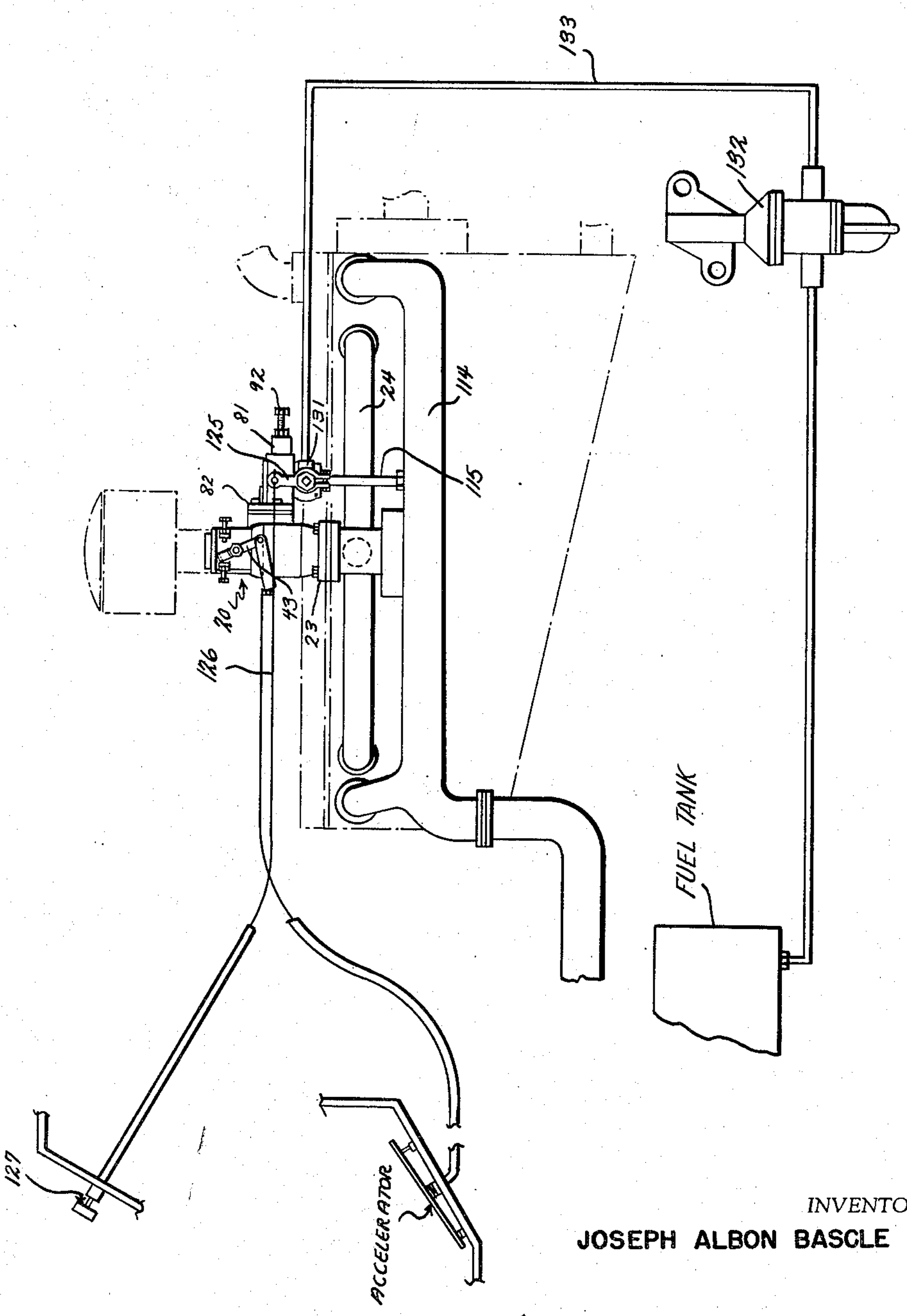
Dec. 29, 1953 J. A. BASCLE 2,664,279

PRESSURE CARBURETOR AND FUEL-AIR RATIO REGULATOR

Filed April 31, 1950 5 Sheets-Sheet 1

FIG.I.



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PRESSURE CARBURETOR AND FUEL-AIR RATIO REGULATOR

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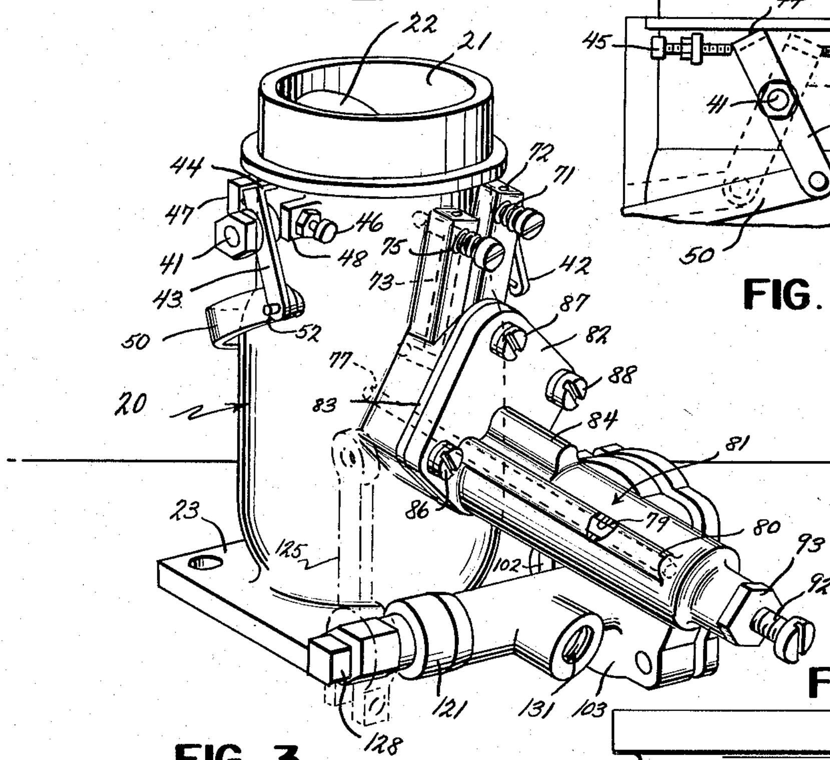
FIG. 2.



