

June 11, 1963

R. S. DEMITZ
CARBURETOR

3,093,699

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3 Sheets-Sheet 1

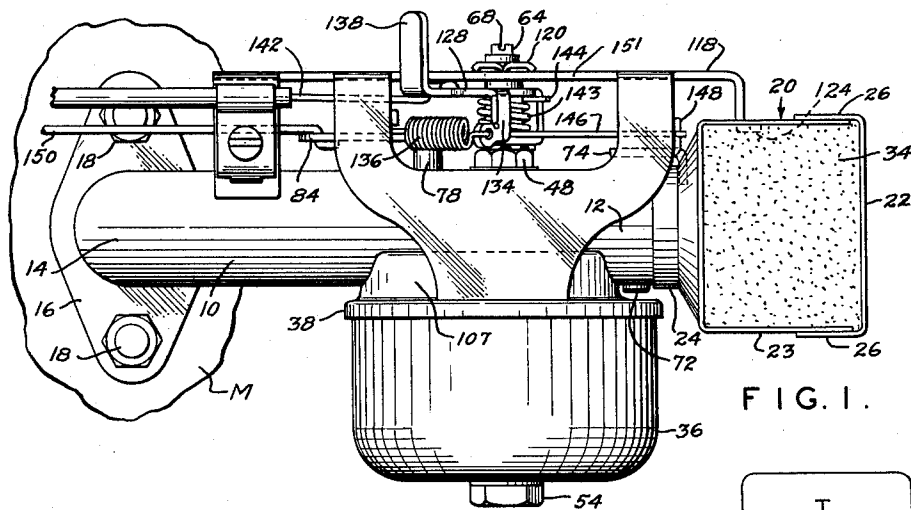


FIG. 1.

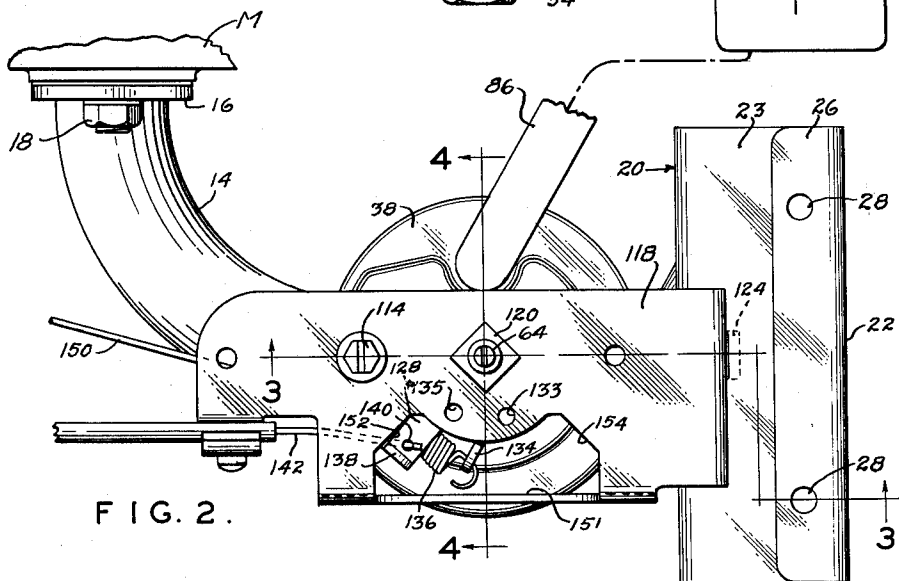


FIG. 2.

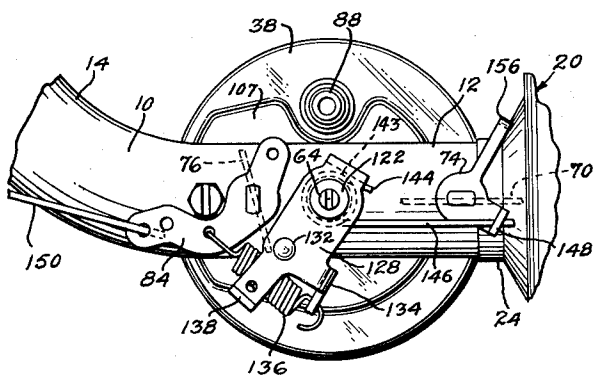


FIG. 7.

