March 5, 1957 O. BENVENUTI 2,783,983

CARBURETOR

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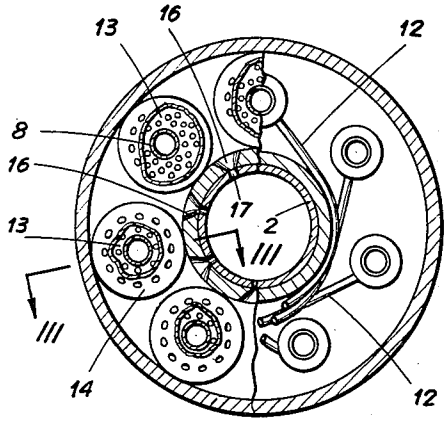
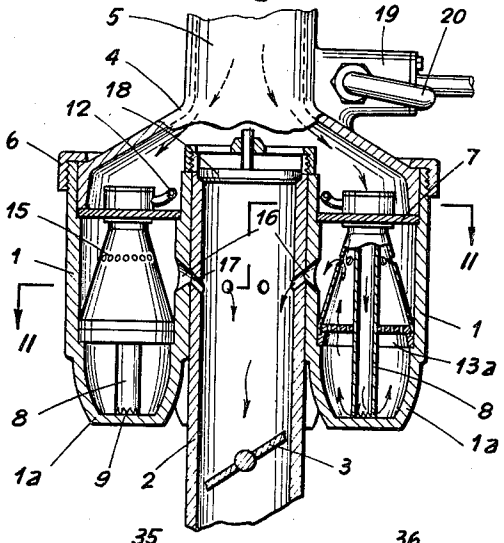


