

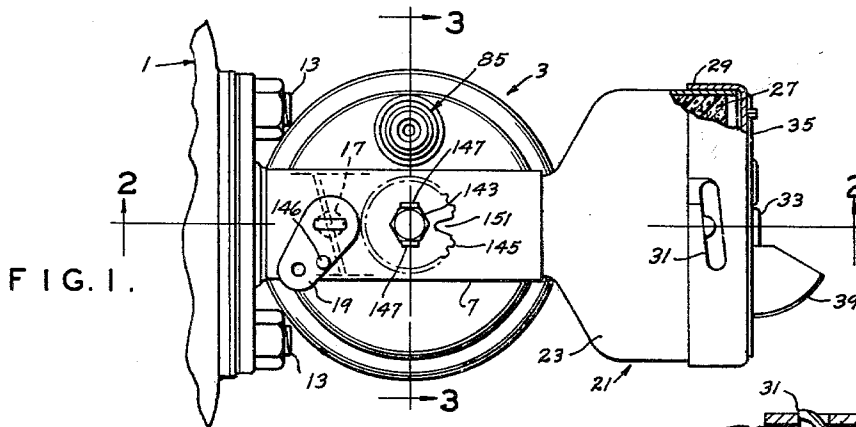
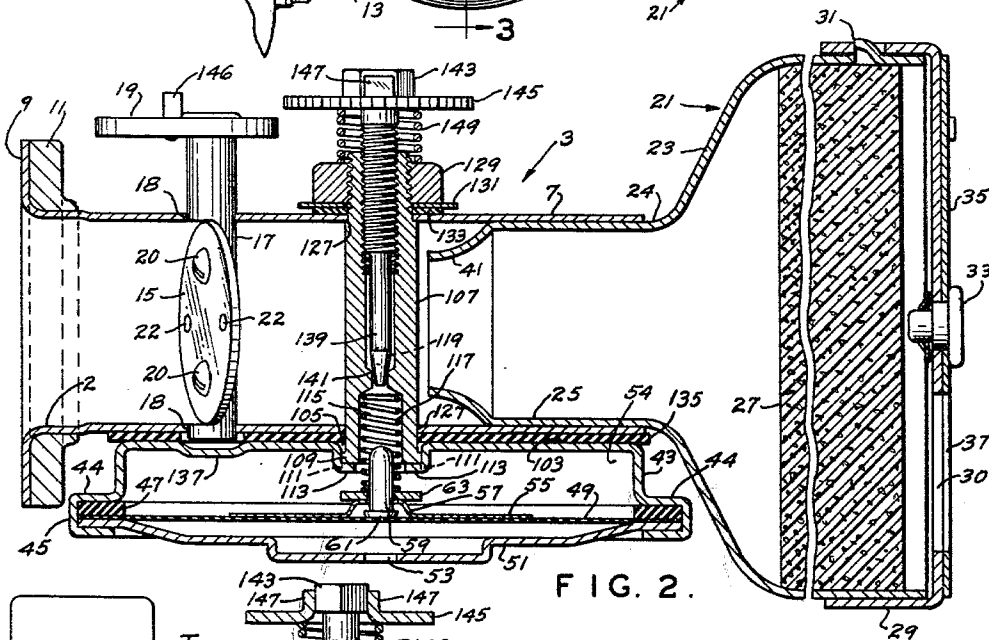
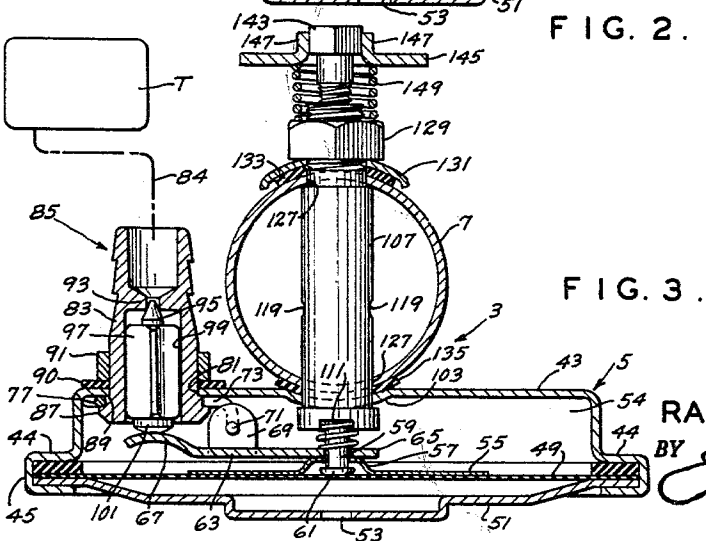
March 23, 1965