INVENTOR.
ROBERTS S. DEMITZ
BY *John B. Johnson*

AGENT

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R. S. DEMITZ

3,093,699

CARBURETOR

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FIG. 4.

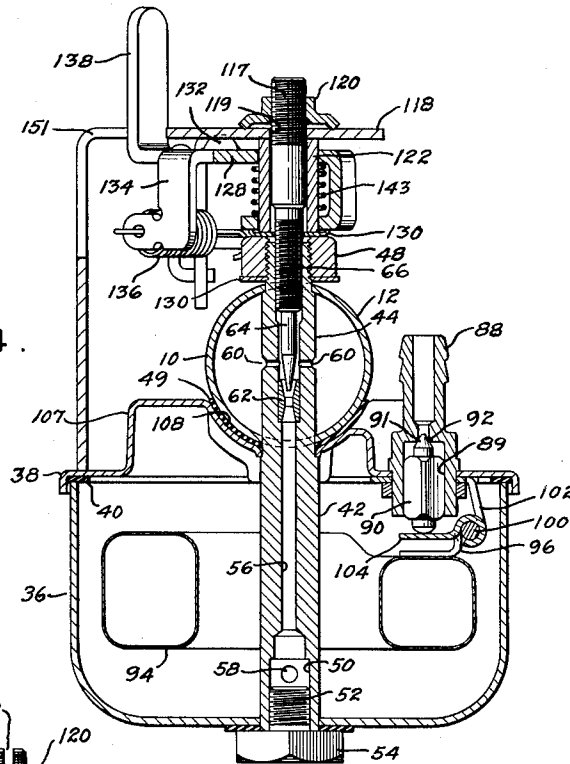
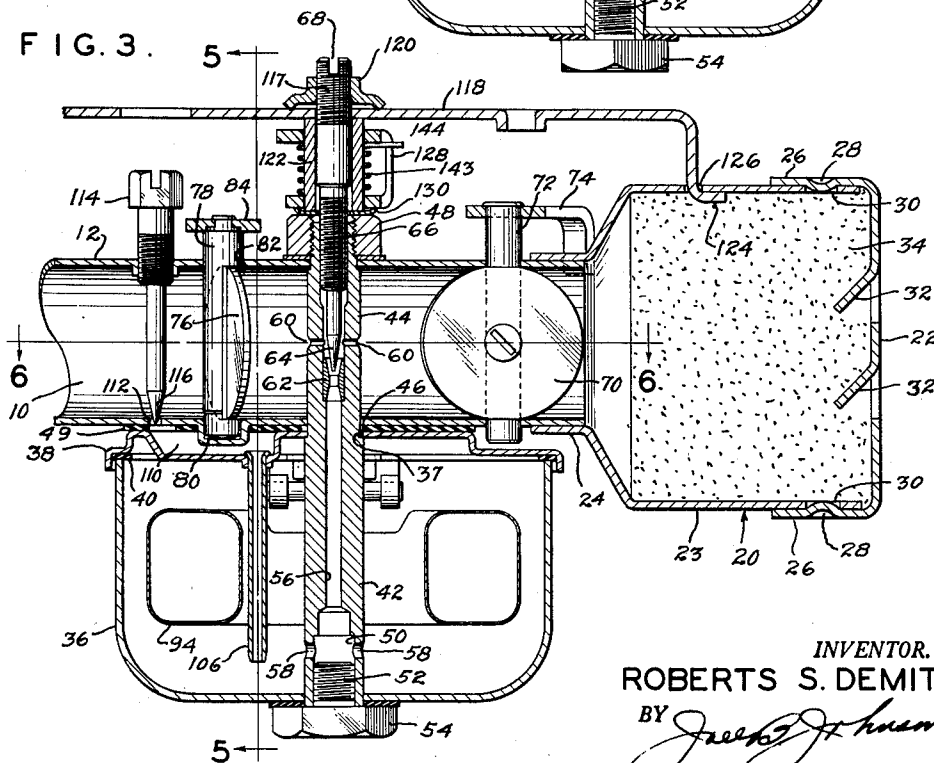


FIG. 3.



INVENTOR.
ROBERTS S. DEMITZ

BY *James J. Hanson*

AGENT

June 11, 1963

R. S. DEMITZ
CARBURETOR

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FIG. 5.

