April 28, 1925. 1,536,043

E. A. BESSOM

CARBURETOR

Filed April 30, 1917 4 Sheets-Sheet 1

Fig. 3.

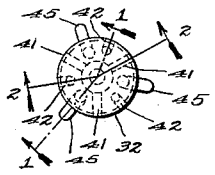


Fig. 1.

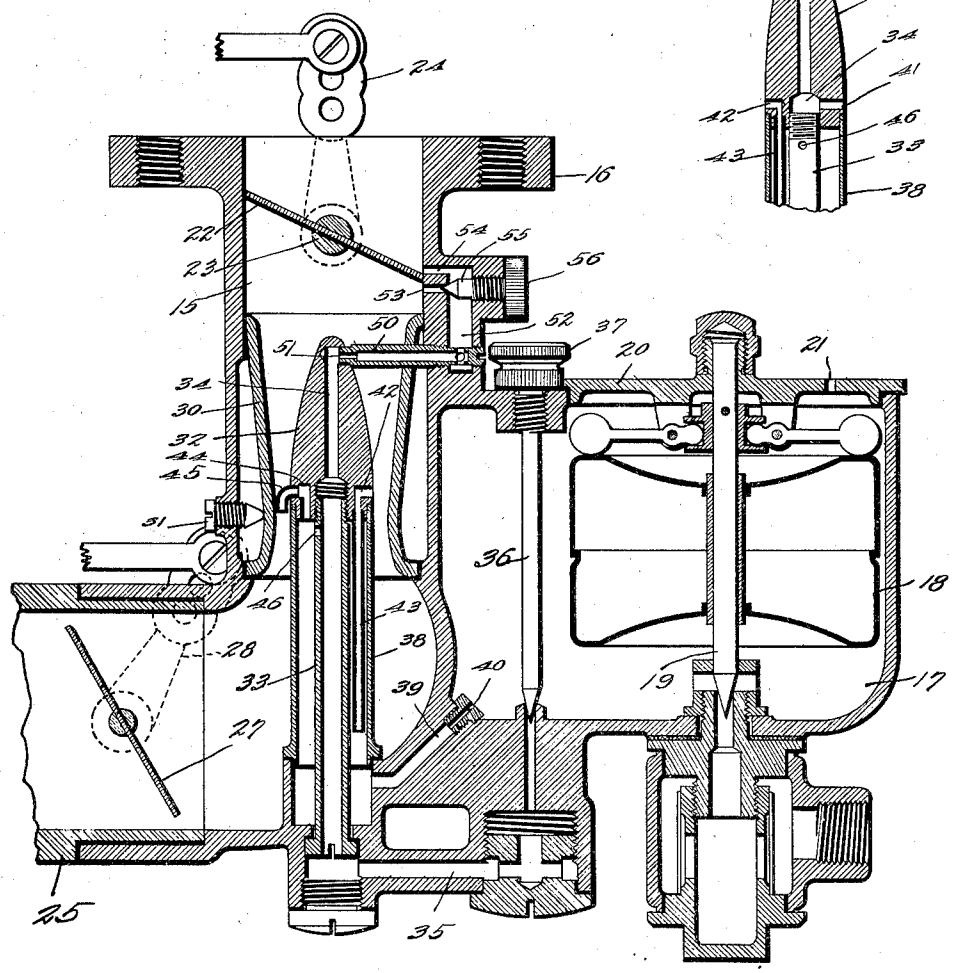


Fig. 2.

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1,536,043

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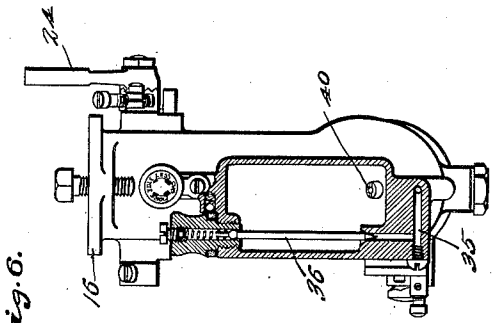


Fig. 6.

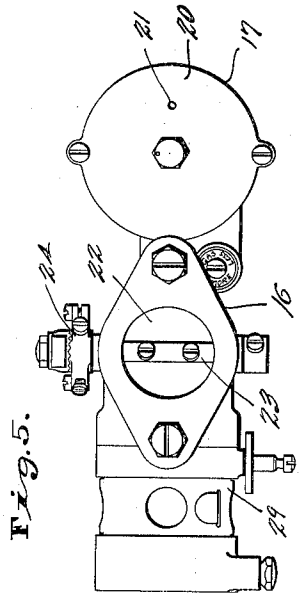


Fig. 5.

