Oct. 25, 1966 L. T. BARNES 3,281,132

CARBURETOR

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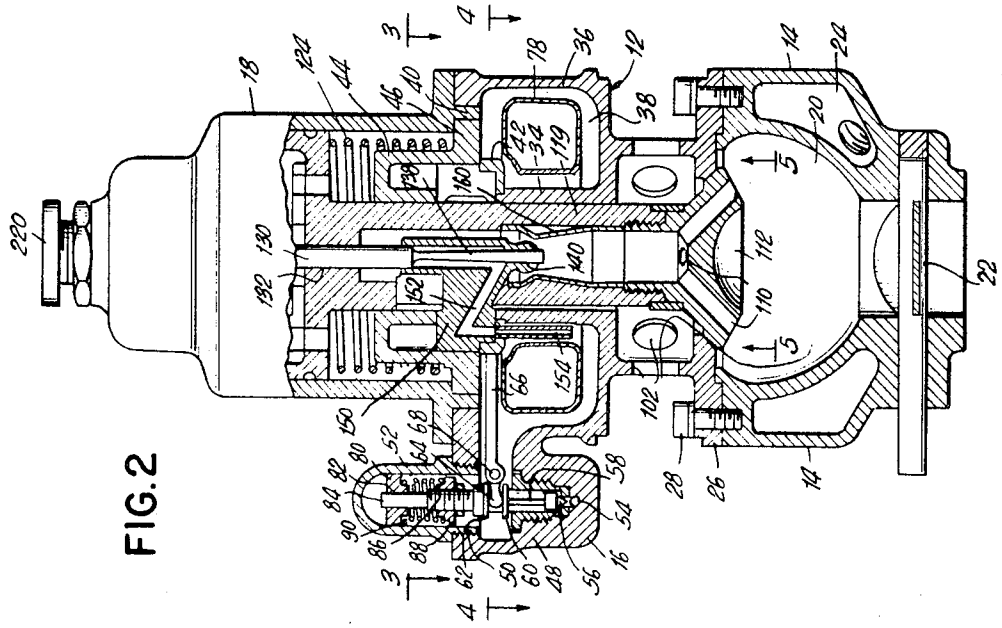


