July 14, 1931. W. H. WEBER 1,815,019

CARBURETOR

Filed June 2, 1927 2 Sheets-Sheet 1

Fig. 1.

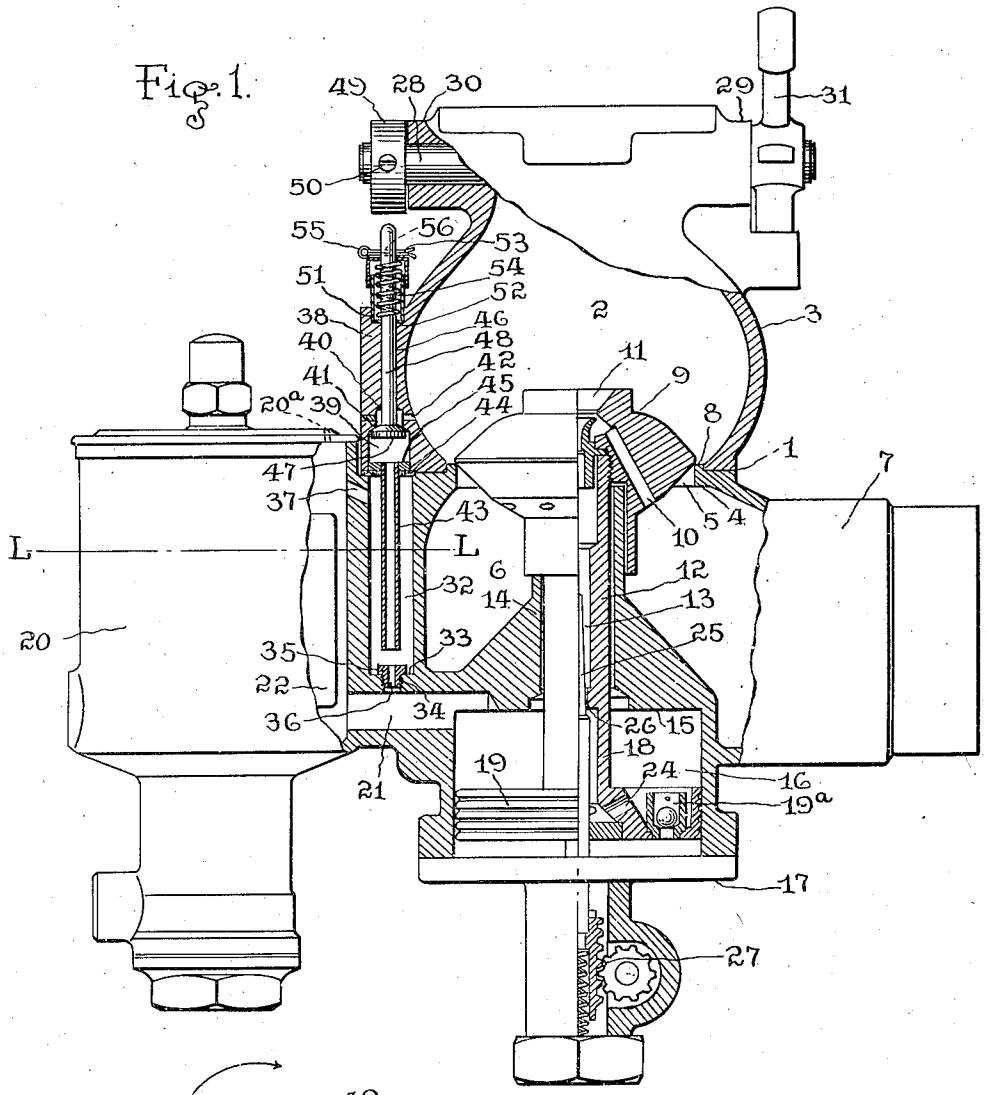
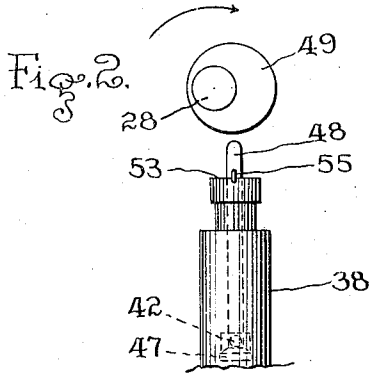


Fig. 2.