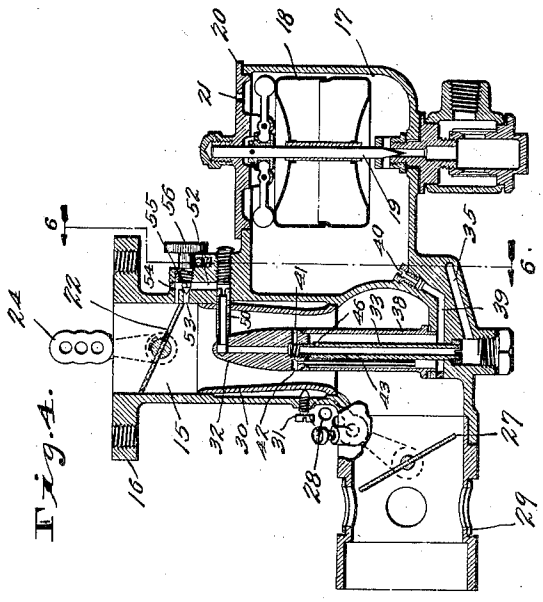


Fig. 4.

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Fig. 8.

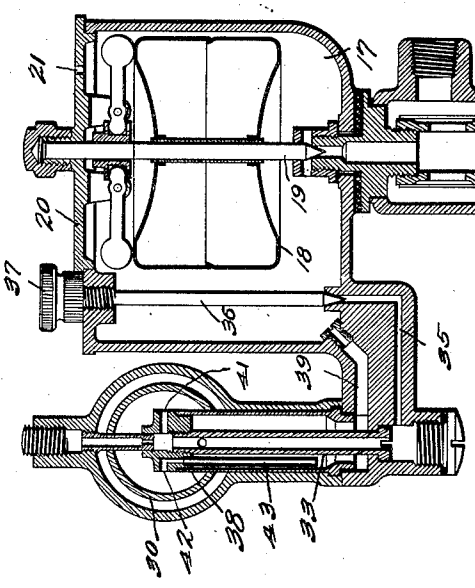


Fig. 15.

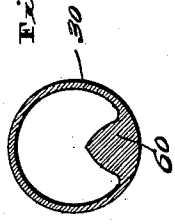


Fig. 10.

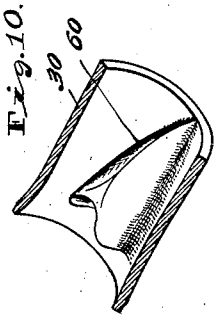


Fig. 7.

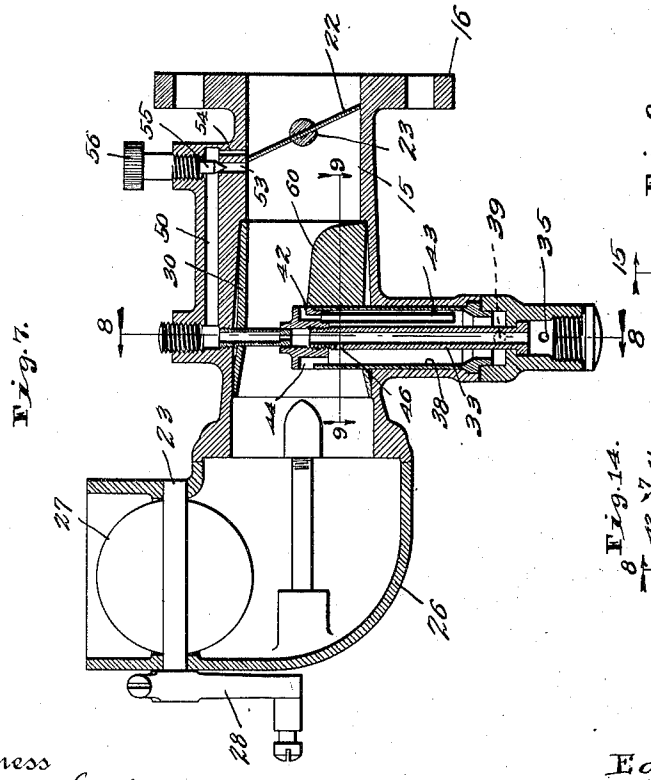


Fig. 9

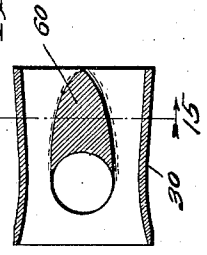
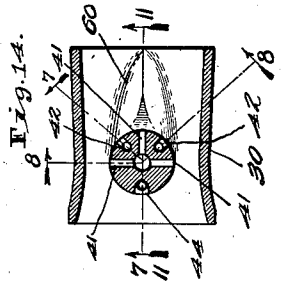


Fig. 14.



