June 24, 1930. E. F. GEIGER 1,767,664

CARBURETOR

Filed April 30, 1926 3 Sheets-Sheet 1

Fig. 1,

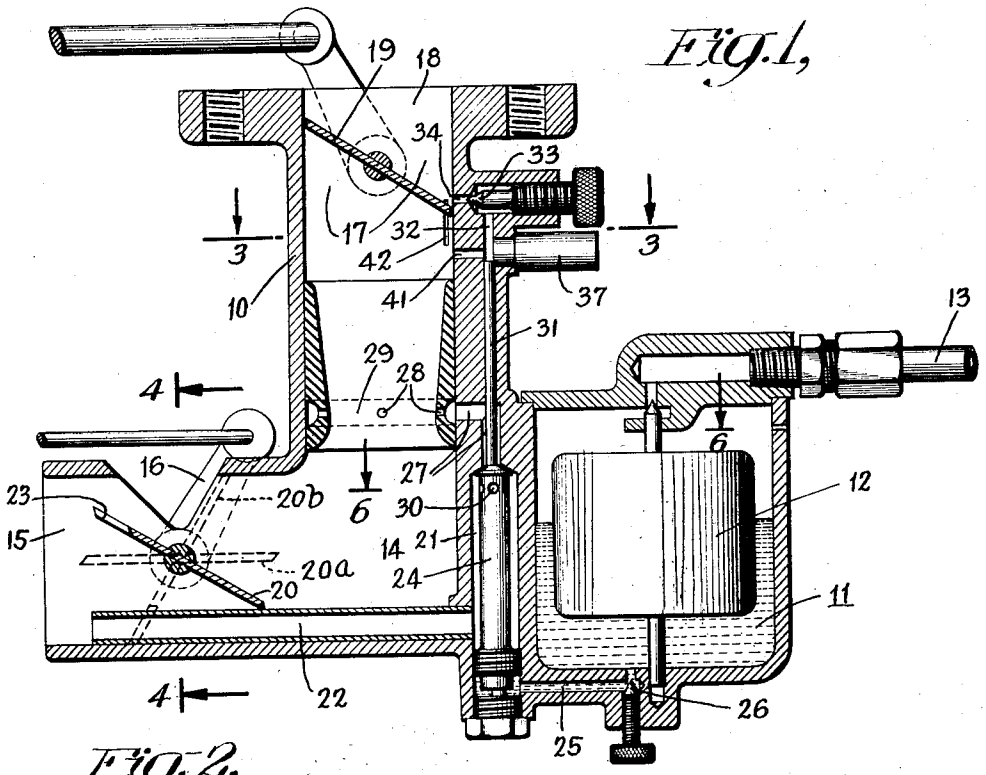


Fig. 2,

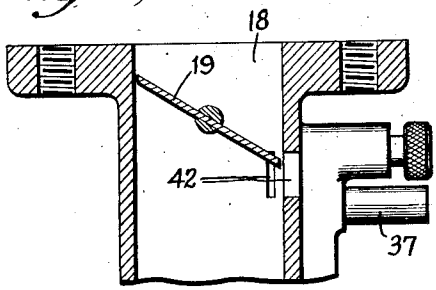


Fig. 4,

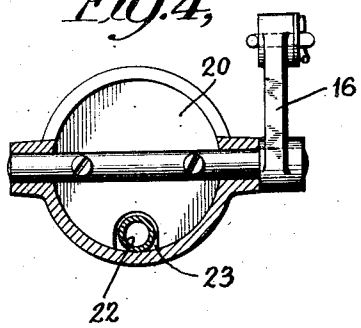
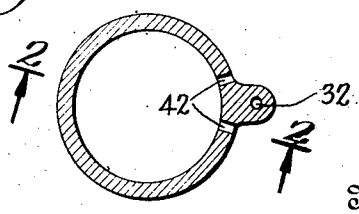


