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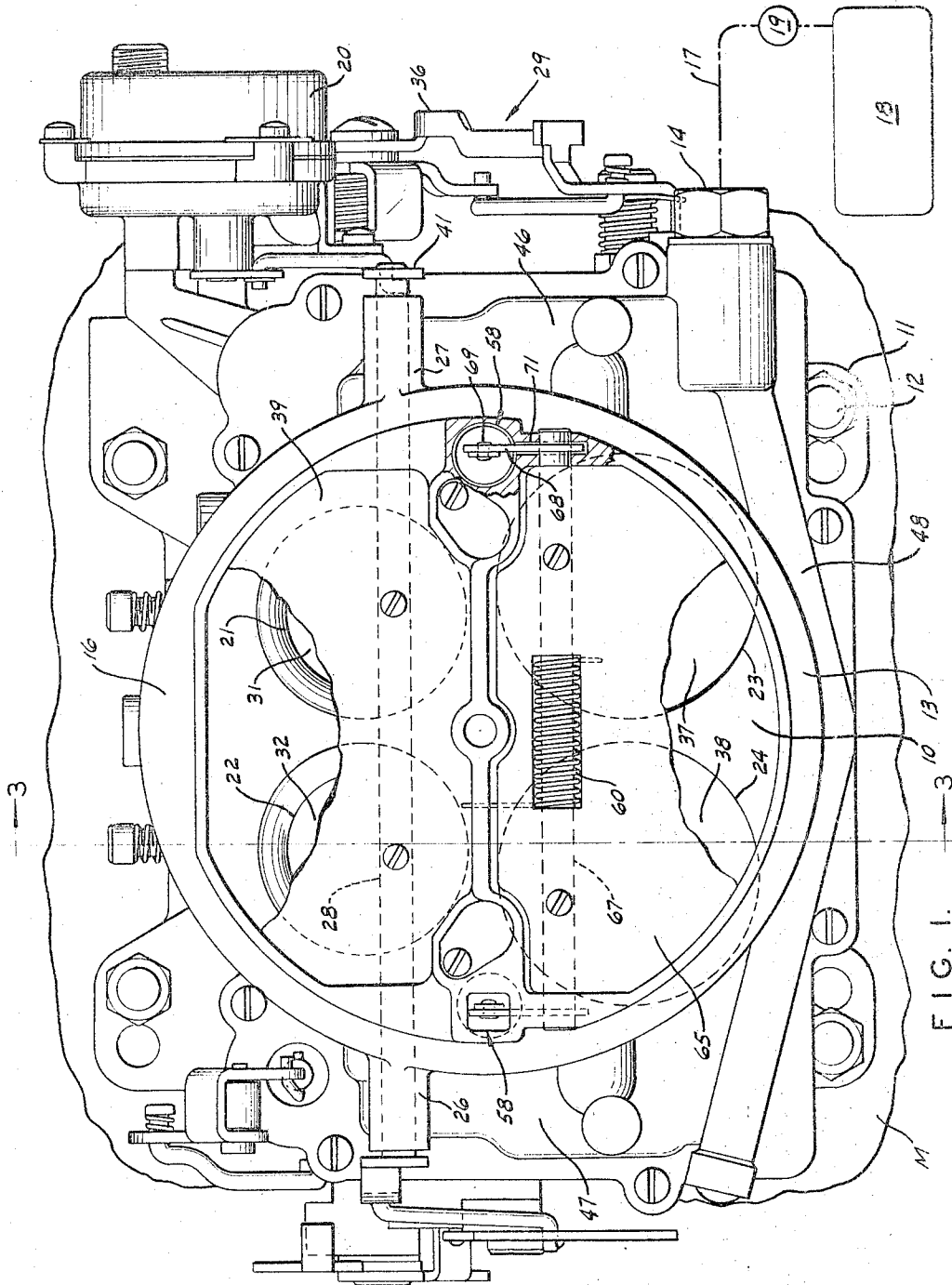
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CARBURETOR