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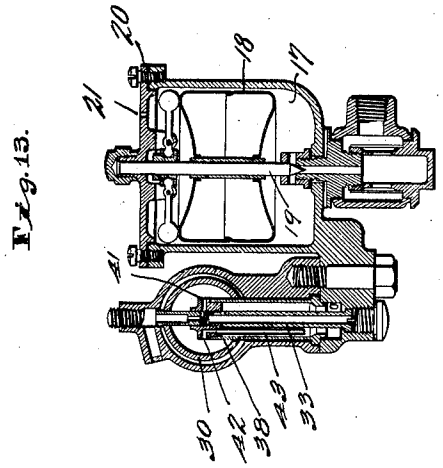


Fig. 13.

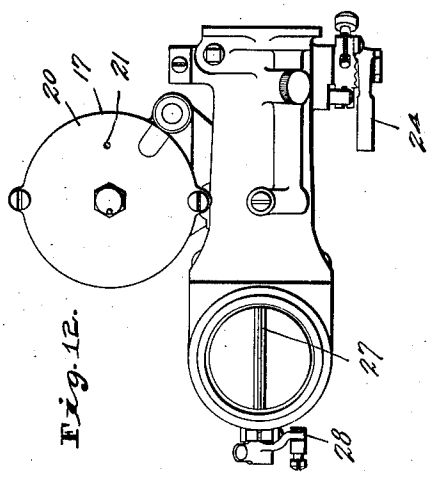


Fig. 12.

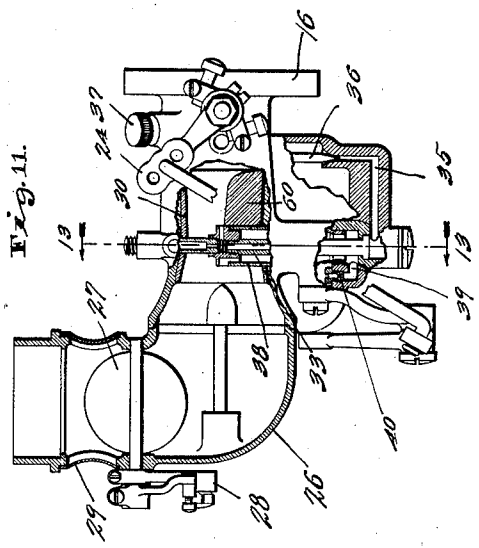


Fig. 11.

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Patented Apr. 28, 1925. 1,536,043

UNITED STATES PATENT OFFICE.

EARL A. BESSOM, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO THE WHEELER-SCHEBLER CARBURETOR CO., OF INDIANAPOLIS, INDIANA, A CORPORATION OF INDIANA.

CARBURETOR.

Application filed April 30, 1917. Serial No. 165,323.

To all whom it may concern:

Be it known, that I, EARL A. BESSOM, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented a new and useful Carburetor, of which the following is a specification.

In carburetor design the great object has always been to obtain a proper proportion in mixing the fuel and air under the varying conditions encountered. However, great difficulty has been experienced in attaining this object, because, although the flow of fuel and the flow of the air are fundamentally according to the same law, yet there are certain disturbing influences, as the viscosity, surface tension, and the relatively greater inertia of the liquid fuel. In consequence, a certain head, or suction, is necessary in order to initiate the fuel discharge from the nozzle, and this head or suction is a constant which enters into the relation between the air flow and the fuel flow; thus the ordinary carburetor discharges a greater proportion of fuel for high velocity flow than for low velocity flow, producing too rich a mixture at high speeds and too lean a mixture at low speeds. In addition, upon a sudden change in the velocity of flow, as on a sudden opening of the throttle, the greater inertia of the liquid fuel retards its response to the change so that momentarily there is an excess of air, producing too lean a mixture at the very time when a rather richer mixture is needed in order to produce the desired engine acceleration.

It is the object of my present invention to avoid these disturbing effects, and to produce a carburetor which will give the proper proportion of air and fuel under all conditions; and to do so by a carburetor having no normally moving parts except the throttle itself.