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3,174,731

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

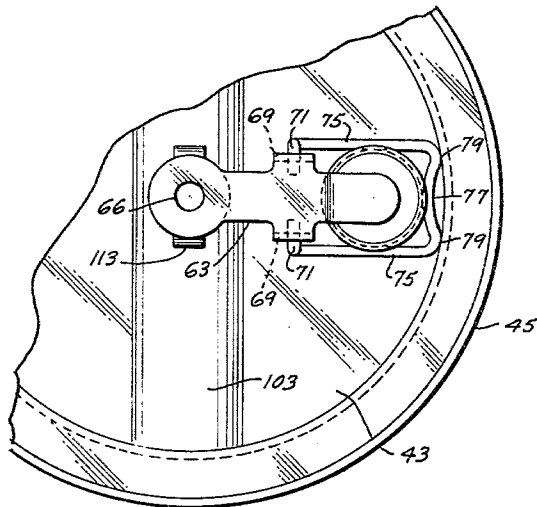


FIG. 7.

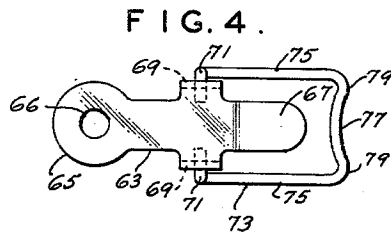


FIG. 4.

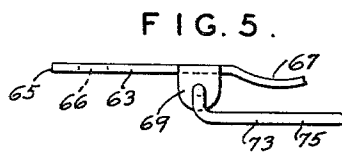


FIG. 5.

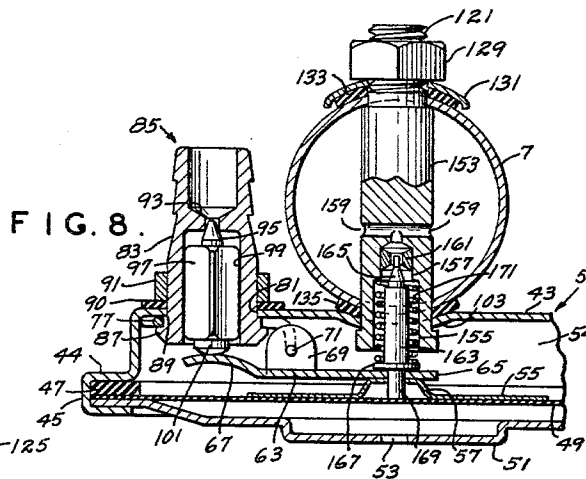


FIG. 8.