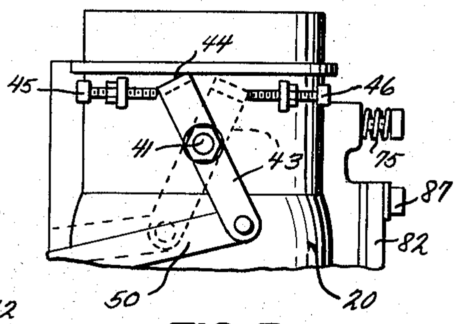


FIG. 5.

FIG. 4.

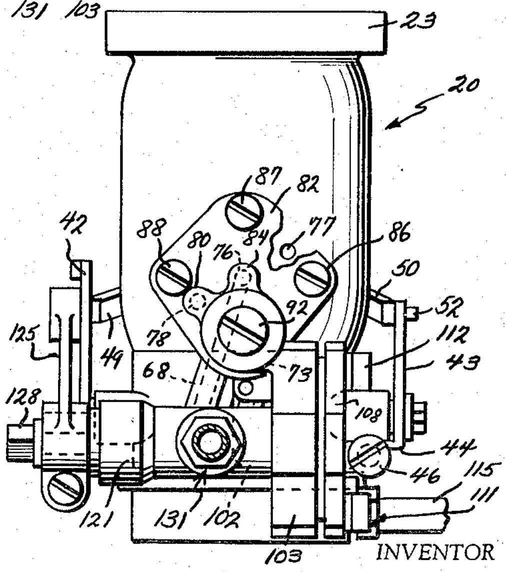
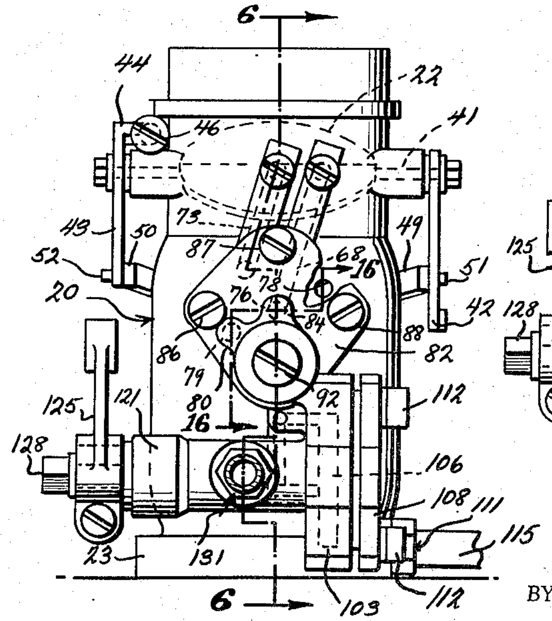


FIG. 3.



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PRESSURE CARBURETOR AND FUEL-AIR RATIO REGULATOR

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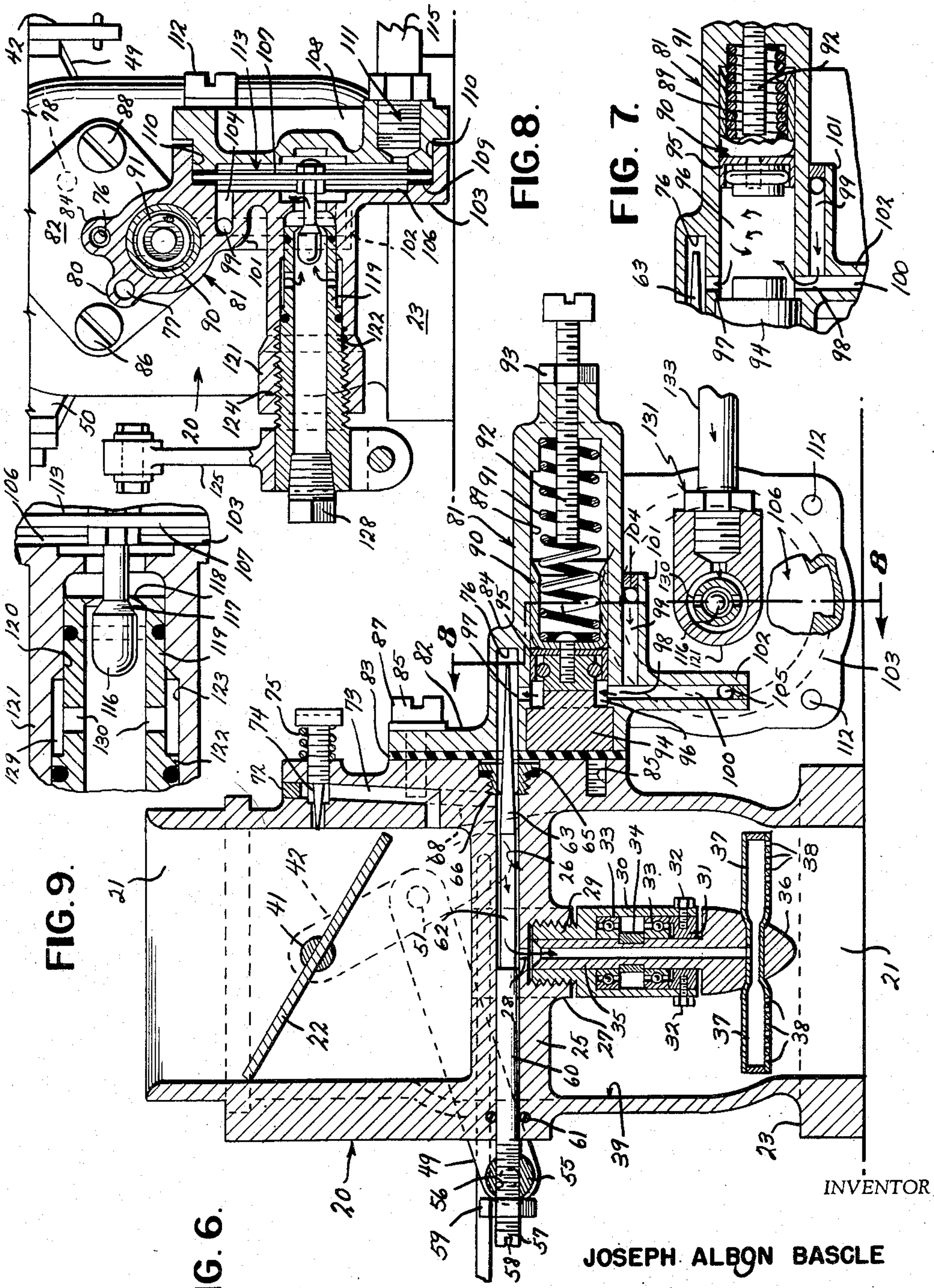

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PRESSURE CARBURETOR AND FUEL-AIR RATIO REGULATOR

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FIG. 10.