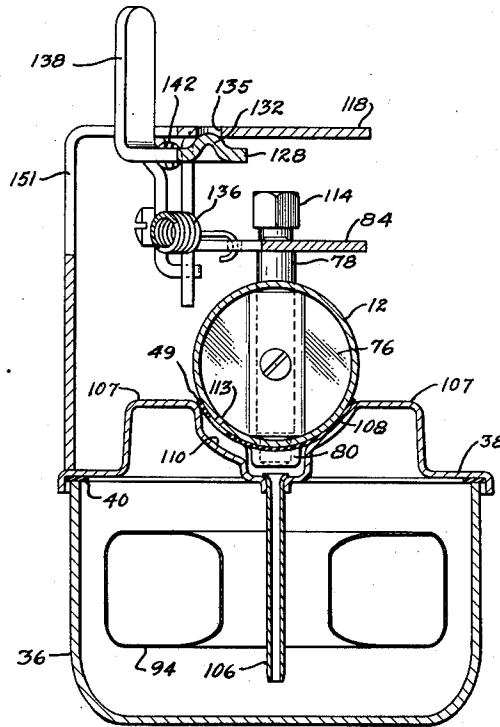
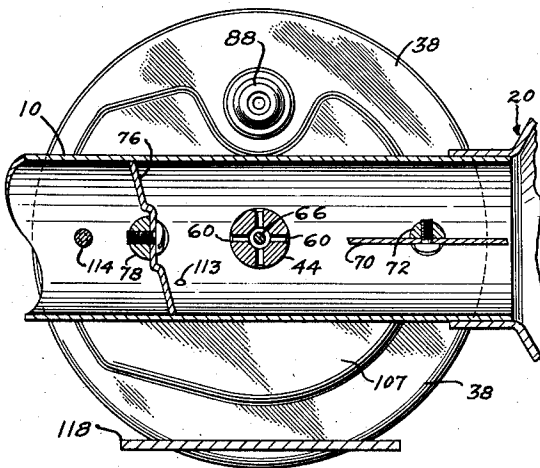


FIG. 6.



INVENTOR.
ROBERTS S. DEMITZ
BY *James D. Johnson*
AGENT

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3,093,699

CARBURETOR

Roberts S. Demitz, University City, Mo., assignor to ACF Industries, Incorporated, New York, N.Y., a corporation of New Jersey

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5 Claims. (Cl. 261-65)

This invention is directed to a carburetor for an internal combustion engine.

In the manufacturing of carburetors for small engines, it is often desirable that the cost of the carburetor be kept to a minimum. This may necessitate an economy in the manufacturing of the carburetor in which there is provided a minimum number of parts and a minimum amount of costly machine operations. Furthermore, it may be desirable that the parts themselves be made of low cost materials, which could eliminate costly die casting processes. Furthermore, it is necessary that a carburetor meeting these desirable objectives be also one which can be fabricated to reasonable tolerances with a minimum amount of scrap and further perform satisfactorily all of the functions expected of such a unit.

It is therefore an object of this invention to provide a novel carburetor for an internal combustion engine which is of low cost in manufacture.

It is another object of the invention to provide a novel carburetor for an internal combustion engine having a minimum number of parts so that the cost of the carburetor is further reduced.

It is another object of the invention to provide a novel carburetor for an internal combustion engine in which the parts of the carburetor are made from elements requiring a minimum number of costly machining operations.

It is another object of this invention to provide a novel, low cost carburetor for an internal combustion engine meeting required tolerances to minimize scrap in the manufacture of the carburetor.

The invention is one in which a carburetor has been designed to provide simple structural elements consisting of a tubular member for a mixture conduit and a cylindrical fuel bowl structure. The fuel bowl and mixture conduit are fixed together by a single common bolt, which is also utilized as the main fuel nozzle of the carburetor, as well as providing a restricted area in the mixture conduit for a pressure reducing venturi effect. The carburetor parts are made from sheet metal, resulting in a design which is simple in its manufacture and assembly, as well as one which eliminates costly parts formed by die casting and subsequent machining. Also the novel structure is one in which the tolerances provided by the fitted parts are within reason and provide an operable device for the purposes desired.

FIG. 1 is a view in elevation of the carburetor, in accordance with the invention shown, attached to the intake manifold of an engine.

FIG. 2 is a plan view of the carburetor of FIG. 1.