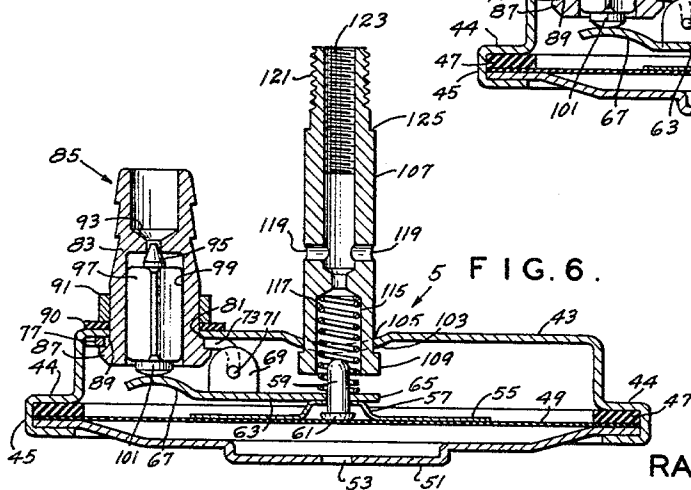


FIG. 6.

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4 Claims. (Cl. 261-67)

This invention relates to carburetors, and with regard to certain more specific features, to carburetors of the type having a diaphragm for control of fuel admission thereto.

Among the several objects of the invention may be noted the provision of a simple carburetor of the class described for two-cycle and four-cycle internal combustion engines such as are used on apparatus such as power lawn mowers and the like; the provision of a carburetor of the class described which may be manufactured at low cost primarily from easily fabricated sheet metal and one which may be readily and quickly but accurately assembled from convenient subassemblies with minimum chance of error and without finicky adjustments. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of which will be indicated in the following claims.

In the accompanying drawings, in which several of various possible embodiments of the invention are illustrated,

FIG. 1 is a plan view of a carburetor made according to the invention;

FIG. 2 is an enlarged longitudinal section taken on line 2-2 of FIG. 1;

FIG. 3 is an enlarged cross section taken on line 3-3 of FIG. 1;

FIG. 4 is a plan view of a clip and lever subassembly;

FIG. 5 is a side elevation of FIG. 4;

FIG. 6 is a cross section of a subassembly of fuel inlet and metering parts;

FIG. 7 is a fragmentary bottom plan view of FIG. 6, parts being removed, the plan being rotated 180° with respect to the showing in FIG. 6; and

FIG. 8 is a fragmentary cross section showing an alternative form of the invention.

Carburetors for use on engines employed on power lawn mowers and like apparatus are required to be reliable and of low cost. To this end the so-called diaphragm or pressure type of carburetor is well suited because it requires no complicated bowl and float leveling devices or fuel pumps. By means of the present invention the simplicity of such carburetors is improved and their costs minimized.

Referring now more particularly to the drawings, there is shown at numeral 1 the intake manifold of an engine to be served by the carburetor the entire assembly of which is indicated by numeral 3. In FIG. 6 is shown a subassembly which is numbered 5 in general. As will be made clear, this subassembly 5 is constructed for easy application to a simple sheet metal mixture conduit or tube 7. Tube 7 is flanged at 9 (FIG. 2). It is adapted for telescopic insertion into a bolting ring 11. It is also outwardly radially swaged to fit therewith as at 2. Connecting bolts 13 attach ring 11 and flange 9 to the intake manifold 1 passing through suitable openings for the purpose.

In the tube 7 is located a throttle valve 15 which is supported upon a rotatable cross shaft 17 in the tube 7 and which carries an outer control lever 19. At numeral 21 there is shown in general a filter assembly.

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This comprises a sheet metal flared cup 23 from which extends a sleeve portion 25 adapted to be telescoped into the outer open end of the tube 7. The end of the sleeve 25 is converging to form a venturi surface 41. In the cup 23 is contained a disc of suitable air-filtering material 27. On the open end of the cup 23 is a cap 29 having a quick detachable bayonet connection 31. This cap 29 has openings in its face, one of which is shown at 30. Pivoted at 33 on the cap 29 is an air control shutter 35 in which are openings, one of which is shown at 37, for variable registry with the openings 30 to control inlet air. An operating handle is shown at 39.

