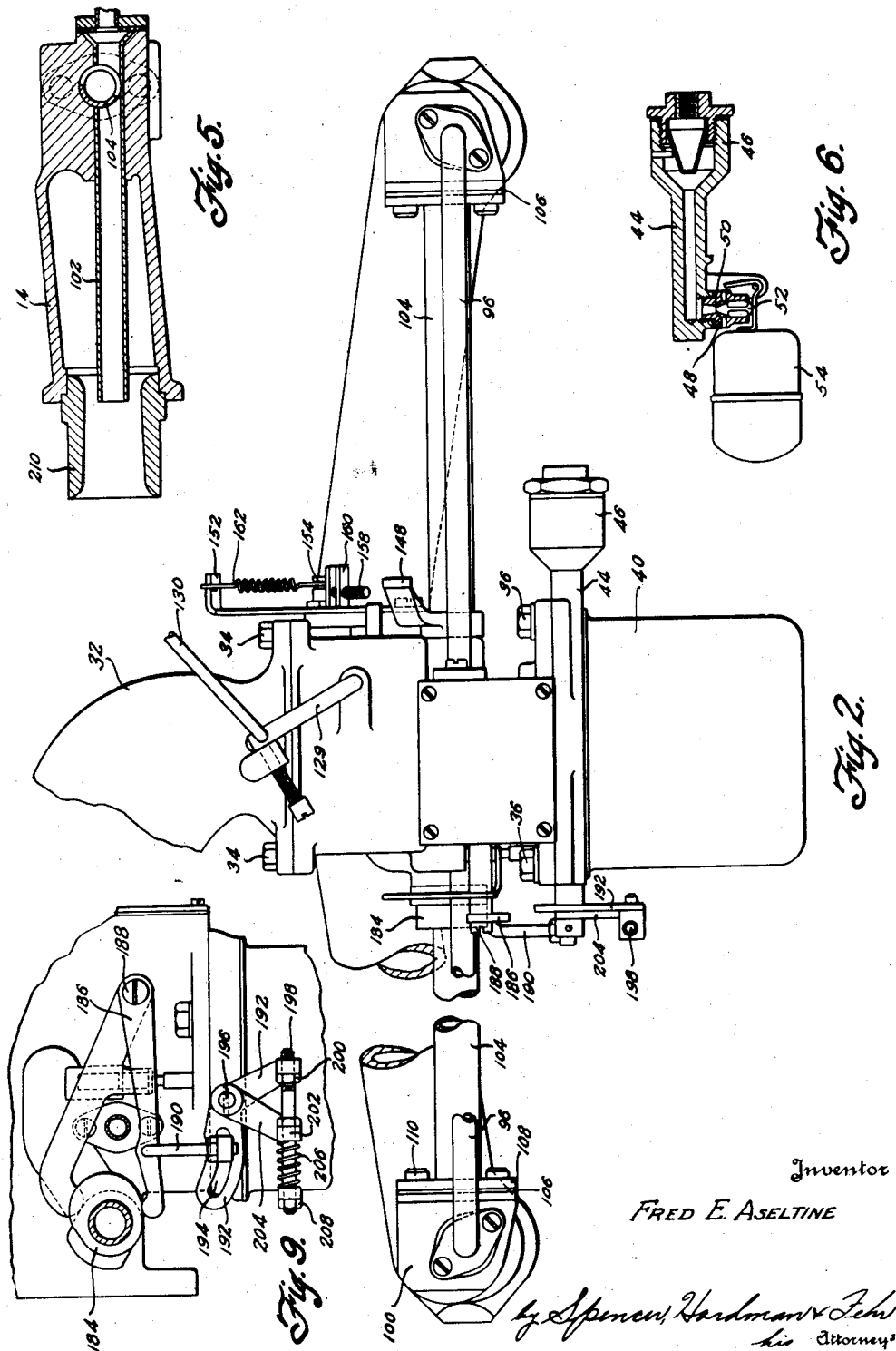
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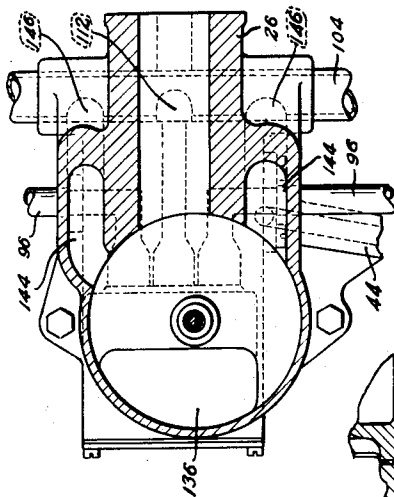


Fig. 7.