Fig. 2

Fig. 1



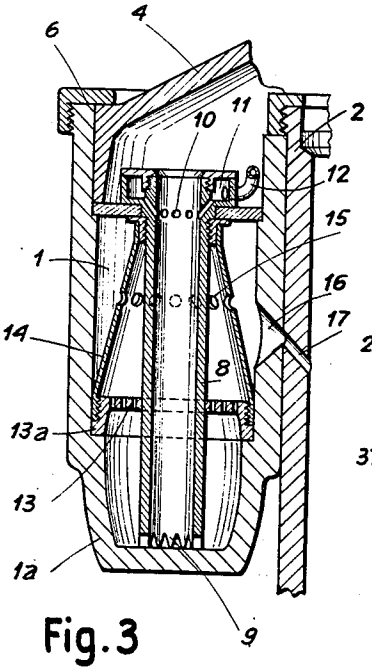


Fig. 3

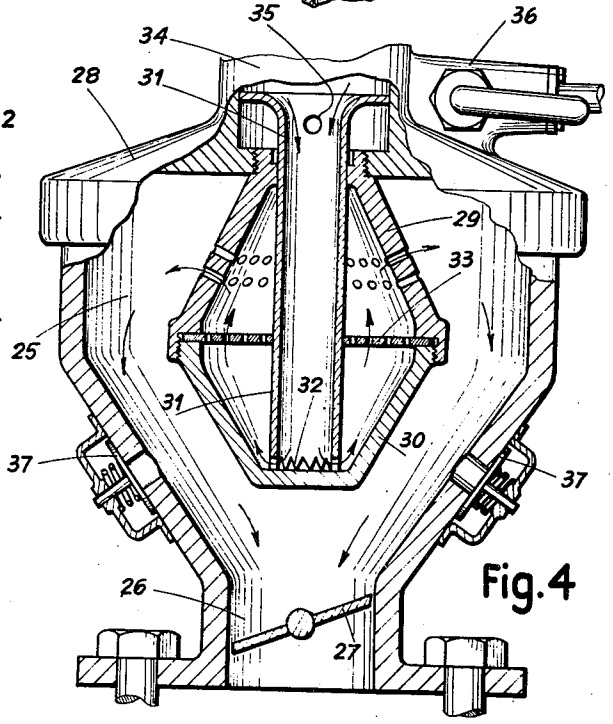


Fig. 4

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Fig. 5

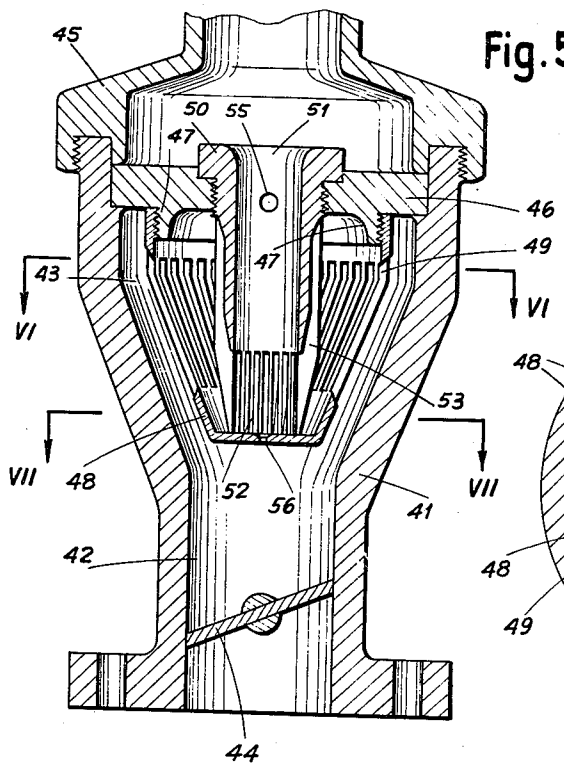


Fig. 6

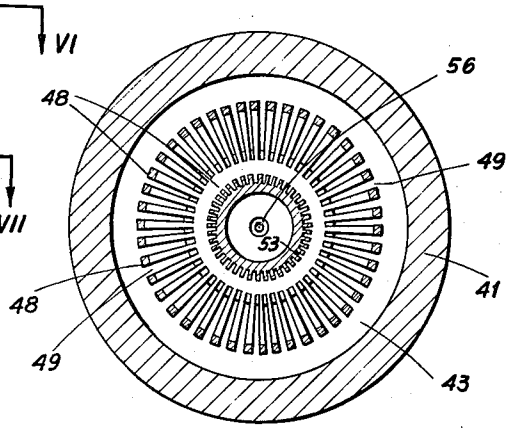


Fig. 8

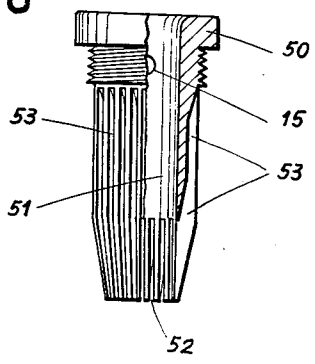
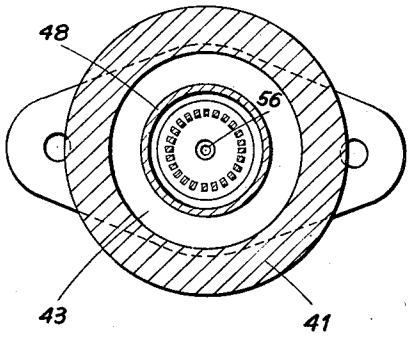


