Aug. 30, 1966 R. L. FLEMING 3,269,377

ANTI-SMOG CARBURETOR FOR INTERNAL COMBUSTION ENGINES

Filed July 30, 1964 3 Sheets-Sheet 1

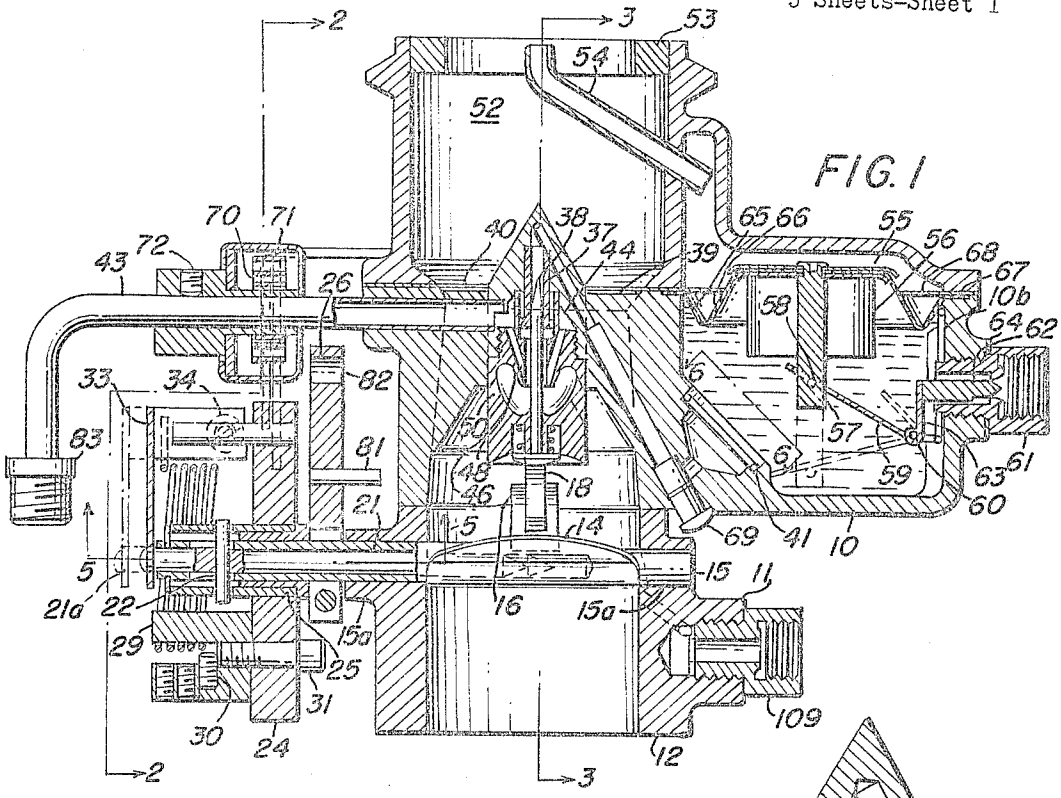


FIG. 1

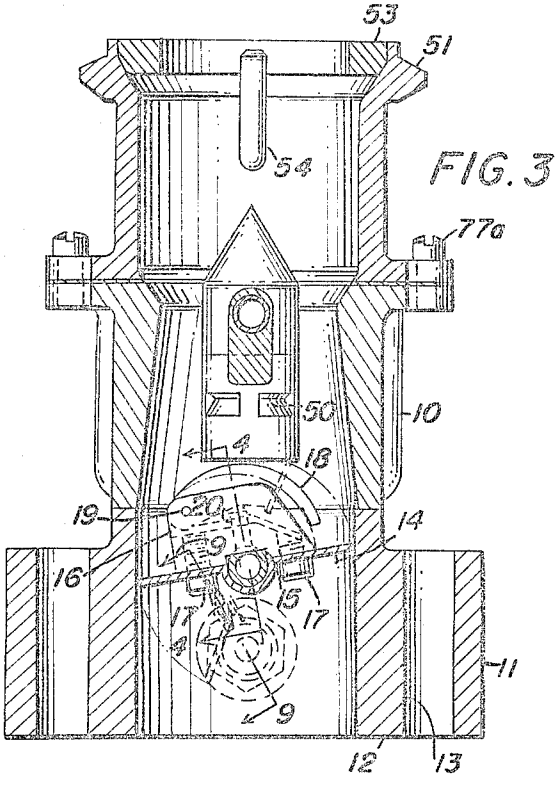


FIG. 3

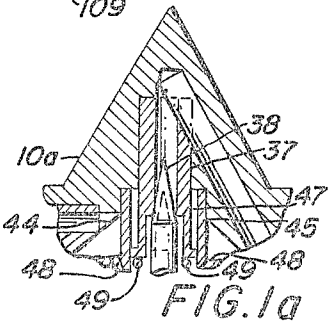


FIG. 1a

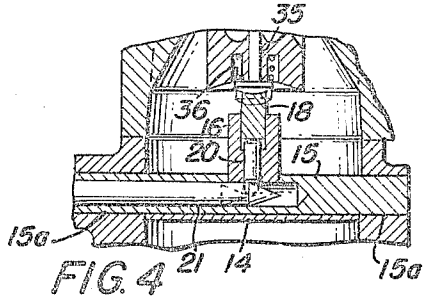


FIG. 4

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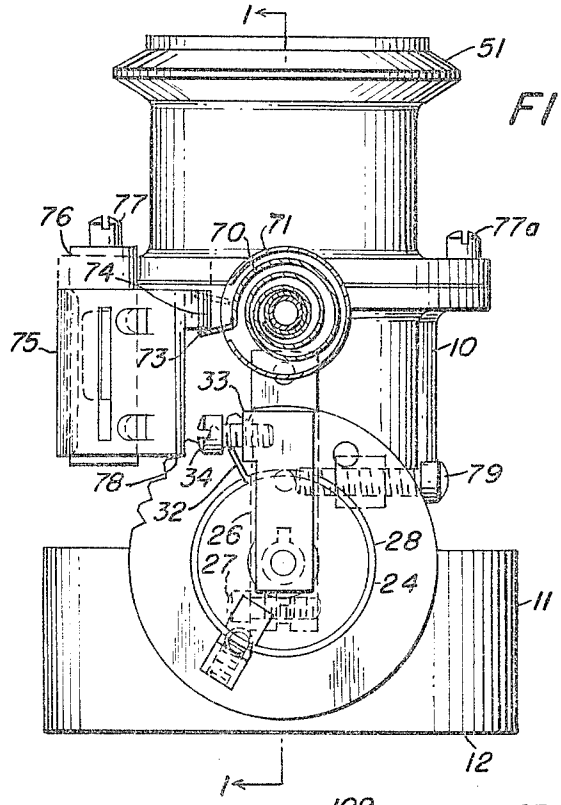



FIG. 2

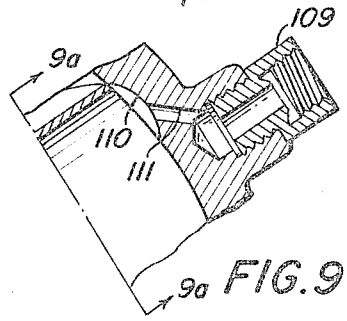



FIG. 9

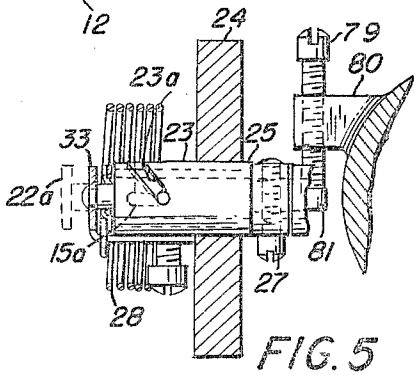



FIG. 5

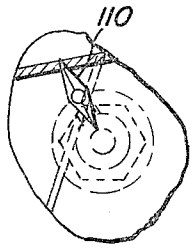



FIG. 9a

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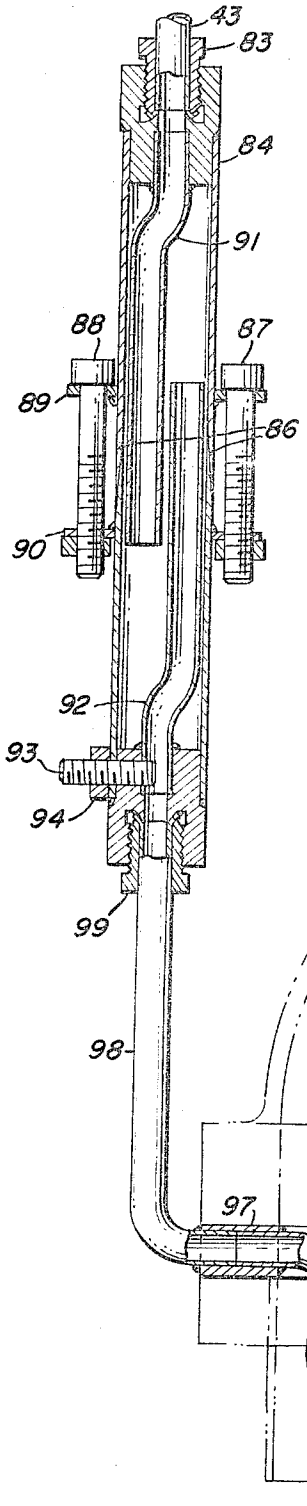



FIG. 7.

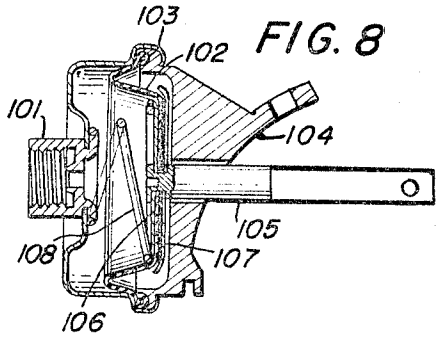



FIG. 8

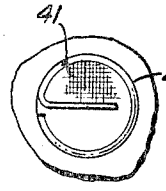



FIG. 6

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3,269,377

# ANTI-SMOG CARBURETOR FOR INTERNAL COMBUSTION ENGINES

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12 Claims. (Cl. 123—119)

This invention relates to carburetors for internal combustion engines and more particularly to a carburetor in which the liquid fuel is precisely metered through a continuously adjustable metering valve, and nearly instantaneously vaporized by heating the fuel above its boiling point in the vaporization chamber thereafter mixing the fuel vapor with the intake air when both constituents are in the gaseous form.

