June 8, 1965 R. E. KALERT, JR 3,188,060

CARBURETOR

Filed April 9, 1962 2 Sheets-Sheet 1

FIG. 1.

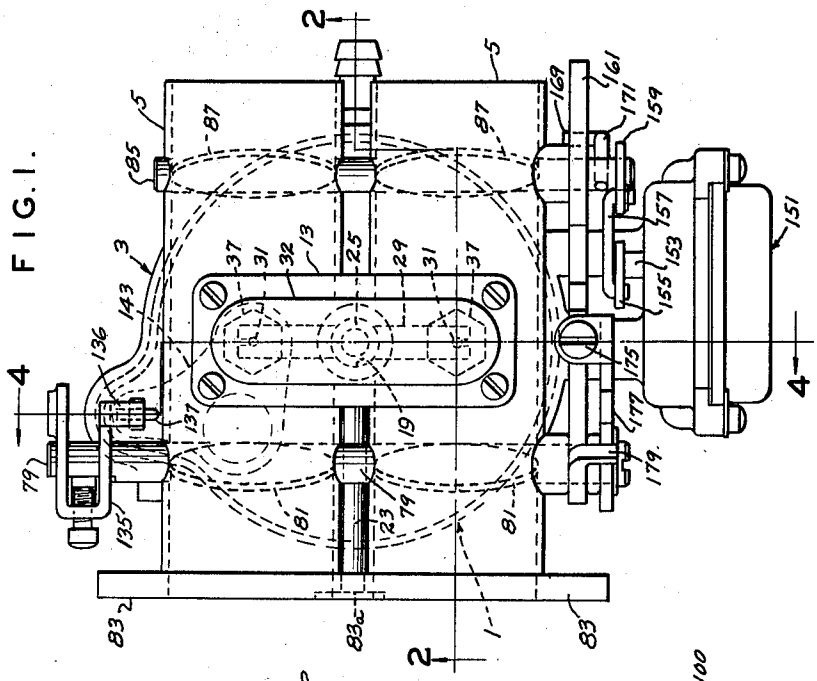


FIG. 2.

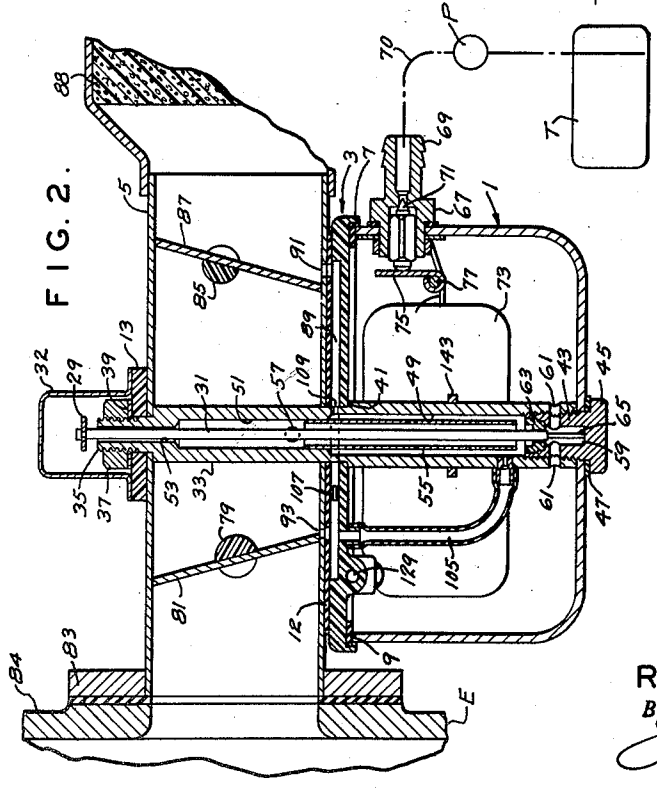
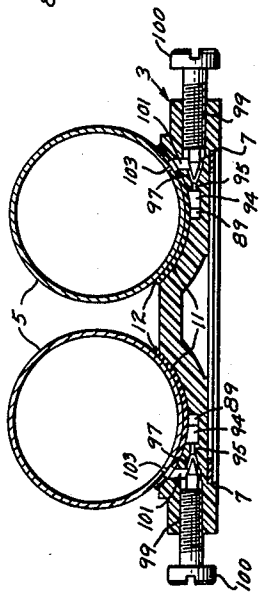


FIG. 3.



