

Sept. 29, 1970

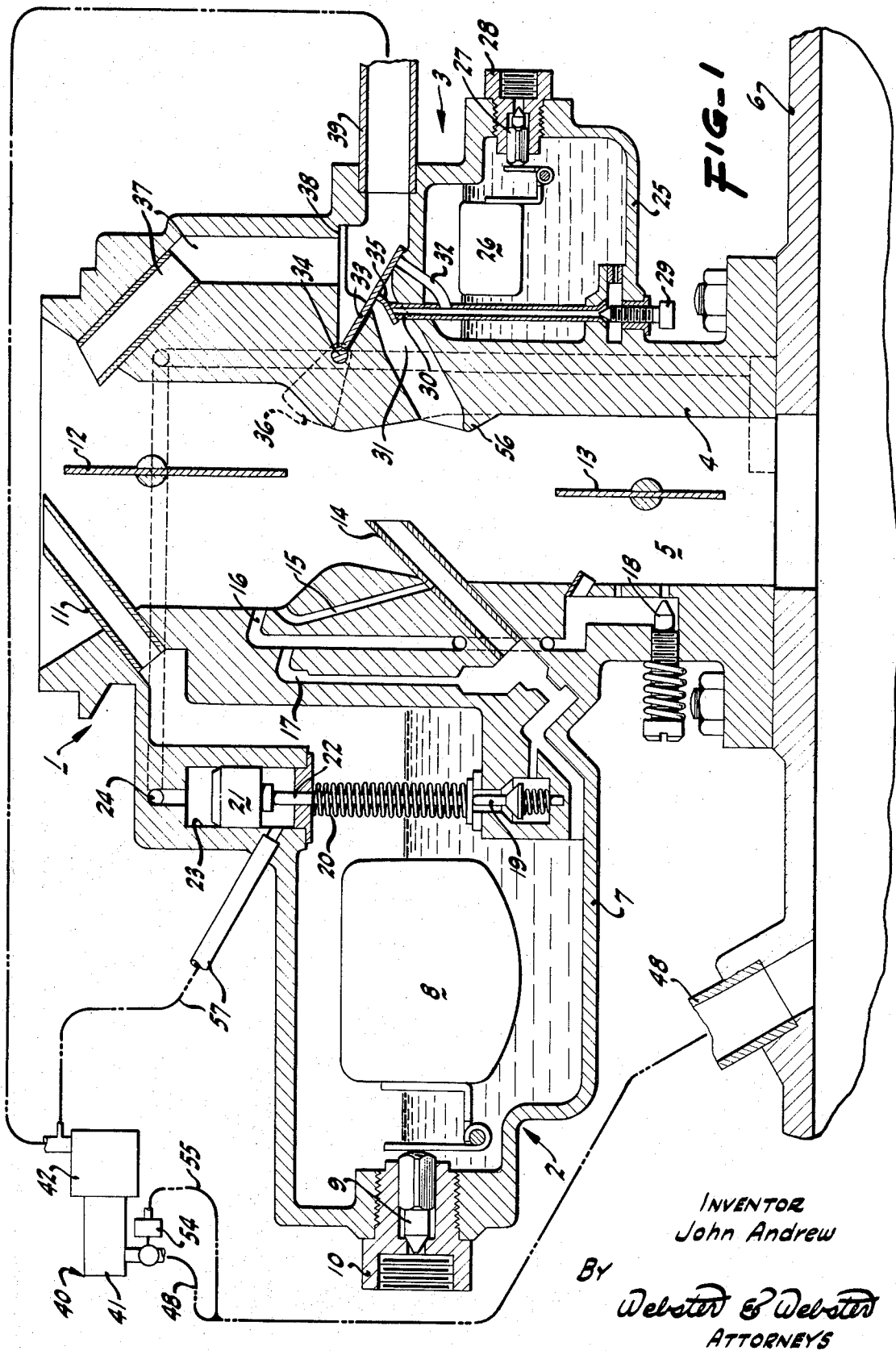
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3,531,094