The accompanying drawings illustrate my invention in its preferred form as adapted for vertical and horizontal types of carburetors, Figs. 1 to 6 inclusive relating to the vertical type and Figs. 7 to 13 inclusive to the horizontal type. Fig. 1 is a vertical central section through a vertical type carburetor embodying my invention in its preferred form, the fuel nozzle being in section on line 1—1 of Fig. 3, and the whole being shown somewhat schematically so as to indicate all the fuel and air passages; Fig. 2 is a central vertical section through the upper part of the fuel nozzle of Fig. 1, being taken on the line 2—2 of Fig. 3; Fig. 3 is a plan of a fuel nozzle of Figs. 1 and 2; Fig. 4 is a section similar to Fig. 1 through the same type of carburetor, but shows the carburetor with its parts arranged as it is used in actual practice, instead of merely schematically as in Fig. 1; Fig. 5 is a plan of the carburetor shown in Fig. 4; Fig. 6 is a vertical section on the line 6—6 of Fig. 4; Fig. 7 is a vertical central section through a horizontal type carburetor also embodying my invention, being shown somewhat schematically, the fuel nozzle being in section on the line 7—7 of Fig. 14; Fig. 8 is a section on the line 8—8 of Fig. 7, with the fuel nozzle in section on the line 8—8 of Fig. 14; Fig. 9 is a section through the Venturi tube of Fig. 7, being taken on the line 9—9 of such figure; Fig. 10 is a perspective view of the lower half of such Venturi tube; Fig. 11 is a vertical central section, with some parts in elevation, through a horizontal type carburetor, somewhat similar to Fig. 7, showing the carburetor as actually constructed, with the fuel nozzle in section on the line 11—11 of Fig. 14; Fig. 12 is a plan of the carburetor shown in Fig. 11; Fig. 13 is a section on the line 13—13 of Fig. 11, with the fuel nozzle in section on the line 8—8 of Fig. 14; Fig. 14 is a plan view of the fuel nozzle of Figs. 7 and 11; and Fig. 15 is a section on the line 15—15 of Fig. 9.

In both the vertical and the horizontal types of my carburetor, there is a mixing tube 15 provided at its discharge end, the top in the vertical type and the right-hand end in the horizontal type as shown in Figs. 7 and 11, with a flange 16 for connection to the intake manifold of the engine, and a float chamber 17 at the side of the mixing tube 15. The float chamber contains a float 18 which operates a fuel inlet valve 19 to control the supply of fuel from any suitable source to the float chamber 17 so as to maintain a constant fuel level therein. The removable cap 20 of the float chamber is provided with a small hole 21 sufficiently large so that atmospheric pressure is maintained upon the surface of the fuel in the float chamber. A throttle 22 is mounted on a cross pin 23 in the mixing tube 15 near its discharge end, and is provided with a suita-

ble operating arm 24 whereby it may be operated in the usual manner. The intake end of the mixing tube 15 may be turned out of alignment with the main portion of such mixing tube, as to the horizontal in the vertical type, whereby if desired it may receive a pipe 25 leading from any heating source for heating the air supplied to such mixing tube. In the horizontal type, illustrated in Figs. 7, 11, and 12, the mixing tube is shown provided with an inlet elbow 26 which may be adjusted to different angular positions around the axis of the mixing tube, so that the intake end of this elbow is either upward, downward, or to either side, being shown adjusted so that it is upward. A choke valve 27 provided with an operating arm 28 is preferably mounted in the intake end of the mixing tube, so as to control the ingress of air thereinto. If desired, provision may be made for diluting the heated air supplied to the mixing tube by air taken direct from the atmosphere, as by a sleeve valve 29 on the intake side of the choke valve 27, so that such choke valve wholly controls the air entering the mixing tube. All the air to be carbureted travels through the mixing tube, controlled by the choke valve 27 and the throttle 22. Within the mixing tube 15, between the choke valve 27 and the throttle 22, there is a Venturi tube 30, which is conveniently formed as a separate piece from the mixing tube 15 and is clamped in place in any suitable manner, as by a set screw 31 in the vertical type, so that if necessary or desirable the Venturi tube may be removed and one having a different contraction substituted.

The fuel nozzle has various orifices opening into the Venturi tube, as will be explained. As shown, this fuel nozzle is separated from the Venturi tube and located within it, and the orifices thereof do not open through the walls of the Venturi tube; but this separateness is not essential, and the various nozzle orifices may open into the Venturi tube from either within or without.