Fig. 7



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Fig. 10

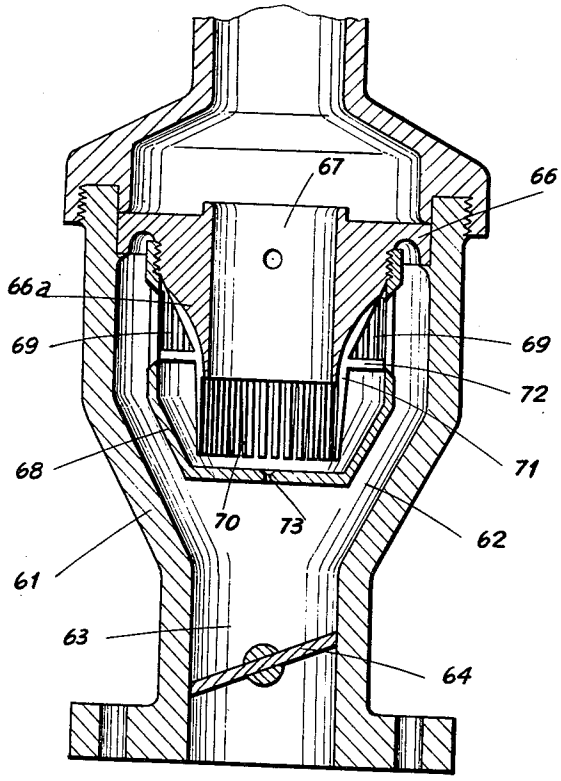
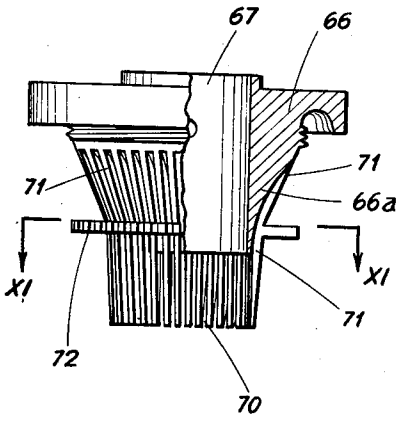


Fig. 9



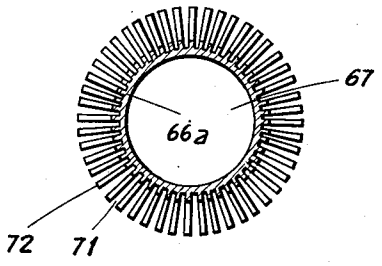


Fig. 11

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CARBURETOR

Ottavio Benvenuti, Florence, Italy

Application January 27, 1953, Serial No. 333,501

Claims priority, application Italy February 12, 1952

5 Claims. (Cl. 261—51)

The present invention relates to carburetors for producing a mixture of combustion air and the vapor of a volatile liquid fuel, the mixture ordinarily being used for supplying internal combustion engines.

A carburetor according to the invention includes at least one unit comprising at least one air induction pipe, having at least one opening for the supply of the liquid fuel to be vaporized, this pipe projecting inside a small chamber or cup so that its bottom end bears against the bottom of the cup and being provided with a plurality of passages affording communication between the pipe and the cup or chamber adjacent said bottom end, and baffle devices having a plurality of passages through which the air and fuel mixture must pass in order to reach the carburetor outlet.

The plurality of passages provides a path for the air and fuel mixture through the device, which includes portions in which there is a predominantly or nearly absolutely laminar motion of the liquid, the current or stream of which is subdivided into a plurality of liquid threads which pass through said passages (apertures or slots) and other portions in which there is a substantially turbulent flow of the mixture.

The device is provided with means, which may be of a well known type, for delivering the fluid in quantities which are proportional or otherwise correlated to the amount required in the mixture produced.

In the accompanying drawings which illustrate how the invention may be carried into effect:

Figure 1 is a longitudinal cross-section of a multiple unit carburetor embodying the invention;

Figure 2 is a section taken on line II—II, Fig. 1;

Figure 3 is a partial section on a larger scale taken on line III—III, Fig. 2;

Figure 4 is a vertical section of a carburetor comprising a single unit;

Figure 5 is a longitudinal section of a second embodiment showing a modified form of carburetor according to the invention;

Figure 6 is a section taken on line VI—VI, and

Figure 7 is a section taken on line VII—VII of Fig. 5;

Figure 8 is a longitudinal section of an internal member of the carburetor shown in Fig. 5;

Figure 9 is a longitudinal section of a third embodiment of the device;

Figure 10 is a view partly in section of an internal member of the carburetor of Fig. 9, and

Figure 11 is a partial section taken on line XI—XI of Fig. 10.

