

May 30, 1961

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2,986,381

CARBURETOR FOR INTERNAL COMBUSTION ENGINES

Filed Sept. 8, 1959

4 Sheets-Sheet 1

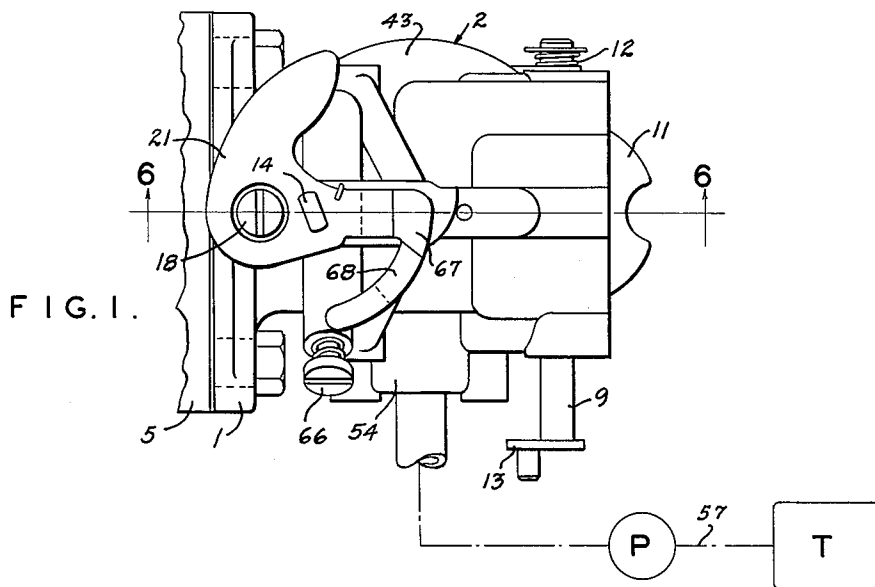


FIG. 1.

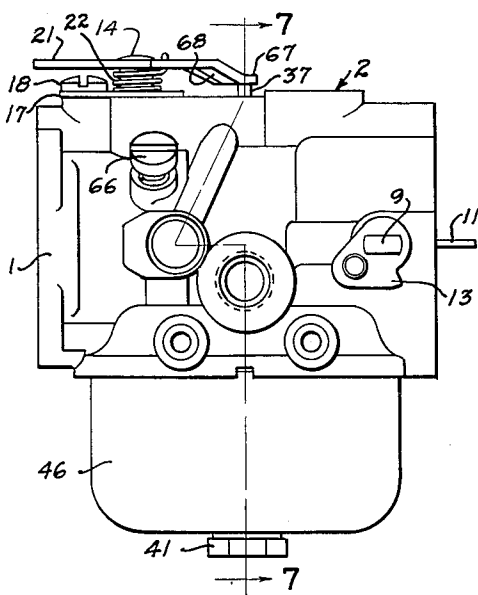


FIG. 2.

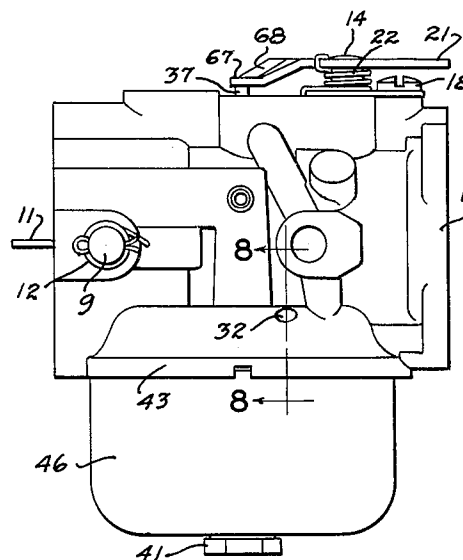


FIG. 3.