AUXILIARY CARBURETOR

Filed March 5, 1969

2 Sheets-Sheet 1



Sept. 29, 1970

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AUXILIARY CARBURETOR

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2 Sheets-Sheet 2

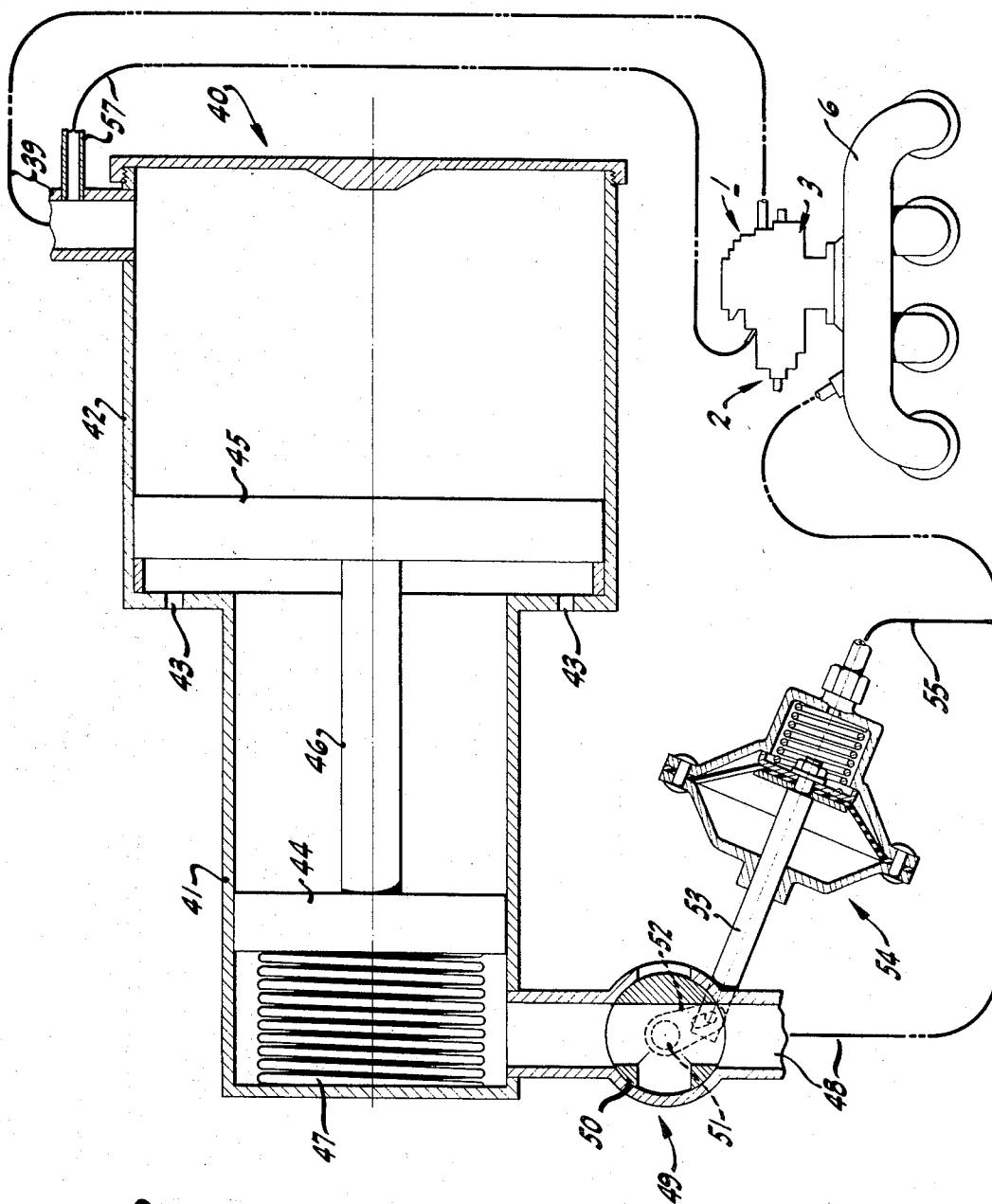


FIG-2

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3,531,094

AUXILIARY CARBURETOR

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Filed Mar. 5, 1969, Ser. No. 804,426
Int. Cl. F02m 7/08

U.S. Cl. 261—23

10 Claims

ABSTRACT OF THE DISCLOSURE

An auxiliary carburetor, arranged in conjunction with a main conventional carburetor and operative—automatically—to deliver a supplemental, well-atomized fuel-air mixture into the bore of the throttle body of the conventional carburetor, whereby to maintain engine efficiency during relatively short periods of partial fuel starvation due to a condition of low vacuum and which occurs, for example, when the throttle valve is quick-opened relatively wide for acceleration; the requisite air stream for the auxiliary carburetor, and as needed to produce the supplemental fuel-air mixture, being provided by an air pump which functions only in response to such a low vacuum condition.