The functions of this new type of carburetor are performed in basically two stages operating simultaneously. The first stage performs the operation of precisely metering the liquid fuel past a cam-operated metering valve having a variable positive pressure-drop across the valve. Subsequently, the metered liquid fuel is dispensed into a vaporization chamber (similar to a type of flash boiler) where the second stage of operation occurs in which the liquid fuel is nearly instantaneously heated beyond its boiling point, thus becoming a pure vapor for the gaseous state of the fuel. Thus, the two stages of operation occur on a continuous basis wherein the gaseous fuel is admitted to the air stream just ahead of the throttle plate through equally spaced radial ports to effect a 360° presentation of fuel to provide a uniform intermixing of fuel in its gaseous state and intake air, of course, in the gaseous state, to a conventional internal combustion engine, using gasoline or other similar type fuel. Since the fuel in the air are gases, at the time of intermixture, the two volumes diffuse into each other, and become a homogeneous mixture, thus creating a uniformity in the fuel-air mixture of the two gases which is unequalled by any other carburetor design and which thus eliminates a basic deficiency of present-day carburetors, which is a major contributor to the creation of smog and general air contamination. In general, the homogeneous mixing of fuel and air both in their gaseous state in this new carburetor promotes nearly 100 percent combustion efficiency, thereby eliminating or minimizing incomplete combustion and the resulting smog-creating by-products.