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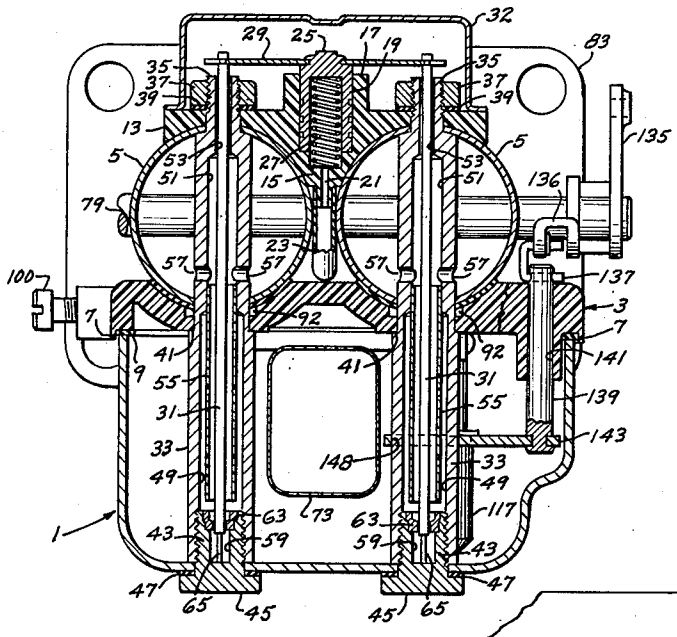


FIG. 4.

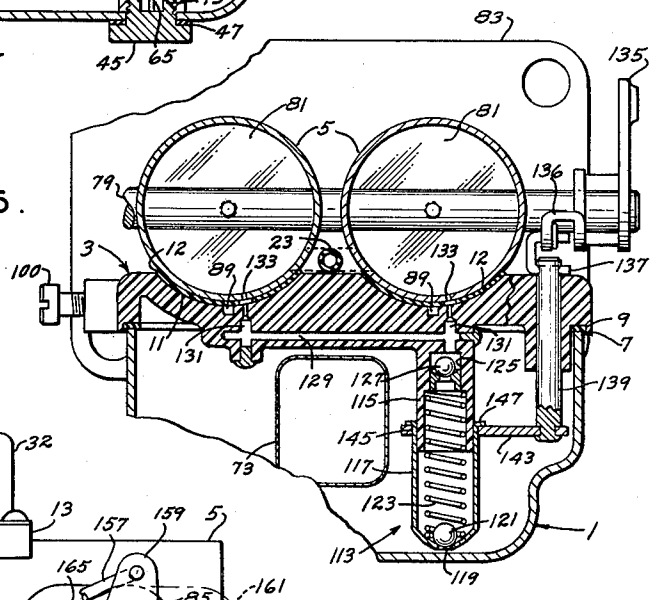


FIG. 5.

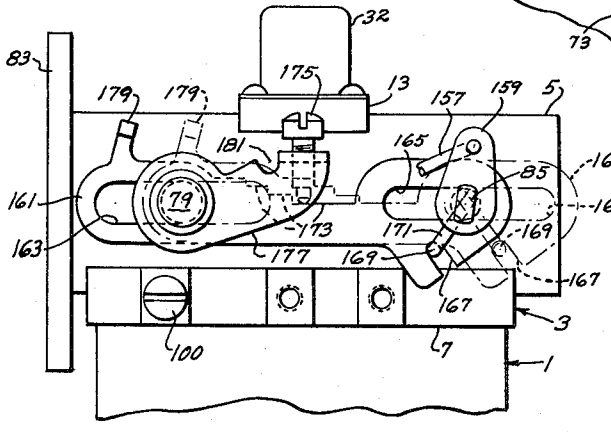


FIG. 6.