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4 Sheets-Sheet 2

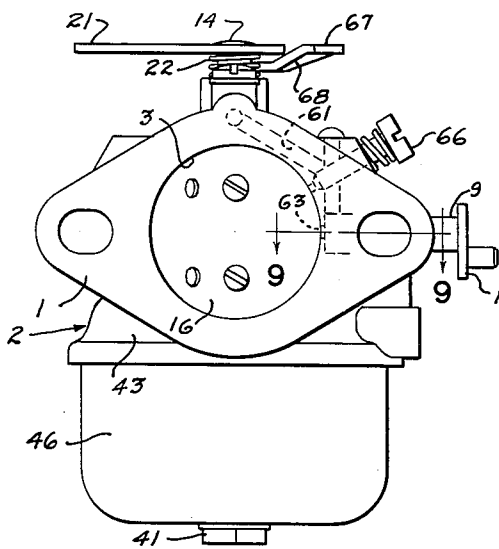


FIG. 4.

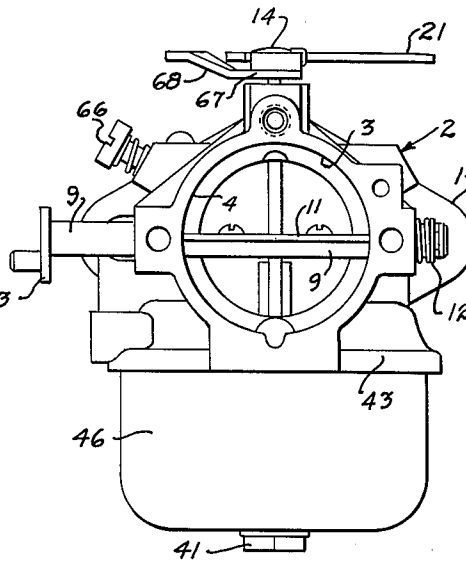


FIG. 5.

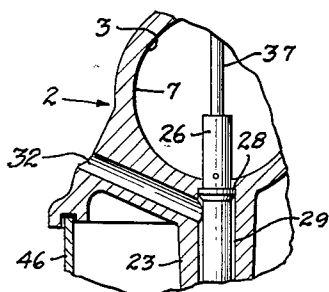


FIG. 8.

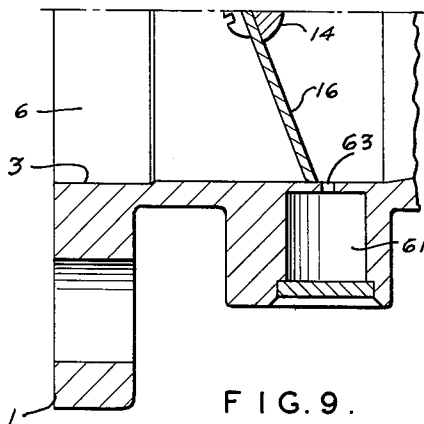


FIG. 9.

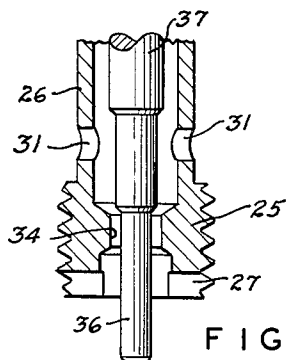


FIG. 10.