FIG. 2

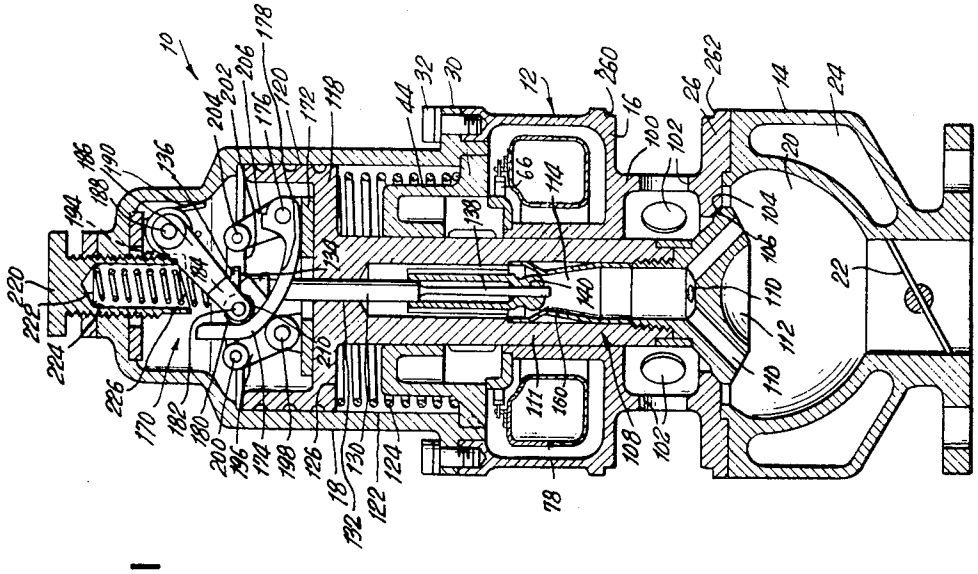


FIG. 1

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FIG. 3

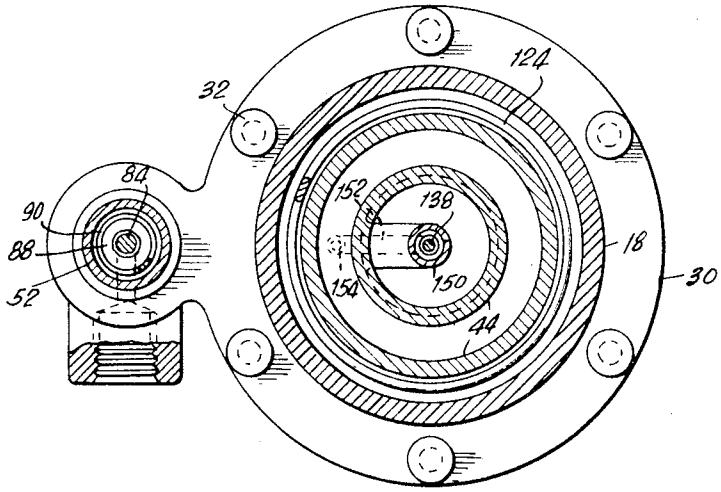
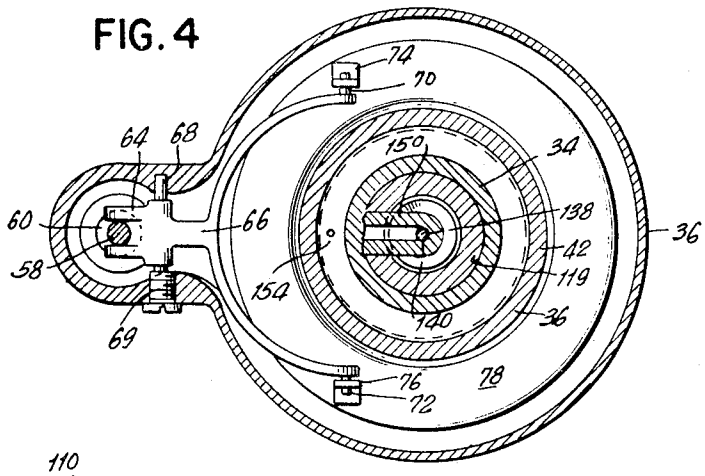


FIG. 4



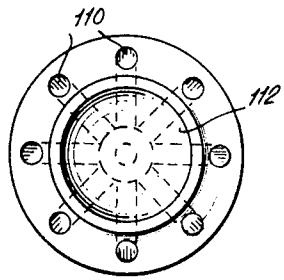


FIG. 5

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FIG. 6.

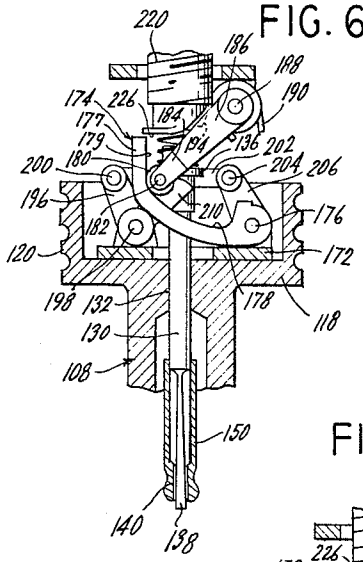


FIG. 7.

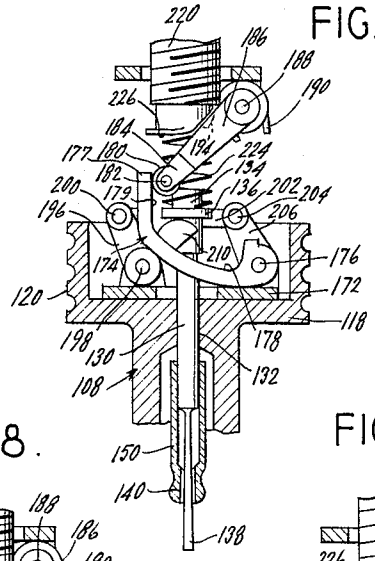


FIG. 8.

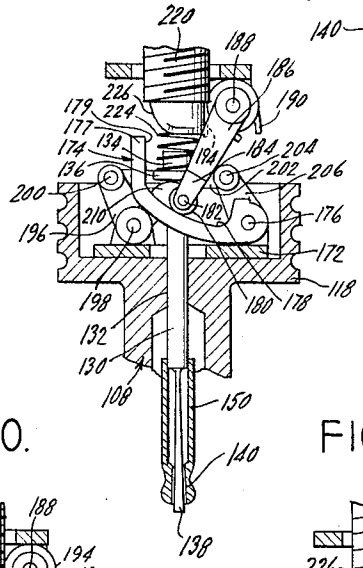


FIG. 9.

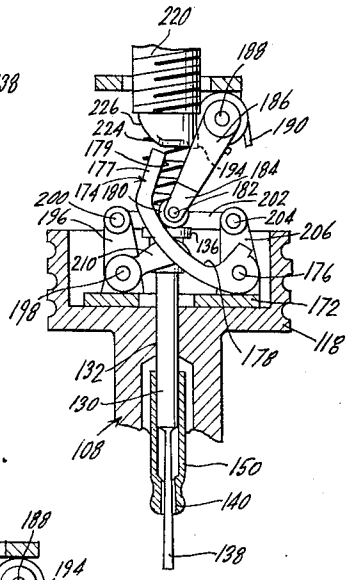


FIG. 10.