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3,188,060

CARBURETOR

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Filed Apr. 9, 1962, Ser. No. 186,083
10 Claims. (Cl. 261—23)

This invention relates to carburetors, and particularly to a dual carburetor for an internal combustion engine.

Among the several objects of the invention may be noted the provision of a carburetor, and particularly a dual carburetor of economical construction, as to which certain parts which have heretofore been die cast may be economically made of sheet metal, and as to which assembly of parts is simplified; the provision of such a dual carburetor in which the mixture conduits are economically constituted simply by cylindrical tubes, such as sheet metal tubes, located in side-by-side relation on a fuel receptacle, and in which elements are provided for fastening the tubes to the receptacle with these elements additionally serving the purposes of providing portions of restricted cross sectional areas in the tubes for a venturi effect and providing passages for induction of fuel from the receptacle to the tubes; the provision of a carburetor such as described having means for metering flow of fuel to the tubes, this means more particularly comprising metering rods extending through the fastener elements; and the provision of a carburetor such as described having an effective idle system, acceleration pump system, and fast idle control. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated.

FIG. 1 is a plan view of a dual carburetor of this invention;

FIG. 2 is a vertical longitudinal section taken substantially on line 2—2 of FIG. 1, and showing the inlet valve;

FIG. 3 is a vertical transverse section, omitting certain parts, showing a portion of the idle system of the carburetor;

FIG. 4 is a vertical transverse section taken on line 4—4 of FIG. 1, certain parts being omitted;

FIG. 5 is a vertical transverse section, omitting certain parts, showing the acceleration pump system; and

FIG. 6 is a fragmentary side elevation showing a fast idle control.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, a dual carburetor of this invention is shown to comprise a fuel receptacle constituted by a bowl 1 and a cover 3 on the bowl. Two mixture conduits, each designated 5, are located in horizontal side-by-side relation on cover body 3. Bowl 1 is shown as comprising a generally circular cup, and may be a deep-drawn sheet metal cup or molded plastic cup, for example. Cover 3 is shown as a generally circular molded plastic cover having a downwardly extending peripheral rim 7 which fits on the outside of the bowl. A gasket 9 is interposed between the cover and the rim of the bowl. Each mixture conduit 5 is shown as a cylindrical tube, and may be a sheet metal tube or a plastic tube, for example. The cover 3 has two elongate recesses of shallow arcuate cross section in its top, each recess being designated 11. The arcuate cross section of these recesses corresponds to the cylindric shape of tubes 5. These recesses are located side-by-side in the top of the cover, and each tube 5 is seated in a respective recess

with a gasket 12 under the tube. Each tube 5 is of such length as to project beyond the cover at both ends.

A saddle body 13, which as shown may be a molded plastic saddle, straddles the two tubes 5. The latter are spaced from one another to some extent, and the saddle has a central portion 15 extending down into the space between the tubes. It also has an upwardly extending central boss 17, with a vertical cylindric bore 19 extending down through the boss into the central portion 15 constituting a vacuum cylinder. A vacuum port 21 is provided at the lower end of this vacuum cylinder 19, and a vacuum tube 23 has one end connected to this port, extends out between the tubes 5, and is adapted for connection of its other end to the intake manifold of the engine on which the carburetor is used, as will be made clear, so that intake manifold vacuum is drawn in the lower end of vacuum cylinder 19. A piston 25 is vertically slidable in cylinder 19, and is biased upward by a spring 27. A crosshead 29 is secured on the upper end of the piston, extends laterally on both sides of the piston over the tubes 5, and carries two metering rods each designated 31 extending downward from its outer ends. A cover 32 is provided on the saddle.