Numeral 43 indicates a shallow sheet metal cup peripherally stepped down as shown at 44 to form a clinching flange 45 which may be swaged by spinning to clinch together a washer 47, a flexible diaphragm 49 and a sheet metal cover 51, the latter having a central air inlet opening 53. FIG. 7 illustrates flange 45 before swaging. FIGS. 1, 3 and 6 illustrate it after swaging. The diaphragm 49 is composed of any suitable flexible material such as, for example, a nylon base synthetic fuel resistant rubber. Diaphragm 49 forms a fuel chamber 54 with the bottom of cup 43. Resting loosely on the diaphragm is a circular sheet metal transfer plate 55. Stamped centrally into the plate 55 is a bulge 57 in which is a central opening for loosely receiving a centering pin 59 having a head 61 which is located in the space under the bulge.

At numeral 63 is shown a stamped sheet metal rocker lever at one end 65 of which is an opening 66 accepting the pin 59. The lever 63 at its other end is formed with a bulge 67. Struck up from the sides of the lever 63 are ears 69 in which are openings for accepting inwardly turned ends 71 of a U-shaped spring clip or bale 73 having side legs 75 and an arcuate connection 77 therebetween forming corners 79. As will be seen from FIGS. 4 and 5, a subassembly may easily be formed between the wire lever clip 73 and the lever 63, accomplished by snapping the inwardly turned wire ends 71 into the openings in the ears 69.

A hole 81 (FIGS. 3, 6 and 8) is formed in cup 43 for accepting a body portion 83 of a needle valve inlet assembly 85. The body 83 is stepped at 89 and flanged at 87 so that upon insertion into hole 81 a surrounding groove will be formed of a size adapted snugly to accept the clip wire 73. Before insertion of said clip wire, a washer 90 is slipped over the body 83 on the outside of the cup 43 and the assembly 85 held in place by force-fitting a sleeve 91 around the body 83. Within body 83 is located a seat 93 for a needle valve 95 the stem 97 of which is of cruciform shape slidably fitting into the inlet 99 of the body 83. At the opposite end of the cruciform stem 97 is a contact head 101 for engaging the bulge 67 of lever 63.

The base of the cup 43 has an inwardly formed cylindrical surface 103 for nesting the tube 7. In the center part of the cylindrical surface 103 is an opening 105 for accepting a metering tube 107 inserted from the inside of cup 43. This is in the form of a hollow bolt having a flange 109 in which are opposite slots 111 (FIGS. 2 and 3) for accepting crimped-in, end portions of opposite ears 113 struck from the opposite sides of the opening 105. The metering tube has an inlet 115 in which is located a compression spring 117 for reacting against the end 65 of the lever 63. At 119 (FIGS. 3 and 6) is shown a pair of opposite ports in the tube 107. The upper end of the tube 107 is exteriorly threaded at 121 and internally threaded at 123. It is also provided with a shoulder 125. The metering tube 107 is inserted through diametrically opposite openings 127. In this position tube 7 lies within the cylindrical surface 103 and is held in place by a nut 129

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screwed against a washer 131 under which is a gasket 133. Nut 129 forces the upper surface of tube 7 against shoulder 127 and the lower surface tightly against a sealing gasket strip 135 located between the tube 7 and the base of the cup 43. Suitable openings are provided in the strip 135 to accommodate the tube 107 and the end of the shaft 17. An additional bulge 137 is provided in the surface 103 to prevent interference with the end of shaft 17.

The metering tube 107 has threaded into it a metering pin 139 one end of which is tapered to cooperate with a seat 141 in the tube 107. The seat 141 is below the pair of opposite ports 119. The upper end of the metering pin 139 is formed with a hex-shaped head 143 under which is located an indicator dial 145. Tongues 147 struck up from the dial 145 engage the opposite flats of the head 143 so that they may be rotated as a unit. A compression spring 149 reacting between the dial 145 and the nut 129 holds up the dial and serves to maintain any rotary adjustment given to the metering pin 139. The margin of the dial 145 is notched as shown at 151 to provide a visible index of the adjustment with respect to whatever indicia (not shown) it may be desired to employ on adjacent parts. A stud 146 extending above the top surface of the throttle lever 19 provides a wide open throttle stop, as the stud 146 will strike the edge of dial 145 in the wide open throttle position.