The liquid fuel metering valve is operated directly by the throttle plate with a positive pressure-drop across the valve and can vary the volume or fuel rate of flow according to the need of the engine. The use of a metering cam makes it possible to precisely control the variation of the volume or fuel rate of flow according to the individual characteristics of an engine model type and to compensate for each different engine design and/or functional variations under all operating conditions and speed. This is not unlike the metering of fuel in conventional carburetors through fuel jets, and the like, but, in the carburetor of the present invention, the fuel is metered to a higher degree of accuracy in the control of fuel flow rate.

The throttle plate is the primary control for varying the fuel rate of flow for normal engine operation, and a secondary control is made possible through a variable positioning pin, thus controlling the relative position of the fuel metering cam on the throttle plate to take care of abnormal engine operations, such as choking under cold-starting operations and also for acceleration and deceleration operating conditions. Thus, these two mediums of control over the fuel rate of flow allow this carburetion system to match the needs of the engine automatically to the full range of engine operating conditions from operating through full power to engine braking. For instance, if the engine accelerates, the throttle plate makes its usual increased opening to admit more intake fuel-air mixture to the engine, which causes the fall of the primary control cam to increase the fuel flow rate proportional to the increased flow rate of the intake air, as for normal engine operation. In addition to this primary control, the quick action of fast accelerating conditions causes the secondary control to temporarily further increase the fuel flow rate by physically lowering the cam, until the engine acceleration has matched the load and is up to the speed representative of the new position of the throttle plate or degree of opening in the carburetor throat. The secondary control then automatically returns the cam to its normal operating relative throttle plate position by physically raising it back, until a further need arises causing this secondary control again to operate in a manner similar to that described above.



With this preliminary understanding of the mode of operation of this anti-smog carburetor in charging intake air with fuel and the manner in which it operates under various normal and abnormal engine operating conditions, the details of operation, described in the following presentation, will provide a clear understanding of the carburetor, its parts, and their corresponding functions and interrelationship, together with the similarities and differences between the carburetor of the instant invention and present-day carburetor designs. This description will provide a clear understanding of the need for specific elements of hardware in this new design in providing the necessary control over the before-mentioned functions and conditions of operations and the interrelationship of these various elements of hardware.

This new and different, basic improvement pertains to a carburetor, in which the liquid fuel is precisely metered through a metering valve which is continuously adjustable and simltaneously operated in conjunction with or by a throttle plate or other type air valve, so as to maintain a constant fuel to air ratio by weight; and which ratio can be fuel enriched under automatic choking and/or accelerating operation and this precisely metered fuel is near-instantaneously vaporized by heating the fuel above its boiling point in a vaporization chamber before mixing the fuel vapor with the intake air. Thus this carburetor uses a relatively safe, non-hazardous liquid fuel like gasoline, but in operation on an internal combustion engine it more closely resembles the operation of a LPG (liquid petroleum or propane gas) carburetor. This means that it promotes near-100% combustion efficiency, and thus clean-burning engine operation, resulting in very low hydro-carbon content and other air contaminants in its exhaust gases, compared to the conventional gasoline carburetor equipped internal combustion engine.

Further advantages of this new and different basic improvement over conventional gasoline carburetors are near-instantaneous engine warm-up, automatic compensation of the fuel to air ratio in terms of volumetric weight during changes in atmospheric pressure, also during accelerating and/or choking conditions; and finally during various possible attitudes of the engine and/or vehicle with respect to horizontal plane and in turning corners at high speeds and other such forces that affect the metering of liquid fuel from a confined and constantly replenished supply reservoir within the carburetor.

And still a further advantage of this new and different basic improvement consists of higher engine performance and/or power, due to an automatic system of introducing hot water vapor in the exhaust gases through suitable communicating porting and tubing and pressure/flow initiating and/or control devices from the exhaust manifold or muffler system, such that a catalytic action is promoted in the combustion operation not unlike that of water injection systems presently in use.

And still another advantage of this improvement over

present day carburetors is the self-priming starting fuel supply system, which prevents accidental or intentional flooding of the engine. Thus, until the original cause of failure of the engine to start is corrected, the pin-pointing of the problem is not further clouded with the flooding of the engine with raw gasoline or other fuel.

Finally, all of these advantages of this new and different basic improvement add up to an overall increased mileage rate/gallon of fuel for any given driver and car combination over the same combination operating with a conventional type of gasoline carburetor on the car's engine. Because driving habits have much to do with actual mileage economy obtained on the same car by several different drivers, identical mileage rate per gallon is unlikely but the percentage of improvement would be much closer if not identical among almost all drivers.

These and other advantages of which this new and different basic improvement in a gasoline type carburetor is capable of having, will become apparent from the description of said carburetor with reference to the accompanying drawings in which:

FIG. 1 is a side elevation sectional view of the carburetor on line 1—1 of FIGS 2.

FIG. 1A is an enlarged view of the metering orifice assembly in the carburetor.

FIG. 2 is a one end view thereof and partial section on only line 2—2 of FIG. 1.

FIG. 3 is a sectional view through the throat area of the carburetor of line 3—3 of FIG. 1.

FIG. 4 is a partial sectional view on line 4—4 of FIG. 3.

FIG. 5 is a partial sectional view on line 5—5 of FIG. 1.

FIG. 6 is a partial sectional view on line 6—6 on FIG. 1.

FIG. 7 is sectional view of hot gas pilot tube and carbon trap/flame arrestor additions to the carburetor.

FIG. 8 is sectional view of variable positions spark advance operator addition to the carburetor.

FIG. 9 is a sectional view of vacuum pressure control slot and communicating holes on line 9—9 of FIG. 3.

FIG. 9*a* is a view taken of vacuum pressure control slot on line 9*a*—9*a* of FIG. 9.

Similar numbers refer to similar parts throughout the several views.