Fig. 3,



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By his Attorneys

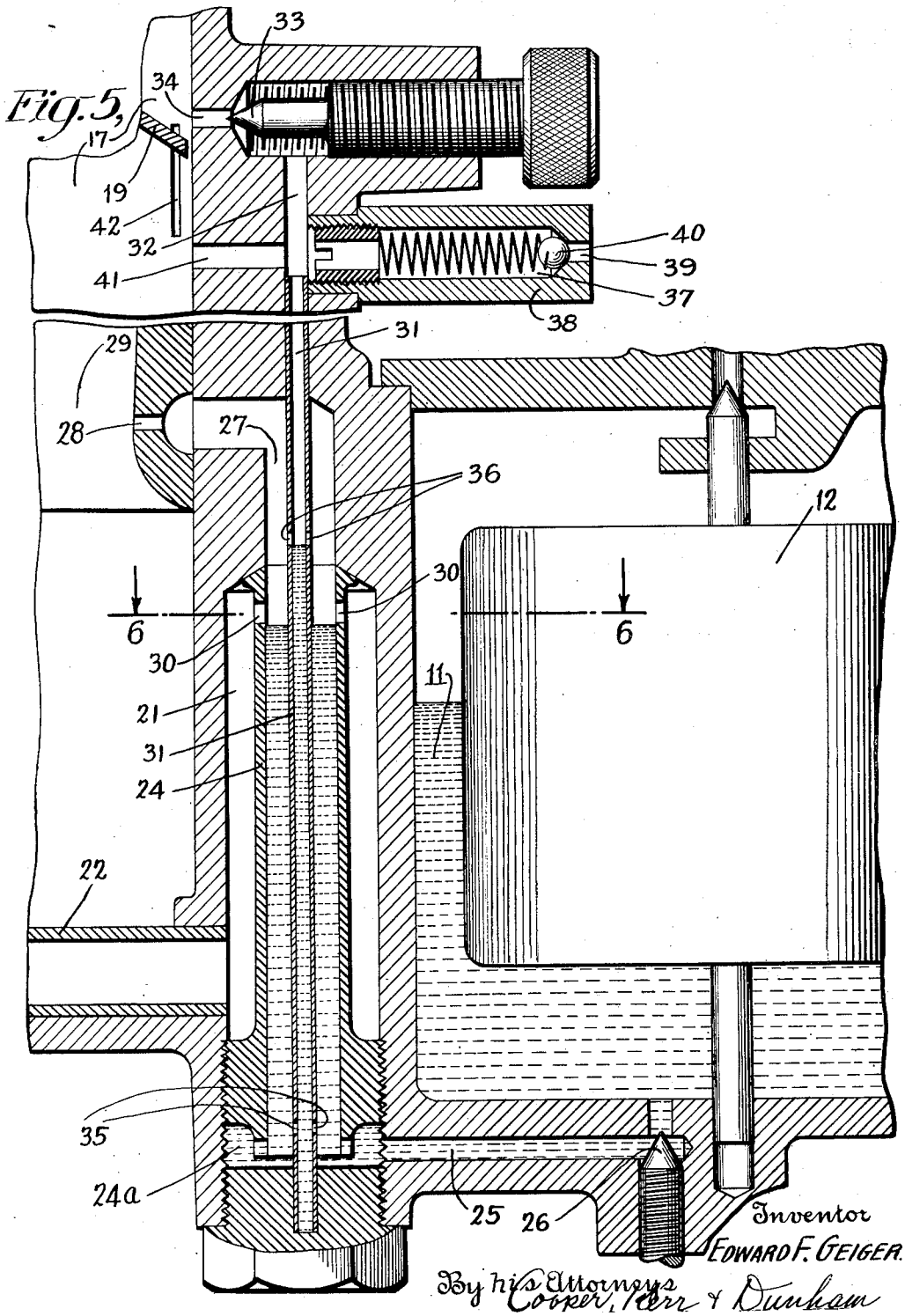
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CARBURETOR

