

Nov. 8, 1938.

W. H. WEBER

2,136,353

CARBURETOR

Filed March 24, 1934

4 Sheets-Sheet 1

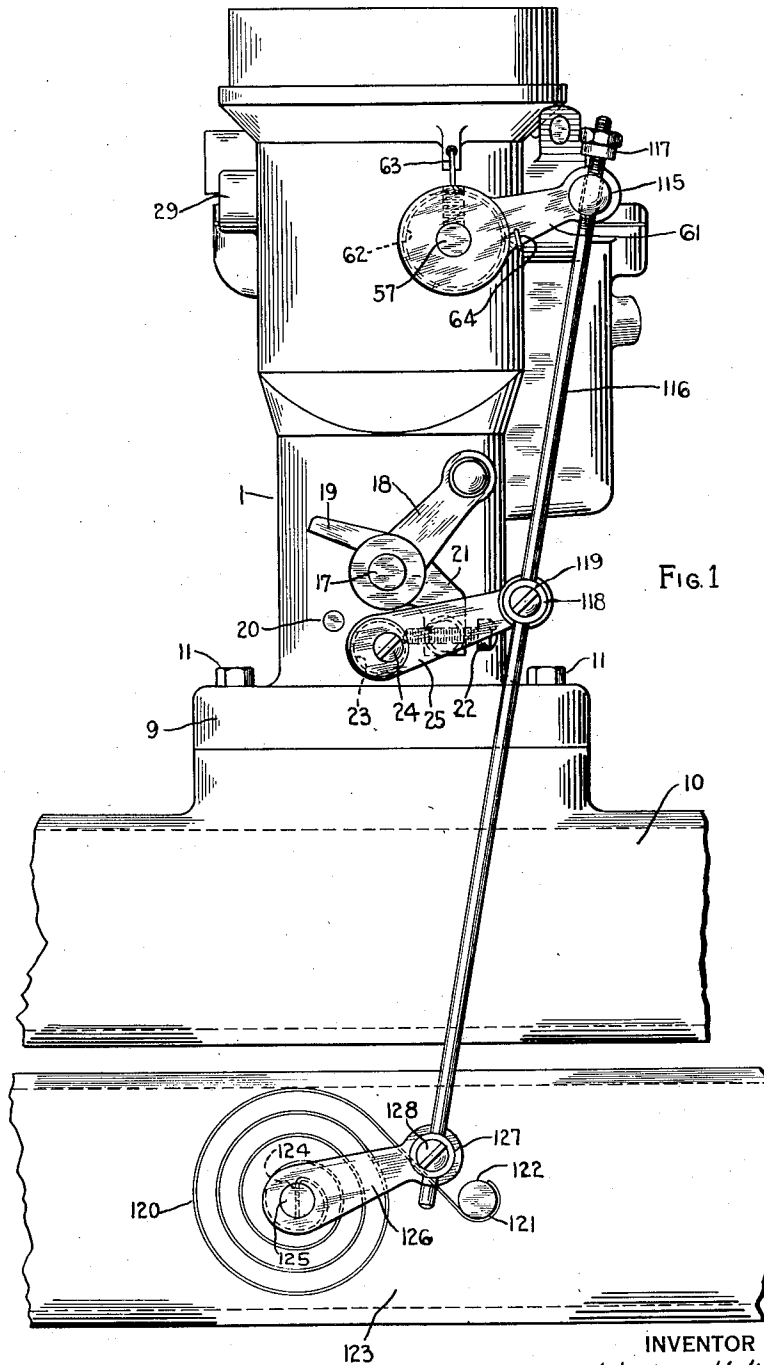


FIG. 1

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4 Sheets-Sheet 2

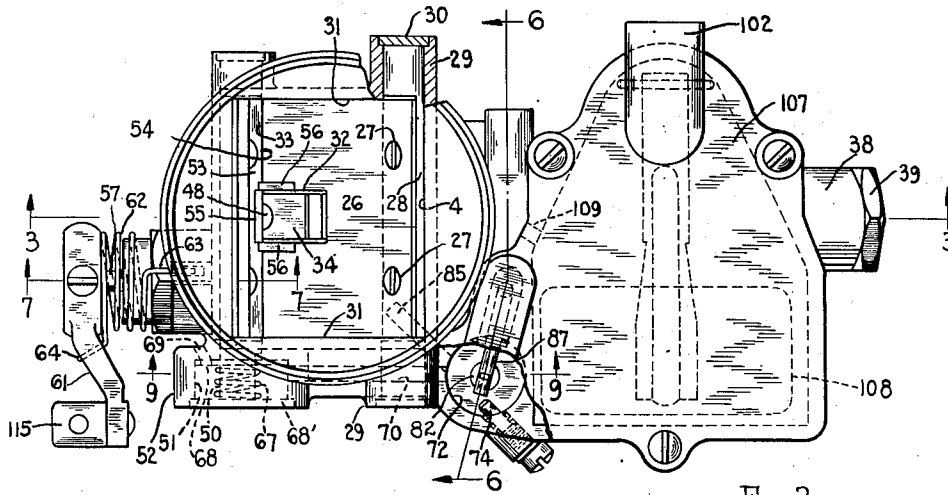


FIG. 2

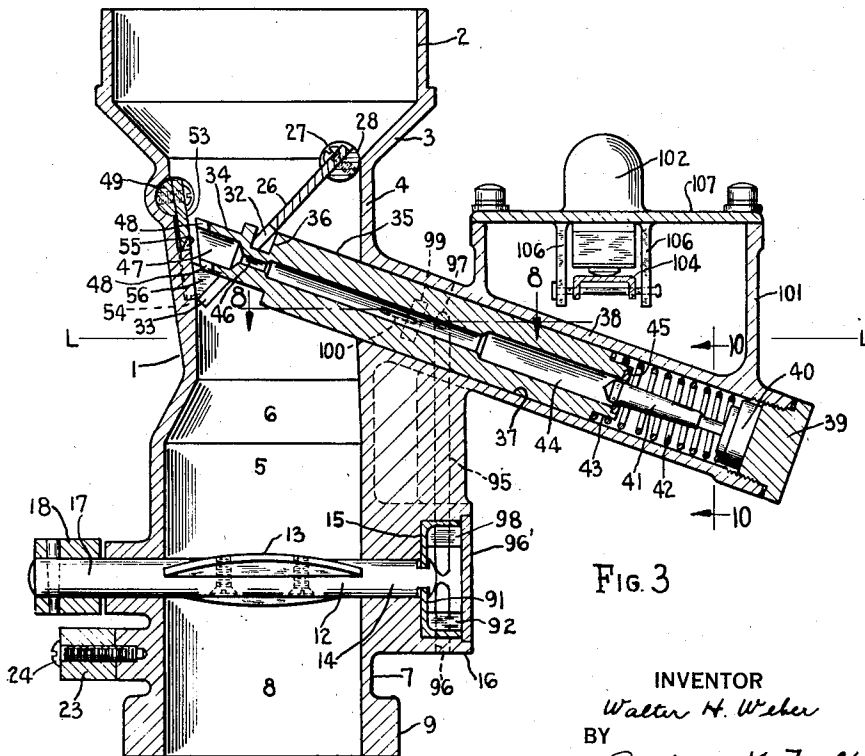


FIG. 3

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4 Sheets-Sheet 3

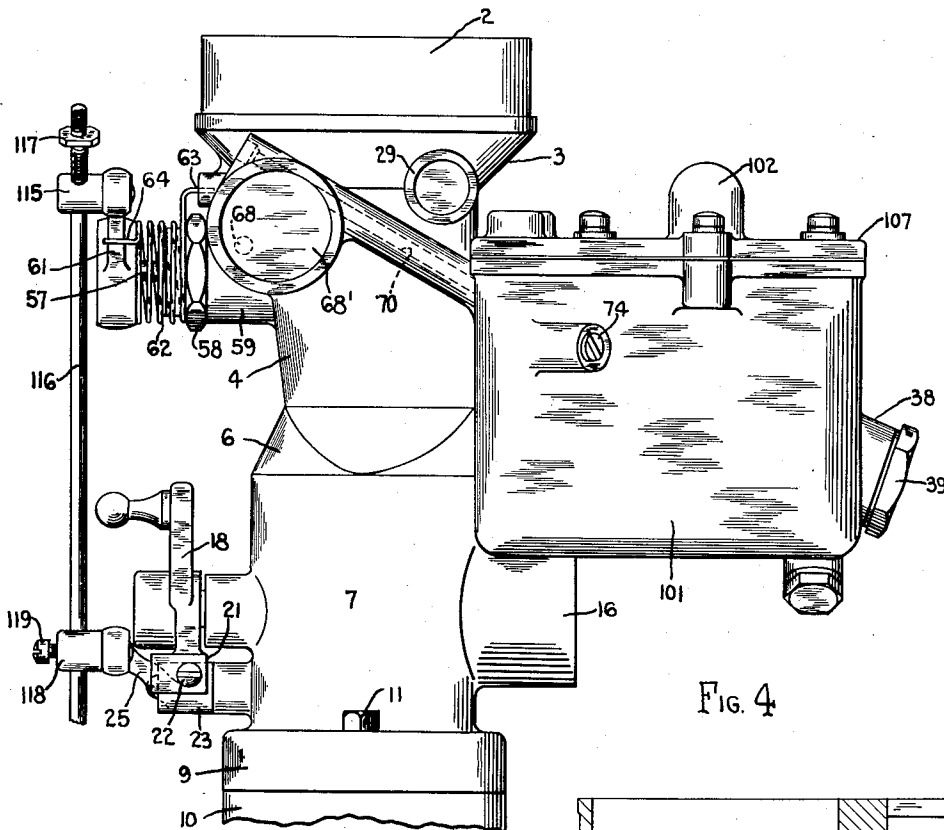


FIG. 4

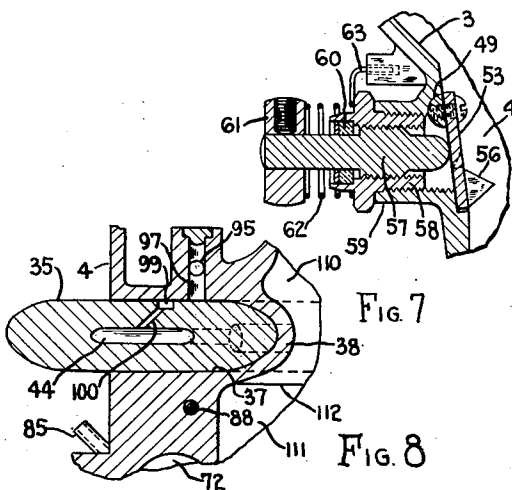


