May 30, 1967 D. D. STOLTMAN 3,322,408

CARBURETOR

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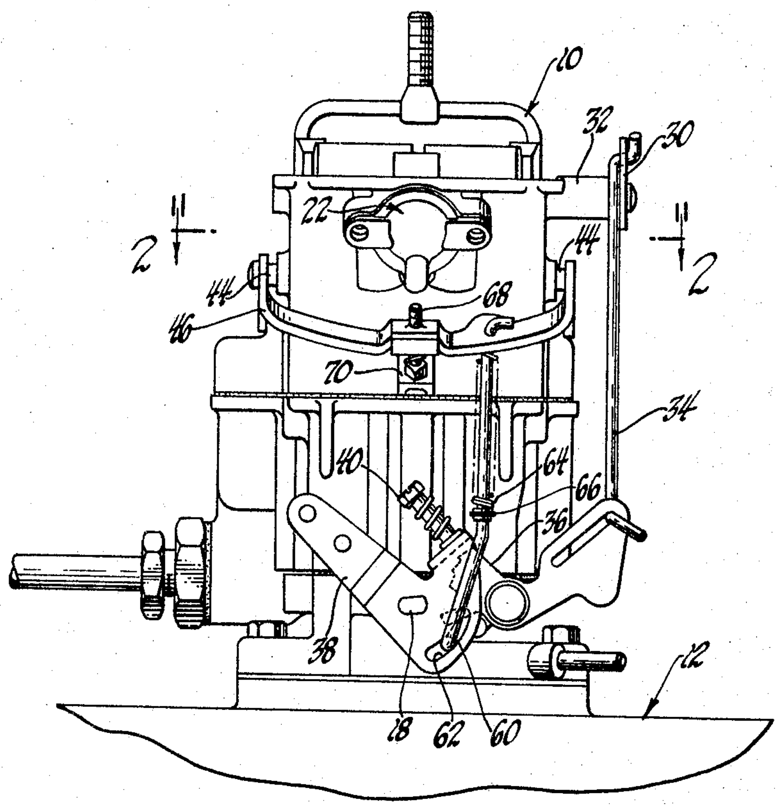

