

Aug. 8, 1944.

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2,355,267

CARBURETOR

Filed Sept. 10, 1941

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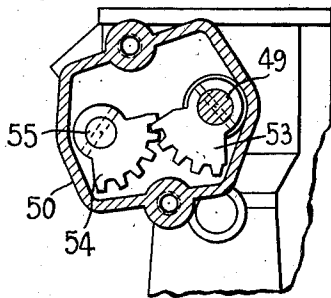


FIG-6

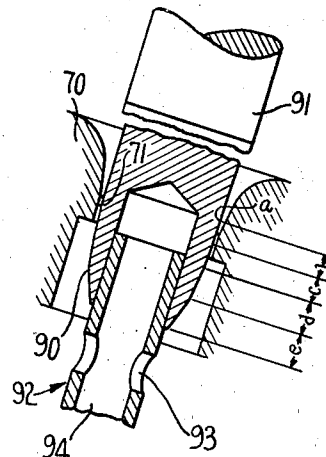
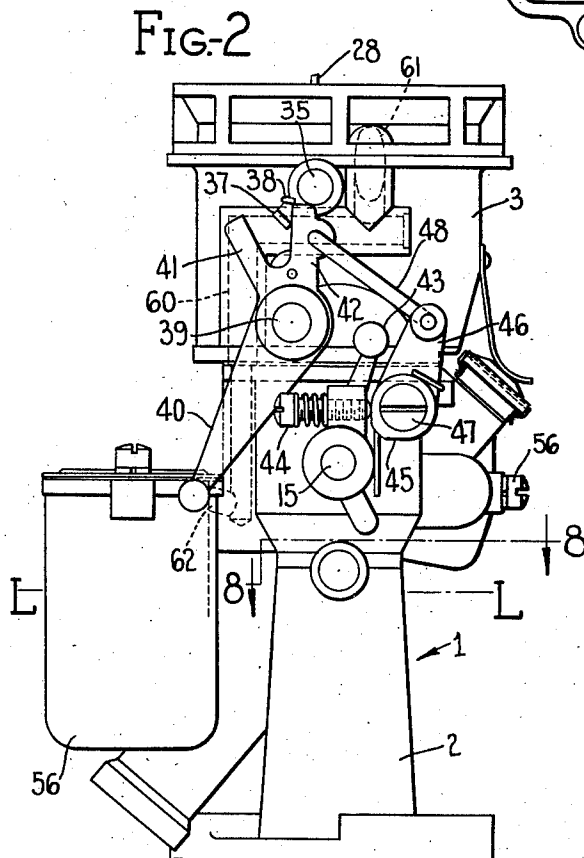
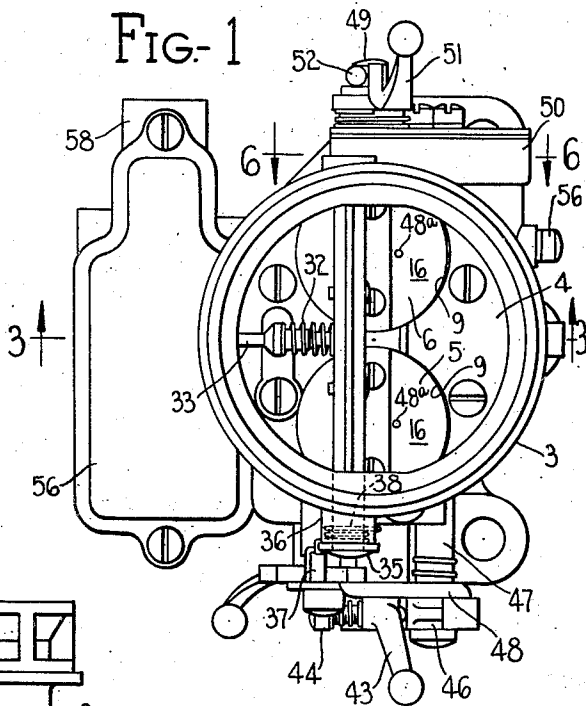


FIG-9

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5 Sheets-Sheet 2

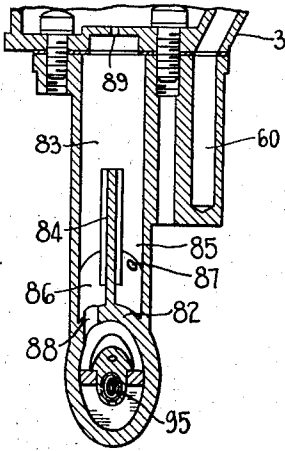


FIG-5

FIG-3

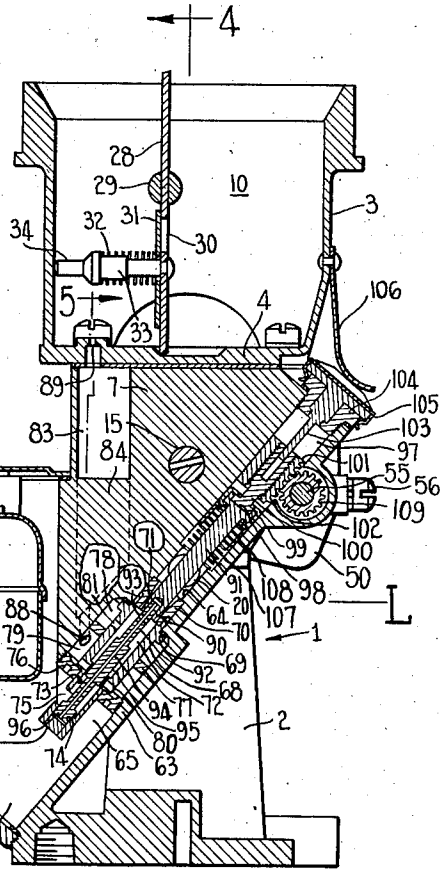


FIG-4

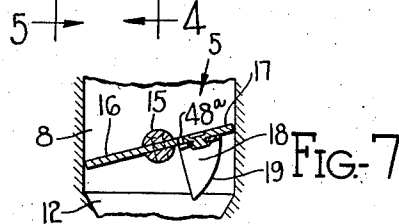
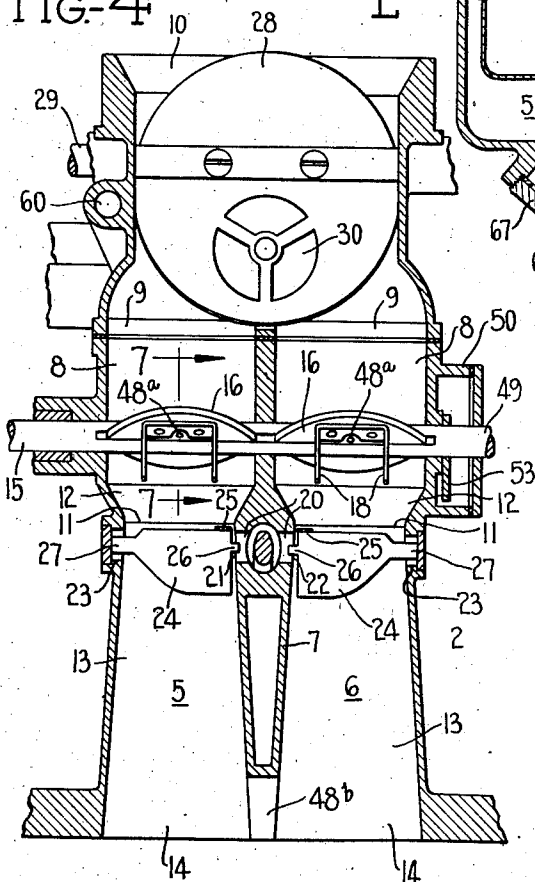