Each metering rod 31 extends downward from crosshead 29 through a tubular fastener element or bolt 33 which extends vertically downward across the respective tube 5 on a diameter of the tube, and through the cover 3 and the bowl 1, reaching to the bottom of the bowl. There are two such bolts 33, one extending downward diametrically across one of the tubes, and the other extending downward diametrically across the other of the tubes. Each bolt 33 has a reduced upper end portion 35 which extends through a hole in the top of the respective tube 5 and through a hole in the saddle body 13, and which has a nut 37 threaded thereon with a sealing washer 39 under the nut. Each bolt extends down through a hole in the bottom of the respective tube, a hole in the respective gasket 12, and a hole in the cover 3, and has its lower end in engagement with the bottom of the bowl. Each bolt has an upwardly facing annular shoulder 41 engaged by the bottom surface of the cover 3. The tightening of each nut 37 draws the saddle, the respective tube 5 and the cover 3 together between the nut 37 and shoulder 41. Threaded in the lower end of each bolt is a screw 43 extending through a hole in the bottom of the bowl and having a head 45 engaging the bottom of the bowl, with a sealing washer 47 interposed between the head and the bottom of the bowl. Upon tightening screws 43, the heads 45 will press the fuel bowl upwardly and seal its rim against gasket 9.

As above mentioned, each bolt 33 is tubular, being internally formed to provide a cylindric fuel well 49 in the lower portion thereof within the bowl, a passage 51 of smaller diameter than the fuel well in the portion thereof within the respective tube 5, with a bore 53 at its upper end of smaller diameter than passage 51 sized for sliding fit of the metering rod 31 extending down therethrough. A fuel tube 55 has its upper end press-fitted in the lower end of passage 51, and extends down into the fuel well 49. Immediately above the upper end of the fuel tube, each bolt 33 has radial ports 57 from passage 51 into the respective tube 5. Each screw 43 has a recess 59 extending down from the upper end thereof, and each bolt and screw has ports as indicated at 61 in FIG. 2 for flow of fuel from the bowl into this recess. A metering jet 63 is threaded in the upper end of each recess 59, and the lower end of each metering rod which, as shown, has a single step 65, extends through the respective metering jet.

A needle valve body 67 is secured in a hole in the peripheral wall of the bowl 1. This has a nipple 69 for connection of a fuel line (not shown) for delivery of

fuel from a source of fuel to the bowl. A needle valve 71 in valve body 67 is controlled by a float 73 in bowl 1 on a float arm 75 pivoted at 77 in the bowl. The arrangement is such that upon lowering of the level of fuel in the bowl below a predetermined height (as determined by the setting of float 73), valve 71 is permitted to open for delivery of fuel to the bowl and when the fuel level rises to said predetermined height with accompanying rise of the float, valve 71 closes.

Fuel may be brought into the needle valve body 67 from a fuel tank T through a fuel conduit 70 connecting the fuel tank to the inlet fitting 69. An appropriate fuel pump P may be used to force fuel through conduit 70 into the carburetor inlet.

A throttle shaft 79 extends horizontally across the two tubes 5 adjacent one end of the tubes, constituting their downstream end. Two throttle valves each designated 81 are secured on this shaft, one in each tube 5. Each throttle valve, as shown, comprises an elliptical sheet metal disk. A flange plate 83 is provided on the downstream ends of tubes 5 to attach the carburetor to the intake manifold 84 of an engine E on which it is used. Vacuum tube 23 is connected to a hole in plate 83 (FIG. 1) as indicated at 83*a* so that intake manifold vacuum is drawn in tube 23 during engine operation.

Bolts 33 extend downward across tubes 5 generally centrally of the length of the tubes (and diametrically in relation to the tubes), and the throttle valves or throttles 81 are located on the downstream side of the bolts (FIGS. 2). The latter provide portions of restricted cross-sectional area in the tubes to provide a venturi effect. Upstream from bolts 33, a choke valve shaft 85 extends horizontally across the two tubes 5, adjacent the other end of the tubes (constituting their inlet end). Two choke valves each designated 87 are secured on this choke valve shaft, one in each tube. Each choke valve, as shown, comprises an elliptical sheet metal disk, and is unbalanced to open. An air cleaner, schematically shown at 88, is attached to the inlet ends of the tubes 5, to filter air flowing into the tubes 5 due to engine suction.

