Nov. 17, 1936. W. H. WEBER 2,061,494

CARBURETOR

Filed June 12, 1935 6 Sheets-Sheet 1

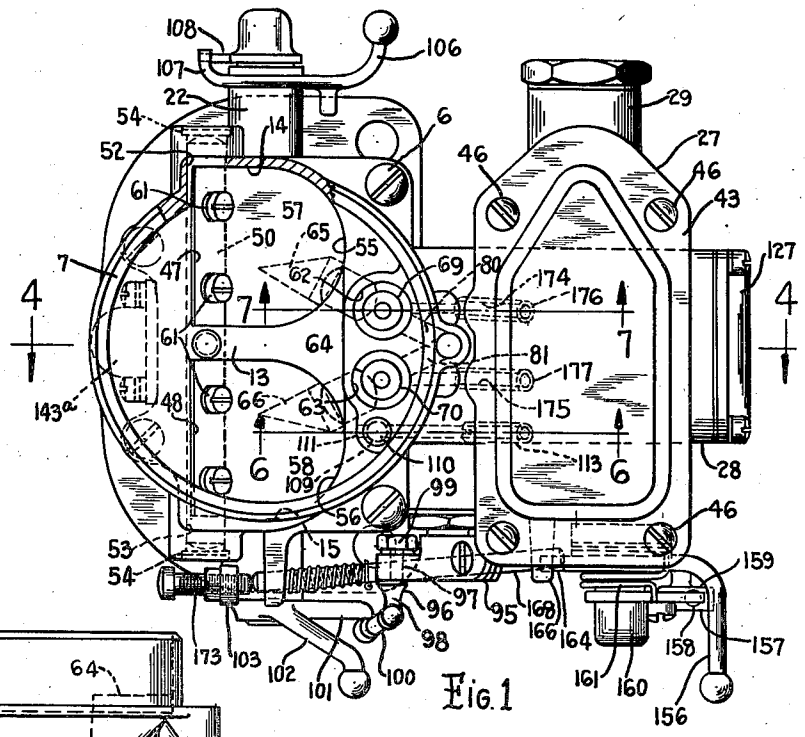


Fig. 1

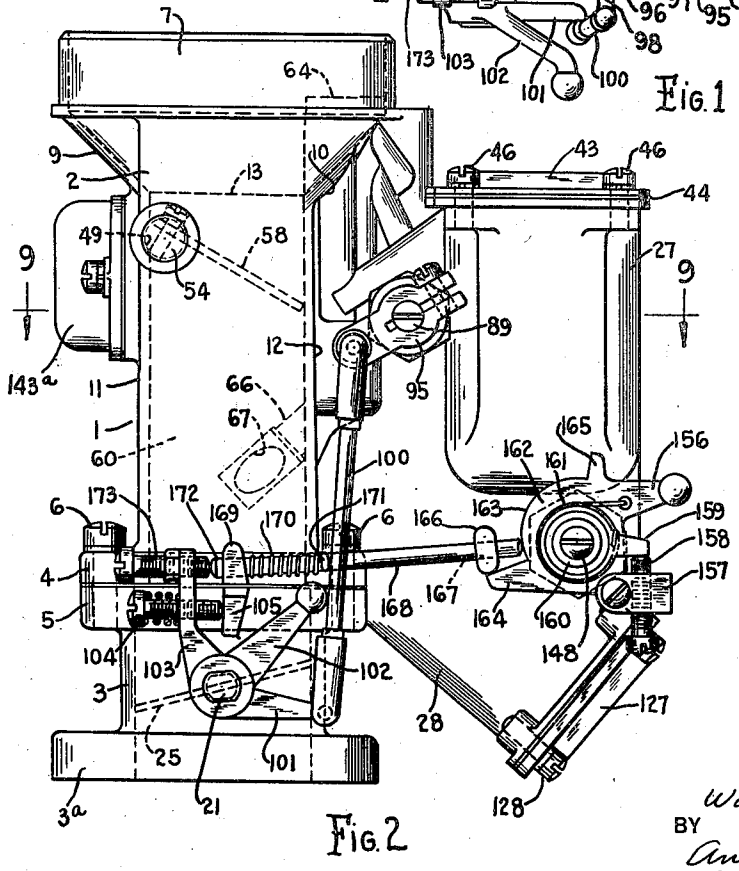


Fig. 2

INVENTOR
Walter H. Weber
BY
Andrew K. Foulds
His ATTORNEY

Nov. 17, 1936. W. H. WEBER 2,061,494

CARBURETOR

Filed June 12, 1935 6 Sheets-Sheet 2

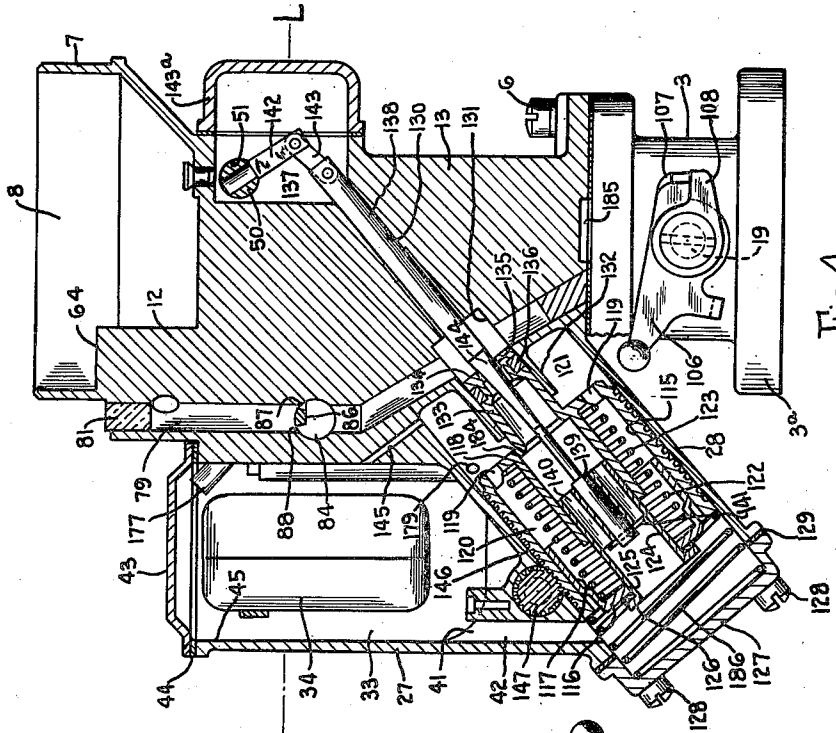


FIG. 4

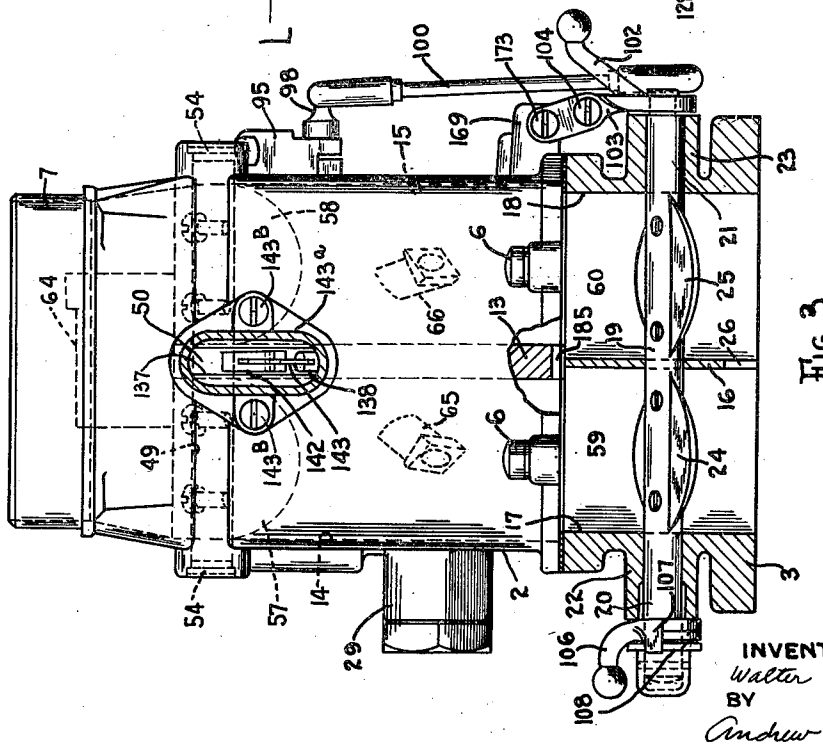


FIG. 3

INVENTOR
Walter H. Weber
BY
Andrew K. Fowlds
his ATTORNEY

Nov. 17, 1936. W. H. WEBER 2,061,494

CARBURETOR

Filed June 12, 1935 6 Sheets-Sheet 3

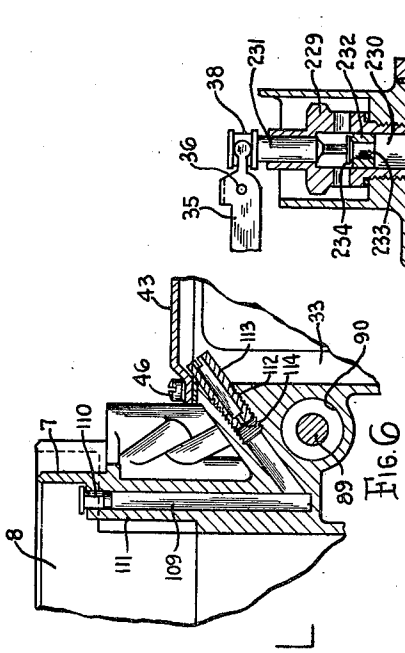


Fig. 6

Fig. 20

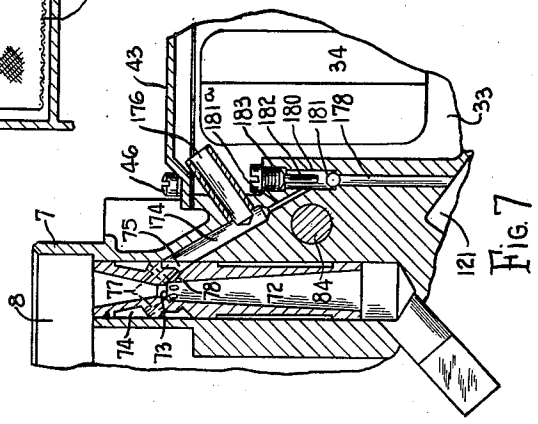


Fig. 7

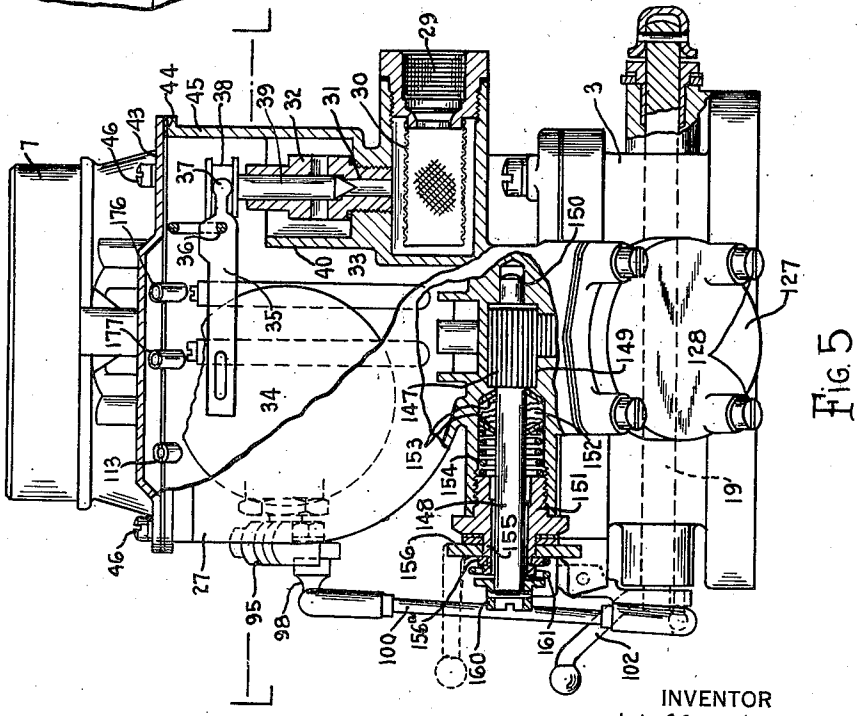


Fig. 5

INVENTOR
Walter H. Weber
BY
Andrew K. Toulde
his ATTORNEY

Nov. 17, 1936. W. H. WEBER 2,061,494

CARBURETOR

Filed June 12, 1935 6 Sheets-Sheet 4

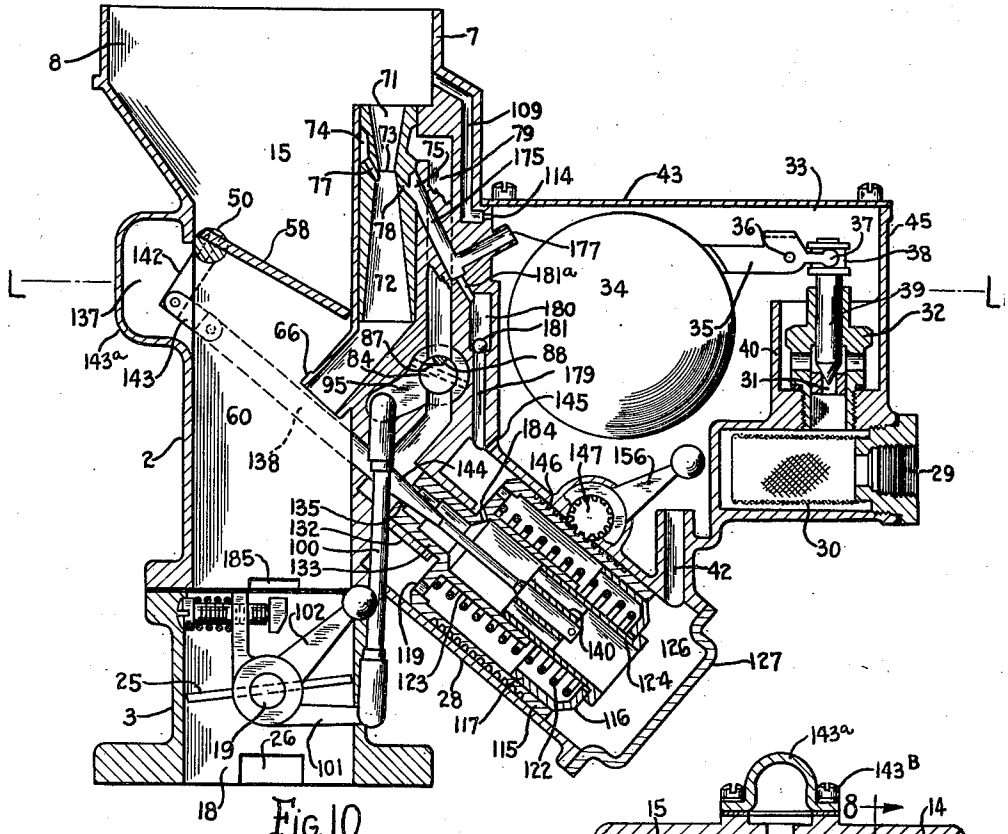


FIG. 10

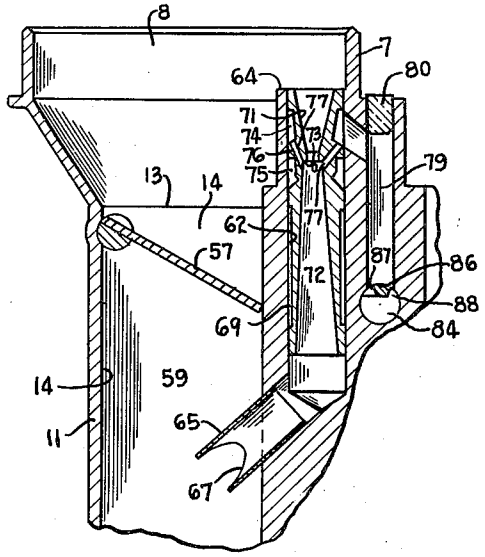


FIG. 8

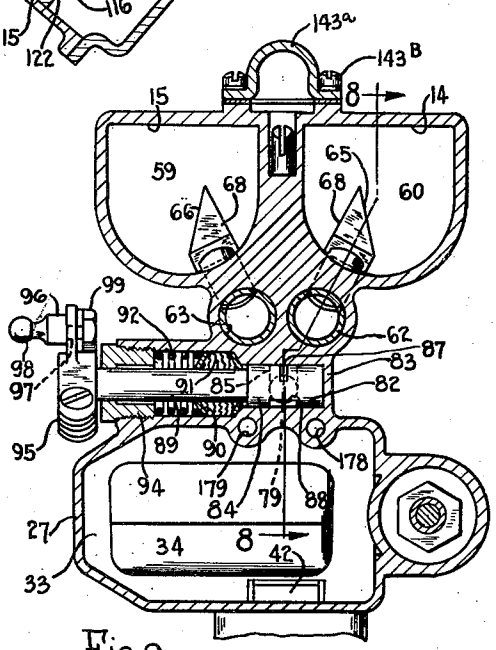


FIG. 9

INVENTOR
Walter H. Weber
BY
Andrew K. Fowler
