

Dec. 27, 1955

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2,728,563

MULTISTAGE CARBURETOR

Filed Jan. 29, 1952

5 Sheets-Sheet 1

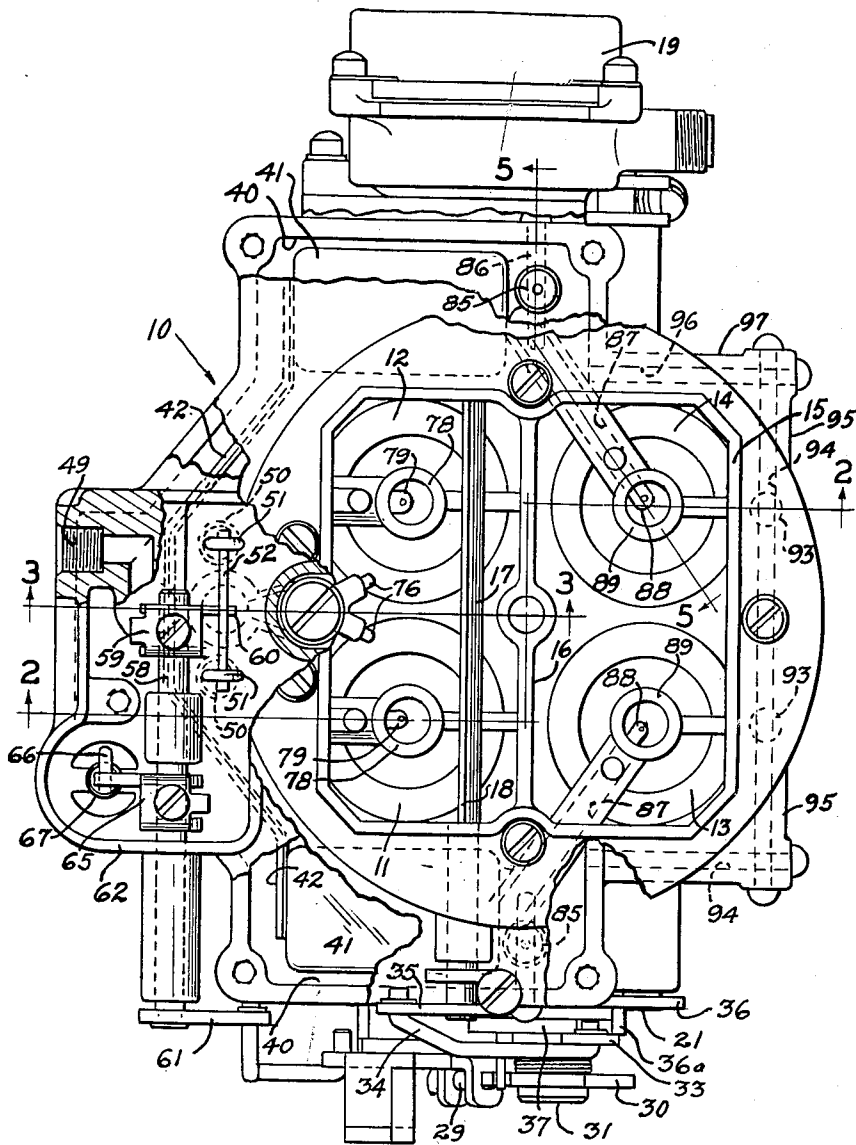


FIG. 1.