FIG. 3 is a partial, longitudinal sectional view of the carburetor of FIG. 2 as viewed along section lines 3-3.

FIG. 4 is a transverse sectional view of the carburetor of FIG. 2 along section lines 4-4.

FIG. 5 is a transverse sectional view of the carburetor along lines 5-5 of FIG. 3.

FIG. 6 is a partial longitudinal sectional view of the carburetor of FIG. 3 taken along section lines 6-6.

FIG. 7 is a partial plan view of the carburetor of FIGS. 1 and 2 with the control plate removed to show the underlying parts.

In accordance with the invention, and as shown in the figures of the drawing, the carburetor consists of a tubular mixture conduit structure 10, consisting of a sheet metal

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tube of uniform diameter having a straight portion 12 at one end and a curved portion 14 at the other end. A flange 16 is fixed to the curved end 14 of the mixture conduit and provides a means for attaching the carburetor to the manifold M of an engine. Attachment may be in any appropriate manner as by threaded bolts 18, for example, extending through flange 16 and threaded into the manifold M. The other end of the mixture conduit 10 is fixed to an air filter housing 20, which consists of a rectangular metal box structure 23 made of sheet metal in which one side 22 comprises a detachable metal plate and a cover for the air filter. The air filter structure 23 has a central portion drawn out into a cylindrical collar 24 which forms a press fitting onto the tubular end of the conduit portion 12, as shown in FIGS. 1 and 6, for example. The cover plate 22 of the air filter housing 20 is formed with a pair of longitudinal flange members 26 which fit over the side walls of the box structure 20 and in which are small indentations 28 for fitting into apertures 30 through the side walls of the box structure 20. The indentation 26 and apertures 30 form a means for detachably fastening the cover plate 22 to the air filter housing structure.

Within the cover plate 22 are formed longitudinal louvers 32 which are bent inwardly and provide openings through the cover for air entering the mixture conduit 10. Also, the ends of the air filter housing 23 are open for the admission of air into the housing. The housing itself is filled with an air filtering material, such as spun glass or a sponge plastic material, through which air may pass and the dirt particles therein filtered out. The air filter material 34 is formed in the shape of a rectangular block which fits snugly into the box structure 23 of the air filter.

Depending from the straight tubular portion 12 of mixture conduit 10, there is a fuel bowl or reservoir 36 which, as shown in the figures, is cup-shaped and cylindrical in form. The open end of the fuel bowl 36 is closed by a fuel bowl cover 38, which is formed to fit the circular top edge of the bowl 36. Fitted between the fuel bowl 36 and the cover 38 is a fuel resistant gasket 40 for preventing fuel leakage between the bowl and its cover 38.

A single bolt 42 is used for holding and fixing the mixture conduit 10 rigidly to the fuel bowl 36 and the fuel bowl cover 38. The bolt 42 extends through the bottom of fuel bowl 36, along the central axis of the fuel bowl 36, through an appropriate aperture 37 in the fuel bowl cover and transversely through the center of the conduit portion 12 substantially normal to the axis of the conduit 10. The portion of bolt 42 within the fuel bowl 36 is of slightly greater diameter than the portion 44 of the bolt passing through the conduit 10. Between these two bolt portions of different diameters there is thus formed a shoulder 46. The aperture 37 through the fuel bowl cover 38 is of the diameter of the bolt portion 44 so that shoulder 46 rests against the under side of the fuel bowl cover and for tightly holding the cover to the conduit structure 10. The upper portion of bolt 42 is threaded and supports a nut 48. In assembling the carburetor, bolt 42 is passed through the several carburetor parts and positioned, as shown in FIG. 3, with the shoulder 46 of the bolt against the underside of the fuel bowl cover 38. Tightening down of nut 48 against the upper surface of the conduit structure 12 tightens the fuel bowl cover 38 against a gasket 49 positioned between the fuel bowl cover and conduit 10.

The lower end of bolt 42 has an enlarged boring 50, which at the outer end thereof is threaded to receive a bolt 52 having a head 54. The carburetor fuel bowl 36 is attached to the bolt 42 by the headed bolt 52 which firmly presses the fuel bowl from its bottom to force the upper lip of bowl 36 against the flanged rim of the bowl cover 38 with the fuel resistive gasket 40 inbetween.