The carburetor shown in Figs. 1 to 3 includes an annular chamber 1 surrounding a delivery conduit 2 which leads to the intake manifold (not shown) an engine through a throttle controlled butterfly valve 3. The chamber 1 is closed at its top by a cap 4 formed by an air induction conduit 5 the cap being held against the wall of the chamber 1 by means of a ring 6; the cap 4 also engages an annular plate 7 disposed in the upper part of the chamber 1. The bottom of the chamber 1

is provided with a plurality of cups or small tanks 1*a* and the plate 7 carries a vaporizing unit aligned with the said cups. Each unit or group includes an induction pipe 8 extending vertically from the plate 7 to the bottom of the corresponding cup 1*a*; the lower edge or rim of each conduit 8 is serrated thus providing passages between the pipe 8 and the cup 1*a*. Each pipe 8 communicates at top with a chamber formed between the plate 7 and the cap 4 and has a series of apertures 10 adjacent its upper end, through which holes is fed the liquid fuel coming from a manifold 11 which is supplied by pipe 12 from the liquid fuel supply source. Below the plate 7 each pipe 8 is surrounded by a perforated disc 13 having a rim 13*a* which rests on the bottom of the chamber 1 around the edge of the cup 1*a*. The disc 13 operates as a baffle and is surmounted by a casing 14 having the shape of a truncated cone coaxial with the pipe 8 and open at its lower end; this casing 14 operates as a baffle and is provided with at least one ring of apertures 15 located in an intermediate position. The cup 1 has some flared apertures 16 in its inner cylindrical surface, these apertures being respectively aligned with inclined apertures 17 formed in the pipe 2.

The pipe 2, which is coaxial with the pipe 5, preferably has a valve 18, opening upwardly and thus providing for the passage of gas from the conduit 2 to the conduit 5.

The liquid delivery device, of any known type, which feeds the small pipes 12 is housed in the body 19 (see Fig. 1) and is controlled, for example, by a lever 20 combined with the control lever of the throttle 3.

Air passes through the pipes 5 and 8, the passages 9, the apertures in the baffles 13 and 14, the openings 16—17 into the engine intake pipe 2. The high speeds taken up by the air in the conduits 8 operate to ensure that the correct amount of liquid fuel is drawn in through the apertures 10. The air liquid fluid mixture travels along paths where there is a predominant laminar motion and parts where the turbulent flow is predominant; in practice, besides undergoing sudden deviations, the fluid passes through the passages formed by the serrated edges 9, the apertures in the discs 13 and the apertures 15, where the motion is laminar, at relatively high velocity while during its passage through the chambers defined by the cups 1*a* and by the baffles 13, and by the baffles 13 and 14, a turbulent flow is obtained. The fluid fuel jet may be adjusted by changing the feed through the small tubes or pipes 12 from the supply device 19—20 or also by means of a float device, preferably in dependence on the openings of the throttle 3, or again by varying the number of units in the chamber 1 which are brought into operation.

The valve 18 prevents any backfiring or over pressures in the conduit 2 from being discharged through the apertures 17—16—15 and the pipes 8, since when the said valve is raised it permits direct discharge into the pipe 5.

In the embodiment shown in Fig. 4, there is a chamber 25 which communicates at bottom with an intake pipe 26 fitted with a throttle 27, the chamber 25 being closed at top by a cover or lid 28. A perforated baffle 29 in the form of a truncated cone depends in the chamber 25 is rigidly connected to the cover 28 and is connected at its lower end to a cup 30. An induction pipe 31 extends along the inside of the baffle 29 and has a bottom serrated edge 32 which is supported on the bottom of the cup 30; a perforated baffle 33 separates the interior of baffle 29 from the interior of the cup 30. The pipe 31 communicates with the pipe 34, through which the air to be mixed is supplied. An aperture 35 in the profiled top edge of the pipe 31 supplies the correct amount of fuel in through a delivery device or unit 36. Outwardly opening valves 37 are provided in the wall of the chamber 25 so as to dis-

charge to atmosphere any possible over pressures emanating from the conduit **26**.