Filed Sept. 2, 1965

3 Sheets-Sheet 1



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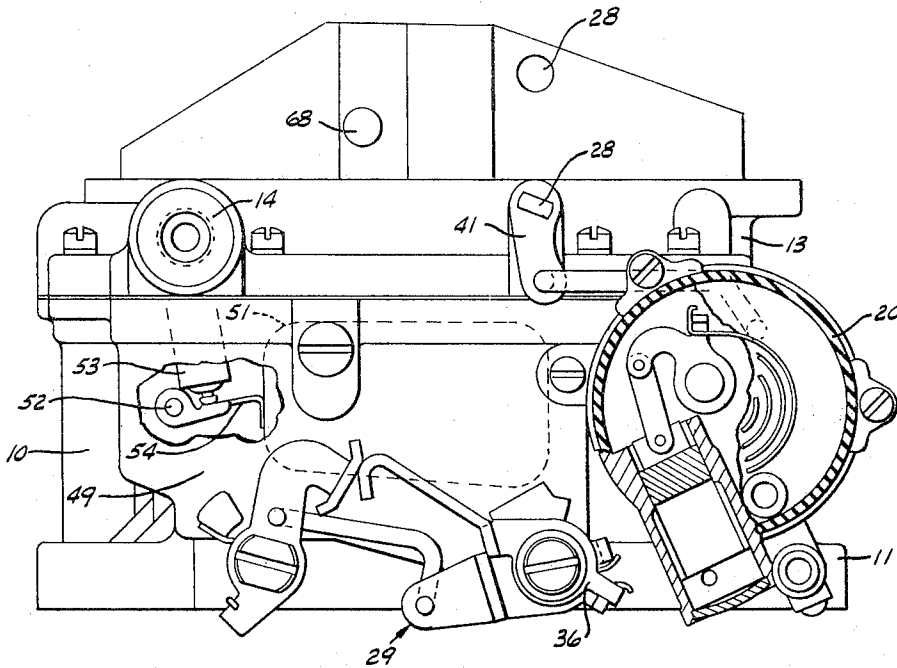


FIG. 2.

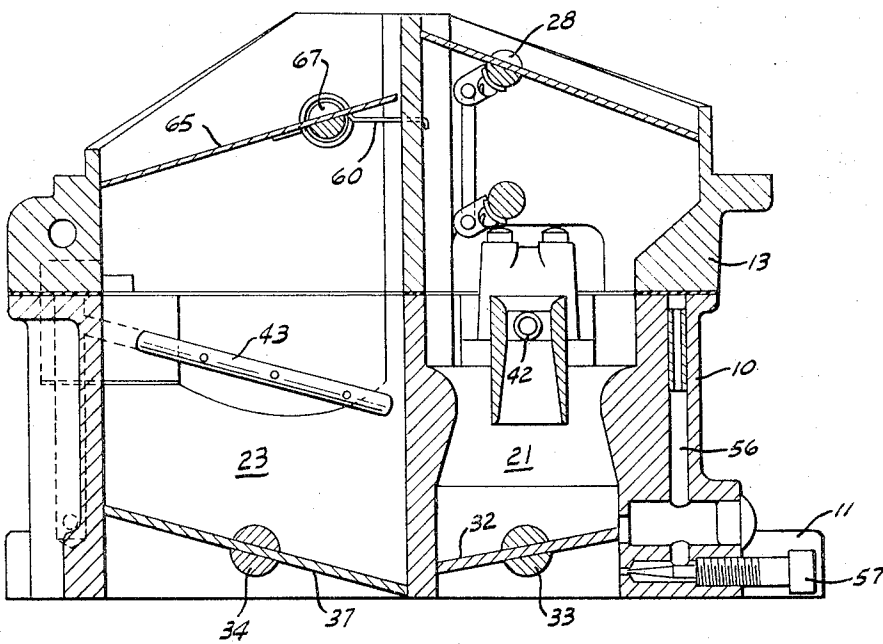


FIG. 3.

