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VANED VALVE

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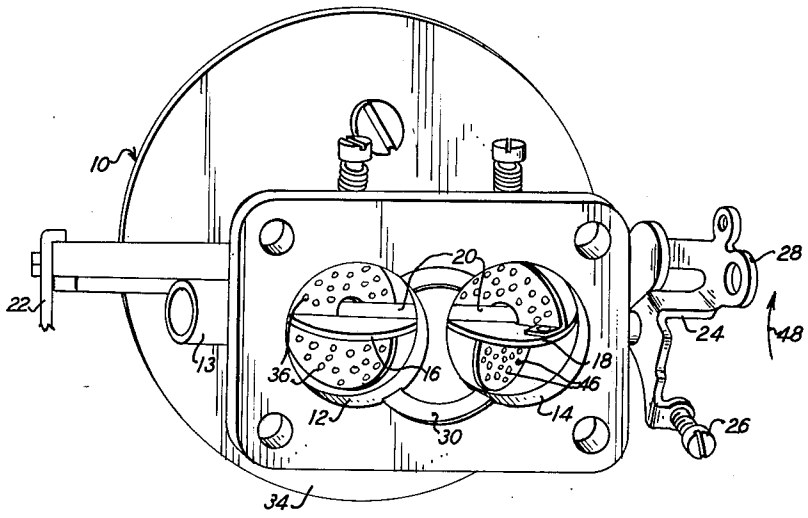


Fig. 1

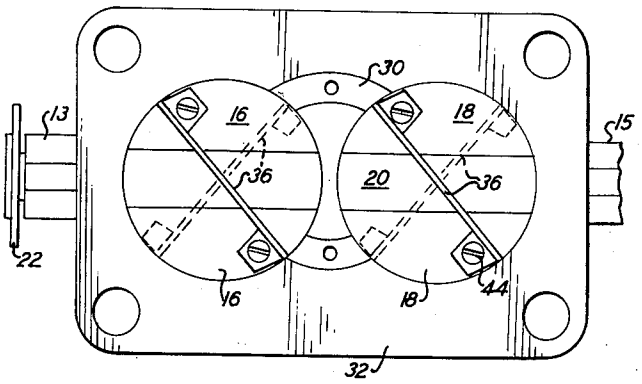


Fig. 4

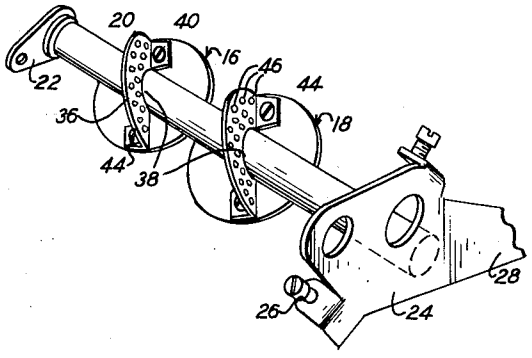


Fig. 2

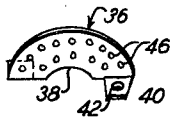


Fig. 3

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VANED VALVE

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This invention relates to a throttling valve primarily useful for carburetors and in particular relates to a modified butterfly throttling vane in a valve for a gas and liquid charge forming device, such as a carburetor. The throttling vane hereof has a baffling means mounted upon the vane progressively operative as the vane is opened for increased liquid mist suspension flow therethrough. The baffling means comprises a secondary vane which is operative in part to more finely break up liquid droplets suspended in the gas into a finer mist. It is also operative in part to impart a spiral helical movement of the suspended mist particles in air for optimum carburetion effect.

According to the present invention a butterfly throttling vane of the carburetor has an auxiliary baffling vane mounted angular to the surface thereof whereby upon opening of the vane, that is, reducing the throttling effect of the normal vane from full closed position, the auxiliary vane becomes operative to have a baffling effect upon gas and liquid particles suspended therein. Such mounting of an auxiliary vane angular to the normal vane makes such auxiliary vane progressively effective as a gas suspension baffling means as the normal traveling vane is progressively opened.

