

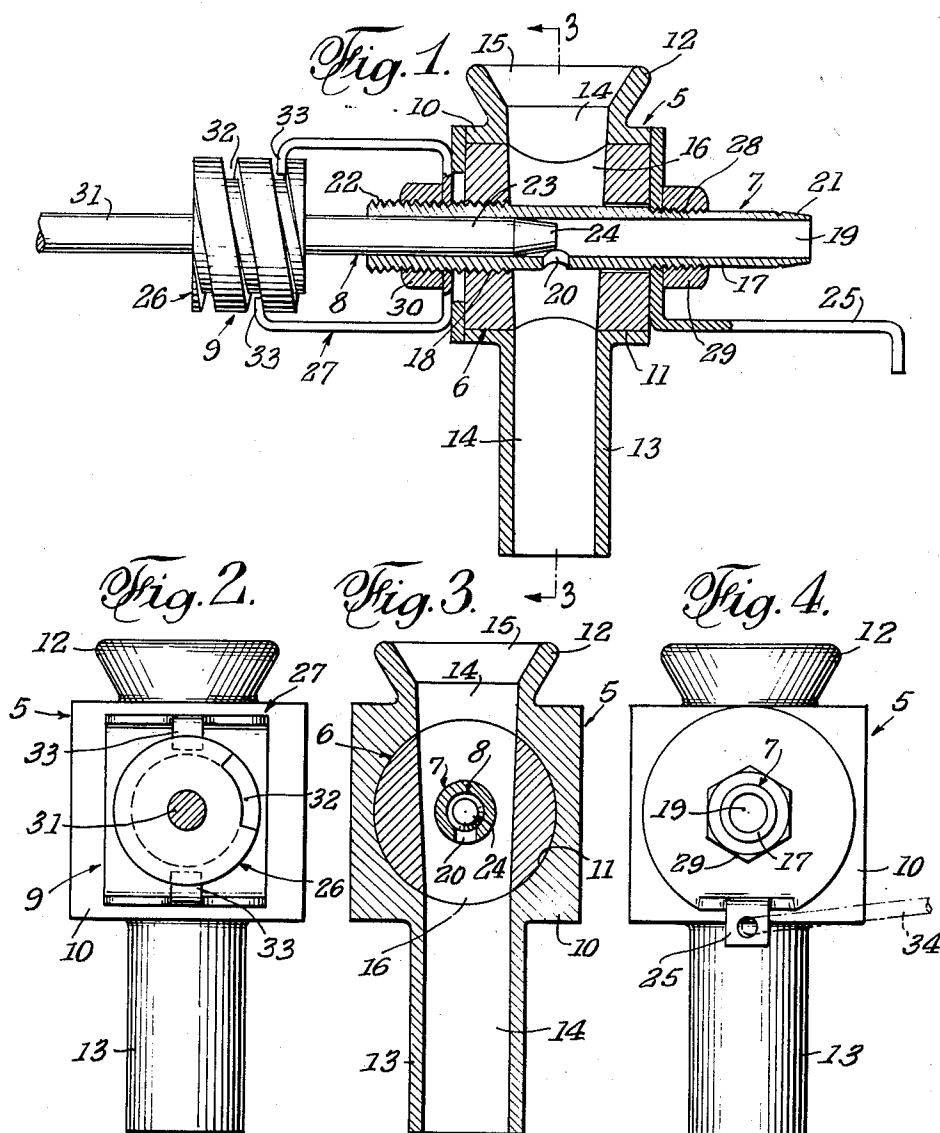
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FUEL-METERING DEVICE

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FUEL-METERING DEVICE

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This invention relates to a fuel-metering device for feeding fuel to small engines such as may be used on model air planes and the like.

An object of the invention is to provide simple, yet effective, means that may be controlled by a simple movement of a control element to vary the richness of the mixture of carbureted air being fed to a model engine.

Another object of the invention is to provide a small and compact device that enables controlled metering of fuel in a fuel-air mixing device by simple push and pull of a control element.

A still further object of the invention is to provide, in a metering device, novel control means enabling accurate adjustment of a metering member by use of a simple push-pull control member.

The invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. However, the drawing merely shows and the following description merely describes, one embodiment of the present invention, which is given by way of illustration or example only.

In the drawing, like reference characters designate similar parts in the several views.