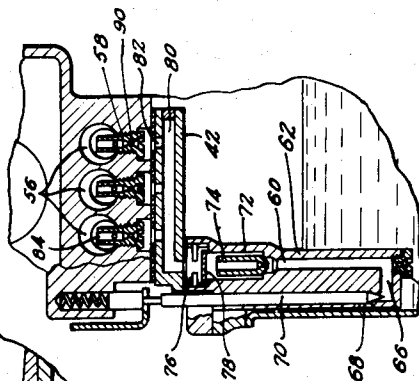


Fig. 4.

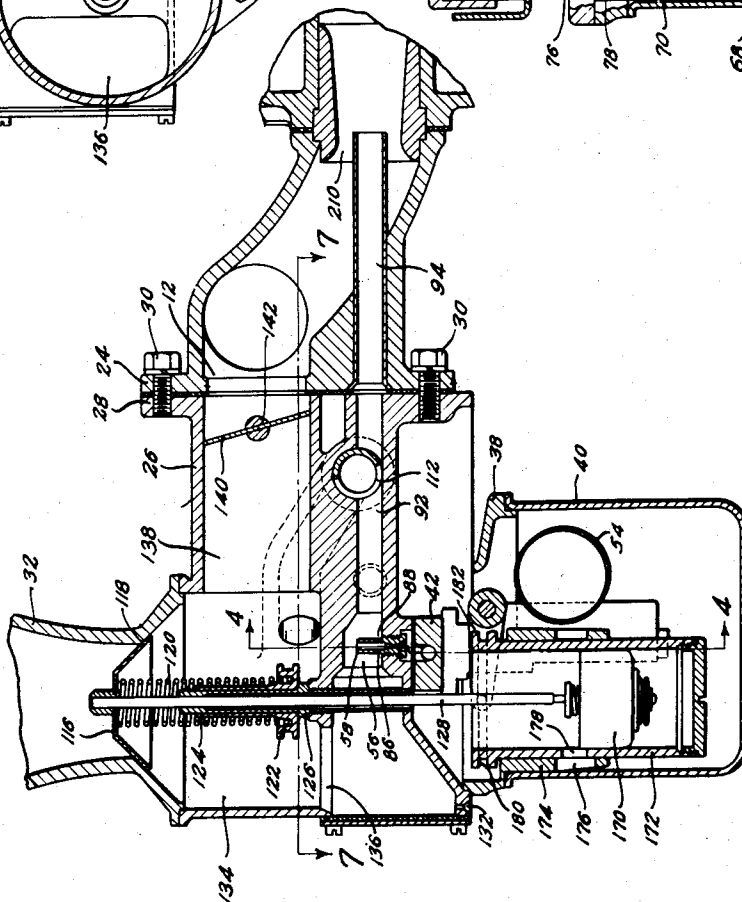


Fig. 3.

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UNITED STATES PATENT OFFICE

1,966,329

CHARGE FORMING DEVICE

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ware

Application May 23, 1930, Serial No. 454,911

21 Claims. (Cl. 123—52)

This invention relates to charge forming devices for internal combustion engines, and more particularly to devices of this character which comprise a plurality of primary carburetors for delivering a primary mixture of fuel and air to a plurality of secondary mixing chambers located adjacent the engine intake ports and in which the primary mixture is mixed with additional air under certain operating conditions.

A device of this character is shown in the co-pending application of Wilford H. Teeter and Fred E. Aseltine, Serial No. 221,371, filed on September 22, 1927.

It is an object of the present invention to provide, in a device of the character above referred to, means to improve the engine operation during the acceleration period following an opening movement of the throttle.

It is a further object of the invention to provide means for improving the distribution of the fuel mixture to the various engine cylinders.

With these objects in view, one feature of the present invention consists of the provision of a primary throttle which extends across all of the primary mixture conduits at equal distances from the outlet ends thereof so that the primary mixture travels the same distance in each conduit after passing the throttle.