In a preferred construction that auxiliary vane is mounted normal to the plane of the main vane and at an angle of about 45° to its axis of rotation whereby it tends progressively to baffle the mist suspension in air to a greater degree as the main vane becomes more widely opened. As mounted substantially normal to the plane of the main vane, the auxiliary vane would tend directly to counteract and intercept gas particles acting as a baffle to prevent large surges of carbureted gas. As mounted at 45° to the axis of rotation of the main vane, the auxiliary vane further imparts to the carbureted gas a helical swirl to the carbureted gas.

It is preferred that the auxiliary vane have numerous perforations which tend to allow the liquid droplets suspension in gas to pass through the auxiliary vane surface, the numerous perforations in the auxiliary vane tending each to break up some of the particles in smaller ones, each perforation forming an auxiliary passageway through which gas passes as a tiny jet with over-all improved carburetion. These perforations mounted to pass through the auxiliary vane become progressively operative and more effective as the auxiliary vane itself is caused to intercept and baffle larger volumes of gas with the progressive opening of the main vane.

Thus this invention comprises a modified carburetor throttling valve, typically a butterfly simple disc vane, whose position is varied from a flat throttling substantially full (idling) closure seat in a carbureted gas passageway, to a full open vane position. Such throttling valve has numerous uses as here modified, has greatest advantages for control of suspension of mist in gas such as carbureted gasoline particles into air, fed to an engine for combustion thereof. While it will be understood that the present valve may have other applications, it is essentially useful for a curbetor throttle valve and the further description herein is made with respect to its use for carburetion of suspension of a fuel, such as liquid gasoline, in air being fed to a motor for operation thereof.

The third and substantial advantage hereof, however, lies in the perforation of the auxiliary vane with numerous holes. These have a double effect, the large particles of suspended liquid such as fuel in the air are made more homogeneous and broken into smaller particles, but that

effect also is modified by the perforation, each comprising a tiny duct and in itself operates as a small jet, the vane surface thereby deflecting much of the suspension with a plurality of small jets, similar to a diffraction grating. That is, each operates as a Venturi throat. The invention is further described in its relation to the drawings, wherein:

FIG. I is a perspective of the assembly of the valve vanes in a double passage carburetor body, with the manifold removed,

FIG. II shows the valve vane structure removed from the carburetor body to illustrate the operation of the vanes as a sub-assembly,

FIG. III shows a single auxiliary vane detail, and

FIGI. IV shows a top plan view of the carburetor with the manifold removed.

Referring first to FIG. I, a carburetor body **10** is shown in perspective, and comprises a conventional double passageway carburetor feeding suspension of gasoline in air through two passageways **12** and **14**. The carburetor body structure **10** per se is conventional and forms no part of this invention. For present purposes it will be noted that the passageways **12** and **14** have mounted therein a pair of main carburetor vanes **16** and **18**, shown in detail in FIG. II. These main vanes, as conventional, are mounted for rotation in a rotor rod which is supported for rotation at opposite outer body walls of the passageways in journals **13** and **15**, with each vane disposed in a passageway **12** and **14**, respectively, for rotary throttling of carbureted gasoline and air passing therethrough. The vanes **16** and **18** are usually fitted in slots (not shown) cut radially through the rotor rod **20**, as in conventional carburetor construction, but may be otherwise supported for rotation in control of gas flow through these passageways.

Rotor shaft **20** may have a crank-arm **22** mounted near one end for attachment of a spring or other biasing means (not shown) to normal closed position of the vanes, and a crank arm **24** is mounted near the opposite end, the latter having a positionable screw-stop **26** at one side and a means **28** at an opposite side for receiving an accelerator rod for manual rotation of the rotor rod **20** and the vanes **16** and **18**. Moreover, as shown, the body of the control means is fitted with conventional flanges **32** and **34** to which manifolding and gasoline supply and adjusting means for usual carburetor construction may be attached.