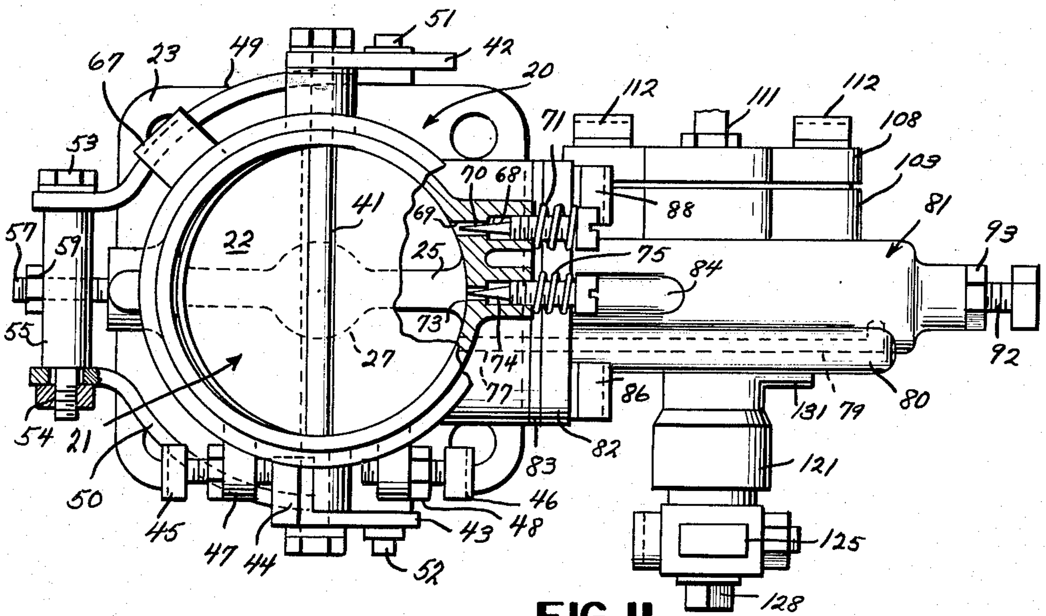

FIG. 11.

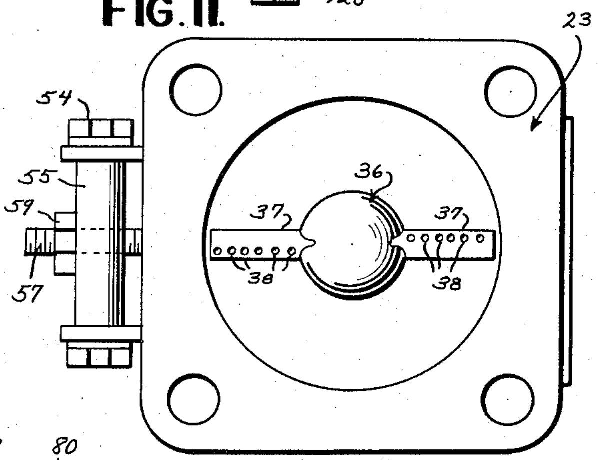

FIG. 16.

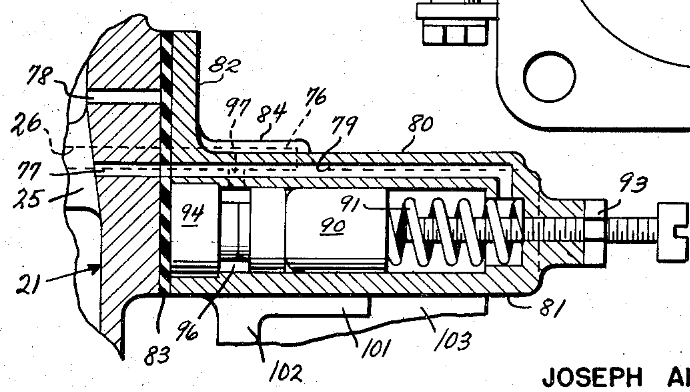

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FIG. 12.

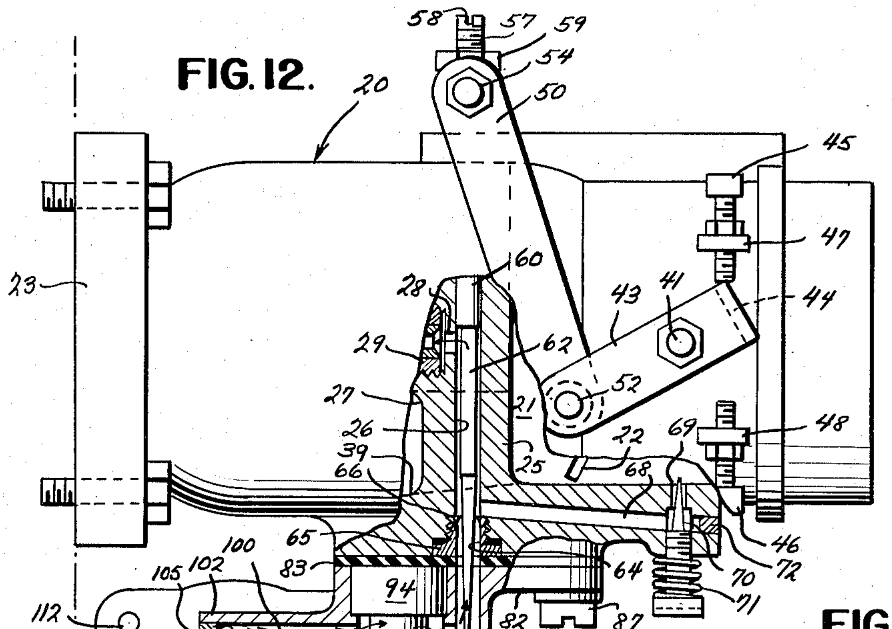
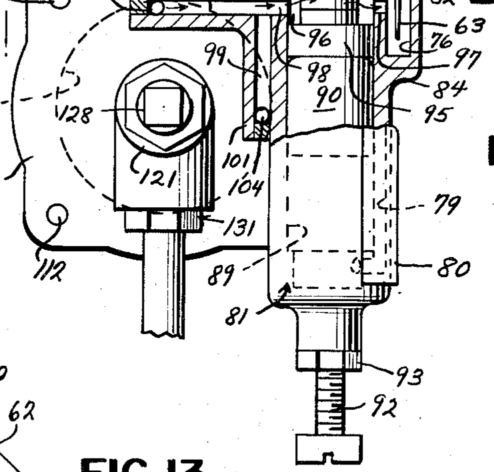



FIG. 15.

