Aug. 18, 1936. H. H. GRAZER 2,051,038

DOWNDRAFT CARBURETOR

Filed Oct. 16, 1935 2 Sheets-Sheet 1

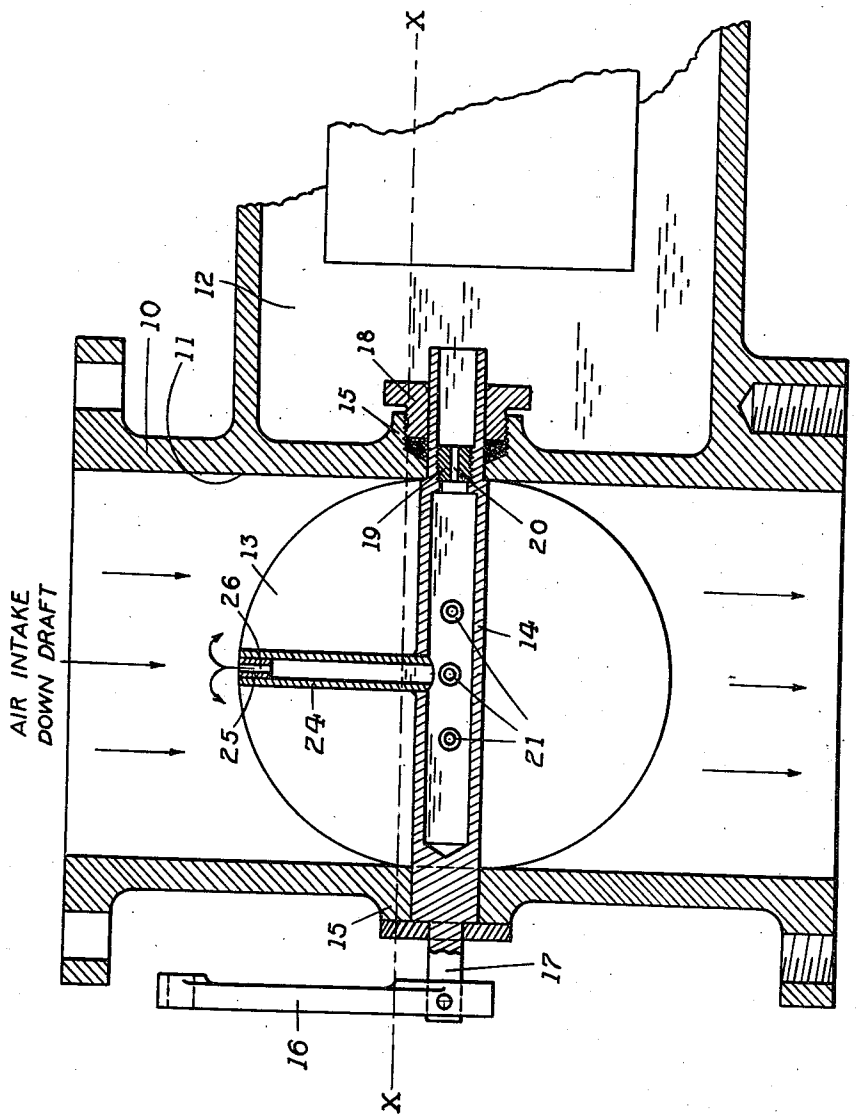


Fig. 1.

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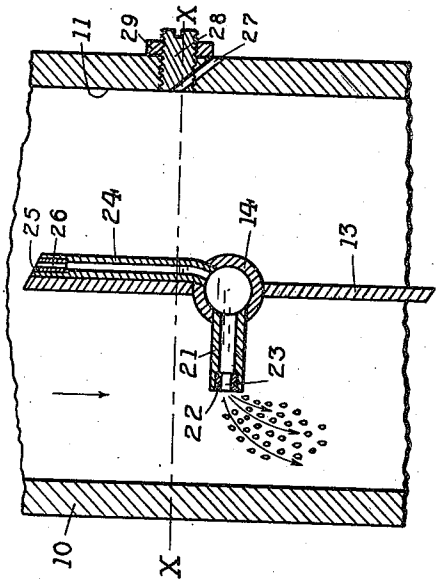


Fig. 4.