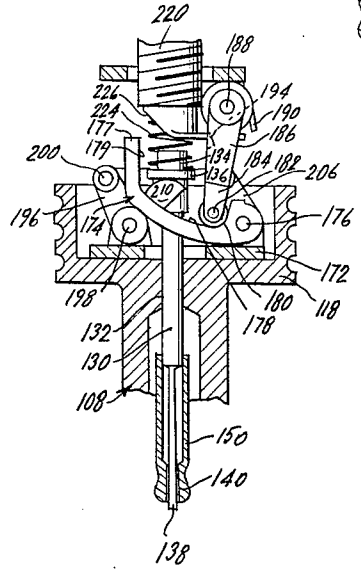
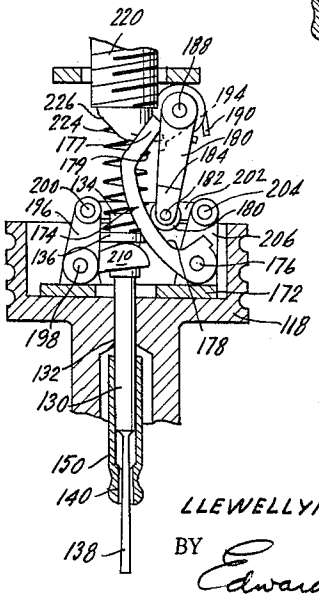


FIG. 11.



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3,281,132

CARBURETOR

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Filed Aug. 23, 1965, Ser. No. 481,617
13 Claims. (Cl. 261—50)

This application contains subject matter identical to that disclosed in my co-pending application Serial No. 127,170 filed July 27, 1961 and constitutes a continuation-in-part thereof.

This invention relates to a carburetor for an internal combustion engine and more particularly to a down draft carburetor of a variable vacuum design.

The primary object of the present invention resides in the provision of a carburetor for an internal combustion engine such as used on passenger cars and the like wherein the carburetor is so designed as to permit a motor car or other automotive vehicle to operate smoothly under varying conditions such as cornering at considerable speeds, driving at various atmospheric conditions such as at low and high elevations, accelerating out of a curve, and with the vehicle in a tilted position.

A further object of the present invention is to provide, in a carburetor, high jet friction for fuel so that when the throttle is closed suddenly the fuel will not continue to flow because of jet friction thereby eliminating overrunning.

In accordance with an illustrative embodiment of the invention there is provided a down draft carburetor comprising a body having an air valve movably mounted therein. The air valve has a fuel passage therein and a metering needle is disposed in the fuel passageway for controlling the amount of fuel flow from a fuel chamber surrounding the air valve to the manifold. One of the principal features embodied in the invention is means for affording a variably progressive lift of the fuel needle with respect to the lift of the air valve, so as to achieve a jet orifice whose coefficient of discharge under all ordinary conditions is approximately constant with a fine atomizing of the fuel near the orifice. In order to achieve the variable progressive lift of the fuel needle in comparison to the lift of the air valve there is provided a linkage means including a cam mounted on the air valve which is engaged by a link pivoted to the body of the carburetor, which link engages the cam and the needle. An adjusting screw having another cam mounted thereon is threadedly engaged in the body and is adapted to adjustably engage the link on the first cam to control the relative rate of motion of the needle and the air valve.

Another feature of the invention resides in the employment of a float concentric with the air valve disposed in the fuel chamber. This concentric float permits a motor car such as is used in racing to corner at considerable speed and to accelerate out of the curve without starving off the fuel supply. The concentric float controls suitable fuel flow means for feeding fuel to the fuel chamber.

The construction of this invention features an additional novel arrangement in parts wherein the fuel passageway in the air valve is provided with a venturi therein with the fuel needle extending into the venturi and being tapered upwardly so that the further the needle extends downwardly into the venturi, the greater the amount of fuel will be able to flow between the needle and the venturi. Because of the use of the venturi there is a fine atomizing of the fuel near the orifice and more complete combustion is achieved.

A further object of the invention resides in the provision of a down-draft carburetor which is constructed and arranged so as to permit a jacket for heated water to warm the fuel air mixture to be provided.

The construction of the carburetor according to the present invention is such that the carburetor operates under a variable depression. When a constant suction carburetor is called upon to perform high duty such as in racing, it will no longer work under its normal or designed depression. However, a higher depression than is usually suitable for a constant suction design is also desirable in order to effect atomization of the fuel when discharge rate is high. The present invention is designed to provide fine atomization of the fuel under special conditions and is designed to work at a depression as high as 25" of water at its maximum limit while the low limit of working before the air valve lift is 7" to 8" of water. By keeping the lower limit of working pressure low, the weight of the moving part, that is the air valve, and hence its inertia can be kept down. The air valve is counterbalanced as it is inverted and balanced by metered springs. Further, under slow running and like conditions the depression in the mixing chamber is 4" of water, but owing to the great restriction caused by the venturi tube about the orifice, the air velocity at this point is extremely high and in the order of 200' per second.

A further object of the present invention is to provide a carburetor which has means for adjustment of the spring action on the fuel needle with respect to the air valve so that the carburetor can be adjusted for use at both low and high altitudes.