Fig. 1 is a longitudinal sectional view of a fuel-metering device according to the present invention.

Fig. 2 is an end elevational view thereof, as seen from the left of Fig. 1.

Fig. 3 is a vertical sectional view as taken on the plane of line 3—3 of Fig. 1.

Fig. 4 is an end elevational view as seen from the right of Fig. 1.

The present device comprises, generally, a hollow body 5, a rotatable valve plug 6 controlling flow through the body 5, a hollow axle 7 on which the plug 6 is carried, a metering valve needle 8 within the hollow axle 7 controlling flow from the hollow of said axle into the body 5, and a control 9 for the valve 8.

The body 5 is provided with a main part 10 in which is formed a cylindrical, transverse passage 11, an upper flared extension 12, and a lower tubular extension 13. The passage 11 is receptive of the plug 6, the upper extension 12 constitutes an air intake, and the tubular extension 13 constitutes a carbureted fuel-conducting passage. The extensions 12 and 13 are provided with a passage 14 that bisects the transverse passage 11, said passage 14 being shown as convergingly tapered from the top downward. This convergence is clearly shown in Figs. 1 and 3.

Above the passage 11, the passage 14 constitutes an air intake and, to this end, is flared as at 15, and below the passage 11, the passage 14 constitutes a fuel-conducting line.

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The plug 6 is fitted in the passage 11 and is of cylindrical form to be capable of rotational movement in said passage. As best seen in Figs. 1 and 3, said plug is provided with a transverse passage 16, the same forming a connecting passage between the upper and lower portions of passage 14 and, accordingly, is tapered to comprise part of said passage 14. Thus, when the plug passage 16 is aligned with the passage 14, a uniformly converging passage is provided from top to bottom of the body 5. It will be clear, however, that upon rotation of the plug 6 the flow in the body is restricted according to the degree of rotation of the plug, and the same may be completely shut off if the rotation is of sufficient degree to move the passage 16 out of register with the passage 14.

The axle 7 comprises a tube 17 upon which the plug 6 is mounted and which is connected to said plug by means of threads 18. The horizontal passage 19 of the axle is a through passage, the same, therefore, passing through the plug 6. Where the tube extends across the plug passage or port 16, the same is provided with a porthole 20 that affords communication between the passage 19 and the port 16 of the plug. An extension 21 of the axle is adapted to be connected to a tube or other connection from a liquid fuel reservoir or tank, and the opposite extension 22 extends outwardly beyond the end of the plug and threads 18 are continued along the extension 22. The diametral size of tube 7 is so much smaller than the size of passage 16 that, as seen in Fig. 3, flow around said tube is afforded.

The metering valve 8 comprises a needle 23 that has a conical end 24 directed toward the fuel inlet end 21 of the axle 7. Said needle is disposed within the end 22 of said axle and said conical end is located with respect to the porthole 20 so as to control flow through said hole according to the longitudinal adjustment of the needle. In this manner an atomization chamber is formed centrally in the transverse passageway 16 in the plug 11 serving as a barrel-type air-controlling gate valve. A spray bar formed by the needle 23 and the hollow shaft or axle 17 with the transverse port 20 is within the atomization chamber at the center thereof.

The control 9 for the metering valve 8 is shown as comprising a control arm 25 on one side of the body 5, a cam 26 fixedly carried by the needle 23, and follower means 27 connected to the axle 7.

The arm 25 is affixed to the axle 7 as by threads 28 and a lock nut 29 may be used to lock the assembly, whereby upon rotational manipulation of the arm 25, the axle is turned around its axis and the plug similarly turned so as to effect angular displacement of the passage port 16 of the plug relative to the passage 14 in the body. In a somewhat similar manner, the lock nut 30 engaged with the threads 22 of the axle locks the follower means 27 so that the same rotates bodily the axle 7. Therefore, control movement of the arm 25 is transmitted to the cam follower means 27.

The cam 26 is preferably held against rotation and the holding means may be applied to a stem extension 31. Thus, by holding the stem 31 fixed against rotation, both the cam 26 and the needle 23 are similarly held non-rotative. The cam is provided with a helical groove 32 and the follower means 27 is provided with fingers 33 that are engaged in said groove 32. It will be clear, therefore, that upon turning movement of the arm 25 around the axis of the axle 7, the resultant turning movement of the cam follower means 27 and the fingers 33 thereof will be translated to a longitudinal movement of the cam 26 and, therefore, of the needle valve 23.