FIG-7

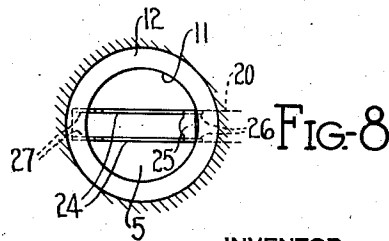


FIG-8

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CARBURETOR

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5 Sheets-Sheet 3

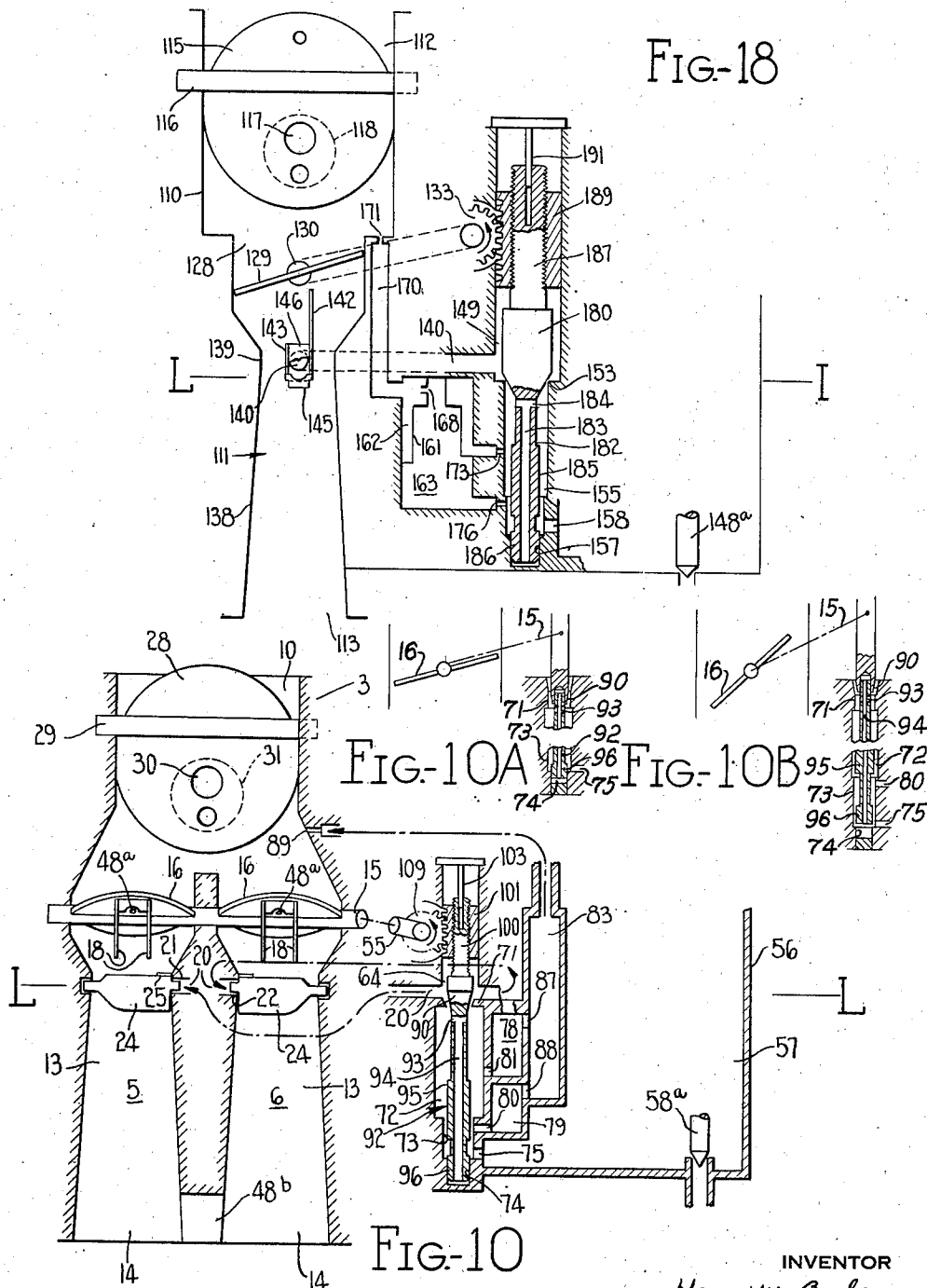


FIG-18

FIG-10A FIG-10B

FIG-10

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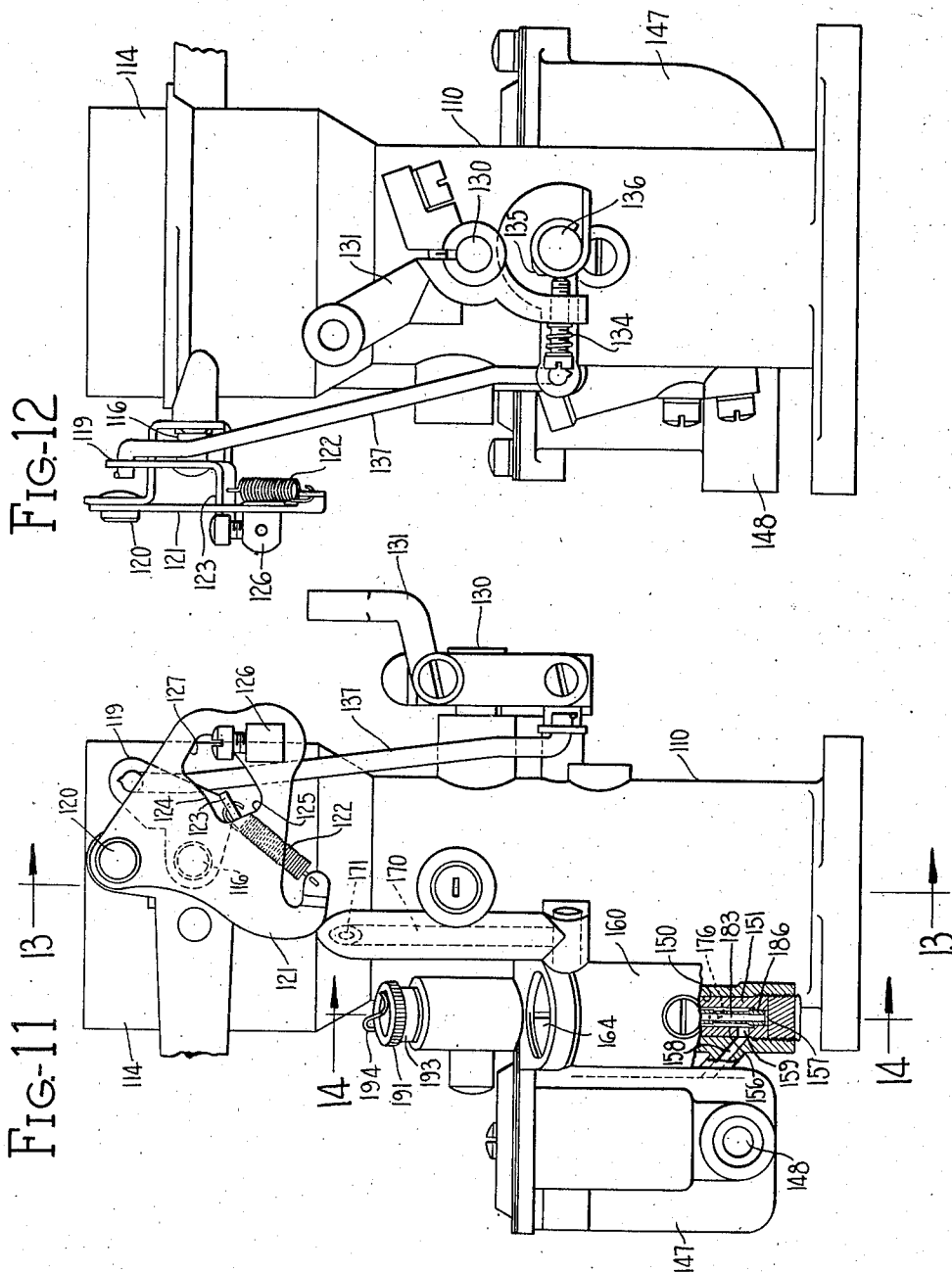
CARBURETOR