Bolt 42 is formed with a hollow passage 55 along its axis extending from the boring 50 upwardly into the upper bolt section 44. Ports 58 are formed in the lower end of bolt 42 to form passageways between the fuel bowl 36 into the enlarged boring 50. These ports 58 connect the fuel bowl to the axial passage 56. At the upper end of passage 56 other ports 60 are formed connecting passage 56 to the central region of the conduit 10. These ports 60 may be four in number, as shown in FIG. 6, and leading outwardly at 90 degrees from each other from passage 56. The ports 60 are positioned substantially on a common plane through the axis of the conduit portion 12 and normal to the axis of bolt 42. Within the upper portion of passage 56 and below ports 60 there is positioned a metering restriction element 62 into which an adjusting needle 64 partially extends. Needle 64 has a portion 66 threaded into the upper end of bolt 42 to provide axial movement of the needle 64 in restriction 62. Adjustment of the needle 64 can be made by use of a screw driver slot 68 at the other end of needle 64.

A choke valve 70 is mounted on a choke valve shaft 72 journaled through appropriate apertures in the conduit portion 12 between the air filter 20 and the upper end 44 of bolt 42. To one end of the choke shaft 72 is a choke operating lever 74. The choke valve 70 itself is an elliptical piece of metal having a transverse axis a little greater than the diameter of the conduit portion 12, and a conjugate axis substantially equal to the diameter of conduit portion 12. Thus, the choke valve 70, upon being turned from its opened position, shown in FIG. 6, to a closed position, will abut against the wall of the tubular conduit portion 12, which provides a stop means for the choke valve.

A throttle valve 76 is appropriately mounted for rotational movement within conduit portion 12 on a throttle shaft 78, which is journaled at one end in a recess 30 drawn out of the wall of conduit portion 12 and at the other end in an aperture 82 through the wall of the conduit. A throttle operating lever 84 is fixed to one end of the throttle shaft 78 to provide rotational movement to the throttle 76. Throttle valve 76 is formed in a manner similar to choke valve 70 with an elliptical configuration so that the wall of conduit portion 12 provides a stop means for the throttle, when rotated to its closed position, as shown in FIG. 6.

Fuel is brought into the fuel bowl 36 from a tank T by any appropriate means, such as gravity, for example, through a flexible conduit 86 to an inlet fitting 88, shown in detail in FIG. 4. Slidably mounted within an enlarged passage 89 of fitting 88 is a needle valve 90 having a sharp tapered conical point 91 at one end to cooperate with a valve seat structure 92 of fitting 88. Valve 90 is operatively controlled by a float operated mechanism, which consists of a float structure 94, to which is attached a float lever 96. One end of lever 96 is hinged about a pin 100 supported by an arm structure 102 from the inlet fitting 88. The other end of float lever 96 forms a valve operating arm 104, which abuts against the adjacent end of the needle valve 90. As is well known, the level of the fuel within bowl 36 determines whether fuel will flow past valve 90. When the fuel level in bowl 36 reaches a predetermined point, the float arm 104, acted upon by float 94, forces the needle valve 90 against its seat 92 to close off the flow of fuel in the fuel bowl through inlet fitting 88.

In operation, air sucked into the manifold M of the engine is pulled through the air filter material 34 and through the mixture conduit 10. During normal operation of the engine, the choke valve 70 is in a wide open position, as indicated in FIG. 6, for example. Also, the throttle 76 is between a partially open to wide open position. Thus, air can flow through the carburetor and the conduit 10 into the manifold M.

In accordance with the invention, air flowing through the conduit portion 12 is forced into the restricted regions

between the upper bolt portion 44 and the inner surface of the wall of conduit portion 12. These restricted regions provide a venturi effect, in which the flow of air is speeded up around the surface of bolt portion 44 with a resulting sub-atmospheric pressure in these regions. This sub-atmospheric pressure condition causes a flow of fuel under atmospheric pressure from the bowl 36 through ports 58 into the passage 56 and upwardly through the metering restriction 62. From restriction 62, the fuel flows out of ports 60. The ports 60, pointed upstream of the air flow, will permit some air to flow into the upper end of passage 56 to mix with the fuel and pass out of the downstream passages 60 as a mixture of fuel and air. The needle 64 is adjusted to provide the desired amount of fuel for part throttle and wide open throttle conditions of operation.