Still further objects and features of this invention reside in the provision of a down-draft carburetor that is simple in construction, efficient in operation, capable of being utilized in conjunction with various existing internal combustion engines, and which is efficient in use.

These, together with the various ancillary objects and features of the invention which will become apparent as the following description proceeds, are attained by this down-draft carburetor, a preferred embodiment of which has been illustrated in the accompanying drawings, by way of example only, wherein:

FIG. 1 is a vertical sectional view of a down-draft carburetor constructed in accordance with the concepts of the present invention;

FIG. 2 is another vertical sectional view of the carburetor, taken on a plane normal to the plane of FIG. 1, and illustrating in particular the coaction between the float and the means for feeding fuel into the fuel chamber;

FIG. 3 is a horizontal sectional view taken along the plane of line 3—3 in FIG. 2 illustrating particularly the construction of the air valve and relative arrangement of the needle valve and fuel passageway in the air valve communicating with the fuel chamber;

FIG. 4 is a horizontal sectional view taken along the plane of line 4—4 in FIG. 2, illustrating details of the float and fuel feeding mechanisms;

FIG. 5 is a horizontal sectional view taken along the plane of line 5—5 in FIG. 2 and showing the air valve in a bottom plan view;

FIG. 6 is a partial elevational view showing the control assembly for the fuel metering needle at a setting for a lean fuel mixture, with the engine in starting or idling condition;

FIG. 7 is a partial elevation view similar to FIG. 6 with the assembly set for a lean fuel mixture, but with the engine in accelerated condition;

FIGS. 8 and 9 are partial elevational views, similar to FIGS. 6 and 7, but showing the control assembly for the fuel metering needle at a setting for medium fuel mixture, with the engine respectively at starting and accelerated conditions; and

FIGS. 10 and 11 are partial elevation views similar to FIGS. 8 and 9, but showing the control assembly for the fuel metering needle at a setting for rich mixture.

With continuing reference to the accompanying drawings wherein like reference numerals designate similar parts throughout the various views, reference numeral **10** generally designates a down-draft carburetor constructed in accordance with the present invention. The carburetor is provided with a body **12** formed of several sections including a base section **14**, a central section **16**, and a cover section **18**. The base section is designed to be connected to the intake manifold by means of suitable fasteners and includes a bowl **20** for receiving an atomized fuel-air mixture for feeding past a butterfly valve **22** into the manifold. Surrounding the bowl is a jacket **24** adapted to be filled with hot water for heating the fuel air mixture so that better vaporization can be obtained and so as to aid in the starting operation of the internal combustion engine when it is cold.

The middle section **16** of the carburetor is provided with a flange **26** and bolts **28** or other suitable fasteners extend through the flange **26** into the base **14** for attaching the middle section **16** of the carburetor in a detachable manner to the base. The cover **18** is likewise provided with a flange **30** and bolts **32** or other suitable fasteners are threadedly engaged in the middle section **16** of the carburetor for detachably securing the cover thereto.

It is to be noted that each of the sections of the body **12** are preferably cast from bronze or aluminum. The central section **16** of the body is provided with an inner wall **34** defining a fuel chamber **38** in conjunction with the outer wall **36** of the middle section **16**. The fuel chamber **38** is closed off at the top by a downwardly extending projection **40** of the cover **18** and by a ring **42** and a housing **44**. The housing **44** is provided with a flange **46** which extends between the projection **40** and a ring **42**.

Also provided on the central section **16** is a fuel inlet member **48** which has an internally threaded portion **50** for reception of a cap **52**. A fuel supply line **54** is connected to the full inlet member **48** and is designed to feed fuel upward through the fuel inlet member and into the fuel chamber **38**. In order to control flow of fluid there is provided a needle valve **56** having a rod **58** attached thereto and having a pair of collars **60** and **62** on the rod. The collars are adapted to be engaged by a follower **64** which, as can be best seen in FIG. 4 is in the form of a bifurcated end portion of a float bracket **66** pivoted as at **68** to the central section **16**. The bracket **66** is in the form of a yoke of semi-circular shape and has stub axles **70** and **72** on the ends thereof which stub axles engage the bearing blocks **74** and **76** fixed to a float **78** which is substantially of a doughnut or torus shape and is concentrically disposed about the cylindrical inner wall **34** of the central portion **16**.

The cap contains a plate **80** provided with an aperture **82** therethrough, through which the upper end **84** of the pin **58** extends. The pin **58** is provided with a threaded portion **86** and threadedly engaged on the threaded portion is a washer **88**. A spring **90** is positioned so as to bias the plate **80** and the washer **88** whereby the needle valve **56** is normally urged to a closed position and is held out of the closed position by action of the yoke **66**. As can be readily seen, the float is in a lowered position due to a low level of fluid in the fuel chamber **36**. Further, when the level of fuel in the fuel chamber **38** achieves that to which the assembly is set for optimum performance of the carburetor, by adjustment of the position of the threaded washer **88**, the pin **58** will be pushed downwardly until the needle **56** cuts off the flow of fluid to the fuel chamber **38**. As fuel leaves the fuel chamber **38**, the needle valve **56** will open permitting the fluid chamber **38** to be always filled to the proper level.