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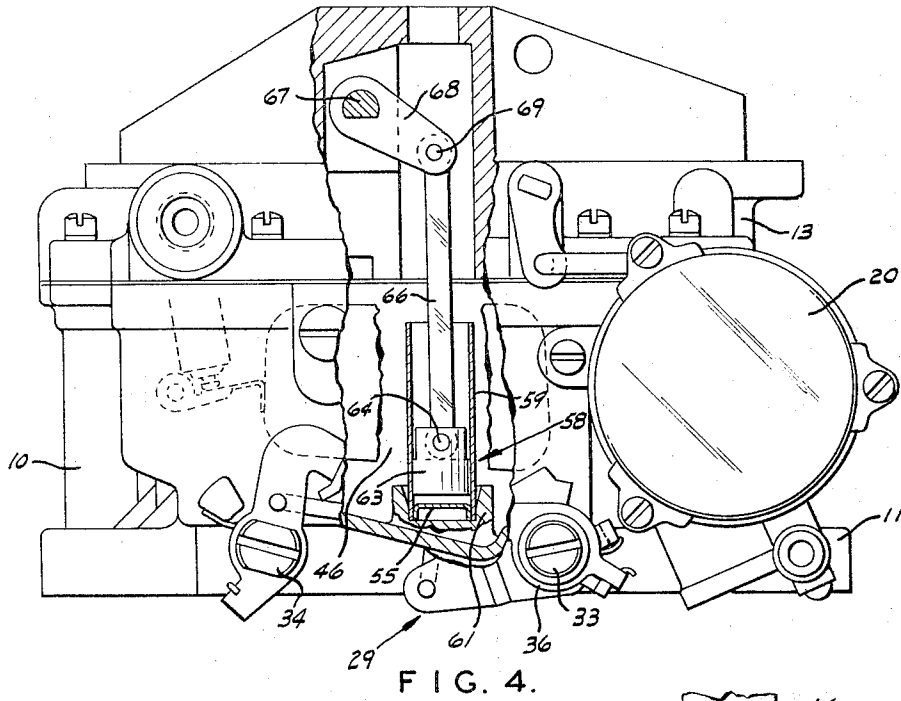


FIG. 4.

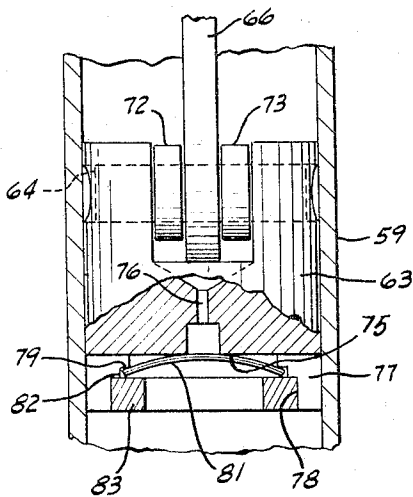


FIG. 5.

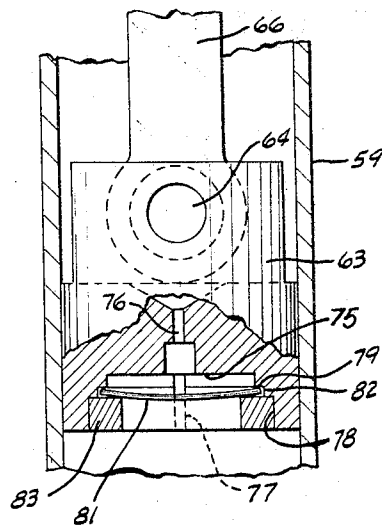


FIG. 6.

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CARBURETOR

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8 Claims. (Cl. 261—23)

This invention relates to a carburetor. It relates in particular to an air valve carburetor having dampening means associated with the air valve to control movement thereof.