his ATTORNEY

Nov. 17, 1936. W. H. WEBER 2,061,494

CARBURETOR

Filed June 12, 1935 6 Sheets-Sheet 5

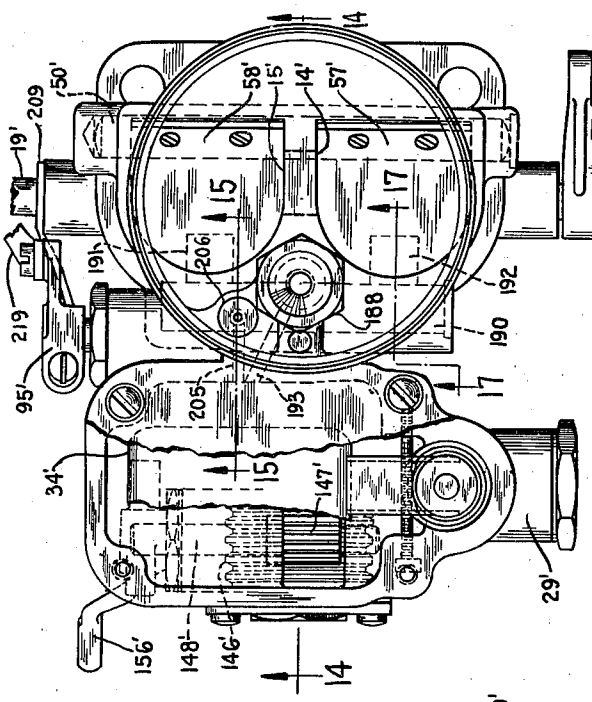


FIG. 11

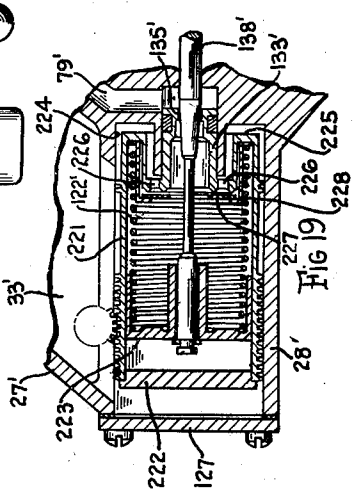


FIG. 19

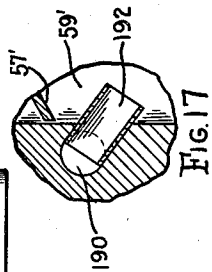


FIG. 17

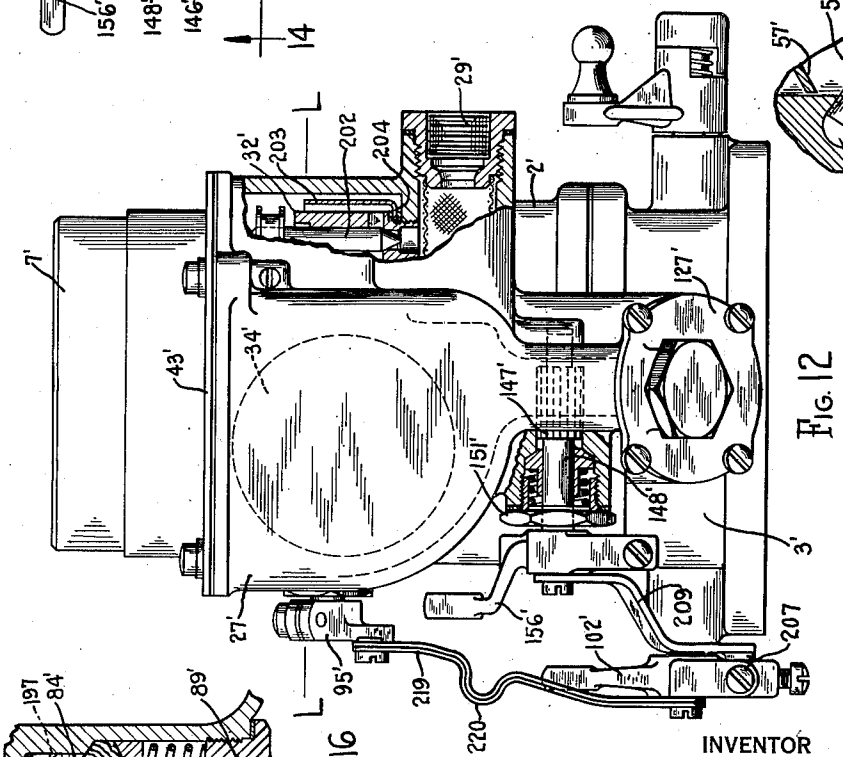


FIG. 12

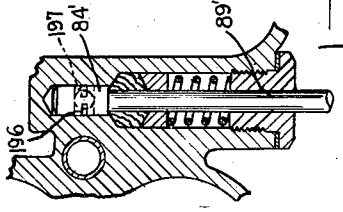


FIG. 16

INVENTOR
Walter H. Weber
BY
Andrew K. Faulds
his ATTORNEY

Nov. 17, 1936. W. H. WEBER 2,061,494

CARBURETOR

Filed June 12, 1935 6 Sheets-Sheet 6

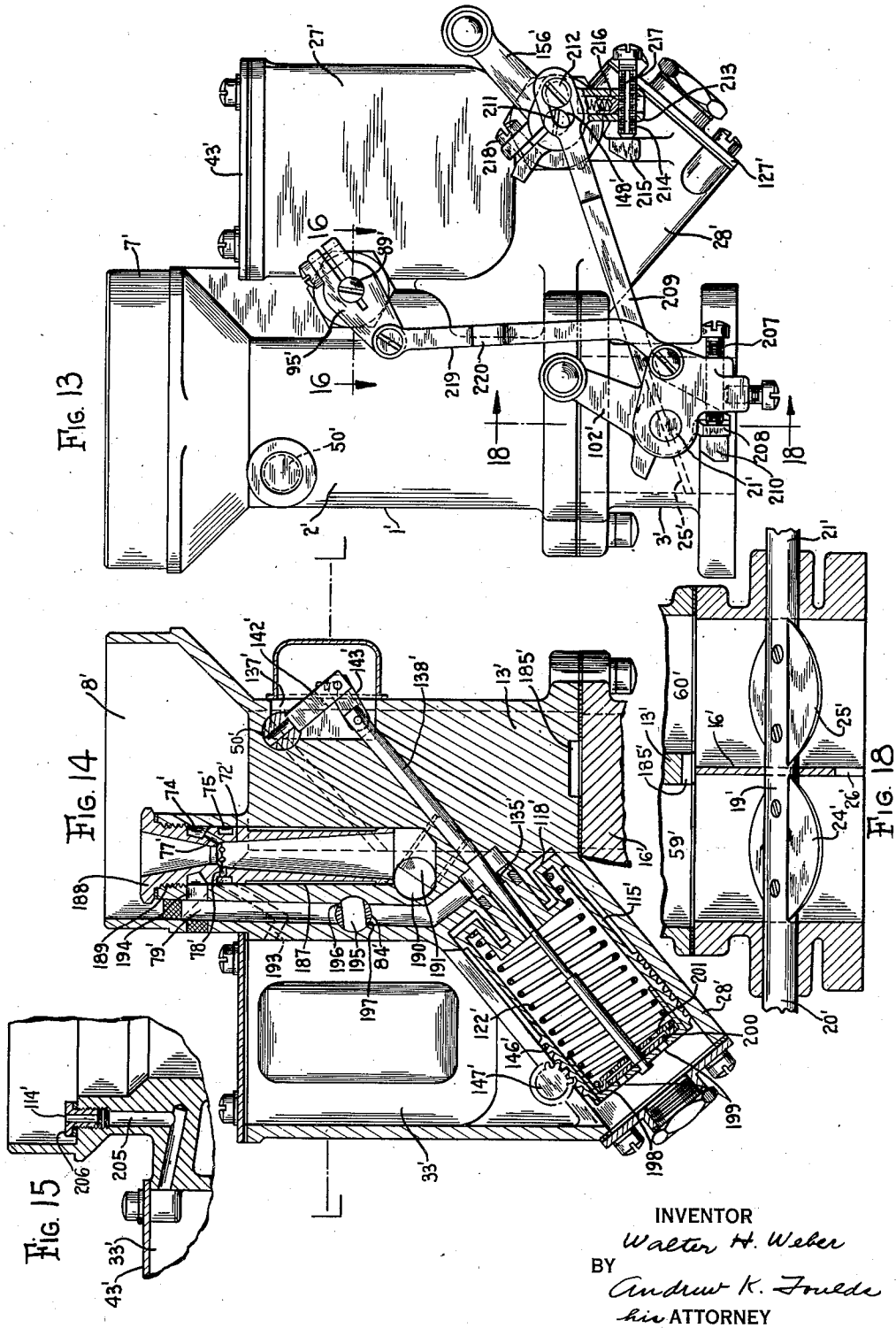


FIG. 13

FIG. 14

FIG. 15

FIG. 18

INVENTOR
Walter H. Weber
BY
Andrew K. Fowler
his ATTORNEY

Patented Nov. 17, 1936

2,061,494

UNITED STATES PATENT OFFICE

2,061,494

CARBURETOR

Walter H. Weber, Detroit, Mich., assignor to Detroit Lubricator Company, Detroit, Mich., a corporation of Michigan

Application June 12, 1935, Serial No. 26,290

43 Claims. (Cl. 261—46)

My invention relates to new and useful improvements in carburetors, and more particularly to a carburetor for supplying a mixture of fuel and air to an internal combustion engine.