The carburetor includes a substantially oval shape casing, generally indicated by numeral **10** in FIGS. 1, 2, and 3. The casing comprises a lower portion marked **11**, said portion being diamond-shape in form creating a base with peripheral flange **12**. The flange contains a plurality of holes **13** for reception of screws by which the housing may be mounted over an opening in the intake manifold of an internal combustion engine, such as the engine of an automobile, truck, bus or other vehicular or stationary power plant. Said lower portion **11**, serving as a base and mounting for a throttle plate **14** type air valve with a through throat area opening at bottom and at top of said lower portion **11**. A tubular throttle plate axle **15** with journals **15***a* at both sides of throat opening as shown in FIG. 1. Located on the top side of throttle plate **14** and within the confinement of a flat on said axle **15** is a metering cam base **16** which is suitably fastened by screws **17** to said throttle plate **14**, as shown in FIG. 3 and FIG. 4. A metering cam **18** is mounted in cam base **16** and held in pivotable connection thereon by pin **19** and with its free end engaging a positioning pin **20**, which is piloted within cam base and extends into suitable clearance hole in throttle plate axle **15**, such that the opposite spherical radius end of positioning pin **20** rides the conical surface of the adjustment rod **21** that is a loose slide fit inside tubular axle **15**. The adjustment rod **21** is displaced axially by the combined effort of the fixed pin **22** in the said adjustment rod **21** riding in a straight elongated slot **15***a* in the tubular axle **15** when forced by helical slots **23***a* as shown in FIGS. 1 and 5 in tubular hub **23** of inertial flywheel **24**. Said flywheel is piloted on tubular axle **15** by bearing **25** such that the inertial flywheel **24** can have angular displacement (rotation) with respect to tubular axle **15** and thereby act as a cam-out screw when the throttle lever **26**, held in tight friction grip of axle **15** by clamp screw **27** is pivoted by linkage to the accelerator pedal (not shown). And said motion being quicker than inertial flywheel **24** will accelerate, this causes the adjustment rod **21** to have a temporary axial displacement until return spring **28** through its spring rate creates a time delay suitable to allow the positioning pin **20** to readjust the metering cam **18** to an opened valve position and then back to its normal reference position by the action of the return spring **28**. The phantom outline **21***a* shows said adjustment rod **21** in its maximum displaced position. And as shown in FIG. 1 said return spring **28** is adjustable in its spring rate and thus capable of varying the acceleration rate of the engine to pick up speed by means of an anchorage clamp **29**, with a plurality of adjustment or set screws **30** by which the number of active coils of this return spring **28** can be changed from a maximum to a minimum number of coils in torsional stress by tightening or loosening one or more of these set screws **30**. Said anchorage clamp **29** is fixed to inertial flywheel **24** by means of screw **31** and rotates with said flywheel such that said return spring **28** acting in torsion like a clock spring applying a spring load with its engagement leg **32**, as shown in FIG. 2, riding the idle mixture adjustment rod bracket **33** causes the inertial flywheel **24** to follow the rotation of said adjustment rod bracket **33** under a delayed time period, necessary for accelerating the engine with the fuel enrichment, so that this inertial flywheel assembly provides by this action a readjustment cycle of the metering cam **18** as previously described. The idle mixture adjustment rod bracket **33** has an adjustment screw **34**, which makes it possible to vary the fuel-to-air ratio at the idle speed range, which automatically then maintains this ratio for all other engine speeds.

Directly above metering cam **18** as shown in FIG. 1 is the fuel metering valve **35** with its spring **36** spring-loading said valve against the cam surface of said metering cam, which controls the opening in the metering orifice **37** with respect to the conical surface **38** at the top end of the metering valve, which varying of said opening controls the flow of fuel. This metering orifice **37** is a shrink fit in carburetor casing **10** in the central cone-shaped portion **10***a* suspended in the middle of the carburetor throat by strut members **39** and **40**. A long drilled hole in strut **39** at an angle such as to communicate with a cross-drilled hole from the fuel strainer **41** which is held in its counter bore area by wire snap ring **42** which counterbore is at the bottom of the fuel supply chamber. The blind end of the long drilled hole communicates with a drilled hole from the top end of metering orifice **37** in the cone shape portion **10***a*. A reamed hole in strut **40** parallel to the throttle valve axle **15** retains tubing member **43** which pilots into annular trepanned or recessed groove **44** generally surrounding the metering orifice **37** and actually separated from said orifice by the top tubular portion **45** of the vaporization chamber **46** creating an insulating air gap **47**. In operation, hot exhaust gases are conducted into said groove **44** which acts as a manifold to four angular holes **48** which direct these hot exhaust gases into the vaporization chamber along with four radial holes **49** at the midpositions to angular holes **48** in which the hot exhaust gases instantaneously heat up the metered fuel running down the metering valve stem above its boiling point, thus causing it to change, to its vaporized or gaseous state, and drive it out through four radial ports **50** in said vaporization chamber, through which it homogeneously mixes with the intake air before passing through the throttle plate **14** air valve.

The carburetor casing **10** has an upper portion **51** as shown in FIG. 1 which has a through throat opening **52**

with an intake air velocity orifice plate 53, in the center of which opening an intake air Pitot tube 54 communicates through the wall in the throat with a cavity that comprises a top sealed chamber 55 for the combination float operator and pressure differential diaphragm 56. Said float operator has a stem portion 57 with a pin 58 through it, which captures the elongated slot of lever 59 which in turn pivots on wire form 60 that is confined in vertical grooves 10*b* in the side of the fuel supply chamber on either side of the fuel inlet fitting 61 which is screwed into a boss on side of casing 10. This inlet fitting 61 has a needle valve seat that engages the needle valve 62 when said valve is displaced by leg 63 of the lever 59, which is controlled by the float operator 56 as the fuel liquid level rises and falls under the normal continuous flow of fuel to the engine when it is in operation. The gasket 64 seals the threaded connection of the inlet fitting 61 and the carburetor casing 10. The flexible pressure differential diaphragm portion 65 of the combination float operator 56 has an inverted conical shape 66 that is molded as a single conical shape with circular flange portion 67 that is squeezed to an air-tight seal, between the recess in casing 10 and, the bottom surface of upper portion 51 through gasket 68. This sealed air chamber 55 into which intake air Pitot tube 54 communicates, transmits the Pitot tube air pressure to the effective area of said inverted conical diaphragm, so as to cause an identical pressure on the top surface of the fuel's liquid level, which in turn causes a suitable fuel pressure drop across the metering orifice and metering valve's common opening at all speeds of engine operation. At the opened end of the long angular drilled hole in strut 39 a seal plug 69 is pressed in place in casing 10.