Air valve carburetors in general provide a free acting flapper valve disposed upstream of the carburetor throttle in the mixing conduit, being responsive to passage of air through the mixing conduit. Such air valves are found to be highly desirable particularly in multi-barrel carburetors embodying primary and secondary mixing conduits. In such units, the air valve is most advantageously disposed within one or more of the secondary mixing conduits and arranged to be actuated into an open position at a predetermined speed of the engine or condition in the primary mixing conduits.

Basically the air valve is operated between fully open and fully closed positions. Thus, at the initial opening of the valve, a relatively large volume of air will be suddenly introduced to the intake manifold to mix with the air fuel mixture passing from the primary conduits. In theory, air flow from the secondary mixture conduits carries a sufficient amount of fuel to maintain a predetermined air fuel ratio when combined with the mixture from the primary conduits.

In actuality, however, it is found that the sudden influx of air resulting from the air valve being snapped open, is such that the overall mixture in the engine intake manifold is substantially leaned. This condition, as reflected in engine operation, yields a flat or apparent decrease in power due to the excessive leanness of the fuel mixture. Thus, the air valve embodies at least one disadvantage.

A further detriment attributed to the use of the air valve arrangement becomes noticeable on a sudden decrease of engine speed as when the engine is abruptly slowed to idle conditions. Under the latter circumstances, this is, when the engine is permitted to rapidly decelerate, the air valve will snap to a closed position thereby shutting off virtually the entire air flow from the secondary mixture conduit.

The result of this action is a considerable enrichment of the fuel mixture at the intake manifold and as a consequence the emission from the engine to the atmosphere of increased amounts of unburned hydro-carbons. Although no severe operational defect is realized due to this fuel enrichment under decelerating and idle conditions, it does result in excessive amounts of unburned hydro-carbons being passed into the atmosphere, an unfavorable situation which promotes the creation of smog.

It is demonstrated in the prior art that the movement of an air valve may be successfully tempered by use of such devices as dash pots and the like. Thus, it has been found advantageous particularly in the instance of multi-barrel carburetors, to associate operation of the air valve in the secondary mixture conduits with dampening means which may be either variable or constant.

The above noted faults attributed to air valve operation become accentuated under cold conditions as when the engine is initially started, or even when it operates in the cold ambient. Thus, until the engine becomes sufficiently warmed to assume normal operating characteristics, such operations will tend to be erratic and uncertain.

It is therefore an object of the invention to provide an

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improved air valve carburetor which overcomes the above-mentioned operating difficulties.

A further object of the invention is to provide an air valve carburetor adapted to foster smooth engine operation under cold starting conditions.

A still further object of the invention is to provide an air valve carburetor including means to regulate operation of the air valve to assure a more uniform air fuel mixture at the engine intake manifold.

Still another object is to provide an air valve carburetor of the type described in which means is connected to the air valve to dampen movement of the latter in response to temperature of the fuel held in the carburetor.

Still another object of the invention is to provide an air valve carburetor of the type described including a dash pot arrangement associated with the air valve and having a thermally responsive element in the dash pot to alter the degree of air valve dampening as a function of engine fuel temperature.

These and other objects of the invention will become clear to those skilled in the art from the following description of the invention made in conjunction with the accompanying figures in which:

FIGURE 1 is a top view of a multi-barrel carburetor having parts broken away to show interior members.

FIGURE 2 is a side elevation in parts of cross section of the carburetor shown in FIGURE 1.

FIGURE 3 is a vertical section taken along 3—3 in FIGURE 1.

FIGURE 4 is a side elevation in partial cross section of the carburetor shown in FIGURE 1 with a portion of the wall broken away to show interior members.

FIGURE 5 is an enlarged view in cross section of a portion of the carburetor shown in FIGURE 4, and,

FIGURE 6 is a view similar to FIGURE 5.