An object of my invention is to provide a carburetor which will operate efficiently throughout the range of engine operation, supplying thereto a properly proportioned explosive mixture of air and fuel.

Another object is to provide means to control the quantity of fuel supplied so as to maintain the proper air-fuel ratio throughout engine operation.

Another object is to provide means to augment the supply of fuel for engine acceleration.

Another object is to provide a carburetor which is particularly adapted to draw or lift fuel to its constant level reservoir from a lower level supply tank while maintaining a highly efficient carburetion of fuel and adequate supply thereof to the engine.

Another object is to provide novel means for regulating the ratio of fuel to air supplied by the carburetor.

The invention consists in the improved construction and combination of parts, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawings, to be taken as a part of this specification, I have fully and clearly illustrated several carburetors embodying my invention, in which drawings—

Figure 1 is a top plan view of a carburetor embodying my invention;

Fig. 2 is a view thereof in side elevation;

Fig. 3 is a view in side or end elevation, looking from left to right facing Fig. 1;

Fig. 4 is a view in vertical central section on the line 4—4 of Fig. 1, taken in the direction of the arrows;

Fig. 5 is a view in side or end elevation with certain parts broken away to show internal structure and looking from right to left facing Fig. 1;

Fig. 6 is a detail view in vertical section on the line 6—6 of Fig. 1;

Fig. 7 is a detail view in vertical section on the line 7—7 of Fig. 1;

Fig. 8 is a detail view in vertical section on the line 8—8 of Fig. 9;

Fig. 9 is a view in horizontal section on the line 9—9 of Fig. 2;

Fig. 10 is a diagrammatic view showing the relation of the ports and passages and the mechanical structure of the carburetor shown in Figs. 1 to 9 inclusive;

Fig. 11 is a top plan view with certain parts broken away to show the internal structure of another carburetor embodying my invention;

Fig. 12 is an end or side view in elevation with certain parts broken away and partly in section, looking from left to right facing Fig. 11;

Fig. 13 is a view in side elevation, looking from left to right facing Fig. 12;

Fig. 14 is a view in vertical central section on the line 14—14 of Fig. 11;

Fig. 15 is a detail view in vertical section on the line 15—15 of Fig. 11;

Fig. 16 is a detail view in horizontal section on the line 16—16 of Fig. 13;

Fig. 17 is a detail view in vertical section on the line 17—17 of Fig. 11;

Fig. 18 is a detail view on the line 18—18 of Fig. 13;

Fig. 19 is a detail view in section of a modification also taken on the line 14—14 of Fig. 11, and

Fig. 20 is a detail view in section of another form of float chamber inlet controlling valve.

Referring to the drawings by characters of reference and particularly Figs. 1 to 10 inclusive thereof, 1 designates generally a carburetor body or main casing comprising an upper air inlet and mixing chamber member 2 and a lower throttle body member 3 which are provided with cooperating end flanges 4, 5 respectively, rigidly secured together by bolts 6. The member 2 is preferably formed at its upper end with a susbtantially cylindrical wall 7 to receive a dust collector or the like, not shown, and which defines the carburetor air inlet 8. Opposite side or end portions 9, 10 of the main casing converge downward to the upper ends of the opposite end or side walls 11, 12 of the main casing. The space within the member 2 is divided internally by a vertical partition or wall 13 into laterally positioned downward discharging bores 14, 15, each of which is in open communication at its upper end with the inlet 8. The throttle body member 3 is also provided with a vertical partition or wall 16 which aligns vertically with the wall 13 to divide the member 3 into parallel, vertical, susbtantially cylindrical bores 17, 18 which together with the bores 14, 15 and the common inlet 8, define parallel, vertical, downward discharging, flow passageways through the main casing. Extending diametrically through the bores 17, 18, there is a throttle shaft 19 which is journaled at its mid-portion through the partition 16 and which projects at its opposite end

portions 20, 21 through journal bearings 22, 23 respectively, in which the end portions are closely fitted to prevent leakage of air around the end portions and into the throttle bores 17, 18. Mounted on the shaft 19 there are throttle plates or valves 24, 25, preferably of the butterfly type, controlling the discharge of the explosive mixture from the outlets of the bores 17, 18 respectively. The partition 16 may be provided with a cross passage or aperture 26, establishing communication between the bores 17, 18 posterior to or on the outlet side of the throttle valves 24, 25 to aid in homogenizing the mixture and equalizing the suction in the throttle bores.

Supported by the end casing wall 10, 12 and positioned laterally thereof there is a constant level fuel reservoir or float chamber casing 27 and also a dash-pot and pump casing 28 which is positioned beneath the reservoir 27 and inclined upward to its juncture with the wall 12. The reservoir 27 is provided with a fuel inlet 29 preferably provided with a strainer 30 and leading through a valve port 31 in a valve guide member 32 into float chamber 33. Within the casing 27 and in chamber 33 there is a float member 34 responsive to variation in liquid level and which is supported on one end of a float arm or lever 35 pivotally supported on a pin 36 secured in the side walls of the casing 27. The other end of lever 35 is provided with a yoke 37 received between the flanges of a collar 38 mounted on a vertically reciprocal valve 39 guided in the bore of member 32 and controlling the port 31. Within the chamber 33 there is a partition 40 which provides a dam separating the relatively small portion or area of chamber 33 around port 31 from the remainder of the chamber 33, the partition or dam terminating at its upper edge slightly below the normal liquid level in chamber 33 as determined by the float 34 so that should valve 39 fail to seat, the main body of liquid fuel in chamber 33 will not drain out of the chamber, being maintained therein by partition 40 at substantially the desired constant level. The outlet 41 from chamber 33 is on the opposite side of partition 40 from port 31 and opens through the bottom wall of casing 27 into a fuel conduit 42 which extends vertically downward into the outer end portion of casing 28, see Fig. 4. The reservoir casing 27 is provided with a cover or closure member 43 which is sealed by a gasket 44 to the top edge of the float chamber casing wall 45 to prevent leakage or uncontrolled admission of air into the chamber 33 above the liquid therein, the cover being tightly fixed in position by screws 46.

The inside face of wall 11 within the bores 14, 15 is straight to form flat, vertical, internal wall surfaces 47, 48 in a common plane, the surfaces 47, 48 being provided with a horizontal, shallow, segmental recess 49 adjacent their upper ends to receive the circumferential edge portion of a shaft 50 which extends through or across the bores 14 and 15 and through a close fitting aperture 51 in the wall 13. The ends of the shaft 50 are journaled in cylindrical bores 52, 53 formed in the side walls of the member 2. The outer ends of the bores 52, 53 are closed and sealed by plug members 54. The inside walls of bores 14, 15 opposite the wall 11 and adjacent the reservoir casing 27 are preferably substantially semi-circular in horizontal cross-section, as at 55, 56. Within each of the bores 14, 15 and rigidly fixed to the shaft 50, there are valve members 57, 58 which are responsive to suction and which control the admission of air from the inlet 8 to the mixing chambers 59, 60 in bores 14, 15. The valve members 57, 58 are preferably secured to the shaft 50 by screws 61 and extend in a downward inclined direction at an angle of substantially 30°, for example, to the horizontal and toward the curved walls 55, 56, the valve members being similarly curved at their free end edges to conform to and seat against the curved wall surface. The valve members 57, 58 closely fit the bores 14, 15 so as to prevent leakage of air therepast into the mixing chambers.

In the casing wall 12 are a pair of laterally spaced, vertical bores 62, 63 which open at their upper ends into the air inlet 8 through the top face of a horizontal shoulder 64 formed in the upper portion of wall 12. The bores 62, 63 extend vertically downward to a point below the air valves 57, 58 and thence extend at a downward inclination and inwardly to the mixing chambers 59, 60 respectively, opening thereinto radially through the curved walls 55, 56, see Fig. 8. In the mixing chamber outlet end portions of the bores 62, 63 there are rigidly secured projecting mixture discharge nozzle members 65, 66 having cylindrical bores therethrough and preferably being externally rectangular in transverse cross-section. The discharge orifice 67 of each nozzle member opens through a nozzle end face which is inclined to the longitudinal axes of the nozzle members, providing a beveled nozzle end portion having an extended side wall 68 on each nozzle member which is directed toward the partition 13, which nozzle construction acts to enhance the even distribution of the mixture discharged from the nozzle members. In and tightly fitting the vertical portions of bores 62, 63 there are tubes 69, 70, see Fig. 1, which are of a general Venturi type and of identical construction and therefore a description of tube 69 will suffice for both. The tube 69 has a converging inlet bore portion 71 and a diverging outlet bore portion 72, which portions are joined at the throat of the tube by an annular shoulder 73 facing the diverging portion 72. The tube 69 has in its upper end portion vertically spaced, circumferential recesses which define with the wall of bore 62 upper and lower annular chambers 74, 75 respectively, which are separated by a circumferential, annular shoulder or flange 76 which fits the bore 62. The taper of the converging bore portion 71 is preferably formed with a 22° included angle and the taper of the diverging portion 72 is preferably formed with a 7° included angle so that the tube 69 is substantially of Venturi tube form but is modified by the downward facing shoulder 73 at its throat. The tube 69 has a plurality of fuel discharge passages or ports 77 having their inlet ends circumferentially spaced about the annular chamber 74 and opening therefrom in downward converging relation into the diverging bore portion 72 at the throat of the tube 69 and just below or at the shoulder 73. Also opening into the diverging bore portion 72 there are one or more ports or passages 78 having their inlet ends opening from the annular chamber 75 and extending in an upward inclined direction with their outlet ends opening or discharging at the throat of tube 69 in the same plane transverse to the longitudinal axis of the tube as are the outlets of ports 77 and therefore directly below or at the shoulder 73, the outlet or discharge ends of the ports 77 and 78 being equally spaced from the shoulder 73 so that the ports 77, 78 will be subject equally to any variations of pressure in the bore of tube 69. The increased diameter

of the tube throat resulting from shoulder 73 prevents restriction of the throat by the fuel discharging thereinto through ports 77 and maintains the suction on ports 77 and 78 substantially the same as the throat suction would be if no fuel were admitted thereto, thereby increasing the suction or decreasing the pressure on ports 77 and 78 relative to the suction or pressure which would be obtained if shoulder 73 were not employed.

Also in the wall 12 and preferably between the bores 62, 63 and the reservoir casing 27, there is a vertical fuel conduit 79 which branches at its upper end to feed fuel to the annular chambers 74 of the tubes 69, 70, these chambers communicating with conduit 79 through the branch conduits 80, 81, see Fig. 1. Extending into the wall 12 there is a horizontal, cylindrical bore 82 which intersects the conduit 79 and which is closed at its inner end by an end wall 83, the bore 82 at its intersection with the conduit 79 forming a valve chamber and being of greater diameter than the diameter of conduit 79. In the bore or chamber 82 there is a cylindrical, rotatable valve member 84 which when in its position most restricting the conduit 79 has on its underside a substantially segmental cross slot 85 of a width substantially equal to the diameter of conduit 79. The remaining segmental portion 86 is cut away at its opposite side edges to provide ports 87, 88 which register with the conduit 79 and which act as the valve member is rotated to regulate and permit an increasing flow through the conduit 79. The valve member 84 has a stem 89 which extends externally of the wall 12 and through a packing recess 90 formed as an enlargement of and at the outer end portion of bore 82. In the recess 90 and surrounding stem or shaft 89 is packing material 91 positioned between cone-shaped metal retaining discs and which is held under compression by a helical coil spring 92 surrounding stem 89 so as to prevent leakage of air from atmosphere to the conduit 79. The spring 92 is held under compression by engagement at its outer end with a sleeve nut 94 screw-threaded into the recess 90. The valve member 84 is preferably of greater diameter than its stem 89 to provide an outward facing shoulder against which one of the cone-shaped packing retainers abuts and which prevents movement of the valve member out of its chamber. On the projecting end of the stem or shaft 89 is a crank or lever arm 95 which is adjustably fixed thereto. Mounted on the free end of the arm 95 there is an eccentric 96 comprising eccentrically joined pins 97, 98 of which pin 97 extends through an aperture in arm 95 to be locked in adjusted position by the nut 99. The projecting pin 98 forms a connecting arm on the lever 95 and has pivotally secured thereto one end of a connecting link or member 100. The other end of link 100 is pivotally secured to an arm 101 rigid with the throttle operating lever 102 which is rigidly fixed on the projecting end portion 21 of the throttle shaft. The throttle lever 102 also has rigid therewith an arm 103 which extends upwardly when the throttle valves are in closed position. The arm 103 carries an adjustable stop member or screw 104 cooperable with an abutment or flange 105 projecting from the throttle body member 3 to regulate or limit the extent of closing movement of the throttle valves, the members 104, 105 forming the throttle valve idle adjustment. On the other projecting end portion 20 of the throttle shaft there is journaled for rotation relative thereto an operating lever 106 having an arm 107 cooperable with an abutment member 108 fixed on the shaft end portion 20. The arm 107 and the abutment member 108 cooperate on clockwise rotation of arm 106, facing Fig. 4, to move the throttle valves toward open position and limit closing movement of the throttle valves but as will be apparent, do not interfere with opening movement of the throttle valves by the lever arm 102. The lever 106 is adapted for connection to the manual throttle setting adjustment member, mounted in current automobile practice on the automobile instrument board or dash within easy reach of the operator. The throttle lever 102 is adapted for connection by suitable linkage to the foot or accelerator pedal and is the normal throttle operating means.