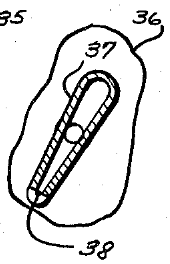


FIG. 14.

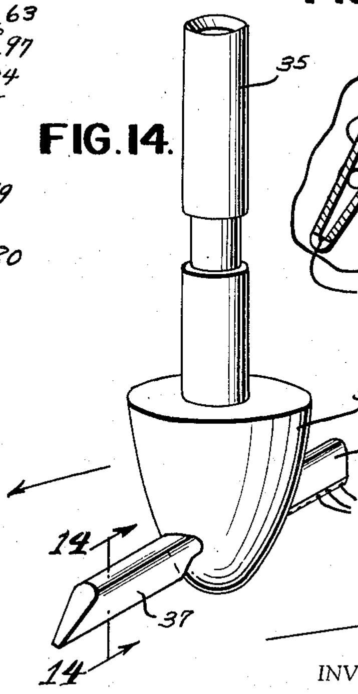
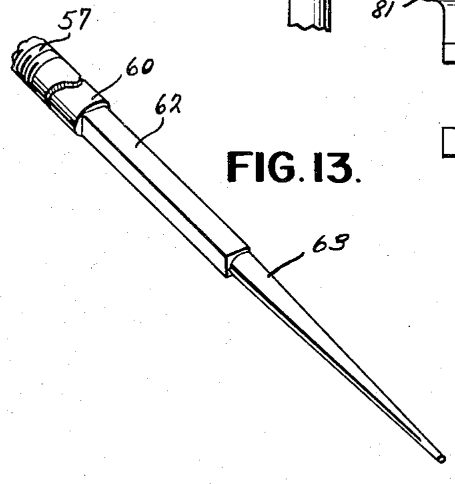


FIG. 13.



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Patented Dec. 29, 1953

2,664,279

UNITED STATES PATENT OFFICE

2,664,279

PRESSURE CARBURETOR AND FUEL-AIR RATIO REGULATOR

Joseph Albon Bascle, New Orleans, La.

Application August 31, 1950, Serial No. 182,502

4 Claims. (Cl. 261—88)

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The present invention relates to a pressure carburetor and fuel-air ratio regulator and has for an object to produce a fuel-pressure type carburetor primarily created and designed to function with a fuel-air ratio regulator of the type described in my prior co-pending application Serial No. 113,142, filed August 30, 1949, now Patent 2,523,550 dated September 26, 1950.

Another object of the present invention is to provide a carburetor in which the customary Venturi throat is eliminated and in which a spinning diffuser is used to homogenize the fuel-air mixture throughout the speed and power ranges of the internal combustion engine which is being served by the improved carburetor.

A further object of the invention is to provide an improved carburetor-regulator combination in which the liquid fuel is channeled and circuited to move upwardly from the supply pump to the metering means in a stabilized and air-free movement.

A still further object of the invention is to provide an improved carburetor in which the fuel-air regulator body, and parts thereof, may be variously assembled to the carburetor shell without destroying the previously described features and functions, thereby allowing the carburetor to be mounted on the engine in updraft, downdraft or horizontal fashion.

A still further object of the invention is to provide an improved carburetor capable of all of the previously described features and functions and also having the common features of an accelerating pump, speed and mixture adjustments, and other conventional fittings of present day carburetors.

A still further object of the invention is to provide certain improvements over the regulator described and claimed in my prior copending application aforesaid in order to make the same more adaptable to the improved carburetor and carburetor shell as herein illustrated and described.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein the symbols refer to like or corresponding parts throughout the several views,

Figure 1 is a diagram illustrating an internal combustion engine of an automobile with the conventional controls and with applied thereto an improved pressure carburetor and fuel-air ratio regulator constructed in accordance with the present invention.

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Figure 2 is a perspective view of the improved pressure carburetor and fuel-air ratio regulator taken from the regulator side of the carburetor with the choke control lever shown in dotted lines.

Figure 3 is a front elevational view of the improved device with the carburetor body arranged in downdraft vertical position.

Figure 4 is a view similar to Figure 3 with the carburetor body inverted to assume the updraft vertical position.

Figure 5 is a fragmentary side elevational view illustrating the adjustable limit stop for the throttle valve.

Figure 6 is a vertical sectional view taken on an enlarged scale on the line 6—6 of Figure 3.

Figure 7 is a fragmentary vertical sectional view taken through the accelerating pump with the pump piston in the outer position and with the coil spring compressed.

Figure 8 is a fragmentary vertical sectional view taken on the line 8—8 of Figure 6 and showing the regulator diaphragm and its valve.

Figure 9 is a fragmentary sectional view taken on the same section as Figure 8 but on an enlarged scale and showing a wide open position of the diaphragm valve and its fuel orifice.

Figure 10 is a top plan view of the improved device with parts broken away and parts shown in section and illustrates particularly the air bleed and idling control needle valve.

Figure 11 is a bottom plan view of the carburetor body showing the spinner and its blades in bottom plan.

Figure 12 is a side elevational view of the improved device with parts broken away and parts shown in section with the carburetor body arranged in a horizontal position and with the regulator attachment carried beneath the carburetor body.

Figure 13 is a fragmentary perspective view of one form of a main metering needle valve employed.

Figure 14 is a perspective view of an improved form of spinner employed.

Figure 15 is a vertical section taken on the line 14—14 of Figure 13 and showing the spinner blade construction, and

Figure 16 is a fragmentary section taken on the line 16—16 in Figure 3.

Referring more particularly to the drawings, 20 designates a carburetor body or shell having a downdraft air passage 21 therethrough which communicates with the atmosphere, usually through an air cleaner, at its upper end and with the intake manifold of an internal combustion engine at its lower end. In this air passage 21 is the conventional pivoted butterfly throttle valve 22.