Advantages of the invention accrue from the fact that the parts are mostly composed of sheet metal stampings and of simple screw machine parts or the like. This fact lends itself to low cost production of the parts themselves. Moreover, the parts as a whole are arranged for rapid final assembly from basic subassemblies. Thus (FIG. 6) initially the metering tube 107 may be inserted into the opening 105 of cup 43 and the adjacent ears 113 of the cup crimped into the slots 111 (FIG. 2). This holds the metering tube in position on the cup 43. Next the fuel inlet body 83 is inserted into opening 81 and washer 90 exteriorly applied, after which sleeve 91 is pressed home. Then with the cup 43 inverted, valve 97 is dropped into the opening 99 and the spring 117 dropped into the opening 115. Then the lever assembly of FIG. 4 is brought into position and the wire corners 79 are pushed at an angle into the corner of the cup 43 adjacent the flange 87. Then the clip 73 is rotated toward the bottom of the cup 43 so as to snap the legs 75 and arcuate connection 77 into the groove under the flange 87. This presses corners 79 of clip 73 against the arcuate corner of the cup 43 (FIG. 7), so that the clip or bale 73 is automatically and properly positioned to orient the lever 63 radially with end 65 in alignment with the inlet 115 of the metering tube 107. Then pin 59, after having been inserted through the central opening in the transfer plate 55, is itself inserted into the hole 66 of lever 63. This assures proper central location of the transfer plate 55. Pin 59 also keeps spring 117 concentric with lever 65 and prevents friction of the spring against side of the inlet 115. Next the washer 47 is placed on step 44 and then the diaphragm 49 is laid in place on the washer and also over the pin head 61 in the recess 57. Finally the cover 51 is applied and held while flange 45 is swaged into holding position. The result is the subassembly shown in FIG. 6.

The diaphragm 49 is circular and not directional in its assembly. It has no perforations for possible leakage. In the subassembly of FIG. 6, plate 55, diaphragm 49, gasket 47 and cover 51 are all non-directional in their assembly, which provides for ease and economy of assembly.

Next the gasket strip 135 is laid into the semi-circular surface 103 and the metering tube 107 inserted through openings 127 so as to be in position across the tube 7. Then gasket 133 and washer 131 are placed around tube 107 and the nut 129 screwed home. This holds the FIG. 6 assembly in proper alignment on the tube

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7. In this position the pair of opposite ports 119 is transverse to the axis of tube 7. The positioning of the ears 113 of cup 43 in slots 111, and the proper positioning of cup 43 on tube 7 by nesting of the tube 7 in the surface 103 assures this. The spring 149 is next placed in position and the metering screw 139, with the dial 145 fixed thereto under head 143, is screwed home in the metering tube 107.

The valve 15 may be assembled in the tube 7 either before or after application of the assembly of FIG. 6, being accomplished by first riveting the lever 19 to the cross shaft 15 and then inserting the latter into the prepared openings 18. Thereafter the valve 15 may be inserted into the tube and attached to the shaft 17 by means of the screws shown at 20. The shaft 17 has a flat side for engagement therewith by the flat valve 15. The valve includes idle-speed openings 22.

Tubular portion 25 of the filter assembly 21 is telescoped into the inlet end of tube 7 until the end of portion 25 is spaced a predetermined distance from the surface of bolt 107. The two tubular portions 7 and 25 are held together by friction, as tubular portion 25 is press-fitted into tube 7. In a carburetor of the type described, the inside diameter of tube 7 is around 0.802 inch and the outside diameter of tubular portion 25 is around 0.806 inch. The end of tubular portion 25 is spaced 0.277 inch from the surface of the metering bolt 107, which has an outside diameter of around 0.280 inch.