The center section **16** of the body **12** is provided with a portion **100** of reduced cross sectional dimension which has a plurality of apertures **102** therethrough communicating with the atmosphere. Further, the flange portion **26** of the central section **16** is provided with a valve seat **104** in the form of a bevelled surface which is adapted to cooperate with the bevelled surface **106** of an air valve member **108** which is slidably movably closely fitted with the inner cylindrical wall **34** of the center section **12**. The air valve **108** has its lower portion provided with a plurality of diverging passages or outlets **110** which communicate with the mixing chamber **20**. The bottom end **112** of the air valve member **108** is concave. The air valve member is provided with a fuel vapor passage **114** therein which communicates with the outlet **110**. Further, the air valve is provided with an enlarged area **118** and a cylindrical wall **120** which closely engages the inner surface **122** of the cover portion **18**. A coil spring **124** engages the flange **46** of the housing **44** and the shoulder **126** formed by the enlargement **118**, so that the spring **124** normally urges the air valve **108** into a closed position preventing flow of air from entering the mixing chamber **20**. However, when the air valve member moves downwardly due to suction induced in the mixing chamber **20** and applied against the bottom surface of the air valve member, the air valve member will be sucked downwardly against the action of the spring **124** permitting flow of air into the mixing chamber **20** and thence into the manifold.

A metering needle **130** is slidably, movably disposed and extends upwardly and out of the air valve member through a bore **132** in the upper portions of the air valve member. The metering needle **130** is provided with a bushing or fitting **134** having a collar **136** at the upper end thereof and is provided with an upwardly tapering portion **138** which controls flow of fluid through an orifice **140**. The orifice **140** is formed in an orifice block **150** (FIG. 2) which is fixedly held in place in association with the housing **44** and which has a tortuous passageway **152** therein communicating at one end with the tube **154**, which extends into the fuel chamber **38**, and at the other end with the orifice **140**. The orifice block **150** extends through a slot in the valve member **108**, thereby permitting downward sliding movement of said valve member relative to the orifice block **150**, which is always stationary.

Fixed in place and held thereto by the lower portion **111** of the air valve **108**, which is threadedly detachably secured to the upper member **119** of the air valve member **108**, is a venturi **160**. The venturi **160** is adapted to move with the air valve **108** and the orifice block **150** extends almost all the way through to the constriction when the air valve is in a closed position such as during idling operation of the engine.

It will be observed that the orifice block **150**, having the fuel orifice **140**, is a fixed portion of housing **44** and is, therefore, stationary at all times. The metering needle **130**, on the other hand, is mounted on and carried by the air valve **108** such that when the air valve **108** is drawn downwardly, the needle **130** is drawn with it, so that its narrower upper tapered portion **138** moves into registry with the orifice **140** and permits fuel to feed therethrough. If the metering valve **130** were rigidly secured to the air valve **108**, the amount of fuel fed through orifice **140** would be dependent solely on the degree of travel of said air valve. In accordance with the invention herein, however, there is provided an arrangement whereby the metering needle **130** can move at a controlled rate relative to the movement of the air valve **108**; that is to say, the rate of movement of needle **130** can be adjusted so that its movement is selectively faster than the rate of movement of the air valve **108**.

In order to accomplish the aforementioned adjustment, an assembly generally indicated at **170** is provided. This assembly includes a plate **172** mounted on the air valve to which a multiplying lever **174** is pivoted at **176**. The multiplying lever **174** has a cam surface **178** which is adapted to be engaged by a roller cam follower **180**

rotatably mounted by means of axle **182** and the bifurcated ends **184** of a link **186** pivotally mounted at **188** on the cover section **18** of the body and normally urged by torsion springs **190** upwardly clockwise as shown in FIG. 1. The link **186** is provided with a notch **194** therein. A further link **196** is pivoted as at **198** to the plate **172** and also pivoted at **200** to a link **202** which is pivoted at **204** to a link **206** also pivoted to the plate **172** by pivot shaft **176** making a parallelogram linkage. The link **206** is thus mounted to turn in unison with multiplying lever **174**. The link **196** is formed as a lever having an angularly disposed integral arm **210** having a terminal cam surface which engages the collar **136** at the upper end of the metering needle **130** so that as the link **196** rotates, it will translate such rotational motion to reciprocal motion of the metering needle **130**.

Threadedly secured in the cover **18** is an adjusting cap **220** which has a recess **222** therein. Within the recess **222** there is provided a spring **224** which engages the cap **220** and the collar **136** on the metering needle **130**.