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5 Sheets-Sheet 2

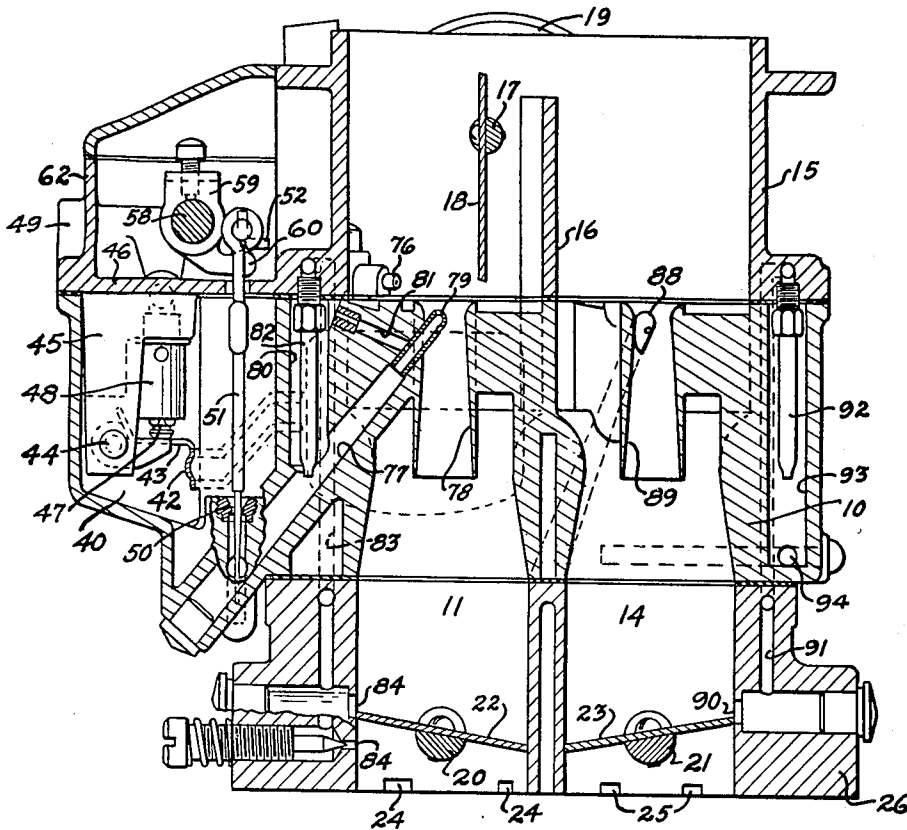


FIG. 2.

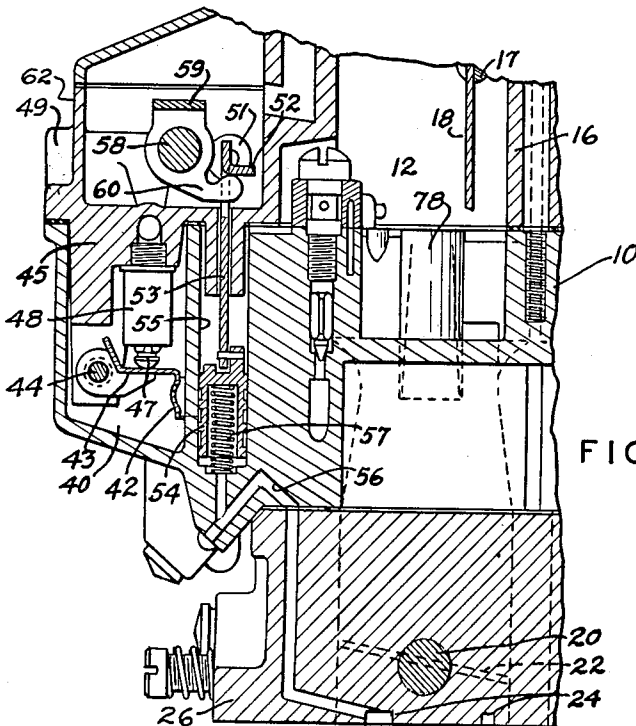


FIG. 3.