Walter H. Weber INVENTOR

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Fig. 3.

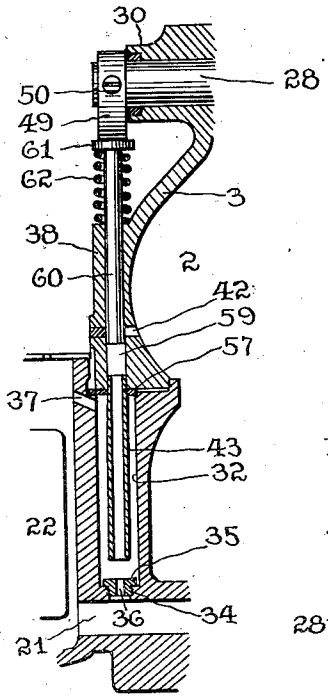
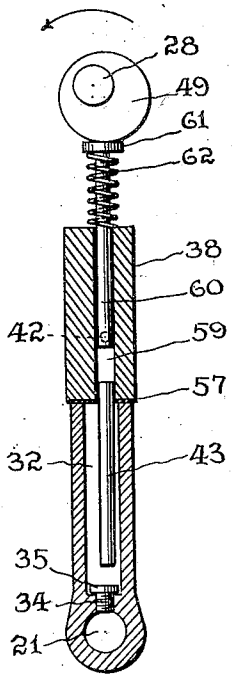


Fig. 4.



PART THROTTLE

Fig. 6.

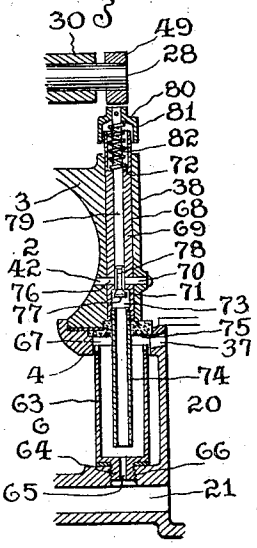
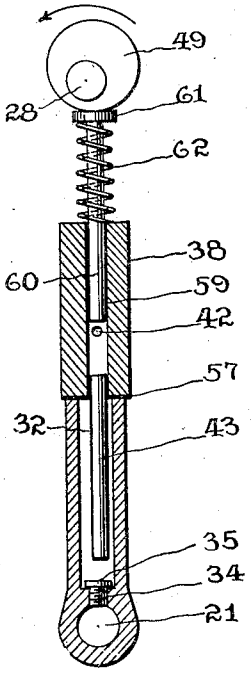


Fig. 5.



WIDE OPEN THROTTLE

INVENTOR
Walter H. Weber
BY C. E. Hughes
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Patented July 14, 1931 1,815,019

UNITED STATES PATENT OFFICE

WALTER H. WEBER, OF DETROIT, MICHIGAN, ASSIGNOR TO DETROIT LUBRICATOR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN

CARBURETOR

Application filed June 2, 1927. Serial No. 195,985.

My invention relates to new and useful improvements in carburetors, and more particularly to a power well adapted to supply additional fuel to the mixing chamber to supplement the mixture fed thereto by the main air and fuel nozzles.

An object of my invention is to provide a carburetor which will supply a proper and adequate combustible mixture to the cylinders of an internal combustion engine at both part open and wide open throttle positions.

A further object is to supplement the normal combustible mixture of fuel and air to meet the requirement of the necessary enriched mixture to give the desired "punch" or quick acceleration upon sudden opening of the throttle valve.

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 I have fully and clearly illustrated a preferred embodiment of my invention, to be taken as part of the specification, and wherein—

Figure 1 is a side elevation, partially in section, of a well known form of carburetor showing the preferred form of my power well applied thereto;

Fig. 2 is a detail view showing the power well valve-operating mechanism;

Fig. 3 is a detail elevation in section showing a modified form of power well and valve operating mechanism;

Figs. 4 and 5 are details showing valve positions in the modified form of Fig. 3, and

Fig. 6 is a detail in vertical section of another form of power well and valve mechanism therefor.