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Fig. 5,



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CARBURETOR

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Fig. 6,

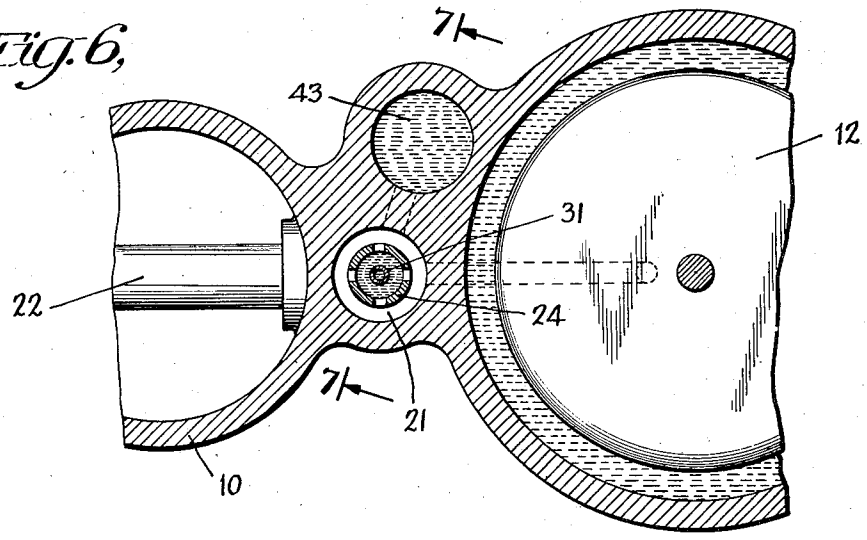
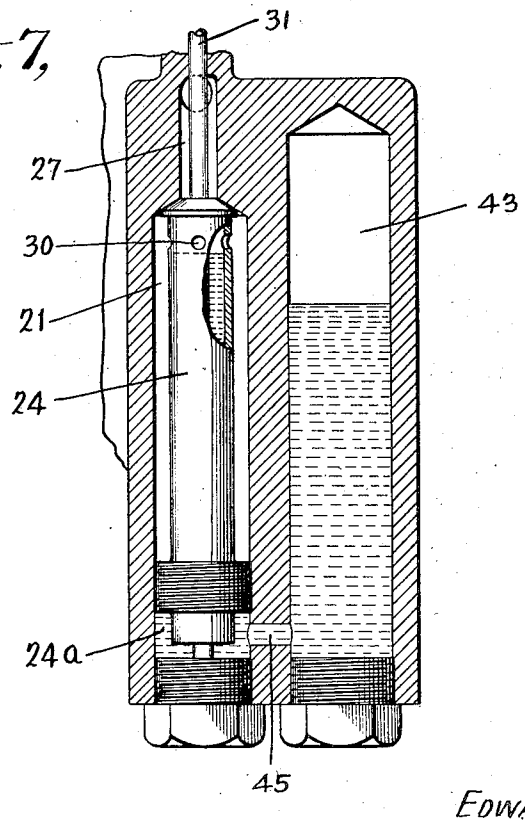


Fig. 7,



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Patented June 24, 1930 1,767,664

UNITED STATES PATENT OFFICE

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CARBURETOR

Application filed April 30, 1926. Serial No. 105,668.

This invention relates to improvements in carburetors and has among its objects to produce a carburetor which will supply the proper fuel mixture to an engine at all speeds and at all power requirements.

Another object of the invention is to provide a carburetor in which the mixture is maintained within a definite and predetermined range of limits during the running of the engine at normal speed and power regardless of the throttle opening.

Another object of the invention is to provide a carburetor in which the proportion of fuel to air constituting a mixture is increased when engine is running below normal speed and is decreased when the engine is running above normal speed at any throttle opening.

Another object of the invention is to produce thorough atomization of the fuel at all engine speeds.

Another object of my invention is to provide a carburetor that will preheat the fuel by agitating it in currents of heated air before it is atomized and discharged into the mixing chamber of the carburetor.

Another object of my invention is to provide a carburetor which embodies simple means that prevents a leaning of the mixture upon a sudden opening of the throttle.

Further and other objects will appear in the detailed description of the invention and in the claims.

In the drawings:

Fig. 1 is a sectional view of the carburetor embodying the principles of my invention.

Fig. 2 is a section on line 2—2 of Fig. 3.

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

Fig. 4 is a section on line 4—4 of Fig. 1 when the choke valve is in a closed position.

Fig. 5 is an enlarged view of a portion of Fig. 1 illustrating the atomizing devices and mixing chambers.

Fig. 6 is a horizontal sectional view on line 6—6 of Fig. 5.

Fig. 7 is a vertical sectional view on line 7—7 of Fig. 6.

In the particular form in which I have chosen to illustrate my invention, 10 designates a main body or casing having an integrally formed float chamber 11. In this float chamber is mounted the usual float and needle valve 12 for controlling the flow of fuel fed by gravity or pressure from a fuel supply into the float chamber through the supply pipe 13.

