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R. F. BRACKE

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CARBURETOR

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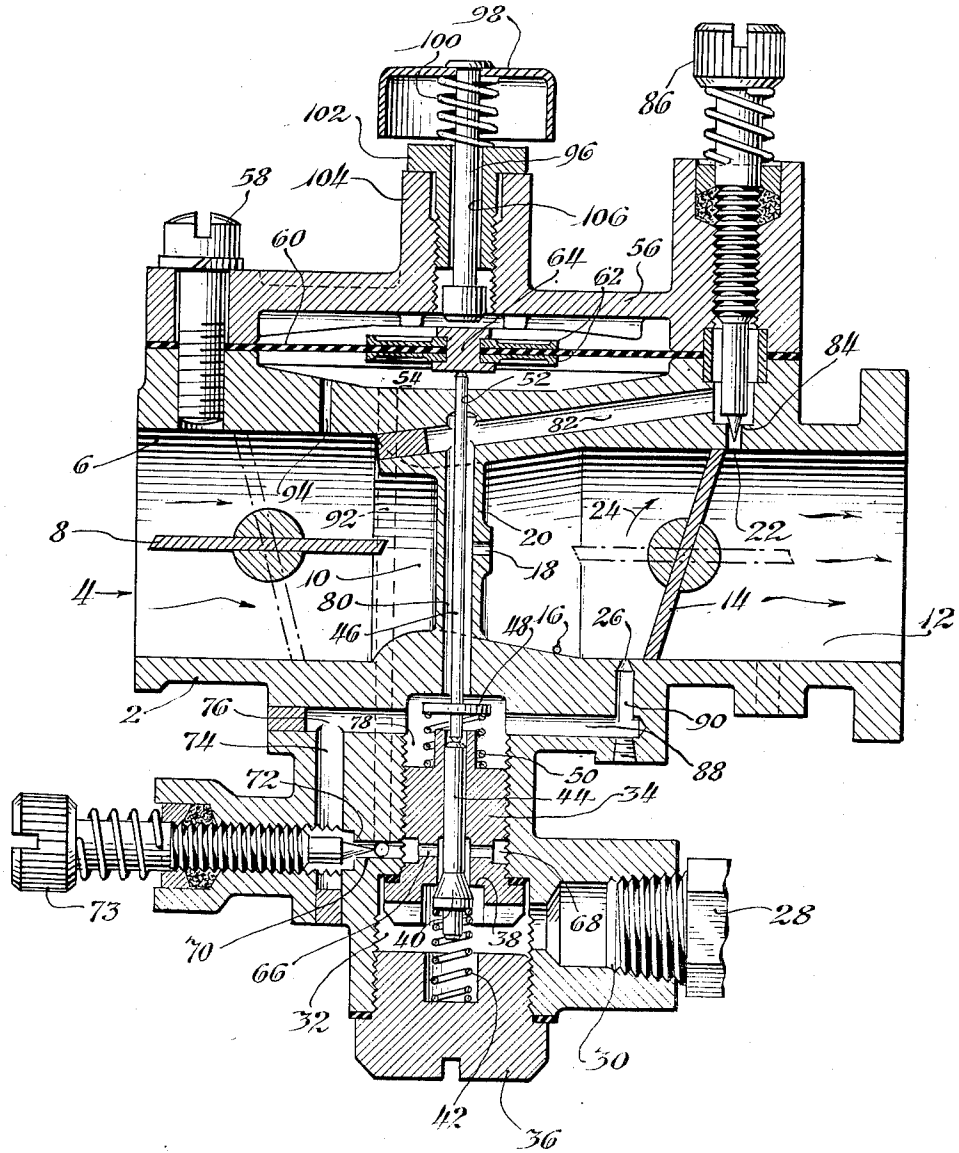

Inventor:

Robert F. Bracke

By Dinkler, Horton, Allbery, Hangsmann & Klopper

Attorneys.

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CARBURETOR

Robert F. Bracke, Arlington Heights, Ill., assignor, by mesne assignments, to R. F. Bracke & Company, Chicago, Ill., a partnership composed of Hazel B. Bracke and Robert Anderson

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1 Claim. (Cl. 261—41)

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My invention relates to carburetors and is more particularly concerned with carburetors of a type which can be operated in any position.

In modern aircraft practice it is common to utilize carburetors which will operate in any position. Such carburetors however are intricate, expensive, and cumbersome, and are entirely unsuitable for use with small power tools.

A primary object of my invention is to provide a compact, simple, inexpensive yet efficient carburetor especially adapted for small tools and similar uses and capable of operating effectively in all positions.

Another object of my invention is to provide a carburetor of the foregoing type which is easy to start.