Referring to the drawings by characters of reference, 1 designates a carburetor casing, preferably of cast metal, having a mixing chamber 2 with side walls 3 and a base or partition wall 4 having an opening 5 therethrough into an air chamber 6. A tubular air inlet 7, which may be provided with an air heater jacket of any well known type, opens into chamber 6 to supply air thereto. The opening 5 is provided with an annular valve seat 8 on which a suction operated gravity valve 9 seats. Unobstructed air ducts 10, of which but one is shown, lead from the air chamber 6 at the under side of the valve 9 through the same to a nozzle 11 in the top thereof for the passage of air from the inlet 7 and chamber 6 to the mixing chamber. A stem 12 depends from valve 9 and has a hollow bore 13 which forms a longitudinal passageway therethrough, and which leads at its upper end to nozzle 11. The stem 12 is slidably mounted for vertical reciprocation in a guiding boss or sleeve 14, which rises from the lower or base wall 15 of air chamber 6. A dash-pot chamber 16 having the wall 15 as its top, is preferably integral with the casing 1 and is closed at its bottom by a cap 17. The free, lower end 18 of stem 12 projects downward into chamber 16 and rigidly carries a dash-pot piston 19. Liquid fuel is fed to this dash-pot chamber 16 from a suitable fuel reservoir 20 through a communicating passage 21 in casing 1. Within the reservoir 20, which is open to the atmosphere through hole 20^a, is a fuel inlet control mechanism (not shown) of any common type which is operated by the float 22 to maintain the fuel level substantially constant at the level L—L, Fig. 1. As the stem 12 rigidly connects the air valve 9 with the dash-pot piston 19, it is evident that opening of the valve 9, due to sub-atmospheric pressure in the mixing chamber 2, will be controlled in the usual and well known manner by the piston 19 to cause gradual movement of valve 9 from its seat 8. The piston 19 has a plurality of automatic valves 19^a, preferably of the ball check type, which allow liquid in chamber 16 to pass above piston 19 to permit quick closing of the valve 9. Liquid fuel from the chamber 16 enters the bore 13 through ports 24 in the stem 12, and passage of the fuel to nozzle 11 is controlled by a tapered needle valve 25 which extends upward within the bore 13 and cooperates with an orifice 26 therein. The valve 25 is adjustably mounted in the cap 17 for adjustment into and out of orifice 26 by rack and pinion mechanism 27. As the orifice 26 is through the stem 12 which is fixed to the air valve 9, movement of valve 9, due

to change of pressure in chamber 2, will open or close the fuel nozzle orifice 26 as and when the valve 9 opens or closes the air inlet opening 5 to thereby supply proper proportions of fuel and air to the mixing chamber 2. The upper end of the mixing chamber 2 has a mixture outlet opening controlled by a throttle valve, preferably of the plate or butterfly type (not shown), which is fixed on a shaft 28 freely journaled in bearings 29, 30, in casing 1. The shaft 28 extends outside the casing, and fastened on one end thereof adjacent bearing 29 is a control lever 31 which may have a rod or other linkage, if desired, by which it may be operated from a point within easy reach of the operator to control the throttle valve.

A more detailed description of the main carburetor is not considered essential, as it is of a type well known and is of itself no part of my present invention, except as it enters in combination with my improvement to be described.