Positioned at one side of the vertical tube receiving bore 63 and in the wall 12, there is an air supply passage or duct 109 which is closed at its top end by a plug 110 and which has an air inlet port 111 adjacent its upper end, the port being downward inclined for dirt elimination and opening into the common air inlet 8. The duct 109 opens at its opposite end at an upward inclination into the float chamber 33 adjacent the cover member 43. Screw-threaded or otherwise sealed in the outlet end portion 112 of duct 109 is a plug member 113 having a calibrated air flow controlling port 114 to regulate the admission of atmospheric air from inlet 8 to the interior of the float chamber above the liquid level therein. The plug member 113, which is hollow, projects from the wall of the chamber 33 and terminates well above the liquid level.

Within the dash-pot and pump casing 28 there is a cylindrical housing member 115 which is longitudinally reciprocal therein. The housing member 115 is internally cylindrical to receive a piston 116 which is preferably substantially cup-shaped, having a cylindrical side wall portion 117 fitting the bore of housing member 115 and cooperating therewith to guide the piston 116. The housing member has an end wall 118 opposite the piston 116 and toward which the piston moves upon its compression stroke. Through the end wall 118 there are a plurality of ports 119 establishing communication between the chamber 120 within the housing and the portion of the chamber 121 on the opposite side of wall 118. Within the chamber 120 there is a helical coil spring 122 which at its opposite ends abuts the inside face of the end wall 118 and the inside face of piston 116, being held under compression therebetween to normally urge the piston to the position shown in Fig. 4 and through its suction stroke. The chamber 120 is annular in cross-section, having its inner cylindrical wall formed by a tubular member or sleeve 123 which projects concentrically from wall 118 and by a tubular member 124 which slidably fits within the member 123. The member 124 extends through a central aperture 125 in the piston 116 and is provided with a circumferential end flange 126 which abuts the outside face of piston 116, the piston being held against flange 126 by spring 122 so that the member 124 and the piston 116 are movable in unison. The casing 28 is preferably provided with a cover member 127 which is removably secured in position by screws 128, a gasket 129 being provided to seal the joint. Extending diagonally through the main casing and the partition wall 13 at an angle of

substantially 45°, there is a guide bore 130 which is concentric with the bore of casing 28 and which opens thereinto at its lower end. The lower end portion of bore 130 is of enlarged diameter, as at 131, the enlarged bore portion being provided with a cylindrical flange extension 132 which projects into chamber 121. The enlarged bore portion 131 intersects and communicates with the conduit 79 below or on the inlet side of the metering valve 84. Projecting concentrically from the outside face of wall 118, there is a tubular member or sleeve 133 which is reciprocal in the enlarged bore portion 131 and which has an end wall 134 having a central fuel port 135 therethrough. The tubular member 133 is preferably provided with a circumferential recess containing suitable packing material 136 to prevent passage of fuel through bore 131 around the member 133. The upper end of bore 130 opens into a vertical, substantially rectangular recess or chamber 137 formed or opening into the partition 13. Longitudinally reciprocal in the bore 130 is a rod 138 which extends at its upper end into chamber 137 and at its lower end through a central aperture 139 in a ported spider 140 within and rigid with the tubular member 124 and preferably formed integrally therewith. The rod 138 is held in engagement with the member 124 by a cross pin 141 passed through the rod and engaging the under or inlet side of the spider 140. The upper end of rod 138 is connected to an arm or crank member 142 positioned in chamber 137 and rigid with and projecting from shaft 50. A link 143 pivotally secured at its opposite ends to the arm 142 and the rod 138 operatively connects the same so that the air valves 57, 58 are operatively connected to the piston 116, the air valves normally being urged toward closed position by the force of spring 122. The chamber 137 is closed and sealed by a cap or cover member 143a which is secured and sealed to the main casing by screws 143b. The portion of the rod 138 intermediate its ends and which extends through port 135 comprises a fuel metering valve defined by the tapered portion 144. The portion 144 may have a plurality of different tapers to enhance the control of the fuel flowing through port 135. It is to be noted that the annular orifice surrounding valve 144 and defined by port 135 is never closed as this would prevent supply of fuel to the mixing chamber. The chamber 121 in casing 28 is in communication at its uppermost point with the float chamber below the liquid level therein by means of a bleed passage 145 which is calibrated and of minute cross-section, preferably of such small size that substantially no fuel will be discharged therethrough under piston compression into the float chamber, the bleed passage functioning to relieve the chamber of gas or air bubbles which might trap therein. The housing member 115 has an external tooth rack 146 extending longitudinally thereof. The rack teeth preferably extend completely around the housing member 115 so that the rack can not become disengaged from the teeth of pinion 147 with which it meshes. The pinion 147 is rigidly fixed on an operating shaft 148, preferably being formed integral therewith and is positioned in a bore 149 extending horizontally into the casing wall which separates the interiors of the reservoir casing 27 and the pump casing 28. The shaft 148 is journaled at its inner end in the closed end of the bore, as at 150, and at its outer end is journaled in the packing nut 151 which closes the bore 149. The portion of the bore 149 containing pinion 147 is sealed against leakage of air thereinto from atmosphere by packing material 152 positioned between oppositely directed conical metal plates 153 and held under compression by a helical coil spring 154 positioned between the nut 151 and the packing material. The nut 151 has a cylindrical extension 155 on which is journaled for rotation an operating lever 156, the lever preferably being held axially in position by a U-shaped locking member 156a, for example. Rigid with the lever 156 there is an arm 157 which carries an adjustment screw 158 which forms a stop for engagement by a lug or stop member 159 carried by a sleeve 160 rigidly secured on the external projecting end of shaft 148. The lug 159 and stop screw 158 are normally urged into engagement with each other by a coil spring 161 which surrounds the extension 155 and has one end anchored to the lever 156 and its other end anchored to the shaft 148, preferably by engagement with the lug 159. The lever 156 is provided with a flat plate portion 162 having its marginal edge or face 163 forming an eccentric cam surface. At the ends of the surface 163 there are stop lugs 164, 165 which limit rotation of lever 156 and therefore of shaft 148 and which engage a stop member 166 projecting from the pump casing 28. The stop member 166 is provided with a guide aperture 167 aligned with the cam face 163 and through which one end of a thrust rod 168 extends for engagement with the cam face 163. The other end portion of the rod 168 is guided in an apertured lug or ear 169 projecting from the casing flange 4 in overlying relation to the idling abutment stop 105. The rod 168 is held in engagement with the cam face 163 by a helical coil spring 170 surrounding the rod and fixed thereto at one end, as at 171, and having its other end engaging the ear 169. The throttle lever arm 103 extends upward into opposing relation to the free end 172 of rod 168 and carries an adjustable abutment screw 173 cooperable with the rod end 172 and engageable thereby upon operation of the rod 168 by the cam face 163 to move the throttle valves toward open position.

The annular chambers 75 in the bores 62, 63 are in communication with the float chamber 33 above the liquid level therein by means of conduits 174, 175 respectively, which have their inlet ends defined by tubular members 176, 177 respectively, which extend at an upward inclination through the float chamber wall and to a point closely adjacent the float chamber cover member 43 to prevent the ingress of fuel to the conduits 174, 175. The conduits 174, 175 are each in communication with the pump chamber 120 by means of the conduits 178, 179 which have vertically extending portions opening downward and through the top wall of chamber 121 on opposite sides of the bleed passage 145, see Figs. 4, 7 and 9. As the conduits 178, 179 are of identical construction, the conduit 178 alone is shown in vertical longitudinal section in Fig. 7. Within the vertical portions of each of the conduits 178, 179 there is a valve chamber 180 containing a check valve 181 preferably of the ball type, having a horizontal seat and only sufficiently heavy to prevent withdrawal of fuel from the chamber 121 by suction in the throats of tubes 69 and 70 respectively. The valves 181 serve to close the conduits 178, 179 upon the downward return or suction stroke of piston 116 to prevent the indrawing of air or gas to the pump chamber and to insure the filling of the pump chamber with

liquid fuel which enters the same through the piston clearance around wall 117. The conduits 178, 179 are preferably turned at the chambers 180 above the valves 181 to align with and open into the conduits 174, 175. The portions of conduits 178, 179 between chambers 180 and conduits 174, 175, respectively, are restricted by calibrated bores 181a, which are of sufficiently large diameter to permit an adequate pump discharge therethrough and which serve in conjunction with the flow areas of conduits 174, 175 to prevent the suction on ports 78 from drawing fuel from the pump chamber into conduits 174, 175. The restricted bores 181a also serve to increase the rapidity of discharge from the pump at the point where the discharging fuel meets and joins the air stream in conduits 174, 175. Stop members 182 are preferably provided to limit the lift of the valves 181 and preferably comprise pins carried by and depending from screws 183 which are screw-threaded into the top ends of the vertical portions of bores 178, 179. The main fuel conduit is provided with a bleed hole 184 through the end wall 118, see Fig. 4, and establishing communication between the interior of the tubular member 123 and the chamber 121 so that any trapped air or gas bubbles can escape from the main fuel conduit into chamber 121 and thence through bleed passage 145.

The mixing chambers 59, 60 are also preferably in communication with each other through a horizontal slot 185 anterior to the throttle valves 124, 125 to equalize the sub-atmospheric pressures in the mixing chambers and acting on the discharge nozzles 65, 66.

In a carburetor such as the one illustrated in Figs. 1 to 10 inclusive, I have found it desirable and that the carburetor will operate efficiently when the following dimensional sizes are utilized; but the sizes given are to be taken merely as illustrative and are not, as will be obvious, to be considered as limiting or circumscribing the scope of the claims. It is preferable that in each tube, one air suction port 78 be used having a diameter of .043" but a plurality of such ports 78 may be employed in each tube having the sum total of their cross-sectional areas equivalent to .043". Preferably six ports 77 are provided in each tube for supplying fuel to the bypass passageway, each such port having a diameter of .059". The throat between the converging-diverging bores 71, 72 is preferably ⅛", with the shoulder 73 increasing the size at the throat to $\frac{5}{32}$" diameter. The diameter of the fuel passage or conduit 79 is preferably $\frac{7}{32}$" diameter. The main fuel port or orifice 135 preferably has a diameter of .171" and the taper of the metering valve 144 may generally be considered as a taper of substantially ½" per foot. The economizer valve 84 acts to control fuel flow through passage 79 and to decrease the flow permitted by metering valve 144 between say 25 miles per hour and 65 miles per hour level road car speeds by from two to three pints of gasoline per hour. When the carburetor serves as the agency or means for lifting fuel from a lower level tank or source of supply to the float chamber 33, the calibrated air inlet port 114 is preferably of a diameter of .041" which results in the maintenance of a vacuum or sub-atmospheric pressure above the liquid level in the float chamber sufficient to raise fuel from the low level supply tank by suction and to maintain a substantially constant pressure differential of 9" of gasoline between the pressure acting on the surface of the gasoline in reservoir 33 and the pressure or vacuum transmitted through conduit 79 and serving to draw fuel or gasoline from the reservoir 33 to the mixing chambers. The diameter of bleed passage 145 is preferably .042" and the diameter of bleed port 184 is also preferably .042". The piston side wall 117 preferably has a mean diametral clearance in the bore of housing member 115 of .0025". The metering rod 138 is preferably $\frac{3}{16}$" in diameter and has a longitudinal travel of $\frac{7}{16}$" on full movement of the air valves, the tapered metering valve 144 being preferably set so that when the air valves are in closed position it will be substantially $\frac{1}{16}$" in longitudinal movement from engagement or seating in the orifice 135. The housing member 115 has ¼" longitudinal movement on full movement of lever 156. The force exerted by dash-pot spring 122 when the parts are in the positions shown is sufficient to hold the air valves 57, 58 closed against a vacuum in the mixing chambers corresponding to 24" of gasoline. The pump discharge ducts 178, 179 are each $\frac{3}{32}$" in diameter and are each restricted by bores 181a to a diameter of .046". The bores of tubes 176, 177 are each $\frac{5}{32}$" in diameter. The float chamber inlet port 31 is $\frac{5}{32}$" in diameter. The nozzle members 65, 66 have bores of $\frac{5}{16}$" diameter, and at the base of the inclined orifice face are $\frac{7}{16}$" square in transverse cross-section. The pressure equalizing slot or epening 185 is ½" wide and $\frac{3}{32}$" deep, the slot 26 being ½" wide and ⅜" deep. The effective flow areas of economizer valve ports 87 and 88 are respectively slightly less than .001 square inch and .004 square inch when the valve 84 is in engine idling position, Fig. 10, the diameter of valve 84 being $\frac{3}{16}$".

A helical coil spring 186 is preferably positioned in the casing 28 and held under compression between the cover member 127 and the lower end of the housing member 115 in order to take up any lost motion between the rack 146 and pinion 147 thereby insuring the maintaining of the orifice 135 in a given position for a given setting of the lever arm 156.