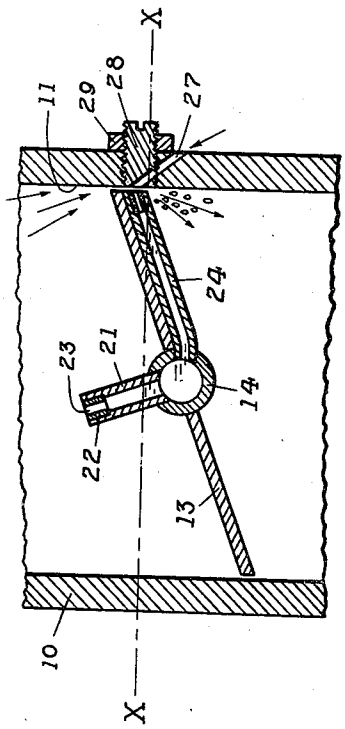


Fig. 2.

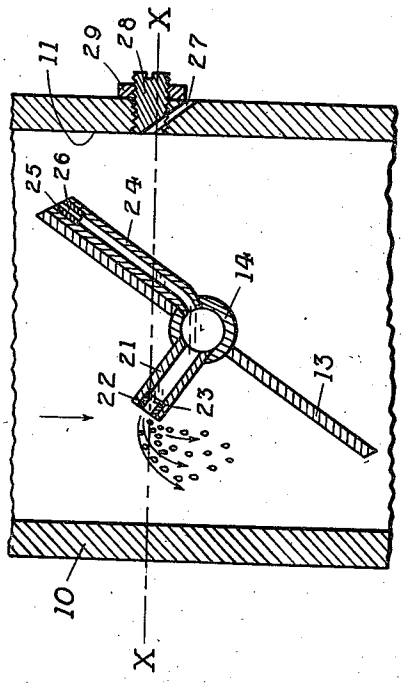


Fig. 3.

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UNITED STATES PATENT OFFICE

2,051,038

DOWNDRAFT CARBURETOR

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Application October 16, 1935, Serial No. 45,198

10 Claims. (Cl. 261—62)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention relates to carburetors and it has particular relation to carburetors of the downdraft type for use in airplanes and other aircraft.

One of the objects of the present invention is the provision of a carburetor of the character described having means movable with the throttle valve for feeding the fuel in volumes proportional to amount the valve is open and in the properly atomized condition.

Another object of the invention is the provision of a carburetor having a throttle valve equipped with means for feeding fuel into the air intake passageway for idling purposes when the valve is closed.

A further object of the invention is the provision of a carburetor so constructed as to obtain a thorough atomizing of the fuel without the usual Veturi tube, thus materially simplifying the construction and number of working parts.

Still another object of the invention is the provision of a carburetor operating upon a gravity feed principle by means of which a proper acceleration over the entire speed range is obtained and the tendency for the combustion mixture to lean down when the engine is running at low speed due to overload is minimized.

With these and other objects in view, as well as other advantages which may be incident to the use of the improvements, the invention consists of the parts and combinations thereof hereinafter set forth and claimed, with the understanding that the several necessary elements constituting the same may be varied in proportion and arrangement without departing from the nature and scope of the invention, as defined in the appended claims.

In order to make the invention more clearly understood there are shown in the accompanying drawings means for carrying the invention into practical effect, without limiting the improvements in their useful application to the particular construction, which, for purpose of explanation, have been made the subject of illustration.

In the accompanying drawings:

Fig. 1 is a vertical sectional view through the air intake manifold or passageway of a downdraft carburetor constructed in accordance with the invention and showing the throttle valve open;

Fig. 2 is a similar view taken at right angles to Fig. 1, and showing the throttle valve closed, but fuel being delivered for idling purposes from an auxiliary or idler jet;

Fig. 3 is a view similar to Fig. 2 but showing the throttle valve half open and fuel being fed into the intake manifold from a plurality of main jets under the influence of suction developed by the inflowing air; and

Fig. 4 is a similar view but illustrating the throttle fully open and fuel being fed under the action of both suction and gravity.

Referring to the drawings, a carburetor constructed in accordance with the present invention is shown as comprising a casting 10 having an air intake passageway or manifold 11 and a float chamber 12 formed therein. Air from the outer atmosphere flows downwardly through the passageway 10, as indicated by the arrows in Fig. 1, and is controlled by means of a discoidal throttle valve 13 that is suitably fixed to a tubular shaft 14 journalled in bearings 15 formed in the side walls of the passageway 11. A lever 16 is fixed to a reduced out end 17 of the shaft 14 and is adapted to be connected with the rod or links by means of which the valve 13 is operated.