The carburetor body 20 is supported by a base flange 23 upon the intake manifold 24 (Figure 1) of an internal combustion engine, the same being bolted to the manifold or otherwise secured thereto so that the air passage 21 communicates with the induction system of the engine.

Extending across the air passage 21 is a bridge 25 having a fuel passage 26. At its central or intermediate point the bridge 25 supports an enlarged downwardly extending boss 27 which is hollow and internally threaded and communicates at its upper end through a port 28 with the fuel passage 26. An externally threaded reduced stud 29 is adapted to be screwed into the boss 27; such stud projecting upwardly from a stationary tubular spinner support 30 into the lower end of which is removably fitted a retaining ring 31, being held to the support 30 as by set screws 32 or other appropriate fastenings. The ring 31 supports the ball bearings 33 which provides for the anti-friction rotation of the hollow spinner shaft 35. These ball bearings 33 are arranged between the hollow spinner shaft 35 and the outer tubular wall of the support 30. The ball bearings may be in any suitable number, two series of such bearings being shown with a spacing ring 34 therebetween.

At its lower end the hollow spinner shaft carries a streamline head 36 which is also tubular in prolongation of the fuel passage which extends through the hollow spinner shaft 35. The lower nose of the head 36 is closed below the tubular spinner blades 37 which project out substantially radially from the head 36 and which internally are in communication with the internal tubular passage of such head 36 in order to receive the fuel supply therefrom. The blades 37 are suitably flattened or shaped whereby the downdraft air issuing downwardly through the passage 21 incident to the suction demands of the engine will impinge upon the upper surface of the blades 37, imparting to such blades and to the head 36 and shaft 35 a spinning or rotary motion. In the trailing edges of the hollow spinner blades 37 are made numbers of dispersion apertures 38 out through which the fuel will issue into the air stream moving downwardly through the air passage 21.

The downdraft air passage 21 is expanded laterally as indicated at 39 over a section which may initiate above the bridge 25 and terminate below the spinner blades 37. Such section 39 affords an enlarged chamber of an expanded diameter over the normal diameter of other cross sectional parts of the downdraft air passage 21 for the purpose of securing a substantially constant cross sectional area of the downdraft passage 21 throughout its length; the expanded portion 39 being to compensate for the mass of constructions necessarily introduced into the air passage by the bridge 25 and the spinner unit.

Below the spinner the air passage becomes a mixing chamber.

The spindle 41 of the throttle valve 22 is journaled through the carburetor body 20 with its ends projecting outward thereof, to receive fixedly thereon an operating arm 42 adapted to be connected to the accelerator and a stop arm 43. The latter arm 43 has at its upper end an inwardly projecting stop finger 44 arranged between two stop screws 45 and 46 which are adjustably

mounted in outstanding bosses 47 and 48 on the carburetor body 20.

The arms 42 and 43 are also utilized to connect with the ends of curved links 49 and 50. The links are swiveled connected to the arms by the pivots 51 and 52. The convergent ends of the links 49, 50 are swivelly connected at 53 and 54 to opposite ends of a cross head 55. A threaded opening 56 extends completely through the cross head 55 and is arranged to receive the threaded section 57 of a fuel control or metering needle adjustably received in the bore 26 of the bridge 25. A cross slot 58 in the outer end of the needle is adapted to receive screw driver or other tool for rotating the needle to adjust the same axially inward and outward with respect to a metering jet. A lock nut 59 threaded to outer section 57 of the needle is adapted to bind against the cross head to hold the needle in adjusted position.

The needle is formed with a rounded bearing section 60 on which the same rotates in the cylindrical fuel passage 26, and having an O-ring 61 or some other sealing means fitted about the needle section 60 to prevent the escape of the liquid fuel.

The needle also includes a flat or straight-line section 62 which with the cylindrical wall of the fuel passage 26 forms ducts along which the liquid fuel may pass to the port 28 and to the spinner.

The needle also includes a tapering inner section 63 which fits through the main jet or orifice 64 in a screw threaded plug 65 which is removably fitted in a screw threaded socket 66 in the outer wall portion of the carburetor body 20 in alignment with the bore 26.

The usual vacuum spark control connection is provided at 67. (Figure 10).

An air bleed channel 68 is made in the carburetor body 20 or in an outstanding rib thereof with its receiving mouth 69 opening in the air passage 21 on the atmospheric side of the throttle valve 22 while the discharge end of this channel 68 communicates with the fuel bore 26 down stream of the jet orifice 64. A screw fitted and adjustable tapered needle 70 governs the entrance of atmospheric air to the receiving mouth 69 and is held in adjusted position by the tension spring 71. The bleed channel 68 may be drilled through the rib and the upper outer end of the channel subsequently closed off by a plug 72. (Figure 12).

An auxiliary air channel 73 for idling adjustment is also provided in the carburetor body 20 or in an outstanding rib thereof having a screw fitted and adjustable tapered needle 74 on the atmospheric side of the throttle valve 22 to govern the entrance of atmospheric air to the channel and the delivery of such atmospheric air to the vacuum side of the throttle 22 on which the lower end of the channel 73 opens. A tension spring 75 preserves the adjustment of the needle 74. (Figure 6).

The tapering section 63 of the fuel control needle projects outwardly of the bore 26 and is received into a needle receiving chamber 76 forming part of the fuel passage complementary to the bore 26. Two vacuum ducts 77 and 78 are made through the carburetor body 20, the inner ends of these ducts communicating with the vacuum space of the air passage 21. Either one of these ducts 77 or 78 is adapted to communicate with a vacuum duct 79 formed in a rib 80 of the accelerating pump body 81 which is carried by a mounting plate 82 adapted to be removably affixed to the carburetor body in either one of two relatively inverted positions in which the duct 79 registers with one of the ducts 77 or 78 in the carburetor body, the other vacuum duct 77 or 78 being masked by the mounting plate 82 and its gasket 83. (Figures 3 and 4).

The needle receiving chamber 76 is in a rib 84 of the accelerator pump body and the center line of this chamber 76 is the axis about which the pump body 81 and its mounting plate 82 are rotated through 180 degrees for the purpose of making the attachment available for use on either downdraft or updraft carburetors. To this end the vacuum duct 79 in rib 80 is on the same radius from the rotating axis as the vacuum ducts 77 and 78.