BACKGROUND OF THE INVENTION

It is well recognized that an internal combustion engine will tend to momentarily stall or "lug" when the throttle valve is quick-opened relatively wide for the purpose of acceleration, and at which time there is a resultant reduction of vacuum in the carburetor and with attendant partial fuel starvation of the engine. While accelerator pumps and auxiliary jets in sundry embodiments have been employed for the purpose of supplying supplemental fuel during periods of low vacuum and partial fuel starvation, the supplemental fuel—as so supplied—is not always sufficiently broken down nor atomized for best engine operation, including some loss of combustion effect in the engine. The present invention was conceived by me in the course of endeavors seeking a solution to such problem.

SUMMARY OF THE INVENTION

The present invention provides, as a major object, a novel auxiliary carburetor—arranged in combination with, and supported in part by, the throttle body of a conventional carburetor—which is automatically operative, in response to a condition of low vacuum in the conventional carburetor, to then deliver a supplemental, well-atomized fuel-air mixture into the bore of the throttle body of said conventional carburetor whereby to prevent partial fuel starvation of the engine, and which otherwise occurs upon reduction of vacuum due to the throttle valve being quick-opened for acceleration.

The present invention provides—as another object—an auxiliary carburetor, as above, which includes (as a separate but conduit-connected instrumentality in the present embodiment) a novel air pump which functions, only in response to a low vacuum condition in the conventional carburetor, to create the requisite air stream for the supplemental fuel-air mixture which the auxiliary carburetor produces and delivers to the bore of said conventional carburetor.

The present invention provides, as an additional object, a novel auxiliary carburetor which will permit the elimination of the usual accelerator pump from the conventional carburetor and will also greatly reduce the need for auxiliary jets therein.

The present invention provides, as a further object, an auxiliary carburetor which is designed for ease and economy of manufacture.

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The present invention provides, as a still further object, a practical, reliable, and durable auxiliary carburetor and one which is exceedingly effective for the purpose for which it is designed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional elevation showing a conventional carburetor as modified to include the present auxiliary carburetor; the air pump unit and connecting conduits being shown diagrammatically.

FIG. 2 is a sectional elevation of the air pump unit and its control mechanism; the auxiliary carburetor and connecting conduits being shown diagrammatically.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now more particularly to the drawings and to the characters of reference marked thereon, the numeral 1 indicates the entire carburetor unit comprised of a main, conventional carburetor 2, and the auxiliary carburetor 3 of the present invention.

As usual, the main carburetor 2 comprises an upstanding throttle body 4 having a relatively large diameter barrel or bore 5; such throttle body 4 being secured in connection, and with the bore 5 in communication, with the intake manifold 6 of the engine.

A main fuel bowl 7 is formed on and extends laterally from the throttle body 4; such bowl enclosing a pivoted float 8 which operates a needle valve 9; the latter controlling the amount of fuel which enters the bowl 7 from a fitting 10 to which a fuel supply conduit (not shown) is adapted to be threadingly coupled.

The bowl 7 of the main carburetor 2 is vented by an air-bleed tube 11 opening to atmosphere above the choke valve 12 disposed in the upper portion of the throttle body bore 5.

The usual throttle valve 13 is located in the lower portion of the throttle body bore 5 a substantial distance below the choke valve 12.

The main nozzle of the carburetor 2 is indicated at 14; the air-bleed tube for the main nozzle being indicated at 15. A further air-bleed tube is indicated at 16, while the idle tube is indicated at 17, and the idle adjustment screw at 18.

The power system of the main carburetor 2 includes, in the present illustration, a power valve 19 adapted to be opened by a spring 20, but held closed under a condition of normal high vacuum in the throttle body bore 5. The power valve 19 is held closed by means of a piston 21 on the upper end of the power valve rod 22; such piston 21 being slidable in a cylinder 23. The piston 21 is normally held raised in the cylinder 23—closing the power valve 19—by virtue of the high vacuum being imposed on the head of piston 21 through the medium of a vacuum passage 24.