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5 Sheets-Sheet 3

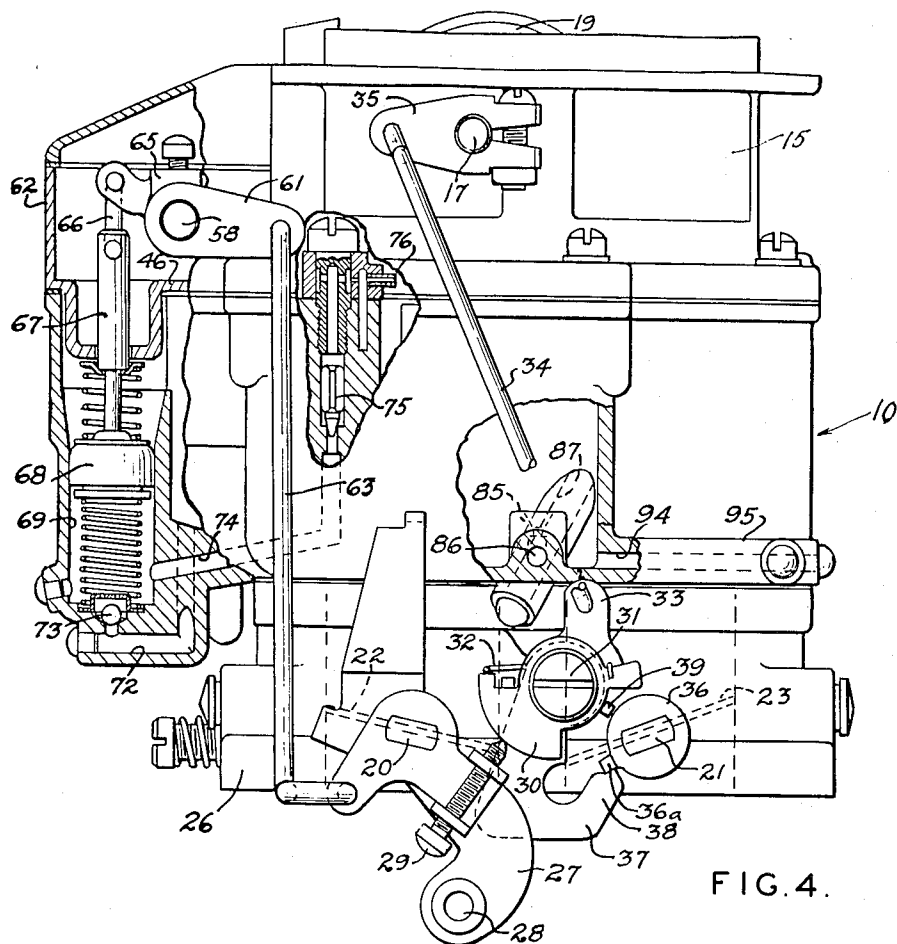


FIG. 4.

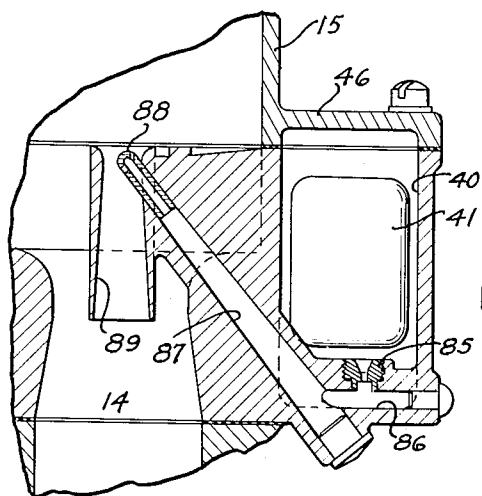


FIG. 5.

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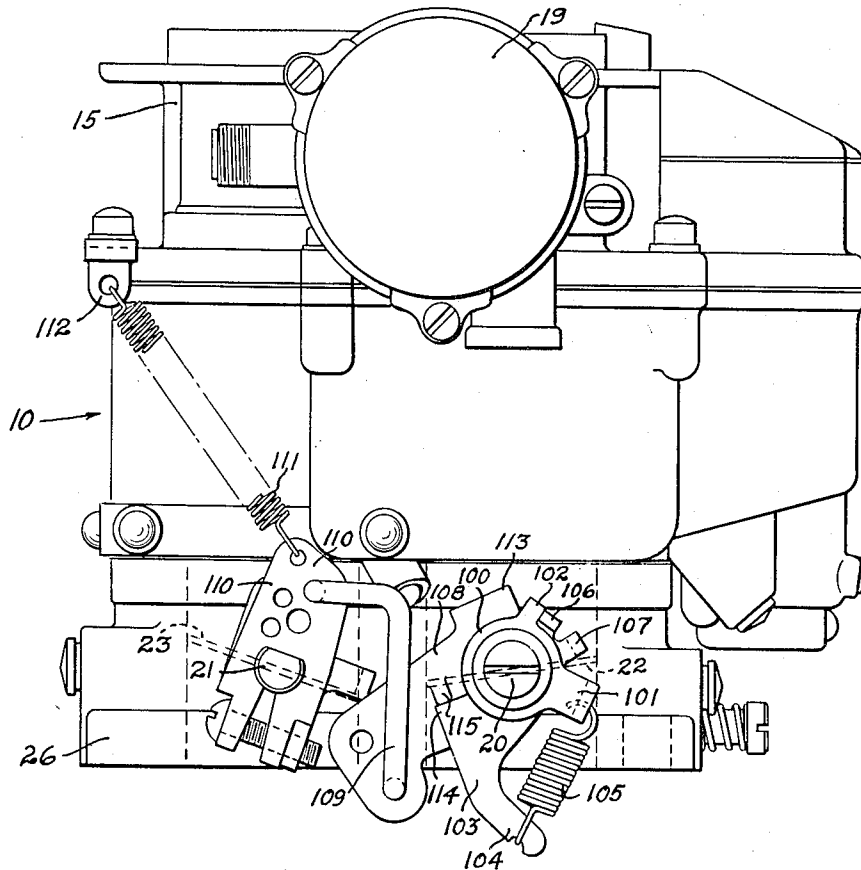
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MULTISTAGE CARBURETOR

