

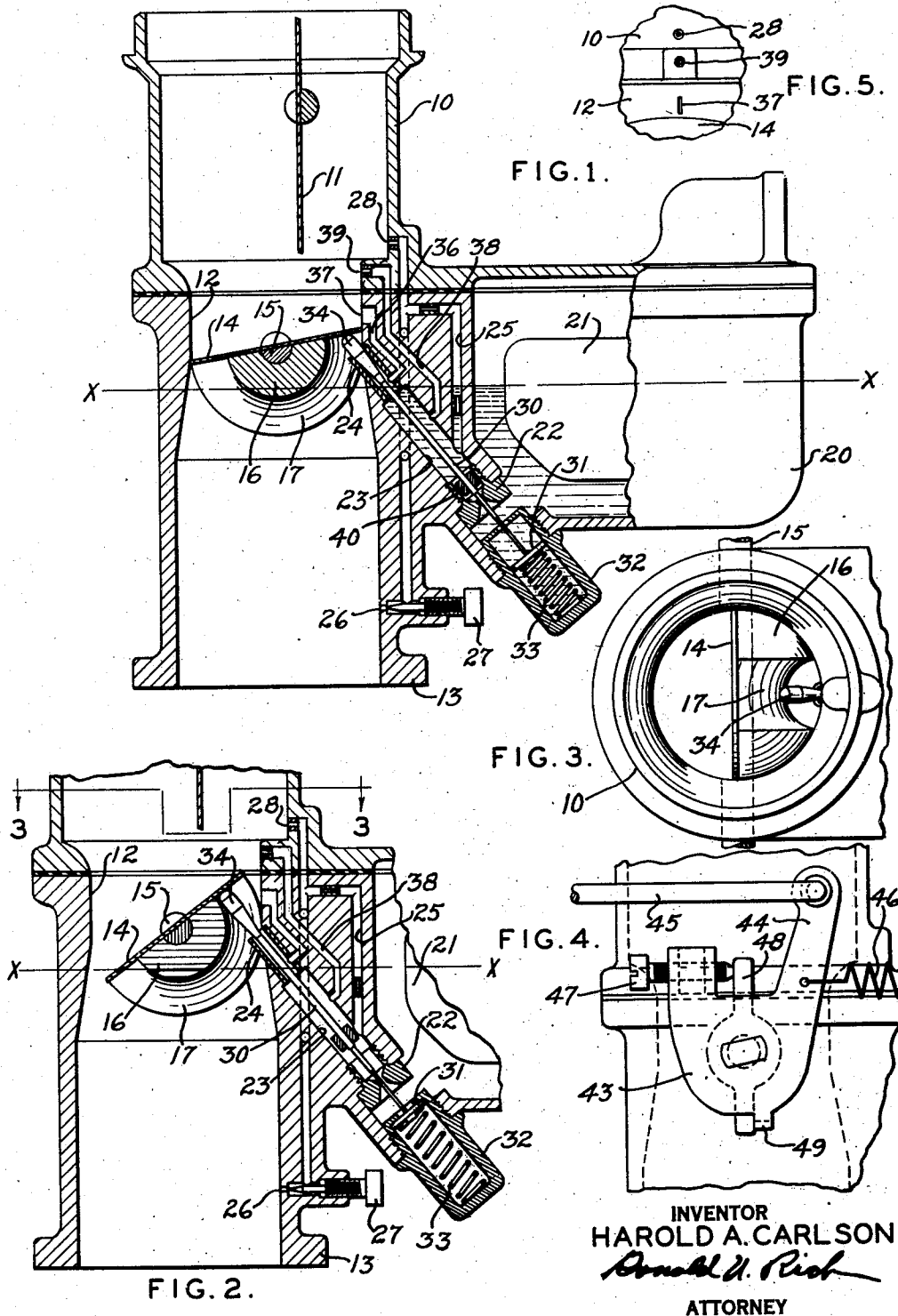
Sept. 10, 1946.

H. A. CARLSON

2,407,534

CARBURETOR

Filed April 27, 1943



UNITED STATES PATENT OFFICE

2,407,534

CARBURETOR

Harold A. Carlson, University City, Mo., assignor
to Carter Carburetor Corporation, St. Louis,
Mo., a corporation of Delaware

Application April 27, 1943, Serial No. 484,787

7 Claims. (Cl. 261-41)

1

This invention relates to carburetors for internal combustion engines and consists particularly in novel means for controlling the proportions of fuel and air supplied thereby.

The invention is more specifically concerned with a carburetor of the anterior throttle type in which the fuel for normal operation, as well as idling, is supplied posterior to the throttle valve. In this type of carburetor, particularly, where used with an automotive engine, there is some difficulty in controlling the fuel supply during idling and light load operation because of the fact that the fuel nozzle or nozzles are subjected to high suction at such times. In the present invention, there are provided main and idling fuel supply systems with means for greatly restricting or preventing the discharge of fuel from the relatively large main nozzle during idling.

It has been found that, whereas, the submerged air bleed is a desirable feature during part throttle or economy range operation in that it is a leaning influence, a constant air bleed may make it difficult to obtain a sufficiently rich mixture when the throttle is substantially opened for power operation.