From the above, it will be apparent that for each mixture conduit or tube 5, there is provided a so-called high speed circuit (as distinguished from a low speed or idle circuit), operative when the throttle shaft is rotated to open the throttles to supply fuel from the bowl 1 to the tube 5. As to each tube 5, this circuit is via ports 61, recess 59 in screw 43, metering jet 63, fuel tube 55 and ports 57 in bolt 33. The rate of flow is determined by the position of metering rod 31 in jet 63, being relatively low when the metering rod is down (high intake manifold vacuum) and relatively high when the metering rod is up and the step 65 is in the jet (low intake manifold vacuum).

To provide an idle system for the mixture conduits or tubes 5, the cover body 3 is formed with a pair of blind-end grooves 89 (FIGS. 2 and 3) formed in the bottom of arcuate recesses 11. These grooves 89 extend lengthwise of the tube 5 underneath the tubes, and are sealed at the top by gaskets 12. Each tube 5 and the respective gasket 12 are ported as indicated at 91 for entry of air to the upstream end of the respective groove from upstream of the respective choke valve 87. The cover 3 is cored out as indicated at 92 in FIG. 4 for passage of air around each bolt 33 to the portion of the groove downstream from the bolt. For each tube 5, there is an idle port 93 communicating from the respective groove 89 through the wall of the tube 5 and gasket 12. Adjacent the downstream end of each groove 89, there is a laterally extending groove 94 (see FIG. 3) also sealed at the top by the respective gasket 12, which communicates through a horizontal passage 95 in the cover to the inner conical end 97 of an idle adjusting screw hole 99 extending horizontally inward from the side of the cover. An idle adjustment screw 100 is threaded in each hole 99. A passage 101 extends upward from each hole 99 adjacent its inner end to a hole in the respective gasket 12 in register with an idle adjustment port 103 in the respective tube 5. Two idle fuel tubes such as indicated at 105 in FIG. 2 are provided for delivery of fuel from fuel well 49 to the idle air passages provided by grooves 89 adjacent their downstream ends. A restriction 107 in each groove 89 provides a calibrated air bleed from port 91 into the idle circuit. A vent 109 (see FIG. 2) is provided in each bolt 33 in communication with the respective air passage 89 to provide atmospheric air pressure to the surface of the fuel in fuel wells 49.

For supplementing delivery of fuel to each tube 5 on acceleration (fast throttle opening), a fuel pump 113 (FIG. 5) is provided. This comprises a tubular boss 115 formed as an integral part of the cover body 3 extending down into the bowl 1. Vertically slidable on this boss is a cup-shaped pump member 117 formed as a hollow cylinder having an inlet port 119 at its lower end and a ball check valve 121 for port 119. A spring 123 biases member 117 downward to an extended position relative to boss 115. The latter has an outlet 125 at its upper end containing an outlet check valve 127. Outlet 125 communicates with a horizontal pump delivery passage 129 provided in cover 3 extending transversely in relation to tubes 5. Vertical passages 131 extend from horizontal passage 129 to pump delivery ports 133 provided in gaskets 12 and tubes 5. Passage 129 extends transversely relative to tubes 5 in a vertical plane downstream from the throttles so that ports 133 open into the tubes 5 downstream from the throttles.