According to the improvements of this invention, the main vanes **16** and **18** have mounted to both opposite surfaces a semi-circular disc **36**, each of which is cut away arcuately at **38** as shown in detail in FIG. III, to accommodate the annular rotor rod **20**. At each opposite end of a semi-circular disk **36** are two ear portions **40** each bent normal to its plane, and in opposite directions, each ear **40** being perforated by a hole **42** for securing the disc half **36** normal to the face of a main vane **16** or **18**, such as with a small screw fastener **44** as shown in FIG. II. Each disc **36** further has a number of perforations **46** extending through its plane body from side to side, there being numerous such perforations. These preferably are uniformly, but may be variably sized for varying carburetion effects as desired.

As illustrated in FIG. I, the semi-circular discs **36** are mounted at 45° angles to the axis of rotation of the rotor rod **20**, but to each opposite face of a main disk the semi-circular disk attaches in an opposite angular direction as shown in FIG. I, whereby the two discs, in plan, cross each other at 90° angles and, in combination, present an opposite, helical twist or swirl to the flow of gases.

As shown, in operation, as shown in FIG. III, the discs **16** and **18** in full seated position, supported in the passageways **12** and **14** throttle all gas (gasoline and air) flow through the passageways other than auxiliary gas flow through such passageways as **30** for idling operation of

an engine when using a carburetor as shown. As the rotor rod **20** is rotated slowly manually in the direction of the arrow **48**, the main vanes **16** and **18** move to open position, ultimately to the position shown in FIG. I. At that position while apparently fully opening the passageways **12** and **14** to carbureted gas flow, with vanes **16** and **18** in full open position, simultaneously have moved the auxiliary vanes **36** into relatively full baffling position in the passageways. In that position, and as shown in FIG. I, the rising carbureted gas mixture is intercepted by the vanes **36** on opposite sides of each vane **16** and **18** and for the most part strike these vane surfaces. That baffling effect presents, as a first result, an impacting surface which can vary the particle size of droplets suspended in the gas by striking the same as a baffle. As a second result, the vanes each being at opposite 45° angles to the axis of rotation of the main vane, causes the flowing carbureted droplets in the gas to rotate in a swirling motion which again varies the particle size of the droplets. As a third effect each vane, having numerous perforations **46**, as shown, allows a portion of the gas to pass through such perforations emerging as a plurality of tiny jets which in turn varies the particle size. A net result is more homogeneous formation and distribution of very fine carbureted liquid particles in a gas particularly at high wide-open or surging position of the main vane where any tendency to imperfect carburetion resulting from rapid opening of the carburetor valve to production of imperfect carbureted mixtures is greatest.

As thus, described, the rotary vane of a butterfly valve is modified by mounting a secondary vane normal thereto and preferably extending as a vane normal to both surfaces of a main vane. The mounting of the secondary vane angular to the axis of rotation tends to impart a progressive baffling as well as a swirling helical twist to the gases, giving much improved homogeneity to combustible liquid suspension in gas to reduce the droplets of liquid to finest mist or fog form homogeneously throughout the gaseous suspending medium. Further homogeneity is achieved by perforating the auxiliary vane so that presenting its surface as a baffle to the suspension of droplets causes the suspension to pass through each perforation, operating as a tiny jet, so that a large portion of the gas is broken into a plurality of small jets passing from surface to surface of the angularly presented secondary vane.

That angular presentation to the direction of gas flow is variable with the valve setting, and also varies with the configuration of the jets. Thus the perforations in the secondary vane may be circular and may be all of the same size and evenly distributed, but they need not be. That is, the jets may be ovular with the longest axis, or alternately the shortest axis, oriented in the direction of gas passage over a usual vane setting, conforming to an average engine speed of the carburetor; or the oval shapes may be heterogeneously distributed for concentration in a particular portion of the vane, depending largely upon the gas flow pattern in the area where the largest, or alternatively, the smallest gas flow volume impinges for passageway therethrough.