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4 Sheets-Sheet 3

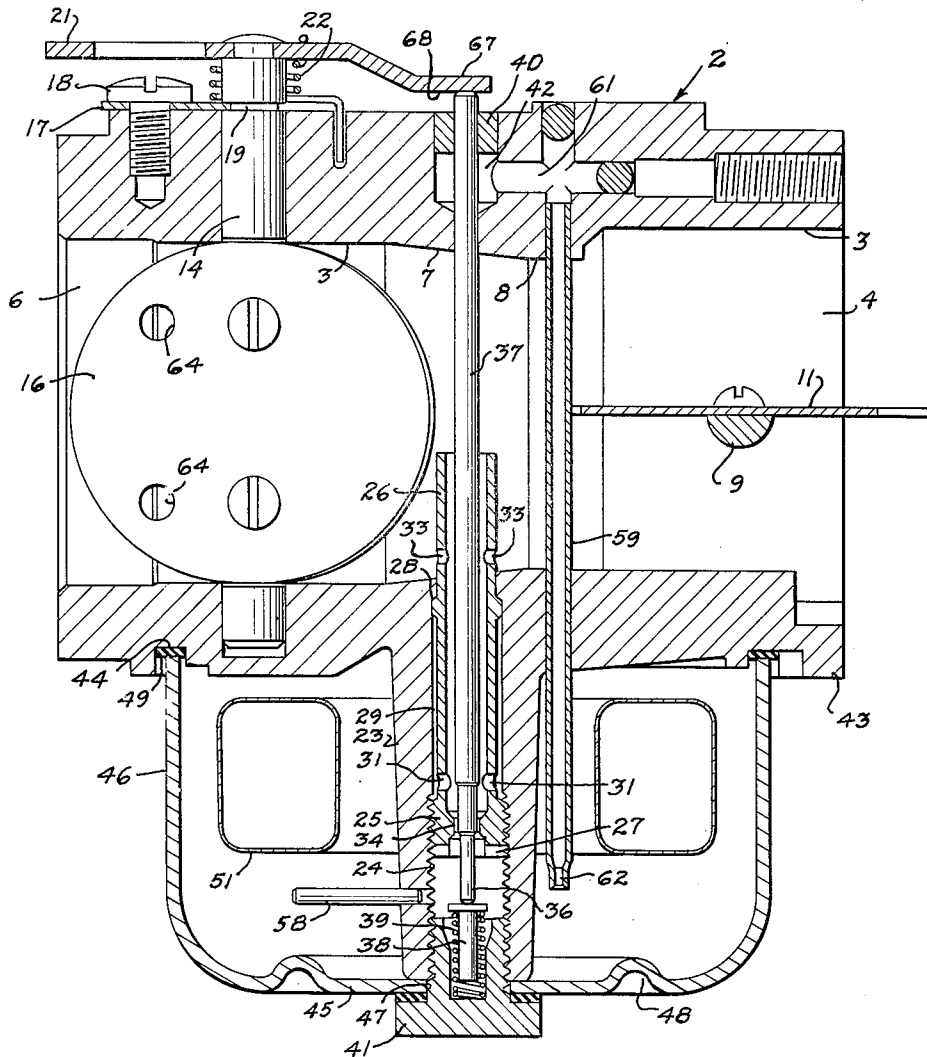


FIG. 6.

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4 Sheets-Sheet 4

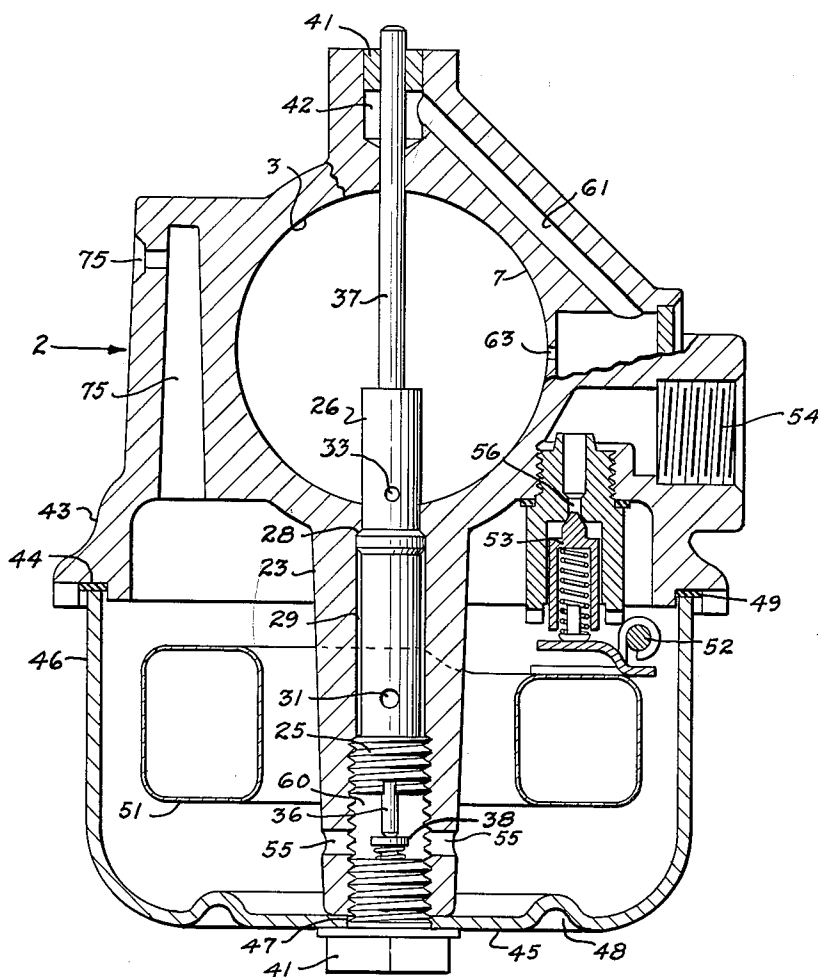


FIG. 7.