The inner end of the shaft 14 extends through a suitable packing gland 18 which is threaded into the inner bearing 15 and communicates with the gasoline or other fuel supply in the float chamber 12 below the fluid level X—X thereof. The passage of fuel from the chamber 12 into the shaft 14 may be restricted by means of a member 19 which is threaded into the inner end of the shaft 14 and having a passage or duct 20 provided therein of reduced cross-sectional area.

Communicating with the shaft 14 within the intake passage 11 are a plurality of tubular main jets 21 herein shown as extending in a direction normal to the plan of the valve 13, but it will be understood that the angularity of these jets may be altered as desired in order to obtain the best results. The flow of fuel through the jets 21 may be restricted by means of members 22 threaded into the ends of the jets and having reduced ports 23 formed therein.

Also communicating with the tubular shaft 14 is a single idler or auxiliary jet 24 which extends along the lower face of the valve 13 and at substantially right angles to the main jets 21. This jet is also provided with a member 25 at its outer end having a small duct 26 therein for limiting the flow of fuel therethrough as in the case of the main jets 21. When the valve 13 occupies a closed position, as shown in Fig. 2, the idler jet 24 registers with an air bleed port 27 communicating with the outer atmosphere through the side wall of the passageway 11, for a purpose hereinafter to be described. This port is formed partly in the side wall of the passageway 11 and partly in a screw

plug 28 which is threaded into said wall and maintained in an adjusted position by a lock nut 29. The flow of air through the port 27 may be controlled by slightly rotating the plug 28 so as to offset the portion of the port 27 in the plug with respect to that in the wall.

In operation, let it first be assumed that the throttle valve 13 is closed, as shown in Fig. 2 and that the engine is idling. Under such conditions the idler jet 24 registers with the air bleed port 27 at substantially the fuel level X—X, and practically the only air that passes the throttle valve is a relatively small amount passing the same adjacent to the idler jet 27. This air draws a limited quantity of fuel from the jet 24 by suction and delivers the same in an atomized condition into the passageway 11 below the valve 13.

Let it now be assumed that the throttle valve 13 is moved to a half open position, as shown in Fig. 3. Under these conditions the idler jet 24 is elevated above the fuel lever X—X, thereby interrupting the feeding of fuel from this jet. This movement of the valve 13 simultaneously lowers the main jets to positions substantially on the level with said fuel level X—X where a greater amount of fuel is introduced into the passageway 11, both by reason of the increased number of these jets and the increased suction induced by the greater volume and velocity of the air flowing past the valve 13. The fuel thus introduced into the intake passage will be thoroughly atomized and mixed with the proper amount of air.

If the throttle valve 13 be opened to its fullest extent, as shown in Fig. 4, the main jets 21 pass below the fuel level X—X and causes a still greater flow of fuel to be induced by suction, as above explained, and also by gravity. The feed of fuel from the main jets 21 in the positions of the valve 13 shown in Figs. 3 and 4 is augmented by air pressure exerted behind the fuel in these jets through the idler jet 24, which in both instances is above the fuel level X—X.

From the foregoing it will be apparent that the fuel introduced into the intake manifold or passageway 11 as it all times proportional to the extent that the throttle valve is open and, hence the volume of air flowing downwardly in the passageway 11. The orifices 23 and 26 in the main and idler jets 21 and 24, respectively, are of such cross-sectional area as will permit the passage of the proper amount of fuel at all times. The angularity of the main and idler jets 21 and 24 may be altered with respect to one another and with respect to the plane of the valve 13, if such change may be found to be desirable.

Other modifications and changes in the proportions and arrangement of the parts may be made by those skilled in the art without departing from the nature and scope of the invention, as defined in the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What I claim is:

1. In a downdraft carburetor the combination with an air intake passageway having a throttle valve therein carried by a tubular operating shaft which communicates with a supply of fuel, of a jet communicating with said shaft and movable therewith to and from a position above the fluid level of the supply of fuel in which position said throttle valve is closed, and to and from a position below said fluid level in which latter position said valve is fully open and fuel is fed from said jet into said intake passageway under the influence of gravity.

2. In a downdraft carburetor the combination with an air intake passageway having a throttle valve therein carried by a tubular operating shaft which communicates with a supply of fuel, of a jet communicating with said shaft and movable therewith to and from a position above the fluid level of the supply of fuel in which position said throttle valve is closed, a position substantially at the level of said supply of fuel in which position said valve is partly open and fuel is fed from said jet into said intake passageway in a restricted quantity by suction developed by the inflowing air, and to and from a position below said fluid level in which latter position said valve is fully open and fuel is fed from said jet into said intake passageway under the influence of gravity.