Within the wall of air chamber 6 and in a vertical plane through the axis of shaft 28, is a vertical cylindrical bore 32 serving as a power well or fuel cup. The lower end or base 33 of the bore 32 terminates directly above the passageway 21, and opens thereinto through a port 34 which serves as a fuel inlet. The port 34 is internally threaded to receive a screw plug 35 having a calibrated orifice 36 therethrough to restrict the opening of port 34. The side wall of the well or bore 32 adjacent the reservoir 20 has a port or air bleed 37 therethrough which opens into the reservoir 20 above the normal level of fuel therein. Due to the orifice 36 the level of fuel will be the same in the well 32 as in the reservoir 20, and due to the port 37 the atmospheric pressure on the liquid in the reservoir will also be maintained on the fuel in the well 32. The side wall 3 of the mixing chamber 2 has a vertical boss or extension 38, which is directly above the power well 32. The lower end of boss 38 has a compartment 39 in axial alignment with well 32, which is provided with a cylindrical, axial recess 40 having an annular shoulder or valve seat 41. The recess 40 is laterally adjacent the mixing chamber 2 and is in communication therewith through a port or inlet passage 42 which opens into the mixing chamber 2, preferably at a point intermediate the levels of the air inlet 5 and of the fuel inlet 11; but the passage 42 may open through wall 3 at any point above inlet 5. Within the well 32 is an unrestricted open tube or conduit 43, the lower end of which terminates short of the bottom of the well 32 and above the orifice 36. At the upper end of tube 43 and surrounding the same, is a partition supported by the wall of chamber 6, preferably in the form of a disk 44 and gasket 45 which closes the top of well 32 and separates it from compartment 39. The boss 38 has a vertical guideway 46 therethrough which opens into the recess 40. Within the recess 40 is a reciprocating valve 47 which cooperates with seat 41 to close off the passage from the well 32 to the mixing chamber 2. Projecting upward from valve 47 is a valve stem 48 which is slidably mounted in guideway 46 for vertical reciprocation therein. The stem 48 projects above the top of boss 38 adjacent to and directly beneath an end of throttle shaft 28 which extends beyond bearing 30. On this end of shaft 28 there is a cam 49, preferably an eccentric, which is adjustable about shaft 28 relative to the throttle and has means to fix it in adjusted position, such as a set screw 50. The cam 49 is out of contact with stem 48 for all positions of the throttle, except for wide open, or nearly wide open throttle, when the cam will engage and depress the stem 48 to open valve 47. The top of the boss 38 has a cylindrical socket 51 therein which surrounds the stem 48. In the socket 51 is a cylindrical two-part telescopic casing having heads 52, 53, which are axially apertured to receive stem 48. Within the telescopic casing and surrounding the stem 48 is a coil spring 54 which abuts the inside surfaces of the casing heads 52, 53, and is held under compression by a cotter or other pin 55 passed through a hole 56 in stem 48. The spring 54 thus exerts its expansive force through head 53 and pin 55 upon the valve stem 48 to hold the valve 47 on its seat 41.

In the modification of the power well shown in Figs. 3, 4 and 5, the bore through the boss 38 is of uniform cross-sectional area, with the tube 43 fitting tightly at its upper end in the bore. A gasket 57 closes the top of well 32 and surrounds the tube 43. Within the bore 59 is a rod 60 having a sliding fit therein. Communicating with the bore 59 and mixing chamber 2, is a port or inlet 42 which corresponds to inlet 42 of Fig. 1. The rod 60 is vertically reciprocable in the bore 59 to cover or uncover the port 42. At its upper end the rod 60 has a head or abutment 61 between which and the top of boss 38 is a coil spring 62 surrounding rod 60, which maintains the head 61 in contact with cam 49. This spring 62 normally tends to raise the rod 60 to uncover port 42, but the cam 49, in this modification, is adjusted and fixed by screw 50 to hold the rod 60 depressed to cover port 42 when the throttle is closed, and for all positions of the throttle, excepting substantially wide open throttle, when the cam 49 has been rotated by shaft 28 to the position shown in Fig. 5.

In the further modification of the power well shown in Fig. 6, the wall of the air chamber 6 is of too thin metal line to contain the power well, as in Figs. 1 and 3, and, therefore, the power well is in the form of a cylindrical cup 63 positioned in the air inlet chamber 6. The bottom of the cup 63 has a de-

