

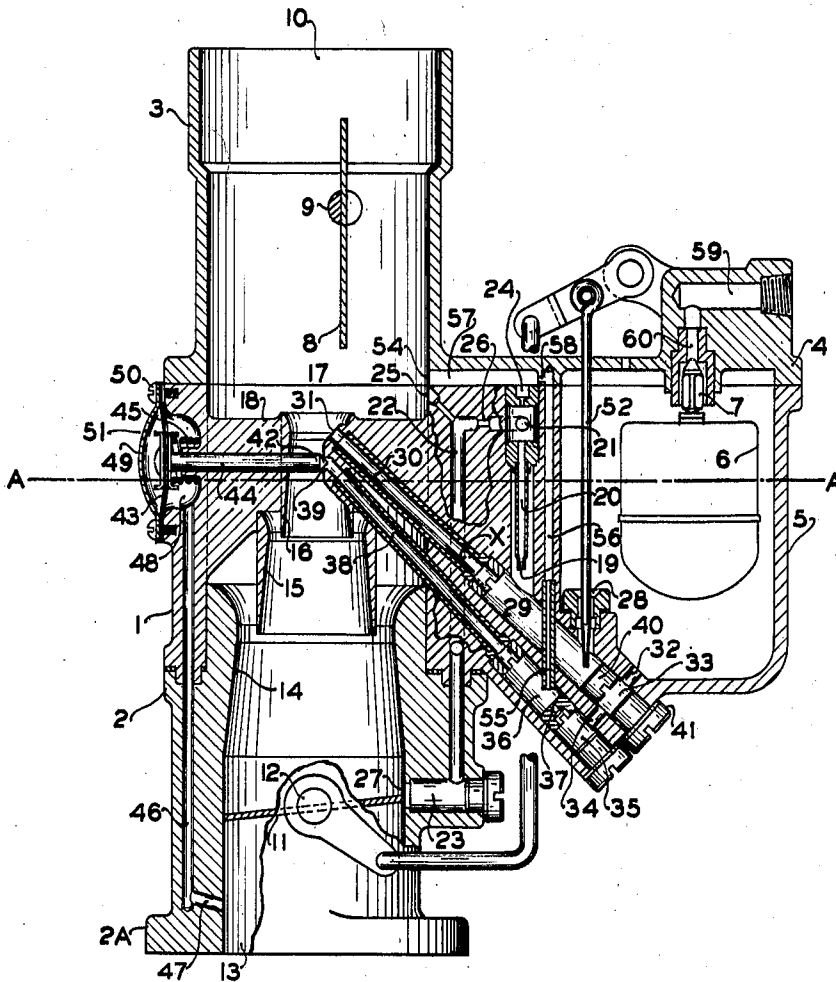
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CARBURETOR

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CARBURETOR

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This invention relates to carburetors for internal combustion engines and more particularly to downdraft carburetors of the plain tube type.

Constructions of the more successful current downdraft plain tube carburetors comprise a main mixing conduit having an air inlet controlled by a choke valve and an outlet controlled by a throttle valve. A main fuel supply conduit arranged to discharge into the mixing conduit at a point of high velocity and an idling fuel supply conduit arranged to discharge into the mixing conduit near the edge of the throttling valve when the same is in or near a closed position.

It has been found desirable in constructions of the above character to interconnect the main and idling fuel supply conduit and to provide a common feed from the constant level fuel chamber.

It has also been found desirable and practical to control the common feed in accordance with the position of the throttle valve by means of throttle interconnected valve mechanism. This means permits an accurate control of the quality of the mixture at all points in the part throttle or economy range.

It will be understood that a smooth blending and transfer from the idling supply to the main supply as the throttle valve is slowly opened is inherent in this arrangement.

It is also true, however, that a disadvantage of this arrangement becomes evident when considering the effect of a rapid opening movement of the throttle valve.

To exemplify, assume an engine is operating under the normal load of an automobile at idling speeds with the throttle near a closed position.

At this time the total fuel is fed through the idling system. As the common supply is necessarily restricted to the greatest extent at this time, the fuel will be withdrawn or lowered in the main supply conduit to a greater or lesser extent depending on the driving conditions and the general calibration of the carburetor.

If the throttle is now rapidly opened, the depression or vacuum in the intake manifold momentarily drops to almost atmospheric pressure and as a result fuel will cease to discharge from the idling passage.