The invention also incorporates means for utilizing such an air bleed to aid in properly proportioning the fuel and air mixture during part throttle operation, while substantially eliminating the effect of the air bleed when the throttle is more fully open and relying upon a submerged metering valve for proper proportioning at such times.

The invention also takes advantage of the principle that a submerged air bleed aids in lifting the fuel through the nozzle, even though it is a leaning influence, whereas an air bleed above the fuel level merely tends to reduce the effective suction applied to the fuel.

The above objects and features are attained substantially in the accompanying drawing in which

Fig. 1 is a vertical, transverse, central section through a carburetor embodying the invention.

Fig. 2 is a partial view similar to Fig. 1 but showing the throttle valve in a different position.

Fig. 3 is a top view of the barrel portion of the carburetor and showing the throttle wide open.

Fig. 4 is a side view of a part of the carburetor showing the throttle control mechanism.

Fig. 5 is a view of a portion of the inner wall of the carburetor barrel.

The carburetor shown comprises a downdraft mixture conduit including an air inlet horn 19 which may be controlled by a butterfly choke

2

valve 11, an intermediate Venturi tube 12, and an outlet portion flanged as at 13 for attachment to an engine intake manifold (not shown). A butterfly throttle plate 14 is pivotally mounted within Venturi tube 12 on a shaft 15. Secured or formed on the lower surface of plate 14 is a spheroidal part 16 having a groove 17 of semi-circular section extending transversely of the throttle shaft and from side to side thereof.

Adjacent the mixture conduit there is provided a bowl 20 within which fuel is maintained at a substantially constant level $x-x$ by the usual needle valve mechanism including a float 21. In the lower portion of the bowl there is provided a metering orifice element 22 through which fuel is supplied to an inclined passage 23 terminating in main nozzle 24 which discharges posterior to throttle plate 14 and into recess 17. An interconnected idling passage 25 extends from main fuel passage 23 upwardly above the fuel level and then downwardly to an idling port 26 having an adjusting screw 27. An idle air bleed is provided at 28.

A metering pin 30 has a stepped portion which operates within metering orifice 22 and at its lower extremity mounts a disk 31 which is slidable in a cup 32 threaded into the bottom of bowl 20. The disk and metering rod are constantly urged upwardly by a coiled spring 33 seated in the cup. The disk is perforated to prevent dash pot action. At its upper extremity, pin 30 has a tapered enlargement 34 which is urged toward and against the throttle valve plate by spring 33. This enlargement closely fits nozzle 24 when the throttle valve is closed, as in Fig. 1, but as the throttle is opened, the effective nozzle opening is controlled by the tapered portion of the enlargement. An air bleed passage 36 extends from nozzle 24 above the normal fuel level to a port 37 just anterior to but clear of throttle plate 14 when closed. A second air bleed passage 38 extends from main fuel passage 23, below the normal fuel level, to a port 39 which is slightly anterior to port 37. Port 39 is substantially more restricted than port 37, which is formed as a slot, and is located somewhat farther from the throttle, as shown. An enlargement or plunger 40, for a purpose to be described hereafter, is secured to metering pin 30 within main fuel passage 23, but is substantially smaller than this passage so as not to substantially restrict the flow of fuel there-through.

Rigidly secured to one end of throttle shaft 15 is an operating crank 43 having an apertured arm 44 to which is secured a link 45 extending to the

accelerator pedal adjacent the operator. The usual throttle return spring is indicated diagrammatically at 46. Crank 43 also carries an idle adjusting screw 47 for engagement with a fixed abutment 48 for limiting the closed position of the throttle valve. A permanently positioned lip 49 also limits closing movement of the throttle, in case screw 47 should be withdrawn too far to prevent damaging or wedging of the throttle plate.

This carburetor operates as follows:

During idling operation, when throttle plate 14 is closed, valve enlargement 34 substantially restricts main nozzle 24 and is assisted by the suction breaking action of air passage 36 in preventing the passage of fuel through the main nozzle. Accordingly, idling fuel will be supplied through branch passage 25 and port 26 which is calibrated to form the proper idling mixture. At such time the throttle plate will be closed so that port 37 is subjected to atmospheric pressure. As the throttle valve is opened, valve enlargement 34 is moved upwardly by spring 33 so as to gradually increase the effective opening in the nozzle outlet and, at the same time, engine suction is applied to port 37 to an increasing degree so that the effect of this passage in bleeding out the suction on the main nozzle is quickly reduced and eventually eliminated because of the proximity of the main nozzle and port. The tapered portion of valve enlargement 34 and the gradual reduction of suction in air passage 36 cooperate in bringing about the increased effectiveness of the main nozzle, although the relatively small discharge from the idling system continues.

During part throttle operation, the pressure in air bleed passage 38 is gradually reduced, as the throttle is opened, but this bleed remains effective to lean out the main nozzle discharge until the throttle has reached a substantially opened position in which the pressures on bleed port 39 and the main nozzle are substantially balanced. During operation in the early part throttle or so-called "off idle" throttle positions, a relatively large part of the metering rod remains in the metering orifice, but approximately as the air bleed becomes ineffective, a smaller step on the metering pin enters the metering orifice to provide a richer power mixture. When the throttle is rapidly opened, the upward movement of plunger enlargement 40 will cause an extra accelerating charge to be injected into the carburetor through the main nozzle. The effect of this plunger, however, being negligible when the throttle is opened slowly because of the very loose fit of the plunger in main fuel passage 23.