The operation of the device shown in Fig. 4 is similar to that of the device shown in Figs. 1 to 3 but in Fig. 4 there is a single group comprising the vertical pipe **31**, the cup **30** provided with the perforated flat baffle **33** and the baffle **29** in the form of a truncated cone, from the apertures in which the mixture arrives in the chamber **25** whence it passes into the conduit **26**.

In the embodiment of the invention shown in Figs. 5 to 8, **41** is the body of the gasifier formed with an outlet pipe **42**, extending from a chamber **43**, having substantially the shape of a truncated cone; a regulating valve **44** of the throttle type is arranged in the pipe **42** for the purpose of regulating the passage of the fluid, as known in carburetter devices for endothermic engines. A cap **45** forming the gas intake pipe is screw-threaded to the top of the body **41**.

A disc element **46** is clamped between the body **41** and the cap **45** when the latter has been fitted, said disc element **46** being provided on its lower surface with a screw-threaded lug **47** to which is fitted a cup **48** shaped as a truncated cone which cup extends inside the conical chamber **43** so as to provide an annular gap between the wall of the chamber **43** and the outer wall of the cup **48** which gap is in communication with the conduit **42**. The cup **48** has a plurality of passages formed by elongated slots **49** through which the fluid is to be passed; the slots **49** extend parallel to the generating lines of the surface of the truncated cone. The disc **46** has a tapped aperture in its centre engaged by an element **50** (also see Fig. 4), forming an induction pipe **51** which starting from the chamber on the top side of the disc **46** is extended longitudinally down to the bottom of the cup **48**; this element **50** is provided with slots **52** extending upwardly for some distance from its bottom edge resting on the bottom of the cup **48** and communicating with tracks **53** extending longitudinally in the wall of the element **50** and starting from the outer surface thereof nearly up to the screw thread thereon.

The member **55** designed to deliver the fluid to be gasified, projects or leads into conduit **51**.

The gas, taken in or forced through the pipe formed on the cap **45**, is forced through the pipe **51**, which has a suitably restricted area, where the gas assumes high velocities and is mixet with the liquid to be gasified, coming through the orifice **55**; the gas, conveying the particles of the liquid, passes through the slots **52** so as to reach the chamber enclosed by the member **50** and by the cup **48**; from the latter, the gas containing the liquid particles already at least partially gasified, passes through the slots **49** into the chamber **43**, and thence into the conduit **42**.

The bottom of the cup **48** has centrally a calibrated aperture **56**, from which any small quantities of the liquid which may remain on the bottom, can pass in addition to a limited gaseous stream, which thus directly reaches the conduit **42** from the conduit **51**.

In the embodiment of the invention shown in Figs 9 to 11, **61** denotes a body similar to the body **41** of Fig. 5 forming a chamber **62** having substantially the shape of a truncated cone connected with an outlet pipe **63**, in which is mounted a valve **64**. Similarly to the device shown in Figs. 5 to 8, a disc-like member **66** is disposed and suitably mounted inside the chamber **62**; this disc **66** is formed centrally with an induction pipe **67** similar to the pipe **51**; the pipe **67** extends within a lug **66***a* of the disc **66**, this lug **66***a* extending within a cup **68**, screwed on to the element **66—66***a*. The cup **68** is provided with a substantially flat base and with a wall having a circular section, starting from said base and initially extending in the manner of a truncated cone, and then becoming substantially cylindrical, in the cylindrical portion, the cup **68** is provided with slots **69** parallel with the generating lines and sufficiently near one another. The pipe **67** is provided, along the end which is in front of the base of the cup with a plurality of slots **70** parallel with the slots **69** and formed in the body **66***a* in correspondence with tracks or guides **71** cut out along the outer wall of the lug **66***a* of the disc **66**. The lug **66***a* also has a projecting flange **72** which is interrupted by a series of substantially radial cuts or slits produced by the formation of the tracks **71**. This flange **72** has a diameter substantially equal to the cylindrical portion of inner diameter of the cup **68**.