pending boss 64 which corresponds to plug 35 and is externally threaded, and has a longitudinal, central, calibrated orifice 65 therethrough which corresponds to the orifice 36 in Figs. 1 and 3. The boss 64 is threaded into an aperture 66 in the casing, and in the vertical center line of boss 38, which aperture communicates with the fuel passage 21 from the reservoir 20. At its upper end the cup 63 fits within a circular opening 67 through the air inlet chamber wall 4. The well or cup 63 is open to the atmosphere through the air bleed 37 in the reservoir 20. Within a vertical bore 68 corresponding to bore 59, Fig. 3, in the boss 38, is a guide sleeve 69 which is fixed therein by a pin 70. The sleeve 69 is recessed at each end to form internal shoulders 71, 72. The lower recess 73 forms a valve chamber, and is internally threaded to receive the threaded end of a fuel-conveying conduit or tube 74 which projects downward into the well 63 to a point adjacent the orifice 65, and which corresponds to tube 43, Figs. 1 and 3. A suitable gasket 75 which surrounds the tube 74 extends across and closes the opening 67 and the well 63 above the air bleed 37. In line with the inlet or port 42 through the wall 3 of the mixing chamber 2, is an aperture 76 in the sleeve 69, through which fuel from the tube 74 may pass. The shoulder 71 in valve chamber 73 serves as a valve seat for cooperation with a valve 77 having a stem 78 of smaller diameter than the bore of sleeve 69. Fixed on the stem 78 and extending upward through the sleeve 69, is a push rod 79 which has a sliding fit in the sleeve. The rod 79 and stem 78 are joined at sufficient distance above port 42 so that there will be free access from well 63 around stem 78 to port 42 when the valve 77 is depressed from its seat 71. The rod 79 projects above sleeve 69 and has fixed to its free upper end an abutment or cap 80 having a depending flange or skirt 81 which telescopes the sleeve 69. Supported by the shoulder 72 in the upper recess, is a coil spring 82 which surrounds the stem 78 and which is held under compression by cap 80 to normally maintain the valve 77 raised against its seat 71. The cam 49 is positioned on the shaft 28, as in the preferred form, Fig. 1, so that at closed and part open throttle it is out of contact with rod 79, but at substantially wide open throttle will engage the rod to open the valve 77.

In operation the air and fuel admitted at the fuel nozzle 11 and the air admitted around valve 9 to the mixing chamber, provide a proper fuel mixture for maximum thermal-efficiency for all normal engine speeds; but at wide open throttle, or upon sudden opening of the throttle, the mixture supplied to the engine is too lean to give the desired power. This difficulty is overcome by my power well. At normal speeds and part open throttle, in the preferred form, Fig. 1, the cam 49 is out of contact with the stem 48, and the valve 47 is therefore held closed by the coil spring 54. Liquid fuel normally stands in the well 32 at substantially half its height and at the level of the fuel in the reservoir 20, indicated by line L—L, so that the tube 43 will be partially filled with liquid fuel, and, as above stated, there will be atmospheric pressure on the surface of the liquid in well 32, due to bleed 37. When the throttle valve is rotated to full open, or substantially full open position, the cam 49 will also be rotated to contact and depress the stem 48 against the action of spring 54 to open the valve 47 and fuel inlet 42. The subatmospheric pressure in the mixing chamber 2 will then cause the greater pressure on the surface of the liquid in the well 32 to force an instantaneous charge of solid liquid fuel into the mixing chamber 2 through port or inlet 42, the charge being the quantity in the well 32 and tube 43 less the amount in the well below the open lower end of tube 43. This charge of liquid fuel will be directly followed by an emulsion of slugs of liquid fuel separated by bubbles of air, the liquid fuel of the emulsion being constant in quantity per unit of time. As long as the valve 47 is held off its seat by the cam 49, the emulsion will be fed to the mixing chamber 2. This emulsion results from the admission of air from the bleed 37 and of liquid fuel from the orifice 36, which simultaneously and continuously enter the power well 32 through their respective inlets. It is of course understood that the fuel content of the emulsion may be varied by changing the size of the orifice 36 in plug 35.

The same result is accomplished when I employ the modified form of power well valve mechanism shown in Figs. 3, 4 and 5. However, the cam 49 is first adjusted, as above described, so that it will hold the rod 60 depressed and the port 42 closed when the throttle valve is closed, and will permit the spring 62 to raise the rod at substantially wide open throttle when the cam has been rotated to the position shown in Fig. 5, so that the lower end of rod 60 will pass above and uncover the fuel inlet 42.

The mode of operation and the function of the further modification shown in Fig. 6, is the same as that described above for the preferred form, shown in Figs. 1 and 2, there being first a charge of solid liquid fuel drawn from the well 63 into the mixing chamber 2 when the throttle valve and the conduits 74, 42 are opened, which charge is followed, so long as the valve 77 is open, by an emulsion of liquid fuel and air drawn from the well 63 into the mixing chamber 2.

