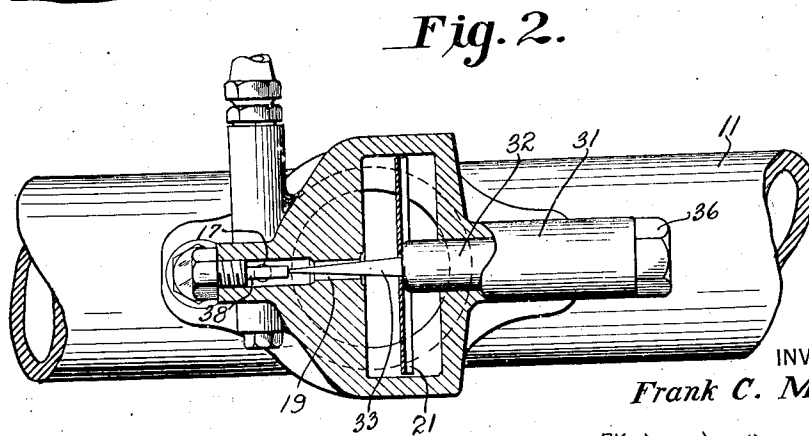
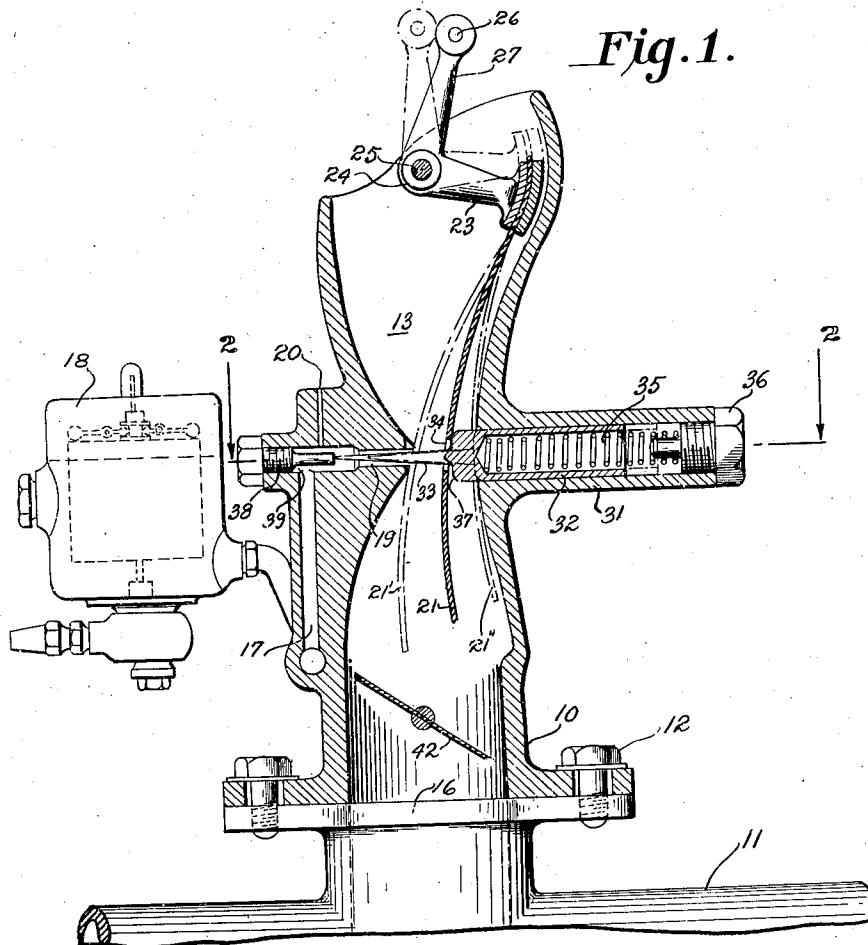


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F. C. MOCK
CHARGE FORMING DEVICE

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CHARGE FORMING DEVICE

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This invention relates to charge forming devices, and more particularly to an improved carburetor adapted for use in aircraft or automobiles.

5 In carburetors for internal combustion engines, it is desirable that the flow of the mixture of fuel and air to the engine be restricted as little as possible when the throttle is wide open. It so happens that atomization of the fuel is best secured by a high velocity of air, and this results in lowering the volumetric efficiency because of the increased friction at the higher velocities.