An aperture **73** similar to and for the same purpose as the aperture **56**, is advantageously provided in the bottom of the cup **68**.

The gas taken in through the pipe **67**, in which it is mixed with the liquid to be gasified which is supplied in any suitable way, passes through the slots **70** into a first chamber defined by the lower portion of the lug **66***a*, the conical portion of the cup **68** and the flange **72** acting as a baffle; from this chamber, the gas passes through the baffle formed by the flange **72** into a second chamber, located above the flange **72** and enclosed by the lug **66***a*, and the wall of the cup **68** containing the slots **69**; from this second chamber the gas passes through the slots **69** into the chamber **62** and then into the outlet pipe **63**.

In this case, the operation is similar to that described in connection with Figs. 5 to 8, with the single difference that the flange **72** constitutes an additional baffle having a plurality of passages providing for the flow of the gas.

In both embodiments shown in Figs. 5 to 11, and similarly to the embodiment shown in Figs. 1 to 4, the desired result is obtained as a result of the sudden change in direction, due to the passage from the conduit **51** or **67** to the slots **52** or **70**; of the passage through the reduced areas, constituted by the slots **52** or **70** and by the slots **49** or **69**; of the presence of the lower or bottom wall of the cup, against which the bigger fluid particles are broken; of the flow conditions of the fluid, which is substantially turbulent in the different chambers through which the fluid passes and substantially laminar along the passages, through the different series of slots. The factors above mentioned enable the liquid to be gasified to undergo extensive fractionation resulting practically in efficient gasification thereof.

The constructional forms illustrated in the drawings and above described are given by way of example only and are subject to many modifications without departing from the scope of the invention as set out in the appended claims.

What I claim is:

1. A carburetor of the class described, comprising: upwardly directed cup means having a bottom; air induction pipe means communicating with the atmosphere and extending downwardly into said cup means, said pipe means comprising a constricted portion of reduced cross-sectional area which increases the flow velocity of said air, said constricted portion extending at least into proximity to said cup bottom, said constricted portion having at least one lateral opening formed therein, said opening being in communication with a source of volatile liquid fuel for said carburetor, said pipe means having a plurality of vertical upwardly extending slots formed in its lower end and a plurality of vertically extending grooves formed on the external surface thereof, said grooves communicating at their lower ends with the upper ends of said slots and forming upward extensions of the external portions thereof, said slots defining a plurality of passages adjacent to said cup bottom and communicating between the interior of the bottom of said constricted portion of said pipe means and the portion of said cup means surrounding said pipe means, said cup bottom acting as an impact surface for breaking up droplets of fuel carried downwardly by said air flowing in said constricted portion; means defining an outlet passage including an expansion chamber for the flow of an air and fuel mixture from said cup means to the intake manifold of an internal combustion engine, said cup means being disposed in said expansion chamber; and baffle means disposed in said outlet passage, said baffle means defining passages producing

turbulence in said mixture in the course of its flow from said cup means to said expansion chamber.

2. A carburetor of the class described, comprising: upwardly directed cup means having a bottom; air induction pipe means communicating with the atmosphere and extending downwardly into said cup means, said pipe means comprising a constricted portion of reduced cross-sectional area which increases the flow velocity of said air, said constricted portion extending at least into proximity to said cup bottom, said constricted portion having at least one lateral opening formed therein, said opening being in communication with a source of volatile liquid fuel for said carburetor; means defining a plurality of passages adjacent to said cup bottom and communicating between the interior of the bottom of said constricted portion of said pipe means and the portion of said cup means surrounding said pipe means, said cup bottom acting as an impact surface for breaking up droplets of fuel carried downwardly by said air flowing in said constricted portion; means defining an outlet passage including an expansion chamber for the flow of an air and fuel mixture from said cup means to the intake manifold of an internal combustion engine, said cup means being disposed in said expansion chamber, and the bottom of said cup means having a small central aperture formed therein communicating directly with said expansion chamber; and baffle means disposed in said outlet passage, said baffle means defining passages producing turbulence in said mixture in the course of its flow from said cup means to said expansion chamber.