The spring **224** exerts a downward biasing force on collar **136**, which in turn biases the lever arm **210** of link **196** in a downward or clockwise direction, and urges the multiplying lever **174** in an upward or clockwise direction through the parallelogram linkage **172**, **196**, **202**, **206**. The cam surface **178** of multiplying lever **174** is thus biased into engagement with the roller **180** on link **186**. The lower end of the cap **220** is shaped to extend at an oblique angle to form a cam **226** which engages within the notch **194** in the link **186** to vary the inclination of said link **186** and selectively position the roller **180** along the cam surface **178**.

It will be observed in FIGS. 6–11 that the multiplying lever **174** has a main body portion **175** having the arcuate cam surface **178**, and a terminal body portion **177** having a planar cam surface **179** arranged at a substantial angle to the arcuate cam surface **178**.

In the position shown in FIGS. 1 and 6, the cap **220** is adjusted so that the highest point on its cam surface **226** engages the notch **194** in link **186**. This positions the link **186** at an angle of approximately 45° from the vertical, as shown in FIG. 1, and represents a setting for lean fuel feed.

The cap **220** may be turned to the position shown in FIG. 8, representing a medium fuel feed. When this occurs, a lower portion of cam surface **226** moves into engagement with notch **194**, causing the link **186** to turn in a counter-clockwise direction toward the vertical. This movement permits the multiplying lever **174** to turn in an upward or counter-clockwise direction, in turn, permitting the metering needle **130** to move downwardly under the biasing force of spring **224**. If the cap **220** is turned to the position of FIG. 10, in which the lowermost portion of cam surface **226** engages notch **194**, the link **186** is turned to the substantially vertical position shown, and the multiplying lever **174** moves counterclockwise to the position shown, allowing the metering needle **130** to move further downwardly under the force of spring **224**. The position of FIG. 10 represents a setting for rich fuel feed.

As can be readily seen, when the metering needle **130** is in a lowered position, the lower the position, the more fluid can flow past the tapered portion **138** of the metering needle. This tapered portion **138** has tapering and inverted slots for the purpose of metering the flow of the fluid with a high jet friction to prevent over-running of the jet upon decreasing engine speed. In other words, spillover is prevented. The grooves in this needle are V-cut and have rounded corners.

In the adjusted position of FIGS. 1 and 6, representing the setting for a lean mixture, the link **186** is disposed at such an angle that it maintains the multiplying lever **174** at the angle shown, with the terminal body portion **177** vertically upstanding. The roller **180** is located at the lower end of the planar cam surface **179** of the terminal

body portion, and the parallelogram linkage is so disposed that the tapering end portion **138** of metering needle **130** blocks the orifice **140**.

When suction in the bowl **20** causes the valve member **108** to slide downwardly, the plate **172**, parallelogram linkage **196**, **202** and **206**, and metering needle **130** are carried downwardly with said valve member **108**. The link **186**, however, remains stationary and its end roller **180** rides along the vertically-disposed planar cam surface **179** of multiplying lever **174**, so that there is no pivoting movement of said lever **174**, no movement of the parallelogram linkage, and no vertical movement of the metering needle **130** relative to the valve member **108**. As shown in FIG. 7, the tapering portion **138** of metering needle **130** moves downwardly through the orifice **140** of the fixed orifice block **150** so that a portion of lesser diameter is brought into registry with said orifice to provide an annular fuel outlet opening. It will be understood, however, that in this lean adjustment of FIGS. 6 and 7, the metering needle **130** is carried downwardly with the air valve member **108** at the same rate of travel as the latter.

When the carburetor assembly is adjusted for a medium fuel mixture, as shown in FIG. 8, by turning the cap **220**, as previously described, the link **186** is pivoted downwardly, or in a couner-clockwise direction by the cam surface **226** of said cap. As link **186** turns from the adjusted position of FIG. 6 to the adjusted position of FIG. 8, the roller **180** rides downwardly along the arcuate cam surface **178** of multiplying lever **174**. This arcuate cam surface **178** describes an arc whose center is at the axis of pivot **188**, so that this adjusting movement does not affect the angular disposition of the multiplying lever **174**, and the metering needle **130** is maintained in the position in which its tapering end portion **138** blocks the orifice **140**.

With the assembly set in this position of medium fuel feed, when the valve member **108** is drawn downwardly by suction, the multiplying lever **174** tends to move away from the roller **180**. However, the spring **224**, exerting a downward biasing force on metering needle **130**, thereby urges the arm **210** of lever **196** downwardly, causing the parallelogram linkage to shift in a direction to move the multiplying lever **174** in a clockwise direction. The multiplying lever is thus biased to remain in engagement with the roller **180**, and as the valve member **108** moves downwardly, the multiplying lever **174** turns in a clockwise direction, lowering the lever arm **210** and permitting the metering needle **130** to be urged downwardly by spring **224**. Thus, the metering needle moves downwardly at a faster rate than the valve member **108**, and the tapering end portion **138** extends a further distance through orifice **140**, presenting an annular opening of greater diameter, as can be seen by a comparison of FIG. 9 with FIG. 7.