Carburetors are ordinarily supplied with Venturi tubes for increasing the velocity without unduly increasing the friction, but there is a limit to Venturi tube restriction beyond which the volumetric efficiency of the engine rapidly falls off, so that in practice, the size of the venturi is usually a compromise between the best size for slow engine speeds and that for high engine speeds. It is desirable to have the Venturi tube vary in size with the requirements of the engine, and one of the objects of the present invention is to provide means for producing such variation.

Under certain conditions such as airplane use, it may also be desirable to decrease the size of the venturi at low altitudes where the atmospheric pressure is too high for best running of the engine, and to increase the size of the venturi at higher altitudes where greater efficiency is needed. The present invention accomplishes the above-noted result by including a manual control whereby the size of the Venturi restriction may be varied.

Variations in size of the venturi also usually require variations in the rate of fuel admission, and this is accomplished in the present invention by means of a valve which is movable with the movable Venturi element. The valve may be a needle valve having a tapered portion which may be formed to give

any desired ratio of fuel to air. For example, it may be desirable to have the fuel opening increase at a slower rate than the air opening to automatically compensate for the tendency of the mixture to become richer at the higher altitudes.

One of the objects of the present invention is to provide a novel carburetor that shall be adjustable for use under various atmospheric conditions.

Another object is to provide in a carburetor having a carbureting chamber novel means for varying the cross-sectional area of said chamber throughout a portion of the length of the latter, said means being particularly adapted to respond to the suction of the cylinders of the engine on which it is installed.

Another object is to provide in a carburetor having a Venturi-shaped carbureting chamber, novel flexible means for varying the cross-sectional area of the chamber, said means being particularly adapted to insure a proper mixture of fuel and air.

A further object is to provide an improved carburetor having the above characteristics including a common control means for governing the proportions of air and fuel supplied to the carbureting chamber in accordance with atmospheric conditions.

A still further object is to provide an improved carburetor that shall be simple, compact, rugged of structure, light of weight, and inexpensive to manufacture.

The above and other objects will appear more fully hereafter in the detailed description of the invention, one embodiment of which is illustrated in the accompanying drawing, wherein like reference characters refer to like parts throughout the several views. It is to be expressly understood that the drawing is for the purpose of illustration only, and is not designed as a definition of the limits of the invention, reference be-

ing had for this purpose to the appended claims.

In the drawing:

Fig. 1 is a longitudinal view in section of a carburetor embodying the invention; and

Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1.

In the form shown, 10 indicates a carburetor casting or body portion which is fixed to the intake of an engine manifold 11, as shown at 12. A Venturi-shaped air passage 13 is provided through the casting 10 forming an air intake or carbureting chamber, the latter registering with opening 16 of the manifold 11.

Fuel is supplied through the carburetor from any suitable source such as a vacuum tank or fuel pump (not shown) to the fuel supply passageway. For maintaining a desired fuel level in the passageway 17, suitable means is provided such as a float chamber diagrammatically illustrated at 18. The passageway 17 is connected with the air passage or carburetor intake 13 by way of a fuel passageway 19 which is provided with an air vent 20 constituting a fuel intake to the chamber 13.

The air passage or chamber 13 is provided with novel means for varying the cross-sectional area thereof, whereby maximum air speed in the chamber is secured in the plane of the fuel intake 19, and a more thorough mixing of the fuel and air is obtained. As shown, a flexible member 21 adapted to serve as an interior wall of the passage 13 is connected at its upper end to an arm 23 of a bell crank lever 24, the latter being rotatably mounted on a pin 25 mounted in the upper end of the air passage 13 and supported by casting 10. The arm 27 of lever 24 is provided with an opening 26 to receive a rod (not shown) for actuating said lever. Upon rocking the lever 24 the wall 21 may be positively moved between the positions indicated by the broken lines 21' and 21'' for varying the cross-sectional areas of the Venturi passage any desired amount and this without destroying the Venturi shape thereof.