Fig. 1

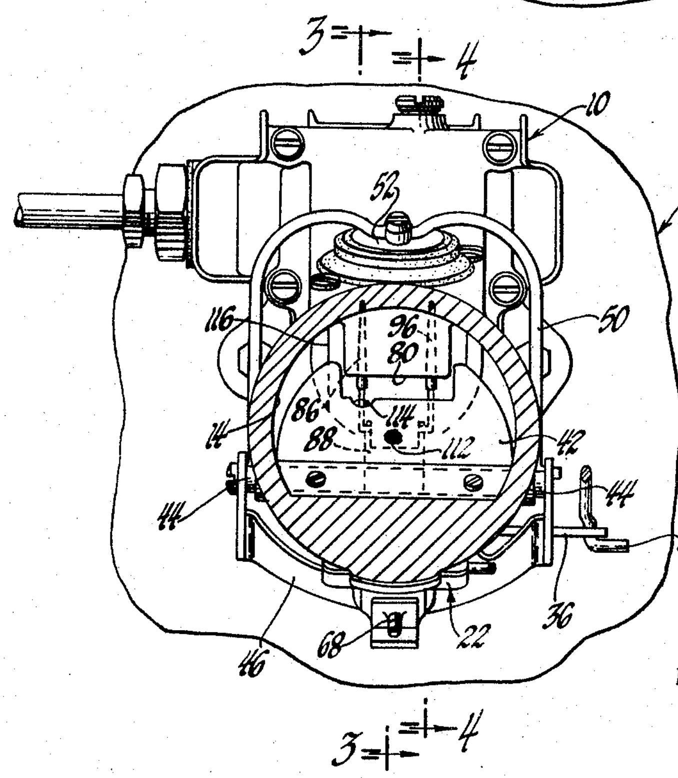

Fig. 2

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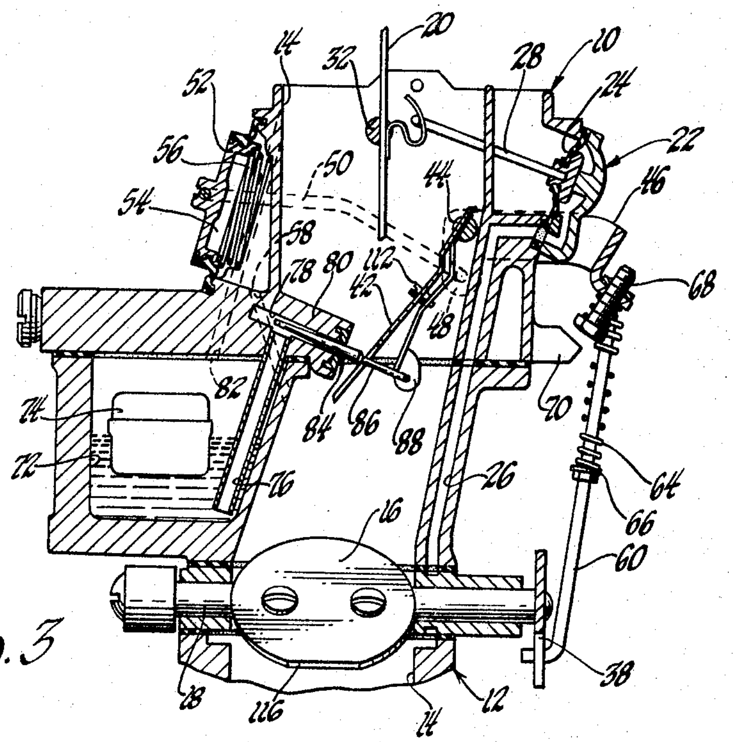

Fig. 3

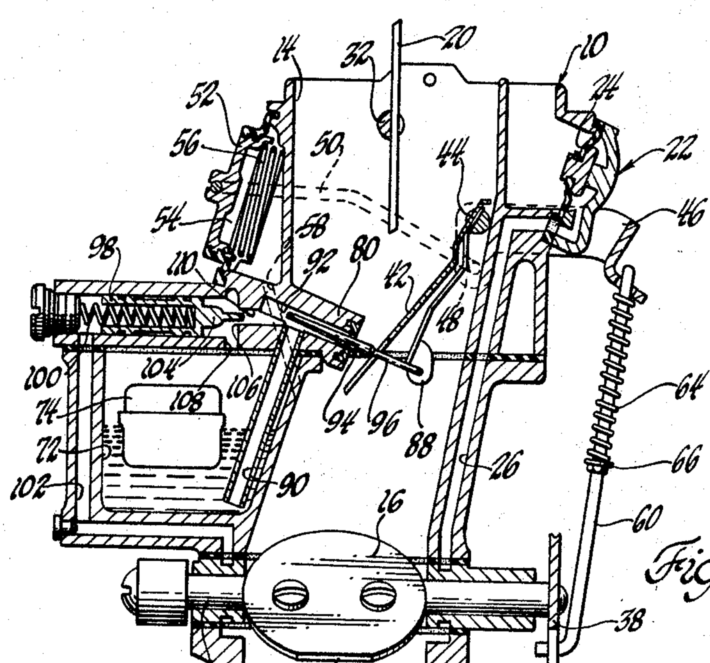

Fig. 4

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This invention relates to carburetors for internal combustion engines and is particularly directed to a carburetor of the air valve type.

An air valve carburetor is uniquely capable of providing an air-fuel mixture which may be closely tailored to the requirements of the engine throughout a wide range of engine air flow rates. In such a carburetor, a flow responsive valve located in the air inlet is positioned by air flow to the engine; this air valve thus regulates and meters the engine air flow. Fuel metering rods are in turn positioned by the air valve so that fuel flow to the engine is metered in desired proportions to the air flow. Since direct control is exerted over both air and fuel flow to the engine, this type of carburetor very accurately regulates the proportions of the air-fuel mixture delivered to the engine.

Until recently air valve carburetors have not achieved a significant degree of commercial success. This may be attributed to, among other reasons, the fact that no available air valve carburetors had the air and fuel metering controls both compactly and conveniently located. This invention provides an air valve carburetor in which these controls are located so that fuel is metered as it is delivered into the air stream in the center of the mixture conduit. The controls are thus readily accessible for servicing and yet are located so that a proper distribution of the air-fuel mixture may be formed in the mixture conduit.