This carburetor has the advantage of being air bled in the economy range but the leaning effect of the bleed is substantially reduced when a rich power mixture is required. Vent 37 additionally cooperates with valving enlargement 34 to provide a suitably lean economy mixture. Since the throttle plate is tightly closed during idling, no air can pass this plate and, consequently, icing, which is due to condensation of moisture as it passes the throttle plate particularly before the engine has become fully heated, is eliminated. By the use of the anterior throttle arrangement, highest available suction is utilized without the interposition of auxiliary venturis. During cold starting, throttle plate 14 may be partly opened and choker 11 closed in the customary manner. However, in some cases, the choker valve may be eliminated as substantial suction for drawing fuel through the main nozzle

exists posterior to the throttle even during cranking. Transverse recess 17 formed on the throttle provides for concentration of the air flow about the main nozzle, particularly during full throttle operation, as indicated in Fig. 3.

Various features may be modified as will occur to those skilled in the art and the exclusive use of all modifications as come within the scope of the appended claims is contemplated.

I claim:

1. In a carburetor, a mixture conduit, a butterfly throttle valve therein having a spheroidal posterior surface with a recess extending normal to the valve axis, a main fuel nozzle with its outlet discharging into said recess, a throttle actuated valve in said nozzle for increasingly restricting the same as the throttle is closed, an air bleed passage opening into said conduit through a port adjacent the edge of said throttle valve when closed, and a second air bleed extending from said nozzle and opening into said conduit beyond said first bleed passage, both said bleed passages being swept by said throttle valve initially during opening thereof for sharply reducing the effectiveness thereof.

2. In a downdraft carburetor, a mixture conduit, a constant level fuel chamber, a main fuel nozzle discharging into said conduit below said throttle, an air bleed passage extending from said nozzle at a point above the normal fuel level therein, and a second air bleed passage extending from said nozzle at a point below said fuel level, said passages opening into said conduit close to said throttle and on the side thereof which moves anteriorly during throttle opening but at different distances anteriorly therefrom whereby the air pressure in one of said bleed passages varies at a different rate during opening of said throttle from that in the other bleed passage.

3. In a carburetor, a mixture conduit having a throttle therein, a constant level fuel chamber, interconnected main and idling fuel systems communicating with said chamber through a common metering orifice, said systems having discharge orifices constantly posterior to said throttle, a valve for closing said main system when said throttle is closed, and an air vent extending from said main system at a point above the normal fuel level therein to said mixture conduit slightly anterior to said throttle and on the anteriorly moving side thereof for bleeding out any suction applied to said main system when said throttle is closed and, thereby assisting said valve in preventing discharge from said main system when said throttle is closed.

4. In a carburetor, a downdraft mixture conduit having a butterfly throttle therein, a constant level fuel chamber, a main fuel passage extending from said chamber into said conduit and having a discharge opening located immediately posterior to said throttle when closed, a valve in the discharge end of said fuel passage and engageable by said throttle, when closed, to close said passage, a spring normally tending to open said valve in said passage and urging the same toward said throttle, and an air vent extending from said passage above the normal fuel level therein to said mixture conduit at a point slightly anterior to said throttle for bleeding out any suction applied to said fuel passage past said valve when said throttle is closed.

5. In a carburetor, a mixture conduit, a main fuel nozzle and an air bleed port having openings therein, and a throttle valve mounted between said openings, said valve having a pivotal

5

shaft, an anterior disc portion, and a spheroidal posterior portion with an annular recess extending transversely of said shaft into which said main nozzle extends and directly discharges.

6. In a carburetor, a mixture conduit, a butterfly throttle therein pivoted on a shaft and having a disc portion and projecting structure with an annular recess extending transversely of said shaft, said recess being of semi-circular section along any plane through said shaft, a main fuel nozzle extending through the wall of said conduit into said recess, and an air bleed passage extending from said nozzle to a port in the wall of said conduit immediately anterior to the edge of the said disc portion of said throttle when closed and in position to be swept by said edge during throttle opening.

7. In a carburetor, a mixture conduit, a butterfly throttle disc therein, a constant level fuel

6

chamber, a venturi-like restriction in said conduit posterior to said throttle disc, a main fuel nozzle extending from said chamber into said restriction, a valve for closing said nozzle when said throttle is closed and adapted to be opened when said throttle is opened, and an air vent extending from said nozzle above the normal fuel level therein to a port in the wall of said conduit immediately anterior to said throttle when closed for bleeding out any suction in said nozzle so as to aid said valve in preventing the discharge of fuel therefrom, said port being positioned to be swept by said throttle during initial opening thereof to expose said port to the engine suction and thereby reduce the bleeding and consequent fuel flow restricting effect of said vent as said throttle and said valve are opened.

HAROLD A. CARLSON.