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FIG-12

FIG-11



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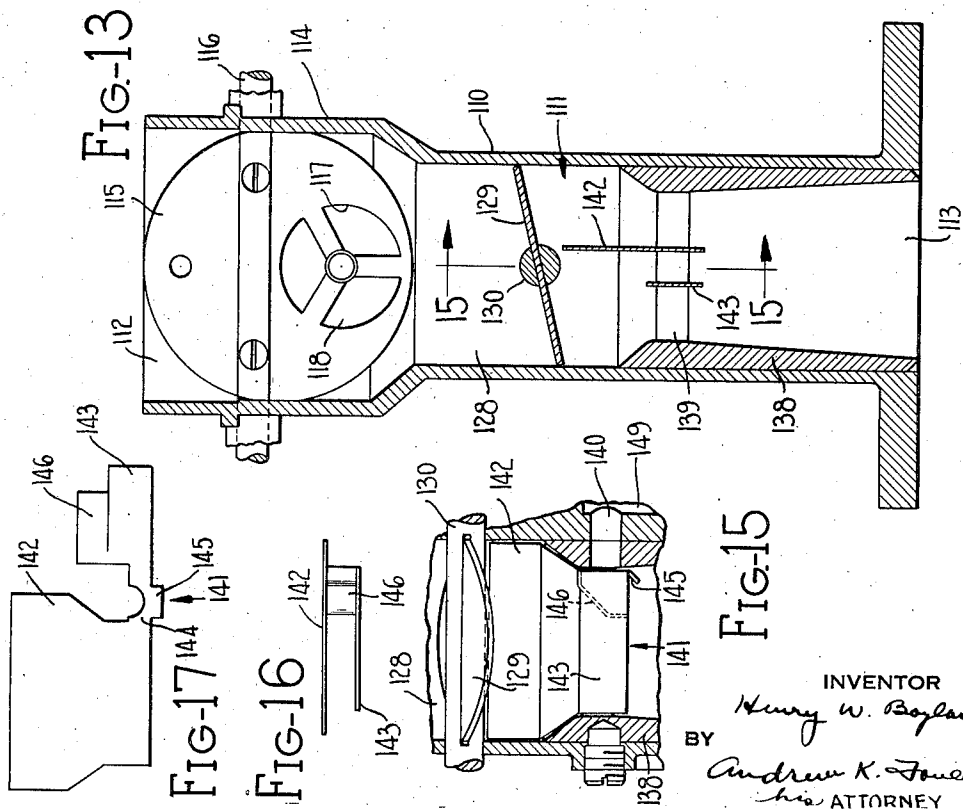
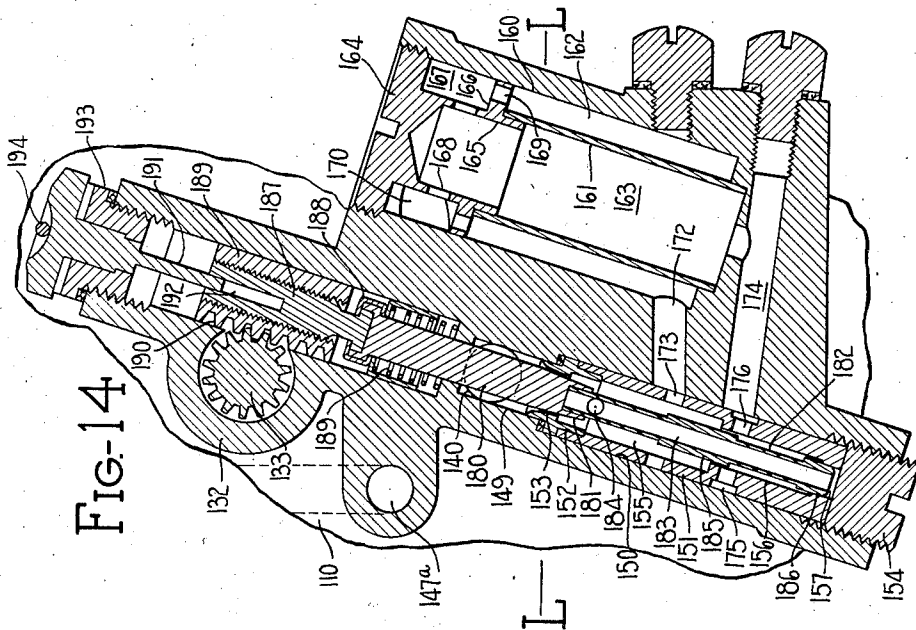
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CARBURETOR

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5 Sheets-Sheet 5



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2,355,267

CARBURETOR

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Application September 10, 1941, Serial No. 410,251

6 Claims. (Cl. 261—50)

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

An object of the invention is to provide a carburetor which will supply a proper fuel mixture for all ranges of engine operation.

Another object is to provide means for temporarily increasing the ratio of fuel to air for rapid acceleration.

Another object is to provide means for increasing the ratio of fuel to air during high power demands.

Another object is to provide a carburetor which is particularly adapted for utilizing an anterior throttle valve.

The invention consists in the improved construction and combination of parts to be more fully described hereinafter, 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 there are fully and clearly illustrated several preferred embodiments of the invention, in which drawings:

Figure 1 is a top plan view of a duplex downdraft throttle anterior carburetor embodying the invention;

Fig. 2 is a view in side elevation of the carburetor;

Fig. 3 is a view in section on the line 3—3 of Fig. 1;

Fig. 4 is a partial view in section on the line 4—4 of Fig. 3;

Fig. 5 is a detail view in section on the line 5—5 of Fig. 3;

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

Fig. 7 is a detail view in section on the line 7—7 of Fig. 4;

Fig. 8 is a detail view in section on the line 8—8 of Fig. 2;

Fig. 9 is an enlarged detail view of the metering valve in relation to its orifice in idling position;

Fig. 10 is a diagrammatic view of the duplex carburetor of Figs. 1 to 9;

Fig. 10A is a diagrammatic view showing a position of the parts when the throttle valve has been moved slightly toward open position.