Another feature of this invention resides in the provision of a primary throttle which is hollow and communicates with the main air chamber to receive air therefrom, and which is also provided with orifices for delivering the air received from said air chamber to the primary mixture passages, in order to dilute the primary mixture, the air inlet and delivery ports being so constructed that the amount of air supplied to the various primary mixture passages is increased as the throttle is opened.

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 plan view of the present invention shown in connection with an engine block, portions of which are shown in horizontal section.

Fig. 2 is an elevation of the device looking toward the engine.

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

Figs. 4, 5 and 6 are fragmentary, detail sections on the lines 4—4 of Fig. 3, and 5—5 and 6—6 of Fig. 1.

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

Fig. 8 is a detail view of the throttle operating mechanism.

Fig. 9 is a fragmentary elevation of the carburetor unit seen from the left in Fig. 2.

Referring to the drawings, 10 indicates the main air manifold having an inlet 12, and three outlet branches 14, 16 and 18, each of which is adapted to register with one of the engine intake ports 20, when the device is assembled. The manifold is provided with flanges 22, by means of which it is secured to the cylinder block in the usual manner and said manifold is provided with a flange 24 adjacent the inlet, to which the carburetor unit may be attached.

The carburetor unit comprises a main housing 26, which is provided with a flange 28 adapted to be secured to the flange 24, by screws 30, as shown in Fig. 1. An air inlet coupling 32 is secured in an opening in the upper wall of the housing by screws 34 and admits air to the interior of said housing for a purpose to be described later. The main housing has secured to the lower side thereof by screws 36, a frame 38 from which a fuel bowl 40 is suspended in the manner described in the application above referred to.

This frame supports a dashpot cylinder and other mechanism hereinafter referred to, while a fuel distributing block 42 is supported on the bottom wall of the main housing in the manner also described in the earlier application.

The fuel is supplied to the bowl 40 through a fuel supply conduit 44 provided with a nipple 46 adapted to be connected to a pipe extending to the main fuel supply tank (not shown). The construction of this fuel admitting means is the same as that shown in the earlier application and it is sufficient for the purposes of this disclosure to say that the passage 44 communicates at its inner end with a nipple 48, which is provided with a constriction 50 controlled by a valve 52 operated by a float 54 to maintain a substantially constant level of fuel in the bowl in the usual manner.

Fuel is supplied to a plurality of primary mixing chambers 56, formed in the lower wall of the main housing, by nozzles 58, the structure of said nozzles and mixing chambers being more fully described hereinafter. Fuel is conducted from the fuel bowl to the nozzles by a fuel supply passage 60, extending vertically through a member 62 which is supported by the distributing block 42 in the manner described in the earlier application. The passage 60 communicates with

the fuel in the bowl through a calibrated plug 64 having a fixed orifice and by a passage 66 extending horizontally from the passage 60 and communicating with the interior of the bowl by means of an orifice 68, normally closed but adapted to be opened at a predetermined throttle position by a valve 70, which extends upwardly through the top of the fuel bowl and is adapted to be operated by the throttle in a manner fully described in the earlier application. At its upper end, the passage 60 is enlarged, as indicated at 72, to form a valve chamber in which is received a two-stage, suction operated, fuel valve 74 adapted to regulate the flow of fuel in accordance with variations of the engine suction. Above the enlargement 72 there is a further enlargement 76 in which is received a check valve 78 adapted to prevent the return of fuel to the float chamber on any reduction in the mixing chamber suction, as fully described in the earlier applications. The enlargement 76 communicates directly with a fuel passage 80, formed in the fuel distributing block which, through the medium of orifices 82, supplies fuel to each of the primary fuel nozzles 58, as indicated in Fig. 4.

Each fuel nozzle 58 is provided with a main fuel outlet 84 in the top of the nozzle and a secondary fuel outlet comprising two fuel feeding orifices 86 and 88, on opposite sides of the nozzle near the bottom of the mixing chamber. During operation at higher speeds, sufficient suction is maintained at the nozzle to draw fuel from the main fuel outlets, but at idling or low speed operation under load, the suction is sufficient only to maintain the fuel at a point between the main and secondary fuel outlets, under which conditions fuel flows from the orifices 86 and 88 due to the action of gravity. Each fuel nozzle is provided with a restricted fuel metering orifice 90 to regulate the flow therefrom.