The details as well as other objects and advantages of this invention are disclosed in the following description and in the drawings in which:

FIGURE 1 is an elevational view of the carburetor mounted upon an engine;

FIGURE 2 is a sectional view of the carburetor along line 2—2 of FIGURE 1 and illustrates the configuration and location of the air valve;

FIGURE 3 is a sectional view along line 3—3 of FIGURE 2 illustrating the economy metering system of this carburetor; and

FIGURE 4 is a sectional view along line 4—4 of FIGURE 1 illustrating the power metering system of this carburetor.

Referring to the drawing, a carburetor **10** is secured to the intake manifold **12** of an internal combustion engine. A single mixture conduit **14** extends through the carburetor and is controlled at the outlet end by a throttle valve **16** secured to a throttle valve shaft **18**.

A choke valve **20** is disposed in the inlet to mixture conduit **14** and is controlled in the conventional manner by a thermostatic member (not shown) and a vacuum break mechanism **22**. As illustrated in FIGURES 3 and 4, the vacuum break mechanism **22** includes a diaphragm **24** subjected on its right-hand side to manifold vacuum through a passage **26** which communicates with mixture conduit **14** below throttle valve **16**. Before the engine is started, choke valve **20** will be closed by the thermostatic element. However, as soon as the engine begins to run under its own power, diaphragm **24** will be pulled to the right and a plunger **28** secured thereto will pull choke valve **20** to a slightly open position to lean the mixture.

As shown in FIGURE 1, a lever **30** secured to choke valve shaft **32** vertically positions a link **34** which in

turn positions a fast idle cam **36**. A throttle lever **38** secured to throttle shaft **18** carries an idle adjusting screw **40** which cooperates with fast idle cam **36** in the customary manner to regulate the throttle position during warm-up of the engine.

As shown in FIGURES 2 through 4, an air valve **42** is pivotally disposed in mixture conduit **14** upon an air valve shaft **44** which extends through the walls of mixture conduit **14**. A U-shaped lever **46** is secured at both ends to the ends of air valve shaft **44** and extends about the exterior of the carburetor. As shown in FIGURES 3 and 4, lever **46** includes arms **48** (one being located on each end of lever **46**). A U-shaped link **50** is connected at both ends to arms **48** and extends about the exterior of the carburetor to be secured to a flexible diaphragm member **52**. The exterior of diaphragm **52** is acted upon by atmospheric pressure while the other side of diaphragm **52** is subjected to the pressure in the chamber **54** enclosed thereby. Atmospheric pressure operates on diaphragm **52** in an air valve opening direction and is opposed by the bias of a spring **56** within chamber **54**. Chamber **54** is subjected through a passage **58** to the pressure in mixture conduit **14** at a location between air valve **42** and throttle valve **16**.

As throttle valve **16** opens, the vacuum existing therebelow is applied against the downstream side of air valve **42** and against diaphragm member **52**. Diaphragm **52** is pulled to the right and, through link **50** and arms **48**, rotates air valve shaft **44** in a counterclockiwse direction. Air valve **42** is thus opened and admits air to reduce the vacuum therebelow. Diaphragm **52** and spring **56** cooperate to maintain the vacuum below air valve **42** within a predetermined range.

As shown in FIGURES 1, 3 and 4, a link **60** is positioned in a slot **62** in throttle lever **38** and extends through an opening in the U-shaped lever **46**. A spring **64** is compressed about link **60** between lever **46** and a shoulder **66** formed on link **60**. As throttle valve **18** is brought to a wide open position, link **60** will be forced upwardly by the end of slot **62**. Spring **64** then urges the U-shaped lever **46** in a counterclockwise, or air valve opening, direction. Thus air valve **44** will be urged open whenever the throttle **16** is opened suddenly, thereby increasing air flow through mixture conduit **14**.