A manually operable throttle lever 135 is provided on throttle shaft 79. Lever 135 has a pump operating arm 136 connected by a link 137 to a plunger 139 slidable in a vertical bore 141 in cover 3. A horizontal plate 143 (FIGS. 1 and 5) is fixed on the lower end of the plunger. This plate has an opening 145 receiving the pump member 117, the later having an outwardly directed flange 147 at its upper end bearing on the plate, and an opening 148 (FIG. 4) receiving one of the bolts 33 with a sliding fit, so that this bolt serves as a guide for the plate. The arrangement is such that on rotation of the throttle lever 135 and throttle shaft 79 to open the throttles, plunger 139 is pulled upwardly to move plate 143 upwardly thereby raising pump member 117 through a pressure stroke to pump fuel to tubes 5 via passages 129 and 131. On rotation of throttle shaft 79 in closing direction, plunger 139 and plate 143 moved downwardly to permit spring 123 to lower pump member 117. Check valve 121 opens for filling the pump member 117 with fuel from the bowl during its downward movement.

At 151 in FIG. 1 is indicated an automatic choke control of the type including a thermostatic coil responsive to engine temperature (and which may also include a manifold vacuum responsive piston). At 153 is indicated the shaft of the choke control. On this shaft is an arm 155 connected by a link 157 to an arm 159 on the choke shaft 85. It will be understood that the thermostatic coil of the choke control acts as a spring to bias shaft 153 to turn in the direction to close the choke valves 87, and that as the engine warms up, the coil relaxes to enable the choke valves to open. The details of the construction and operation of this automatic choke control are not further described as they do not constitute a part of this invention. A detailed description of a control similar to that shown at 151 is set forth in U.S. Patent 2,715,500 issued August 16, 1955 to L. D. Boyce.

At 161 is indicated a slide member having elongate horizontal slots 163 and 165 receiving the ends of the throttle shaft 79 and choke shaft 85 on the same side of the carburetor as the choke control 151. Toward its choke shaft end, slide 161 is formed with an angle 167 receiving a pin 169 on a crank arm 171 fixed to the end of the choke shaft. The arrangement is such that when the choke valves are closed, the slide 161 occupies the

right-hand dotted line position shown in FIG. 6, and as the choke shaft rotates to open the choke valves, the slide is moved toward the left to a position such as shown in solid lines in FIG. 6. The slide is formed with steps indicated at **173**, engageable by a stop screw **175** at the end of a throttle stop arm **177** secured on the end of the throttle shaft. The arrangement is such that when the slide **161** is in the closed-choke dotted line position, corresponding to a cold engine condition, screw **175** will engage the highest of the steps **173** to limit the degree of closure of the throttle valves thereby to provide for a fast idle operation of the engine. As the engine warms up, and when the throttle is opened, the unbalanced choke valves open and rotate the choke valve shaft **85** and arm **171** in clockwise direction, as viewed in FIG. 6. This moves the slide **161** toward the left, thereby bringing successively lower idle steps **173** into position for engagement by screw **175**, thereby reducing the degree of opening of the throttle valves for changing conditions of engine idle. The slide has a projecting lug **179** which is in the path of rotation of a surface **181** of arm **177**. When the throttle valves are fully opened under cold-engine closed-choke conditions surface **181** will strike lug **179** and pull the slide toward the left, to open the choke valves, so that air may be sucked into the intake manifold by cranking the engine. This clears the manifold of excess fuel in the event the manifold has been flooded.

Operation is as follows:

Upon high-speed operation (throttle valves **81** and choke valves **87** open), induction of fuel from bowl **1** to each tube **5** occurs via the respective ports **61**, recess **59**, metering jet **63**, fuel tube **55**, passage **51** and ports **57**. Induction occurs due to each bolt **33** traversing the respective tube and restricting its cross-sectional area generally centrally of the length of the tube, so that a venturi effect is obtained. Flow of fuel is metered by metering rods **31** which move up and down in response to variation in intake manifold vacuum. A predetermined level of fuel is maintained in the bowl by means of the float-controlled needle valve **71**.

For low-speed operation (throttle valves **81** in an idling position), induction of fuel occurs from each fuel well **49** to the respective tube **5** via the respective idle fuel tube **105**, groove or passage **89**, and ports **93** and **103**, idle air being supplied via passages **89** and economizers **107**. Slide **161** determines the position of the throttle valves at idle.