The mounting plate 82 is held to the side wall of the carburetor 20 by three screws or other fastenings 86, 87 and 88 which are adapted to be removably threaded into screw threaded sockets 85 in such wall of the carburetor body 20. It will be noted that whereas there are only three screws there are four sockets 85 all distributed equidistantly about the rotational axis so that in the upright position the screw 87 will occupy the uppermost socket 85 and in the inverted position this screw 87 will occupy the lowermost socket 85.

The outer end of the vacuum duct 79 in the rib 80 communicates with the accelerating pump cylinder 89 outwardly beyond the liquid sealing reciprocating piston 90 which is urged inwardly by a pressure coil spring 91 and is restricted in its outward travel by an adjustable travel-limiting screw 92 (as shown in Fig. 7) adjustably threaded through the outer wall of a cylinder 89. A lock nut 93 threaded on the screw 92 binds against the end of the cylinder to lock the adjustment. A plug 94 is driven into the inner end of the cylinder 89 after the spring and piston have been introduced and this plug has a reduced inner end to engage against the inner end portion of the piston to restrict the inward travel of the piston. The piston may be provided with a spring-loaded cup washer 95 to seal against the escape of the liquid fuel which flows about the annular channel 96 formed about the reduced inner end of the plug 94. This annular channel 96 connects through a port 97 with the needle receiving chamber 76 at its upper end and through a port 98 at its lower end with two right angularly diverging channels 99 and 100 which are drilled or otherwise formed in ribs 101 and 102 on the main diaphragm body 103 of the air-fuel ratio regulator.

It will be noted that the channel 99 extends horizontally and the channel 100 vertically. (As shown in Fig. 6). At their outer ends these channels connect respectively with ports 104 and 105 which open at approximately 90 degrees apart into the fuel pressure chamber 106 of the fuel-air ratio regulator, which chamber is at one side of the diaphragm 107. The diaphragm 107 is held at its edges between the main diaphragm body 103 and a diaphragm holding plate or cover 108. Suitable gaskets may be placed against opposite marginal edges of the diaphragm 107 and such gaskets and the included marginal edge of the diaphragm are clamped against the inner wall of an annular recess 109 of the main diaphrgam body 103 by an annular reduced section 110 of the holding plate 108. In this way the holding plate, although substantially square in elevation, may be rotated with respect to the main diaphragm body 103. In order that the exhaust pressure connection 111 may be maintained at all times at the

lowermost point of the plate 108 irrespective of the erect or inverted position of the attachment to the carburetor. Cap or machine screws 112 are preferably employed to secure the holding plate 108 to the main diaphragm body 103; it will be observed that these screws 112 pass through and engage only marginal portions of the plate 108 and body 103 externally beyond the edges of the diaphragm 107 and its gaskets, so that the screws or other fastenings 112 do not pass through any portion of the diaphragm 107 or its gaskets. An exhaust pressure chamber 113 is provided on the holding plate side of the diaphragm 107 and this exhaust pressure chamber 113 communicates with the exhaust manifold 114 (Fig. 1) by a pipe 115 which fits into the connection 111. Exhaust pressure in the chamber 113 opposes the fuel pressure in the fuel pressure chamber 106 and the diaphragm 107 is influenced to move or flex by the differential of these pressures.

Affixed to move with the diaphragm 107 is a tapered pin or other type metering valve 116 having a tapered section 117 movable through a metering port 118. The metering port is formed in the inner end wall of a small diameter piston 119 fitted to reciprocate in a small cylinder 120 in the inner end of a cylindrical body 121. This small diameter piston 119 forms an inner extension of a large diameter piston 122 fitted to reciprocate in a large cylinder 123. Appropriate sealing rings may be provided for both pistons and the pistons are connected for conjoint axial movement in and out with respect to the cylindrical body 121. This movement is accomplished by the rotation of the pistons 119 and 122. The piston 122 at its outer portion is provided with screw threads 124 which engage similarly internal threads upon the cylinder body 121. The large piston 122 projects outwardly from the cylinder body 121 and upon this outwardly projecting end is affixed an operating arm 125 connected to a Bowden wire 126 or other connection which extends to a choke control knob 127. The knob 127 will be normally in a forward position against the instrument board. In starting, this knob 127 will be pulled out away from the instrument board thus rotating the operating arm 125 and the pistons 119 and 122 in a direction which will move the metering port or orifice 118 inwardly to enlarge the port area by shifting to a smaller conic section of the tapering section 117 of the metering valve 116. A screw or other plug 128 may be employed to close the outer end of the hollow pistons 119, 122. The metering valve 116 is assembled to the piston 119 by entering its larger end through the metering port or orifice 118 and to facilitate the assembly the larger outer free end of the metering valve 116 which extends off the base of the cone 117 is rounded or tapered at its free end. (Figures 8 and 9).

The small cylinder 119 extends partially into the larger cylinder 123 so as to form an annular chamber 129 which communicates with the interior space of the hollow pistons 119, 122 through one or more radial ports 130. Gasoline or other fuel is introduced into the annular chamber 129 through a fuel inlet connection 131 entering through the side wall of the cylindrical body 121. This connection 131 connects with the A. C. pump or other fuel pump 132 by a pipe 133 (Fig. 1).

In operation, the liquid fuel from the fuel tank (Fig. 1) will be pumped by the pump 132 to the fuel inlet connection 131, to and through the annular chamber 129, ports 130 and to the interior of the pistons 119, 122. From the internal space of these pistons 119, 122 the fuel under the combined control of the pistons and conic section 117 of the metering valve 116 will be allowed to pass into the fuel chamber 106 at one side of the diaphragm 107. Such fuel under pump pressure will pass along the face of the diaphragm 107 to the ports 104 and 105. These ports pass the liquid fuel to the channels 99 and 100 and to the port 98 through which the fuel flows to the annular chamber 96. From the chamber 96 the fuel is forced through the port 97 into the passage 76 and from the main carburetor orifice 64 the fuel in controlled volume is passed to the bore 26 and along the flat sides 62 of the metering needle 60 by which the fuel under pressure is forced through the port 28 and to the tubular shaft 35 of the spinner. The fuel passes down into and through the tubular head 36 and into the tubular blades 37 by which the fuel is discharged through the apertures 38 to the descending air stream. The spinner moves through all cross sectional portions of the air passage 21 and due to the numerous apertures 38 extending over a major portion of the diameter of the air passage 21 and due to the fact that these perforations are constantly rotating in a number of concentric circles within the air passage 21 the discharge of the fuel to the air stream is made at great numbers of different points. The apertures are of a pre-selected diameter. Preferably the diameter varies. The perforations of smallest diameter are at the outer ends of the blades 37 and the diameters are graduated inwardly toward the center at which latter point the perforations of larger diameter will occur. This arrangement will ensure adequate delivery of the fuel to all of the orifices irrespective of their positions from the center of the spinner. The distribution of fuel through these numerous orifices 38 at variously placed positions in the air stream will ensure to all parts of such air stream an adequate and substantially uniform supply of the fuel to the end that the ratio of the fuel to the air will be uniform and the resulting mixture substantially homogeneous throughout for better combustion.