FIG. 7

FIG. 8

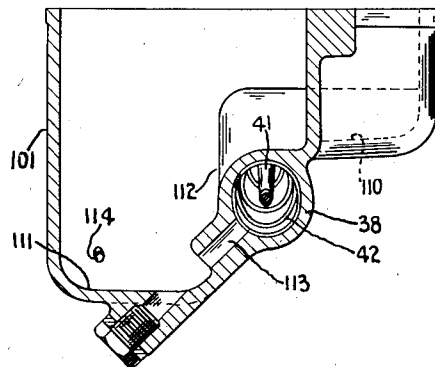


FIG. 10

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4 Sheets-Sheet 4

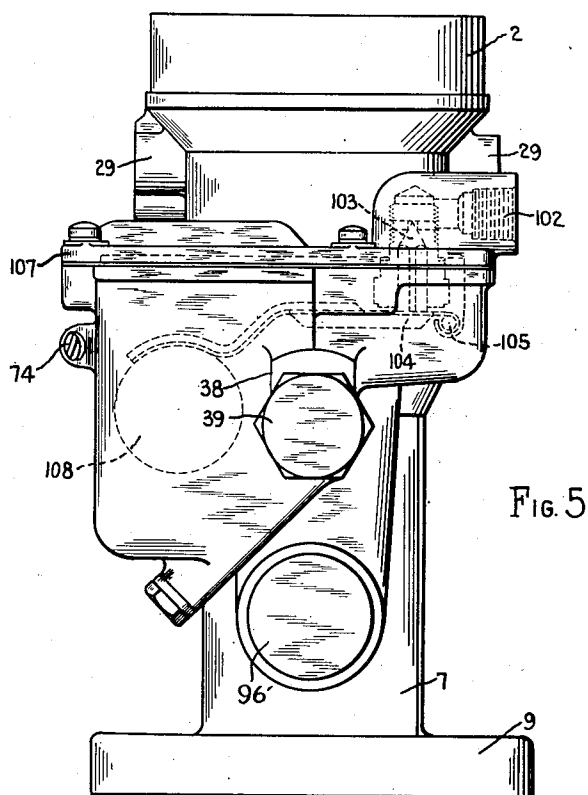


FIG. 5

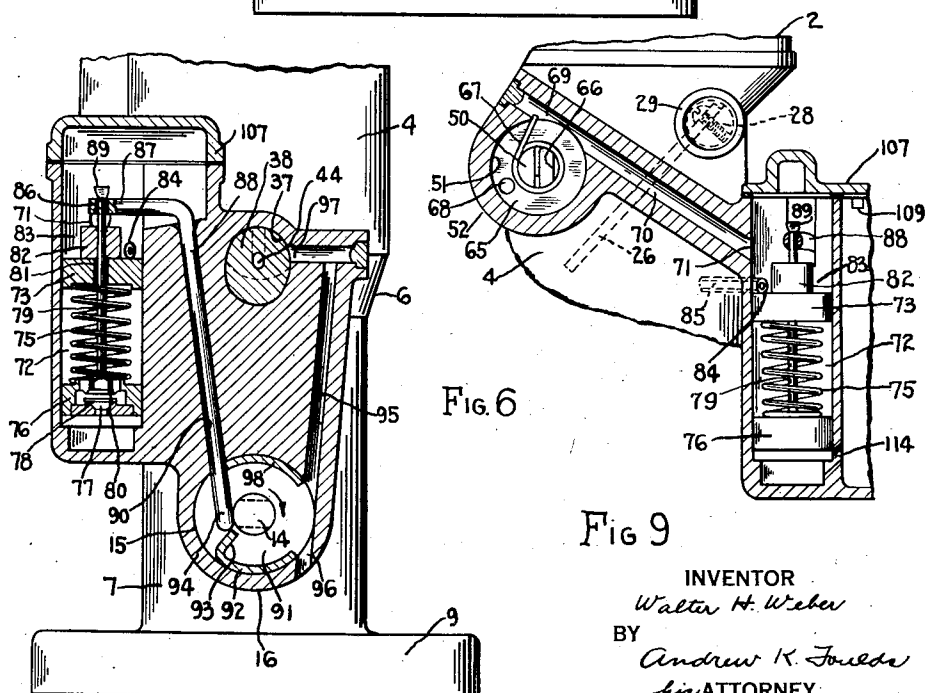


FIG. 6

FIG. 9

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UNITED STATES PATENT OFFICE

2,136,353

CARBURETOR

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Application March 24, 1934, Serial No. 717,130