When the carburetor assembly is adjusted for a rich fuel mixture, as shown in FIG. 10, the cap **220** is turned until the lowest point of its cam surface **226** engages the notch **194**, and the link **186** is thus disposed in a substantially vertical position. The multiplying lever **174** is biased further in a clockwise direction so that it is more vertically upstanding from the pivot **176**, and the lower portion of its arcuate cam surface **178** is in engagement with roller **180**.

At this setting, when suction in the bowl **20** causes the valve member **108** to slide downwardly, the multiplying lever **174** is spring-urged an appreciable distance clockwise in order to remain in engagement with roller **180**. Thus, as the metering needle **130** is carried downwardly with valve member **108** to unblock the orifice **140**, it is also moved downwardly a substantial distance relative to the valve member **108**, under action of the multiplying lever **174** through the parallelogram linkage. In the position of FIG. 11, therefore, the upper portion of the tapering end **138** of the metering needle is located within

the orifice **140**, and its small diameter provides a large annular fuel outlet opening.

The venturi **160** terminates short of the outlets **110** and the venturi will change the rate of flow of the fuel to increase it to the extent that it flows at the rate of about 200 feet per second causing the fuel to atomize into a fine mist which is combined with air in the bowl **20** after the fuel has left the outlet **110**. The air brought into the bowl **20** may of course be filtered by a filter or screen positioned concentrically about the portion **100** of reduced cross sectional area by means of the complementary notches **260** and **262** formed in the center section **16** of the under surfaces of the center section **16** of the body.

The float **78** which is concentrically disposed about the air valve member **108** and about the fuel passage controls the operation of the fuel needle valve **56** whereby flow of fuel into the fuel chamber **38** is controlled. As the speed of the engine increases, a greater suction on the bowl **20** will be present and the air valve member **108** which is normally held in a raised position against gravity by the spring **124** will be sucked downwardly. Dependent on the position of the link **186**, the metering needle **130** will move with respect to the air valve member. The farther the metering needle **130** is permitted to move downwardly, the greater the flow of fuel into the bowl **20** there will be.

A latitude of modification, change and substitution is intended in the foregoing disclosure and in some instances some features of the invention will be employed without a corresponding use of other features. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the spirit and scope of the invention herein.

I claim:

1. A carburetor comprising a body, an air valve movably disposed in said body, said air valve having a fuel passage therethrough, a metering needle disposed in said passage, first means mounting said air valve for movement in said body and second means connecting said needle to said air valve for movement with said air valve and for relative movement with respect thereto, adjusting means coacting with said second means for adjusting the relative movement of said needle with respect to said air valve in response to movement of said air valve between one extreme where said needle is carried by said air valve without movement relative thereto, and another extreme where said needle is carried by said air valve and has maximum movement relative thereto, said body including a chamber concentric with said air valve, said passage communicating with said chamber, a float concentric with said air valve disposed in said chamber, and fuel flow means connected to and controlled by said float for feeding fuel to said chamber.

2. A carburetor comprising a body, an air valve movably disposed in said body, said air valve having a fuel passage therethrough, a metering needle disposed in said passage, a stationary fuel orifice in said passage surrounding and controlled by said needle, means for adjusting said needle relative to said air valve to adjust the mixture of air and fuel, first means mounting said air valve in said body and second means mounting said needle in said body for adjusting the relative movement of said needle with respect to said air valve upon movement of said air valve, said fuel passage having a venturi therein surrounding said orifice, said venturi being carried by said air valve for movement therewith, said needle extending beyond said orifice into said venturi, said needle being tapered upwardly so that the further said needle extends downwardly into said venturi, the greater the amount of fuel that can be discharged from said venturi.

3. A carburetor comprising a body, an air valve movably disposed in said body, said body including a valve seat, spring means supporting said air valve and urging said air valve against said seat, said air valve having a fuel passageway therethrough, a metering needle disposed in said passage, linkage and cam means mounting said needle and said air valve in said body for progressively moving said needle in response to movement of said air valve, and said linkage and cam means including means adjusting said needle and air valve between one extreme where said needle is moved with said air valve without movement relative thereto and another extreme where said needle is moved with and has maximum movement relative to said air valve.

4. A carburetor according to claim **3**, in which said linkage and cam means includes a first cam mounted on said air valve, means operatively coupling said first cam with said needle, a link mounted on said body engaging said first cam, a second cam and means adjustably mounting saaid second cam on said body for engagement with said link to adjust the position of said link on said first cam.