An idling system is provided, for low speed for idling operation of the engine and consists of a tube 106 extending into the fuel bowl at one end and having its other end press-fitted into the fuel bowl cover 38 and supported thereby. The fuel bowl cover is drawn to form projecting shoulders 107 (FIGS. 1, 4 and 5) and a semi-cylindrical supporting surface 108 which provides a cradle into which the mixture conduit portion 12 fits and is held in a fixed position and thus prevents relative movement between cover 38 and portion 12. A recess 110 (FIGS. 3 and 5) is formed in the cylindrical surface 108 and extends underneath and around the throttle shaft journaling recess 80. The upper end of idle tube 106 extends through the fuel bowl cover 38 into this recess 110. Gasket 49 seals the recess 110 from fuel flow between the cover 38 and conduit 10. An idle port 112 is formed through the wall of conduit 10 to provide passage of idle fuel from recess 110 into the mixture conduit 10. Port 113 through conduit 10 into recess 110 provides air flow into recess 110 to mix with the idle fuel. Port 113 thus provides an air bypass around the throttle 76 in its closed position. An idle adjustment screw 114 is threaded vertically through the upper wall of conduit 10, as shown in FIG. 3. Screw 114 has a pointed needle end 116 extending into idle port 112 to provide a manual control for idle mixture flow through port 112.

During operation of the idle system, the throttle 76 is normally closed or nearly closed. The high vacuum provided on the downstream side of throttle 76 is sufficient to suck fuel from bowl 36 through idle tube 106 into the recess 110 and out of the idle port 112. The fitting of the carburetor parts is such, however, that with the throttle 76 fully closed, additional air will flow around the throttle and mix with the idle fuel from port 112 to provide a mixture of fuel and air sufficient for engine idling purposes. Features of the idle system and the fabricated metal parts of the carburetor are described and claimed in the copending application of William F. Ott et al., filed March 20, 1961, Serial No. 97,007.

Mounted on the bolt 42 is a control plate 118. Plate 118 is fixed to the top of the fuel adjusting needle 64, which is threaded at 117 to receive a nut 120. In assembling the control plate 118 to the carburetor structure, an ear or L-shaped tab 124 at the end of plate 118 is positioned within a slot 126 in the upper side wall of the air filter housing 23, and then plate 118 is brought down onto the sleeve 122. Portion 66 of needle 64 is then inserted through an aperture 119 in plate 118 and threaded into the upper portion of bolt 42. Nut 120 is threaded onto needle portion 117 and is tightened to force plate 118 against the end of sleeve 122, which in turn rests against the top of nut 48.

A control lever structure 128 is rotatably journaled on the sleeve 122. A spring washer 130 fixed between sleeve 122 and nut 48 has portions spring-pressing the control lever 128 upwardly against the control plate 118. A dimple 132 (FIGS. 4 and 5) is struck upwardly out of the surface of control lever 128 to cooperate with apertures 133 and 135 formed in the control plate 118. Under action of the spring washer 130, dimple 132 will ride into the apertures 133 and 135 as the control lever 118

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is rotated from one position to another. The control lever 128 has several operating arms or extensions for controlling operation of the carburetor. One arm 134 (FIG. 4) extends downwardly from an upper surface of lever 128. A coil spring 136 has one end attached to lever arm 134 and the other end attached to the throttle control lever 84. A second arm 138 of control lever 128 forms a manual means for operating the control lever 128 and also has an aperture 140 to which may be attached a Bowden cable 142 for operating control lever 128 from a distance.

A coil spring 143 (FIGS. 1, 3 and 7) is mounted on the bushing 122 and has one end 144 rigidly held by the central portion of control lever 128. The other end of spring 143 consists of a straight section 146 extending from the bushing 122 into an aperture formed in an arm 148 of the choke control lever 74. The throttle valve 76 of the carburetor is also controlled by a governor device, such as an air fan and movable diaphragm, attached to a wire 150 connected to the throttle lever 84.

In the operation of the engine and motor, the starting of the motor may take place by closing the choke valve 70. This is done by moving the control lever 128 to its farthest position to the right, as viewed in FIGS. 1, 2 and 7, for example. This may be done by means of the manual lever 138 or the Bowden cable 142. The control lever 128 in this position forces arm 134 of the lever against the straight portion 146 of spring 143, which rotates the choke lever 74 counterclockwise, as viewed in FIG. 7, to a substantially closed position. This closed position of the choke valve provides sufficient air flow through conduit 10 for starting of the engine, but also insures an enriched mixture for starting. The control lever 128, in this choking position, also holds the throttle valve in a wide open position by its connection to the throttle lever 84 through arm 134 and spring 136. The throttle is held opened against any spring bias tending to close the throttle, which may be exerted by the governor control or other means.