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2,986,381

CARBURETOR FOR INTERNAL COMBUSTION ENGINES

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6 Claims. (Cl. 261—41)

This invention relates to carburetors for internal combustion engines, and more particularly, to a carburetor embodying means for more accurately controlling the proportion of fuel and air supplied to an engine to provide greater economy and better engine performance.

The present invention contemplates the provision of a carburetor particularly adapted for use on outboard motors for boats. For many years, outboard motors were of relatively small horsepower and consumed small quantities of fuel. Therefore, fuel economy was not an important factor. During recent years, the market is being supplied with high horsepower outboard motors which consume large quantities of fuel. It is, therefore, an object of the invention to provide a carburetor which more accurately controls the fuel mixture supplied to the engine to effect greater economy of operation and better engine performance.

Another object of the invention resides in the provision of a common manually operable control mechanism for accurately proportioning the fuel and air mixture supplied to meet engine requirements throughout the range of engine speeds.

A further object of the invention resides in the provision of a carburetor embodying an idle fuel system and a main fuel system selectively operable responsive to manual operation of a throttle valve, the main fuel system embodying a stepped fuel metering rod axially movable within a main fuel nozzle.

Another object of the invention resides in the provision of a carburetor embodying a fuel well surrounding the main fuel nozzle to supply an additional quantity of fuel and air to the main nozzle during fast acceleration of an engine.

Another object of the invention is to provide a carburetor which is inexpensive in construction and reliable in operation throughout the speed range of an engine.

The invention embodies other novel features, details of construction and arrangement of parts which are hereinafter set forth in the specification and claims and illustrated in the accompanying drawings, forming part thereof, wherein:

Fig. 1 is a top plan view illustrating a carburetor embodying features of the invention.

Fig. 2 is an elevation showing one side of the carburetor.

Fig. 3 is an elevation showing the other side of the carburetor.

Figs. 4 and 5 are elevations showing opposite ends of the carburetor.

Fig. 6 is a longitudinal section taken along the line 6—6 of Fig. 1.

Fig. 7 is a transverse section taken along the line 7—7 of Fig. 2.

Fig. 8 is a fragmentary section taken along the line 8—8 of Fig. 3.

Fig. 9 is a fragmentary section taken along the line 9—9 of Fig. 4 showing the throttle valve in closed position.

Fig. 10 is a fragmentary section illustrating the metering rod as positioned within the main fuel nozzle to control the flow of fuel therethrough.

Referring now to the drawing for a better understanding of the invention, the carburetor is shown in Figure 6 specifically as comprising a body 2 having a horizontal mixture conduit 3 provided with an air inlet 4, an outlet 6, and a venturi 7 having a throat 8. A flange 1 (Figs. 1 and 4) is provided on the outlet end of the body for attachment to an engine inlet manifold 5.

A choke valve shaft 9 is journaled in bearing apertures formed in the body 2 to support a choke valve 11 for pivotal movement within the air inlet 4. The choke valve 11 is normally maintained in its full open position, as indicated in Fig. 6, by means of a torsion spring 12 (Fig. 5) having one end thereof secured to the shaft 9 and its other end secured to the body 2. The choke valve 11 is adapted to be pivoted to its closed or choke position by manual movement of an arm 13 secured to one end of the choke shaft 9.

A throttle shaft 14 is journaled in bearing apertures formed in the body 2 to support a throttle valve 16 for pivotal movement in the outlet 6, the shaft being engaged against axial movement relative to the body 2 by means of a plate 17 secured to the body by a screw 18 and having an end thereof engaged in an annular groove 19 formed in the shaft. A manually operable control arm 21 is secured to one end of the throttle shaft 14 to control the proportion and quantity of fuel and air supplied to the engine. The throttle valve 14 is biased toward its closed position by means of a helical torsion spring 22 having one of its ends engaging the body 2 and its other end engaging the control arm 21.