The main carburetor 2, including the foregoing generally conventional structure, is modified—to include the auxiliary carburetor 3—in the manner illustrated in FIG. 1 and wherein such auxiliary carburetor is shown as comprising the following.

A separate, suitably vented, fuel bowl 25 is formed on the throttle body 4 on the side opposite the main fuel bowl 7; such separate fuel bowl 25 being fitted internally with a float 26 which operates a needle valve 27 to control the fuel level in said bowl 25. Fuel is fed to the bowl 25 by means of a conduit (not shown) which threadingly engages a fitting 28 outwardly of the needle valve 27.

Fuel from the bowl 25 feeds through a needle valve 29 to an upstanding auxiliary nozzle 30, the upper end or tip of which protrudes a short distance into an auxiliary fuel-air mixture feed passage 31 formed in the throttle

body 4 and having an inner end opening in communication with the throttle body bore 5 from laterally thereof and intermediate the choke valve 12 and throttle valve 13. The point of opening of the auxiliary fuel-air mixture feed passage into the bore 5 is preferably in a horizontal plane slightly below the delivery or discharge end of the main nozzle 14 protruding into said bore 5 from the opposite side of the throttle body. An air-bleed tube 32 communicates between the passage 31 rearwardly of the projecting tip of auxiliary nozzle 30 and a point on said nozzle adjacent but short of such tip.

The auxiliary fuel-air mixture feed passage 31 is normally closed outwardly of the projecting tip of the auxiliary nozzle 30 by means of a flap valve 33 pivoted as at 34. In its closed position, the flap valve 33 not only closes the adjacent end of the air-bleed tube 32, but also closes the protruding tip of the auxiliary nozzle 30; this latter closure being accomplished by means of an ear 35 on the underside of the flap valve 33. Upon upward swinging of the flap valve 33—to open the passage 31 in the manner and for the purpose hereinafter described—not only is the air-bleed tube 32 opened, but so is the protruding tip of the auxiliary nozzle 30; the latter opening occurring upon the ear 35 swinging away from such nozzle tip.

The flap valve 33 is provided at one end of its pivot shaft with a counterweight 36 which is in a raised position when said flap valve 33 is closed; the flap valve 33 normally being closed by the suction effect in the passage 31 between the auxiliary nozzle 30 and bore 5, which suction effect is attendant a normal condition of high vacuum in said bore 5.

An air entry duct 37 leads from above the choke valve 12 downwardly in the throttle body 4 to communication with the passage 31 outwardly of the flap valve 33 when the latter is closed.

Upon the suction effect in the passage 31 diminishing by reason of a condition of low intake vacuum, the counterweight 36 swings the flap valve 33 upwardly against a seat 38 formed at the lower end of the air entry duct 37, whereby such duct is then closed.

At the rear end thereof, the auxiliary fuel-air mixture feed passage 31 is connected to a conduit 39 of substantial internal diameter; such conduit leading to connection with the discharge end of a suitably mounted air pump unit indicated generally at 40. Preferably the air pump unit 40 is mounted relatively close to the carburetor unit 1; such air pump unit (as shown diagrammatically in FIG. 1, and in detail in FIG. 2) being constructed as follows:

A relatively large diameter but two-stage cylinder forms the body of the air pump unit and comprises one stage indicated at 41 and another and larger stage indicated at 42; the latter stage being vented at the end adjacent the stage 41, as at 43.

A piston 44 is reciprocally disposed in the cylinder stage 41, while a piston 45 is reciprocally disposed in the cylinder stage 42; such pistons being connected in unitary relation by an axial rod 46. The pistons 44 and 45 are normally (i.e. under a condition of high intake vacuum) retracted in the corresponding cylinder stages 41 and 42; a heavy-duty helical compression spring 47 then being compressed between the piston 44 and the adjacent end of the cylinder stage 41.

The piston 44 is normally maintained in such retracted position, with the spring 47 compressed and hence loaded, by a suction effect produced in the cylinder stage 41 between said piston 44 and the outer end of the cylinder stage 41; this being attained by means of a vacuum conduit 48, of relatively large internal diameter, which connects between the outer end portion of said cylinder stage 41 and the intake manifold 6.

