Aug. 16, 1932. G. M. BICKNELL 1,872,559

CARBURETOR

Filed Aug. 9, 1929 2 Sheets-Sheet 1

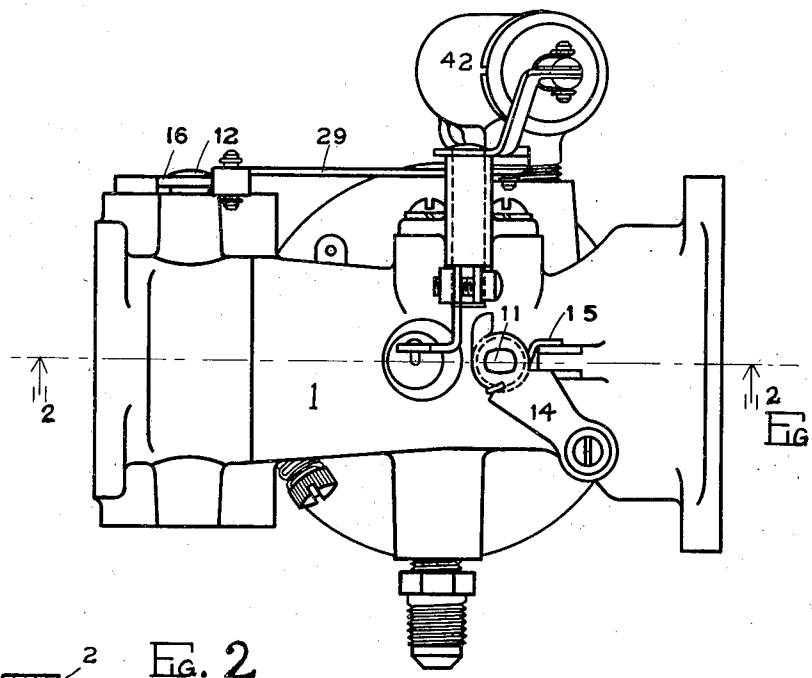


FIG. 1

FIG. 2

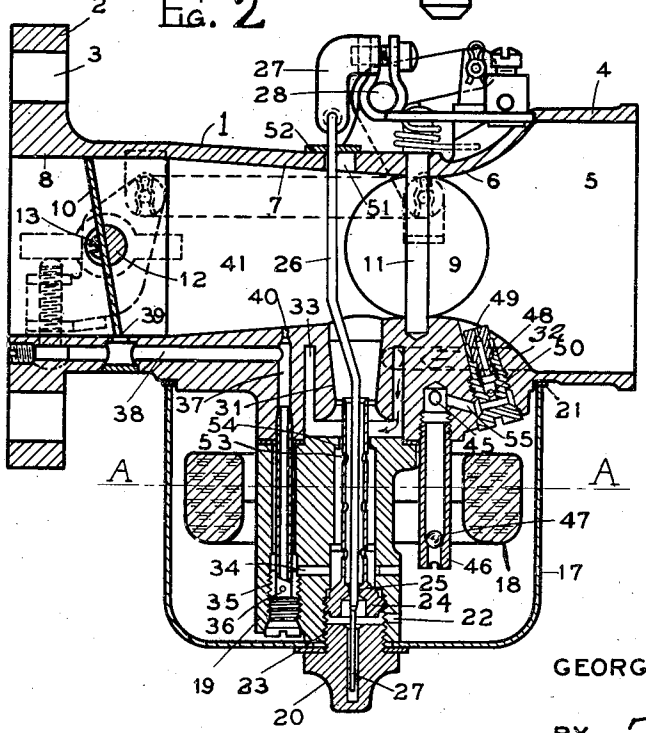
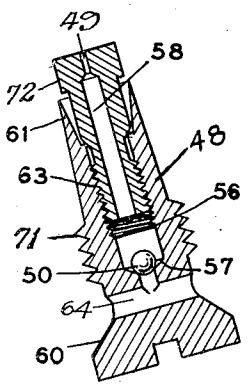


FIG 5



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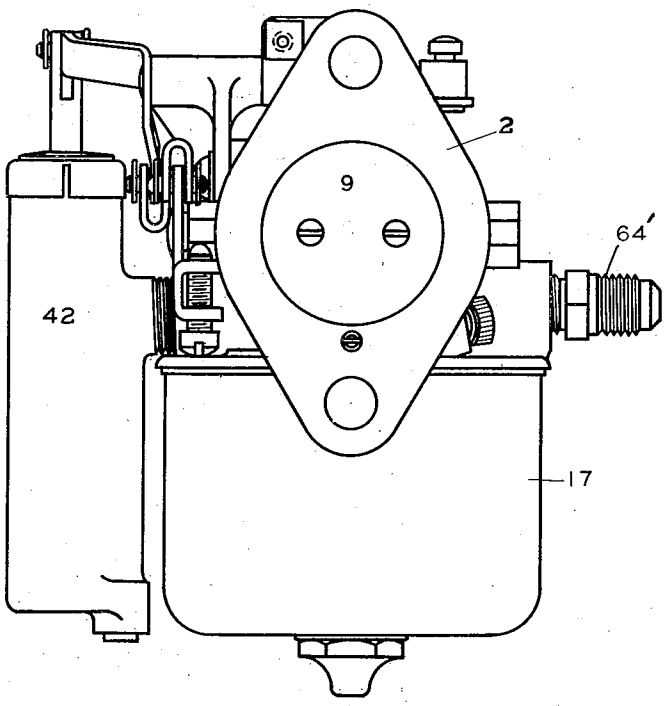