As the fuel in the main supply conduit has been lowered it will be seen that an interval is required to fill this conduit before any can be discharged. During this interval the engine will not be supplied with sufficient fuel from either the idling or main fuel supply and an objectionable irregularity in engine operation results. This lag in fuel discharge becomes more pronounced with in-

creased restriction of the common feed from the constant level chamber.

Accelerating pumps arranged to discharge a predetermined amount of fuel upon opening movements of the throttle remedy this condition as well as supply auxiliary fuel for varying intervals when rapid substantial throttle opening movements reduce the air velocity in the mixing conduit to a point where the main fuel conduit ceases to feed sufficiently.

Considerable difficulty, however, is encountered in obtaining the correct discharge for both rapid small opening movements of the throttle and for greater throttle openings, the discharge requirements not being proportionate to the throttle travel.

It is an object of this invention to provide a generally new and improved downdraft carburetor of the plain tube type in which the advantages of interconnected main and idling fuel supply passages and the control of a common feed therefor by throttle interconnected valve mechanism is retained.

It is a further object of this invention to provide a carburetor of the above character having two main fuel supply conduits, one of which is interconnected to an idling fuel supply conduit and the other provided with a pressure responsive control valve.

Other objects and advantages will appear in the following description and drawing, referring to which:

The single figure is a diagrammatic representation of a carburetor constructed in accordance with my invention.

Numeral 1 indicates a main body casting arranged for assembly in any suitable manner with flange casting 2. A flange 2a formed at the lower end of casting 2 is arranged for suitable attachment to the intake manifold of an internal combustion engine (not shown). The air inlet casting 3 having a constant level chamber cover 4 formed integral therewith is also attached to the main body casting 1 in any suitable manner. A constant level chamber 5 is formed as an integral part of the main body casting 1 and a substantially constant level of fuel as indicated by the dot-dash line A—A is maintained therein by the float 6 and the inlet valve 7. The choke valve 8 attached to the pivotally mounted choke shaft 9 controls the air inlet 10. It will be understood that this valve may be of any suitable design and be operated manually or automatically in any suitable manner to provide enrichment during abnormal engine operation.

A throttle valve 11 attached to the pivotally mounted throttle shaft 12 controls the outlet 13.

A series of three venturis are provided, the largest of which being indicated by the numeral 14 is formed in the flange casting 2. The two smaller venturis 15 and 16 are supported in the mixing conduit by the webs or struts 18.

Fuel is supplied from the constant level chamber 5 during the idling range of operation by the idling system, which comprises a fuel metering orifice 19, passages 20, 21, 22, 23, air bleed 24 and 25, restriction 26 and discharge port 27.

It will be understood that discharge port 27 may be shaped or proportioned to suit individual requirements.

During part throttle operation in which is customarily called the economy range, fuel is supplied to the mixing conduit from the constant level chamber through calibrated jet 28, passage 29, primary nozzle 30 and primary discharge tip 31. A gradually decreasing amount of fuel is supplemented by the idling system as the throttle is moved open.

A stepped or tapered metering rod 52 is provided to vary the flow through jet 28 in accordance with the position of the throttle. As the vacuum in the intake manifold drops below a predetermined point, due to increased engine load, auxiliary fuel is supplied to the mixing conduit through passages 32, 33, 34, 35, 36, calibrated restriction 37, secondary nozzle 38, and secondary discharge tip 39. Passage 33 is defined at the lower end of passage 29 by the plugs 40 and 41.

A pressure responsive valve 42 adapted to control secondary discharge tip 39 is provided. Pressure responsive means for controlling valve 42 comprises a flexible diaphragm 43, rigidly attached to the extended valve stem 44, a calibrated compression spring 45 constantly urging the diaphragm toward a valve open position, and passages 46 and 47 for communication below the throttle valve.

Diaphragm 43 forms a flexible partition in the cup-shaped chamber 48 which is formed as a recess in the main body casting 1 and is provided with cover 49. Screws 50 are provided for attachment of cover 49 and diaphragm 43 to the main body casting.

Vent 51 provides communication to atmosphere on one side of the diaphragm.

To provide a momentary enrichment and a means of further controlling the total fuel supply to the mixing conduit during the last-mentioned operating condition, a communication is provided between the passage 36 and the mixing conduit at 54 comprising the passages 55, 56, 57 and restriction 58.