Fig. 10B is a diagrammatic view showing the position of the parts when the throttle valve has been moved to a still further open position.

Fig. 11 is a view in side elevation of a single downdraft anterior throttle carburetor embodying the invention, but having a portion of the fuel conduit in longitudinal section;

Fig. 12 is a view in elevation looking from right to left of Fig. 11;

Fig. 13 is a view in longitudinal central section

through the mixing chamber and taken on the line 13—13 of Fig. 11;

Fig. 14 is an enlarged detail view in section on the longitudinal center line of the fuel control or economizer means and taken on the line 14—14 of Fig. 11;

Fig. 15 is a detail view in section on the line 15—15 of Fig. 13 but showing the nozzle and baffle member in side elevation;

Fig. 16 is a detail top plan view of the nozzle and baffle member;

Fig. 17 is a detail view of the blank from which the nozzle and baffle member is formed; and

Fig. 18 is a diagrammatic view of the single carburetor of Figs. 11—17.

Referring to the drawings, Figs. 1—10 by characters of reference, numeral 1 designates generally the casing of a duplex downdraft type carburetor having a lower body member 2 on which is mounted a cylindrical air inlet housing 3 having a bottom wall 4. The member 2 has a pair of parallel passageways 5, 6 therethrough separated by a partition wall 7. Each passageway 5, 6 has a cylindrical air inlet and throttle bore 8 registering with an opening 9 in the housing bottom wall 4 for supply of air from the common air inlet 10 of housing 3. Each passageway 5, 6 is of general Venturi form below its bore 8 and has a throat 11 with a converging air inlet 12 and a diverging mixing chamber 13 having a mixture outlet 14. Extending transversely through the partition wall 7 and the air inlet throttle bores 8, there is a throttle shaft 15. Mounted on the throttle shaft in each passageway there is a throttle valve 16 of the balanced butterfly type, which valves are movable simultaneously toward open position and to closed position. Secured to the outlet or under side of each valve 16 and on the leading wing 17 thereof there are a plurality of air guide vanes 18 extending transversely to the throttle shaft and having their edges which face the passageway wall curved as at 19, see Fig. 7, to provide clearance on opening movement of the valve. The vanes 18 tend to eliminate swirling or turbulent flow of the air entering the converging air inlets 12. Extending transversely through the wall 7, there is a fuel discharge passageway 20 opening into each of the passageways 5, 6 substantially at but on the mixing chamber side of their throats 11, to provide horizontally directed oppositely discharging fuel outlets or orifices 21, 22 which are alined with each other and discharge substantially parallel to the axis of the throttle shaft 15. The wall of each passageway 5, 6 has a recess 23, Fig. 4, opposing its orifice 21, 22. Extending between each opposed orifice and recess and bridging the passageway there are parallel air baffle plates 24 extending vertically at each side of the orifice so that the discharge from each orifice is longitudinally of

and between the top and bottom edges of its respective plates. Each pair of plates 24 is joined by a horizontal cap portion 25 overlying the air inlet side of the orifice to shield the orifice from the incoming air stream. The ends of the plates 24 terminate in positioning ears 26, 27 which extend respectively into the orifices 21, 22 and the recesses 23 to hold the plates against displacement.

In the air inlet 10 there is a disk type choke valve 28 mounted eccentrically on a shaft 29 journaled in the side walls of the housing 3. The valve 28 has an opening 30 therethrough controlled by a poppet type valve plate 31 which is urged to closed position by a coil spring 32. The valve plate 31 is reciprocal on a rod 33 secured to the valve 28, the rod having a shoulder against which spring 32 abuts. The free end 34 of rod 33 is engageable with the wall of housing 3 to limit the movement of valve 28 beyond full open position. One end 35 of valve shaft 29 projects from the end of a sleeve 36, Fig. 1, extending from the housing 3. Rigidly secured on the external shaft end 35 there is a lever arm 37. Within the sleeve 36 there is a coil tension spring 38 having one end engaging the lever arm 37 and its other end anchored to the sleeve 36 so that the spring 38 is operable to move the choke valve 28 to closed position. Journaled on a stub shaft 39 projecting from the external wall of housing 3 below the shaft 35 there is a choke lever 40, Fig. 2, having a bifurcated upper end providing spaced arms 41, 42 engageable with the lever arm 37. The arm 42 in the position shown, is holding valve 28 in open position. On clockwise movement of lever 40, the arm 41 is engageable with lever arm 37 to move the valve 28 toward closed position against air pressure or to hold it tightly closed. One end of the throttle shaft 15 projects below the stub shaft 39 and carries an accelerating pedal throttle lever 43 having an idle adjustment screw 44. A kicker cam 45 is carried by a lever 46 mounted on a shaft 47 and is engaged by the end of the idle screw 44. The lever 46 is connected to the lever arm 42 by a link 48. The throttle plates 16 each have an orifice 48^a therethrough for bleeding a supplemental quantity of minimum air for engine idling. In the wall 7 at the mixture outlets 14 there is a cross slot 48^b connecting the mixing chambers 13 for synchronizing the pressures therebetween.

The other end 49 of the throttle shaft projects through a gear housing 50 and has journaled on its external end a hand throttle lever 51 engageable with a shaft, Figs. 1, 4 and 6, pin 52 to move the throttle valves 16 toward open position. Fixed on the throttle shaft end 49 within housing 50 there is a gear sector 53 which meshes with a gear sector 54 fixed on a shaft 55 journaled in a bushing (not shown) fixed in casing 1 by screw 56.

Supported by the casing member 2 and positioned at one side of the passageways 5, 6 there is a constant level fuel reservoir having a liquid receiving chamber 57 with an inlet 58 for connection to a suitable source of fuel supply. The reservoir contains the usual inlet valve 58^a (Fig. 10) and float mechanism having a float 59 (Fig. 3) for maintaining a constant liquid level. An air inlet passageway 60 shown in dotted lines in Fig. 2 leads from the interior of air inlet housing 3, as at 61, on the inlet side of the air choke valve 28 to the reservoir chamber at 62 above the liquid level therein designated by the line L—L.