3. In a downdraft carburetor the combination with an air intake passageway having a throttle valve therein carried by a tubular operating shaft which communicates with a supply of fuel, of a jet communicating with said shaft and disposed at an angle to the plane of said throttle valve and movable therewith to and from a position above the fluid level of the supply of fuel in which position said throttle valve is closed, and to and from a position below said fluid level in which latter position said valve is fully open and fuel is fed from said jet into said intake passageway under the influence of gravity.

4. In a downdraft carburetor the combination with an air intake passageway having a throttle valve therein carried by a tubular operating shaft which communicates with a supply of fuel, of a jet communicating with said shaft and movable therewith to and from a position above the fluid level of the supply of fuel in which position said throttle valve is closed, and to and from a position below said fluid level in which latter position said valve is fully open and fuel is fed from said jet into said intake passageway under the influence of gravity, and an idling jet mounted on and communicating with said shaft for feeding a limited quantity of fuel into said intake passageway when said valve is closed.

5. In a downdraft carburetor the combination with an air intake passageway having a throttle valve therein carried by a tubular operating shaft which communicates with a supply of fuel, of a jet communicating with said shaft and movable therewith to and from a position above the fluid level of the supply of fuel in which position said throttle valve is closed, and to and from a position below said fluid level in which latter position said valve is fully open and fuel is fed from said jet into said intake passageway under the influence of gravity, an idling jet mounted on and communicating with said shaft for feeding a limited quantity of fuel into said intake passageway when said valve is closed, and an air bleed communicating through the wall of said passageway with the outer atmosphere adjacent to said idling jet when the throttle is in its idling position for supplying additional air to the fuel fed by said idling jet.

6. In a downdraft carburetor the combination with an air intake passageway having a throttle valve therein carried by a tubular operating shaft which communicates with a supply of fuel, of a jet communicating with said shaft and movable therewith to and from a position above the fluid level of the supply of fuel in which position said throttle valve is closed, and to and from a posi-

tion below said fluid level in which latter position said valve is fully open and fuel is fed from said jet into said intake passageway under the influence of gravity, an idling jet mounted on and communicating with said shaft for feeding a limited quantity of fuel into said intake passageway when said valve is closed, an air bleed a limited quantity of fuel into said intake passageway with the outer atmosphere adjacent to said idling jet when the throttle is in its idling position for supplying additional air to the fuel fed by said idling jet and means for controlling the flow of air through said air bleed.

7. In a downdraft carburetor the combination with an air intake passageway having a throttle valve therein carried by a tubular operating shaft which communicates with a supply of fuel, of a jet communicating with said shaft and movable therewith to and from a position above the fluid level of the supply of fuel in which position said throttle valve is closed, and to and from a position below said fluid level in which latter position said valve is fully open and fuel is fed from said jet into said intake passageway under the influence of gravity, and an idling jet mounted on and communicating with said shaft for feeding a limited quantity of fuel into said intake passageway when said valve is closed, said idling jet being adapted to supply air pressure back of the fuel fed by said main jet, thus to expedite the atomizing of the fuel.

8. In a downdraft carburetor the combination with an air intake passageway having a throttle valve therein carried by a tubular operating shaft which communicates with a supply of fuel, of a jet communicating with said shaft and movable therewith to and from a position above the fluid level of the supply of fuel in which position said throttle valve is closed, and to and from a position below said fluid level in which latter position said valve is fully open and fuel is fed from said jet into said intake passageway under the influence of gravity, and an idling jet mounted on and communicating with said shaft for feeding a limited quantity of fuel into said intake passageway when said valve is closed, said idling jet being disposed at an angle to said main jet and adapted to be elevated when said main jet is lowered to supply air pressure back of the fuel fed by said main jet, thus to expedite the atomizing of the fuel.

9. In a downdraft carburetor the combination with an air intake passageway having a throttle valve therein carried by a tubular operating shaft which communicates with a supply of fuel, of means carried by the throttle valve and movable to and from positions above and below the level of the fuel supply for feeding fuel into the intake passageway in volumes proportional to the amount the valve is open.

10. In a downdraft carburetor the combination with an air intake passageway having a throttle valve therein carried by a tubular operating shaft which communicates with a supply of fuel, of a main jet carried by the throttle valve and movable to and from positions above and below the level of the fuel supply for feeding fuel into the intake passageway in volumes proportional to the amount the valve is open, and an idling jet also carried by the throttle valve for feeding fuel in a lesser volume into said passageway for idling purposes when the valve is closed.

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