A rotary valve, indicated generally at 49, is interposed in vacuum conduit 48 and includes a rotor 50 which—in one position and which is normal—is open relative to the vacuum conduit 48. In another position of the rotor 50, it closes the valve 49 relative to the vacuum conduit 48

on the intake manifold side and opens said conduit to atmosphere on the cylinder side.

The rotor 50 is carried on a cross shaft 51 having a radial arm 52 on its outer end; such radial arm being connected to the free end of a push-pull rod 53 extending from a vacuum-retracting spring-advanced type of actuator 54; such actuator being connected by a conduit 55 leading either directly to the intake manifold 6, or to connection with the vacuum conduit 48 as shown.

Under normal engine operation, and during a condition of high intake vacuum, the flap valve 33 remains closed with attendant closure by ear 35 of the auxiliary nozzle 30. At such time, the rotary valve 49 is also open relative to the vacuum conduit 48 whereby the condition of high intake vacuum produces the suction effect which retracts the piston 44 and, consequently, the piston 45 against the compression of spring 47.

With the flap valve 33 and the rotary valve 49 in the positions described above, the main carburetor 2 alone functions.

However, upon the occurrence of a condition of low intake vacuum (as for example due to quick-opening of the throttle valve 13 for acceleration), the auxiliary carburetor 3 comes into play as follows:

Upon the occurrence of a condition of low intake vacuum, and resultant diminution of the suction effect in the auxiliary fuel-air mixture feed passage 31 inwardly of flap valve 33, the counterweight 36 swings said flap valve upwardly in closing relation to the seat 38 and the air entry duct 37, while opening said passage 31 to the conduit 39; such upward movement of the flap valve 33 also opening the auxiliary nozzle 30 and uncovering the air-bleed tube 32.

At the same time, the actuator 54—in response to the condition of low intake vacuum—responds and closes the rotary valve 49 relative to the vacuum conduit 48 on the intake manifold side, and opens said conduit to atmosphere on the cylinder side. When this occurs, the suction effect in the outer portion of cylinder stage 41 is relieved and spring 47 forcefully advances the piston unit comprised of the pistons 44 and 45. As the piston 45 thrusts forward in the cylinder stage 42, a forceful air stream is produced in the conduit 39 and hence through the auxiliary fuel-air mixture feed passage 31. As such forceful air stream flows through passage 31 and over the protruding tip of the auxiliary nozzle 30, fuel is drawn from the bowl 25 and through said nozzle 30 to provide a fuel-air mixture which then discharges from the inner end of said passage 31 into the bore 5 of the throttle body 4. By the time such supplemental fuel-air mixture reaches and discharges into the bore 5, it is well atomized, and—in supplement to the fuel delivering from the main nozzle 14—prevents partial fuel starvation of the engine and attendant lugging which otherwise frequently occurs during the moments of existence of a condition of low intake vacuum.

Also, a beneficial effect is attained by the auxiliary fuel-air mixture discharging from passage 31 at a point below the discharge end of the main nozzle 14.

Further, a bottom ledge 56, which projects into the bore 5 at the inner or discharge end of the passage 31, is beneficial in attaining better atomization of the supplemental fuel-air mixture as it delivers from said passage 31 into the bore 5.

When the auxiliary carburetor 3 is in operation, it is desirable that the power valve 19 not open, and this is accomplished by providing a relatively small conduit 57 connected between the conduit 39 and the cylinder 23 below the piston 21. Thus, a small amount of the forceful air stream from conduit 39 produces a pressure in cylinder 23 below the piston 21 to counteract any tendency of said piston 21 to lower and open the power valve 19.

Upon re-establishment of a normal condition of high intake vacuum, the flap valve 33 immediately swings down and, in addition to closing the auxiliary nozzle 30

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and air-bleed tube 32, also closes the passage 31 whereby air may then flow through the duct 37 and in reverse through the conduit 39 as the piston 45 retracts to its starting position; the latter occurring upon the rotary valve 49 opening relative to the vacuum conduit 48 where-
 5 by the re-established condition of high intake vacuum is imposed on and the suction effect retracts the piston 44 against spring 47.

With a main conventional carburetor 2 provided with the auxiliary carburetor 3 of the present invention, opera-
 10 tion of an internal combustion engine, as in a motor vehicle, is greatly improved both with respect to the prevention of stalling or lugging due to partial fuel starvation upon the quick-occurrence of a condition of low intake vacuum, and, additionally, the fuel mixture at such time
 15 provides for greater engine efficiency.