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5 Sheets-Sheet 4



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5 Sheets-Sheet 5

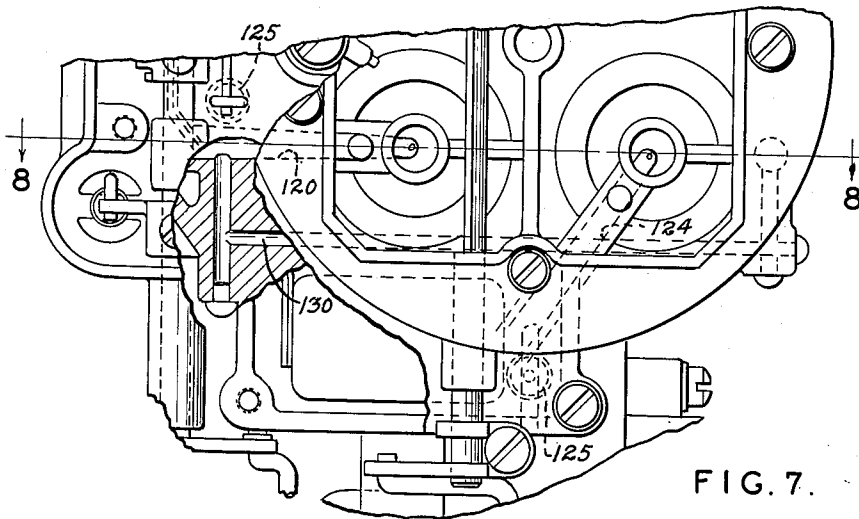


FIG. 7.

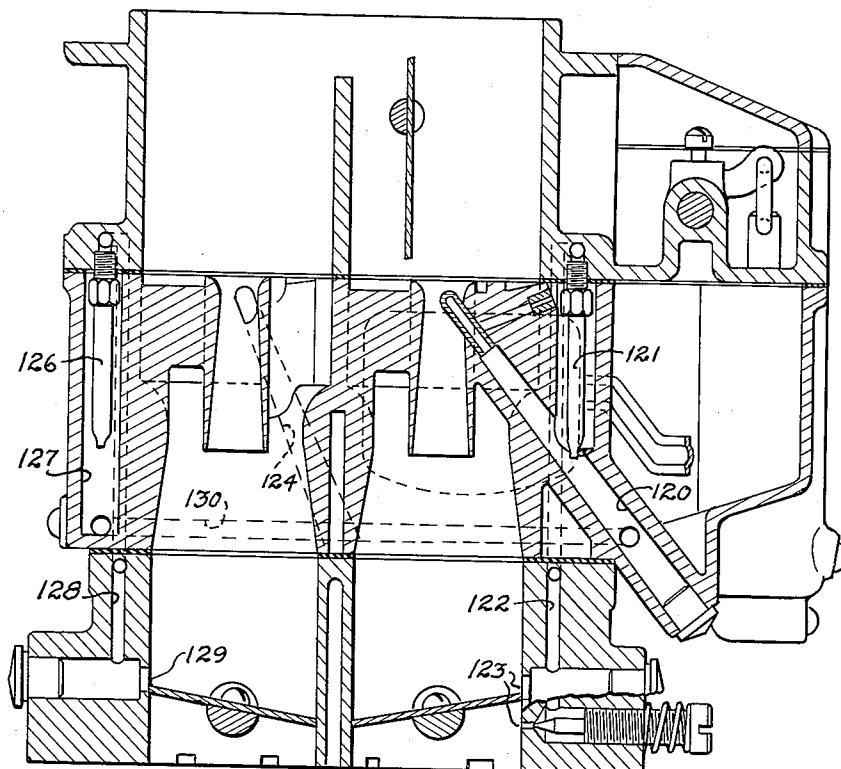


FIG. 8.