The air passage 21 is of substantially uniform cross section throughout the carburetor which differs radically from conventional carburetors employing a Venturi throat. The Venturi throat is employed in order to pull the fuel into the air stream and also to accelerate the movement of the air past the fuel nozzles and jets. However, the venturi sacrifices the volumetric capacity of the carburetor to meet the complete suction demands of the engine at all times. In accordance with the present invention the substantial uniformity of cross section of the air passage 21 throughout clears the passage of any throttling or air checking obstructions except for the minor masses of the bridge 25 and the spinner unit, but these obstructions are offset by the widening of the air passage at 39. Then to compensate for the absence of the venturi the fuel is introduced not at one point as in the Venturi system but at a plurality of points crosswise of the entire air stream. Of course this discharge is aided by the fact that the fuel delivery is under pressure. The fuel moves at a large number of points concentrically into the air stream having the advantage over the Venturi system in producing volumetric efficiency of the carburetor. In the Venturi system the fuel discharge into the air stream takes

the form of a conical pattern. This pattern is affected by the velocity of the air stream inasmuch as the lines of fuel flow are forced inwardly reducing the area of the fuel cone when the velocity of the air exceeds the combined velocity and weight of the fuel movement. Then the fuel cone collapses and does not extend outwardly into the outer portions of the air stream which portions are therefore starved proportionately to the collapse of the fuel cone. In the case of the Venturi system therefore the volumetric efficiency of the carburetor is depreciated and in addition the combustible mixture particularly at the full throttle speed and power positions of the carburetor is deficient. Such combustible mixture is not wholly homogeneous and particularly is this so at the outer portions of the air stream which are not penetrated by the fuel liquid. This loss of efficiency in conventional carburetors is corrected in the present device in that the volumetric efficiency through the carburetor shell of the present invention is calculated to be raised to the point of straight tube air flow and the fuel diffusing method employed therein distributes the fuel throughout the entire air flow area; specifically the velocity of the air in this instance does not tend to deflect or destroy the possibility of a completely homogeneous mixture.

The conventional carburetor owing to the fuel discharge arrangement requires the introduction of the fuel at a remote point from the manifold whereas in the present device the spinning diffuser is located very close to the base flange 23 and at an extremely low point in the air passage 21 so that the fuel and air combustible mixture promptly on its formation enters the manifold. At this lower point where the spinner diffuser is located the air flow is relatively straight and therefore the fuel flow is not subject to distortion or deflection.

In accordance with the present system the liquid fuel is pumped under pressure in a path which is generally upwards from the pump 132 except for certain portions of the channel as for instance the channel 99 may be horizontal, but no channel for the fuel extends downwardly and the great majority of the length of the passage is upwardly. Due to the upward flow of the liquid fuel the dispersal of the accumulating air is automatic and constant in process. Therefore the system cannot become air bound nor the fuel flow instable or intermittent. There is therefore secured a positive air flow and a positive fuel flow at all times.

Moreover the cross section of the liquid fuel channel is substantially uniform in cross section throughout. This arrangement has the effect of causing the fuel supply to the main carburetor jet 64 to be constant in pressure and volume.

To further aid in the final breaking up of the fuel particles the air passage 68 constantly introduces a portion of atmospheric air into the outwardly moving fuel stream on the downstream side of the jet orifice 64. (See Figure 12).

With the engine cold, in starting, the choke knob 127 is first pulled out which shifts the pistons 119, 122 inwardly and opens the metering fuel port 118 for the purpose of introducing a rich mixture to the engine on starting. At the same time the accelerator is operated to open the throttle valve 22. The needle 60 is entrained through the links 49, 50 to move outwardly in the bore 26 proportionately to the opening of the throttle 22 so that main carburetor jet orifice 64 is opened proportionately wider as the throttle

22 is progressively opened. This entrainment produces a pre-selected fuel-air ratio mixture which in turn yields a combustible mixture proper for normal operation. This ratio may be changed or adjusted by backing off the lock nut 59 toward the needle 60 by means of a screw driver or other tool applied to the cross slot 58, after which the nut 59 is again tightened against the cross head 55 so that the proportion or ratio of the fuel to air is to be maintained throughout the speed range of the engine.

When the engine warms, the control knob 127 is pushed in to restore the position of the fuel orifice 118 to the normal operating position.

For sustained power requirements of the engine, such as when accelerating or in hill climbing, the proportion of fuel to air is automatically increased under the action of the regulator. Since under these conditions there is a sudden rise in exhaust pressure in the exhaust manifold to which the exhaust chamber 113 of the regulator is connected, such increment in pressure in the exhaust pressure chamber 113 of the regulator will flex the diaphragm 107 in the direction of the pistons 119, 122. In this movement the diaphragm 107 will carry the metering valve 116 in an axial movement inwardly of the small cylinder 119 thus shifting the conic section 117 of the valve respectively to the fuel orifice 118, bringing a smaller cross sectional area of the tapered section 117 within the orifice 118. Thus the fuel pump will be able to pass a greater volume of the liquid fuel into the liquid fuel chamber 106 of the regulator and on into the carburetor by the channels heretofore described. This increase in liquid fuel volume will be accompanied by an increase in pressure which will automatically enrich the fuel mixture for power requirements. Thus by the use of the exhaust pressure in the fuel-air ratio regulator and the entrainment of the fuel metering needle 60 with the butterfly valve 22 a cooperative control of the fuel air mixture is achieved throughout the speed and power requirements of the engine.