A further object of my invention is to provide a new and improved carburetor of the foregoing type which gives a good idle mixture and an enriched mixture just above idle speed.

Still another object of my invention is to provide a new and improved carburetor which gives accurate metering for all speeds and in all positions.

Another object of my invention is to provide a new and improved carburetor which is impossible to flood by tickling.

Another object of my invention is to provide a new and improved carburetor utilizing small, light parts having small movements and which is not affected by vibration.

Still another object of my invention is to provide a carburetor having a new and improved construction and arrangement of parts.

In the drawing the single figure is an elevational view in section of a preferred form of my invention.

Referring to the drawing it will be seen that my carburetor comprises a body 2 having an air inlet 4 leading to a choke bore 6 provided with any usual choke valve 8. The choke bore 6 in turn communicates with a Venturi shaped air passage 10 discharging into the throttle bore 12. A throttle valve 14 which may be of any usual construction is located in the throttle bore 12. A small vent 16 is provided to prevent flooding of the carburetor under any conditions of operation.

A high speed fuel jet 18 is located in the Venturi shaped passage 10 and a feature of my invention lies in the positioning of this jet intermediate its fuel control valve and the operating means therefor. It is to be noted that this jet, preferably but not necessarily, coincides with the central axis of the passage in the direction of flow of air therethrough and is formed in the wall of a tubular part 20 which bisects the Venturi shaped passage 10. An idle jet 22 is also provided and another feature of my invention lies in the relationship between this jet and the throttle valve 14. It will be noted from the arrow 24 that this throttle valve opens in a clockwise direction rather than in the usual counterclockwise direction, with the result that the amount of fuel delivered by the idle jet during part-throttle operation is reduced. This leads to better fuel economy and operating conditions particularly in two-cycle engines.

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For some purposes a third jet 26 may be provided. This fuel jet 26 is for the purpose of enriching the mixture at speeds very slightly above idle and is particularly advantageous where the carburetor is to be utilized on a four-cycle engine. This jet 26 however is not essential and may be dispensed with if desired. The carburetor is adapted to be connected to any suitable source of fuel supply by means of a pipe 28 threadedly attached to a tapered fuel inlet 30 provided in the lower part of the body 2. This inlet communicates with a chamber 32 formed between a valve seat member 34 and a plug 36. The member 34 has a valve seat 38 adapted to be engaged by the tapered surface of a main fuel valve 40 which is urged toward its seat by a spring 42. An important feature of my invention lies in the construction and arrangement of this fuel valve and the means for controlling it. The fuel valve 40 has an upwardly projecting stem 44 whose upper end is spaced slightly from the lower end of an operating rod 46 when the parts are in rest position, as shown in the drawing. This operating rod has a flange 48 resting on a spring 50 of just sufficient strength to overcome the weight of rod 46 and any frictional resistance to movement thereof so that this rod is returned to the position shown independently of the main fuel valve 40 and offers no resistance to closing movement of this valve.

The operating rod 46 passes through the tube 20 and its upper end slides freely in the wall 52 just beneath a diaphragm chamber 54 whose lower part is formed in the upper end of the body 2. The upper part of the diaphragm chamber 54 is formed by a cover 56 attached to the body 2 by screws 58 or in any other suitable manner. A diaphragm 60 of flexible material impervious to gasoline and oil has its edge confined between the body 2 and cap 56 and forms a seal therebetween. The central portion of the diaphragm 60 is provided with metal plates 62 held in place by a rivet 64. The lower face of this rivet is positioned to engage the upper end of the actuating rod 46 and move it downwardly under the in-

fluence of the diaphragm 60 in a manner hereinafter more fully described.

The main fuel valve 40 controls communication between the chamber 32 and radial passages 66 leading to an annular chamber 68. A duct 70 connects the annular chamber 68 with a high speed orifice 72 controlled by the high speed needle valve 73 which is adjustable to vary the effective size of the orifice 72. Fuel flowing past the orifice 72 travels by way of ducts 74 and 76, chamber 78, and passageway 80 to the main fuel jet 18. Passage 80 also continues past the main fuel jet and connects with duct 82 leading to idle orifice 84 which is adjustably controlled by the idling needle valve 86 to regulate the discharge of fuel through idle jet 22. In carburetors also equipped with the jet 26, this jet receives its fuel from chamber 78 by way of ducts 88 and 90.

A passage 92 connects the lower side of the diaphragm chamber with the fuel duct 70 leading to high speed orifice 72 so that the suction available to move the central portion of the diaphragm 60 downwardly is the suction existing in the passage between the main fuel valve and the high speed orifice. This passage 92 also removes from the diaphragm chamber any fuel which may leak thereinto around the upper end of the rod 46 and maintains the diaphragm chamber free of fuel so that the diaphragm can accurately and immediately reflect changes in the forces acting thereon.