The operation of the carburetor above described is as follows, the casing 1 having been secured by flange 3a and sealed to a duplex engine-intake manifold and the float chamber inlet 29 having been connected by a suitable conduit to a low level source of fuel supply or main tank. The main fuel orifice 135 is adjusted or set for warm engine idling operation relative to valve 144 by means of adjustment screw 158 without changing thereby the normal position, Fig. 2, of lever 156. The throttle valves will also be set or adjusted for warm engine idling operation and the economizer valve will be set or adjusted to start restricting the main fuel supply at about 25 miles per hour level road car speed. With the parts in the positions shown, the lever 156 is rotated counterclockwise, facing Fig. 2, which rotates pinion 147 in a clockwise direction, Fig. 4, to move the housing member 115 downward and toward the casing cover member 127. The extent of rotation of lever 156 is dependent upon the engine temperature at starting or engine cranking and if the engine is extremely cold, the lever will be rotated until stop 165 engages stop member 166. The downward movement of housing member 115 by operation of lever 156 moves the sleeve member 133 relative to valve 144 to increase the size of the annular fuel orifice through port 135, thereby to increase the ratio of fuel to air supplied to the mixing chambers

and to provide an enriched mixture for engine starting. This movement of housing member 115 also compresses spring 122 thereby increasing the load on or resistance to opening movement of the air valves 57, 58, holding them closed and sealed against the suction in the mixing chambers. In addition, the cam face 163 moves the thrust rod 168 longitudinally against the force of the light return spring 170 and pushes on the adjustable abutment screw 173 to rotate or move the throttle valves 24, 25 toward open position, the extent of opening movement of the throttle valves being determined by the adjustment of screw 173 and the throttle valves being sufficiently opened when stop 165 engages stop 166 to maintain warm engine operation at a high idling speed equivalent to say 15 miles per hour level road car speed. Movement of throttle arm 103 by rod 168 also moves the throttle arm 101 which is connected to the economizer valve 84 but the movement is insufficient to change the effective flow area through conduit 79 as the extent of closing movement of economizer valve port 88 is fully compensated by the opening movement of economizer valve port 87, the port or slot 88 not being fully closed by this movement of the throttle valves. If the engine is now cranked for starting, the sub-atmospheric pressure created thereby in the mixing chambers 59, 60 will be insufficient even with the lever arm 156 in its normal warm engine operating position, as in Fig. 10, to cause opening movement of the air valves 57, 58 but air entering the main inlet 8 will by-pass the air valves by means of the passageways through the tubes 69, 70. The air passing the throats of tubes 69, 70 will create suction on the fuel ports 77 and the air lift or suction ports 78. The suction on ports 77 will be transmitted to annular chamber 74 and thence to conduit 79 through the communicating branch conduits 80, 81. Liquid fuel will therefore be drawn from reservoir or chamber 33 through conduit 42, chamber 121, tubular members 124, 123 and 133, and the more widely opened fuel orifice 135 into conduit 79 and thence through ports 77 into the throats of tubes 69, 70, the economizer valve 84 not restricting the flow of the fuel which has been permitted to flow through the orifice 135. The suction at the throats of tubes 69, 70 acting on ports 78 acts through conduits 174, 175 and their respective tubes 176, 177 to withdraw vapor of the liquid fuel and air from the float chamber 33 above the liquid level therein thereby creating a sub-atmospheric pressure on the liquid in the float chamber, which suction is not satisfied by the air admitted through calibrated port 114 to the float chamber and thence to withdrawal conduits 174, 175. By inclining the passages or ports 78 as above described toward the tube air inlet end, I have found by manometer test that sudden changes of pressure at the tube throat are not as quickly transmitted to the float chamber air space as when the longitudinal axis of the ports are normal or at right angles to the longitudinal axis of the tube and by manometer, dynamometer and road test that the sudden inrush of air into the carburetor due to automatic excess opening of the suction responsive valves on quick opening of the throttle or when the throttle is "kicked open" is compensated for by the concurrent and momentary increase in the pressure differential acting on the fuel in the float chamber. The air entering the float chamber through port 114 and tube 113 serves due to the spacing of tube 113 from the tubes 176, 177, to sweep continuously from the chamber above the liquid level the gas or vapor of the liquid fuel and causes discharge of the gas or vapor through tubes 176, 177 into the Venturi type tubes 69, 77. The air entering tubes 69, 70 from main inlet 8 mixes at the throats of the tubes and below the shoulders 73 with the liquid fuel supplied thereto through ports 77, the rich mixture thus formed discharging at a downward inclination through the nozzle members 65, 66 into the mixing chambers 59, 60. The sub-atmospheric pressure created in the float chamber above the liquid level therein by the suction at the throats of tubes 69, 70 draws fuel from the low level main tank through inlet 29 into the chamber 33 upon lowering of float 34 which opens the float controlled valve 39 thereby replenishing the fuel withdrawn from chamber 33 and maintaining the liquid level therein constant at the line L—L. The depression or vacuum at engine idling speeds with the parts positioned as in Fig. 10 and dimensioned as above set forth will be substantially equal to 40'' of gasoline over the liquid in the float chamber. Upon operation of the engine under its own power and as the engine warms up, the lever 156 will be returned from its starting position and in a clockwise direction, facing Fig. 2, toward the warm engine operating position thereof shown in Fig. 2 so as to decrease the ratio of fuel to air discharging to the engine from the mixing chambers. The extent of return movement of lever 156 will be readily determined by the operator in accordance with resulting engine performance, the return movement, as will be obvious, decreasing the added resistance to opening movement of or load on the air valves 57, 58 by spring 122, decreasing the temporarily increased effective flow area through main fuel orifice 135 and also permitting movement of the throttle valves toward normal warm engine idling position. With lever 156 in any position wherein stop 164 is out of engagement with stop 166 the ratio of fuel to air supplied to the engine will be increased for all engine speeds. When the engine has been completely warmed up, the lever 156 will have been returned to the position shown in Fig. 2 when the remaining parts and mechanism of the carburetor will be in the positions shown in the drawings at engine idling speeds. As the throttle valves are gradually moved toward open position to increase the speed of the engine for level road engine operation, the decreasing pressure or increasing suction in the mixing chambers will cause opening movement of the air valves 57, 58, their positions being determined by the quantity of air flowing therepast into the mixing chambers and being such as to maintain the sub-atmospheric pressures in the mixing chambers within predetermined limits and substantially constant. The opening movement of the air valves 57, 58 rotates shaft 50 counter-clockwise, facing Fig. 4, to move or pull rod 138 upward and metering valve 144 in an opening direction or away from its orifice 135 to increase the quantity of fuel supplied to the conduit 79 and the mixing chambers to maintain the desired fuel-air ratio in accordance with the opening movement of the air valves 57, 58. As above noted, the economizer valve 84 does not act below a position of the throttle valves corresponding to say 25 miles per hour level road car speed to restrict or cut down the quantity of fuel supplied through orifice 135 but as the throttle valves are moved further open to further in-

crease the engine speed, the economizer valve 84 limits the fuel which has passed through orifice 135 as the valves 144 and 84 simultaneously move toward further open positions. The fuel flowing through orifice 135 will be limited or restricted by the economizer valve 84 at level road loads until the economizer valve 84 has been moved to a position by operation of the throttle valves corresponding to a throttle valve open position of substantially 65 miles per hour level road car speed. Above 65 miles per hour level road car speed, the economizer valve 84 no longer restricts the fuel which is supplied through orifice 135 so that the ratio of fuel to air supplied to the mixing chambers is then solely under control of the metering valve 144.

The operation of the air valves 57, 58 is controlled by the spring 122 and the dash-pot and pump piston 116 which serve to steady the movement of the air valves and to prevent fluctuating operation thereof, the spring 122 also serving to move the air valves toward closed position upon increase of pressure in the mixing chambers whether caused by increased load on the engine or movement of the throttle valves toward closed position. During full load, wide open throttle operation of the engine, the economizer valve 84 will be in wide open position, permitting substantially unrestricted flow through conduit 79 and therefore the metering valve 144 will be in complete control of the fuel supplied to the mixing chambers as determined by and in accordance with the position of the air valves 57, 58.

Upon quick opening movement of the throttle valves 24, 25 for rapid acceleration of the engine, the sudden decrease in pressure in the mixing chambers will cause air valves 57, 58 likewise to move quickly in an opening direction causing operation of the piston 116 to compress fuel in the bore of housing member 115. The fuel under pressure will be discharged by piston 116 through ports 119 in the housing member wall 118 and thence upwardly through conduits 178, 179, lifting ball checks 181 and discharging thence into and through conduits 174, 175 and their outlet ports 78 into the throats of tubes 69, 70, thereby augmenting or supplementing the fuel supplied to the mixing chambers through conduit 79. Some of the fuel so discharged may pass into the tubes 176, 177 if the discharge from the pump chamber is sufficiently rapid and will be discharged by the air entering the tubes 176, 177 through ports 78 upon cessation of the piston movement. The bleed passages 145 and 184 are relatively so small that substantially no fuel is discharged therethrough on the pump discharge stroke, substantially all of the fuel passing up into and through the conduits 178, 179. The operation of the pump piston will not affect the discharge of fuel through the main fuel discharge conduit as the main conduit which opens from the float chamber through opening 41 extends concentrically through the pump chamber and is separated therefrom by the tubular members 124, 123 and 133 which form a partition or cylindrical wall separating the conduit from the pump chamber.

The carburetor shown in Figs. 11 to 18 inclusive is similar in many respects to the carburetor above described and shown in Figs. 1 to 10 inclusive and therefore the primes of the reference characters applied to Figs. 1 to 10 inclusive will be employed to designate the same parts of the carburetor of Figs. 11 to 18. This carburetor of Figs. 11 to 18 inclusive will now be described and differs from the carburetor of Figs. 1 to 10 inclusive in the following respects: Instead of employing a separate by-pass passageway for by-passing each of the air valves, a passageway having a common inlet and a branched outlet is employed. This passageway comprises a single vertical bore 187 containing a Venturi type tube 188 substantially similar to the tubes 69, 70, save that it is screw-threaded, as at 189, into the threaded upper end portion of the bore of passageway 187. The vertical portion 187 of the by-pass passageway opens at its lower end into a transverse horizontal passageway portion 190 which is vertically below the closed position of the air valves and which is positioned laterally of the mixing chambers 59', 60'. The passageway portion 190 comprises a manifold defining passageway branches having from its opposite end portions downward inclined bores opening into the mixing chambers 59', 60' and in these bores are hollow nozzle members 191, 192 which project into the mixing chamber bores 15' and 14' respectively. The annular chamber 78' in the tube 188 is in communication with the float chamber 33' above the liquid level therein by means of a conduit 193. The upper end of fuel conduit 79' opens through a single port 194 into the annular fuel chamber 74'. The economizer valve 84' shown in detail in Fig. 16 functions to obtain the same result as valve 84 but is provided with a transverse passage 195 having a diameter equal to the diameter of conduit 79' and which is movable into registry therewith in the full open position of valve 84'. The upper and lower segmental portions of valve 84' are provided with upper and lower radial slots 196, 197 which provide a minimum flow through the conduit 79' and which meter the flow through said conduit as the valve is moved in clockwise direction, facing Fig. 13, on opening movement of the throttle valves. The housing member 115' does not have any ports in its end wall 118', the pump discharge being through the orifice 135' and the conduit 79'. In the bore of housing member 115' there is a piston 198 which has ports 199 therethrough establishing communication between the interior of the dash-pot and pump casing 28' and the interior of the housing member 115'. The ports 199 are controlled by a check valve 200, preferably a flat circular disc, retained in operative position by a spider 201. The spider 201 is held in engagement with the inside face of piston 198 by the helical coil spring 122'. The metering valve rod 138' which extends through the main fuel orifice 135' passes through suitable apertures in the spider 201 and check valve 200 and is suitably rigidly secured to the piston 198 so that the piston and air valves are movable in unison. The fuel inlet valve 202 controlled by the constant level float 34' is of the conventional type, the fuel retaining partition which prevents draining of the float chamber in this carburetor being a cup-like member 203 surrounding the valve guide member 32' and clamped in position thereby, as at 204. The air inlet to the top of the float chamber from the main air inlet 8' is through a duct 205 having in its inlet end a calibrated plug 206 having therethrough the calibrated orifice 114', see Fig. 15. The throttle lever 102' which is fixed on the throttle shaft end portion 21' has an adjustable abutment screw 207 which engages a transverse flange or arm 208 on an operating link 209 which is journaled on the throttle shaft end portion 21' and positioned between the lever 102' and the throttle body 3'. The flange 208 is movable into

engagement with a lug or ear 210 on the throttle body member 3' to limit closing movement of the throttle valves 24', 25'. The other end of the link 209 is slotted, as at 211, to provide a lost-motion connection with the pinion operating lever 156'. Through the slot 211 there is a screw 212 which is eccentric to the pinion shaft 148' and which secures the link 209 to the lever 156'. The lever 156' has an arm 213 carrying an adjustable abutment screw 214 engageable with a stop 215 on the casing 28'. The arm 213 is provided with a longitudinal recess which intersects the transverse threaded bore carrying the screw 214. In the longitudinal recess there is a detent member or dog 216 normally urged into engagement with the screw 214 by a light coil backing spring, the detent 216 cooperating with longitudinal slots or grooves 217 in the screw 214 to hold or lock the screw in adjusted position. The lever 156' is normally held rigid with shaft 148' by a clamping screw 218, the lever 156' being adjustable about shaft 148' to regulate the position of the lever 156' relative to pinion 147' and the throttle valves. The throttle lever 102' is operatively connected to the economizer valve lever or crank 95' by a link 219 which is temperature responsive and preferably of bimetal having a loop or bowed portion 220 to multiply the longitudinal expansion or contraction of the link upon temperature change. The link 219 expands upon decrease of temperature and therefore moves the economizer valve 84' toward open position without disturbing the setting of the throttle valves with the result that the economizer valve 84' permits a greater flow of fuel, the flow permitted increasing with decrease of temperature thereby causing an increase in the ratio of fuel to air and the supply of a richer fuel mixture to the engine at level road car speeds between 25 and 65 miles per hour. The sizes of the ports and passageways and of the other parts of this carburetor are preferably the same as like ports and parts described above in connection with Figs. 1 to 10 inclusive. The operation of this carburetor will be clear to those skilled in the art from the detailed description of operation of the carburetor of Figs. 1 to 10 inclusive, taken with the foregoing description of differences of this carburetor with respect to the carburetor of Figs. 1 to 10 inclusive. However, it may be noted that the main fuel supply is augmented or supplemented on the pump discharge by additional fuel supplied through the main conduit 79'. Since the economizer valve 84' is operated upon operation of the throttle valves and the movement of the piston 198 results from opening of the air valves 57', 58', it will be apparent that the economizer valve 84' does not obstruct the discharge of fuel by the pump piston.