The primary mixing chambers 56 comprise the enlarged anterior ends of primary mixture passages 92. There are three of these passages, the middle one of which extends straight through the main housing to communicate directly with a tube 94 fixed in the manifold and extending through the middle branch thereof, as indicated in Figs. 3 and 7. The two outer passages 92 are of angular form, as shown in Fig. 7, and communicate with tubes 96, which extend laterally from the main housing and at their outer ends are provided with plates 98, which are attached to projecting bosses 100, formed integrally with the manifold outlet branches 14 and 18, as indicated in Fig. 1. These tubes 96 communicate at their ends with tubes 102 similar to the tube 94, which are fixed in the manifold outlet branches 14 and 18 in the same manner as the tube 94 is fixed in the middle branch.

The flow of fuel mixture through the primary mixture passages is controlled by a primary throttle valve which, according to this invention, is in the form of a long tube 104, rotatably mounted in the main housing and extending into recesses formed in the bosses 100, as shown in Fig. 1. Suitable packing glands 106 are secured between the bosses 100 and plates 108, secured to the bosses by screws 110, to prevent leakage of air around the tube 104. Air is admitted to the tube from the main air chamber in a manner to be hereinafter described, and is supplied to the three primary mixture passages through openings 112 in the wall of the tube 104, as shown in Figs. 3 and 7, the openings 112 registering with

the primary mixture passages when the device is assembled.

Substantially all of the air entering the carburetor flows through the air coupling 32 and is controlled by a main air valve 116 normally held against its seat 118 by a spring 120 received between the valve and the flange 122 projecting from the sleeve 124, which is slidable on a guide sleeve 126 fixed in the housing and serving as a guide for the stem 128 on which the main air valve is secured. In order to choke the carburetor to facilitate starting, the flange 122 is adapted to be lifted by a lever 129, which extends through the housing, as indicated in Fig. 2 and is provided with a connection 130 extending to a point convenient to the operator as fully described in the earlier application. To provide sufficient air to carry the starting fuel to the engine cylinders when the choke mechanism is operated, orifices 132 are provided in the main housing, as shown in Fig. 3. The construction of the air valve and the choke mechanism comprise no part of the present invention and are of the same construction as fully shown and described in the earlier applications previously mentioned.

The air which is admitted through the coupling 32 flows into a main air chamber 134, from which air is supplied to the primary mixture passages through a fixed opening 136 in the bottom of the air chamber and to the secondary mixing chambers through a passage 138, which communicates with the inlet 12 of the manifold when the device is assembled, and through which the flow of air is regulated by a secondary air throttle 140, secured to a shaft 142 which is journaled in the wall of the main housing and is operated in the manner fully described in the earlier application and briefly described hereinafter.

Air is also supplied from the main air chamber 134 to the interior of the tube 104, which forms the primary throttle, by means of passages 144 formed in bosses projecting from the main housing 26 on each side of the secondary air passage 138, as shown in Figs. 1 and 7. The passages 144 communicate with ports 146 formed in the wall of the tube 104, to supply air thereto and the ports are of such size as to register with the passages 144 in all positions of rotation the tube may occupy. The air thus admitted to the tube 104 is delivered through the ports 112 to the various primary mixture passages in the manner briefly described hereinbefore, the amount of air thus supplied depending on the position of the tube 104, the ports in the tube being so located that a greater quantity of air is supplied to the primary mixture passages as the tube is rotated to increase the area of the primary mixture passages, or in other words, as the primary throttle is opened to permit an increased quantity of primary mixture to be supplied to the engine. It will be noted that the construction is such that it is exactly the same distance from the primary throttle to the delivery end of each primary mixture passage, this construction being provided for a purpose to be more fully described hereinafter.

In the form of device disclosed herein, the primary mixture passages between the primary mixing chambers and the primary throttle are of smaller size than in the earlier application above referred to, and since the throttle tube 104 is adapted to deliver additional air to these passages in all positions the throttle tube may occupy, it will be clear that the primary mixture passages at points anterior to the throttle are adapted to convey a super-rich mixture. Because of the

small size of the primary mixture passage, the primary mixture is adapted to flow at high velocity at points anterior to the throttle, while the velocity is reduced to some extent at points between the throttle and the intake ports. This construction is provided to increase the efficiency of the device during the acceleration period as will be more fully pointed out hereinafter.