As shown in FIGS. 1 and 2, the tubing member 43 has a heat-sensing bi-metal thermostat type spring element 70 in fixed relation to its housing 71 so as to conduct heat from the I.D. of said housing through the bi-metal element, which housing is adjustable in pivotal and axial location on the tubing 43 by means of set screw 72, such that leg 73 of said bi-metal element can be adjusted to operate tang 74 of vertically slideable ratchet pawl 75 that is guided and held by fixed bracket 76 with said assembly anchored to carburetor casing 10 by screw 77. This thermostat assembly is set for a certain period of elapsed time, satisfactory to the necessary choking (fuel enrichment cycle) of engine during warm-up. The inertial fly-wheel 24 has suitable plurality of ratchet teeth notches 78 in one segment of its peripheral surface to engage said tang 74 of ratchet pawl 75, such that a clockwise rotation of the inertial flywheel 24 will escape one or more of said notches 70 when the bi-metal element 70 allows the ratchet pawl to hang low enough to engage said notches. When a satisfactory temperature of said element 70 is reached the leg 73 lifts the ratchet pawl 75 up out of the engagement path. Thus when the accelerator is depressed prior to the necessary warm-up period of engine operation, the inertial flywheel rotates with the throttle plate axle assembly and when released quickly, it returns to its original starting position but the spring loaded inertial flywheel's mass causes a time delay in its return under said spring load and thus one or more notches of higher chocking positions are escaped past the pawl and thus the metering valve is held farther open than when it is in an unchoked position. So the greater the number of notches that are captured into engagement with the ratchet pawl, the more fuel enriched is the air mixture until the bi-metal element 70 reaches its release temperature and the ratchet pawl is completely retracted, allowing the spring-loaded intertial flywheel to return to its unchocked position.

The idle engine speed adjustment screw 79 as shown in FIGS. 2 and 5 is held in projected portion 80 of casing 10, such that said screw bears against the O.D. of pin 81 which is in a fixed position in throttle lever 26 and parallel with tubular throttle axle 15. The hole 82 is said throttle lever provides a suitable pivot point for linkage to the accelerator pedal (not shown) as is in common use in present-day carburetors.

As shown in FIG. 7, tubing member 43 leading away form carburetor (not shown in this view) has a male flare tube fitting 83, that screws into top half of carbon trap/flame arrestor 84 which together with lower half 85 forms a closed chamber with a taper seal joint 86, held together by bolts and nut assemblies 87 and 88 by means of welded washer flanges 89 and 90. The top half 84 has an offset internal communicating tube 91 whose outlet end passes a similar offset tube 92 projecting into the upper half, such that any carbon or other deposits carried in the exhaust gases can be filtered out before reaching the carburetor vaporization chamber. In the lower half 85 a flow rate adjustment screws 93 with a jam nut 94 provides control over the amount of hot exhaust gases, so that an excess of heat in the vaporization chamber can be prevented from causing partial vaporization of fuel as it is flowing through the metering valve.

The exhaust gas Pitot tube 95 has an external conical chamfer 96 which tapers to a sharp edge at the periphery of its inside diameter and said tube has several radius bends to form a loop section, one end of which welds to a diamond-shaped flange 97 of a little greater thickness than the O.D. of the tube. Another tubing member 98 butts and welds to this welded flange end of Pitot tube 95 continuing the communication of hot exhaust gases from the Pitot tube 95 through tubing member 98 to its flared end with male flare tube fitting 99 that screws into the lower half 85 of the carbon trap flame arrestor assembly.

In FIG. 8 a variable position spark advance diaphragm type operator is shown in which a back housing 100 has a female flare tube fitting 101 in air-tight connection, and in which an inverted conical shape flexible diaphragm operator 102 has its peripheral flange 103 captured in an air-tight connection with front housing 104 by a crimped type peripheral closing operation. A stem portion 105 of said diaphragm operator extends through a loose guided clearance hole in front housing 104 such that air is vented from the chamber of the front housing side of said diaphragm through to the distributor housing (not shown). The diaphragm backup inner disc 106 and outer disc 107 is held in air-tight riveted assembly with the flexible diaphram 102 and said assembly is spring loaded by a spiral type compression spring 108 with desired variable spring rate, such that a suitable variable vacuum pressure created beyond the throttle plate in the aforementioned carburetor and conducted to said female flare tube fitting 101 by suitable tubing (not shown) to communicate with similar female flare tube fitting 109 shown in FIG. 1, will satisfactorily reposition the spark advance mechanism in the distributor such that each throttle position has a more ideal spark advance position.

In FIG. 9, is shown a sectional view of the vacuum pressure control slot 110 which is machined into throat area as shown in FIG. 3 such that angular (pivotal) movement of the throttle plate 14 progressively uncovers a greater flow area of this vacuum pressure slot 110 from a minimum flow area at idle engine speed to a maximum flow area at wide-open throttle engine speed. A drilled hole 111 at a suitable angle, communicates the female flare tube fitting 109 to the vacuum pressure control slot, such that sufficient flow area in this wide-open throttle position reduces the vacuum pressure to a minimum and at the other extreme position the idle speed adjustment will produce a maximum vacuum pressure, with said flow control slot 110 nearly closed off.