31 Claims. (Cl. 123—119)

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

5 An object of my invention is to provide a carburetor of the type in which the fuel is proportioned in accordance with the volume of air admitted to the carburetor mixing chamber.

10 Another object is to provide a carburetor having means to increase the richness of the fuel mixture for engine starting operation.

15 Another object is to provide a carburetor having means to increase the ratio of fuel to air for acceleration and for full load engine operation or wide open throttle running.

20 Another object is to provide thermostatic means responsive to engine temperature for controlling the ratio of fuel to air supplied to the engine by the carburetor.

25 Another object is to provide means for automatically moving the throttle valve toward open position during the starting operation of the carburetor.

30 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.

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

40 Figure 1 is a view of my carburetor in side elevation, showing the same in relation to the inlet and exhaust manifolds with its thermostat controlling means;

45 Fig. 2 is a top plan view of the carburetor having certain parts broken away to show the internal construction;

50 Fig. 3 is a view in section on the line 3—3 of Fig. 2;

Fig. 4 is a view in elevation, looking from the right toward the left facing Fig. 1;

45 Fig. 5 is a view in elevation, looking from the right toward the left facing Fig. 4, but with the thermostatic operating means omitted;

50 Fig. 6 is a view in section on the line 6—6 of Fig. 2;

Fig. 7 is a detail view in section on the line 7—7 of Fig. 2;

55 Fig. 8 is a detail view in section on the line 8—8 of Fig. 3;

Fig. 9 is a detail view in section on the line 9—9 of Fig. 2, and

60 Fig. 10 is a detail section on the line 10—10 of Fig. 3.

Referring to the drawings by characters of reference, 1 designates generally a carburetor body having a substantially vertical passageway there-through comprising at its upper end an air inlet

portion 2 which is substantially cylindrical and tapers, as at 3, into a vane box portion 4 which is substantially rectangular in internal cross-section. The portion 4 discharges into and comprises a part of the mixing chamber 5 which includes a portion 6 having a pair of converging and a pair of diverging walls connecting the outlet end of the box portion 4 to the cylindrical throttle body portion 7. The throttle body portion 7 provides the mixture outlet 8 and has a lateral surrounding flange 9 by which the carburetor may be secured to the inlet manifold 10 by bolts 11 or the like. The throttle body portion is substantially internally cylindrical in cross-section and receives a throttle shaft 12 carrying a throttle valve 13 of the disk or butterfly type. One end 14 of the throttle shaft 12 extends into a cylindrical recess 15 formed in a boss 16 projecting from the side of the throttle body portion. The other end 17 of the throttle shaft projects from the carburetor body and is provided with an operating lever 18 having a stop arm 19 cooperable with a stop member 20 to limit movement of the throttle when it has reached wide open position. The lever 18 also has an arm 21 provided with an adjustment screw or cam follower member 22 which extends into engagement with the face of an eccentric cam 23 journaled on a screw 24 projecting from the side wall of the carburetor body and positioned directly beneath the shaft 17. The cam 23 is rigid with and operable by a lever arm 25 so that movement of the arm 25 to rotate the cam 23 will act against the screw 22 to adjust the position of the throttle valve 13 when in closed idling position or to limit its closing movement while permitting free opening movement thereof.

Positioned in the box portion 4 there is a suction responsive valve member or vane 26 which is preferably a substantially rectangular plate extending diagonally downward across the passageway through the portion 4. The plate 26 is rigidly fixed at its upper edge, as by screws 27, to a freely rotatable shaft 28 which is journaled at its opposite ends in the side walls of the carburetor body which is preferably provided with external bearing bosses 29 receiving the ends of the shaft. The open outer ends of the bosses 29 are closed and sealed by disk plugs 30. The shaft 28 is preferably positioned substantially in lateral engagement with a side wall of portion 4 substantially at the junction between the portions 3 and 4 so as to prevent air flow between the shaft and the wall of the box portion 4. The side edges of the valve plate 26 are in substantial engagement with the opposite side walls 31 of the portion 4 so as to prevent air flow through the passageway at the sides of the valve plate 26. The plate 26 is provided with a substantially rectangular slot 32 which extends into the plate midway

between its side edges and from its free or air flow controlling edge 33. The slot 32 receives the substantially rectangular discharge end portion 34 of a cylindrical nozzle member 35 which has a surrounding shoulder 36 engaging the rear or underface of the valve plate 26 so that the valve plate and nozzle member are operatively connected for movement in unison. The nozzle portion 34 extends substantially to the side wall of the box portion 4 and into overlying relation to the controlling edge 33 of the valve plate. The rectangular portion 34 cooperates with the side edges of the slot 32 to prevent rotation of the nozzle member 35 about its longitudinal axis.

The nozzle member 35 is longitudinally reciprocable and fits for free sliding movement in the cylindrical bore 37 of a tubular housing or member 38 which extends externally at a downward inclination from the side wall of the portion 4 beneath the shaft 28 and midway between the side edges of the valve plate 26 so that the nozzle member 35 extends into the interior of the portion 4 at an upward inclination. The outer end of the tubular housing 38 is closed by a plug member 39 against which is seated a supporting block 40 having a rearward converging tapered metering pin or valve 41 projecting therefrom in the longitudinal center line of the housing 38. The supporting block 40 is held against the plug 39 by a helical coil spring 42 which surrounds the metering pin and seats at its other end against the inner end of the tubular nozzle member 35 which is of reduced external diameter, as at 43, to receive and center its end of the spring 42.