Extending in the plane of the wall 7 and between the passageways 5, 6 and formed in part

by the wall 7 there is a tubular housing member 63, Fig. 3, having the mid-portion of its bore providing a fuel passageway 64, Figs. 3 and 10, which is of substantially equal diameter to, and intersects the mid-point of the horizontal discharge passageway 20. Below the reservoir liquid level the housing bore is of enlarged diameter as at 65, the enlarged bore intersecting the reservoir chamber 57 and extending therebelow to provide a sump 66 which is closed and sealed by a plug 67. Positioned concentrically within the enlarged bore 65 there is a tubular member or housing 68 having an annular flange and compression washer 69 fitting against the upper end of the enlarged bore. The upper end of the member 68 extends into the passageway 64 and carries an annular metering valve orifice member 70 having a fuel orifice 71 substantially at, but slightly below the plane of the reservoir liquid level. The orifice member 70 abuts a downward facing shoulder to positively position the orifice member with respect to the reservoir liquid level. Within the member 68 there is a longitudinal flow or well chamber 72 having its upper end formed by the orifice member 70. Opening concentrically through the lower end wall of chamber 72 there is an inlet passageway 73 of reduced diameter. The lower end of passageway 73 opens into a pocket or recess 74 which forms a valve sleeve, the pocket 74 having its top edge chamfered and being of slightly less internal diameter than the diameter of passageway 73. Through the side wall of passageway 73 there is a rectangular fuel inlet port 75 having its lower edge defining a portion of the top edge of pocket 74. The tubular member 68 is held rigidly in position by a disk closure member 76 having abutting engagement with a shoulder on member 68 and screw-threaded into the wall of bore 65 at its communication with reservoir chamber 57. The closure member 76 thus provides in the upper end portion of bore 65 around member 68 a fuel containing space, which is divided by an annular partition plate 77 into an upper compartment providing a low speed accelerating well chamber 78 and a lower compartment providing a high speed accelerating well chamber 79. Through the wall of member 68 from the bottom end of chamber 79 into the passageway 73 there are a plurality of ports 80. The chamber 78 is in communication with the interior of member 68 by a port 81. In the casing member 2 directly above and separated from the chambers 78, 79 by an inclined wall 82 there is a chamber 83, Figs. 3, 5 and 10, having a vertical partition 84 in the plane of the longitudinal axis of bore 65. The partition 84 extends above the reservoir liquid level and divides the chamber 83 into a low speed accelerating fuel compartment 85 and a high speed accelerating fuel compartment 86. The compartment 85 communicates with the upper compartment 78 through an aperture 87 in wall 82 so that the compartments 78 and 85 provide a low speed accelerating well. The compartment 86 communicates through an aperture 88 in wall 82 with the lower compartment 79 to provide a high speed accelerating well. The bottom wall 4 of the inlet housing 3 has a calibrated air bleed inlet 89 therethrough opening into the top end of the chamber 83 so that the high and low speed accelerating wells are open to atmosphere with controlled maximum air, but subject to a reduced or sub-atmospheric pressure, and a reduced air supply upon movement of choke valve 28 toward closed position.

Extending through the orifice 71 there is a

metering valve or pin 90 having a multiple taper, see Fig. 9, and having a stem 91 extending through passageway 64 and across passageway 20. Fitting tightly and thereby held against movement in an end socket or recess in the end of valve member 90 there is a tube or tubular extension 92 which projects through flow chamber 72 and the inlet passageway 73 and terminates in the pocket 74. Through the walls of the tube 92 closely adjacent the valve member 90 there is a cross passage 93 which intersects the tube bore 94 to provide outlet ports therefrom. The flow area of the combined outlets from the cross passage 93 is slightly greater than the area of the calibrated bore 94. Figs. 3, 9 and 10. The tube 92 has a cylindrical enlargement or plug 95 intermediate its ends and which extends into, and in spaced relation to the walls of, passageway 73 so as to provide a calibrated annular inlet orifice to the chamber 72. The flow area of this annular orifice determines the sub-atmospheric pressure in chamber 72 or on the inlet side of orifice 71 at which air from bleed 89 will sweep out the chamber 78 and chamber 72 above aperture 81, discharging the fuel therefrom through passageway 20 into the mixing chambers 13 of passageways 5 and 6. For a given size orifice around the plug 95 in the outlet of passageway 73, the flow area at the metering valve orifice 71 will regulate the sub-atmospheric pressure in the chamber 72, and accordingly the size of the outlet orifice from passageway 73 around plug 95 will determine the extent of opening of the metering valve at which the low speed accelerating well will discharge. The free end of tube 92 has a head 96 preferably of the same diameter as the diameter of plug 95 and which fits the bore of pocket 74 to form therewith a piston or slide valve controlling admission of fuel from inlet port 75 to the tube bore 94. The head 96 has its bottom edge chamfered for guiding it into pocket 74 and it extends into pocket 74 at a distance equal to or slightly greater than the distance which plug 95 extends into passageway 73, this distance being less than the metering pin travel required to move ports 93 above or to the outlet side of orifice 71. The depth of pocket 74 is such that the valve 90 will be held substantially .005 inch away from longitudinal seating in orifice 71 when head 96 seats against the bottom of pocket 74. The distance from the upper end of port 75 to the upper end or shoulder of head 96 is substantially equal to or slightly less than the distance which plug 95 extends into passageway 73 so that on movement of plug 95 out of passageway 73, the admission of fuel from port 75 to passageway 73 will be controlled by head 96. The reduced external diameter of tube 92 below plug 95 provides, upon movement of plug 95 out of passageway 73, an annular orifice into chamber 72 of sufficient size so that the high speed accelerating well will discharge through ports 80 into chamber 72.

Above the fuel discharge passageway 20, the bore of housing member 53, Fig. 3, is of slightly enlarged diameter to provide a guideway 97. The metering valve stem 91 extends upward into the guideway 97 and has an end head or flange 98 which fits within a sheet metal coupling member 99 which fits loosely in the guideway 97. Engaging the stem end 98 is the flanged end of an adjustment member 100 which extends through and is supported in the apertured end wall of the coupling member 99 so that the coupling member will draw the metering valve out of the guideway upon withdrawal of the adjustment mem-

ber 100. The adjustment member 100 is adjustably screw-threaded through a sleeve member 101 having a longitudinally extending gear rack 102, the member 101 reciprocally fitting the guideway 97. The upper end of adjustment member 100 has a longitudinal cross slot into which extends a blade adjustment member 103 which is journaled in and through a cap member 104 which closes the upper end of the guideway 97. A U-shaped spring strap 105 extends across the head of member 103 and has its ends frictionally engaging the circumference of cap member 104 to hold the threaded member 100 in its adjusted position in sleeve member 101 thereby holding the metering valve in fixed position relative to the rack 102. A leaf spring 106 engages the end of adjustment member 103 to hold it tightly against cap member 104 thereby sealing the aperture therethrough and additionally opposing rotation of the adjustment member 103. A helical coil spring 107 surrounds the valve stem 91 and is held under compression between a shoulder at the inner end of the guideway and the base of a cup-like follower member 108 which reciprocally fits the guideway 97 and has its base or upper end wall engaging the coupling member 99 and acting to move the metering valve out of orifice 71. The rack 102 meshes with a pinion 109 fixed on the end of shaft 55 so that the metering valve 90 is mechanically interconnected with the throttle valves 16. The loose coupling formed by the coupling member 99 between the adjustment member 100 and stem 91 permits the tube 92 to align with passageway 73 and pocket 74.