The discharge fuel passageway 19 is also provided with novel means for varying the cross-sectional area thereof, said means being under control of the flexible plate 21, whereby a thorough mixture of fuel and air is obtained for starting and normal operation in accordance with atmospheric conditions. In the form shown, body portion 10 is provided with a hollow shank portion 31 extending laterally outwardly for receiving a member 32 slidably therein. The member 32 is positioned in alignment with the passageway 19 and is provided at its inner end with a reduced tapered portion 33 extending through an elongated opening 34 in the wall 21 and terminating within the fuel intake 19. The outer end of the member 32 is re-

cessed to receive a spring 35, the latter abutting against a threaded means 36 constituting a closure for the hollow shank portion 31. The spring 35 tends to move the portion 33 of member 32 into the passageway 19, and for controlling the movement of the member 32, shoulders 37 formed by the reduced portion 33 abut the plate 21 adjacent the opening 34. Thus the lateral movement of the member 32 is controlled by the wall 21. The spring 35 is of such strength as to respond to the movement of the flexible member 21, the latter being of sufficient stiffness to properly actuate the member 32 against the tension of the spring 35 and at the same time having sufficient flexibility to respond to the suction of the cylinders of the engine on which it is installed, for effectively supplying the proper mixture of fuel thereto.

In order to obtain an enriched mixture for starting and warming-up purposes, a stop member 38 is threaded into an opening 39, the latter being in alignment with the passageway 19. The stop member 38 serves to retain the member 32 from further inward movement after the wall 21 moves inwardly from the position indicated by the solid lines. Upon moving the wall 21 between the positions 21' and 21 the mixture is varied during starting and warming-up of the engine.

A throttle 42 is provided in the carbureting chamber 15 for the conventional reason of accelerating and decelerating the engine.

The cross-sectional areas of the fuel intake 19 and the venturi 13 as determined by the tapered needle 33 and wall 21, in full line position, are graduated for normal sea-level operation and are also formed in such a manner that upon the movement of the wall 21 from the full line position to the dotted line position 21'' the cross-sectional areas of the intake 19 and venturi 13 will both be increased in accordance with any desired ratio of air to fuel to obtain efficient operation of the engine.

In use, the lever 24 is moved in a clockwise direction, moving the wall 21 to the position 21' for enriching the mixture for starting the engine. The suction produced by the engine cylinders during the cranking speed is comparatively small, but increases a great amount when the engine starts. At this instant, the flexible plate 21 responds to the greater suction of the engine cylinders and automatically moves to the right, as viewed in Fig. 1, whereby a greater cross-sectional area is provided within the intake 13, and a leaner mixture is automatically supplied to the engine. The operator may, of course, after the engine starts, move the wall 21 between the positions indicated at 21' and 21 for warming-up purposes and normal operation under sea-level atmospheric conditions. During this time the flexible plate 21 continues to respond to the suc-

tion of the engine cylinders for effectively supplying the proper mixture thereto and thereby augmenting the manual operation of the flexible plate for effecting a superior operation of the engine.

If the engine is operated at an altitude sufficiently great to affect the normal running of the engine, the wall 21 and needle 33 are varied from the position shown in full lines to the position shown at 21'', whereby a proper mixture is supplied through the carburetor for maintaining normal operation of the engine.

It will be noted that the velocity of the air in the chamber 13 is greatest in the plane of the orifice 19, whereby the entraining and mixing of the fuel is greatly facilitated.

There is thus provided a charge forming device for controlling the supply of fuel to an internal combustion engine in accordance with the choke opening and the mixture requirements. Further, the novel yielding venturi and the member 32 operate in a superior manner to secure the desired mixture for starting and maintaining normal operation, irrespective of atmospheric conditions. Also, the yielding venturi, being responsive to the suction of the engine cylinders, provides a charge forming device whereby the operation of an engine may be properly carried out by inexperienced operators without damage to such engine. The present device is rugged, very simple in structure, automatic, efficient in operation, and cheap to manufacture.

While the embodiment of the invention illustrated is of the down-draft type, it will be obvious to those skilled in the art that the invention may readily be embodied in other types. Various other changes, modifications, substitutions, additions, and omissions may be made in the device without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A carburetor comprising a casting having an air intake passage therethrough, a fuel supply within said carburetor, means for connecting said fuel supply with said air passage, a flexible member disposed within said passage and adapted to conform to one wall of the passage, the flexible member having one free end responsive to suction for automatically varying the cross-sectional area of said air passage in the plane of said connecting means, and manual means for actuating the said flexible member.

2. In a carburetor, an air intake, a fuel intake, means for varying the cross-sectional areas of both the said intakes, the said means comprising a flexible plate disposed in said air intake, and a valve associated with the fuel intake, the said flexible plate being responsive to suction.