Referring to FIGURE 1, an embodiment of an air valve carburetor of the type presently contemplated is illustrated in a four-barrel unit comprising a plurality of primary and secondary mixture conduits. The carburetor includes basically a cast metal body in which are formed primary and secondary mixture conduits defining venturi passages. An air valve in the secondary of said mixture conduits disposed upstream of the throttle plates, includes an air valve shaft journaled transversely of the conduits. The carburetor body further includes a fuel bowl connected to a source of engine fuel, the flow of which to the fuel bowl is regulated by a float and metering valve arrangement carried in the fuel bowl and actuated in response to the level of fuel therein.

A dash pot positioned in the fuel bowl includes a cylinder defining an elongated sleeve in which a piston is slidably received, the latter being immersed within the fuel to be affected by the temperature of the latter. A passage extending longitudinally of the piston provides a channel for fuel as the piston is reciprocated through the sleeve. A valve member co-operative with the passage is moveable between open and closed positions to alternately form a closure to said passage and regulate or preclude flow of liquid therethrough at colder temperatures. At increased temperatures the thermally responsive valve element is moved to an open position thereby opening said passage to the flow of liquid and in effect lessen the fluid resistance against movement of the piston through the cylinder.

A linkage operably connecting the air valve shaft to the dash pot piston transmits reciprocatory motion in response to movement of the rotatable air valve shaft. Thus, as the fluid resistance to movement of the piston is regulated such resistance will be translated through a connecting arm to the air valve shaft and to the air valve.

The invention is hereinafter described in detail as embodied in a four-barrel carburetor. It is understood

however, by those familiar with the art that the novel, thermally responsive dampening device might as readily be associated with any form of carburetor utilizing an air valve structure.

Referring to FIGURE 1, the carburetor illustrated includes a body 10 supported on a flange 11 which is apertured at its periphery to accommodate studs or bolts 12 for engaging the flange to intake manifold M of an internal combustion engine. A cover 13 fastened to the top of the body 10 forms a float bowl cover having a fuel inlet 14 and a generally circular air horn 16. Fuel inlet 14 is threaded or otherwise adapted to receive a conduit 17 connected to fuel tank 18 for carrying fuel from the latter. Conduit 17 may include a fuel pump 19 to pressurize the stream to the carburetor fuel bowl.

As noted above, the carburetor used for illustrating the present invention is of the dual, multi-stage type. As shown most readily in FIGURE 1, the staging comprises a pair of primary mixture conduits 21 and 22 adjacently located, and a pair of secondary mixture conduits 23 and 24, all of which are clustered in air horn 16. Float bowl cover 13 includes bearing means 26 and 27 at opposed sides thereof to receive a choke valve shaft 28. One end of the said choke valve shaft 28 is operably connected to a fast idle linkage 29 for controlling operation of throttles 31 and 32 in the primary mixture conduits 21 and 22 respectively.

Primary throttle shaft 33 is journaled within spaced apart bearings in diametrically opposed sides of the carburetor body and preferably in flange 11. Throttles 31 and 32 are fixed on the primary throttle shaft 33 within the primary mixture conduits 21 and 22. Said primary throttle shaft 33 and secondary throttle shaft 34 are operably connected by a lever 36 which is in turn adapted to engage a control pedal for regulating the speed of the engine. Secondary throttle shaft 34 is disposed within the secondary mixture conduits 23 and 24 and carries a pair of throttle plates 37 and 38. Said shaft is likewise terminally journaled in the carburetor walls and particularly in the flange 11.

Air flow into the primary mixture conduits 21 and 22 is affected by a choke valve 39 carried on choke shaft 28. Following normal practice, choke valve 39 is disposed in mixture conduit 21 at a point upstream of primary throttle 32. The position of the choke valve 39 is controlled through, or by actuation of a choke lever 41 fixed to the end of choke shaft 28 which is responsive to automatic choke mechanism 20. Thus, rotation of the lever 41 in a counter-clockwise direction as seen in FIGURES 2 and 3, adjusts the position of choke valve 39 to a closed position. Clockwise rotation of lever 41 in contrast moves the choke valve toward an open position.