When the carburetor is constructed to supply fuel mixture to a Ford V-8 engine, for example and solely for illustration of the relation of certain important dimensions to each other, the following table and metering valve construction is set forth:

	Inches diameter
Passageway throats 11	.870
Metering valve stem 91	.171
Metering orifice 71	.156

Metering valve 90 is tapered at $2\frac{1}{4}^\circ$ included angle to provide (Fig. 9) a diameter at "a" of .156" substantially .154" from its minimum diameter, and such that on the longitudinal valve center line:

Taper b of $2\frac{1}{4}^\circ$ included angle, extends .030"
 Taper c of 7° included angle, extends .030"
 Taper d of 16° included angle, extends .047" and
 Taper e of 40° included angle, extends .047"

Metering valve diameter .156" at "a" is, at minimum idling speed position, substantially .015" longitudinally out of or away from diameter .156" of orifice 71.

Pocket 74	.125" diam.—.080" long
Port 75 (top to bottom)	.125" diam.
Passageway 73	.140" diam.
High speed accelerating ports 80	.070" diam.
Low speed accelerating port 81	.076" diam.
Flow chamber 72	.220" diam.
Economizer bore 94	.0635" diam.
Cross passage 93	.055" diam.
Plug 95	.124" diam.
Air bleed 89	.094" diam.
Outlet passageway 20	.250" diam.

The operation of the carburetor of Figs. 1 to 10 is as follows: When it is desired to start the engine, the choke lever 40 will be rotated in a clockwise direction facing Fig. 2 to an extent depending upon engine temperature, that is, in hot

weather or when the engine has been running and it is desired to restart the same there may be no movement required of lever 40. However, in cold weather and with a cold engine the choke lever 40 will be rotated so that arm 42 will permit spring 38 to move the choke valve to or toward closed position. This movement of lever 40 will act through link 48 and lever 46 to rotate the throttle kicker cam 45 to automatically move the throttle valves 16 slightly toward open position. This movement of the throttle valves will act through gear sectors 53, 54 to rotate pinion 109 thereby moving the metering valve 90 to a high idle speed position. As the engine is now "turned-over" sufficiently rapidly for firing, the sub-atmospheric pressure created in passageways 5, 6 will draw fuel through the fuel inlet conduit, that is, from the float chamber through port 75, inlet passageway 73, flow chamber 72 and passages 64 and 20, to discharge from outlets 21, 22 into the passageway mixing chambers 13. If the speed of the engine cranking is sufficient there will also be a sufficient differential of reverse air pressure on the fuel wells from the fuel reservoir so that fuel will be discharged upwardly from the wells through air bleed inlet or orifice 89 into the air inlet 10 anterior to the throttle valves 16. This supplemental starting fuel from the wells will mix with minimum air passing the choke valve 28 and be supplied therewith to the mixing chambers 13. As soon as the engine fires and is running under its own power the increased sub-atmospheric pressure or pressure reduction in passageways 5, 6 will move the choke valve 28 toward open position against the force of spring 38 thereby automatically supplying sufficient air for cold engine idling operation. Opening movement of choke valve 28 will increase the air pressure on air bleed orifice 89 so that fuel will no longer feed therethrough into the air inlet 10. However, the choke valve 28 from an almost closed position to about 15° from full open position will reduce the air flow to and the air pressure on the wells through orifice 89. As a result, the quantity of fuel supplied to passageway 20 will be increased, thereby assuring the supply through the cold manifold to the engine of a proper air-fuel mixture for full range engine operation. The richness of the fuel mixture of course decreasing as the choke valve moves or is moved toward open position as a result of air flow into the fuel conduit through orifice 89. In extremely cold weather starting when choke lever arm 41 engages the arm 37 to lock choke valve 28 in closed position, the idling speed operation of the engine will open poppet valve 31 to supply sufficient air for continued idling speed operation. When the engine has warmed up, the choke lever 40 will be returned to the position shown in Fig. 2 and the arm 42 will be holding the choke valve in full open position as in Fig. 3.

If the throttle valves 16 are moved from idling speed position toward open position to increase the air flow through the passageways 5, 6 to the mixing chambers 13 and consequently the quantity of fuel mixture to the engine, the metering valve 90 will be moved out of the orifice 71, Figs. 3 and 10, proportionately to throttle valve opening to provide a proper economical mixture for level road car speeds. When the throttle valves 16 have been moved to an open position corresponding to say 10 miles per hour level road car speed, Fig. 10A, the metering valve 90 will have moved sufficiently out of its orifice 71 so that the sub-atmospheric pressure in the flow cham-

ber 72 will cause the well chamber 78 and the flow chamber 72 above aperture 81 to empty into the fuel conduit, the supplemental fuel from the well being followed by air from the bleed orifice 89 which is metered at the calibrated aperture 81 so that upon emptying of the low speed accelerating well an emulsion of fuel and air will be fed through the chamber 72 to the metering valve orifice 71. When the throttle valves 16 are opened still further, Fig. 10B, and sufficiently to draw the plug 95 out of inlet passageway 73 which will occur at about 45 miles per hour level road car speed, the well comprising chambers 79 and 86 will discharge its fuel through ports 80 into the fuel conduit and this supplemental fuel will be followed by air from bleed orifice 89 which is metered by calibrated ports 80. Simultaneous with the discharge of well chamber 79, the tube head or valve 96 will have moved out of pocket 74 thereby opening the economizer tube bore 94 directly to inlet port 75 from the fuel reservoir so that supplemental fuel will be continuously discharged from cross passageway 93 directly into the fuel conduit.

The accelerating wells serve to provide the necessary "over rich" mixture for quick acceleration either from idling or from part open throttle position. When the throttle valves 16 are quickly opened but not sufficient to draw the plug 95 out of inlet passageway 73, the sub-atmospheric pressure in flow chamber 72 acting on the low speed accelerating well decreases and well chamber 78 will discharge the necessary quantity of solid liquid fuel into the fuel conduit to assure the discharge of the necessary enriched mixture from outlet 14. Continued operation of the engine at part open throttle will not empty the well chamber 79 of the high speed accelerating well, but if the throttle valves are quickly opened from part throttle sufficiently to withdraw the plug 95 from inlet passageway 73 then there will be a substantially instantaneous discharge of solid liquid fuel into the fuel conduit from the high speed accelerating well chambers 79 and 86 to provide the necessary enriched mixture to the engine for high speed acceleration. As noted above, the economizer passage 94 will be opened when the well chamber 79 discharges and therefore supplemental fuel will continue to be discharged through passage 94 at this throttle valve position and for all further open positions of the throttle valves. Should the throttle valves be quickly opened for rapid acceleration from idling position to an open throttle position corresponding to a level road car speed of 45 miles per hour or more, then there will be a substantially instantaneous discharge of solid liquid fuel from both of the accelerating wells into the fuel conduit and this supplemental discharge which suddenly increases the ratio of fuel to air will be supplemented instantaneously by the continuous discharge through tube bore or passage 94 and its cross passage 93. The chamber 86, however, will not completely empty until the engine has attained a speed corresponding to a car speed of about 8 or 9 miles per hour. It will be noted that upon movement of plug 96 to open the economizer bore 94, the mixing chambers 13 will be supplied from two fuel supply means or jets, each feeding into the fuel discharge cross passage 20, one of these jets being the bore of economizer tube 94 and the other being the annular passageway through tubular member 68 around the tube 92.