The fuel nozzle, as shown, projects upward into the mixing tube 15 in both the vertical and horizontal types, and has its head 32 within the Venturi tube 30. In the vertical type the fuel nozzle projects axially of the Venturi tube, and in the horizontal type transversely thereof. The fuel nozzle has a central or inner tube 33 which communicates at its upper end with a central space 34 within the head 33 and at its lower end with a fuel passage 35 leading from the float chamber 17, the inlet end of this fuel passage being provided with a manually adjustable needle valve 36 extending vertically through the float chamber 17 and having at its upper end a knurled operating head 37. The fuel nozzle also has an outer tube 38, providing a well, which at its lower end communicates with a passage 39 from the float chamber 17, the inlet end of such passage 39 being provided with a plug having a restricted calibrated opening 40 which controls the flow of fuel to the well. The passages 35 and 39 are entirely separate from each other. The central space 34 communicates with a plurality of main discharge outlets 41, which constitute the normal fuel discharge openings. In the vertical type of carburetor these outlets 41 are preferably equally distributed around the circumference of the nozzle head 32, but in the horizontal type I prefer to provide three such openings 41, of which one is directed axially along the Venturi tube 30 toward the discharge end thereof and the other two are directed transversely of such Venturi tube toward either side, as is clear from Fig. 14. The fuel nozzle 32 is also provided with auxiliary or accelerating fuel outlets 42, which are preferably in the same horizontal plane as the main discharge outlets 41, but instead of communicating with the central space 34 communicates with a number of small tubes 43 which depend from the nozzle head 32 into the well between the inner and outer tubes 33 and 38, there being one such tube 43 for each accelerating outlet 42. The tubes 43 extend well down into the well, as is clear from Figs. 1 and 7. In the vertical type of carburetor, the accelerating fuel outlets 42 are preferably equally spaced around the periphery of the nozzle head, being interspersed with the main outlets 41 and conveniently equal in number thereto; but in the horizontal type of carburetor, I prefer to provide two such accelerating fuel outlets, directed generally toward the discharge end of the Venturi tube but displaced about 45° from the axis of the Venturi tube, as is clear from Fig. 14. The nozzle head 32 is also provided with one or more air-admitting openings 44, which at one end lead to the top of the well formed by the inner and outer tubes 33 and 38 and at the other end are open to the space within the Venturi tube 30 and directed in the opposite direction to the flow of air through such tube so as to form Pitot tubes. In the vertical type of carburetor, this is arranged by providing each opening 44 with a small elbow tube 45, the free end of which is directed downward so that it is exposed to the impact of the air passing through the Venturi tube; and there are several of these tubes 45, preferably the same number as of main outlets 41, the tubes 45 being interspersed circumferentially with such main outlets and the accelerating outlets 42. In the horizontal type of carburetor I preferably provide but one opening 44, which is located axially of the Venturi tube and directed toward the intake end thereof; so

that it is also exposed to the impact of the air passing through the Venturi tube. The inner tube 33 is provided near its upper end with a restricted opening 46, connecting the well with the inside of the tube 33 above the normal level of the fuel in the well. This restricted opening 46 provides a leakage connection for air from the well into the inner tube 33, thereby reducing the air pressure on the surface of the liquid in the well from what it would otherwise be, and providing for a greater range of speed during which an increase in speed will produce a momentary increase in the fuel discharge for assisting in the accelerating action as hereinafter explained.

The central space 34 in the fuel nozzle is also connected through an opening at the top with a tube 50, the inlet end of which is provided with a restricted opening 51 to restrict the flow of fuel thereinto. The tube 50 leads to a passage 52 in the main casting of the carburetor, beside and parallel to the mixing tube 15. This passage 52 extends to a point substantially opposite the throttle 22, and is provided with two lateral openings 53 and 54 spaced apart substantially the thickness of the throttle disc 22 and arranged on the intake and discharge side of such throttle when the throttle is fully closed, as is clear from Figs. 1 and 7. The openings 53 and 54 co-operate with that wing of the throttle disc which swings toward the intake end of the mixing tube, so that when the throttle is in closed position its edge is between the two openings, and as the throttle is opened the edge of the disc passes over the opening 53. The communication of the opening 53 with the passage 52 is controlled by a needle valve 55 having a knurled operating head 56, by the setting of which the idling action is controlled.

The operation is as follows:

When the engine is at rest the fuel level within the inner tube 33 and the outer tube 38 and in the small depending tubes 43, is the same, save for capillarity, as in the float chamber 17, fuel being supplied to the inner and outer tubes 33 and 38 through the passages 35 and 39, controlled by the needle valve 36 and restricted jet 40.