Since the mentioned movement of the control arm 25 effects a constriction of air flow through the body along the passage 14 and the port 16, because of the

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rotation of the plug in the body, the mentioned longitudinal adjustment of the needle valve effects a control of flow of liquid fuel from the passage 19 through port 20 in proportion to the flow of air in the passage 14. In the position shown, the fuel line from the passage 19 is unrestricted and fully open, as is the air line through the passage 14. However, when the plug is rotated, there is a resultant restriction of the air flow and of the liquid fuel flow, since the tapered end of the needle 23 closes off flow to the porthole 20 proportionally to the restriction mentioned following the rotation of plug 6. Thus, the liquid fuel flow is metered by longitudinal adjustment and the air flow is controlled or metered by rotational adjustment. The cam groove 32 may be so pitched as to cause a complete closing of fuel flow through the port 20 at the time there is complete closing of air flow through the passage 14. Of course, any condition relating to proportion of air to liquid fuel may be designed into the present device, as desired.

It will be clear, therefore, that merely by pushing or pulling, as the case may be, on a control member 34, the flow of carbureted fuel through the present device may be metered as desired.

While the foregoing specification illustrates and describes what I now contemplate to be the best mode of carrying out my invention, the construction is, of course, subject to modification without departing from the spirit and scope of my invention. Therefore, I do not desire to restrict the invention to the particular form of construction illustrated and described, but desire to cover all modifications that may fall within the scope of the appended claims.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. In a fuel-metering device having a fuel inlet, an air inlet, and an outlet for mixture of fuel and air, an air controlling valve rotatable about an axis and having a passageway transverse to the axis and intersecting it for receiving air from the air inlet, a fuel needle valve comprising a hollow shaft on the axis of the air valve with a transverse port extending into the air valve transverse passageway and a non-rotational needle slidable longitudinally in said hollow shaft for covering and uncovering the said port for opening and closing the fuel valve, and a linkage joining said needle and said air valve for causing simultaneous rotational opening and closing of the air valve and longitudinally sliding opening and closing of the fuel valve, the fuel inlet being at one end of the hollow shaft, and means on the opposite end of said shaft to control movement of the needle.

2. A fuel-metering device comprising a hollow body having a transverse passageway, a rotatable barrel mounted within said body having a transverse passageway cooperating with said body transverse passageway to form an air-controlling valve with an air inlet being formed at one end of the transverse body passageway

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and with the opposite end serving as an outlet for fuel-air mixture, a fuel spray bar mounted within said barrel comprising a hollow shaft coaxially mounted in said barrel and having a transverse port opening in said barrel transverse passageway and a needle longitudinally movable within said hollow shaft for uncovering and covering the port to form the spray bar, and non-rotational and sliding camming means for moving the needle to the port covering position with rotation of the barrel to a position with the transverse passageways out of alignment for closing the air valve, whereby both air and fuel may be fully shut off in the closed position of the valves and increased admission of both fuel and air are coordinated with the opening movement of the valves, said cam means being disposed on one side of the hollow body and affixed to the needle and the hollow shaft extending through the opposite side of the body and constituting a fuel inlet, and a rotatable controller affixed to the shaft and the barrel and engaged with the cam means to slide the latter and the needle, thereby slidingly moving the needle relative to the port while rotationally moving the shaft.

3. Fuel-metering device as in claim 2 wherein the transverse passageway in the body converges from the air inlet end to the outlet end and the transverse passageway in the barrel is correspondingly tapered.

4. Fuel-metering apparatus as in claim 2, wherein cooperating camming means elements are carried by the rotatable barrel and the needle, and a rotation preventing stop is provided for the needle.

5. In a valve, fuel-flow means comprising a tube constituting a fuel inlet at one end and having a port intermediate its ends and a needle in said tube with an end directed toward said port, air-flow means comprising a body having a passage and a valve plug controlling said passage, one end of the passage constituting an air inlet and the opposite end an outlet for a mixture of fuel from said port and air from said inlet, a cam connected to the needle and fixed against rotation, an actuator affixed to both the tube and the plug for rotating the same, and means fixedly carried by the tube and engaged with the cam to move the cam longitudinally during rotational movement of the tube to thereby move the needle longitudinally and change the flow-controlling position of the needle relative to the port in the tube.

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