In Figs. 11-18 inclusive, there is shown a single

type carburetor which operates substantially in the manner above described for the duplex carburetor, but which has certain structural changes and additional features. This single carburetor has a one-piece body 110 having a main vertical passageway 111 therethrough with a top air inlet 112 and a bottom mixture outlet 113. The upper portion of body 110 forms a cylindrical air inlet housing 114 which contains an eccentric disc type choke valve or plate 115 mounted on a shaft 116 journaled in the housing side walls. Through the valve 115 there is an air opening 117 controlled by a spring-pressed plate type poppet valve 118 such as is shown in Fig. 3. One end of shaft 116 extends through the housing wall and has a lever 119 rigidly fixed thereon. Pivoted on a bracket-carried stud 120 vertically above shaft 116 there is a choke lever 121 which extends below the shaft 116 and has a tension coil spring 122 connecting it to a transverse arm 123 on lever 119. The arm 123 extends freely through a slot or aperture 124 in lever 121 and is held against one end 125 of the slot by the spring 122 so that valve 115 is held in wide open vertical position. A pull and push rod may be connected to the lever post 126 to move the lever 121. As the lever 121 is rotated clockwise or toward the left, facing Fig. 11, the spring 122 will pull the choke valve to closed position. When the choke valve has been closed, the continued movement of lever 121 will move slot end 125 away from arm 123 and increasingly load the valve 115. The other slot end 127 is engageable with arm 123 to positively hold the valve 115 in closed position or to limit its opening movement by air pressure.

Below the housing 114, there is a cylindrical air inlet and throttle bore 128 within which there is an anterior balanced butterfly type throttle valve 129 mounted on a throttle shaft 130 extending transverse to shaft 116 and journaled in the walls of body 110. One end of shaft 130 projects externally and has rigidly fixed thereon a throttle lever 131. The other end of shaft 130 extends into a hollow boss 132, see Fig. 14, and has a pinion gear 133 fixed thereon. The throttle lever 131 has an idle adjustment screw 134 co-operable with a lever carried kicker cam 135 journaled on a stud 136. The cam lever is connected by a thrust and pull link or rod 137 to an arm of choke shaft lever 119. Therefore, as choke lever 121 is moved clockwise, the rod 137 is moved downward so as to rotate cam 135 counterclockwise into engagement with screw 134 to open the throttle for cold engine high speed idling.

In the passageway 111, Figs. 13, 15 and 18, below the throttle valve 129, there is a tube 138 of Venturi form having a throat 139. Opening through the body 110 and tube 138, there is a horizontal fuel discharge 140 substantially at the throat 139 and parallel to throttle shaft 130. Bridging the inlet end of the tube 138 and the throttle bore 128 there is a nozzle and baffle member 141 having a pair of parallel baffle plates 142, 143 extending parallel to and directly below the throttle shaft 130 and embracing the discharge opening 140. The plate 142 is cut to fit the inlet end of passageway 111 and seat on the converging end of tube 138. The plate 142 extends upward substantially to the shaft 130 so as to block air flow diagonally across the passageway 111 below the leading edge of valve 129 and diagonally across the outlet of passageway 140. The member 141 is of generally U-shaped form having its base portion 144 cut to conform with the outlet of

passageway 140 and having a lip 145 extending downward and outward from passageway 140. Extending between plates 142, 143 there is a cap portion 146 which is bent outward and downward to form the roof or top wall of the nozzle.

At one side of the body 110 there is a constant level fuel reservoir 147, Fig. 11, having an air inlet passageway 147^a opening upward through the body 110 into the air inlet 112 above valve 115 so that the float chamber is open to atmosphere above the liquid level. The chamber 147 has a fuel inlet 148 and the usual float operated inlet valve 148^a (Fig. 18). Between the reservoir and the passageway 111, the wall of body 110 has an inclined bore therethrough with a fuel passageway 149, Figs. 14 and 18, which intersects the horizontal fuel passageway 140. Below passageway 149, the bore is enlarged, as at 150, to receive a tubular member or housing 151 which fits the bore 150. Fitting in the upper end of member 151 and in the lower end of passageway 149, there is a metering orifice member 152 having a metering valve orifice or port 153. The tubular member 151 and orifice member 152 are held in position against the downward facing end wall or shoulder of bore 150 by a screw plug 154 which closes the lower end of the bore. The orifice 153 is positioned substantially at, but slightly below the plane of the reservoir fuel level, designated L-L. The orifice member 152 forms the upper end of a fuel flow and well chamber 155 into the lower end of which a concentric fuel inlet passageway 156 opens. At its bottom end, the passageway 156 terminates in a cylindrical pocket or recess 157 having its bore diameter reduced slightly relative to the bore of passageway 156. A fuel duct or passage 158 leads from the reservoir 147 into the bore 150 and opens into passageway 156 slightly above pocket 157 through an aperture 159 (Fig. 11). At the side of the bore 150, the body 110 has a cylindrical fuel chamber 160 which is divided internally by a cylindrical partition or tubular member 161 into an annular surrounding fuel well chamber 162 for low speed acceleration, and into a central fuel well chamber 163 for high speed acceleration. The partition 161 is held in position by a plug 164 which closes and seals the top of chamber 160. The plug 164 has a tubular extension 165 which receives and positions the upper end of partition 161 and has a surrounding flange 166 fitting the bore of chamber 160. The annular air chamber or manifold 167 between flange 166 and the head of plug 164 is in communication with chamber 163 by air inlet ports 168 in extension 165 and is in communication with chamber 162 by air inlet ports 169 in flange 166. Air is supplied to air chamber 167 by a duct or conduit 170 which extends upward through the wall of body 110 and has a calibrated inlet 171 (Fig. 11) opening into the air inlet 112 between choke valve 115 and throttle valve 129. From the bottom end of accelerating chamber 162, a duct 172 leads into bore 150 and opens through a calibrated port or orifice 173 into the well chamber 155. From the bottom end of accelerating chamber 163 a duct or conduit 174 leads into bore 150 and opens into an annular or circumferential groove 175 from which ports or orifices 176 open into inlet passageway 156 closely adjacent chamber 155.

Extending through metering orifice 153 there is a tapered metering valve or pin 181 having a stem 180 which extends upward through fuel passageway 149. The valve 181 has a multiple taper similar to valve 90 of Fig. 9. Secured in

the bottom end of valve 181 and extending concentrically therefrom, there is an economizer tube or tubular member 182 which extends through passageway 156 and into pocket 157. The tube 182 has a calibrated bore 183 forming a high speed fuel duct which opens through a calibrated outlet cross passage 184 substantially at valve 181 and into chamber 155. Intermediate its ends, the tube 182 has a circumferential enlargement 185 providing a plug with a downward facing shoulder which extends into passageway 156 to provide a calibrated annular fuel inlet orifice into chamber 155. The end of tube 182 has a head 186 which fits the bore of pocket 157 to provide a slide valve controlling admission of supplemental fuel to high speed duct 183. These parts are arranged and constructed as above described for the duplex carburetor so that as plug 185 pulls out of passageway 156, the head or valve 186 pulls out of pocket 157 and limits flow to passageway 156 from float chamber duct 158.