I claim:

1. In a carburetor having a precise fuel metering system maintaining a normally constant fuel to air ratio by weight but variable under accelerating and choking operations, a working mechanism to control the metering of fuel from the metering orifice of the metering valve to a fuel/air mixing area of a carburetor throttle

air valve which includes in combination: a direct-acting fuel metering valve, a metering cam pivotally mounted on a throttle plate type air valve for operating said fuel metering valve, a positioning pin for varying the meter-in cam position by an engagement with a cone-shaped adjustment rod that is slidable in a tubular axle for said throttle valve, said adjustment pin being controlled in its axial location relative to said axle by a member having a helical slot and a reference pin on said adjustment pin and a straight elongated slot in said tubular throttle plate axle parallel to said axle's axis, said reference pin extending into both of said slots so that an angular movement of said helical slot member causes an axial movement of said adjustment pin to vary the positioning pin and thereby produce corresponding movement of the metering cam through the pivotable arrangement with the throttle plate; said helical slot member being a part of an inertial flywheel mounted on a bearing piloted on and pivotable with said tubular axle, said flywheel being spring loaded to a bracket fixed on said adjustment pin such that the flywheel is always spring returned to an original starting reference position and this reference position being adjustable by an adjustment screw on said fixed bracket which bears on a dowel pin's radial surface which pin is fixed in the flywheel with its axis parallel with the throttle plate's tubular axle, said return spring being of a precise calibrated type to produce a precise time delay with respect to its motion return rate of a specific mass/displacement factor of said inertial flywheel.

2. In a carburetor having a precise fuel metering system maintaining a normally constant fuel to air ratio by weight but variable under accelerating and choking operations, a working mechanism to control the near-instantaneous fuel vaporization of fuel entering the fuel/air mixing area of the carburetor before the throttle air valve which includes in combination: a hot gas fuel vaporization chamber located in the fuel flow stream immediately after the liquid fuel dispensing device and before the fuel enters the intake air stream and before the throttle air valve, said vaporization chamber being connected to the exhaust manifold and receiving hot gases therefrom such that liquid fuel dispensed to said chamber is instantly and continuously heated above its boiling point thereby causing liquid fuel to be changed to its vaporized form, and said vaporized fuel being conducted by these hot-gases under an increased velocity into the intake air stream thru radial ports in said vaporizing chamber to produce near-100% homogeneous mixing of the vaporized fuel with the intake air at a point just ahead of the throttle air valve; said vaporizing chamber having a suitable heat-insulating air gap area with intake air cooling portion surrounding the metering orifice of said fuel metering system for the purpose of preventing partial vaporization of the volatile fuel during the fuel metering operation, and controllable means on the flow rate of hot-gases to said vaporization chamber to vary the heat content to suit the need with respect to the volume of fuel passing thru the vaporization chamber under all speed and conditions of engine operation.

3. In a carburetor having a precise fuel metering system maintaining a normally constant fuel to air ratio by weight but variable under accelerating and choking operations, a working mechanism to provide a means of supplying hot-gases at a variable pressure nearly in proportion to the need in pressure and flow rate to effectively vaporize near-instantaneously the precisely metered fuel in a carburetor having a vaporization chamber which includes in combination: a hot-gas fuel vaporization chamber located in the fuel flow stream immediately after the liquid fuel dispensing device and before the fuel enters the intake air stream and before the throttle air valve, said vaporization chamber being connected to a hot-gas Pitot tube mounted in the engine's exhaust system through an opening in a mounting plate, said hot gas Pitot tube being of a configuration allowing its open end to face opposite the direction of exhause gases flowing through said exhaust system, said Pitot tube inside diameter having a full circle sharp edge which tapers back to the outside diameter such that the maximum impact thrust of said exhaust gases hitting this effective area of the inside diameter produces a flow of these exhaust gases at a variable pressure and flow rate dependent on the velocity of said exhaust gases through the opening of said Pitot tube mounting plate; said hot-gas Pitot tube assembly communicating with the carburetor hot-gas fuel vaporization chamber by means of a hot-gas carbon trap-flame arrestor assembly having an inlet and outlet tube both within a common housing in which these tubes are offset to pass each other slightly so that the hot-gas flow from the inlet tube enters the large common area of the carbon trap housing slowing down its velocity and then reversing its direction for travel to the open end of the outlet tube to continue its flow at its original velocity to the vaporization chamber, said carbon trap housing being separable for periodic cleaning.

4. In a carburetor having a precise fuel metering system maintaining a normally constant fuel to air ratio by weight but variable under accelerating and choking operations, a working mechanism to provide precise control over constant resupplying of fuel to said carburetor and a dependable repeatable reference pressure drop under all driving and climatic conditions across the fuel dispensing metering valve which includes in combination: a combination float and pressure differential diphragm which is mechanically linked to an inlet needle valve to allow a controlled supply of fuel to pass into the carburetor constantly under continuing engine operation, in response to movement of said float and diaphragm unit with the liquid level of the fuel supply in the carburetor to maintain a near-constant confinement of the fuel through communicating parts to the fuel metering orifice dispensing device, accordingly the float and daphragm controls the fuel supply regardless of the attitude of carburetor to the horizontal plane such that at no time is the said fuel supply ever stopped or intermixed with air inclusions which could adversely affect proper engine operation, said diaphragm communicates through a sealed chamber at the opposite side of the diaphragm's liquid fuel surface to an intake air Pitot tube device which is in the air stream with the Pitot tube opening is facing the direction opposite that of the flow of intake air, said opening is tapered to a sharp edge at the inside diameter end face of tube and defines a cone-like shape back to the outside diameter of the tube, said Pitot tube device being capable of sensing a change in ram air pressure by virtue of the air velocity change through the restricting throat opening in which Pitot tube device is mounted and said change in air velocity causing a variation in pressure acting upon the effective area of the said diaphragm surface and liquid fuel confinement to produce a variable pressure drop across said metering orifice dispensing device.