While it is usual to mount the main vanes in a slot through its support rod or shaft **20**, that mounting may be varied such as by flattening one rotor surface in the region of the vane and securing the main vane thereto by screw fastenings, whereby the entire vane assembly may be removed without disassembling the carburetor or removal of the shaft **20**.

As shown in FIG. III, the secondary vane half may be fastened to the main vane through perforated ears **40** by screws **44** so that these secondary vanes may be attached in that manner, to an ordinary carburetor, without removal of the shaft. Thus, it is possible to supply, or sell separately, the secondary vane for mounting by an individual user to the factory assembled carburetor, either by supplying the secondary vane per se or a combination of the secondary vane and the main vane.

Numerous advantages flow from the present construction over ordinary carburetor valves. Optimum over-all carburetion results from the finer atomization of gasoline droplets by this device. First, in general, merely to mount a baffling vane upon a throttle valve vane, has the immediate effect of baffling large surges of gasoline in air suspension, the mere baffling having the effect of obtaining better intermixture of light and heavy hydrocarbon evenly suspended in the gasoline. That is, the auxiliary vane has a progressive baffling effect to offset the rapid opening of the vane, and the consequent irregular distribution of large quantities of liquid in smaller volumes of air, which this construction tends to offset, has a tendency towards variation in the charge of the air to fuel ratio by surging, that is, rapid opening of the vane of the carburetor forms a poor charge. However, that effect of baffling by an auxiliary vane is complemented by having the auxiliary vane mounted at an angle to the axis of the normal vane from throttled or closed position to open position is not directly offset by rotation of the auxiliary vane from open to closed position. Rather, the descent of the auxiliary vane into the passageway, opened by the main vane, is helical whereby the baffling effect upon the rising carbureted mist is to constrain the mist into a gyrating helically twisting, swirling body of mist as it rises through the manifolding. The net effect, it will be observed, results from the mounting of the auxiliary vane at an angle.

Various modifications will occur to those skilled in the art. Such changes as conform to variations in a valve vane for purposes of adapting the present auxiliary vane and the principle of this invention to changes in ordinary valve vanes may be applied. For instance, the inner portion of a vane may be cut away, as shown at **38** in the detail FIG. III, for mounting about the annular rotor shaft **20**. That cut-away portion will vary with the body, i.e., shaft construction to be cleared. Of course, where the shaft per se is not present for support of the main vane, then the cut-away portion **38** is not needed and may be omitted.

While the vanes, auxiliary and main, are circular, they, of course will conform to whatever shape is present for the fluid passageway. The auxiliary vanes moreover extend into the passageway and conform to shape as a baffle, but are not sized to fit it as a closure, and so are of smaller dimensions than the main vane and may even have a different shape. Again, while as shown, the semi-circular secondary vane halves are planar, flat, they may be curved helically to better divert the helical flow of vapors in contact therewith.

It is accordingly intended that the description given herein be regarded as exemplary and not limiting, except as defined in the claims.

I claim:

1. In a butterfly type valve, a main annular vane mounted for rotation within an angular fluid passageway upon a supporting shaft passing diametrically through about the center of said vane to control its rotation the flow of fluid through said passageway and at least one but not more than two secondary perforated vanes mounted normal to and extending a substantial vertical distance from the surface of the said main vane whereby to impart a progressively variable baffling effect to fluid flowing past the main vane in progressive rotation thereof to varied open positions.

2. In a charge forming device an annular passageway for gaseous flow therethrough, a main annular vane mounted to rotate in said fluid passageway upon a supporting shaft passing diametrically through about the center of the said vane between open and closed position in control of gaseous fluid passing therethrough and a pair of secondary vanes, said vanes perforated and each mounted angular to the axis of rotation of the main vane

upon said shaft and extending normal to opposite plane surfaces thereof.