The operating connections for the throttle valves will now be described. Secured in any desirable manner on the throttle tube 104 is an operating arm 148, having a hole in its free end adapted to be connected to some suitable form of operating member extending to a point convenient to the operator of the vehicle. This operating arm is connected by a lost motion connection to an arm 150 adjustably secured in any desirable manner to the end of the shaft 142, outside of the main housing. The lost motion connection comprises an operating link 152, which is pivotally connected to the operating arm 148 and a pin 154 which projects from the free end of the arm 150, extends through a slot 156 in said link. A regulating screw 158 is threaded in lugs 160 projecting from the operating link and may be adjusted to regulate the length of the slot 156, the upper end of said screw constituting the lower end of the slot. A tension spring 162 is connected at one end to the upper end of said operating link and at its other end to the pin 154. This spring tends to hold pin 154 against the upper end of the slot 156. The operating arm is adapted to be moved in a counter-clockwise direction to open the primary throttle and the operating link moved downwardly to a position where the upper end of the slot 156 strikes the pin 154 before the operating arm 150 of the air throttle is moved, whereby the primary throttle is partly opened before the air throttle begins to open. The screw 158 serves as a stop to limit the closing movement of the primary throttle and adjustment of said screw regulates the throttle opening at idling. This lost motion connection is generally adjusted so that the primary throttle moves to a position corresponding to a vehicular speed of approximately twenty miles per hour on the level before the air throttle begins to open.

On any increase in suction in the main air chamber, the air valve 116 is opened to admit additional air and the opening of this valve is retarded to prevent fluttering of the valve and to aid in enriching the mixture for the purpose of acceleration. To retard the opening of the valve in this manner, the valve stem 128 has secured to its lower end the piston 170, which slides in a cylinder 172, which is supported for vertical movement in a guide member 174, which is a part of the frame 38 hereinbefore referred to. The guide member is provided with an orifice 176 which registers with an orifice 178 in the wall of the cylinder to admit fuel thereto when the orifices are in register with each other. As fully described in the earlier application, the cylinder is provided on its outer surface at its upper end with a groove 180, which is adapted to be engaged by pins extending from a yoke member 182, which is operated on opening movement of the throttle to lift the cylinder and increase the resistance of the dashpot to opening movements of the valve so as to increase the effect of said dashpot in enriching the mixture during the acceleration period.

The means for operating the yoke member 182 is of substantially the same construction as in the earlier application and is shown in Fig. 9.

A cam 184 is adjustably secured in any desirable manner on the hollow throttle shaft 104 and engages an arm 186 pivoted on a pin 188, screwed into the main housing. The free end of arm 186 is connected to a link which engages a lever 192, the link being adjustably connected in a slot to vary the movement imparted to said lever. The lever 192 is fulcrumed on a rock shaft 196, which projects through the housing and the other end of said lever has a rod 198 threaded therein and held in place by a lock nut 200. The rod passes loosely through an ear 202 projecting from an arm 204 secured to the rock shaft 196, to the other end of which the yoke 182 is secured, while a spring 206 surrounds the rod between the ear 202 and a nut 208, screwed on the end of the rod. Obviously, as the arm 186 is depressed by the operating cam, the rod 198 is moved to the left operating to lift the dashpot cylinder as more fully set forth in application Serial No. 221,371.

The secondary mixing chambers formed in the outlet branches of the manifold comprise Venturi tubes 210 surrounding the outlet ends of the primary mixture passages, the construction and function of these Venturi tubes being just the same as in the earlier application.

It will be obvious that when the opening of the air valve is retarded, as indicated, that the admission of air is restricted so that less air is supplied to the primary and secondary mixture passages than would be the case if the retarding means were not present and at the same time the suction at the fuel nozzles is necessarily increased so that the supply of fuel during the period of retardation of the air valve is increased. Moreover, because of the small size of the primary mixture passages anterior to the throttle, the velocity of flow therethrough is relatively rapid and greater than it would be if such passages were of larger size. Also on opening of the throttle to accelerate, the suction is increased in such passages tending to increase the velocity of flow, while at points posterior to the throttle there is a reduction in suction and in velocity of flow, which, although partially offset by the admission of additional air through the hollow throttle shaft, produces a temporary lag in the mixture flow. By positioning the throttle relatively close to the outlet ends of all of the primary mixture passages, the temporary lag in the mixture flow is minimized and by placing the throttle the same distance from the outlet end of each of the tubes, the lag in mixture flow is substantially equalized, while the introduction of the diluting air into the primary mixture passages at the same distance from the outlet end of each obviously produces the same effect in each of said passages. Thus the supply of enriched mixture following an opening of the throttle is effected with as little delay as possible and the distribution of the enriched mixture to the various engine cylinders is rendered substantially uniform.