Upon the starting of the engine, the control lever is then moved clockwise, as viewed in FIGS. 2 and 7, into the first intermediate position, in which the dimple 132 rides into aperture 133. In this first intermediate position, the throttle valve 76 is still held in an open position. High speed operation of the engine will cause the engine governor through wire 150 and throttle lever 84 to move throttle 76 to a more closed position against the bias of spring 136, depending upon the desired speed. The movement of the control lever 128 from its choke or start position to the first intermediate position, as described above, allows the arm 134 of control lever 128 to release the end 146 of spring 143, so that under the action of spring 143, the choke lever 74 is rotated clockwise, as viewed in FIG. 7, to a full open position at which it is retained during the other control positions of lever 128. A second arm 156 on the choke valve lever 74 abuts against a portion of the air cleaner 20 to provide a stop means for positioning the choke valve 70 in its wide open position and as seen in FIG. 7.

Movement of the control lever 128 to the second intermediate position, in which the dimple 132 rides into the aperture 135, closes throttle 76, since the spring 136 becomes a rigid connector between the control lever arm 134 and the throttle lever 84. This is the idle position of the engine and with the throttle closed, insufficient air passes through conduit 10 to operate the high speed or main fuel system, in which fuel flows through the outlet ports 60. The idle operation of the carburetor is as described above, in which the fuel is drawn through the idle port 112.

Movement of the control lever 128 to the farthest left position, as shown in FIGS. 2 and 7, for example, holds the throttle 76 in its closed position and in some modifications, one of the arms of control lever 128 may contact an electrically live terminal of the engine ignition system to ground the ignition system and stop the en-

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gine. The operating arm 138 of control lever 128, as shown in FIGS. 2 and 4, for example, extends through an opening 151 in the control plate structure 118. Edges 152 and 154 of this aperture 151 provide a stop structure for the operating arm 138, when in its extreme positions. Features of the carburetor control unit including the control lever 128 are described and claimed in the copending application of Jesse L. Szwargulski et al., filed April 10, 1961, Serial No. 101,706.

The carburetor structure described above is one which is made entirely of sheet metal fabricated parts. The conduit 10 is merely a sheet metal tubing, while the float fuel bowl 36 is a simple sheet metal drawn cup. Float bowl cover 38 is also formed of sheet metal drawn into the shape as described, consisting of the projecting shoulders 107 and the semi-cylindrical supporting surface 108 with the idle passage 110. The air cleaner box structure 20 is formed entirely of sheet metal, and collar 24 is press-fitted onto the open end of conduit portion 12, as shown in FIG. 3. The L-shaped tab 124 of the control plate 118 serves to lock the air cleaner 20 to the mixture conduit 10 and to prevent its rotation or removal.

The single bolt 42, thus, supports and locks all of the carburetor parts together by tightly holding the fuel bowl cover 38 to the fuel conduit mixture conduit 10 and the fuel bowl to this assembly through bolt 54. The upper threaded end 117, of the adjusting needle 64 provides effectively an extension of the bolt 42, and mounts the control plate 118 and control lever 128 to the rest of the assembly. Thus, the single bolt structure 42 together with bolt 52 and the adjusting needle 64, form all the assembly parts for locking and holding the carburetor parts together. This particular construction provides a fabrication which is inexpensive and involves considerable cost saving when compared with similar structures fabricated from complex castings requiring considerable drilling and other machining.

The bolt 42 further provides the venturi effect needed within the main air passage of carburetors and, further, provides a means of conveying fuel from the carburetor bowl to the air stream in the venturi thus formed. As shown, the bolt 42 also is fitted with adjustable means for controlling the flow of fuel, that is mixed with air entering the engine.

As will be readily seen, the configuration disclosed in the foregoing is not the only way of employing the novel features peculiar to this invention.