The metering pin 41 extends into the longitudinal central bore or fuel passage 44 of the nozzle member 35 which has a ported disk or plate 45 fixed in an annular recess in its inner or inlet end and surrounding the metering pin 41 to provide an annular fuel port which is increased in flow area as the nozzle member is moved downward or rearward over the metering pin. The bore 44 is of reduced internal diameter, as at 46, adjacent the discharge end portion 34 to provide a calibrated jet or orifice which discharges into an enlarged cylindrical end recess 47 within the portion 34. The discharge end of the nozzle member 35 substantially engages the side wall of the portion 4 and it is therefore provided with vertically aligned, segmental end recesses 48 which overlie and register with the slot 32 to permit primary air flow to the mixing chamber when the valve plate 26 is in closed position. Parallel to the shaft 28 there is a shaft 49 which is positioned in a plane slightly below the horizontal plane of the shaft 28 with a portion of its circumference recessed in the wall of portion 4 opposite shaft 28 to prevent air leakage and which has its opposite ends journaled in the side walls of the portion 4. One end 50 of shaft 49 projects coaxially into a cylindrical valve chamber 51 formed in a boss 52, projecting from the carburetor body. Within the portion 4 there is a choke plate 53 which is rigidly fixed at its upper edge to the shaft 49 and which lies flat against the inside wall surface of portion 4 in opposed relation to the discharge end of nozzle 35. The choke plate 53 has its vertical side edges substantially engaging the opposite side walls 31 of the portion 4 and has its free lower horizontal edge 54 engageable with the top face of the valve plate 26. The choke plate 53 has a rectangular edge recess 55 extending upwardly thereinto from its horizontal lower edge to receive the nozzle portion 34 when the choke plate is swung outward into the

passageway. The choke plate 53 has parallel, vertically positioned guide members 56 which are substantially triangular and have their projecting underfaces substantially seating on the top face of the valve plate 26 when closed and which lie closely adjacent the opposite vertical sides of the nozzle portion 34 and in continuation of the side edges of slot 32. The triangular members 56 act when valve plate 26 is closed to prevent air from passing around the sides of the nozzle end 34 and thence through slot 32 and insure that the primary air will pass downward through recesses 48 and over the end face of the nozzle. The choke plate 53 is operated by a screw member 57 which engages the rear face of the choke plate, see Fig. 7, and which is adjustably screw-threaded in a sleeve member 58 secured in a hollow boss 59 opening into the interior of the portion 4 and projecting externally from the side wall thereof. The sleeve member 58 is provided with a packing recess containing packing material 60 which surrounds the operating member 57 to prevent leakage of air into the interior of the carburetor. The end of the operating member 57 which projects from the sleeve member 58 is provided with an operating arm 61 rigidly secured thereto. A coil spring 62 surrounds the outer end of the operating member 57 and has one end 63 fixed to the carburetor body and has its other end 64 engaging the arm 61 so that the spring opposes rotation of the operating member 57 to actuate the choke plate 53, the spring serving to return the operating member 57 to its normal inactive position, as in Fig. 7. The end 50 of choke plate shaft 49 has a circular valve plate or disk 65 fixed thereon within the chamber 51. The shaft end 50 and the bore of disk 65 have cooperating flat faces 66 so that the disk is fixed relative to the shaft and is movable therewith. The disk 65 is held against the vertical end wall of chamber 51 by a helical coil spring 67 which surrounds the shaft end 50 and which is held under compression against the disk 65 by the plug closure member 68' for the chamber 51. The disk 65 is provided with a port 68 which registers with an air inlet port 69 in the rear face of the boss 52 when the choke plate is in inactive position, as in Figs. 2 and 3. The spring 67 has one end fixed in a slot in the shaft end and has its other end bearing against the side wall of the chamber so that the spring is under tension and normally acting to hold the port 68 in registry with the chamber air inlet 69 and the choke plate in engagement with its operating member 57. The chamber 51 communicates with the upper end 69' of a downwardly inclined air passage or duct 70 which opens at its lower end 71 into the upper portion of a combined well and pump chamber 72. Within the chamber 72 there is a partition member 73 which is held against upward movement by engagement with the end of a screw 74 which is threaded through the wall of the chamber. The partition member 73 is held up against the screw 74 by a helical coil spring 75 which seats at its lower end on a hollow pump piston 76 having a sliding fit in the chamber 72. The piston 76 has a vertical fuel supply passageway 77 opening therethrough and contains an upwardly opening check valve 78 which closes on upward movement of the piston to prevent downward escape of fuel through the passageway 77 from the chamber 72 above the piston and which opens on downward movement of the piston to permit fuel to flow through the passageway to the space above the piston 76. A piston rod 79

is secured, as at 80, to the piston 76 and extends upward through a central fuel passage 81 through the partition member 73. A cylindrical weighted valve member 82 having a free sliding fit on the rod 79 normally seats by gravity on the top face of partition member 73 to close the passage 81 and provides an annular fuel chamber 83 above the partition member 73. The annular chamber 83 has an outlet 84 above the normal liquid level which discharges through a nozzle 85 into the mixing chamber beneath the shaft 28 and substantially in the horizontal plane of the lower edge of the vane member 26. The upper end of the piston rod 79 extends freely through an aperture 86 in the end of the horizontal arm 87 of an operating rod 88. The piston rod 79 has a head 89 which seats on the top face of the arm 87 being held thereagainst by spring 75 so that the piston rod and the operating rod are held in engagement for movement in unison. The operating rod 88 extends downward through a guide bore 90 in the wall of the carburetor body and projects into the cylindrical recess 15. The rod 88 has a sliding fit in the guideway or bore 90 so that substantially no air can pass from the chamber 15 through the guideway into the top of the pump chamber 72. Rigidly fixed on the end of the throttle shaft within the cylindrical recess 15 there is a circular disk or operating member 91 having a circumferential flange 92 with a radially inturned arm 93 on which the end 94 of the operating rod 88 seats so that rotation of the disk 91 in the direction of the arrow, i. e. on throttle opening movement, will lift the operating rod 88 and the piston 76. An air supply duct or passage 95 has its inlet 96 opening downward through the bottom wall of the boss 16. The duct 95 extends upwardly through the wall of the carburetor body and opens at its discharge end 97 into the bore 37 of the nozzle housing 38. The duct 95 intersects the cylindrical recess 15 so that a circumferential flange 98 on the disk 91 serves as a valve to control air flow through the duct 95. The valve or flange 98 is operable upon rotation of the throttle shaft in the direction indicated by the arrow to completely close off the duct 95. The chamber 15 is closed and sealed by a plug member 96' so that air enters the same solely through the duct inlet 96. The duct outlet 97 is adapted to communicate with the nozzle bore 44 to supply air thereto to reduce the richness of the fuel mixture supplied by the carburetor. In the circumferential face of the nozzle member 35 there is a transverse groove or slot 99 which on movement of the nozzle member 35 is registerable with the duct outlet 97. An air bleed duct or passage 100 extends from the slot 99 through the wall of the nozzle member 35 and discharges into the nozzle bore 44. The bleed passage 100 is preferably inclined to the longitudinal axis of the bore 44 and converges with the bore 44 in the direction of fuel flow so that the air discharged from the passage 100 will aid in the fuel discharge. The fuel well 72 and the main nozzle member 35 are supplied with fuel from a constant level reservoir 101 having a fuel inlet 102 for connection to a source of fuel supply. The fuel inlet 102 is controlled by an upward closing fuel valve 103 which seats upon a float operated lever 104 journaled on a shaft 105 supported in arms 106 depending from the float chamber cover member 107. The free end of the lever 104 is provided with a float 108 which is operable in the usual manner to control the valve 103 to maintain a substantially

constant liquid level in the reservoir 101. The cover member 107 extends over the chamber 72 and closes and seals the top thereof against admission of air. The reservoir has an air inlet 109 above the constant liquid level so that the fuel in the reservoir is under atmospheric pressure.