A small duct 94 connects the lower part of the diaphragm chamber with the choke bore 6 and permits a small quantity of air to bleed into the diaphragm chamber. This air in turn is sucked out of the diaphragm chamber through duct 92 and mixes with fuel supplied to the several fuel jets. The small quantity of air entering the diaphragm chamber through duct 94 assists in maintaining the diaphragm chamber perfectly dry and is too small in volume to have any appreciable effect on the supply of fuel to the several jets.

To facilitate starting, particularly in cold weather, I provide what is commonly known as a tickler. This tickler comprises a plunger 96 having an enlarged lower end normally positioned immediately above the diaphragm rivet 64. The upper end of the plunger is attached to a cap 98 resting on a spring 100 which serves to hold the plunger in elevated position. The lower end of the spring 100 rests upon a sleeve 102 screwed into the upwardly projecting tubular extension 104 of the cover 56. The cap 98 may be pressed downwardly by the fingers to open the fuel valve during a starting operation.

In operation my novel carburetor is attached to the intake manifold of an engine and to a source of fuel such as a fuel supply tank located slightly above the carburetor. Both needle valves are open such for example as one-half to three-fourths of a turn, the choke is closed or partly closed, and if the motor is cold the tickler may be pressed downwardly while the engine is cranked. As soon as the engine starts the tickler is released and the choke is immediately or gradually returned to the open position shown as determined by temperature and other starting conditions.

Air entering the carburetor and flowing through the Venturi shaped passage 10 creates a suction at the high speed jet 18 proportional to engine demand. This suction is communicated to the diaphragm chamber through passage 80, chamber 78, ducts 76 and 74, orifice 72 and ducts 70 and 92.

The upper side of the diaphragm 60 is subjected to atmospheric pressure through the clearance 106 around the plunger of the tickler, and the difference in pressure on the opposite sides of the diaphragm causes the diaphragm to flex downwardly and hold the main fuel valve 40 open. If the suction in the diaphragm chamber is increased, as it is at higher engine demand, the diaphragm is flexed to a greater extent and the main fuel valve opens to a correspondingly greater degree.

The duct 94 allows a small amount of air at atmospheric pressure to bleed into the diaphragm chamber but this inflow of air is not sufficient to affect the operation of the diaphragm. The purpose of this air bleed is to keep the diaphragm chamber dry so that the movement of the diaphragm can instantaneously respond to quick changes of the throttle valve and quick changes in engine demand.

At idle or low speed with the throttle valve closed or nearly closed, as shown in full lines in the drawing, suction is produced in passage 80 by virtue of the connection between this passage and the idle jet 22. Under idle conditions, the main jet 18 does not carry enough suction to feed fuel. Instead, air bleeds in through this jet and into the fuel in passage 80 passing upwardly through passage 80 and duct 82 to idle jet 22. This back bleed forms an emulsion which provides a more uniform idle mixture and smoother engine operation at idle speed.

From the foregoing description taken in connection with the accompanying drawing it will be apparent that my carburetor is of simple construction and that the diaphragm valve and main fuel jet are located concentrically with respect to the Venturi air passage 10. This arrangement is an important feature of my invention and provides a constant quality mixture for any given setting of the valve in the throttle bore regardless of the position of the carburetor. This arrangement together with the small size of the operating parts and their short movements also prevent operation of the carburetor from being affected by vibration.

For some purposes it may be advantageous to eliminate passage 92 and connect the lower side of the diaphragm chamber with the junction of fuel passages 80 and 82 by providing a substantial clearance around the upper end of the actuating rod 46. This alternative construction has been tried and has operated very satisfactorily. Both forms of construction have the advantage of providing a dry diaphragm chamber requiring only a single diaphragm in lieu of the complicated structures heretofore necessary to provide a dry diaphragm chamber or the equivalent thereof.

It is to be understood that my invention is not limited to the particular details shown and described but may assume numerous forms and includes all variations, modifications, and equivalents coming within the scope of the appended claim.

I claim:

A carburetor of the class described comprising a body having a choke bore, a throttle bore and a connecting air passage of Venturi shape, a main fuel jet in said Venturi shaped air passage, an idle jet for said throttle bore, a choke valve in said choke bore, a throttle valve in said throttle bore, a main fuel control valve for said jets, a high speed needle valve between said

last-named valve and said jets, a diaphragm and diaphragm chamber for opening said main fuel valve, a passage connecting one side of said diaphragm with a point intermediate said main fuel valve and said high speed needle valve, means providing communication between the other side of said diaphragm and atmosphere, and a restricted passage connecting said choke bore with the first-mentioned side of said diaphragm.

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