I claim:

1. A carburetor for an internal combustion engine comprising a fuel reservoir, a substantially flat cover plate over the top of said fuel reservoir, a tube of uniform diameter forming a tubular mixture conduit, a portion of the outer surface of said tube being supported by the outer surface of said cover plate, a single bolt having one portion thereof extending from the bottom of said fuel reservoir through said cover plate and a second portion thereof extending through said tubular mixture conduit normal to the axis thereof, said bolt including means fixing said fuel reservoir said cover plate and said tube together, means formed in said outer cover plate surface to prevent relative movement between said cover plate and said tube about the axis of said bolt, said bolt having a fuel passage axially therethrough including a first port opening into said fuel reservoir and a second port opening into said mixture conduit, said second bolt portion having a substantially cylindrical surface forming restricted regions with the inner surface of said mixture conduit to provide a venturi effect for air passing through said conduit, and a throttle valve movably mounted within said mixture conduit adjacent to said restricted regions.

2. A carburetor for an internal combustion engine comprising a fuel reservoir, a separate substantially flat cover plate over said fuel reservoir, a separate thin metal tube of uniform diameter forming a tubular mixture conduit, said tube being supported by said cover plate, a bolt having a first portion thereof extending from the bottom

of said fuel reservoir through said cover plate and a second portion thereof extending through said uniform tube normal to the axis thereof, said bolt fixing said fuel reservoir, said cover plate and said uniform tube together, a shoulder formed on said bolt between said first and second bolt portions, means holding said cover plate and said uniform tube on said shoulder, said bolt having a fuel passage axially therethrough including a first port opening into said fuel reservoir and a second port opening into said mixture conduit, said second bolt portion having a cylindrical surface forming restricted regions with the inner wall surface of said uniform tube to provide a venturi effect of air passing through said conduit, and a throttle valve movably mounted within said mixture conduit adjacent to said restricted regions.

3. A carburetor for an internal combustion engine comprising a fuel bowl, a substantially flat cover plate over the top of said fuel bowl, a thin metal tube of uniform diameter forming a tubular mixture conduit, said tube being supported by said cover plate, a tubular bolt having a first portion thereof extending from the bottom of said fuel bowl through said cover plate and a second portion thereof extending through said metal tube normal to the axis thereof, a shoulder formed on said bolt between said first and second bolt portions, means holding said cover and said metal tube on said shoulder, said bolt having a fuel passage axially therethrough including a first port opening into said fuel bowl and a second port opening into said mixture conduit, said second bolt portion having a cylindrical surface forming restricted regions with the inner wall surface of said metal tube to provide a venturi effect of air passing through said conduit, a throttle valve movably mounted within said metal tube adjacent to said restricted regions, and fastening means extending through the bottom of said fuel bowl and fixed to said one bolt portion to support said fuel bowl tightly against said cover.

4. A carburetor for an internal combustion engine comprising a fuel bowl, a substantially flat cover plate over the top of said fuel bowl, a thin metal tube of uniform diameter forming a tubular mixture conduit, said tube being supported by said cover plate, a tubular bolt having a first portion thereof extending from the bottom

of said fuel bowl through said cover plate and a second portion thereof extending through said metal tube normal to the axis thereof, a shoulder formed on said bolt between said first and second bolt portions, means holding said cover and said metal tube on said shoulder, said bolt having a fuel passage axially therethrough including a first port opening into said fuel bowl and a second port opening into said mixture conduit, said second bolt portion having a cylindrical surface forming restricted regions with the inner wall surface of said metal tube to provide a venturi effect of air passing through said conduit, a throttle valve movably mounted within said metal tube adjacent to said restricted regions, and means formed in the top surface of said cover plate in contact with said metal tube to prevent relative movement between said cover plate and said tube about the axis of said bolt.

5. A carburetor for an internal combustion engine comprising a fuel reservoir including a cover plate, a tube of uniform internal diameter having a straight portion forming a tubular mixture conduit, a bolt having one portion thereof engaging said fuel reservoir and extending through said cover plate and a second portion thereof extending through said tubular mixture conduit normal to the axis thereof, and means on said bolt functioning to draw and fix said cover plate and said tube together, said cover plate being provided with a pair of spaced shoulders for receiving therebetween the tubular mixing conduit to prevent its rotational movement about the bolt structure, said bolt having a fuel passage axially therethrough including a first port opening into said fuel reservoir and a second port opening into said mixture conduit, said second bolt portion having a cylindrical surface forming restricted regions with the inner uniform wall of said straight portion of said tube to provide a venturi effect for air passing through said conduit.

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