On fast opening of throttle valves **81**, pump **117** is actuated through a pressure stroke to pump fuel through passage **129** and branch passages **131** for delivery through ports **133** into the tubes **5**.

It will be observed that each bolt **33** and the respective nut **37** and screw **43** not only serve as means for fastening the respective tube **5** to the cover **3**, but also for fastening the cover to the bowl **1**, providing a venturi effect, and a passage for delivery of fuel from the bowl to the tube. Bowl **1** and tubes **5** may be sheet metal parts for economy, and may, where high corrosion resistance is desired, as for marine use, may be made of sheet brass. Here it will be understood that a cast brass construction would be uneconomic. The bowl cover **3** and saddle **13**, being molded plastic parts for example, are also corrosion-resistant. Other parts, such as bolts **33**, screws **43** etc., may be machined from corrosion-resistant metal, such as brass.

While the carburetor shown herein is a single-stage dual carburetor, it will be understood that certain features of the invention may be applicable to a two-stage dual carburetor, or to single carburetors or carburetors with more than two mixture conduits.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A carburetor comprising a fuel bowl, a cover for the bowl, two tubes each constituting a mixture conduit located in side-by-side relation on top of the cover, a saddle extending across the tubes, means for fastening the saddle on the tubes and for fastening the tubes on top of the cover and providing a portion of restricted cross-sectional area in each tube comprising two tubular fastener elements, each extending downward through the saddle, across a respective tube, through the cover and down into the bowl, each fastener element having a metering jet therein adjacent its lower end in the bowl for flow of fuel through said jet to the respective tube, said saddle being formed to provide a vertical vacuum cylinder between the tubes, said cylinder having a vacuum port at its lower end, means forming an air passage having one end connected to said vacuum port and the other end thereof positioned for connection to said engine for varying the pressure of air within said cylinder in accordance with engine operation, a piston slidable in said vacuum cylinder and extending out of the top of said vacuum cylinder, means biasing said cylinder in upward direction, a metering rod carrier on the upper end of the piston, and metering rods extending downward from said carrier through said fastener elements and metering jets.

2. A carburetor as set forth in claim **1** wherein each fastener element extends down to the bottom of the bowl, and has a screw threaded in its lower end through a hole in the bottom of the bowl for holding the cover on the bowl, said screw having a recess extending down from its upper end, each jet being secured in the upper end of the respective recess, each fastener element and screw being ported for entry of fuel from the bowl to the recess in the screw and for delivery of fuel from the fastener element to the respective tube.

3. A carburetor as set forth in claim **1** having a rotatable throttle shaft extending transversely across both tubes on one side of said fastener elements constituting the downstream side of said fastener elements, two throttle valves fixed to said throttle shaft one in each tube for movement from an open to a closed position, said tubes each formed with a bleed port through the wall thereof upstream of the choke valve therein and an idle port through the wall thereof adjacent to the closed position of said throttle valve therein, a choke shaft extending transversely across both tubes on the other side of said fastener elements, two choke valves on said choke shaft, one in each tube, and wherein said cover is formed to provide two idle air passages, one for each tube, from the bleed port to the idle ports in the tubes, and idle fuel lines connected to the fastener elements within the bowl above the jets and connected to said idle air passages.

4. A carburetor as set forth in claim **3** wherein said tubes are formed with pump delivery ports and said cover is formed to provide a pump delivery passage leading to said pump delivery ports in the tubes, said carburetor having pump means in the bowl for pumping fuel from the bowl to said pump delivery passage, and means for operating the pump means from the throttle shaft.