The carburetor may include other mechanisms as for regulating the positions of the secondary throttle plates 37 and 38 by holding the latter closed until such time as the choke valve 39 achieves its maximum open position. Thus, when choke valve 39 is disposed within its predetermined range of closed positions, it creates in a normal manner, an air choking effect downstream of the primary valves 31 and 32 in the primary mixture conduits 21 and 22 to aspirate fuel from the main fuel nozzles 42 and 43 located in the respective mixture conduits, thereby enriching the air fuel mixture delivered to the engine intake manifold. The operation of the choke valve assembly is well known in the art and functions co-operatively with the presently disclosed device.

Secondary throttle shaft 34 is controlled by linkage 29 from the primary throttle shaft 33. This linkage may include lever 36 carried on the primary throttle shaft 33 and connected through a lost motion linkage to co-operatively rotate the primary and secondary throttles.

Referring again to FIGURE 1, the body 10 of the carburetor is so formed to define a fuel bowl, which fuel bowl includes fuel wells 46 and 47 disposed at opposite sides of the respective mixture conduits, which wells may

be connected through a common cross passage or chamber 48 within cover 13 to receive fuel from fuel inlet 14. Fuel entering the fuel bowl 49 formed by the respective fuel chambers, is controlled by a float actuated metering valve.

As shown in FIGURE 2, float 51 outlined by a dotted line, is journaled on a shaft 52 extending horizontally through fuel bowl 49. A slidable valve element 53 engages the float bracket 54 to urge valve element 53 upwardly into a closed position as the level of the fuel within the well rises.

Similarly, as the fuel level in the bowl drops, moveable valve element 53 will be displaced downwardly, thereby opening the fuel inlet passage until the fuel level within the well rises sufficiently to raise the float and again close the valve. Fuel is introduced to the respective primary and secondary mixture conduits by way of the respective fuel nozzles 42 and 43 disposed within the conduits, forming the main fuel supply, and an idle fuel system defined by a passage 56 within the well of the body. An idle metering jet 57 is also carried in the carburetor well co-operatively with passage 56 to regulate flow of air into the primary mixture conduits.

Referring to FIGURES 1, 3, and 4 the air valve 65 as heretofore mentioned is carried on air valve shaft 67 to normally position the air valve across that portion of the air horn defining the secondary mixture conduits. Air valve 65 comprises basically a flapper member normally free moving, and so mounted as to form a closure to the carburetor secondaries. As shown in FIGURES 1 and 3, the air valve is biased into a normally closed position by a coil spring 60 carried on shaft 67 and having one end in engagement with the center panel which defines respective primary and secondary portions of the air horn. Thus, spring 60 tends to urge air valve 65 into a normally closed position. However, the normally applied pressure of spring 60 is such that the air valve closed position will be maintained only through certain engine speeds after which the valve will be forced open by the flow of air into the carburetor secondaries.

As heretofore mentioned, when the engine is cool and initially started up, the air valve will maintain its closed position, and the engine will operate entirely off the primary mixture conduits. When, however, a sufficient engine speed is achieved, air valve 65 will be displaced to permit a sudden influx of air through the secondary barrels. This, of course, prompts an instantaneous leaning of the mixture downstream of the respective conduits and effects a momentary lessening of engine power.

Referring to FIGURES 1, and 4 to 6, a dash pot assembly 58 associated with the carburetor includes an assembly which may be carried in one or both of the fuel wells 46 or 47.