3. In a carburetor, an air intake, a fuel in-

take, means for varying the cross-sectional areas of both the said intakes, the said means comprising a flexible plate disposed in said air intake, and a valve associated with the fuel intake, the last said means being under control of the first said means.

4. In a carburetor including a body portion having a Venturi air passage having a flexible member therein for varying the effective cross-sectional area thereof, a fuel supply chamber, connecting means between said chamber and said air passage, a valve within said connecting means tending to close the latter, and means associated with the said valve and said flexible member whereby the movement of said valve is controlled by said flexible member.

5. A carburetor including a body portion having an air passage therethrough, a flexible member disposed in said passage for varying the cross-sectional area thereof, said flexible member having an elongated opening intermediate its ends, a fuel supply, connecting means between the latter and said passage and registering with the said elongated opening, a valve chamber disposed in the side wall of said air passage opposite the said connecting means, a yielding valve having a reduced portion disposed in said valve chamber, the said reduced portion extending through said elongated opening and terminating within the said connecting means, shoulders on the said valve for engaging said flexible member adjacent said elongated opening whereby the said flexible member controls the movement of said valve.

6. In a charge forming device, a body portion having a fuel passageway and a Venturi-shaped air passage therein, a flexible plate within said passage, an elongated opening in the said plate intermediate its ends, means for flexing said plate to vary the cross-sectional area of the said passage throughout a portion of its length, a hollow shank portion extending outwardly from the walls of said passage, a slidable member within said shank having a recess therein and a tapered portion extending through said elongated opening and terminating within said fuel passageway, spring means interposed in the recess in said slidable member, threaded means in the outer end of said hollow shank against which one end of said spring abuts, the latter adapted to yieldingly urge the reduced portion of the slidable member into said fuel passageway, and shoulders on said slidable member formed by said reduced portion adapted to engage the flexible member adjacent said elongated opening whereby the said flexible member controls the movement of the said tapered portion within the said passageway, the said flexible plate being responsive to suction.

7. In a carburetor having a Venturi shaped air passage, a curved flexible member with-

in said passage shaped to conform to one wall of the passage when in inoperative position, means for moving the member to inoperative position, and yielding means tending to move
5 the flexible member away from said wall.

8. In a carburetor including a body portion having a Venturi shaped air passage, a member pivotally related to the body, a flexible member having one end fixed to the pivot
10 member to be actuated thereby and extending within the passage, said flexible member being shaped to conform to one wall of the passage when in inoperative position, and yielding means tending to move the flexible
15 member away from said wall.

9. In a carburetor including a body portion having a Venturi shaped air passage, a fuel intake opening into the passage, a flexible curved member mounted within the passage and adapted to vary the effective cross
20 sectional area of the passage, yielding means for urging the flexible member toward the fuel intake, and means actuated by said yielding means to close the fuel intake.

10. In a carburetor including a body portion having a Venturi shaped air passage, a fuel intake opening into the passage, a movable member mounted within the passage adapted to vary the effective cross sectional
25 area thereof, a movable valve member for closing the fuel intake, said valve member having a portion bearing against the movable member to actuate the same, and yielding means urging the valve member into
30 closed position.

11. In a carburetor including a body portion having an air passage, a fuel intake opening into the passage, a movable member mounted within the passage and adapted to
40 vary the effective cross section thereof, a yieldingly actuated valve member movable into the fuel intake for closing the same and having a portion adapted to engage the movable member to urge it toward its closed
45 position, and manually operative means for moving the movable member and valve member toward their open positions.

12. In a carburetor including a body portion having an air passage, a fuel intake
50 opening into the passage, a movable member mounted within the passage and adapted to vary the effective cross section thereof, a yieldingly actuated valve member movable into and out of the fuel intake for controlling
55 the flow of fuel therethrough and having a portion adapted to engage the movable member to urge it toward the closed position, means limiting the inward movement of the valve member, and manually operated means
60 for moving the movable member and valve member toward their open positions.

13. In a carburetor including a body portion having an air passage, a fuel intake opening into the passage, a yieldingly actuated valve member extending across the air
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passage and having a reduced portion movable into and out of the fuel intake for controlling the flow of fuel therethrough, a movable member mounted within the passage adapted to vary the effective cross section
70 thereof and having an aperture through which said reduced portion extends so that the movable member may actuate the valve member in one direction, and manually operable means for moving the movable member and valve member toward their open
75 positions.

In testimony whereof I have signed this specification.

FRANK C. MOCK. 80

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