5. In a carburetor having a precise fuel metering system maintaining a normally constant fuel to air ratio by weight but variable under accelerating and choking operations, a working mechanism to provide an automatic, self-compensating pressure control to the fuel dispensing device such that the pressure drop across said fuel dispensing device is variable in a nearly ideal proportion to the need of the engine which includes in combination: an intake air Pitot tube with a sharp inside diameter tubular opening within the same relative plane of a restrictive large inside diameter orifice plate which controls the intake air velocity, said Pitot tube inside diameter opening being in the approximate center of said inside diameter orifice plate, and said Pitot tube being mounted in a die cast structure and being communicated through suitable connecting passageways to the confined space directly above the fuel level in the carburetor float/needle valve controlled fuel supply chamber, said

space above the fuel liquid level being defined by an air tight chamber venting only to the inside diameter opening of the said intake air Pitot tube such that an increase in the air pressure generated by the ram air affect on the inside diameter opening in the Pitot tube acts upon the fuel liquid level surface, said pressure being utilized to cause a fuel flow through a fuel metering valve and dispensing orifice of said carburetor such that the variation in air velocity due to changing engine speed through the said restrictive orifice plate has a variable ram air effect on the pressure generated by the inside diameter opening in said Pitot tube to vary said pressure to effect a variable pressure drop across the metering valve, thus aiding the metering device in precise repeatable fuel flow control at any and all engine speeds and changes in the air density of intake air with respect to sea level to make a nearly ideal proportional change in said pressure drop across the fuel metering valve and maintain the fuel to air ratio by weight constant in the homogeneous fuel/air mixture.

6. In a carburetor having a precise fuel metering system maintaining a normally constant fuel to air ratio by weight but variable under accelerating and choking operations, a working mechanism to provide an automatic choke release mechanism and means for setting the choking position by a full depression and then quick release of the engine's accelerator pedal when starting the engine, which includes in combination: a bi-metal temperature actuated heat-sensing element in the form of a watch-spring shaped coil of essentially flat wire of a plural number of circular wraps, or coils, said element when elevated in temperature to a range approximately over 250° F. by directing engine exhaust gases to said bi-metal element in a confining chamber having a non-fixed end which operates a linkage to release a pawl in engagement with one of a plurality of ratchet tooth shape recesses in the inertial flywheel of said carburetor, thereby to allow said inertial flywheel to spring return to its unchoked position for normal carburetor operation, said inertial flywheel ratchet tooth shaped recesses providing a number of choke positions to satisfy all engine needs, said inertial flywheel being rotatably mounted on a throttle plate tubular axle, said flywheel having apposing helical slots at one end which act as a double thread worm to produce axial displacement of a reference pin rigidly mounted in an adjustment rod that pilots in said tubular axle, said rod having an adjustment bracket attached at said one end carrying said reference pin and having adjacent the other end a conical surface which occupies a position within the tubular axle, a positioning pin riding on said conical surface to transmit a suitable motion to said positioning pin when induced by said adjustment rod's axial displacement, movement of the positioning pin repositions a metering valve cam housed on the throttle plate and thus varies the fuel to air ration between normal carburetor operation and any one of the choking opsitions as required by engine need and sensed by the said bi-metal element.

7. In a carburetor having a precise fuel metering system maintaining a normally constant fuel to air ratio by weight but variable under accelerating and choking operations, a working mechanism to produce a variable position control of the spark advance, which includes in combination: a variable vacuum pressure control system, said system including an inverted conical diaphragm piston in a suitable housing, said piston having an adjustable calibrated spring load with a definite spring rate such that a given vacuum pressure will repeatedly produce a definite spark advance position of the distributor breaker points, a throttle plate air valve having a suitable tapered slot in the throat area thereof, said slot being vented to communicate with the vacuum side of said inverted conical diaphragm piston, said throttle plate in its increasing angular relationship from its normally closed idling position to its full open throttle position causing said tapered slot to go from a maximum vacuum pressure and minimum spark advance position at idling speed to its minimum vacuum pressure and maximum spark advance position at maximum open-throttle speed, thereby fully uncovering said tapering slot in said throat area at maximum open-throttle position.

8. In a carburetor having a precise fuel metering system maintaining a normally constant fuel to air ratio by weight but variable under accelerating and choking operations, a working mechanism to control the precise metering of fuel from the metering orifice of the fuel dispensing medium to the fuel/air mixing area of the carburetor air valve, which comprises in combination: a direct-acting fuel metering valve, said valve having a stem portion with a tapered conical point at one end and a larger diameter head portion at the other end, said stem portion being piloted within a suitable housing with the conical point end penetrating into a fixed metering orifice communicating with the fuel supply chamber such that a pressure drop across said metering orifice will establish a fuel flow through the opening between the metering valve conical point and the fixed metering orifice, a metering cam pivoted from a hinge point on a metering cam housing mounted on the upstream side of a throttle plate air valve having an axis with a tubular portion, a positioning pin piloting through said cam housing and engaging the bottom-side of the pivotal metering cam at one end thereof and a conical shape point on an adjustment rod at the opposite end thereof, said rod being mounted for axial movement within the tubular portion of the throttle valve axle, a reference pin rigidly mounted on said adjustment rod which pin engages helical slots in an inertial flywheel tubular extension that acts as a double thread screw or worm and in conjunction with a straight elongated slot in the tubular throttle plate axle such that an angular movement of said flywheel causes an axial movement of said adjustment rod and corresponding movement to said positioning pin to allow said metering cam to relocate itself and the metering valve head to produce relative motion of the metering valve head with respect to the fixed metering orifice to thereby vary the fuel flow through said metering valve assembly, said adjustment rod having a bracket fixed at the end projecting out of said throttle plate axle, said bracket having thereon an adjustment screw to engage a reference pin extending parallel to the axis of the throttle plate axle and the inertial flywheel and fixed to said flywheel, a calibrated coil return spring also attached to said flywheel having a 90° leg projecting radially for a distance sufficient to engage the said bracket of the adjustment rod to return said inertial flywheel to its starting point against said adjustment screw to provide the normal fuel/air ratio and idle fuel adjustment, said metering orifice being located above the fuel liquid level and having a suitable volume, such that upon starting the engine an initial trapped volume of fuel is released and flows into the throttle plate area to furnish a self-priming starting fuel supply to said throttle plate and thence to the engine for ease of starting.