It will be understood that communication with the atmosphere or mixing conduit above the fuel level A—A may be provided at any number of points in the passage 36 and the passage through nozzle 38 between restriction 37 and secondary discharge tip 39, to deliver the fuel more smoothly at the point of discharge.

It will be further understood that with the provision of a conventional accelerating pump (not shown), the foregoing communication or air bleeding may be omitted.

In operation, fuel from the storage tank enters the inlet passages 59 and 60 and a substantially constant level, as indicated by dot-dash lines A—A, is maintained in the constant level chamber 5 by the float actuated valve 7.

Assume the engine to be operating at idling speed with the normal load of an automobile and

the throttle valve in a nearly closed position. Under these conditions, a comparatively high vacuum will exist in the induction system posterior to the throttle valve and a substantial vacuum will exist in the idling system, its magnitude depending, of course, upon the position of the edge of the throttle valve with respect to the idle discharge port 27.

The fuel level in primary nozzle 30 will, at this time, be lowered to some point below the fuel level A—A as indicated by the dotted line x, by reason of a depression in idling passage 20 sufficient to induce a greater fuel flow through idling jet 19 than will flow through jet 28 by reason of the head of fuel above it at this time.

It will be noted that the net opening of jet 28 will be smallest also at this time due to the position of metering rod 52.

As the throttle is slowly opened a greater area of port 27 will be exposed to manifold suction and a greater flow of fuel through the idling system will result.

As the opening of the throttle is continued the point of maximum suction that can be applied to port 27 will be reached and thereafter further throttle opening will result in a loss of suction at this point due to a dropping of manifold vacuum.

As the suction on port 27 decreases with further opening movement of the throttle, the level of fuel in nozzle 30 will rise and the velocity of air through the Venturi system will increase until fuel is aspirated from primary discharge tip 31.

Assuming the throttle valve has been rapidly opened to say, approximately, one quarter of its travel, it will be seen that manifold vacuum will momentarily drop substantially and in instances encountered in normal driving, closely approach atmospheric pressure. Under these conditions the discharge of fuel from the idling system is abruptly discontinued and as the fuel level in primary nozzle 30 has been lowered, a short interval will be required to fill this passage to the point of discharge.

The pressure responsive valve 42 opens, however, under these conditions of operation as the manifold vacuum drops below a predetermined point and fuel is immediately available at level A—A in secondary nozzle 38.

It will be understood that valve 42 will remain open during all operation wherein the manifold vacuum is below the predetermined point, and that the composite discharge of the primary and secondary nozzles is required during this range of operation.

The detailed description and structure shown is intended to be illustrative, not limiting, and various modifications within the scope of the following claims are possible.

I claim:

1. In a downdraft carburetor, means forming a mixing conduit, a fuel chamber, float actuated mechanism for maintaining a constant level of fuel in said fuel chamber, a primary fuel passage communicating with said fuel chamber and adapted to discharge into said mixing conduit, branched means cooperating with said primary fuel passage to provide an idling fuel passage, a secondary fuel passage communicating with said constant level chamber at a point below the level of the fuel therein and adapted to discharge into said mixing conduit, a valve for controlling said secondary passage at the point of discharge, a calibrated restriction in said secondary fuel pas-

sage, and a passage for communication between said secondary fuel passage and atmosphere at a point posterior to said calibrated restriction and a point above the level of fuel.

5 2. In a downdraft carburetor, means forming a mixing conduit, a throttle valve in said conduit, a constant level fuel chamber, a branched fuel passage communicating with said constant level chamber, one branch of said branched fuel pas-
10 sage being arranged to discharge fuel into said mixing conduit above the level of fuel and a second branch being arranged to discharge fuel into said mixing conduit posterior to said throttle valve, a variable restriction in said branched
15 fuel passage at a point anterior to the junction

of said branches, mechanism coacting with said throttle valve for reducing the net opening of said variable restriction as said throttle valve moves toward a closed position, a second fuel passage communicating with said constant level fuel chamber and arranged to discharge fuel into said mixing conduit at a point above the level of fuel and below the discharge point of one branch of said branched fuel passage, a pressure responsive valve for controlling said second fuel pas-
10 sage at the point of discharge, and a passage for communication between said second fuel passage at a point below the level of fuel and the atmosphere.

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