5. A carburetor comprising a body having an air valve movably mounted therein, spring means connecting said air valve to said body and normally urging said air valve to a closed position during idling operation, means for urging said air valve to an open position by a vacuum condition in said body during operation at speeds higher than idling, said body having a fuel chamber therein, said air valve having a fuel passageway therein communicating with said fuel chamber, a metering needle disposed in the fuel passageway for controlling the amount of fuel flow from said chamber through said fuel passageway, linkage means connected to said air valve to engage said needle for adjusting the relative travel of said needle with respect to said air valve when said air valve moves in response to a vacuum condition in said body, and means for adjusting said linkage means between a first position in which said needle is moved with said air valve without movement relative thereto and a second position in which said needle is moved with and has a maximum movement relative to said air valve.

6. A carburetor according to claim **5**, in which said carburetor is a downdraft carburetor and includes, a float concentric with said air valve disposed in said chamber, and fuel flow means on said body connected to and controlled by said float for feeding fuel to said chamber.

7. A carburetor according to claim **5**, in which said carburetor is a downdraft carburetor and said linkage means includes a first cam mounted on said air valve and controlling the movement of said linkage, and said adjusting means includes a link mounted on said body for engaging said first cam, and a second cam adjustably mounted on said body engaging said link to adjust the position of said link on said first cam to adjust the relative movement of said needle and said air valve.

8. A carburetor according to claim **5**, in which said carburetor being a downdraft carburetor and, said fuel passageway has a venturi therein, said needle extending into said venturi, said needle being tapered upwardly so that the further said needle extends downwardly into said venturi, the greater the amount of fuel that can be discharged from said venturi so that the rate of fuel flow increases at substantially the same ratio as the rate of air flow increases.

9. A carburetor according to claim **5**, in which said linkage means includes a first cam mounted on said air valve, a link mounted on said body for engaging said first cam and means operatively coupling said first cam with said needle, and in which said adjusting means includes a second cam adjustably mounted on said body engaging said link for adjusting the position of said link on said first cam to adjust the relative movement of said needle and said air valve, said carburetor also including a float concentric with said air valve disposed in said chamber, and fuel flow means on said body connected to and controlled by said float for feeding fuel to said chamber.

10. A downdraft carburetor comprising a body having an air valve movably mounted therein, spring means mounting said air valve in said body and normally urging said air valve to a closed position during idling operation, means urging said air valve to an open position by a vacuum condition in said body during operation at speeds higher than idling, said body having a fuel chamber therein, said air valve having a fuel passageway therein communicating with said fuel chamber, a metering needle disposed in said fuel passageway for controlling the amount of fuel flow from said chamber through said fuel passageway, said fuel passageway having a venturi therein, said needle extending into said venturi, said needle being tapered upwardly so that the further said needle extends downwardly into said venturi, the greater the amount of fuel that can be discharged from said venturi, linkage means connected to said air valve and said needle for adjusting the relative travel of said needle with respect to said air valve when said air valve moves in response to a vacuum condition in said body, said linkage means including a first cam mounted above said air valve, means operatively coupling said first cam with said needle to vary the position of said needle relative to said air valve in response to movement of said first cam a link pivoted to said body and having a roller cam follower engaging said cam, a second cam, and means adjustably mounting said second cam on said body with said second cam engaging said link for adjusting the position of said roller cam follower on said first cam to adjust the relative travel of said needle and said air valve to control the richness of the air fuel mixture.

11. A downdraft carburetor according to claim 10 which also includes a float concentric with said air valve disposed in said chamber, and fuel flow means on said body connected to and controlled by said float for feeding fuel to said chamber.

12. A carburetor comprising a body, an air valve movably disposed in said body, said air valve having a fuel passage therethrough, a metering needle disposed in said passage, first means mounting said air valve in said body and second means mounting said metering needle in said body for progressively moving said needle relative to said air valve in response to movement of said air valve

such that the rate of fuel flow increases and decreases at substantially the same ratio as the rate of air flow increases and decreases, said second means including means mounting said metering needle for adjustable movement with respect to said air valve between a first position in which said needle moves with said air valve and without movement relative to said air valve and a second position in which said needle moves with said air valve and has a maximum movement with respect to said air valve.

13. A carburetor comprising a body having a stationary fuel outlet orifice, an air valve movably mounted in said body, said air valve having a fuel passage therethrough, a metering needle carried by said air valve for movement therewith relative to said stationary fuel outlet orifice, means mounting said metering needle movably relative to said air valve, a linkage mounted on said air valve and engaging said metering needle for adjusting the position of said needle relative to said air valve, a cam member connected to said linkage for varying the position thereof, and manually adjustable means mounted on said body and engaging said cam for progressively adjusting the relative movement of said needle with respect to said air valve in response to movement of said air valve between one extreme in which said needle is moved with said air valve without movement relative to said air valve and another extreme in which said needle moves with said air valve and has a maximum movement to said air valve.

References Cited by the Examiner

UNITED STATES PATENTS

1,010,185	11/1911	Schultz.	
1,356,661	10/1920	Schultz.	
1,737,184	11/1929	Bright.	
2,868,522	1/1959	O'Neil.	
2,999,674	9/1961	McClain	261—50

FOREIGN PATENTS

435,768	9/1935	Great Britain.

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