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2,728,563

MULTISTAGE CARBURETOR

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Application January 29, 1952, Serial No. 268,811

2 Claims. (Cl. 261-23)

This invention relates to multi-barrel or multi-stage carburetion systems for internal combustion systems.

Where an internal combustion engine, particularly of the automatic type, is supplied with fuel by means of a multistage carburetion system, it is desirable that the secondary stage start to function promptly and strongly at the proper time, which may be at a predetermined engine speed or throttle position. Further, it is desirable to provide both the primary and secondary stages with idling fuel systems, but where these systems are interconnected, in the usual manner, with the primary and secondary main fuel nozzles, there is a tendency for the systems to retard the discharge of fuel from the main nozzles at the transfer point. This difficulty is, at least partly, bridged by the accelerating pump in conventional carburetors and such a pump is usually provided for the primary stage of a multi-stage carburetion system.

According to the present invention, the idling system for the secondary stage is fed with fuel independently of the secondary main fuel nozzle so that this tendency of the secondary idling system to retard discharge from the secondary main nozzle is entirely eliminated. According to one form of the invention, the primary idling system is interconnected in the usual manner with the primary main nozzle system, while the secondary idling system is fed from the fuel bowl independently of both main nozzles. In a modified form of the invention, both the primary and secondary idling systems are fed from the primary main nozzle. In both cases, the secondary main nozzle operates independently of the idling systems.

In the accompanying drawings which illustrate the invention,

Fig. 1 is a top view of a four-barrel, multi-stage carburetor embodying the invention, portions being broken away and sectioned.

Fig. 2 is a vertical, transverse section taken substantially on broken line 2-2 of Fig. 1.

Fig. 3 is an approximately half vertical transverse section taken on line 3-3 of Fig. 1.

Fig. 4 is a side view of the carburetor, parts being broken away and sectioned.

Fig. 5 is a vertical section taken substantially on broken line 5-5 of Fig. 1.

Fig. 6 is an elevation of the carburetor taken from the opposite side.

Fig. 7 is a partial top view of a modified form of carburetor, parts being broken away and sectioned.

Fig. 8 is a vertical, transverse section on line 8-8 of Fig. 7.

The drawings illustrate a four-barrel, downdraft carburetor unit having a body 10 including two forward, primary mixture conduits 11 and 12 and two rear, secondary mixture conduits 13 and 14. A rectangular air horn structure 15 is formed at the top of the body and is divided by a partition 16. At the forward side of the partition, a choke shaft 17 is journaled in the air

2

horn walls and mounts an unbalanced choke valve 18 controlled by any suitable automatic choke control mechanism in housing 19. Extending across the primary and secondary mixture conduits, near the lower portions thereof, are throttle shafts 20 and 21 mounting throttle valves 22 and 23. Each pair of primary throttles 22 moves as a unit as does each pair of secondary throttles 23. The primary conduits are connected at their lower extremities by slots 24 and the secondary conduits are connected by slots 25. A flange 26 is provided for attaching the carburetor to an engine intake manifold (not shown).

Rigid with a projecting extremity of primary throttle shaft 20 (Fig. 4) is throttle operating arm 27 having a hole 28 for attachment to the usual accelerator linkage. The throttle arm carries adjusting screw 29 for engaging a fast idle cam 30 pivoted as at 31 to the carburetor body. The cam is connected by a torsion spring 32 to a concentrically pivoted, loose lever 33 which is connected by means of a link 34 to an arm 35 rigid with the projecting extremity of choke shaft 17 opposite housing 19. A small disk 36 is rigid with the adjacent, projecting extremity of secondary throttle shaft 21 and has a radial lug 36a. Also, loosely mounted with respect to pivot element 31 is an eccentrically weighted stop lever 37 having a finger 38 which is normally maintained by its own weight in position to interfere with the counter-clockwise rotation of disk 36 and the secondary throttles. This lock mechanism is covered in copending application, Serial No. 263,291, filed December 26, 1951, in the names of Moseley and Carlson and, as explained there, a lug 39 on lever 33 is in position, when the choke valve is substantially fully opened, to engage eccentrically weighted lever 37 and shift the same from its stop position, permitting normal opening of the secondary throttles.