Within the casing 10 is an air conduit 14 having an inlet at 15 for heated air, an inlet at 16 for cold air, a mixing chamber 17, and a mixture outlet 18.

Mounted in the mixing chamber 17 is a throttle valve 19 for controlling the flow of air through the conduit 14. Mounted in the conduit 14 adjacent to the cold air inlet 16 is a choke valve 20 for controlling the flow of air into conduit 14 and for controlling whether the air is to come from inlet 15 or whether it is to come from inlet 16, or from both inlets. This valve 20 is shown in its normal running position which allows the conduit 14 to be supplied with air mostly through the cold air inlet 16 and only partially through the hot air inlet 15. 20^a shows the position of the valve 20 for cold weather running or for warming up the engine. In this position, a large proportion of the air is drawn through the hot air inlet 15. 20^b shows the position of the valve 20 when it is desired to choke off the entire air supply to conduit 14.

Within the casing 10 is an air chamber 21 that communicates with the hot air inlet 15 through an air conduit 22. The choke valve 20 contains a cut out portion 23 (Fig. 4) so that conduit 22 will not interfere with the closing of the choke valve. Located within the air chamber 21 is a fuel tube 24 that closes off both the upper and lower ends of

the air chamber 21. The interior of the fuel tube 24 communicates at its lower end with the fuel in the float chamber 11 through the fuel chamber 24ª and the fuel passage 25 in which an adjustable needle valve 26 is provided. At its upper end the interior of the fuel tube 24 communicates with air conduit 14 through passage 27 and ports 28 opening into a restricted or venturi section 29 of the air conduit 14. Close to the upper end of the fuel tube 24 are a series of openings 30 connecting the interior of the fuel tube with air chamber 21.

The construction just described creates an auxiliary air passage which leads from the hot air inlet 15 and passes through conduit 22, through air chamber 21, through openings 30, through upper part of fuel tube 24, through passage 27 and ports 28 into the restricted section 29 of air conduit 14.

Inside of the fuel tube 24 is a small auxiliary fuel tube 31 that extends upward within passage 27 and for some distance into passage 32 in casing 10. The passage 32 has an outlet around needle valve 33 and through opening 34 into that portion of mixing chamber 17 located above and on the outlet side of the throttle valve 19. The passage 32 has another outlet through passage 41 which opens into mixing chamber 17 below and on the intake side of throttle valve 19.

The auxiliary fuel tube 31 has openings 35 below the normal fuel level by which fuel enters the auxiliary fuel tube, and a plurality of openings 36 above the fuel level by which air may enter or leave the auxiliary fuel tube through passage 27.

Communicating with passage 32 is a vacuum relief valve 37 comprising a casing 38 having a port 39 opening into the atmosphere. The port 39 is closed by a spring retained ball 40 when the pressure in passage 32 does not fall below a predetermined pressure. When the pressure falls below the predetermined pressure, the port will be opened.

Through the casing 10 and connecting the mixing chamber 17 with the atmosphere are disposed a plurality of openings 42 that serve to admit air into the mixing chamber 17 for the purpose of leaning the mixture when the throttle valve 19 is in a partially closed position. The position, form and size of these openings is dependent upon the operating characteristics of the carburetor and especially upon the size and design of the other ports.

Adjacent to the chamber 21 is a chamber 43 (Figs. 6 and 7) extending higher than the normal level of the fuel in the float chamber 11. Leading from the bottom of chamber 43 is a passage 44 which connects chamber 43 with the interior of fuel tube 24 through the fuel chamber 24ª.