As best shown in FIGURE 3, an adjustable stop **68** is carried by U-shaped lever **46** to cooperate with an abutment **70**, limiting air valve closing movement. Stop **68** allows accurate adjustment of the closed or idling position of air valve **42** and, in addition, yields to absorb impact should a backfire type of explosion occur in the intake manifold, thereby permitting air valve **42** to contact the wall of mixture conduit **14** and avoid distortion of the air valve.

Referring to FIGURE 3, a fuel bowl **72** includes a conventional float mechanism **74** for maintaining the fuel at a substantially constant level. A tube **76** extends from the bottom of fuel bowl **72** to a metering passage **78** in a fuel nozzle **80** projecting into mixture conduit **14**. A passage **82** connects the upper portion of fuel bowl **72** with the inlet of mixture conduit **14** so that the pressure on the fuel surface is maintained at substantially atmospheric pressure. The discharge outlet of metering passage **78** is centered over throttle valve **16** in the subatmospheric pressure region created by air valve **42**. The pressure differential across the fuel in bowl **72** caused by atmospheric pressure on the surface and subatmospheric pressure at the outlet of nozzle **80** causes fuel to flow from the bowl **72** into mixture conduit **14**.

An economy metering orifice **84** is disposed at the discharge outlet of metering passage **78** and is regulated by an economy metering rod **86**. Metering rod **86** is supported and positioned by a metering rod carrier **88** secured to air valve shaft **44**. As air valve **42** opens, metering rod carrier **88** withdraws metering rod **86** from orifice **84** to permit an increase in the fuel discharge from metering passage **78**. This arrangement provides an air-fuel mixture which is closely tailored to the engine requirements throughout the wide range of air flow rates.

Referring to FIGURE 4, a second tube **90** extends from the bottom of fuel bowl **72** to a second metering passage **92** in fuel nozzle **80**. A power metering orifice **94** is disposed at the discharge outlet of metering passage **92** and is regulated by a power metering rod **96**. Metering rod **96** is also supported and positioned by the metering rod carrier **88** which is secured to air valve shaft **44**. As air valve **42** opens, metering rod carrier **88** withdraws metering rod **96** from orifice **94** to permit an increase in the volume of fuel discharged from metering passage **92**. Fuel flow through this power metering system is controlled by a manifold vacuum responsive piston **98** so that a power mixture is delivered only when the manifold vacuum is low, indicating the engine's requirement for an enriched mixture. Piston **98** is biased by a spring **100** against the force of vacuum applied through a passage **102** from the mixture conduit **14** below throttle **16**. The end of piston **98** is formed as a valve **104** which cooperates with a valve seat **106** to prevent air flow from the upper portion of fuel bowl **72** to metering passage **92**. When valve **104** is seated on **106**, the suction created by air valve **42** is effective to draw fuel from fuel bowl **72** past the power metering orifice **94** and rod **96**.

Under higher values of manifold vacuum, piston **98** is drawn toward the left so that valve **104** is unseated from **106**. The nearly atmospheric pressure above the fuel in bowl **72** (applied through passage **82** as shown in FIGURE 3) is then bled through passages **108** and **110**, past valve seat **106**, to reduce the vacuum in metering passage **92** and prevent or reduce fuel flow through the power metering orifice **94**. This arrangement provides a mixture enriched to the precise air-fuel ratios required by the engine.

As shown in FIGURES 2 and 3, an adjusting screw **112** positions metering rod carrier **88** with respect to air valve **42** so that the initial settings of metering rods **86** and **96** with respect to metering orifices **84** and **94** may be accurately determined. This adjustment permits each carburetor to be individually tailored and set to the flow characteristics required by the engine.

As best shown in FIGURE 2, the edge of metering valve **42** has a recess **114** adjacent economy metering rod **86** and economy metering orifice **84**. This recess **114** permits a flow of air past the economy metering rod to provide air flow when the engine is idling. Similarly, the downstream edge of throttle valve **16**, located beneath economy metering rod **86** and orifice **84**, has been flattened as indicated at **116** to permit a flow of idling air. This flow of air through recess **114** and past edge **116** is mixed with fuel drawn through the economy metering orifice **84** to provide an idling air-fuel mixture. Adjustment of screw **40** and stop **68** permit accurate control over the rate of idle air flow, and adjustment of screw **112** permits variation in the idle fuel flow. This combination allows the idle air-fuel mixture ratio and volume to be precisely determined.