For sudden and intermittent enrichment of the fuel air mixture such as during accelerating action, a supplementary enrichment of the mixture is provided by the use of a vacuum actuated accelerating pump 81 wherein the pump plunger 90 is supplied with fuel on the discharge side and is subjected to vacuum influence on the opposite side. It is to be remembered that during normal load operation of the engine a high vacuum condition exists in the inlet manifold and under this influence the accelerating pump plunger 90 will be drawn outwardly by this condition whereas under conditions of sudden acceleration it follows that a sudden drop or collapse of the vacuum will occur and in this manner the spring 91 forces the piston 90 against the body of fuel outwardly and forces an enriched supply of fuel mixture for accelerating purposes. It is pointed out that the A. C. type of diaphragm pump consists of a check valve which prohibits the reverse flow of fuel back into the fuel pump and therefore the discharging portion of fuel from the accelerating pump must necessarily come into the carburetor air stream.

The carburetor body 20 is rotatable about the transverse axis which passes through the center of the bore 26 to bring the carburetor body to an upright or a relatively inverted position. In one of these positions the throttle valve 22 will be above the spinner in which case the device functions as a downdraft carburetor. In

the other case the throttle valve 22 will be below the spinner and the device then operates as an updraft carburetor. In either of these two positions the regulator and the accelerating pump assembly remains in the same position, the bolts 86, 87 and 88 being removed and replaced after the carburetor body 20 has been changed to the desired position. Therefore the port 104 at the upper portion of the round fuel chamber 106 in the regulator (Fig. 6) which port is uppermost, will naturally receive the bubbles of any air entrained in the liquid fuel which bubbles will rise naturally through the liquid fuel in a vertical direction and pass out the uppermost port 104 and thence be evacuated through the channel 99.

However, when the carburetor body 20 is turned on its side to function as a horizontal system (see Fig. 12) the fuel-air ratio regulator attachment will lie below the carburetor, in which case the port 105 will be uppermost and will naturally receive the portion of air ascending through the liquid fuel in the fuel chamber 106. The air will pass out the channel 100.

When the carburetor body 20 is relatively reversed the vacuum ducts 77, 78 will change places. In the downdraft arrangement the duct 77 will register with the duct 79 of the attachment. In the updraft arrangement the duct 78 will register with the vacuum duct 79 of the attachment. (See Figures 3 and 4).

Referring more particularly to Figures 14 and 15, in one method of producing the spinner blade construction, a round cross-section hollow tube of substantially the same external diameter of the internal diameter of the cross opening through the spinner head 36 is entered snugly through this opening until the central portion of the tube arrives in the opening with substantially equal end portions of the tube projecting beyond the opening at opposite sides of the spinner head. Thereupon by use of a special forming tool, the outer projecting end portions of the tube are flattened and slightly rotated in relatively opposite directions to produce the cross sectional form of Figure 15. In this figure the leading edge of the blade so produced is the upper enlarged round edge with the sides of the blade 37 tapering downwardly and rearwardly with respect to the direction of rotation to the lower trailing edge at which are produced the apertures 38. The blade 37 at one side of the spinner head 36 is shaped reversely to its companion on the other diametric side of the spinner.

Although I have disclosed herein the best form of the invention known to me at this time, I reserve the right to all such modifications and changes as may come within the scope of the following claims.

What I claim is:

1. A carburetor comprising a body having a substantially vertically straight down-draft air passage open to atmosphere above and to the engine below, a bridge across the air passage having a fuel passage therein in communication with a source of fuel supply, a throttle above the bridge, and a spinner assembly below the bridge comprising a spinner support depending from said bridge, a hollow spinner shaft in open communication at its upper end with the fuel passage in said bridge and journalled to rotate in said support and having a stream-lined downwardly projecting head on its lower end extending below the support, and hollow flat blades extending radially from said head in interior communication with the internal space of the hollow

shaft and receiving fuel therefrom, said radial flat blades inclined on their radial axes to intercept the current of air descending in said air passage, said hollow blades having dispersion apertures in the upper faces of the blades against which the down-draft air impinges, said apertures being close to the trailing edges of the blades.

2. A carburetor comprising a body having a downdraft air passage therethrough in communication with the atmosphere at its upper end and with the engine suction at its lower end, said passage having three sections and being substantially straight in a vertical direction throughout its length with an upper throttle section, an intermediate section of larger diameter than that of the other sections and a lower mixing section joined to the intermediate section by a downwardly narrowing portion, a bridge across the air passage substantially between the throttle and intermediate sections and having a fuel passage in communication with a source of fuel supply, a throttle valve in the throttle section, and a spinner assembly in the intermediate section comprising a support depending from the bridge, a hollow rotary spinner shaft journalled in said support in communication at its upper end with the fuel passage in said bridge and having below the support a hollow head externally streamlined from a wide base downwardly to a reduced rounded nose with the streamlined head included within the downwardly narrowing portion of the air passage, and hollow flat spinner blades in communication with the internal spaces of the head and shaft and carried by said head within the confines of the downwardly narrowing portion, the flat blades being inclined about radii of the head with their upper air-receiving surfaces having fuel dispersion apertures near the trailing edges of the blades.

3. A carburetor comprising a body having a down-draft air passage therethrough in a substantially straight line open to atmosphere above and to engine below, a bridge across the passage having a fuel passage in communication with a source of fuel supply, a throttle in the air passage on the upstream side of the bridge, and a spinner assembly on the downstream side of the bridge comprising a spinner hollow shaft and connected head, a support for rotatably journalling the shaft in dependent relation to the bridge with the upper end of the internal space of the shaft open to the fuel passage in the bridge, and spinner blades radiating from the head, said blades being flat and hollow and inclined to radial axes which pass substantally through the central axes of the blades so that upper sides of the blades are inclined to and presented to the downwardly moving air stream, said upper blade sides having fuel dispersion apertures therein upstream of the downwardly moving air stream in the air passage.

4. A carburetor comprising a body having an air passage substantially straight in an approximately vertical direction from end to end open at its upper end to atmosphere and at its lower end to an engine induction system, a bridge across an intermediate part of the air passage having a fuel passage therein in communication with a source of liquid fuel supply, a throttle in the air passage upstream of the bridge, and a spinner assembly downstream of the bridge comprising a hollow shouldered support depending from the bridge, a hollow spinner shaft received within the support and in communication with the fuel passage in the bridge, spaced bearings between the shaft and support with the upper bearings fitted against the shoulder, a spacer between the bearings supporting the shaft from the lower bearings, a retainer member in the lower end portion of the support below the lower bearing, and hollow spinner blades carried by the shaft in communication with the interior fuel space of the shaft and having fuel dispersion apertures therein.

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