The fuel reservoir 101 extends transversely across the nozzle housing 38 and has its bottom wall stepped as at 110, 111, the steps being joined by a vertical side wall 112 (Fig. 10). The nozzle housing forms a part of the bottom wall step 110 and the side wall 112 at their juncture. Fuel is supplied to the housing bore 37 adjacent the metering pin supporting block 40 through an upward inclined duct or passage 113 which opens at its lower end through the side wall 112 adjacent the bottom wall step 111. The pump chamber 72 is formed in the vertical wall portion of the carburetor body between the reservoir 101 and the mixing chamber 5 and has a fuel supply inlet port 114 opening from the reservoir adjacent the bottom wall step 111 into the bottom end of the pump chamber beneath piston 76 (Fig. 9).

The lever arm 61 is provided at its free end with a swiveled stud 115 which is transversely apertured to receive one end of an operating or connecting rod 116 which is freely slidable through the stud. The upper end of rod 116 is screw-threaded to receive an adjustable stop nut 117 which determines the free movement of rod 116 prior to engagement of nut 117 with the stud 115 and consequent movement of arm 61 by rod 116. The rod 116 extends downward through a swiveled stud 118 projecting from the free end of the cam lever arm 25. The rod 116 is fixed in the stud 118 by a set screw 119 so that any movement of rod 116 moves arm 25. The lower end of rod 116 is connected to automatic operating means such as a spiral coil thermostat 120 of bimetal which is responsive to engine temperature. The thermostat 120 has one end 121 fixed to a post 122 which is rigidly secured to the engine block or exhaust manifold 123. The other thermostat end 124 is fixed to a shaft 125 rotatably supported in any suitable manner and having fixed thereon a lever arm 126 provided with a swiveled stud 127 at its free end. The stud 127 receives the lower end of rod 116 which is rigidly secured to the stud by a set screw 128.

The operation of my carburetor is as follows: The parts are shown in the positions which they will have when the engine is at rest and is completely warmed up. If the engine is now cranked for starting, the subatmospheric pressure in the mixing chamber 5 will draw fuel from the reservoir 101 through duct 113 into housing bore 37 and thence through the metering pin orifice and jet 46 to discharge from the nozzle member 35 into the air stream passing through the nozzle recesses 48 and the valve plate recess 32 to provide a suitable mixture for engine idling operation. With the engine running, if the throttle valve is now moved toward open position against the force of the pump spring 75, the suction in the mixing chamber will increase and cause the valve plate 26 to swing counter-clockwise facing Fig. 3 and toward open position to increase the air supplied to the mixing chamber. Opening movement of plate 26 will move the nozzle member 35 against the force of spring 42 which therefore resists opening movement of plate 26. As the nozzle member moves down over the metering pin 41, the area of the annular fuel orifice around pin 41 will increase so that the quantity

of fuel discharging from jet 46 will be increased to maintain the proper proportions of fuel and air supplied to the mixing chamber. When the throttle valve has been opened to provide a level road car speed of say fifteen miles per hour, the groove 99 will communicate with air passage outlet 97 and start to bleed economizing air into the nozzle bore 44 through duct 100. The groove 99 will remain in communication with passage outlet 97 during normal level road car speeds as the valve plate 26 moves further open due to opening of the throttle valve 13. At high level road car speeds, say above sixty-five miles per hour, the groove 99 will have been moved beyond outlet 97 to discontinue the supply to the nozzle of economizing air through duct 100. As the throttle valve is moved toward open position, the valve 98 on the throttle shaft will be turned gradually across the air passage 95 and will completely cut off the passage at a level road car speed corresponding to say sixty-five miles per hour. This valve 98 functions under full load conditions to cut off the economizing air when the suction on plate 26 is not sufficient to move groove 99 out of registry with passage outlet 97 so that the fuel supplied by the main nozzle will be increased for full load power demands. During the foregoing operations, the pump chamber 72 is supplied above the normal fuel level with air at atmospheric pressure so that fuel will not be drawn therefrom into the mixing chamber through nozzle 85. This atmospheric air is supplied to the top of chamber 72 from air inlet 69 through the open valve port 68, the chamber 51 and duct 70. The weighted valve member 82 also acts to prevent fuel from being drawn from chamber 72 through port 81 when air inlet 69 is open. If the throttle valve is moved quickly toward open position, the operating arm 93 fixed on the throttle shaft will push the rod 88 upward and lift the piston 76 against the force of spring 75 to force fuel through the partition bore 81 into the annular chamber 83, the check valve 78 preventing escape of fuel through passage 77. The fuel forced up through port 81 will lift the valve member 82 which will reseat itself upon cessation of fuel pressure and thereby prevent any fuel trapped in chamber 83 from returning through port 81. As the fuel feeds into chamber 83, the atmospheric air entering from passage 70 will force the fuel through the outlet port 84 and its nozzle 85 into the mixing chamber to supplement the fuel supplied by the main nozzle thereby providing the necessary enriched mixture for rapid acceleration. The fuel forced above partition 73 will not be discharged as fast as it is supplied to chamber 83 so that the nozzle 85 will continue to discharge fuel after movement of piston 76 stops and until the chamber 83 is emptied, resulting in smooth engine operation.

When the engine is stopped and permitted to become cold, the thermostat coil 120 will unwind, rotating the shaft 125 and its lever arm 126 clockwise facing Fig. 3, so that rod 116 will be pulled downward. As the rod 116 moves downward, it will turn the arm 25 and its cam 23 which by its engagement with screw 22 will rotate the throttle valve toward open position. After partial movement of arm 25, the stop nut 117 will engage stud 115 and rotate the arm 61 and its operating member or screw 57 against the force of the screw return spring 62. The rotation of screw 57 pushes the choke plate 53 inward swinging it and its supporting shaft 49 counter-clockwise facing Figs. 3 and 7, so that the lower horizontal edge of

plate 53 rides up upon the top face of valve plate 26 and swings the plate 26 counter-clockwise against the resistance of spring 42. This movement of plate 26 pushes the nozzle member 35 into its housing 38 and downward over metering pin 41 to increase the annular fuel port around pin 41 and by compressing spring 42 acts to increase the resistance of spring 42 to opening movement of valve plate 26 away from the choke plate 53. The rotation of shaft 49 carries with it the valve disk 65 and moves port 68 out of registry with air inlet 69 so that the mixing chamber suction on nozzle 85 will draw fuel therethrough into the mixing chamber. The valve member 82 is sufficiently light in weight, so that mixing chamber suction induced by engine cranking speeds will lift it from its seat. If the engine is now cranked for starting, the suction in the mixing chamber will be increased as the throttle valve 13 has been moved by cam 23 to a position which will maintain cold engine idling operation. With the nozzle member 35 moved by thermostat 120 to increase the annular fuel port around pin 41 and to increase the resisting force of spring 42, the ratio of fuel-air mixture supplied by the main air and fuel inlets will be increased and will be supplemented by solid liquid fuel from nozzle 85 since the air bleed inlet 69 is closed. Movement of valve plate 26 by the choke plate 53 will increase the resistance of spring 42 to opening movement of valve plate 26 in response to mixing chamber suction, so that for a given mixing chamber suction, less air will be admitted to the mixing chamber, as the choke plate is swung into the mixture passageway. As the engine warms up, the thermostat 120 will turn shaft 125 counter-clockwise and move lever arm 126 to push upward on rod 116 to move cam 23 counter-clockwise and finally to the position shown in Fig. 1 so that the idling position of the throttle valve will depend upon the temperature of the engine. As the rod 116 moves upward, it will permit spring 62 to return operating screw 57 toward and finally to its position as shown in Fig. 7. The spring 67 on shaft end 50 returns the choke plate 53 to inactive position, maintaining the choke plate in engagement with screw 57 and acting to prevent chattering or fluttering of the choke plate. As the choke plate 53 is returned toward inactive position, the valve disk 65 will be rotated to bring valve port 68 into registry with air inlet 69. As the port 68 comes into communication with inlet 69, there will be a period before the suction on nozzle 85 is satisfied by the air admitted through duct 70, when the nozzle will discharge an emulsion of air from duct 70 and fuel from chamber 72. As the choke plate 53 is returned toward inactive position, the valve plate 26 will follow with it in accordance with the mixing chamber suction acting on the plate 26.