5. A carburetor for an internal combustion engine and comprising a pair of separate tubular members each adapted to be fixed at one end to said engine with the axes thereof horizontal during engine operation, a cover body extending below and fixed to said tubular members and including means on the top surface thereof spacing said tubular members from each other with said axes thereof substantially parallel, a removable fuel receptacle fixed to the bottom surface of said cover body and extending below said tubular members, a different choke valve movably mounted in each tubular member, a different throttle valve movably mounted in each tubular member

between the corresponding choke valve and said one end of the tubular member, means forming a different fuel passage from said fuel bowl to each one of said tubular members, said fuel passages each having an opening into the corresopnding tubular member between said corresponding choke and throttle valves for the passage of fuel from said fuel receptacle to said corresponding tubular member, said fuel passage means including a different tubular element extending vertically across each one of said tubular members to form a venturi restriction between the corresponding choke and throttle valves, each of said tubular elements having an end extending through the top of the corresponding tubular member, a saddle body fixed to said tubular element ends and having a portion extending between and spacing said tubular members, a metering jet in each of said fuel passages, a pair of metering rods each having one end thereof extending into a different one of said jets for metering fuel flow therethrough and movably mounted within a different one of said tubular elements, the other end of each of said metering rods extending through the end of the corresponding tubular element, and motor means mounted on said saddle body and fixed to said other metering rod ends to control movement of each of said one metering rod end within the corresponding jet in response to engine operation.

6. The invention of claim 5 wherein said cover body and said saddle body are formed of a plastic material.

7. The invention of claim 5, including means for moving said throttle valves simultaneously between open and closed positions, said cover body being formed with fuel conduits, a different idle fuel aperture through the wall of each tubular member adjacent to the closed position of the corresponding throttle valve, each of said apertures opening into a different one of said fuel conduits, and a pair of idle fuel tubes each having one end connected to the tubular element and the other end thereof opening into a different one of said fuel conduits.

8. The invention of claim 5, wherein said motor means comprises a closed chamber formed in said saddle body, means forming a movable wall of said closed chamber, connecting means joining said movable wall to said other metering rod ends for operating said metering rods, and means forming an air passage having one end connected to said closed chamber and the other end thereof adapted to the connected to said engine for varying the pressure of air within said closed chamber in accordance with engine operation for operating said movable wall and metering rods.

9. The invention of claim 7, wherein each of said idle tubes is connected to a different one of said fuel passages between the jet therein and the fuel passage opening into the corresponding tubular member whereby idle fuel to said idle tubes is controlled by the corresponding metering rod in accordance with engine operation.

10. A carburetor for an internal combustion engine and comprising a tubular member forming an air and fuel mixture conduit and adapted to be fixed at one end to said engine during engine operation, a molded plastic cover body fixed to one side of said tubular member, a removable fuel bowl fixed to said cover body, a choke valve movably mounted in said tubular member, a throttle valve movably mounted in said tubular member between said choke valve and said one end thereof, means forming a fuel passage from said fuel bowl to said tubular member, said fuel passage having an opening into said tubular member between said choke and throttle valves for the passage of fuel from said fuel bowl to said tubular member, said fuel passage means including a tubular element extending across said tubular member to form a venturi restriction between said choke and throttle valves, a tubular boss depending from and formed integral with said cover body and extending into said fuel bowl, a hollow cylinder telescoped over said boss for movement relative thereto, a coil spring within said boss and hollow cylinder biasing said hollow cylinder away from said boss, an inlet opening into lower end of said cylinder, an inlet check valve in said inlet cylinder opening, an outlet passage in the upper end of said boss, an outlet check valve in said outlet passage, operative means connected to said cylinder to move said cylinder over said boss against the bias of said coil spring, and a fuel passage through said plastic cover body connecting said outlet passage and said tubular member.

References Cited by the Examiner

UNITED STATES PATENTS

2,124,777	7/38	Hunt et al.	261—52
2,166,899	7/39	Blattner	261—52
2,400,035	5/46	Weber.	
2,501,926	3/50	Beard.	
2,518,794	8/50	Kittler et al.	
2,656,166	10/53	Foster.	
2,715,500	8/55	Boyce.	
3,013,778	12/61	Carlson et al.	
3,093,699	6/63	Demitz	261—72

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