9. In a carburetor having a precise fuel metering system maintaining a normally constant fuel to air ratio by weight but variable under acceleration and choking operations, a working mechanism to control the time period amount of fuel dispensed to the air stream under accelerating and choking operations, which includes in combination: a direct-acting fuel metering valve operated by a metering cam on a throttle plate type air valve having a tubular axle, a positioning pin to vary the metering cam position by movement of an adjustment rod having a cone-shape end in engagement with one end of said positioning pin, said body being slidable in the tubular throttle valve axle and being controlled in its axial location relative to said axle by helical slots in an inertial flywheel hub extension into which a reference pin in said adjustment pin projects while also being confined in a straight elongated slot in said throttle tubular

axle parallel to its axis, such that angular movement of said axle with relation to the momentarily stationary helical slots of the inertial flywheel causes said adjustment rod to have axial movement to vary the positioning pin and appropriately vary the metering cam through a pivotable arrangement with the throttle plate, said inertial flywheel mounted on a bearing piloted on and pivotable with said tubular axle, said flywheel being spring-loaded to a bracket fixed on the said adjustment rod such that the flywheel is always spring returned to an original starting position and this position being adjustable by a setting screw on said fixed bracket, said screw bearing against the radial surface of a dowel pin fixed in the inertial flywheel, said pin's axis being parallel to the axis of the throttle plate tubular axle, said return spring being operated during accelerating and choking operations by a rate capable of being adjusted by means of a screw operated clamp which holds two or more of the close-wound torsional spring coils as a solid unit to vary thereby the number of free coils to produce a desired spring return rate within the capacity of said return spring.

**10.** In a carburetor having a precise fuel metering system maintaining a normally constant fuel to air ratio by weight but variable under accelerating and choking operations, a working mechanism to provide a means of inducing hot-water vapor from the engine exhaust gases into the intake air stream of the carburetor, upstream from the air valve such that the water vapor acts as a catalyst in the combustion reaction of the new intake air and fuel mixture to produce a power-boosting and more complete near-perfect combustion efficiency at a variable pressure and flow rate proportional to the exhaust gas velocity at various engine speeds which is nearly in proportion to the need of the engine as its speed is varied, which includes in combination: a hot-water vapor induction nozzle area in communication with the air stream before the throttle plate air valve, with an exhaust hot-gas Pitot tube mounted in the engine's exhaust system through an opening in a mounting plate, said hot-gas Pitot tube being of a configuration allowing its open end to face opposite to the direction of exhaust gases flowing through said exhaust system, said Pitot tube inside diameter having a full circle sharp edge which tapers back to the outside diameter such that the Pitot tube receives the maximum impact thrust of said exhaust gases, said hot-gas Pitot tube assembly communicating with said carburetor hot-water vapor induction nozzle area by means of a hot-gas carbon trap/flame arrestor assembly having an inlet and outlet tube both within a common housing in which these tubes are offset to pass by each other slightly so that the hot-gas flow from the inlet tube enters the large common area of the carbon trap housing slowing down its velocity and then reversing its direction and travels to the open end of the outlet tube to continue its flow at its original velocity to the hot-water vapor induction nozzle, said carbon trap housing being separable for periodic cleaning.

**11.** In a carburetor having a precise fuel metering system maintaining a normally constant fuel to air ratio by weight but variable under accelerating and choking operations, a working mechanism to control the near-instantaneous fuel vaporization of fuel entering the fuel/air mixing area of a carburetor, which includes in combination: a hot gas fuel vaporization chamber located in the fuel flow stream immediately after the liquid fuel dispensing device and before the fuel enters the intake air stream and before the throttle type of valve, said vaporization chamber having a sealed heating chamber with a source of heat energy, that is variably controlled by a mechanism operated by the throttle air valve, said sealed chamber being in the direct path of the dispensed liquid fuel such that this fuel is near-instantaneously heated to its boiling point and turned into a pure vapor thereby creating an inherent vapor pressure which aids in the expelling of said fuel vapor out of said vaporization chamber through radial outlet ports to the intake air stream thereby causing a homogeneous mixing of the fuel vapor particles throughout the intake air volume on a continuous flowing basis controlled by the throttle air valve, a secondary adjustment mechanism on said heat energy source such that the heat energy supplied to the vaporization chamber which is in close proximity to the fuel metering and dispensing device can be varied so that no partial vaporization of fuel takes place during the fuel metering operation due to excess heat energy within said vaporization chamber.

**12.** In a carburetor having a precise fuel metering system maintaining a normally constant fuel to air ratio by weight but variable under accelerating and choking operations, a working mechanism to control the metering of fuel from the metering orifice of a metering valve to a fuel/air mixing area of a carburetor throttle air valve, which includes in combination: a throttle plate air valve having a tubular axle, a directly-acting fuel metering valve operated by a diaphragm type piston actuator that is controlled by intake Pitot tube ram air pressure acting on the effective area of said diaphragm to produce a resulting force opposed by a precisely calibrated spring such that the position of said direct-acting valve can be repeatable effected at all engine speeds so as to maintain the normally constant fuel to air ratio by weight, said calibrated spring being responsive to movement of an adjustable cam surface operated by a lever mechanically linked for movement in conjunction with an inertial flywheel mechanism mounted on a bearing piloted and pivotable on the throttle plate axle, said flywheel being spring-loaded to a fixed bracket on said lever such that the flywheel is always spring returned to the original starting reference position, said reference position being adjustable by a setting screw on said fixed bracket which engages the radial surface of a dowel pin fixed to said flywheel with said pin's axis parallel to the throttle plate's axle, said return spring being of a precise calibrated type to produce a precise time delay with respect to its motion return rate of a specific mass/displacement factor of said flywheel.

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