In Fig. 19, I have shown a modification of the dash-pot and pump structure contained in the casing 28'. In this form, the reciprocal housing 221 which is substantially similar in form to housing member 115' is closed and sealed at its lower end by an end wall or plug 222. Within the bore of housing member 221 there is a piston 223 which is secured to the end of metering valve rod 138' and which cooperates with the air valve resisting spring 122', as described above. The housing member 221 is at its upper end portion adjacent conduit 79' of less diameter than the bore of casing 28' so as to provide an annular passageway 224 for supplying fuel from the float chamber 33' to the conduit 79'. The end wall 225 of member 221 opposite the plug member 222 and corresponding to end wall 118', Fig. 14, is provided with a plurality of valve ports or apertures 226 which are controlled by a flat disc check valve 227. The disc valve 227 may be of a stiff, light fabric impervious to liquid, and be held in a valve cage or retaining member 228. The end of spring 122' opposite piston 223 preferably abuts a flange on the cage 228 to hold the same in engagement with the end wall 225 and in fixed position in the housing member 221. The fuel fed from the float chamber 33' and passing through annular passageway 224 passes substantially directly from ports 226 into the tubular member 133' for supply to conduit 79'. On sudden opening movement of the air valves connected to rod 138' the fuel under pressure by piston 223 forces valve 227 to its seat, closing the ports 226 and discharging through orifice 135' to supplement or augment the normal fuel discharge through conduit 79'.

The float chamber inlet controlling valve shown in Fig. 20 may be used in lieu of the inlet valves above described. In the float chamber inlet passage 29 there is a ported guide member 229 having a vertical bore 230 therethrough to receive the reciprocal valve operating member or stem 231 carrying at its upper end the flanged collar 38 cooperating with the float actuated lever 35. The lower end portion of the guide member bore 230 is of enlarged diameter to receive a ported valve seat member 232 which is rigidly fixed in the bore as by a press fit. The inlet port 233 through member 232 is controlled by a check valve 234, preferably a flat disc, which seats on an annular rib or bead seat on the top face of member 232 and surrounding port 233. The valve 234 is separate from stem 231, so that it can seat independently of the action of stem 231. The valve 234 is normally moved to its seat by float 34 acting through stem 231 when the liquid level reaches line L—L thereby maintaining a constant liquid level in chamber 33 and is also closed irrespective of float operation when the fluid pressure in chamber 33 exceeds the pressure in the inlet 29 thereby preventing liquid fuel in the main supply line to inlet 29 from draining back into the main lower level supply tank. The valve 234 will open when the liquid level drops below line L—L, if the pressure in inlet 29 exceeds the pressure acting on the chamber or outlet side of the valve which is the case during operation or running of the engine.

Although I have described the carburetors embodying my invention as particularly adapted and constructed for drawing or lifting fuel from a low level supply tank to the carburetor float chamber, I have found these carburetors are equally operable to supply a proper mixture of air and fuel to an internal combustion engine when the float chamber is supplied with fuel by an auxiliary pump or other independent supply means. However, I have found that these carburetors when utilized with an independent means for supplying fuel to the constant level chamber may have their efficiency of operation increased somewhat by reducing the resistance of the air valve or dash-pot spring and by maintaining atmospheric pressure over the liquid in the float chamber. The float chamber may be placed under atmospheric pressure by increasing the effective flow area of the calibrated air inlet port 114 or 114'.

What I claim and desire to secure by Letters Patent of the United States is:

1. A carburetor comprising a casing having a

passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a bore portion of restricted cross-sectional flow area, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, said conduit being sealed against admission of air and having a portion of its length above the liquid level in said reservoir, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said bore portion, said outlets being positioned in a common plane normal to the longitudinal axis of said bore portion whereby said conduits are subjected equally to variations in pressure in said bore portion, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said bore portion and through said second-named passageway into said mixing chamber.

2. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a pasageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a bore portion of restricted cross-sectional flow area, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, said conduit being sealed against admission of air and having a portion of its length above the liquid level in said reservoir, an air and vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said bore portion, said outlets being positioned in a common plane normal to the longitudinal axis of said bore portion whereby said conduits are subjected equally to variations in pressure in said bore portion, and means to supply air to said reservoir above the liquid level therein at a point spaced from the inlet to said second-named conduit whereby the supplied air will sweep the interior of said reservoir above the liquid level and will maintain over the liquid a greater pressure than exists in said fuel conduit.

3. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a converging bore portion and a diverging mixture discharge bore portion, an annular shoulder joining said bore portions and facing said diverging portion, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said second-named pasageway, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said second-named passageway, said conduit outlets being positioned closely adjacent to and substantially equally spaced from said shoulder and between said shoulder and said mixing chamber, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said second-named passageway and thence into said mixing chamber.

4. A carburetor comprising a casing having a passageway therethrough including a downward discharging mixing chamber having an air inlet in alignment therewith, suction responsive means pivotally supported for downward swinging movement and controlling admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a downward extending passageway having an air inlet and discharging laterally into said mixing chamber, an extension for the discharge end of said second-named passageway spacing the outlet of said second-named passageway from the walls of said mixing chamber, said second-named passageway having a converging bore portion and a diverging mixture discharge bore portion, an annular shoulder joining said bore portions and facing said diverging portion, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging laterally into said diverging portion, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging laterally into said diverging portion, said conduit outlets being positioned closely adjacent to and substantially equally spaced from said shoulder, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said second-named passageway and thence into said mixing chamber.

5. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a bore portion of restricted cross-sectional flow area, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, said conduit being sealed against admission of air and having a portion of its length above the liquid level in said reservoir, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said bore portion, said outlets opening laterally through the side wall of said bore portion and being positioned in a common plane normal to the longitudinal axis of said bore portion whereby said conduits are subjected equally to variations in pressure in said bore portion, and means to supply air to said second-named conduit, said air supply means being calibrated whereby to maintain sub-atmospheric pressure in said reservoir above the liquid level therein.

6. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive

means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a bore portion of restricted cross-sectional flow area, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, said conduit having a portion of its length extending above the liquid level in said reservoir, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said bore portion, said outlets being positioned in a common plane normal to the longitudinal axis of said bore portion whereby said conduits are subjected equally to variations in pressure in said bore portion, fuel metering means in said fuel conduit, means operatively connecting said suction responsive means and said metering means, said fuel conduit being open at all positions of said metering means, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said bore portion and through said second-named passageway into said mixing chamber.

7. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a bore portion of restricted cross-sectional area, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said bore portion, said outlets being positioned in a common plane normal to the longitudinal axis of said bore portion whereby said conduits are subjected equally to variations in pressure in said bore portion, a valve in said fuel conduit, a throttle valve controlling discharge from said first-named passageway, temperature responsive means operatively connecting said valves, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said bore portion and through said second-named passageway into said mixing chamber.

8. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a bore portion of restricted cross-sectional flow area, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said bore portion, said outlets being positioned in a common plane normal to the longitudinal axis of said bore portion whereby said conduits are subjected equally to variations in pressure in said bore portion, two fuel metering valves in said fuel conduit, one of said valves being operatively connected to said responsive means, a throttle valve controlling discharge from said first-named passageway, means operatively connecting the other of said metering valves to said throttle valve, said one metering valve controlling fuel flow at substantially closed and at substantially wide open throttle valve positions, said other metering valve controlling fuel flow at intermediate throttle valve positions, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said bore portion and through said second-named passageway into said mixing chamber.

9. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a bore portion of restricted cross-sectional area, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, said conduit having a portion of its length extending above the liquid level in said reservoir, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said bore portion, said outlets being positioned in a common plane normal to the longitudinal axis of said bore portion whereby said conduits are subjected equally to variations in pressure in said bore portion, means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit so that fuel will be discharged into said bore portion and through said second-named passageway into said mixing chamber by the maintained pressure differential, and means to supplement the discharge of fuel supplied by the maintained pressure differential.

10. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a bore portion of restricted cross-sectional flow area, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said bore portion, said outlets being positioned in a common plane normal to the longitudinal axis of said bore portion whereby said conduits are subjected equally to variations in pressure in said bore portion, a pump in said

fuel conduit, means operatively connecting said pump to said suction responsive means, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said bore portion and through said second-named passageway into said mixing chamber.

11. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a converging-diverging bore portion, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, said conduit having a portion of its length extending above the liquid level in said reservoir, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said bore portion, said outlets being positioned in a common plane normal to the longitudinal axis of said bore portion whereby said conduits are subjected equally to variations in pressure in said bore portion, a pump supplied from said reservoir, a discharge conduit leading from said pump and discharging into said converging-diverging bore portion, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said bore portion and through said second-named passageway into said mixing chamber.

12. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a converging-diverging bore portion, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said bore portion, said outlets being positioned in a common plane normal to the longitudinal axis of said bore portion whereby said conduits are subjected equally to variations in pressure in said bore portion, a pump supplied from said reservoir, a discharge conduit leading from said pump and opening into said second-named conduit anterior to said bore portion, means in said discharge conduit to close said discharge conduit against indrawing of air to said pump, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said bore portion and through said second-named passageway into said mixing chamber.

13. A carburetor comprising a main casing having a passageway therethrough including a mixing chamber having an air inlet, an air valve responsive to mixing chamber suction and controlling the admission of air to said chamber, a fuel supply conduit discharging into said mixing chamber, a fuel receiving casing carried by said main casing, a housing member containing a dash-pot chamber reciprocal in said second-named casing, a wall of said housing member having a fuel port communicating with said conduit, a piston in said dash-pot chamber, a fuel metering rod extending through said fuel port and defining with said wall an annular orifice, said rod having one end connected to said piston, means operatively connecting the other end of said rod to said air valve, and means carried by said main casing to move said housing member relative to said rod thereby to regulate the flow of said orifice.

14. A carburetor comprising a main casing having a passageway therethrough including a mixing chamber having an air inlet, an air valve responsive to mixing chamber suction and controlling the admission of air to said chamber, a fuel supply conduit discharging into said mixing chamber, a casing carried by said main casing, a housing member containing a dash-pot chamber reciprocal in said second-named casing, a sleeve member slidably fitting and terminating in said conduit and extending from said housing member, said sleeve member having a fuel port establishing communication between said dash-pot chamber and said conduit, a piston in said dash-pot chamber, a fuel metering rod extending through said fuel port and having one end connected to said piston, means operatively connecting the other end of said rod to said air valve, and means carried by said main casing to move said housing member to regulate fuel flow through said port.

15. A carburetor comprising a main casing having a passageway therethrough including a mixing chamber having an air inlet, an air valve responsive to mixing chamber suction and controlling the admission of air to said chamber, a fuel supply conduit discharging into said mixing chamber, a casing carried by said main casing, a housing member containing a dash-pot chamber reciprocal in said second-named casing and having a sleeve member slidably fitting in said conduit, said sleeve member having a fuel port, a piston in said dash-pot chamber, a fuel metering rod extending through said fuel port and having one end connected to said piston, means operatively connecting the other end of said rod to said air valve, a toothed rack on said housing member, and a pinion engaging said rack to move said housing member to regulate fuel flow through said port.

16. A carburetor comprising a main casing having a passageway therethrough including a mixing chamber having an air inlet, an air valve responsive to mixing chamber suction and controlling the admission of air to said chamber, a fuel supply conduit discharging into said mixing chamber, a casing carried by said main casing, a housing member containing a dash-pot chamber reciprocal in said second-named casing and having a fuel port communicating with said conduit, a partition dividing said housing member into a dash-pot chamber and a fuel passage feeding said port, a supplemental fuel supply conduit leading from said dash-pot chamber and discharging into said mixing chamber, a piston in said dash-pot chamber operable to force fuel through said supplemental conduit, a fuel metering rod extending through said fuel port and into said passage, means connecting said rod to said piston, means

connecting said rod to said air valve, and means to move said housing member to regulate fuel flow through said port.

17. A carburetor comprising a casing having a main passageway therethrough including a mixing chamber having an air inlet, a suction responsive air valve in said passageway and controlling admission of air to said mixing chamber, a wall of said casing having a passageway by-passing said air valve and communicating at its outlet end with said main passageway, said by-pass passageway having a converging-diverging bore portion defining a throat, a fuel supply conduit discharging laterally into said throat, a dash-pot chamber receiving liquid fuel and having communication with said by-pass passageway, a piston in said dash-pot chamber, said casing having a guide bore opening into said conduit, means operatively connecting said air valve to said piston and extending through said bore and into said fuel conduit, and a fuel metering valve carried by said connecting means and controlling flow through said conduit.