FIG. 3

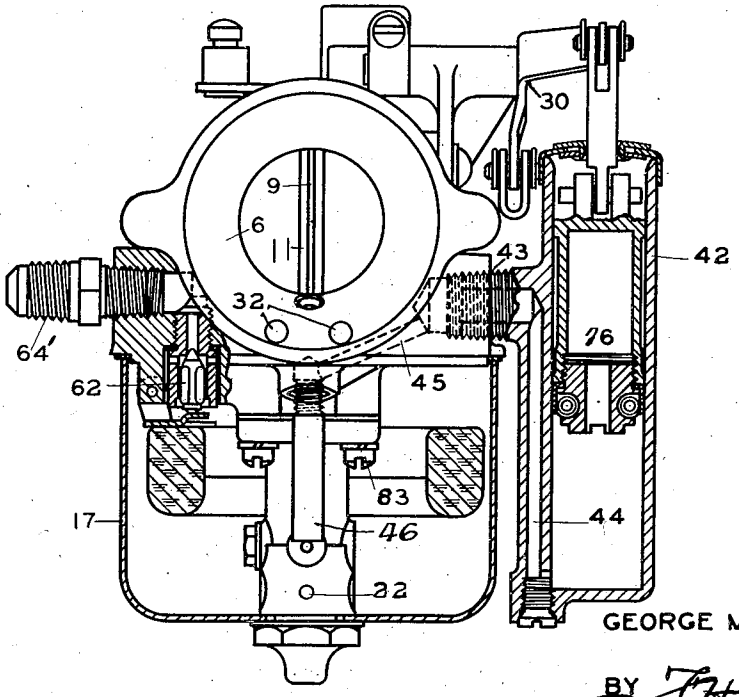


FIG. 4

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UNITED STATES PATENT OFFICE

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CARBURETOR

Application filed August 9, 1929. Serial No. 384,610.

This invention relates to carburetors for internal combustion engines.

It is an object of the invention to produce a carburetor in which the fuel will only have to be lifted a very short distance from the fuel level in the supply chamber or float bowl by the suction of the air stream.

It is a further object of this invention to produce a carburetor in which the air and fuel passageways are short and direct without sacrificing any efficiency in mixing qualities.

A further object of this invention is to produce a carburetor in which the velocity of the flow of air is built up smoothly until it reaches the point where the highest velocity is required, and then permitted to slow down gradually as it passes from the carburetor.

Other objects of the invention will appear from the following description and the accompanying drawings, referring to which:

Figure 1 is a plan view of a carburetor constructed according to my invention.

Figure 2 is a sectional elevation of the carburetor shown in Figure 1, sections being taken along the line 2—2 looking in the direction of the arrows.

Figure 3 is an end elevation of the carburetor shown in Figures 1 and 2.

Figure 4 is an end elevation with parts in section of the carburetor shown in Figures 1, 2, and 3 taken from the end opposite to that shown in Figure 3.

Figure 5 is a detail view of the pump outlet nozzle structure.

The reference numeral 1 indicates a casting forming the main body member of the carburetor. This casting is provided at one end with a flange 2 having bolt holes 3 by means of which the carburetor may be secured to the intake manifold of an internal combustion engine. At the end opposite the flange 2 is a somewhat enlarged portion 4. The passageway 5 of substantially circular cross section throughout is formed in the casting. The passage is restricted, as indicated at 6, and gradually enlarged again, as indicated at 7, to form a venturi at the throat of which the speed of flow of the air is considerably increased. The discharge end of the passageway terminates in a cylindrical portion 8, as shown.

The flow of air through the carburetor is controlled by two valves comprising a choke valve 9 and a throttle valve 10, the choke valve being, in this instance, mounted on a vertical shaft 11, and the throttle valve being mounted on the shaft 12. Suitable screws 13 are provided to attach the throttle valve to the shaft 12. The choke valve shaft is split to receive the valve 11, which is attached to it by solder or any other suitable means (not shown). A suitable operating lever 14 is attached to the choke shaft 11 and a spring 15 is provided to yieldably hold the choke in closed position. A throttle operating lever 16 is suitably attached to the shaft 12 of the throttle.