Under operating conditions, the pumping action of the associated engine will cause heated air to pass through conduit 22, through openings 30 and into passage 27 from which some of the air will pass through openings 36 into auxiliary fuel tube 31, passage 32 to mixing chamber 17, by passing through passages 41 and 34, the remainder of the air drawn into passage 27 will pass through ports 28 into conduit 14. The pumping action of the engine will also draw fuel through tubes 24 and 31, which fuel will mix with the air drawn through openings 30 and 36 and be carried along with it into conduit 14 and mixing chamber 17. The fuel as it mixes with the air in the vicinity of openings 30 and 36 is considerably agitated by the rush of air through these openings and is preheated by the heat carried by the air. A variation in the position of the throttle valve will cause a variation in the rate of flow of air through opening 34, passage 41 and ports 28 because of the accompanying changes produced in pressure throughout the carburetor unit as is readily understood. When the pressure in passage 32 falls below a predetermined pressure, as will occur, for example, when the throttle valve 19 is open and a considerable depression exists in the pressure in the mixing chamber 17, preventing relief through passage 41, the relief valve 37 will operate to allow air to enter through port 39. By reason of this valve, when the lowest allowable pressure in passage 32 is reached, the air will be admitted to prevent the pressure in pasage 32 from being further lowered.

When choke valve 20 is in an open position (as shown in Fig. 1) and throttle valve 19 is in a nearly closed position, and the engine is running at a slow or idling speed, then a depression of pressure or suction exists at the upper or outlet side of throttle valve 19 and in passages 34 and 32. The depression in passage 32 tends to be somewhat relieved by the inflow of air through passage 41, but it is sufficient to raise the level of the fuel in auxiliary fuel tube 31. The air entering through openings 36 will pick up particles of fuel from auxiliary fuel tube 31 to be discharged therewith through passage 34 into mixing chamber 17 where it mixes with the main air supply comprising air drawn through the upper parts of openings 42 and air passing the edges of throttle valve 19. The object of the openings 42 is to lean out the mixture when the throttle valve is in a partially closed position.

At low idling speeds there is little or no movement of air through ports 28 for the nearly closed position of the throttle valve does not permit of a high rate of flow of air at the restricted section 29 and the pressure at ports 28 is substantially the same as that in passage 27. Some of the air passing the

edge of the throttle valve is admitted through the lower portions of openings 42. The setting of needle valve 33 determines the quality of the mixture when the engine is idling.

With the throttle open, the full suction at the engine intake manifold is made effective on all portions of conduit 14. The effect of this suction is to produce a strong current of air in conduit 14 which will cause a condition of high vacuum at ports 28 in the Venturi section 29 of the conduit. The high suction thereby created at ports 28 permits a larger amount of heated air to be drawn through conduit 22, chamber 21, and openings 30 where it will break the fuel in fuel tube 24 into small particles and the resultant mixture of the air and fuel will pass into the mixing chamber directly through ports 28.

Except for frictional losses, the amount of suction in conduit 14 is communicated through port 41 to passage 32 until the pressure in passage 32 falls below the predetermined pressure at which valve 37 is designed to function. The valve 37 will function when the engine is accelerating and has reached a speed at which the suction created in passage 32 permits the spring pressed ball 40 to be displaced to allow air to enter. The opening of the valve prevents the suction in passage 32 from becoming substantially greater and thereby prevents any substantial increase in the amount of fuel fed into conduit 14 due to auxiliary fuel tube 31. Further increase in the engine speed after this point has been reached results in a leaning out of the mixture because as the engine accelerates the increase in the amount of fuel is substantially dependent solely upon the suction through ports 28. With an open throttle and high engine speed, the suction through ports 28 will become greater than the suction in passage 32 so that there will be an actual reversal in the direction of air travel in auxiliary fuel tube 31, thereby allowing air to flow from passage 32 through openings 36 into passage 27, reducing the suction in this passage. Such reversal of air flow tends to prevent too great a fuel flow through ports 28 at high speeds, thereby tending to prevent over-enrichment of the fuel mixture at high speeds.

Because the inertia of the fuel is greater than that of air, I have made special provision to aid in preventing a temporary leaning out of the mixture following an opening movement of the throttle valve. Chamber 43 is closed at the top and it communicates through passage 45 with the fuel at the bottom of fuel tube 24 through chamber 24a. The fuel in this chamber 43 is held in equilibrium between the pressure of the air in the top of chamber 43, the pressure in passage 27 and the hydrostatic head of fuel in fuel tube 24. An opening movement of the throttle valve 19 will cause a drop in the pressure in passage 27 with an accompanying descent of the level of the fuel in chamber 43 because of the flow of fuel from chamber 43 through passage 45, chamber 24a, and into the fuel tube 24. This extra fuel compensates for the temporary dearth of fuel drawn through passage 25 following an opening movement of the throttle valve. The normal fuel level in chamber 43 is obtained in the following manner: When fuel is first introduced into the carburetor it will flow into chamber 43 through chamber 24a until the pressure exerted by the confined air in chamber 43 prevents further flow of fuel into that chamber. When the fuel thus enters 43 at the bottom, the static head of the fuel in the float chamber 11 compresses the air in the reservoir 43 above the entering fuel until equilibrium is reached. This compressed air is then in condition to act to rapidly force the fuel out of the reservoir into space 24a which is directly and closely adjacent 43 when the engine conditions demand a temporary extra small supply of fuel. After such temporary excess withdrawal of fuel is completed, the compression conditions are reestablished in chamber 43 ready for a further operation when the demand arises. The exact level of this fuel in the chamber is unimportant.