18. A carburetor comprising a casing having a main passageway therethrough including a mixing chamber having an air inlet, a suction responsive air valve in said passageway and controlling admission of air to said mixing chamber, a passageway by-passing said air valve and communicating at its outlet end with said main passageway, said by-pass passageway having a converging-diverging bore portion defining a throat, a fuel supply conduit discharging into said throat, a dash-pot chamber receiving liquid fuel and having communication with said by-pass passageway, a piston in said dash-pot chamber, means operatively connecting said air valve to said piston, said connecting means extending into said fuel conduit, a fuel metering valve carried by said connecting means, a reciprocatory sleeve member in said conduit and having a port receiving said metering valve, and means to move said sleeve member to regulate fuel flow through said conduit.

19. A carburetor comprising a main casing having vertical downward discharging passageways therethrough with aligned flat internal wall portions, a shaft having its side face in contact with said wall portions, an air valve plate member in each passageway, said valve members being secured at one edge to said shaft and extending at a downward inclination therefrom, said casing having a guide bore extending at a downward inclination between said passageways from a point adjacent the underside and intermediate the ends of said shaft, a reciprocal rod guided in said bore, means operatively connecting one end of said rod to said shaft, a dash-pot and pump casing carried by said main casing and receiving the other end of said rod, a housing member having an end wall and reciprocal in said dash-pot casing, a sleeve member projecting from said end wall and reciprocally fitted in said bore, said sleeve member having a fuel orifice receiving said rod, said rod having a metering valve portion cooperable with and controlling fuel flow through said orifice, means to reciprocate said housing member, a piston in said housing member and secured to and movable with said rod, a float chamber casing carried by said main casing in overlying relation to said dash-pot casing, a fuel conduit connecting the interiors of said float chamber casing and said dash-pot casing, said main casing having in its wall opposite said shaft a vertical bore having its inlet end open to atmosphere, a transverse bore communicating with said vertical bore and having outlets discharging into said passageways posterior to said valve members, a tube in said vertical bore and having a converging-diverging bore forming a throat, a fuel conduit leading from said guide bore on the outlet side of said orifice and discharging into said throat, an air suction conduit leading from the interior of said float chamber casing and discharging into said throat, throttle valves posterior to said air valve members and controlling discharge from said passageways, and means to equalize the suctions in said passageways anterior to said throttle valves.

20. A carburetor comprising a main casing having vertical downward discharging passageways therethrough with aligned flat internal wall portions, a shaft having its side face in contact with said wall portions, an air valve plate member in each passageway, said valve members being secured at one edge to said shaft and extending at a downward inclination therefrom, said casing having a guide bore extending at a downward inclination between said passageways from a point adjacent the underside and intermediate the ends of said shaft, a reciprocal rod guided in said bore, means operatively connecting one end of said rod to said shaft, a dash-pot and pump casing carried by said main casing and receiving the other end of said rod, a housing member having an end wall and reciprocal in said dash-pot casing, a sleeve member projecting from said end wall and reciprocally fitted in said bore, said sleeve member having a fuel orifice receiving said rod, said rod having a metering valve portion cooperable with and controlling fuel flow through said orifice, means to reciprocate said housing member, a piston in said housing member and secured to and movable with said rod, cooperable tubular members separating the interior of said housing member into a central fuel conduit opening into said sleeve member and an annular dash-pot and pump chamber containing said piston, a float chamber casing carried by said main casing in overlying relation to said dash-pot casing, a fuel conduit connecting the interiors of said float chamber casing and said dash-pot casing for supplying fuel to said annular chamber and to said tubular members, said main casing having in its wall opposite said shaft a pair of vertical bores having their inlet ends open to atmosphere and having their outlet ends discharging respectively into said passageways posterior to said air valve members, a tube fitted in each of said vertical bores and having a converging-diverging bore forming a throat, a main fuel conduit leading from said guide bore on the outlet side of said fuel orifice and discharging into said throats, air suction conduits leading from the interior of said float chamber casing and discharging into said throats, pump discharge conduits leading from said pump casing to said air suction conduits, the end wall of said housing member being ported to establish communication between said annular pump chamber and said discharge conduits, and means to prevent withdrawal of fuel by suction from said discharge conduits.

21. A carburetor comprising a casing having an open-ended downward discharging substantially vertical passageway therethrough, the open upper end of said passageway defining an air inlet and the open lower end of said passageway defining a mixture outlet, the wall of said casing

having an open-ended bore extending longitudinally of said passageway and having its upper end defining an air inlet and its lower end defining a mixture outlet, said bore opening laterally into said passageway and having a tubular extension spacing the outlet of said bore from the walls of said passageway, suction responsive means controlling admission of air to said passageway and positioned in overlying relation to said tubular extension, said bore having a converging-diverging portion forming a throat, a fuel supply conduit discharging into said throat to supply a mixture of air and fuel to said passageway, movable fuel metering means controlling said conduit, and means operatively connecting said suction responsive means and said metering means.

22. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a converging-diverging bore portion, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, a conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said bore portion, said outlets being positioned in a common plane normal to the longitudinal axis of said bore portion whereby said conduits are subjected equally to variations in pressure in said bore portion, fuel metering means in said fuel conduit, a throttle valve controlling discharge from said first-named passageway, means operatively connecting said throttle valve and said metering means, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said bore portion and through said second-named passageway into said mixing chamber.

23. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and discharging into said mixing chamber, two fuel metering valves in said fuel conduit, one of said valves being operatively connected to said suction responsive means, a throttle valve controlling discharge from said passageway, means operatively connecting the other of said metering valves to said throttle valve, said one metering valve controlling fuel flow at substantially closed and at substantially wide open throttle valve positions, said other metering valve controlling fuel flow at intermediate throttle valve positions, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit.

24. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a converging-diverging bore portion, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, two fuel metering valves in said fuel conduit, one of said valves being operatively connected to said suction responsive means, a throttle valve controlling discharge from said first-named passageway, means operatively connecting the other of said metering valves to said throttle valve, said one metering valve controlling fuel flow at substantially closed and at substantially wide open throttle valve positions, said other metering valve controlling fuel flow at intermediate throttle valve positions, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said bore portion and through said second-named passageway into said mixing chamber.

25. A carburetor comprising a main casing having a passageway therethrough with an air inlet, a fuel supply conduit discharging into said passageway, a casing enclosing a dash-pot chamber communicating with said conduit, a tubular member reciprocal in said conduit, a piston in said chamber, suction responsive means controlling admission of air from said air inlet to said passageway, a fuel metering member extending into said tubular member and cooperating therewith to control the fuel flow through said conduit, said metering member interconnecting said suction responsive means and said piston, and means to adjust said tubular member relative to said metering member to regulate the ratio of fuel to air supplied to said passageway.

26. A carburetor comprising a main casing having a passageway therethrough with an air inlet, a fuel supply conduit discharging into said passageway, a casing enclosing a dash-pot chamber communicating with said conduit, a tubular member reciprocal in said conduit, packing material sealing the space between said tubular member and the wall of said conduit, a piston in said chamber, suction responsive means controlling admission of air from said air inlet to said passageway, a fuel metering member extending into said tubular member and cooperating therewith to control the fuel flow through said conduit, said metering member interconnecting said suction responsive means and said piston, a shaft carried by said main casing, and cooperable means on said shaft and said tubular member operable upon rotation of said shaft to adjust said tubular member relative to said metering member to regulate the ratio of fuel to air supplied to said passageway.

27. A carburetor comprising a main casing having a passageway therethrough with an air inlet, a fuel supply conduit discharging into said passageway, a casing enclosing a dash-pot chamber communicating with said conduit, a tubular member reciprocal in said conduit, a piston in said chamber, a tubular member extending from said piston concentrically with said first-named tubular member and having longitudinal sliding engagement therewith, a helical coil spring having one end acting against said first-named tubular member and having its other end acting against said piston, a fuel supply reservoir having an outlet opening into said chamber, said tubular

members comprising a passageway establishing communication between said reservoir and said conduit, suction responsive means controlling admission of air from said air inlet to said passageway, a fuel metering member extending into said first-named tubular member and cooperating therewith to control the fuel flow through said conduit, said metering member interconnecting said suction responsive means and said piston, and means to adjust said first-named tubular member relative to said metering member to regulate the ratio of fuel to air supplied to said passageway.

28. A carburetor comprising a main casing having a passageway therethrough including a mixing chamber having an air inlet, an air valve responsive to mixing chamber suction and controlling admission of air to said chamber, a fuel supply conduit discharging into said chamber, a casing carried by said main casing and containing a dash-pot chamber, a piston in said dash-pot chamber, a fuel metering rod operatively connected to said valve and to said piston, a pair of concentric relatively movable tubular members surrounding said rod and extending between said conduit and said piston, said tubular members being laterally spaced from said rod and from the side walls of said dash-pot chamber and having a port cooperable with said rod to provide a fuel orifice, means to supply fuel to the interior of said tubular members for flow to said conduit, and means cooperable with the tubular member having said port to adjust said member relative to said rod to control the ratio of air to fuel supplied to said mixing chamber.

29. A carburetor comprising a casing having a main passageway therethrough including a mixing chamber having an air inlet, a suction responsive air valve in said passageway and controlling admission of air to said mixing chamber, a passageway by-passing said air valve and communicating at its outlet end with said main passageway, said by-pass passageway having a converging-diverging bore portion defining a throat, a fuel supply conduit discharging into said throat, a dash-pot chamber receiving liquid fuel and having communication with said by-pass passageway, a piston in said dash-pot chamber, a rod member extending through a side wall of said fuel conduit into said dash-pot chamber and operatively engaging said piston, said rod member having operative connection with said air valve such that movement of said air valve will be transmitted to said piston, a reciprocatory sleeve member in said conduit and surrounding said rod member, said rod member having a tapered portion cooperable with the bore of said sleeve member to meter fuel flow through said fuel conduit, and means to adjust said sleeve member longitudinally of said rod member to control the ratio of fuel to air supplied to said main passageway.

30. A carburetor comprising a casing having a main passageway therethrough including a mixing chamber having an air inlet, a suction responsive air valve in said passageway and controlling admission of air to said mixing chamber, a passageway by-passing said air valve and communicating at its outlet end with said main passageway, said by-pass passageway having a converging-diverging bore portion defining a throat, a fuel supply conduit discharging into said throat, a dash-pot chamber receiving liquid fuel and having communication with said by-pass passageway, a piston in said dash-pot chamber, means operatively connecting said air valve to said piston, said connecting means extending into said fuel conduit, a fuel metering valve carried by said connecting means, a reciprocatory sleeve member in said conduit and having a port receiving said metering valve, a spring interposed between said sleeve member and said piston and opposing operation of said air valve by mixing chamber suction, and means to move said sleeve member to increase simultaneously the resistance of said spring to air valve movement and to increase the effective flow area of said port.

31. A carburetor comprising a main casing having a vertical downward discharging passageway therethrough with a flat internal wall portion, a shaft extending transversely through said passageway at said portion, the shaft side face closely fitting with the wall of said passageway, an air valve plate member conforming to said passageway and secured at one edge to said shaft, said valve member extending at a downward inclination from said shaft and having downward swinging opening movement, said casing having a guide bore extending at a downward inclination from the underside of said shaft, a reciprocal rod guided in said bore and projecting from the ends thereof, means operatively connecting one end of said rod to said shaft, a dash-pot casing carried by said main casing and receiving the other end of said rod, a sleeve member reciprocally fitted in said bore and projecting into said dash-pot casing, said sleeve member having a fuel orifice receiving said rod, said rod having a tapered portion intermediate its ends and cooperable with said orifice, means to reciprocate said sleeve member, a piston in said dash-pot casing and operatively connected to said rod, means to supply fuel to said dash-pot casing for flow through said orifice, the wall of said main casing having a downward extending bore having its upper end comprising an air inlet and having its lower end discharging into said passageway posterior to said valve member, a tubular member in said last-named bore and having a converging-diverging bore forming a throat, a fuel conduit leading from said guide bore on the outlet side of said orifice and discharging into said throat, and a throttle valve in said passageway and controlling discharge therefrom.

32. A carburetor comprising a main casing having a vertical downward discharging passageway therethrough with a flat internal wall portion, a shaft extending transversely through said passageway at said portion, the shaft side face closely fitting with the wall of said passageway, an air valve plate member conforming to said passageway and secured at one edge to said shaft, said valve member extending at a downward inclination from said shaft and having downward swinging opening movement, said casing having a guide bore extending at a downward inclination from the underside of said shaft, a reciprocal rod guided in said bore and projecting from the ends thereof, means operatively connecting one end of said rod to said shaft, a dash-pot and pump casing carried by said main casing and receiving the other end of said rod, a housing member having an end wall reciprocal in said dash-pot casing, a sleeve member projecting from said end wall and reciprocally fitted in said bore, said rod having a tapered fuel metering portion cooperable with the bore of said sleeve member to define an annular fuel orifice, means to reciprocate said housing member, a piston in said housing member and operatively connected to said rod for movement

therewith, a float chamber casing carried by said main casing and communicating with said dash-pot casing, the wall of said main casing having a downward extending bore on the opposite side of said passageway from said shaft, the upper end of said last-named bore comprising an air inlet and the lower end of said last-named bore discharging into said passageway posterior to said valve member, the outlet end of said last-named bore having a tubular extension projecting into said passageway to space the discharge therefrom from the walls of said passageway, a tubular member in said last-named bore and having a converging-diverging bore portion forming a throat, a fuel conduit leading from said guide bore on the outlet side of said annular orifice and discharging into said throat, and a throttle valve in said passageway and controlling discharge therefrom.