When the engine is idling, throttle 22 is practically completely closed, so that very little air travels through the Venturi tube 30, and hence there is a high vacuum on the discharge side of the throttle 22. In consequence of this high vacuum, fuel is drawn from the float chamber 17 through the passage 35, the inner tube 33, the central space 34, the restricted opening 51 and tube 50, and the passage 52 to the opening 54, and air is drawn into the passage 52 through the opening 53 to mix with the fuel therein, this mixture of air and fuel being discharged through the opening 54 into the mixing tube 15 on the discharge side of the closed throttle 22. The restricted opening 51 prevents too much fuel from being thus discharged. This produces a rich mixture, which is essential for idling and, among other things, serves to break the surface tension and in effect to eliminate the necessity for the head which is ordinarily necessary to start the flow of the fuel. At this time no fuel is being discharged from the main fuel outlets 41 of the fuel nozzle, and air may even be drawn in through such main fuel outlets and mixed with the fuel supplied from the central space 34 through the restricted opening 51 to the tube 50 and passage 52. The richness of the mixture under idling conditions may be adjusted by the needle valve 55.

As the throttle 22 is opened, more air is drawn through the Venturi tube 30, and the vacuum on the discharge side of the throttle is reduced. At the same time, the edge of the disc 22 partly closes the opening 53, so as to partly shut off the flow of air therethrough, but the air flow past the edge of the disc mixes with the fuel discharge from the opening 54 to form the explosive mixture; and upon a slightly greater opening of the throttle, the opening 53, instead of permitting air flow into the passage 52, permits fuel flow therefrom, for mixing with the air passing the edge of the throttle 22 to form the explosive mixture. The opening of the throttle 22, however, increases the suction on the intake side thereof, so that shortly after the opening of such throttle has begun there is sufficient velocity of air flow through the Venturi tube 30 to reduce the pressure in the contracted portion of such Venturi tube sufficiently so that fuel is drawn out through the main and accelerating fuel outlets 41 and 42, the supply of fuel within the tubes 33 and 38 being maintained from the float chamber 17. This discharge of fuel from the fuel outlets 41 and 42 begins before that through the openings 53 and 54 ceases, so that there is an overlapping in the conditions of discharge from the main and idling nozzles. As the throttle 22 is now opened still farther, the discharge from the openings 53 and 54 gradually becomes less and finally ceases, but in the meantime that from the main and accelerating outlets 41 and 42 increases. For the wider openings of the throttle 22, there may even be a backward flow of air (or rather explosive mixture) in through the openings 53 and 54, the passage 52, and the tube 50, into the central space 34, and thence outward mixed with the main supply of fuel from the main fuel outlets 41, because of the fact that the lowest pressure or highest vacuum on open throttle is at the contracted portion of the Venturi tube 30, at which contracted portion the fuel out-

lets 41 and 42 are located. The amount of fuel discharged from the outlets 41 and 42 varies with the opening of the throttle 22 and with the velocity of the air stream through the Venturi tube 30, and is substantially in proportion to such velocity. As a matter of fact, this arrangement of nozzles is found in practice to produce a rich mixture at idling, a lean mixture for normal running, and a somewhat richer mixture than at normal runing at extremely high speeds, which is found to be extremely desirable.

The fuel level in the well formed by the outer tube 38 varies with the velocity of the fuel flow through the Venturi tube 30. As such velocity increases, such fuel level is lowered, because the impact pressure produced by the Pitot-tube action of the tubes 45 adds itself to the reduced pressure within the Venturi tube so that the pressure on the fuel in the well is higher than the reduced pressure at the openings 42. This is due to the velocity of the air flow through the Venturi tube. When I speak merely of "pressure" I mean the pressure exerted in a direction perpendicular to any air flow, as is usual; as distinguished from "impact pressure".

As a result, if when the engine is idling or operating at slow speed the throttle 22 be opened quickly, the resultant decrease in pressure at the outlet of the Venturi tube 30 produces a substantially immediate increase in the rate of air flow but a less rapid increase in the rate of fuel flow from the main fuel discharge outlets 41. This by itself wound tend to produce a leaner mixture during this vitally important period of acceleration, and might result in the missing of several explosions by the engine, or even in the killing of the engine. It is to take care of this sudden acceleration that the Pitot tube construction and the well are provided. When this sudden opening of the throttle 22 occurs, and there is a sudden increase in the velocity of the air stream through the Venturi tube, part of the rushing air is caught in the openings 44 or their extensions 45 as in Pitot tubes, and the impact of the rushing air causes it to force itself through such openings and tubes into the upper end of the well and there to exert an increased relative pressure on the surface of the fuel in such well, thereby forcing the fuel downward in the well and upward through the tubes 43 and out through the acceleration outlets 42 into the passing stream of air so as to supply momentarily the necessary fuel for proper carburetion during the interim caused by the delay in the acceleration of the fuel flow from the main fuel outlets 41. This may occur for several successive accelerations to successively higher speeds, without an intermediate slowing down, before the fuel level in the well falls below the ends of the tubes 43, which latter action does not take place until a fairly high speed is reached—say perhaps thirty miles an hour if the carburetor is used on an automobile. This relatively wide range of speeds during which an increase in speed causes a momentarily increased flow from the acceleration openings 42 is made possible by reason of the small bleed opening 46, whereby part of the air which is supplied through the Pitot tubes into the well is allowed to escape therefrom into the inner tube 33, to mix with the fuel therein, but such escape reduces the pressure somewhat on the fuel in the well from what it would otherwise have been so that the lower ends of the tubes 43 are not uncovered upon the first slight acceleration.