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

1. A carburetor of the character described, comprising a body having a passageway therethrough with an air inlet, a suction responsive valve member controlling said air inlet, a longitudinally reciprocable nozzle member discharging into said passageway and operatively connected to said valve member for movement therewith, said nozzle member having a longitudinal fuel passage, means to bleed economizing air into said passage, and throttle operated means controlling said air bleed means to control the fuel mixture.

2. A carburetor of the character described, 75

comprising a body having a passageway there-through with an air inlet, a suction responsive valve member controlling said air inlet, a longitudinally reciprocable nozzle member discharging into said passageway and operatively connected to said valve member for movement therewith, said nozzle member having a longitudinal fuel passage, means to bleed economizing air into said passage, a throttle valve controlling the outlet from said passageway, a valve controlling said air bleed means, and means operatively connecting said valves.

3. A carburetor of the character described, comprising a body having a passageway there-through with an air inlet, a suction responsive valve member controlling said air inlet, a longitudinally reciprocable nozzle member discharging into said passageway and operatively connected to said valve member for movement therewith, said nozzle member having a longitudinal fuel passage, a housing having a bore receiving said nozzle member, said nozzle member having an air bleed duct closed by said housing and opening from said bore into said passage, the effective flow area of said duct being decreased as said valve member moves toward closed position, and an air inlet to said bore for supplying air to said duct, said nozzle member acting on movement to increase the flow from said second-named air inlet to said duct as said valve member is moved toward open position.

4. A carburetor of the character described, comprising a body having a passageway there-through with an air inlet, a suction responsive valve member controlling said air inlet, a longitudinally reciprocable nozzle member discharging into said passageway and operatively connected to said valve member for movement therewith, said nozzle member having a longitudinal fuel passage, a housing having a bore receiving said nozzle member, said nozzle member having an air bleed duct opening from said bore into said passage, an air inlet to said bore for supplying air to said duct, said nozzle member acting on movement to establish communication between said duct and said second-named air inlet, and throttle operated means controlling said second-named air inlet.

5. A carburetor of the character described, comprising a body having a passageway there-through with an air inlet, a suction responsive valve member controlling said air inlet, a longitudinally reciprocable nozzle member discharging into said passageway and operatively connected to said valve member for movement therewith, said nozzle member having a longitudinal fuel passage, means to bleed economizing air into said passage, means controlling said air bleed means in accordance with the position of said nozzle member, a throttle valve controlling the outlet from said passageway, means operable with said throttle valve and controlling said air bleed means, and means operable simultaneously with said last-named means to supply supplemental fuel to said passageway.

6. A carburetor of the character described, comprising a body having a passageway there-through with an air inlet, a suction responsive valve member controlling said air inlet, a longitudinally reciprocable nozzle member discharging into said passageway and operatively connected to said valve member for movement therewith, said nozzle member having a longitudinal fuel passage, means to bleed economizing air into said passage, means controlling said air bleed

means, means to supplement the supply of fuel to said passageway, means controlling said supplemental supply means, and means operable simultaneously to actuate said air bleed controlling means and said supplemental supply controlling means.

7. A carburetor of the character described, comprising a body having a passageway there-through with an air inlet, a suction responsive valve member controlling said air inlet, means pivotally supporting said valve member for swinging movement, a longitudinally reciprocable nozzle member operatively connected to said valve member for movement thereby, a metering pin cooperable with the bore of said nozzle member whereby to control fuel flow there-through in accordance with the position of said valve member, a second valve member cooperable with said first-named valve member and determining the effective flow area of said passageway, said first-named valve member being freely movable independently of and relative to said second-named valve member, and means to move said second-named valve member to and to hold said second-named valve member in fixed position in said passageway.

8. A carburetor of the character described, comprising a body having a passageway there-through with an air inlet, a suction responsive valve member controlling said air inlet, means pivotally supporting said valve member for swinging movement, a longitudinally reciprocable nozzle member operatively connected to said valve member for movement thereby, a metering pin cooperable with the bore of said nozzle member whereby to control fuel flow therethrough in accordance with the position of said valve member, a second valve member having a pivotal support and engageable with said first-named valve member to regulate said air inlet and to move said nozzle member relative to said metering pin, a fuel well having an outlet discharging into said passageway above the normal fuel level, means to supply air to said well to satisfy the passageway suction on said outlet whereby to prevent discharge of fuel from said well, a valve controlling said air supply means, and means operable simultaneously to actuate said valve and said second-named valve member.

9. A carburetor of the character described, comprising a body having a passageway therethrough with an air inlet, a suction responsive valve member controlling said air inlet, means pivotally supporting said valve member for swinging movement, a longitudinally reciprocable nozzle member operatively connected to said valve member for movement thereby, a metering pin cooperable with the bore of said nozzle member whereby to control fuel flow therethrough in accordance with the position of said valve member, a second valve member having a pivotal support and engageable with said first-named valve member to regulate said air inlet and to move said nozzle member relative to said metering pin, a fuel well having an outlet discharging into said passageway above the normal fuel level, means to supply air to said well to satisfy the passageway suction on said outlet whereby to prevent discharge of fuel from said well, a valve controlling said air supply means, means operable simultaneously to actuate said valve and said second-named valve member, a piston in said well, a throttle valve controlling the outlet from said passageway, and means operatively connecting said piston and said throttle valve whereby movement of

said throttle valve will actuate said piston to discharge fuel through said well outlet.

10. A carburetor of the character described, comprising a body having a passageway there-
 5 through with an air inlet, a suction responsive valve member controlling said air inlet, means pivotally supporting said valve member for swing-
 10 ing movement, a longitudinally reciprocable nozzle member operatively connected to said valve member for movement thereby, a metering pin
 15 cooperable with the bore of said nozzle member whereby to control fuel flow therethrough in accordance with the position of said valve member, a second valve member having a pivotal
 20 support and engageable with said first-named valve member to regulate said air inlet and to move said nozzle member relative to said metering pin, an operating member to swing said second-named valve member, a throttle valve controlling the outlet from said passageway, adjustable means for determining the extent of closing movement of said throttle valve, and means for simultaneously actuating said operating member and said adjustable means.