The body 2 is provided with a downwardly projecting tubular stem 23 having its lower end internally threaded at 24 for engagement with the lower externally threaded end 25 of a main fuel nozzle 26, as illustrated in Fig. 6. The lower end of the nozzle 26 is slotted at 27 for engagement by a screw driver during assembly to rotate the nozzle into tight leakproof engagement against an annular shoulder 28. The portion of the nozzle between its threaded end 25 and the shoulder 28 is reduced in diameter to define with the stem 23 a fuel well 29. A plurality of ports 31 are formed in the nozzle for the passage of fuel into and out of the lower end of the well 29, and an air bleed passage 32 (Fig. 8) is formed in the body 2 leading from atmosphere to the upper end of the well.

The upper end of the main fuel nozzle 26 projects upwardly into the venturi 7 posterior to the throat 8 and is provided with a plurality of low speed ports 33. A fuel metering orifice 34 is formed in the lower end of the main fuel nozzle 26 to receive the lower end 36 of a metering rod 37. The lower end of the metering rod 37 engages a headed pin 38 which is resiliently supported upon a helical compression spring 39 seated at its lower end in a fuel bowl mounting screw 41. The upper end of the metering rod 37 extends through a bearing 40 press-fitted into an opening 42 in the body 2.

The lower portion of the body 2 is formed with a downwardly projecting annular flange 43 having a recess 44 therein to receive the rim portion of a cup-shape fuel bowl 46, the bottom 45 of the bowl having an aperture 47 to receive the screw 41, and an annular inturned bead 48 concentric with said aperture. During assembly, the screw 41 first engages the bowl rim against a gasket 49 in the recess 44, and then forces the bowl bottom 45 against the stem 23.

A hollow ring-shape float 51 is mounted on a pin 52 (Fig. 7) for pivotal movement within the fuel bowl to actuate a conventional needle valve 53 to control the flow of fuel through an inlet 54 and valve port 56 into the

bowl. The float and valve are adapted to coact to maintain a substantially constant fuel level within the bowl. An air vent 75 leads through the body 2 to the bowl. Fuel is supplied from a tank T (Fig. 1) through a conduit 57 and pump P to the fuel inlet 54. A stop pin 58 (Fig. 6) is provided on the stem 23 to limit downward movement of the float 51. Fuel passes from the bowl through ports 55 into a chamber 60 in the stem 23 below the orifice 34.

An idle fuel system is shown as comprising a hollow idle tube 59 (Fig. 6) extending vertically from within the fuel bowl 46 through the venturi throat 8 to an idle passage 61 in the body 2, the lower end of the tube 59 being disposed below the fuel level in the bowl and provided with a restricted orifice 62. The idle passage 61 extends to an idle port 63 (Fig. 7) leading into the mixture conduit 3 anterior to the edge of the throttle valve 16 when the latter is in its closed position, as illustrated in Fig. 9. Apertures 64 are provided in the throttle valve 16 for the passage of air when the latter is in its closed position. An idle adjustment screw 66 (Fig. 4) is threaded into the body 2 to regulate the flow of fuel through the idle passage 61.

A cam 67 having an inclined surface 68 is provided on the control arm 21 for slidable engagement along the upper end of the metering rod 37 responsive to rotational movement of the control arm, whereby the metering rod is moved axially to vary the quantity of fuel passing through the orifice 34. The lower end of the metering rod may be provided with one or more sections of different diameters, as shown in Fig. 10, or may be formed with a long tapering surface, whereby the flow area through the orifice 34 may be varied responsive to axial movement of the metering rod.

In the operation of the carburetor thus shown and described, fuel is forced from the tank T and through the conduit 57 to the intake 54 by the pump P, and thence through the valve port 56 into the fuel bowl 46 under control of the float actuated needle valve 53 to maintain the fuel at a predetermined level within the bowl.

During idle operation of an engine, the throttle valve 16 is in its closed position and fuel is supplied to the mixture conduit 3 through the idle tube 59, passage 61, and idle port 63, under control of the idle adjustment screw 66. To effect a slight increase in engine speed, the control arm 21 is manually pivoted to move the throttle valve 16 to a part open position to cause fuel to be drawn upwardly through the main nozzle 26 and out through the ports 33 into the mixing conduit 3.