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

1. In a carburetor of the character described, a casing having a mixing chamber, main air and fuel inlets to said mixing chamber, a mixture outlet from said mixing cham-

ber, said casing having a power well, a valve chamber for said power well, a conduit having one end opening adjacent the bottom of said power well and at its other end opening into said valve chamber, a port connecting said valve chamber and said mixing chamber, said power well having a fuel inlet and an air inlet, a valve in said valve chamber to close said port, said valve having a stem reciprocable through said casing, means to normally maintain said valve in closed position, a shaft journaled in said casing at said outlet and projecting beyond said casing, said shaft having its longitudinal axis in a plane through the longitudinal axis of said valve stem, a throttle in said outlet and fixed on said shaft, and a cam fixed on said shaft and adapted to engage directly said valve stem to open said valve.

2. In a carburetor of the character described, a casing having a mixing chamber, said mixing chamber having a main air inlet and a main fuel inlet, a mixture outlet from said mixing chamber, a fuel reservoir, a passage connecting said fuel reservoir and said fuel inlet, said casing having a power well, a valve chamber for said power well, a conduit having one end opening adjacent the bottom of said power well and at its other end opening into said valve chamber, a port connecting said valve chamber and said mixing chamber, a fuel inlet orifice to said power well at its bottom, an air bleed to said power well above the normal fuel level therein, a valve in said valve chamber to close said port, a guideway opening through said casing, a valve stem fixed to said valve and guided for longitudinal movement in said guideway, a spring engaging said stem to normally maintain said valve in closed position, a shaft journaled in said casing at said outlet and projecting beyond said casing, said shaft having its longitudinal axis in a plane through the longitudinal axis of said guideway, a throttle carried by said shaft within said outlet, an adjustable cam fixed on said shaft external to said casing and having a portion adapted to engage directly said valve stem to open said valve against the action of said spring.

3. A carburetor of the character described, comprising a casing having a mixing chamber, main air and fuel inlets to said mixing chamber, a fuel reservoir, a passageway from said fuel reservoir to said fuel inlet, a fuel well, a constantly open fuel inlet of constant bore for admission of fuel from said reservoir to said well, an air inlet to said well above the normal fuel level therein for the admission of atmospheric air to said well, a conduit opening into said mixing chamber, a portion of said conduit extending into said well concentric therewith and terminating adjacent to but spaced from the fuel inlet to said well, a valve in said conduit, means to normally hold said valve in closed position to prevent flow of air or fuel through said conduit to said mixing chamber, and manually operable means to open said valve whereby the liquid fuel maintained in said well will be discharged through said conduit into said mixing chamber and subsequently, upon maintenance of said valve in open position, air admitted to said well from said second air inlet and fuel admitted to said well from said constantly open fuel inlet of constant bore will be discharged together from said well through said conduit into said mixing chamber.

4. A carburetor of the character described, comprising a casing having a mixing chamber, said mixing chamber having an outlet, a throttle valve to control said outlet, main air and fuel inlets to said mixing chamber, a fuel reservoir, a passageway from said fuel reservoir to said fuel inlet, a fuel well, a constantly open fuel inlet of constant bore for admission of fuel from said reservoir to said well, an air inlet to said well above the normal fuel level therein for the admission of atmospheric air to said well, a conduit opening into said mixing chamber, a portion of said conduit extending into said well concentric therewith and terminating adjacent to but spaced from the fuel inlet to said well, a valve in said conduit, means to normally hold said valve in closed position to prevent flow of air or fuel through said conduit to said mixing chamber, and means actuated by movement of said throttle valve to open the valve in said conduit whereby the liquid fuel maintained in said well will be discharged through said conduit into said mixing chamber and subsequently, upon maintenance of said valve in open position, air admitted to said well from said second air inlet and fuel admitted to said well from said constantly open fuel inlet of constant bore will be discharged together from said well through said conduit into said mixing chamber.