25 11. A carburetor of the character described, comprising a body having a passageway there-
 30 through with an air inlet, a suction responsive valve member controlling said air inlet, means pivotally supporting said valve member for swing-
 35 ing movement, a longitudinally reciprocable nozzle member operatively connected to said valve member for movement thereby, a metering pin cooperable with the bore of said nozzle member whereby to control fuel flow therethrough in accordance with the position of said valve member, a second valve member having a pivotal support and engageable with said first-named valve member to regulate said air inlet and to move said nozzle member relative to said metering pin, an operating member to swing said second-named valve member, a throttle valve controlling the outlet from said passageway, adjustable means for determining the extent of closing movement of said throttle valve, means operatively connecting said operating member and said adjustable means, and means responsive to engine temperature for actuating said connecting means.

12. A carburetor of the character described, comprising a body having a passageway there-
 50 through including an air inlet and a mixing chamber, a pivotally supported valve plate responsive to suction and extending across said passageway between said inlet and said chamber, a nozzle housing having a longitudinal bore opening into
 55 said passageway through a side wall of said chamber, a longitudinally reciprocable nozzle member supported in said bore and extending through said plate into said air inlet, said plate and said nozzle member being operatively connected for movement in unison, said nozzle member having a longitudinal open ended fuel pas-
 60 sage therethrough opening at its discharge end on the inlet side of said plate, a metering pin in said bore extending into the inlet end of said passage, and a helical coil spring surrounding said metering pin and abutting the inlet end of said nozzle member to oppose opening movement of said valve plate.

13. A carburetor of the character described, comprising a body having a passageway there-
 70 through including an air inlet and a mixing chamber, a pivotally supported valve plate responsive to suction and extending across said passageway between said inlet and said chamber, a nozzle housing having a longitudinal bore open-

ing into said passageway through a side wall of said chamber, a longitudinally reciprocable nozzle member supported in said bore and having its discharge end extending through said plate into said air inlet, said plate and said nozzle member being operatively connected for movement in unison, said nozzle member having a longitudinal open ended fuel passage there-
 5 through, a metering pin in said bore extending into the inlet end of said passage, means resisting movement of said valve plate in response to mixing chamber suction, a choke plate pivotally supported at one edge in said passageway and having its opposite edge movable into said pas-
 10 sageway and engageable with the inlet face of said valve plate, said valve being freely movable independently of movement of said choke plate, said choke plate acting on movement to move said nozzle member relative to said metering pin, and means to operate said choke plate and to hold said choke plate in fixed position in said passageway.

14. A carburetor of the character described, comprising a body having a passageway there-
 25 through including an air inlet and a mixing chamber, a pivotally supported valve plate responsive to suction and extending across said passageway between said inlet and said chamber, a nozzle housing having a longitudinal bore opening into said passageway through a side wall of said chamber, a longitudinally reciprocable
 30 nozzle member supported in said bore and having its discharge end extending through said plate into said air inlet, said plate and said nozzle member being operatively connected for movement in unison, said nozzle member having a longitudinal open ended fuel passage therethrough, a metering pin in said bore extending into the inlet end of said passage, means resisting movement of said valve plate in response to mixing
 35 chamber suction, a choke plate pivotally supported at one edge in said passageway and having its opposite edge movable into said passageway and engageable with the inlet face of said valve plate, said valve plate being movable independently of said choke plate, said choke plate acting on movement to move said nozzle member relative to said metering pin, and an adjusting screw extending through the wall of said body and engaging the rear face of said choke plate.

15. A carburetor of the character described, comprising a body having a passageway there-
 55 through, an inclined valve plate pivotally supported at one edge and extending across said passageway, means to supply fuel to said passageway, a choke plate pivotally supported at one edge and having its opposite edge engaging said valve plate to regulate admission of air to said passageway, a shaft rotatable with said choke plate, said body having an air inlet chamber receiving said shaft, an air inlet to said chamber, a valve member on said shaft controlling said air inlet, a fuel well having an outlet above the normal fuel level discharging into said passageway, and a conduit connecting said chamber and said fuel well above the normal fuel level.

16. A downdraft carburetor comprising a body having a vertical passageway therethrough, said passageway having a portion of substantially rectangular internal cross-section, a substantially rectangular valve plate pivotally supported at its top edge at one side wall of said portion and inclined downward across said portion, a nozzle housing having its bore inclined to said passage- 75

way and opening into said rectangular portion beneath said valve plate, a nozzle member longitudinally reciprocable in said housing bore and having its discharge end extending through said valve plate, said nozzle member having a shoulder engaging said valve plate whereby said nozzle member and said valve plate are movable in unison, a fuel passage extending longitudinally through said nozzle member, a metering pin in said housing bore and extending into the inlet end of said fuel passage, and means to supply fuel to said housing bore for discharge through said fuel passage.

17. A downdraft carburetor comprising a body having a vertical passageway therethrough, said passageway having a portion of substantially rectangular internal cross-section, a substantially rectangular valve plate pivotally supported at its top edge at one side wall of said portion and inclined downward across said portion, a substantially rectangular choke plate pivotally supported at its top edge at the opposite side wall of said portion, said choke plate having its lower edge portion engageable with the top face of said valve plate to control the effective flow area of said passageway, a nozzle housing having its bore inclined to said passageway and opening into said rectangular portion beneath said valve plate, a nozzle member longitudinally reciprocable in said housing bore and having its discharge end extending through said valve plate, said nozzle member having a shoulder engaging said valve plate whereby said nozzle member and said valve plate are movable in unison, a fuel passage extending longitudinally through said nozzle member, a metering pin in said housing bore and extending into the inlet end of said fuel passage, and means to supply fuel to said housing bore for discharge through said fuel passage.

18. A carburetor of the character described, comprising a body having a passageway therethrough with an air inlet, a valve controlling said air inlet, a lever for moving said valve, means to supply fuel to said passageway, a throttle valve having an operating lever and controlling flow through said passageway, a cam member movably supported by said body adjacent said operating lever, a lever for turning said cam member, a cam follower member adjustably mounted on said operating lever and engageable with said cam member, means operatively connecting said air valve lever and said cam lever, and temperature responsive means for actuating said connecting means.

19. A carburetor comprising a body having a passageway therethrough with an air inlet, a valve plate pivotally supported for swinging movement and extending across said passageway, a nozzle member reciprocally supported by the wall of said body, said valve plate having an aperture therethrough for the passage of primary air, said nozzle member having its discharge end extending through said aperture into said air inlet, said valve plate being operatively connected to said nozzle member, and a fuel valve operable by movement of said nozzle member and controlling the discharge therefrom, said fuel valve including a metering pin extending into the bore of said nozzle member.