It will also be understood that since the hollow throttle tube connects all of the primary mixture passages with each other, that it acts as an equalizer tending to equalize the pressure conditions in the various primary mixture passages.

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 com-

- bustion engines comprising, a plurality of separate primary mixture passages, means for supplying air to said passages, fuel inlets in said passages at varying distances from the outlet ends thereof, secondary mixture chambers and throttling means in said primary mixture passages for controlling the flow therethrough, said throttling means being positioned the same distance from the outlet end of each mixture passage.
2. A charge forming device for internal combustion engines comprising a plurality of separate primary mixture passages of varying lengths, means for supplying fuel and air to said passages at different distances from their outlet ends, secondary mixture chambers and throttling means in said primary mixture passages for regulating the flow therethrough, said throttling means being positioned the same distance from the outlet end of each mixture passage.
3. A charge forming device for internal combustion engines comprising a plurality of separate primary mixture passages adapted to deliver mixture to the separate intake ports of a multi-cylinder engine, means for supplying fuel and air to said passages at different distances from their outlet ends, secondary mixture chambers and throttling means in said primary mixture passages for regulating the flow therethrough, said throttling means being positioned relatively close to the engine intake ports and the same distance from the outlet end of each mixture passage.
4. A charge forming device for internal combustion engines comprising, a plurality of secondary mixing chambers, a plurality of separate primary mixture passages adapted to deliver a primary mixture of air and fuel to said secondary mixing chambers, means supplying fuel and air to said primary mixture passages at different distances from the outlet ends thereof, and throttling means for said primary mixture passages positioned the same distance from the outlet end of each passage.
5. A charge forming device for internal combustion engines comprising, a plurality of secondary mixing chambers, a plurality of separate primary mixture passages of different lengths adapted to deliver a primary mixture of air and fuel to said secondary mixing chambers, means supplying fuel and air to said primary mixture passages at different distances from the outlet ends thereof, and throttling means for said primary mixture passages positioned the same distance from the outlet end of each passage.
6. A charge forming device for internal combustion engines comprising, a plurality of secondary mixing chambers located adjacent the engine intake ports, a plurality of separate primary mixture passages adapted to deliver a primary mixture of air and fuel to said secondary mixing chambers, means supplying fuel and air to said primary mixture passages at different distances from the outlet ends thereof and throttling means for regulating the flow through said primary mixture passages, said throttling means being positioned the same distance from each primary mixture passage end and relatively close to the secondary mixing chambers.
7. A charge forming device for internal combustion engines comprising, a plurality of separate mixture passages adapted to communicate with a plurality of engine intake ports, fuel inlets in each of said passages, air inlets for said passages, all of said air inlets being positioned the same distance from the outlet ends of said mixture passages.
8. A charge forming device for internal combustion engines comprising a plurality of separate mixture passages adapted to communicate with a plurality of engine intake ports, fuel and air inlets in each of said passages, auxiliary air inlets for said passages, all of said auxiliary inlets being the same distance from the outlet ends of said passages.
9. A charge forming device for internal combustion engines comprising a plurality of separate mixture passages adapted to communicate with a plurality of engine intake ports, means for supplying fuel to each of said passages at different distances from the outlet ends thereof and air inlets for admitting air to said mixture passages, all of said inlets being positioned the same distance from the outlet ends of said passages.
10. A charge forming device for internal combustion engines comprising, a plurality of secondary mixing chambers, a plurality of separate primary mixture passages adapted to deliver a primary mixture of air and fuel to said secondary mixing chambers, fuel inlets for supplying fuel to each of said primary mixture passages and air inlets for admitting air thereto, said air inlets being the same distance from the outlet ends of the mixture passages.
11. A charge forming device for internal combustion engines comprising, a secondary mixing chamber, primary carbureting means including a primary mixing chamber adapted to deliver a primary mixture of fuel and air to said secondary mixing chamber, means for supplying fuel and air to said primary mixing chamber, an air inlet supplying air to said secondary mixing chamber, and common means for regulating the flow of primary mixture from said primary carbureting means and for supplying auxiliary air thereto.
12. A charge forming device for internal combustion engines, comprising a plurality of separate mixture passages adapted to communicate with a plurality of engine intake ports, means for supplying fuel and air to each of said mixture passages, and a single means for simultaneously regulating the flow through all of said mixture passages and for supplying auxiliary air thereto.
13. A charge forming device for internal combustion engines, comprising a plurality of separate mixture passages adapted to communicate with a plurality of engine intake ports, means for supplying fuel and air to each of said mixture passages, and a single means for supplying auxiliary air to all of said mixture passages and for equalizing the pressure therein.
14. A charge forming device for internal combustion engines comprising, a plurality of secondary mixing chambers, a plurality of primary mixture passages adapted to deliver a primary mixture of fuel and air to said secondary mixing chambers, means for supplying fuel and air to the primary mixture passages, and a single means for regulating the flow of mixture through said primary mixture passages and for equalizing the pressure therein.
15. A charge forming device for internal combustion engines comprising a plurality of secondary mixing chambers, a plurality of primary mixture passages adapted to deliver a primary mixture of fuel and air to said secondary mixing chambers, means for supplying fuel and air to the primary mixture passages, and a single means for