Further gradual pivotal movement of the control arm 21 moves the throttle valve 16 toward its full open position and permits the spring 39 to raise the metering rod 37 as the latter passes along the inclined surface 68 on the cam 67 to thereby increase the flow area and the volume of fuel flowing through the orifice 34 for passage upwardly and out through the upper end of the main nozzle 26 into the center of the mixture conduit 3.

When the throttle valve 16 is opened quickly to provide rapid acceleration of an engine, additional fuel and air is drawn from the well 29 through the openings 31 into the main nozzle 26 for discharge therefrom into the mixing conduit 3.

By providing a manually operable mechanical means for simultaneously operating the throttle valve and metering rod, the quantity and proportion of fuel and air may be accurately controlled to effect a material saving of from 10% to 30% in fuel and an improvement in engine performance during idling, part throttle, acceleration, and full throttle. In the operation of a boat equipped with two 50 or 60 horsepower engines, it will be appreciated that such a saving in fuel is of major importance, as it decreases the cost of operation and permits an increase in the range a boat may travel when supplied with a predetermined quantity of fuel.

Certain structures have been described herein which

will fulfill all the objects of the present invention, but it is contemplated that other modifications will be obvious to those skilled in the art which come within the scope of the invention as defined by the appended claims.

I claim:

1. A carburetor for an internal combustion engine and comprising a body including a mixture conduit adapted to be horizontally disposed and having an inlet, an outlet and a venturi surface therebetween, a throttle valve in said outlet, a throttle shaft journaled in said body and secured to said throttle valve, a fuel bowl mounted on said body, means forming a tubular fuel passage extending from said body and terminating at one end in said bowl, a main fuel nozzle mounted in said fuel passage means and projecting through said venturi surface into said mixture conduit, means forming in said terminating end of said fuel passage a metering orifice, a movable metering rod extending through said nozzle and having a tapered end extending through said orifice to vary the flow area therethrough, an opening from said fuel bowl into said fuel passage for the flow of fuel from said bowl upwardly through said nozzle, said fuel passage means and said nozzle defining an annular well provided at its upper end with an air bleed passage, said nozzle having an opening leading to the lower end of said well above said metering orifice and adjacent to said tapered metering rod end, and mechanical means to actuate said throttle valve and metering rod simultaneously to variably proportion the fuel air mixture supplied to satisfy engine requirements at different speeds, said mechanical means comprising a spring biasing said metering rod in one direction, a control arm secured to said throttle shaft and a cam on said arm engaging the other end of said metering rod for moving said metering rod against said biasing spring.

2. A carburetor for an internal combustion engine and comprising a body including a horizontal mixture conduit having an inlet, an outlet and a venturi surface therebetween, a throttle valve in said outlet, a throttle shaft journaled in said body and secured to said throttle valve, a fuel bowl mounted on said body, a tubular stem depending from said body into said bowl, a hollow screw extending through said fuel and threaded into said stem to fasten said fuel bowl to said stem, a main fuel nozzle mounted in said stem and projecting through said venturi surface into said mixture conduit, a metering orifice adjacent to the lower end of said stem, a movable metering rod extending through said nozzle and having a tapered end extending through said orifice therein to vary the flow area through said orifice, and stem having an opening for the passage of fuel from said bowl upwardly through said nozzle, said stem and nozzle defining an annular well provided at its upper end with an air bleed passage, said nozzle having an opening leading to the lower end of said well above said metering orifice and adjacent to said tapered metering rod end, and mechanical means to actuate said throttle valve and metering rod simultaneously to variably proportion the fuel air mixture supplied to satisfy engine requirements at different speeds, said mechanical means comprising a spring means within said hollow screw and in contact with said tapered metering rod end for biasing said metering rod in one direction, a control arm secured to said throttle shaft, and a cam on said arm engaging the other end of said metering rod for moving said metering rod against said biasing spring means.