3. In a charge forming device an annular passageway for gaseous flow therethrough, a main annular vane mounted to rotate in said fluid passageway upon a supporting shaft passing diametrically through about the center of said vane between open and closed position in control of gaseous fluid passing therethrough, and a pair of secondary vanes, said vanes perforated and each mounted angular to the axis of rotation of the main vane upon said shaft and extending normal to opposite plane surfaces thereof, the angle of one secondary vane extending from one surface being opposite with respect to said axis to the angle of the other secondary vane extending from the opposite surface.

4. In a charge forming device an annular passageway for gaseous flow therethrough, a main annular vane mounted to rotate in said fluid passageway upon a supporting shaft passing diametrically through about the center of said vane between open and closed positions in control of gaseous fluid passing therethrough, and a pair of secondary vanes, each mounted angular to the axis of rotation of the main vane upon said shaft and extending normal to opposite plane surfaces thereof, each secondary vane being disposed at an approximately 45° angle to said axis, the angle of one secondary vane extending in an opposite direction to the angle of the opposite secondary vane.

5. In a butterfly valve, a main annular vane mounted for rotation within an angular fluid passageway upon a supporting shaft passing diametrically through about the center of said vane to control its rotation, the flow of fluid through said passageway and at least one secondary vane mounted normal to the surface of the said main vane, whereby to impart a progressively variable baffling effect to fluid flow past the main vane in progressive rotation thereof to varied open positions, said secondary vane having a plurality of perforations therein sized to allow reduced fluid flow therethrough.

6. In a charge forming device an annular passageway for gaseous flow therethrough, a main annular vane mounted to rotate in said fluid passageway upon a supporting shaft passing diametrically through about the center of said vane between open and closed positions in control of gaseous fluid passing therethrough, and a pair of secondary vanes, each mounted angular to the axis of rotation of the main vane upon said shaft and extending normal to opposite plane surfaces thereof, the angle of a secondary vane extending from one surface being opposite with respect to said axis, to the angle of the other secondary vane extending from the opposite surface, each said secondary vane having a plurality of perforations sized to allow fluid passage therethrough.

7. In a charge forming device an annular passageway for gaseous flow therethrough, a main annular vane mounted to rotate within said fluid passageway upon a supporting shaft passing diametrically through about the center of said vane between open and closed positions in control of gaseous fluid passing therethrough, and a pair of secondary vanes each mounted angular to the axis of rotation of the main vane upon said shaft and extending normal to opposite plane surfaces thereof, the angle of a secondary vane extending from one surface being opposite, with respect to said axis, to the angle of the other secondary vane extending from the opposite surface, each secondary vane having a plurality of perforations sized to allow fluid passage therethrough, each said secondary vane being semi-circular in form and oppositely directed securable means normal to its plane for fastening the said secondary vane to a surface of the main vane.

8. A dual throat carburetor comprising parallel gaseous passageways, a pair of throttle vanes supported for rotation in each throat and a pair of semi-circular disc-like adapter plates, each mounted normal to and on opposite surfaces of a vane, each adapter plate being mounted to the vane surface at an angle to the axis of rotation with the angle of each adapter plate opposite to the angle of the mating adapter plate of the pair.

9. A throttling valve comprising a valve enclosing a passageway having a support rod mounted in said passageway and journaled at each end for rotation, a solid annular disc vane, said vane secured for rotation upon said support rod for rotating control of gas flow in said passageway, a pair of perforated mating semi-circular disc-like adapter plates, each of said plates mounted on an opposite surface of said annular vane, each at an angle to the axis of rotation of said support rod with the angle of each adapter plate opposite to the angle of its mating adapter plate.

10. An adapter plate for attachment to a carburetor throttle vane comprising a semi-circular disc, said disc formed from sheet metal and having securing means at each end supporting said plate normal to the surface of said vane, a plurality of perforations extending from surface to surface through each disc adapted for turbulating air passing around said disc and through said perforations.

11. A dual throat carburetor as described in claim 8 wherein the adapter plates are angularly mounted to create a counter-clockwise air flow in one passageway and a clockwise air flow in the second passageway.

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