admitting auxiliary air to all of said primary mixture passages and for equalizing the pressure therein.

16. A charge forming device for internal combustion engines comprising a plurality of secondary mixing chambers, a plurality of primary mixture passages adapted to deliver a primary mixture of fuel and air to said secondary mixing chambers, means for supplying fuel and air to the primary mixture passages, and a hollow tube for supplying air to all of said primary mixture passages and for controlling the flow of mixture therethrough.

17. A charge forming device for internal combustion engines comprising a plurality of secondary mixing chambers, a plurality of primary mixture passages adapted to deliver a primary mixture of fuel and air to said secondary mixing chambers, fuel inlets for supplying fuel to said primary mixture passages, a main air chamber adapted to supply air to said primary mixture passages and a throttle regulating the flow through all of said passages comprising a hollow tube adapted to receive air from said main air chamber and to deliver such air to all of said mixture passages.

18. A charge forming device for internal combustion engines comprising a plurality of secondary mixing chambers, a plurality of primary mixture passages adapted to deliver a primary mixture of fuel and air to said secondary mixing chambers, means for supplying fuel to said primary mixture passages, a main air chamber adapted to supply air to said primary mixture passages and secondary mixing chambers, and an auxiliary air passage connecting all of said primary mixture passages and main air chamber, said passage communicating with the primary mixture passages of equal distances from the outlet ends thereof.

19. A charge forming device for internal combustion engines comprising a secondary mixing chamber, a primary mixture passage adapted to deliver a primary mixture of fuel and air to said secondary mixing chamber, means for supplying fuel to said primary mixture passage, a main air chamber adapted to supply air to said primary mixture passage and secondary mixing chamber, a hollow throttle controlling the flow through the primary mixture passage, and an air passage connecting the main air chamber with the hollow throttle to supply additional air to the primary mixture passage.

20. A charge forming device for internal combustion engines comprising a plurality of secondary mixing chambers, a plurality of primary mixture passages adapted to deliver a primary mixture of fuel and air to said secondary mixing chambers, means for supplying fuel to said primary mixture passages, a main air chamber adapted to supply air to said primary mixture passages and secondary mixing chambers, and means for introducing auxiliary air into the primary mixture passages at equal distances from the outlet ends thereof.

21. A charge forming device for internal combustion engines comprising a manifold having a plurality of outlet passages adapted to communicate with the intake ports of the engine and a single intake passage, a carburetor unit cooperating with said manifold and having a plurality of primary carburetors adapted to form a primary mixture of fuel and air, an air inlet for supplying air to the manifold, conduits for conveying the primary mixture to the manifold, and throttling means in the primary mixture conduits for regulating the flow of mixture through said conduits, said throttling means being equally distant from the outlet ends of the conduits.

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