20. A down-draft carburetor comprising a body having a vertical passageway therethrough with an air inlet, said passageway having a straight wall portion, a valve plate conforming to said passageway and pivotally supported at its top edge along said portion, said valve plate being re-

sponsive to suction and inclined downward across said passageway, a nozzle housing opening into said passageway beneath said valve plate, said valve plate having an aperture therethrough at its free edge, a nozzle member longitudinally reciprocal in said housing bore and extending across said passageway with its discharge end extending through said plate aperture into said air inlet, means operatively connecting said plate and said nozzle member for movement of said nozzle member by said valve plate, a fuel valve controlling the supply of fuel to said nozzle member and operable by movement of said fuel nozzle, and means to supply fuel to the inlet side of said fuel valve for discharge through said nozzle member.

21. A carburetor of the character described, comprising a body having a passageway therethrough with an air inlet, a fuel supply means discharging into said passageway, a valve plate responsive to suction and controlling admission of air from said inlet to said passageway, a fuel valve controlling the supply of fuel to said fuel supply means and operatively connected to said valve plate to increase the supply of fuel to said passageway as said valve plate moves toward open position, and a choke plate pivotally supported in said passageway and cooperable with said valve plate, said choke plate being movable into said passageway and over the inlet face of said valve plate to regulate the flow area of said passageway, said valve plate being movable by suction independently of said choke plate.

22. A carburetor of the character described, comprising a body having a passageway therethrough with an air inlet, a fuel supply means discharging into said passageway, a valve plate responsive to suction and controlling admission of air from said inlet to said passageway, a fuel valve controlling the supply of fuel to said fuel supply means and operatively connected to said valve plate to increase the supply of fuel to said passageway as said valve plate moves toward open position, and a choke plate pivotally supported in said passageway and cooperable with said valve plate, said choke plate being movable into said passageway and over the inlet face of said valve plate to regulate the flow area of said passageway, said valve plate being movable by suction independently of said choke plate, said choke plate having its free edge engaging the inlet face of said valve plate so that movement of said choke plate into said passageway will move said valve plate toward open position.

23. A down-draft carburetor comprising a body having a vertical passageway therethrough with an air inlet, said passageway having a portion of substantially rectangular internal cross-section, a substantially rectangular valve plate conforming to said portion and pivotally supported at its top edge at one side of said portion, said valve plate being inclined downward across said portion and having an aperture through its free edge, a substantially rectangular choke plate pivotally supported at its top edge at the opposite side wall of said portion, said choke plate having its lower edge portion engageable with the top face of said valve plate to control the effective flow area of said passageway, a nozzle housing having its bore opening into said rectangular portion beneath said valve plate, a nozzle member longitudinally reciprocal in said bore and extending across said passageway, the discharge end of said nozzle member extending through said aperture into said air inlet, means to transmit movement of said valve plate to said

nozzle member, a fuel valve operable by movement of said nozzle member and controlling the supply of fuel thereto, and means to supply fuel to the inlet side of said fuel valve for discharge through said nozzle member.

24. A carburetor comprising a body having a passageway therethrough with an air inlet, means to supply fuel to said passageway, an adjustable valve member controlling admission of air to said passageway, an operating member for moving said valve member to and holding said valve member in flow restricting position, supplemental fuel supply means discharging into said passageway, means to supply air to said supplemental means, a valve controlling said air supply means, a throttle valve controlling the outlet from said passageway, adjustable means for determining the extent of closing movement of said throttle valve, and means for simultaneously actuating said operating member, said adjustable means and the valve for said air supply means.

25. A carburetor of the character described, comprising a body having a passageway therethrough with an air inlet, a suction responsive valve member controlling said air inlet, means pivotally supporting said valve member for swinging movement, fuel supply means discharging into said passageway, a fuel valve controlling the supply of fuel to said fuel supply means and operable by said valve member, a second valve member having a pivotal support and cooperable with said first-named valve member to regulate said air inlet, an operating member for moving said second-named valve member to passageway restricting position, a throttle valve controlling the outlet from said passageway, adjustable means for determining the extent of closing movement of said throttle valve, and means for simultaneously actuating said operating member and said adjusting means.

26. A carburetor of the character described, comprising a body having a passageway therethrough with an air inlet, a valve member responsive to suction and controlling said air inlet, means to supply fuel to said passageway, a valve controlling the supply of fuel to said fuel supply means and operable by said valve member, an air inlet for bleeding air into said fuel supply means, and a valve operable by said suction responsive valve member for controlling said air bleeding inlet.

27. A carburetor of the character described, comprising a body having a passageway therethrough with an air inlet, a valve member responsive to suction and controlling said air inlet, means to supply fuel to said passageway, a valve controlling the supply of fuel to said fuel supply means and operable by said valve member, an air inlet for bleeding air into said fuel supply means, a valve operable by said suction responsive valve member for controlling said air bleeding inlet, a throttle valve controlling the outlet from said passageway, a second valve controlling said air bleeding inlet, and means operable upon operation of said throttle valve to actuate said second air bleeding valve.

28. A carburetor of the character described, comprising a body having a passageway therethrough with an air inlet, a suction responsive valve member controlling said air inlet, means pivotally supporting said valve member for swinging movement, fuel supply means discharging into said passageway, a fuel supply valve for said

supply means and operatively connected to said valve member for movement thereby, a second valve member pivotally supported and cooperable with said first-named valve member to regulate said air inlet, said first-named valve member being freely movable independently of said second-named valve member, supplemental fuel supply means having an outlet discharging into said passageway, means to supply air to said supplemental means to satisfy the passageway suction on said outlet, a valve controlling said air supply means, and means operable to move said second-named valve member relative to said first-named valve member to restrict flow through said passageway and simultaneously to move the valve for said air supply means to flow restricting position to provide fuel discharge from said supplemental means.

29. A carburetor of the character described, comprising a body having a passageway therethrough with air and fuel inlets, a manually operable throttle valve having a shaft and controlling flow through said passageway and being freely movable toward open position, said valve being movable to closed engine idling position at the will of the engine operator to control engine idling operation, an adjustable stop member for variably limiting the extent of closing movement of said valve through a range of engine idling positions, said stop member comprising a rotatable cam eccentrically mounted on said body, said stop member and said throttle shaft being closely adjacent each other, an arm rigidly secured to and movable with said valve, and a stop member on said arm and engageable with said cam on valve closing movement to limit throttle valve closing movement.

30. A carburetor of the character described, comprising a body having a passageway therethrough with air and fuel inlets, a manually operable throttle valve controlling flow through said passageway and freely movable toward open position, said valve being movable to closed engine idling position at the will of the engine operator to control engine idling operation, an adjustable stop member for limiting the extent of closing movement of said valve, said stop member comprising a rotatable cam having a cam surface and being eccentrically mounted on said body, means movable with said valve and engageable with said cam surface on valve closing movement irrespective of the rotary position of said cam, said stop member and said cam engaging means being carried as a unit by said throttle valve containing body, a thermostat responsive to engine temperature and operable to move said cam as engine temperature increases to permit further closing movement of said valve, an arm on said cam, and a rod operatively connecting said thermostat and said arm.

31. A carburetor comprising a body having a passageway therethrough with an air inlet, means to supply fuel to said passageway, a pump chamber for supplying supplemental fuel to said passageway, a piston in said chamber, a closure member for the upper end of said chamber and having a central fuel port, a piston rod for said piston and extending up through said port, and a valve member seating on said closure member to close said port and slidably guided on said rod.

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