The fuel is supplied to the inlet 64′ of the carburetor from any conventional source, as by gravity feed from the main supply tank or from a vacuum tank, or it may be supplied from a fuel pump. It is maintained at a constant level in the fuel bowl 17 by the float 18, a float valve 62 adapted to control the fuel inlet being provided. A float bowl supporting member 19 is attached to the main body member 1 by suitable means, such as screws 83, and a retaining nut 20 is threaded into this member to hold the cup-shaped bowl 17 in position against its annular seat 21 on the body member 1. A passageway 22 is formed in the bowl supporting member 19 and serves to admit fuel to the threaded bore 23. The main nozzle member 24 is threaded into this bore, and the nozzle is provided with a calibrated metering orifice 25 through which the fuel is drawn by suction. A metering wire 26 extends through the metering orifice 25 and is connected to an operating lever 27 mounted on a shaft 28 which is operated by movement of the throttle, a link 29, and a crank 30 being provided for that purpose. The metering wire passes through a port 51 in the walls of the main mixing chamber 41, and a sealing disk 52 is loosely mounted on the wire 26 to close the port 51, as indicated. The metering wire 26 is provided with a portion 27 of smaller or different diameter from the main part of the wire. This

is for the purpose of adjusting the effective size of the metering orifice 25 as the throttle is opened or closed.

A small venturi or choke tube 31 is formed in the main body member with the throat substantially at the level of the outlet of the nozzle 24. This venturi discharges into the main venturi just inside of its throat and inside the choke valve 9. One or more air inlet ports 32 are formed in the entrance of the main venturi and connected to an annular space 33 surrounding the choke tube 31. The entrance to these air inlets 32 is outside the choke valve, and air may by-pass the choke valve by flowing through the passages 32, 33, and 31.

A small bore 34 is formed in the member 19 to permit fuel to flow from the bore 23 to a chamber 35 which is threaded to receive an idling tube 36. This tube communicates with passages 37 and 38 in the main body member of the carburetor which lead to a port 39 at the edge of the throttle valve 10. An air bleed 40 is formed to admit air from the main mixing chamber 41 to the idling duct.

An accelerating pump cylinder 42 is threaded to the main body member at 43, and a passageway 44 leads from the lower end of the cylinder through the threaded portion, as shown, to communicate with the bore 45 in the body member. A small tube 46 is threaded into the body member to communicate with the bore 45, and an inwardly opening check valve 47 is mounted in the tube. It will be understood that the lower end of the tube is below the fuel level in the float bowl. A jet nozzle 48 is threaded into the body member in communication with the bore 45 and arranged to discharge through a minute orifice 49 just outside the choke valve 9, and an outwardly opened ball check valve 50 is mounted in the jet nozzle 48.

The accelerating pump nozzle comprises a body member 48 having screw threads 71 for attachment to the corresponding threads in the body of the carburetor, and a jet member or nozzle proper 72, which is threaded or otherwise attached to the body member 48 as shown. The nozzle body 48 is bored transversely at 64 to provide communication through the bores 55, 45, and 44 with the cylinder of the pump. A longitudinal bore 56 in the nozzle body is provided with a shoulder or valve seat 57 to receive the ball check 50. The ball check is retained by the member 72, which has an axial bore 58 terminating in a minute orifice or jet 49.

An important feature of the nozzle is the sealing means, as the leakage of air into the accelerating pump system, or fuel out of it, might upset the calibration of the carburetor. In order to produce an effective sealing means, I form a shoulder or head 60 having a fairly abrupt taper, and a seating part 61, having a slow taper and a thin wall. The spacing of these tapered parts is such that the slim taper 61 seats first, and the thin walls 61 are slightly distorted as the nozzle body is brought up against the seat 60. A very positive seal is formed in that manner.

The operation of the device is as follows:

Fuel being supplied to the fuel bowl by suitable means and maintained therein substantially at the level indicated at A—A, the fuel flows through the passages 22 and 25 to the main nozzle 24. It also flows through port 53 in the wall of the main nozzle and the passage 34 to the idling duct 36.

It being desired to start the engine, the choke valve 9 is closed and the throttle valve 10 suitably adjusted, if desired. This may be done either manually or by connection to the choke valve operating means. Such means, however, forms no part of this invention and is not shown.

When the engine is operated by the starting means, air is drawn through the passages 32 to the choke tube 31 in which it is brought to a comparatively high velocity in the restricted portion of the venturi therein. Inasmuch as the fuel is at a level comparatively near the top of the nozzle, fuel is readily lifted through the nozzle by the suction in the venturi, together with air, which may be drawn in through the ports 53. It will be understood that the nozzle does not fit closely in the bore 54 and that air may pass downwardly through the crevice therebetween to enter the nozzle through the port 53 and form an emulsion therein. This emulsion is comparatively light in specific gravity and is readily lifted through the short distance between the fuel level and the top of the nozzle.