3. A carburetor for an internal combustion engine and comprising a body including a mixture conduit having an inlet, an outlet and a venturi surface therebetween, a throttle valve in said outlet, a throttle shaft journaled in said body and secured to said throttle valve, a fuel bowl mounted on said body, a tubular stem depending from said body into said bowl, a hollow screw extending through said fuel bowl and threaded into said stem to fasten said fuel bowl to said stem, a main fuel nozzle mounted in said stem and projecting through said venturi

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surface into said mixture conduit, said fuel nozzle having a metering orifice adjacent to its lower end, a movable metering rod extending through said nozzle and having a tapered end extending through said orifice therein to vary the flow area through said orifice, said stem having an opening for the passage of fuel from said bowl upwardly through said nozzle, said stem and nozzle defining an annular well provided at its upper end with an air bleed passage, said nozzle having an opening leading to the lower end of said well above said metering orifice and adjacent to said tapered metering rod end, and mechanical means to actuate said throttle valve and metering rod simultaneously to variably proportion the fuel air mixture supplied to satisfy engine requirements at different speeds, said mechanical means comprising a spring means within said hollow screw and in contact with said tapered metering rod end for biasing said metering rod in one direction, a control arm secured to said throttle shaft, a cam on said arm engaging the other end of said metering rod for moving said metering rod against said biasing spring means, and a spring connected to said control arm to move said cam and metering rod against said biasing spring means.

4. A carburetor for an internal combustion engine and comprising a body including a horizontal mixture conduit having a venturi surface therein, a throttle valve in said mixture conduit, a throttle shaft journaled in said body and secured to said throttle valve for moving said throttle valve from an open to closed position, a fuel bowl mounted on said body, a tubular structure depending from said body into said bowl, a main fuel nozzle mounted in said tubular structure and projecting through said venturi surface into said mixture conduit, a metering orifice adjacent to the lower end of said tubular structure, a movable metering rod extending through said nozzle and having a tapered end extending through said orifice therein to vary the flow area through said orifice, said tubular structure having an opening for the passage of fuel from said bowl upwardly through said nozzle, means to actuate said throttle valve and metering rod to variably proportion the fuel air mixture supplied to satisfy engine requirements at different speeds, and an idle fuel system comprising an idle tube extending through said venturi surface and across said mixture conduit, one end of said idle tube extending into said fuel bowl and the other end thereof terminating in said body, said body having an idle port opening into said mixture conduit anterior to said throttle valve in closed position and an idle passage leading from said other end of said idle tube to said idle port.

5. A carburetor for an internal combustion engine and comprising a body including a mixture conduit having a venturi surface therein, a throttle valve in said mixture conduit, a throttle shaft journaled in said body and secured to said throttle valve for moving said throttle valve from an open to a closed position, a fuel bowl mounted on said body, a tubular stem depending from said body into said bowl, a main fuel nozzle mounted in said stem

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and projecting through said venturi surface into said mixture conduit, said fuel nozzle having a metering orifice adjacent its lower end, a movable metering rod extending across said mixture conduit and through said nozzle and having a tapered end extending through said orifice therein to vary the flow area through said orifice, said stem having an opening for the passage of fuel from said bowl upwardly through said nozzle, means to actuate said throttle valve and metering rod to variably proportion the fuel air mixture supplied to satisfy engine requirements at different speeds, and an idle fuel system comprising an idle tube extending through said venturi surface and across said mixture conduit parallel to said metering rod, one end of said idle tube extending into said fuel bowl and the other end thereof terminating in said body, said body having an idle port opening into said mixture conduit anterior to said throttle valve in closed position and an idle passage leading from said other end of said idle tube to said idle port.

6. A carburetor for an internal combustion engine and comprising a body including a mixture conduit adapted to be horizontally disposed and having a venturi surface therein, a throttle valve in said mixture conduit, a throttle shaft journaled in said body and secured to said throttle valve for moving said throttle valve from an open to closed position, a fuel bowl mounted below said body, a tubular structure depending from said body into said bowl, a main fuel nozzle mounted in said tubular structure and projecting through said venturi surface into said mixture conduit, means forming a metering orifice adjacent to the lower end of said tubular structure, a movable metering rod adapted to be vertically disposed and extending across said mixture conduit through said nozzle and having one tapered end extending through said orifice therein to vary the flow area through said orifice, means slidably mounting the other end of said metering rod in the upper portion of said body, and an idle fuel system comprising an idle tube adapted to be vertically disposed and extending through said venturi surface and across said mixture conduit, one end of said idle tube extending into said fuel bowl and the other end thereof terminating in the upper portion of said body, said body having an idle port opening into said mixture conduit anterior to said throttle valve in closed position and an idle passage leading from said other end of said idle tube around said other metering rod end to said idle port.

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