The dash pot assembly 58 includes an elongated thin walled tubular sleeve or cylinder 59 uprightly supported within the fuel well 46 and sealably carried in hub 61 formed in the lower surface of the fuel bowl. The tubular sleeve 59 is provided at the lower end with a transverse wall 55 forming a closure thereto for providing an open ended upright cylinder. A piston 63 is slidably received in the sleeve 59 and includes a pin 64 passing there-through which engages a forward end of elongated connecting rod 66. The latter extends upwardly toward an air valve shaft 67 holding air valve 65, and operably engages a lever 68 by means of a cross pin 69.

Lever 68 is carried on the air valve shaft 67 either by pinning thereto, or as shown in FIGURE 5, by being so conformed to engage the irregular air valve shaft end. As shown in FIGURE 1, the lever 68 is positioned by an elongated slot 71 formed within the body upper wall to be guided during the arcuate movement of the lever.

The dash pot under normal circumstances is substantially completely immersed within fuel held in the fuel wells. Although a solid walled cylinder or sleeve 59 is presently shown, the latter may be provided with lateral

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apertures for admitting fuel to the cylinder above the piston.

Piston 63 is slidably received within the cylinder 59 forming a slight clearance with the walls of the latter to permit reciprocal movement of said piston 63 within the fuel. This piston as shown is provided with a transverse opening to receive the pin 64 which pivotally connects to the lower end of elongated connecting rod 66. A transverse slot in the upper part of the piston 63 accommodates the connecting rod end together with a pair of spacers 72 and 73 for properly positioning the connecting rod 66. The lower end of piston 63 is formed with a plurality of concentric bores of decreasing diameter which terminate in a restricted metering passage 76 and form a stepped configuration defining peripheral shoulders between the respective bores. The largest diameter of said bores forms an annular seat 75. A by-pass opening 77 is also formed in the lower side of the piston 63 communicating said passage with the under side of the piston for passing fuel therethrough as will be hereinafter noted.

The outer bore 78 in the piston lower face, forms a peripheral shoulder 79 substantially concentric with the passage 76. A thin, thermal disk 81 is received within the bore 82 and is positioned against the peripheral shoulder 79. A circular retainer 83 such as an expandable ring is received in the outer bore 78 and longitudinally positions disk 81. In accordance with the invention, the thermal disk 81 comprises a wafer-like metallic member being readily affected by a temperature differential to deform the disk between relative positions as illustrated in FIGURES 5 and 6. Thus, when fuel held within the carburetor fuel bowl is relatively cold, the thermal disk will assume the position shown in FIGURE 5. In this position, the disk 81 will be operably deformed having the center disposed in contact with the opening of the passage 76 thereby forming a closure to the passage and avoid the flow of fuel therethrough.

While not presently shown, thermal disk 81 may be provided with a suitably resilient seat for engaging the peripheral opening of annular seat 75 thereby forming a liquid tight seal with passage 76. Conversely, as the fuel within the fuel bowl becomes heated due to engine operation or to other effects, the thermal disk will become sufficiently heated to suitably deform into the position shown in FIGURE 6. The basic operation and function of the thermal disk is well-known and said disk may be selected to respond within a predetermined temperature range.

With the disk disposed as shown in FIGURE 6, a through passage will be formed in the piston communicating the lower part thereof through the by-pass 77, around thermal disk 81 and thence through the restricted passage 76 communicating with the upper part of the piston. With disk 81 positioned as shown in FIGURE 6, there will be only limited fluid resistance to the reciprocatory movement of the piston within the cylinder. In contrast with the thermal disk as shown in FIGURE 5, engaging the annular seat 75 of piston opening 76, movement of the piston through the sleeve 59 will be substantially impeded in either direction, because of the limited annular passageway for fuel defined by the adjacent piston outer surface, and cylinder wall.

Operationally, the function of the disclosed dash pot arrangement is to impede, though not prevent opening and closing of the air valve in response to the temperature of fuel within the fuel well. Thus, at lower temperatures, and with the thermal disk displaced as shown in FIGURE 5, movement of the air valve 65 within the secondary mixture conduits will be dampened by virtue of the limited liquid access way formed between the piston and the cylinder wall. However, after the engine has run for a sufficient length of time to become heated, the thermal disk will again deform to the position shown in FIGURE 6 thereby opening the by-pass and permitting fuel flow, and consequently ready passage from the cylinder through the piston.