The metering stem 180, Figs. 14 and 18, abuts the end of a screw-threaded adjustment member 187 to which it is connected for relative rotation by a coupling member 188. A spring 189 surrounds the stem 180 and acts upward against the coupling member 188 to urge the metering valve 181 upward out of its orifice or toward open position. The adjustment member 187 is adjustably threaded in a rack member 189 which reciprocally fits its bore and has gear teeth 190 meshing with pinion 133. The metering valve 181 is adjustable relative to its orifice to determine the idling fuel flow by a key member 191 which fits slidably in a slot 192 in the end of adjustment member 187. The key member 191 rotatably fits in an annular plug 193 which closes the upper end of the metering pin bore. A spring clip 194 holds the key member 191 against unintended rotation which would change the setting of the metering valve.

The operation of this single carburetor will be clear from the foregoing description and the description of operation of the duplex carburetor of Figs. 1-10. The annular orifice area provided in passageway 156 by plug 185 determines the open position of metering valve 181 and the sub-atmospheric pressure on the inlet side of orifice 153 in chamber 155 at which the low speed accelerating well, comprising annular chamber 162 and the portion of chamber 155 above orifice 173, will dump its fuel into the fuel conduit. The extent of opening or the open position of the metering valve 181 at which plug 185 moves out of its orifice or passageway 156 determines the dumping of the high speed accelerating well formed by central chamber 163 and duct 174. The metering valve is, of course, adjusted so that it does not seat to close orifice 153 in the minimum idling speed position of the throttle valve 129.

What is claimed and is desired to be secured by Letters Patent of the United States is:

1. A carburetor comprising a casing having a passageway therethrough with an air inlet and a mixture outlet, a constant level fuel reservoir, a fuel conduit leading from said reservoir and discharging into said passageway, a metering valve controlling fuel flow through said conduit, an atmospheric fuel well for supplying fuel and air to said conduit on the inlet side of said metering valve and below the reservoir fuel level, a second atmospheric fuel well for successively supplying fuel and air to said conduit below the res-

ervoir fuel level and at a point between the point of discharge of said first-named well and said metering valve, means determining the open position of said metering valve at which said second well will supply air to said conduit, means determining the open position of said metering valve at which said first-named well will supply air to said conduit, and means operable to supply fuel to said conduit adjacent said metering valve upon supply of air to said conduit from said first-named well.

2. A carburetor comprising a casing having a passageway therethrough with an air inlet and a mixture outlet, a constant level fuel reservoir, a fuel conduit leading from said reservoir and discharging into said passageway, a metering valve controlling fuel flow through said conduit, an atmospheric fuel well for supplying fuel and air to said conduit on the inlet side of said metering valve and below the reservoir fuel level, a second atmospheric fuel well for successively supplying fuel and air to said conduit below the reservoir fuel level and at a point between the point of discharge of said first-named well and said metering valve, means determining the open position of said metering valve at which said second well will supply air to said conduit, means operable by said metering valve and determining the open position of said metering valve at which said first-named well will supply air to said conduit, and means controlled by said metering valve and operable to supply fuel to said conduit adjacent said metering valve upon supply of air to said conduit from said first-named well.

3. A carburetor comprising a casing having a passageway therethrough with an air inlet and a mixture outlet, a constant level fuel reservoir, a throttle valve, a main fuel conduit having a valve port and leading from said reservoir to said passageway, a metering valve operable by said throttle valve and controlling flow through said port, low speed accelerating means to supply a quantity of fuel followed by air to said conduit at an open position of said metering valve, high speed accelerating means to supply a quantity of fuel followed by air to said conduit at a further open position of said metering valve, and means movable with said metering valve and operable to supply a metered quantity of supplemental fuel to said conduit for all open positions of said metering valve beyond a predetermined open position, said movable means being initially positioned to discharge fuel into said conduit anterior to said metering port and on movement of said metering valve being positioned to discharge into said conduit posterior to said metering port.

4. A carburetor comprising a casing having a mixing chamber with an air inlet and a mixture outlet, a throttle valve for said mixing chamber, a constant level fuel reservoir, a fuel conduit leading from said reservoir to said mixing chamber and having a flow chamber with an outlet orifice and an inlet passage, a metering valve cooperable with said orifice, a tube having an open end and extending from said valve through said flow chamber and said passage, a pocket opening into said passage and receiving the end of said tube, a head on said tube slidably fitting said pocket, a circumferential plug on said tube and positioned within said passage to restrict flow to said flow chamber, opening movement of said metering valve acting to move said plug out of said passage and simultaneously to move said head out of said pocket and into position to

restrict flow through said passage, said tube having an outlet adjacent said valve and positioned on the outlet side of said orifice upon movement of said head out of said pocket so that said tube will discharge fuel into said conduit beyond said valve, an air bled fuel well discharging into said flow chamber, said plug cooperating with the wall of said inlet passage to determine the open position of said metering valve at which said well will discharge, an air bled fuel well discharging into said inlet passage, said plug on movement out of said inlet passage establishing flow from said second-named well, and means operatively connecting said metering valve to said throttle valve.

5. An anterior throttle carburetor comprising a casing having a mixing chamber with an air inlet and a mixture outlet, an anterior throttle valve for said mixing chamber, a constant level fuel reservoir, a fuel passage having an enlarged bore at its lower end communicating with said reservoir, a tubular member in said bore and having an internal elongated chamber and an external shoulder seating against the end wall of said bore, said tubular member having at its upper end a metering orifice substantially in the plane of the reservoir fuel level, said fuel passage having a transverse passage portion leading from above said orifice and having a fuel outlet opening into said mixing chamber on the outlet side of said throttle valve, a guideway aligned with said tubular member and extending from said fuel passage, a metering valve extending into said guideway, a sleeve member reciprocally fitting said guideway and having an external rack, gear means interconnecting said rack and said throttle valve, said sleeve member being adjustably screw-threaded on said stem to determine the position of said metering valve relative to said throttle valve, said tubular member having a pocket at its lower end and an inlet passage extending from said pocket to said elongated chamber, a tube on said metering valve and extending into said pocket, a head on said tube and fitting said pocket to cut off fuel admission to said tube, a circumferential enlargement on said tube within said inlet passage and restricting flow to said elongated chamber, said tube having an aperture closely adjacent said metering valve for discharge of fuel from said tube, an air bled well discharging into said elongated chamber, an air bled well discharging into said inlet passage, said tube aperture, said head and said enlargement being so related to said metering valve that in the full open position of said metering valve, said enlargement will be out of said inlet passage, said head will be out of said pocket and said tube aperture will be positioned on the outlet side of said orifice, means on said throttle valve to guide air flow to said mixing chamber, and baffle means in said mixing chamber deflecting air flow away from said fuel outlet.

6. An anterior throttle carburetor comprising a casing having a passageway therethrough having an air inlet and a mixture outlet and a converging-diverging portion forming a throat, a butterfly throttle valve in said air inlet and controlling the volume of mixture discharged through said outlet, said casing having a fuel outlet orifice adjacent and on the outlet side of said throat and discharging parallel to the axis of said valve, a vane on said throttle valve and in a plane transverse to the plane of discharge from said orifice, said vane being positioned on the mixture outlet and leading side of said throttle valve, a baffle plate positioned at each side of said orifice and extending across said passageway parallel to the plane of discharge from said orifice, a flange bridging the space between said plates and shielding the air inlet side of said orifice, means on said plates extending into said orifice to locate said plates, and means to supply fuel to said orifice.

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