Reviewing the basic configuration of this carburetor, it will be noted that air flow is generally in the downward direction but varies slightly from the vertical in passing the fuel metering orifices. This variation is created by the slight offset of the mixture conduit inlet from the outlet which is greatly advantageous since it permits the fuel metering orifices to be centered over the throttle valve. Such an arrangement promotes a proper distribution of the air-fuel mixture within the mixture conduit.

It should also be noted that the fuel is discharged along the metering rods in a direction slightly depressed from the horizontal. Thus the fuel is discharged at a right angle to the air flow and an even distribution of the fuel throughout the mixture conduit is achieved.

I claim:

1. An internal combustion engine carburetor comprising a downdraft mixture conduit, a throttle valve pivotally disposed in said mixture conduit and having a recess in the downstream edge thereof to permit flow of an idling air-fuel mixture when said throttle valve is closed, a downwardly inclined fuel delivery nozzle extending into said mixture conduit and having a discharge end centered above said throttle valve, fuel delivery passage means connected to said nozzle to supply fuel thereto, a fuel metering orifice in the discharge end of said nozzle, a metering rod in said mixture conduit associated with said orifice to vary the effective area thereof and control fuel flow therethrough, an air valve pivotally disposed in said mixture conduit, means to position said air valve in accordance with air flow through said mixture conduit, said air valve being contoured to fit closely about said fuel delivery nozzle and having a recess adjacent said metering orifice to permit flow of idling air when said air valve is closed, and means connecting said metering rod to said air valve to support and position said metering rod whereby fuel flow is controlled in accordance with air flow.

2. The carburetor of claim **1** which further includes means connecting said air valve and said throttle valve to urge said air valve to a open position as said throttle valve approaches a wide open position.

3. The carburetor of claim **1** which further includes adjustable stop means to prevent closure of said air valve beyond a predetermined position under normal operating conditions.

4. The carburetor of claim **3** wherein said stop means is yieldable to permit further closing movement of said air valve in the event of a backfire through said mixture conduit.

5. An internal combustion engine carburetor comprising a downdraft mixture conduit; a throttle valve in said mixture conduit; a fuel delivery system including a fuel bowl, a nozzle extending downwardly into said mixture conduit and having a discharge end centered above said throttle valve, and passage means connecting said nozzle and said fuel bowl; and a metering system including economy and power fuel metering orifices, a metering rod associated with each of said orifices to vary the effective area thereof and control fuel flow therethrough, an air valve rotatably disposed in said mixture conduit to maintain the pressure at the discharge end of said nozzle below the pressure in said fuel bowl during engine operation, means to position said air valve in accordance with air flow through said mixture conduit, means connecting said metering rods to said air valve to support and position said metering rods whereby fuel flow is controlled in accordance with air flow, and control means adapted to prevent fuel flow through said power metering orifice when the pressure in said mixture conduit downstream of said throttle valve is below a predetermined value.

6. The carburetor of claim **5** wherein said control means comprises an air bleed adapted to increase the pressure at said power metering orifice to prevent fuel flow therethrough and valve means permitting air flow through said air bleed when the pressure in said mixture conduit downstream of said throttle valve is below said predetermined value.

7. An internal combustion engine carburetor comprising a downdraft mixture conduit; a throttle valve in said mixture conduit; a fuel delivery system including a fuel bowl, a nozzle extending downwardly into said mixture conduit and having a discharge end centered above said throttle valve, and passage means connecting said nozzle and said fuel bowl; and a metering system including a fuel metering orifice in the discharge end of said nozzle, a metering rod in said mixture conduit associated with said orifice to vary the effective area thereof and control fuel flow therethrough, an air valve rotatably disposed in

said mixture conduit, means to position said air valve in accordance with air flow through said mixture conduit, a support member movable with said air valve and secured at one end to said air valve and at the other end to said metering rod to support and position said metering rod whereby fuel flow is controlled in accordance with air flow, and means for adjusting said other end of said support member relative to said air valve whereby said metering rod may be properly positioned relative to said metering orifice.

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