Operation is as follows, assuming that the carburetor has been bolted to the intake manifold 1 as shown in FIG. 1 and that an elevated fuel tank T is connected by a fuel conduit 84 to the inlet body 83:

Some choke effect for starting is obtained from the filter material. If this is insufficient an additional choke effect can be obtained by rotating the shutter 35 to close or more nearly close the air intake ports 30. Throttle valve 15 is opened. Cranking of the engine generates a partial vacuum in the tube 7, which sucks air through the filter 27 and which is communicated through ports 119 and passage 115 to chamber 54. Ambient air pressure moves the diaphragm 49 inwardly and rocks the lever 63 counterclockwise, as viewed in FIG. 3. This opens valve 95, with a resulting inflow of fuel into fuel chamber 54. Fuel then flows through passage 115 and ports 119. Fuel issuing from the ports 119 is swept into the manifold 1 by air moving through tube 7.

After the engine starts, the ports 30 may be fully opened and the throttle valve 15 closed to the amount controlling the speed desired. Under these conditions because of the restriction of the venturi surface 41, vacuum is maintained in tube 7 downstream of the surface 41. This retains a sub-atmospheric pressure within chamber 54. Atmospheric pressure against the outside of diaphragm 49 is opposed by spring 117 and the pressure of fuel in chamber 54. Engine vacuum reflected through the metering bolt 107 into chamber 54 causes a displacement of fuel within the fuel chamber and a lessening of fuel pressures in the chamber 54. This permits the diaphragm assembly to be moved inwardly to open valve 95 and fuel flows into chamber 54 to replace fuel flowing through the metering bolt 107 to the mixing tube 7. At this time flow of air through the converging venturi 41 and around tube 107 is accelerated and aids in drawing fuel through bolt 107 and in providing a fuel spray at the outlets of ports 119.

Under cranking and load conditions, the fuel-air mixture is comparatively rich and under low-load running conditions it is comparatively lean. Metering action in tube 107 is controlled by turning the metering pin 139 for optimum engine operation. A diaphragm type of carburetor such as herein described is of advantage on apparatus such as lawn mowers which are subject to large tilting angles on terraces and the like. This, in the case of float types of carburetors, tends to cause erratic action. The diaphragm type minimizes such action.

Referring to FIG. 8, there is shown an alternative form of the device in which like numerals designate like parts. In this form the metering member or tube 153 is made solid at its upper end. It is attached to the subassembly 5 as already described in connection with the metering tube 107 (see nut 129). The manually operated metering pin 139 is omitted. Metering tube 153 at its lower end is bored as shown at 155 and counterbored as at 157. The counterbore 157 is in communication with transverse ports 159 and contains a metering jet 161. At 163 is shown a metering pin having a taper and a step at 165 for throttling cooperation with the metering jet 161. This pin has a shoulder 167 which rests on the inner end of lever 63. It has an extension 169 which enters the opening in the bulge 37 of the transfer plate 55. A compression spring 171 in bore 155 reacts from metering tube 153 to the shoulder 167, tending to open the annulus between the ring 161 and taper 165 and at the same time tending to push the diaphragm 49 and close the valve 95. Conversely, as the valve 95 is opened, the annulus tends to close.

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 and air mixture conduit, a fuel chamber including a diaphragm forming a wall thereof and having a surface outside said chamber exposed to ambient air pressure, means forming a fuel inlet passage to said fuel chamber and a valve seat within said passage, a valve slidably mounted within said passage, a lever pivotally mounted within said fuel chamber with one end in contact with said valve to close said valve on said seat, a tubular member forming a fuel outlet passage between said fuel chamber and said mixture conduit, a coil spring coaxially mounted within said tubular member and extending into said fuel chamber in contact with and biasing one end of said lever in valve closing position, a plate loosely positioned on the center portion of said diaphragm wall and between said diaphragm and the other end of said lever, and a retaining pin supported by the central portion of said diaphragm and loosely extending axially through said plate, said other lever end and coaxially into said spring and said tubular member to be guided thereby and to retain said plate, lever and spring in operative engagement, whereby movement of said diaphragm by ambient air pressure will move said lever to open said valve, said one end of said supporting pin having a head to retain said pin end between said diaphragm and said plate.