3. A carburetor of the class described, comprising: upwardly directed cup means having a bottom; air induction pipe means communicating with the atmosphere and extending downwardly into said cup means, said pipe means comprising a constricted portion of reduced cross-sectional area which increases the flow velocity of said air, said constricted portion extending at least into proximity to said cup bottom, said constricted portion having at least one lateral opening formed therein, said opening being in communication with a source of volatile liquid fuel for said carburetor; means defining a plurality of passages adjacent to said cup bottom and communicating between the interior of the bottom of said constricted portion of said pipe means and the portion of said cup means surrounding said pipe means, said cup bottom acting as an impact surface for breaking up droplets of fuel carried downwardly by air flowing in said constricted portion; means defining an outlet passage for the flow of an air and fuel mixture from said cup means to the intake manifold of an internal combustion engine; a frusto conical body member open at its lower and smaller end, said body member being spaced from and surrounding said cup means and defining an expansion chamber included in said outlet passage, said air and fuel mixture passing outwardly from said body member from said lower end; and baffle means disposed in said outlet passage, said baffle means defining passages producing turbulence in said mixture in the course of its flow from said cup means to said expansion chamber.

4. A carburetor of the class described, comprising: upwardly directed cup means having a bottom; air induction pipe means communicating with the atmosphere and extending downwardly into said cup means, said pipe means comprising a constricted portion of reduced cross-sectional area which increases the flow velocity of said air, said constricted portion extending at least into proximity to said cup bottom, said constricted portion

having at least one lateral opening formed therein, said opening being in communication with a source of volatile liquid fuel for said carburetor; means defining a plurality of passages adjacent to said cup bottom and communicating between the interior of the bottom of said constricted portion of said pipe means and the portion of said cup means surrounding said pipe means, said cup bottom acting as an impact surface for breaking up droplets of fuel carried downwardly by said air flowing in said constricted portion; means defining an outlet passage including an expansion chamber for the flow of an air and fuel mixture from said cup means to the intake manifold of an internal combustion engine, said cup means being disposed in said expansion chamber; baffle means disposed in said outlet passage, said baffle means defining passages producing turbulence in said mixture in the course of its flow from said cup means to said expansion chamber; throttle controlled means for regulating the supply of liquid fuel to said carburetor; and further throttle controlled means disposed in said outlet passage and coordinated with said first-named throttle controlled means for regulating the flow of said air and fuel mixture to said intake manifold.

5. A carburetor of the class described, comprising: upwardly directed cup means having a bottom; air induction pipe means communicating with the atmosphere and extending downwardly into said cup means, said pipe means comprising a constricted portion of reduced cross-sectional area which increases the flow velocity of said air, said constricted portion extending at least into proximity to said cup bottom, said constricted portion having at least one lateral opening formed therein, said opening being in communication with a source of volatile liquid fuel for said carburetor; means defining a plurality of passages adjacent to said cup bottom and communicating between the interior of the bottom of said constricted portion of said pipe means and the portion of said cup means surrounding said pipe means, said cup bottom acting as an impact surface for breaking up droplets of fuel carried downwardly by said air flowing in said constricted portion; means defining an outlet passage including an expansion chamber for the flow of an air and fuel mixture from said cup means to the intake manifold of an internal combustion engine, said cup means being disposed in said expansion chamber; baffle means disposed in said outlet passage, said baffle means defining passages producing turbulence in said mixture in the course of its flow from said cup means to said expansion chamber; means defining a backfire passage from said intake manifold to the atmosphere, said backfire passage by-passing said cup means and said baffle means; and check valve means included in said backfire passage, said check valve means being normally closed and opening when the pressure in said intake manifold passage rises above atmospheric pressure.

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