5. A carburetor of the character described, comprising a casing having a mixing chamber, main air and fuel inlets to said mixing chamber, a fuel reservoir, a passageway from said fuel reservoir to said fuel inlet, a fuel well, a constantly open fuel inlet of constant bore for admission of fuel from said reservoir to said well, an air inlet to said well above the normal fuel level therein for the admission of atmospheric air to said well, a conduit opening into said mixing chamber, a portion of said conduit extending into said well concentric therewith and terminating adjacent to but spaced from the fuel inlet to said well, a valve in said conduit, said valve having a stem projecting through and reciprocable in said casing, spring means acting on said valve stem and on said casing to normally hold said valve in closed position to prevent flow of air or fuel through said con-

duit to said mixing chamber, and manually operable means acting on said valve stem to open said valve whereby the liquid fuel maintained in said well will be discharged through said conduit into said mixing chamber and subsequently, upon maintenance of said valve in open position, air admitted to said well from said second air inlet and fuel admitted to said well from said constantly open fuel inlet of constant bore will be discharged together from said well through said conduit into said mixing chamber.

6. A carburetor of the character described, comprising a casing having a mixing chamber, said mixing chamber having an outlet, a throttle shaft journaled in said casing through said outlet, a throttle valve on said shaft to control said outlet, cam means on said shaft external of said casing, main air and fuel inlets to said mixing chamber, a fuel reservoir, a passageway from said fuel reservoir to said fuel inlet, a fuel well in said casing substantially in a vertical plane through the longitudinal axis of said shaft, a constantly open fuel inlet of constant bore for admission of fuel from said reservoir to said well, an air inlet to said well above the normal fuel level therein for the admission of atmospheric air to said well, a conduit opening into said mixing chamber, a portion of said conduit extending into said well concentric therewith and terminating adjacent to but spaced from the fuel inlet to said well, a valve in said conduit, said valve having a a substantially vertical stem projecting through and reciprocable in said casing and terminating directly beneath said cam means for actuation thereby, and spring means to normally hold said valve in closed position to prevent flow of air or fuel through said conduit to said mixing chamber, whereby when said throttle valve is opened the valve in said conduit will be opened and the liquid fuel maintained in said well will be discharged through said conduit into said mixing chamber and subsequently, upon maintenance of said valve in open position, air admitted to said well from said second air inlet and fuel admitted to said well from said constantly open fuel inlet of constant bore will be discharged together from said well through said conduit into said mixing chamber.

7. A carburetor of the character described, comprising a casing having a mixing chamber with main air and fuel inlets thereto, a fuel well having a fuel inlet in its bottom wall, a valve chamber above and concentric with said well, a member closing the upper end of said well and positioned below said valve chamber, a passageway opening at one end into said valve chamber and at its other end into said mixing chamber, an open-ended tubular member opening at one end into said valve chamber through said member and depending into said well with its other end opening adjacent the bottom wall of said well, a valve seat in said valve chamber intermediate and spaced from said passageway and said tubular member, a valve cooperable with said seat, and an air inlet to said well above the normal liquid level therein.

8. A carburetor of the character described, comprising a casing having a mixing chamber with main air and fuel inlets thereto, a fuel well having a fuel inlet and having an air inlet above the normal liquid fuel level therein, a valve chamber concentric with and above said well, a partition separating said valve chamber and said well and having an aperture therethrough, an open-ended tubular member rigidly sealed in said aperture and depending into said well substantially to the bottom thereof, a passageway from said valve chamber to said mixing chamber, a valve in said valve chamber between said member and said passageway, and means to open said valve.

9. A carburetor of the character described, comprising a casing having a mixing chamber with main air and fuel inlets thereto and a mixture outlet therefrom, a throttle valve for said outlet having cam means operable therewith, a fuel well having a fuel inlet and having an air inlet above the normal liquid fuel level therein, a valve chamber concentric with and above said well, a partition separating said valve chamber and said well and having an aperture therethrough, an open-ended tubular member rigidly sealed in said aperture and depending into said well substantially to the bottom thereof, a passageway from said valve chamber to said mixing chamber, a valve in said valve chamber between said member and said passageway, means normally urging said valve toward closed position, and a stem on said last-named valve slidable in said casing and extending therethrough into operative relation to said cam means whereby operation of said throttle valve will actuate said last-named valve.

In testimony whereof I have hereunto signed my name.

WALTER H. WEBER.