The mechanism for causing the serial opening of the throttles is mounted on the opposite side of the carburetor (Fig. 6). This mechanism comprises a small, tight lever 100 rigid with primary throttle shaft 20 and having radial, angular lugs 101 and 102. A loose lever 103 is concentrically mounted inwardly of tight lever 100 and has a finger 104 connected by a coiled tension spring 105 to the aforementioned tight-lever finger 101. Spring 105 normally maintains second radial finger 102 on the tight lever in engagement with an angular lug 106 on loose lever 103. Loose lever 103 also has a second, radial, angular lug 107 for a purpose to be described. Another loose lever 108 is also concentrically mounted inwardly of tight lever 100 and aforementioned loose lever 103 and is connected by a link 109 to an arm 110 rigid with the adjacent, projecting extremity of secondary throttle shaft 21. Arm 110 is connected by a coiled tension spring 111 to a lug 112 on the carburetor body or bowl cover for constantly urging the secondary levers closed.

Upon opening movement of primary throttles 22 by means of arm 27, tight lever 100 and first loose lever 103 are rotated counter-clockwise until radial lug 107 engages a shoulder 113 on second loose lever 108, whereupon the three levers rotate as a unit, causing opening of secondary throttles 23, these latter throttles being fully opened during the last part of the opening of the primary throttles. However, in case the secondary throttles are locked, as previously described, tension spring 105 stretches to permit continued opening movement of the primary throttles. Upon closing of the primary throttles, spring 111 causes the secondary throttles to follow. Upon final closing of the primary throttles, a shoulder 114 on loose lever 103 comes in contact with a lug 115 on loose lever 108 to insure full closing of the secondary throttles, all as described in

the above-mentioned Moseley and Carlson application.

Extending partially around the clustered mixture conduits forming the carburetor barrel is a fuel reservoir 40 containing a pair of floats 41 connected by a yoke 42 having a central finger 43 pivotally supported, as at 44, by a structure 45 depending from the carburetor bowl cover 46. Finger 43 supports and actuates a needle valve 47, which, in turn, controls the supply of fuel through valve seat 48 and threaded inlet 49. Floats 41 and needle valve 47, of course, maintain a substantially constant level of fuel within the fuel bowl, as is well known.

Located in the central, lower portion of the constant level chamber are a pair of metering orifice elements 50 controlled by metering pins 51 carried at their upper ends by a crossbar 52. The crossbar is formed as a part of a stem 53 projecting upwardly from a piston 54 which works in a cylinder 55 connected by means of a passage 56 to the primary mixture conduit posterior to throttles 22 therein. A coiled spring 57 constantly urges the piston and metering pins upwardly against the force of suction.

Journalled above the float bowl cover is a countershaft 58 which rigidly mounts a small lever 59 having a finger 60 which underlies crossbar 52 so as to lift the same and the metering pins when the countershaft is rotated counter-clockwise (Fig. 2). The countershaft is connected to the primary throttle valves by means of an arm 61, rigid with the projecting end of the countershaft (Fig. 4) and a link 63 connected to throttle shaft lever 27.

Also rigid with countershaft 58 and within dust cover 62 is a second small arm 65 which is connected by means of a link 66 to a rod 67 projecting from accelerating pump piston 68 working in cylinder 69. Upon upward movement of the piston, when the primary throttle valves are closed, fuel is drawn into cylinder 69 through inlet 72 and past inlet check 73. Upon opening movement of the primary throttles, an accelerating charge is forced through outlet passage 74 past outlet check 75 and into the primary mixture conduits through pump jets 76.

The main fuel supply to the primary mixture conduits is through upwardly inclined main mixture passages 77, communicating with the fuel bowl through metering orifice elements 50 and discharging into Venturi tubes 78 through nozzles 79. Extending vertically upwardly from each main fuel passage 77 is a well 80 which is connected by means of a cross passage 81 to the corresponding nozzle 79 for the purpose of relieving gas bubbles which may form in the base of the main fuel passage. An idle fuel restriction tube 82 depends in well 80 and is connected by a passage 83 to idle ports 84 adjacent, and slightly posterior, to throttle disks 22 when closed.