33. A carburetor comprising a main casing having a passageway therethrough including a mixing chamber having an air inlet, a shaft journaled in the walls of said casing and extending transversely through said passageway, a suction responsive valve member carried by said shaft and controlling admission of air to said mixing chamber, said casing having a guide bore extending from a point adjacent said shaft, a reciprocal rod guided in said bore and projecting from the ends thereof, means operatively connecting one end of said rod to said shaft, a dash-pot casing carried by said main casing and receiving the other end of said rod, a sleeve member reciprocally fitted in said bore and projecting into said dash-pot casing, said rod having a tapered fuel metering portion cooperable with the bore of said sleeve member to define an annular fuel orifice, means to reciprocate said sleeve member relative to said rod to regulate said orifice, a piston in said dash-pot casing and operatively connected to said rod, means to supply fuel to said dash-pot casing for flow through said orifice, said main casing having a downward extending bore with a converging-diverging portion defining a throat, the upper end portion of said last-named bore comprising an air inlet, the lower end portion of said last-named bore discharging into said passageway posterior to said valve member, a fuel conduit leading from said guide bore on the outlet side of said orifice and discharging into said throat, and a throttle valve in said passageway and controlling discharge therefrom.

34. A carburetor comprising a main casing having vertical downward discharging passageways therethrough with aligned flat internal wall portions, a shaft having its side face in contact with said wall portions, an air valve plate member in each passageway, said valve members being secured at one edge to said shaft and extending at a downward inclination therefrom, said casing having a guide bore extending at a downward inclination between said passageways from a point adjacent the underside and intermediate the ends of said shaft, a reciprocal rod guided in said bore, means operatively connecting one end of said rod to said shaft, a dash-pot and pump casing carried by said main casing and receiving the other end of said rod, a housing member having an end wall and reciprocal in said dash-pot casing, a sleeve member projecting from said end wall and reciprocally fitted in said bore, said sleeve member having a fuel orifice receiving said rod, said rod having a metering valve portion cooperable with and controlling fuel flow through said orifice, means to reciprocate said housing member, a piston in said housing member and secured to and movable with said rod, a float chamber casing carried by said main casing in overlying relation to said dash-pot casing, a fuel conduit connecting the interiors of said float chamber casing and said dash-pot casing, said main casing having in its wall opposite said shaft a vertical bore having its inlet end open to atmosphere, a transverse bore communicating with said vertical bore and having outlets discharging into said passageways posterior to said valve members, a tube in said vertical bore and having a converging-diverging bore forming a throat, a fuel conduit leading from said guide bore on the outlet side of said orifice and discharging into said throat, an air suction conduit leading from the interior of said float chamber casing and discharging into said throat, and throttle valves posterior to said air valve members and controlling discharge from said passageways.

35. A carburetor comprising a main casing having vertical downward discharging passageways therethrough, each of said passageways having an air inlet and including a mixing chamber, a shaft journaled in the walls of said casing and extending transversely through said passageways between said air inlet and said mixing chamber, a suction responsive air valve member in each passageway and secured to said shaft such that said valve members are movable in unison, said casing having a guide bore extending between said passageways from a point intermediate the ends of and adjacent said shaft, a reciprocal rod guided in said bore and extending from the opposite ends thereof, means operatively connecting one end of said rod to said shaft, a dash-pot and pump casing carried by said main casing and receiving the other end of said rod, a tubular member reciprocally fitted in said bore and surrounding said rod, said rod having intermediate its ends a metering valve portion cooperable with the bore of said tubular member to define an annular fuel orifice, means to reciprocate said tubular member to regulate the flow area of said orifice, a piston in said dash-pot casing and operatively connected to said rod, a tubular member cooperable with said first-named tubular member and separating the interior of said dash-pot casing into a central fuel conduit and an annular dash-pot and pump chamber containing said piston, a float chamber casing carried by said main casing and communicating with said annular chamber and through the interior of said tubular members with said orifice, a conduit leading from said guide bore on the outlet side of said fuel orifice and discharging into said passageways, and a conduit leading from said annular chamber and discharging into said passageways.

36. A carburetor comprising a main casing having vertical downward discharging passageways therethrough, each of said passageways having an air inlet and including a mixing chamber, a shaft journaled in the walls of said casing and extending transversely through said passageways between said air inlet and said mixing chamber, a suction responsive air valve member in each passageway and secured to said shaft such that said valve members are movable in unison, said casing having a guide bore extending between said passageways from a point intermediate the ends of and adjacent said shaft, a reciprocal rod guided in said bore and extending from the opposite ends thereof, means operatively connecting one end of said rod to said shaft, a dash-pot

and pump casing carried by said main casing and receiving the other end of said rod, a tubular member reciprocally fitted in said bore and surrounding said rod, said rod having intermediate its ends a metering valve portion cooperable with the bore of said tubular member to define an annular fuel orifice, means to reciprocate said tubular member to regulate the flow area of said orifice, a piston in said dash-pot casing and operatively connected to said rod, a tubular member cooperable with said first-named tubular member and separating the interior of said dash-pot casing into a central fuel conduit and an annular dash-pot and pump chamber containing said piston, a float chamber casing carried by said main casing and communicating with said annular chamber and through the interior of said tubular members with said orifice, said main casing having a pair of downward extending bores open at their upper ends to atmosphere and discharging respectively into said passageways posterior to said air valve members, said last-named bores each having a converging-diverging portion forming a throat, a main fuel conduit leading from said guide bore on the outlet side of said fuel orifice and discharging into said throats, and a pair of pump discharge conduits opening into said throats and communicating with said annular chamber.

37. A carburetor comprising a main casing having vertical downward discharging passageways therethrough, each of said passageways having an air inlet and including a mixing chamber, a shaft journaled in the walls of said casing and extending transversely through said passageways between said air inlet and said mixing chamber, a suction responsive air valve member in each passageway and secured to said shaft such that said valve members are movable in unison, said casing having a guide bore extending between said passageways from a point intermediate the ends of and adjacent said shaft, a reciprocal rod guided in said bore and extending from the opposite ends thereof, means operatively connecting one end of said rod to said shaft, a dash-pot and pump casing carried by said main casing and receiving the other end of said rod, a tubular member reciprocally fitted in said bore and surrounding said rod, said rod having intermediate its ends a metering valve portion cooperable with the bore of said tubular member to define an annular fuel orifice, means to reciprocate said tubular member to regulate the flow area of said orifice, a piston in said dash-pot casing and operatively connected to said rod, a tubular member cooperable with said first-named tubular member and separating the interior of said dash-pot casing into a central fuel conduit and an annular dash-pot and pump chamber containing said piston, a float chamber casing carried by said main casing and communicating with said annular chamber and through the interior of said tubular members with said orifice, said main casing having a pair of downward extending bores open at their upper ends to atmosphere and discharging respectively into said passageways posterior to said air valve members, said last-named bores each having a converging-diverging portion forming a throat, a main fuel conduit leading from said guide bore on the outlet side of said fuel orifice and discharging into said throats, an air suction conduit opening into each of said throats and communicating with the interior of said float chamber casing above the liquid level therein, means to bleed air to said float chamber above the liquid level therein, and a pump discharge conduit opening into each of said air suction conduits and communicating with said annular pump chamber.

38. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a bore portion of restricted cross-sectional flow area, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, said conduit being sealed against admission of air and having a portion of its length above the liquid level in said reservoir, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said bore portion, said outlets being positioned in a common plane normal to the longitudinal axis of said bore portion whereby said conduits are subjected equally to variations in pressure in said bore portion, and means to supply air to said withdrawal conduit to maintain a greater pressure over the liquid in said reservoir than is concurrently maintained in said fuel conduit so that fuel will be discharged through said fuel conduit into said mixing chamber, said air supply means being so proportioned relative to the sub-atmospheric pressure produced in said withdrawal conduit as to provide sub-atmospheric pressure in said reservoir over the liquid therein sufficient to draw fuel into said reservoir from a low level supply tank.

39. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling admission of air to said mixing chamber, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a converging bore portion and a diverging mixture discharge bore portion, an annular shoulder joining said bore portions and facing said diverging portion, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said second-named passageway, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said second-named passageway, said conduit outlets being positioned closely adjacent to and substantially equally spaced from said shoulder and between said shoulder and said mixing chamber, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said second-named passageway and thence into said mixing chamber, said vapor withdrawal conduit and said last-named means being so related that said withdrawal conduit acts to maintain during engine operation sufficient depression over the liquid in said reservoir so that liquid fuel will be supplied by pressure difference to said reservoir.

40. A carburetor comprising a casing having a passageway therethrough including a downwardly discharging mixing chamber having an air inlet in alignment therewith, a suction responsive means pivotally supported for downward swinging movement and controlling admission of air to said mixing chamber and operable to

maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a downward extending passageway having an air inlet and discharging laterally into said mixing chamber, an extension for the discharge end of said second-named passageway spacing the outlet of said second-named passageway from the walls of said mixing chamber, said second-named passageway having a converging bore portion and a diverging mixture discharge bore portion, an annular shoulder joining said bore portions and facing said diverging portion, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging laterally into said diverging portion, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging laterally into said diverging portion, said conduit outlets being positioned closely adjacent to and substantially equally spaced from said shoulder, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said second-named passageway and thence into said mixing chamber, said vapor withdrawal conduit and said last-named means being so related that said withdrawal conduit acts to maintain during engine operation sufficient depression over the liquid in said reservoir so that liquid fuel will be supplied by pressure difference to said reservoir.

41. A carburetor comprising a casing having a passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling the admission of air to said mixing chamber and operable to maintain the sub-atmospheric pressure in said mixing chamber within predetermined limits, a passageway having an air inlet and discharging into said mixing chamber, said second-named passageway having a converging-diverging bore portion, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, a vapor withdrawal conduit leading from said reservoir above the liquid level therein and having an outlet discharging into said bore portion, said outlets being positioned in a common plane normal to the longitudinal axis of said bore portion whereby said conduits are subjected equally to variations in pressure in said bore portion, a pump supplied from said reservoir, a discharge conduit leading from said pump and opening into said second-named conduit anterior to said bore portion, and means to maintain a greater pressure in said reservoir above the liquid level therein than exists in said fuel conduit whereby fuel will be discharged into said bore portion and through said second-named passageway into said mixing chamber.

42. A carburetor comprising a casing having an open-ended downward discharging substantially vertical passageway therethrough, the open upper end of said passageway defining an air inlet and the open lower end of said passageway defining a mixture outlet, the wall of said casing having an open-ended bore extending longitudinally of said passageway and having its upper end defining an air inlet and its lower end defining a mixture outlet, said bore opening laterally into said passageway, an extension projecting at the upper side of said bore outlet and operable to deflect the air entering said passageway air inlet away from said bore outlet, suction responsive means controlling admission of air to said passageway and positioned in overlying relation to said extension, said bore having a converging-diverging portion forming a throat, a fuel supply conduit discharging into said throat to supply a mixture of air and fuel to said passageway, movable fuel metering means controlling said conduit, and means operatively connecting said suction responsive means and said metering means.

43. A carburetor comprising a casing having a main passageway therethrough including a mixing chamber having an air inlet, suction responsive means controlling admission of air to said mixing chamber, a passageway having an air inlet and discharging into said main passageway on the outlet side of said responsive means, said second-named passageway having a bore portion of restricted cross-sectional flow area, a liquid fuel reservoir, a fuel supply conduit leading from said reservoir below the liquid level therein and having an outlet at and discharging into said bore portion, said fuel conduit being sealed against admission of air and having a portion of its length above the liquid level in said reservoir, a vapor withdrawal conduit leading from above the liquid level in said reservoir and having an outlet portion discharging into said bore portion, said fuel supply outlet and said outlet portion discharging into said bore portion in a substantially common plane normal to the longitudinal axis of said bore portion so that said conduits are subjected substantially equally to variations in pressure in said bore portion, said conduit outlet portion being inclined to the longitudinal axis of said bore portion and discharging toward the air inlet to said second-named passageway so that sudden changes of pressure in said bore portion will have a delayed transmission through said withdrawal conduit to said reservoir, and means to supply air to said vapor withdrawal conduit to maintain a greater pressure over the liquid in said reservoir than is concurrently maintained in said fuel supply conduit, said air supply means being so proportioned relative to the sub-atmospheric pressure produced in said vapor withdrawal conduit as to provide sub-atmospheric pressure in said reservoir over the liquid therein sufficient to draw fuel into said reservoir from a low level supply tank.

WALTER H. WEBER.

CERTIFICATE OF CORRECTION.

Patent No. 2, 061,494. November 17, 1936.

WALTER H. WEBER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, second column, line 31, for "epening" read opening; page 6, second column, line 5, for the reference numeral "77" read 70; page 10, first column, line 41, and second column, line 34, claims 7 and 9 respectively, before "area" insert flow; page 11, second column, line 15, claim 13, after "flow" insert area; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of February, A. D. 1937.

Leslie Frazer

(Seal) Acting Commissioner of Patents.