At the top of the nozzle, the emulsion is broken up into a spray mixture with the rapidly flowing air passing through the venturi, thus forming a very rich mixture which is suitable for starting purposes, which mixture flows into the engine charging it in the usual manner.

After the engine has been started and warmed up to some extent, the choke valve 9 is opened to permit the rich mixture issuing from the venturi 31 to be diluted and further mixed with fresh air in the main mixing chamber 41.

When the throttle is closed, a comparatively high suction will exist in the suction chamber 55 at the outlet side of the throttle valve 10, while substantially atmospheric pressure may exist in the mixing chamber 41. Under these conditions, suction will be produced in the passage 38, drawing air in through the bleed 40 and drawing fuel up through the idling tube 36, thus forming a mixture suitable for idling conditions.

The piston 76 of the pump is operated downwardly when the throttle is opened and

upwardly when it is closed, with the result that when the throttle is opened, a quantity of fuel will be discharged through the jet nozzle 49 and sprayed into the air stream to temporarily enrich the mixture as required for acceleration.

It will be understood that the invention is susceptible of many modifications, and, accordingly, I do not wish to be limited in my protection, except as set forth in the accompanying claims.

I claim:

1. In a carburetor, means forming a mixing chamber, a fuel reservoir, a spray nozzle having a metering orifice for supplying fuel from said reservoir to said mixing conduit, a metering wire extending through said metering orifice and through said mixing conduit for controlling the flow of fuel to said conduit, an opening of comparatively large size in a wall of said conduit to receive said wire, and a cover slidably mounted on said wire and adapted to close said opening, said cover being adapted to be held firmly in closed position by suction in mixing conduit.

2. In a carburetor, means forming a mixing conduit, a control valve for said conduit, a metering wire passing through said conduit at a point adjacent said control valve, said valve being mounted to rotate on an axis parallel to said wire and adjacent thereto, whereby the combined resistance of said wire and said valve will be reduced to a minimum when the valve is open.

3. In a carburetor, a horizontal passageway of substantially circular cross section, a venturi in said passageway through which the air must pass at a high velocity, a float chamber mounted directly under said passageway, a vertically disposed primary choke tube extending into said float chamber from said passageway, said choke tube being adapted to discharge a mixture of air and fuel into said passageway at a point inside said venturi, an annular well surrounding said choke tube, and an air passage leading from a point in said main air passage outside the venturi to said well.

4. In a carburetor, means forming a mixing conduit, a venturi in said coduit, a manually operable valve mounted near the throat of said venturi to control the flow therethrough, and manually operated means comprising a pump for discharging a jet of fuel against said valve.

5. In a plain tube carburetor, means forming a mixing conduit, throttle and choke valves controlling the flow of fuel through said conduit, an accelerating pump connected to said throttle to discharge fuel upon an opening movement thereof, and a discharge nozzle for said pump, said nozzle being mounted to discharge into said mixing conduit at a point between the inlet end and said choke valve.

6. In a carburetor, a member having a fuel passageway therein, a bore in said member intersecting said passageway, a fluid conducting member having an axial passageway therein and intersecting said bore, a transverse passage in said conducting member providing communication between said passage in the body member and said passage in the conducting member, and means for sealing said conducting member in said body member comprising a tapered seat on each side of said transverse passages.

7. In a device of the class described, a body member having a passageway therein, a bore intersecting said passageway, a conducting member adapted to be sealed within said bore and having a transverse opening between its ends for communication with said passageway, and means for sealing said conducting member within said body member comprising a pair of seats, one of said seats having a slim taper, and the other of said seats having an abrupt taper.

8. In a device of the class described, a body member having a passageway therein, a bore through said body member intersecting said passageway, a conducting member adapted to be inserted within said bore and to be sealed to prevent leakage from said passageway through said bore, and means for sealing the conducting member in said bore comprising two seats adapted to fit the bore, one on each side of said passageway, one of said seats having a comparatively thin wall with a slim taper, the other of said seats being constructed to seat abruptly and positively.

9. In a device of the class described, a body member having a passageway therein, a bore through said body member intersecting said passageway, a conducting member adapted to be inserted within said bore and to be sealed to prevent leakage from said passageway through said bore, and means for sealing the conducting member in said bore comprising two seats on said member adapted to fit the bore, one on each side of said passageway, one of said seats having a comparatively thin wall with a slim taper, the other of said seats being constructed to seat abruptly and positively, and screw threaded means between said seats for attaching said conducting member to said body member.

In testimony whereof, I affix my signature this 30th day of July, 1929.

GEORGE M. BICKNELL.