Formed at the bottom of spaced portions of the constant level fuel reservoir are secondary main metering orifice elements 85 (Figs. 1, 4 and 5) through which fuel is supplied by means of cross passages 86 (Fig. 5) and upwardly inclined, secondary main fuel passages 87 to nozzles 88 discharging within Venturi tubes 89 within secondary mixture conduits 13 and 14. Fuel is supplied to secondary idle ports 90 by means of passages 91, tube restrictions 92 within vertical wells 93 and passages 94 in ribs 95 which open, as best shown in Fig. 4, into the lower, rear portions of the fuel reservoir independently of metering orifice elements 85 and secondary main fuel passages 87. No adjustment is provided for the secondary idle system.

In operation of the fuel supply systems, during first stage operation with the primary throttle valves partly open, the supply of fuel is through primary main fuel passages 77. Of course, idling fuel is supplied to all barrels whenever throttles are closed. As the primary throttle valves reach a predetermined degree of open-

ing, the secondary throttle valves start to open. Thereafter, the secondary throttles open rapidly with relation to the primary throttles, and the secondary main nozzles start to discharge promptly since there is no holding back effect due to secondary idle systems 90, 91, 93, etc. I have found that this provision of independent idle systems for the secondary stage, together with the usual form of interconnected idle systems on the primary stage insures smooth, well-modulated fuel discharge and eliminates the "flat spot" or hesitation which has heretofore been felt when the second stage starts to function. The adjustment of the primary idle only is adequate where both the primary and secondary barrels open into a common intake manifold.

In the modification in Figs. 7 and 8, the primary main fuel passages 120 are supplied with fuel through metering orifice elements (not shown), as in Fig. 2. Similarly, primary idling systems, including restriction tubes 121, passages 122, and ports 123, are interconnected with the primary main nozzle, as in the previous form. Secondary main fuel passages 124 communicate with the constant level chamber through metering orifice elements 125. However, the secondary idling fuel systems, including metering tubes 126 in wells 127, downward passages 128, and ports 129, communicate, by means of cross passage 130, with the primary main fuel passages 120 and thence through the primary main metering orifice elements to the fuel bowl. Thus, in this form, both the primary and secondary idling systems are inter-connected with the primary main fuel system so that the action of the idling systems is blended with that of the primary main fuel discharge. A strong, prompt discharge from the secondary main fuel passages is insured, due to their independence of the idling systems.

While the invention shown is applied to a four-barrel carburetor unit, the number of barrels in each stage is not essential, nor need both stages be incorporated in a single carburetor. Certain features may be incorporated in a multi-barrel, single-stage carburetor. The term "inter-connected idle" system refers to an idling system which communicates with a fuel reservoir through the same metering orifice as the corresponding or cooperating main fuel nozzle. An "independent" idle system is one which communicates with the fuel reservoir independently of the effective metering restriction in the main fuel passage.

Various modifications, as will occur to those skilled in the art, may be made without departing from the spirit of the invention, and the exclusive use of all modifications as come within the scope of the appended claims is contemplated.

I claim:

1. In a multi-stage carburetion system, primary and secondary mixture conduits, fuel reservoir means therefor, serially operated throttles in said conduits, primary main and secondary main fuel supply passages connecting said reservoir means and said conduits, respectively, a metering device between said reservoir and said main fuel supply passage, and idling fuel passages separately connecting with said primary main passage and said conduits, respectively, said secondary main passage communicating with said reservoir means independently of said idling passages.

2. In a multi-stage carburetion system, primary and secondary mixture conduits, fuel reservoir means therefor, serially operated throttles in said conduits, primary and secondary main fuel supply passages connecting said reservoir means and said conduits, respectively, idling passages also connecting said reservoir means through said primary fuel passages, independent of said secondary main fuel supply passages, to portions of said conduits adjacent the edges of said throttles when closed, and adjusting means in said primary idling passage only whereby the total idling fuel supplied through said primary and

secondary idling passages is provided with a single effective adjustment.

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