The action of the well to produce the momentary acceleration in fuel feed is due to the stepping up of pressure from a point of low pressure. The Pitot tubes may be located at any point along the Venturi tube, from one end to the other thereof, and for any of these locations will produce the same effect on the well so long as the choke valve 27 is open; for the pressure due to these Pitot tubes seems to be the resultant of the pressure at the point at which the Pitot tubes open into the Venturi tube and the impact of the rushing air, and the fall in such pressure and the impact are corresponding functions of the velocity of the air, the pressure falling and the impact increasing, as the square of such velocity, so that such resultant is constant for all locations of the Pitot tubes along the Venturi tube and is substantially equal in value to the pressure of the atmosphere. The pressure within the Venturi tube at its contracted portion, at which the Pitot tubes and also the fuel discharge outlets 41 and 42 are most conveniently located, is very much lower than atmospheric pressure during operation, sometimes being a partial vacuum of fifteen or twenty inches of mercury; by reason of the impact of the rushing air the actual pressure within the well is stepped up materially from this reduced pressure toward atmospheric pressure, although such space is not in communication with atmosphere; indeed, it would be stepped up too far, so that the entire action of the well would be obtained at too low a speed, if it were not for the opening 46.

In order to regulate the proportionate amount of fuel and air, it is necessary merely to adjust the needle 36 by its knurled head 37, thus controlling the amount of fuel admitted to the inner tube 33 of the nozzle for a given suction. It is not ordinarily necessary to change this setting of the needle 36, save as the seasons change.

In order to prevent the formation of a

pool of fuel on the discharge side of the fuel nozzle in the Venturi tube in the horizontal type of carburetor, I provide a stream line boss 60 at the place where such pool would otherwise tend to form. This boss fits directly against the outer surface of the outer tube 38 of the fuel nozzle, as is clear from Figs. 7 and 8, and gradually tapers off both vertically downward and laterally toward the center line to form a stream line surface which is swept clean of fuel by the passing stream of air so that no pool of fuel can collect. This also avoids eddying in the flow through the Venturi tube.

In order to facilitate starting, the choke valve 27 may be partly closed in the usual manner, so as to cut down the amount of air admitted to the lower end of the mixing tube 15 and thus increase proportionately the amount of fuel. With the choke valve thus partly closed, the fuel from the well would be discharged from the Pitot tubes as well as from the acceleration fuel outlets under certain conditions, but this merely assists in the starting action and gives a heavy priming.

I claim as my invention:

1. In a carburetor, the combination of a mixing tube, a main fuel nozzle discharging within said mixing tube, a throttle controlling the flow through said mixing tube and located therein on the discharge side of said fuel nozzle, a supplemental fuel passage having two separated openings communicating with said mixing tube respectively on the discharge side and on the intake side of said throttle when the latter is closed, and means for adjusting the effective size of said second opening, said second opening being arranged so that as the throttle is opened the edge of the throttle sweeps over it.

2. In a carburetor, the combination of a mixing tube, a main fuel nozzle discharging within said mixing tube, a throttle controlling the flow through said mixing tube and located therein on the discharge side of said fuel nozzle, and a supplemental fuel passage having two separated openings communicating with said mixing tube respectively on the discharge side and on the intake side of said throttle when the latter is closed, said supplemental fuel passage being provided with means for varying the effective size of the communication from one side to the other of the closed throttle through said two openings, said second opening being arranged so that as the throttle is opened the edge of the throttle sweeps over it.

3. In a carburetor, the combination of a mixing tube, a main fuel nozzle discharging within said mixing tube, a throttle controlling the flow through said mixing tube and located therein on the discharge side of said fuel nozzle, and a supplemental fuel passage having two separated openings communicating with said mixing tube respectively on the discharge side and on the intake side of said throttle when the latter is closed, said second opening being arranged so that as the throttle is opened the edge of the throttle sweeps over it.