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It is clear from the foregoing that the improvement presently embodied in the air valve carburetor provides the latter with a degree of efficiency and versatility heretofore unrealized. It permits not only more efficient operation, but a more complete utilization of the benefits provided by the air valve arrangement in engine operation.

I claim:

1. In an air valve carburetor including:

- (A) a body
- (B) primary and secondary air and fuel mixture conduits forming passages in said body with the primary conduit having a venturi passage,
- (C) a wall in said body separating said primary and secondary passages,
- (D) a throttle plate journaled in each of said mixture conduits for regulating the passage of fuel mixture therethrough,
- (E) an air valve journaled in said secondary mixture conduit upstream of said throttle plate and including an air valve shaft,
- (F) a fuel bowl formed in said carburetor body and being communicated through fuel nozzles to the respective primary and secondary mixture conduits for delivering fuel to the latter to mix with air introduced thereto,
- (G) a dash pot in said fuel bowl including:

- (1) an elongated cylinder,
- (2) a piston immersed in fuel in said fuel bowl and slidably received in the cylinder, said piston being operably connected to said air valve shaft,
- (3) means forming a passage extending longitudinally of said piston and providing communication between opposed ends of said cylinder,
- (4) said means forming a passage including an annular seat,
- (5) a valve member retained in said piston and being co-operative with said means forming a passage to regulate flow of fuel through the latter, said valve member being normally immersed in fuel contained in said fuel bowl to be influenced by fuel temperature,
- (6) said valve member including a deformable valve element being moveable between open and closed positions in response to a fuel temperature gradient and co-operative with said annular seat in said means forming a passage whereby at low fuel temperatures, the said deformable valve element will form a closure across said means forming a passage to prevent flow of fuel therethrough and impede movement of said piston axially through said cylinder thereby dampening movement of the air valve in said secondary mixture conduit in accordance with fuel temperature, and at an increased fuel temperature, said deformable valve element will be displaced from said annular seat thereby permitting fuel flow through said passage and provide a less impeded movement of said piston along said cylinder to effect a lesser degree of dampening of said air valve.

2. In an air valve carburetor as defined in claim 1 wherein said valve member includes a generally circular, thin metallic disk.

3. In an air valve carburetor as defined in claim 1 wherein said piston includes inner and outer substantially concentric bores at the piston lower surface defining a shoulder in said means forming a passage, said valve element includes a thin metallic disk having a peripheral edge thereof in engagement with said shoulder, and a retainer carried in the outer of said concentric bores urging said disk against said shoulder.

4. In a carburetor as defined in claim 3 wherein said piston includes a transverse slot formed in the lower end thereof and defining a lateral passage for fuel passing from

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said means forming a passage when said valve is in the open position.

5. In an air valve carburetor as defined in claim 1 including a plurality of dash pots carried in said body and engaging opposed ends of said air valve shaft to simultaneously act on the latter.

6. In an air valve carburetor as defined in claim 1 including a linkage connecting said piston to said air valve shaft and comprising a lever rigidly carried on the air valve shaft and an elongated rod pivotably connected to the respective lever and to said piston for transmitting movement therebetween.

7. In an air valve carburetor as defined in claim 1 wherein said means forming a passage is provided with a constricted portion to meter the flow of liquid there-through when said deformable valve element is in the open position.

8. In an air valve carburetor as defined in claim 1 wherein said means forming a passage extending through said piston includes a constricted portion communicated

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with the cylinder above said piston, a plurality of concentric bores formed in the piston lower surface defining a repository for said deformable valve element and said deformable valve element carried in said repository and positioned to engage said means forming a passage to limit flow of liquid therethrough.

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