At nearly closed throttle position air passes from conduit 14 through passage 41 and into passage 32, as has been described. However, the throttle does not need to be opened very far before the suctions in passage 32 and in conduit 14 adjacent the port 41 become equal and there is no movement of air through port 41. A further opening of the throttle will cause air to be drawn from passage 32 through port 41 and into conduit 14.

About the time that the throttle valve 19 is opened far enough so that the openings 42 begin to lose their effectiveness in leaning out the mixture, the suction in passage 32 becomes sufficient to cause relief valve 37 to come into action thereby keeping the mixture lean. Also engine speeds above normal will cause an early opening of relief valve 37 thereby causing a leaning out of the mixture.

As the above conditions cover all ordinary engine speeds and loads it will be seen that my invention is economical under ordinary working conditions, and at the same time the conditions for maximum power can always be produced by simply opening the throttle to its full open position.

It has been previously mentioned that air is drawn into passage 27 through ports 30 from air chamber 21. The air in chamber 21 is drawn from the heated air inlet 15 through air conduit 22. Consequently, the air in chamber 21 is heated air and it preheats the fuel in fuel tube 24 by conduction

through the metal of the tube, and, as the air passes through the ports 30, it imparts additional heat to the particles of fuel carried along with it.

No attempt is made to atomize the fuel at openings 30 and 36. The fuel is simply picked up at these points and swept along the passages and tubes by the heated air currents until it reaches the ports and openings leading into conduit 14 where the air currents are caused to be strong enough to finely atomize the heated fuel as it is thrown into the conduit.

I claim:—

1. In a carburetor, the combination comprising a main conduit, a mixing chamber in said conduit having openings communicating with the atmosphere, a main source of air supply connecting with said mixing chamber, a source of fuel supply connecting with said mixing chamber and a throttle valve for regulating the proportion of air flowing through said conduit which is drawn from said source of air supply and through said openings, said openings being so disposed that the edge of the throttle valve itself traverses the openings so that a partially closed position of said throttle valve will leave uncovered sufficient area of said openings to create an appreciable leaning of the mixture, said opening and throttle being so relatively disposed as to admit air both below and above the throttle when the throttle is in partially closed position.

2. In a carburetor, having a main conduit, and a throttle valve disposed within said conduit in combination with a mixing chamber within said conduit, having openings through the wall of the conduit to admit air into said conduit to lean the mixture, said openings being so disposed in the wall with respect to the throttle valve as to be traversed by the throttle valve itself when said throttle valve is in a partially closed position and to admit air into the conduit both below and above the throttle as such conduit traverses the openings.

3. The invention set forth in claim 2 in which the openings extend downwardly from a point substantially in line with the edge of the throttle when in closed position to a position which is substantially below the edge of the throttle when in such closed position.

4. A carburetor comprising a conduit with a throttle, valve therein and having a mixing chamber adjacent the throttle, means for supplying mixture above the throttle at idling speeds, said means comprising a passage with means for supplying both fuel and air thereto, means for supplying mixture to the mixing chamber for running with open throttle, said means comprising a supplementary fuel passage, means for supplying fuel and air to said passage, ports leading from said last mentioned passage to the mixing chamber, and means for supplying progressively greater quantities of auxiliary air as the throttle is opened, said means comprising air ports in the conduit disposed to be directly traversed and uncovered by the edge of the throttle to afford an air passage above the throttle of progressively greater size as the throttle opens.

In testimony whereof I hereto affix my signature.

EDWARD F. GEIGER.