2. A subassembly adapted to be attached to a mixture tube of a vacuum responsive diaphragm carburetor, comprising a cup, a diaphragm, means joining said cup to said diaphragm to form a fuel container therewith, a metering tube extending from the cup, a tubular fuel inlet fitting attached to and extending through said cup and formed with a groove surrounding the same within the cup, a lever having first and second ends, a wire spring clip having a pivotal connection with the lever intermediate said ends, said clip being located in said groove and positioned to place said first end of the lever in operating connection with the inlet valve means and said second lever end opposite said metering tube, resilient means reacting to bias the second end of the lever in a direction to bias the diaphragm and close said inlet valve, movement of the diaphragm under vacuum against said bias adapted to move said lever in a direction to open said valve, said

spring clip having a U-shape with a bottom portion and opposite leg portions of said clip snapped into said groove, said lever being pivotally supported by the ends of the legs of said clip, said clip including corner portions between each leg and the bottom of said clip in contact respectively with wall portions of said cup to retain said clip against rotation in said groove and said lever in said position.

3. A carburetor for an internal combustion engine, said carburetor comprising a cup and a flexible diaphragm sealed across the lip of said cup to form a fuel chamber, means forming a fuel inlet to said fuel chamber, an inlet valve within said fuel inlet, a tube of uniform diameter forming a mixture conduit, tubular fastening means extending through said cup and said tube and securing said cup to said tube and forming a fuel passage from said cup into said tube, means forming an operative connection between said inlet valve and said diaphragm, said operative connection means including a lever pivotally mounted within said cup with one end thereof in operative contact with said inlet valve, a plate within said cup and loosely mounted on the central portion of said diaphragm, a coil spring having one end fixed within said tubular fastening means and extending therefrom into said cup with one end in contact with and biasing the other end of said lever against said plate, and a centering pin loosely held on said diaphragm and extending through said plate and said other lever end through said coil spring into said one end of said tubular member to hold said plate, lever and spring in operating position.

4. A carburetor for an internal combustion engine, said carburetor comprising a cup and a flexible diaphragm sealed across the lip of said cup to form a fuel chamber, means forming a fuel inlet to said fuel chamber, an inlet valve within said fuel inlet, a tube of uniform diameter forming a mixture conduit, fastening means extending through said cup and said tube and securing said cup to said tube and forming a fuel passage from said cup into said tube, said fastening means including a tubular member having one end fixed to said cup and extending through the bottom of said cup into said mixture conduit tube, an adjustable valve means within and supported by said tubular member for metering fuel flow from said cup to said mixture conduit tube, means forming an operative connection between said inlet valve and said diaphragm, said operative connection means including a lever pivotally mounted within said cup with one end thereof in operative contact with said inlet valve, a plate within said cup and mounted on the central portion of said diaphragm, a coil spring having one end fixed within said tubular member and extending from said one end of said tubular member into said cup with the other end thereof in contact with and biasing the other end of said lever against said plate, and a centering pin extending through said plate and said other lever end and through said coil spring into said one end of said tubular member to hold said plate, lever, and spring in operating position.

References Cited by the Examiner

UNITED STATES PATENTS

2,724,584	11/55	Armstrong	261—69
2,768,819	10/56	Bodine	261—69 X
2,979,312	4/61	Phillips	261—35
2,984,465	5/61	Hazzard	261—35
3,089,685	5/63	Hennemann et al.	261—72
3,093,699	6/63	Demitz	261—72

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