4. In a carburetor, the combination of a mixing tube, a Venturi tube located in said mixing tube, a main fuel nozzle discharging within said Venturi tube, a throttle controlling the flow through said mixing tube and located therein on the discharge side of said fuel nozzle, and a supplemental fuel passage having two separated openings communicating with said mixing tube respectively on the discharge side and on the intake side of said throttle when the latter is closed, said second opening being arranged so that as the throttle is opened the edge of the throttle sweeps over it, and said supplemental fuel passage being connected to said main fuel nozzle near its discharge point by way of a restricted opening.

5. In a carburetor, the combination of a mixing tube including a Venturi tube, a fuel nozzle located within said Venturi tube, a well having a restricted fuel supply passage, and a tube dipping into said well, said fuel nozzle being provided with a main discharge opening having a fuel supply passage leading thereto and also with an auxiliary discharge opening communicating with the upper part of said tube dipping into said well, said well being provided with an inlet opening located within said Venturi tube and opening in a direction opposite to the flow through such Venturi tube so as to receive the impact due to the velocity of such flow and with a bleed outlet into said fuel passage leading to the main fuel discharge opening.

6. In a carburetor, the combination of a mixing tube including a Venturi tube, a fuel nozzle located within said Venturi tube, a well having a restricted fuel supply passage, a tube dipping into said well, said fuel nozzle being provided with a main discharge opening having a fuel supply passage leading thereto and also with an auxiliary discharge opening communicating with the upper part of said tube dipping into said well, said well being provided with an inlet opening located within said Venturi tube and opening in a direction opposite to the flow through such Venturi tube so as to receive the impact due to the velocity of such flow, and a throttle and a choke valve located in said mixing tube respectively on the discharge and on the intake sides of said fuel nozzle.

7. A carburetor, comprising a mixing tube having an air inlet opening, a throttle of the butterfly type controlling the flow through said mixing tube, a fuel nozzle discharging into said mixing tube between said air inlet opening and the throttle, and a

supplemental fuel nozzle having two separated openings to the mixing tube respectively on the intake and discharge sides of the throttle when the latter is closed and at that edge thereof which moves toward the first fuel nozzle when the throttle is opened.

8. A carburetor, comprising a mixing tube having an air inlet opening, a throttle of the butterfly type controlling the flow through said mixing tube, a fuel nozzle discharging into said mixing tube between said air inlet opening and the throttle, and a supplemental fuel nozzle having two openings to the mixing tube respectively on the intake and discharge sides of the throttle when the latter is closed and at that edge thereof which moves toward the first fuel nozzle when the throttle is opened, the relative sizes of said two openings being variable.

9. In a carburetor, the combination of a mixing tube, a Venturi tube forming part of said mixing tube, a fuel nozzle discharging within said Venturi tube and having one or more main fuel-discharge openings and one or more supplemental fuel-discharge openings, a main fuel-supply passage supplying said main fuel-discharge openings, a well also receiving a restricted supply of fuel, a Pitot tube subject to the fluid velocity through the Venturi tube and connected to the upper part of said well, and tubes dipping into said well and connected to said supplemental fuel-discharge openings.

10. In a carburetor, the combination of a mixing tube, a Venturi tube forming part of said mixing tube, a fuel nozzle discharging within said Venturi tube, a main fuel-supply passage for said fuel nozzle, a well receiving a restricted supply of fuel and connected to said nozzle to supply fuel thereto, and a plurality of separate Pitot tubes connected to the upper part of said well and opening within said Venturi tube in the direction opposite to the flow of air through said Venturi tube.

11. In a carburetor, the combination of a mixing tube, a Venturi tube forming part of said mixing tube, a fuel nozzle discharging within said Venturi tube, a main fuel-supply passage for said fuel nozzle, a well, a separate fuel-supply passage for said well, each of said two fuel-supply passages having its own controlling restriction, said well being also arranged to supply said nozzle, and a Pitot tube connected to the upper part of said well and having its inlet mouth located in said Venturi tube and opening directly against the air flow through said Venturi tube.

12. In a carburetor, the combination of a mixing tube, a Venturi tube forming part of said mixing tube, a fuel nozzle discharging within said Venturi tube, a main fuel-supply passage for said fuel nozzle, a well, a separate fuel-supply passage for said well, each of said two fuel-supply passages having its own controlling restriction, said well being also arranged to supply said nozzle, and a Pitot tube connected to the upper part of said well and having its inlet mouth located in said Venturi tube and opening directly against the air flow through said Venturi tube, said nozzle being provided with separate sets of discharge openings for the discharge from said first fuel-supply passage and from said well respectively.

In witness whereof, I have hereunto set my hand at Indianapolis, Indiana, this 27th day of April, A. D. one thousand nine hundred and seventeen.

EARL A. BESSOM.