From the foregoing description, it will be readily seen that there has been produced such an auxiliary carburetor as substantially fulfills the objects of the invention, as set forth herein.

I claim:

1. In combination with a main carburetor which includes a throttle body having a bore in communication with, and subject to the intake vacuum from, the intake manifold of an internal combustion engine, a fuel bowl, and a main nozzle fed from the bowl and positioned to deliver a fuel-air mixture into the bore; an auxiliary carburetor, associated with the throttle body, comprising a separate fuel bowl on the throttle body, there being an auxiliary fuel-air mixture feed passage in such body and opening at one end into the bore from laterally thereof, an auxiliary fuel nozzle fed from the separate fuel bowl and positioned to deliver fuel into said passage upon a forceful air stream being induced therethrough in the direction of the bore, an air pump connected to the other end of said passage and operative to produce such an air stream therein, the air pump being out of operation during a condition of high intake vacuum, and means to cause operation of the air pump in response to a condition of low intake vacuum.

2. A carburetor combination, as in claim 1, in which the air pump includes a cylinder, a piston unit reciprocable in the cylinder, and a heavy-duty compression spring in the cylinder between one end thereof and the piston unit, there being an air stream conduit connected between the other end of the cylinder and the auxiliary fuel-air mixture feed passage; and said means to cause operation of the air pump including a vacuum conduit connected between said one end of the cylinder and the intake manifold, the piston unit being vacuum-retracted toward said one end of the cylinder by a condition of high intake vacuum, the spring being compressed and loaded by said retraction of the piston unit, and the spring thrusting the piston unit toward the other end of the cylinder upon occurrence of a condition of low intake vacuum, and such forward thrusting of the piston unit producing said forceful air stream.

3. A carburetor combination, as in claim 2, in which the cylinder is of two-stage form, one stage being of lesser diameter than the other stage, and the piston unit includes axially connected pistons each reciprocable in the corresponding cylinder stage; said one cylinder stage having the vacuum conduit connected thereto.

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4. A carburetor combination, as in claim 2, including a valve in the vacuum conduit, said valve in one position being open relative to the vacuum conduit and in another position closing the vacuum conduit on the intake manifold side and opening said conduit to atmosphere on the cylinder side, and an actuator operative to dispose the valve in said one position and in said other position in response to a condition of high intake vacuum and a condition of low intake vacuum, respectively.

5. A carburetor combination, as in claim 4, in which the valve in the vacuum conduit is of rotary type and includes a shaft fitted with a radial arm; the actuator being of vacuum-retracted spring-advanced type and including a reciprocable rod attached to the radial arm, and a conduit connected at one end to the actuator and at the other end in communication with the intake manifold.

6. A carburetor combination, as in claim 1, including an air entry duct communicating with said auxiliary fuel-air mixture feed passage outwardly of the auxiliary nozzle, a counterweighted flap valve pivotally mounted for movement between a first position closing said passage and opening the air entry duct, and a second position opening such passage and closing said duct; the flap valve occupying said first and second positions under conditions of high intake vacuum and low intake vacuum, respectively.

7. A carburetor combination, as in claim 6, in which the auxiliary nozzle includes a tip protruding into said fuel-air mixture feed passage; there being a member on the flap valve disposed in closing relation to said tip of the auxiliary nozzle when the flap valve is in said first position.

8. A carburetor combination, as in claim 1, in which the auxiliary fuel nozzle includes a tip protruding into said auxiliary fuel-air mixture feed passage; there being moveable means providing a closure for said nozzle tip in response to a condition of high intake vacuum and moving to open such tip in response to a condition of low intake vacuum.

9. A carburetor combination, as in claim 1, in which the main nozzle enters the bore from one side, and the auxiliary fuel-air mixture feed passage opens into the bore from the opposite side and below the discharge end of said main nozzle.

10. A carburetor combination, as in claim 1, including means normally closing the auxiliary nozzle, and a valve normally closing said auxiliary fuel-air mixture feed passage between the auxiliary nozzle and air pump; said closure means opening the auxiliary nozzle and said valve opening such passage only in response to a condition of low intake vacuum.

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U.S. Cl. X.R.

261—26, 30, 34, 57, 69