June 9, 1959 M. C. BROWN ET AL 2,890,032

AUTOMATIC STARTING CARBURETOR

Filed April 18, 1956

3 Sheets-Sheet 1

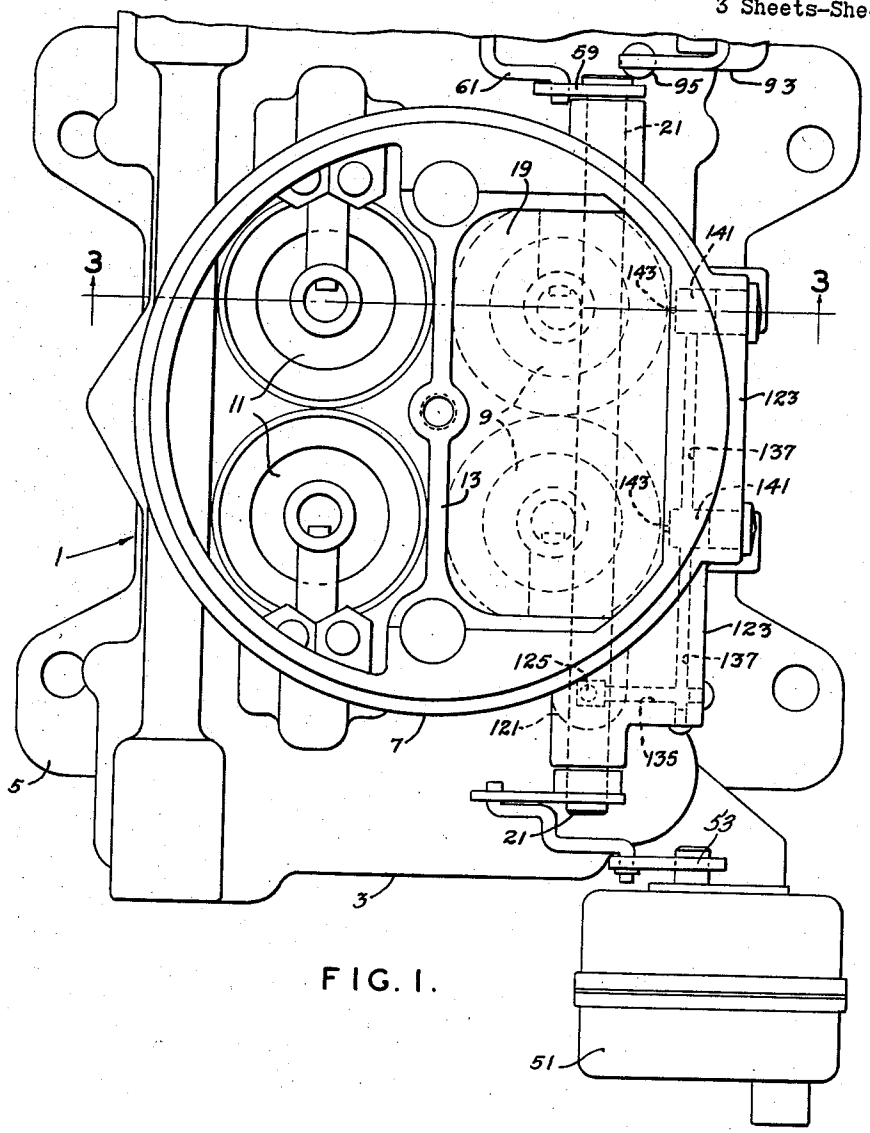


FIG. 1.

INVENTOR.
MORRIS C. BROWN
WENFORD E. HIGHLEY
BY Bertram H. Mann
ATTORNEY

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Filed April 18, 1956 3 Sheets-Sheet 2

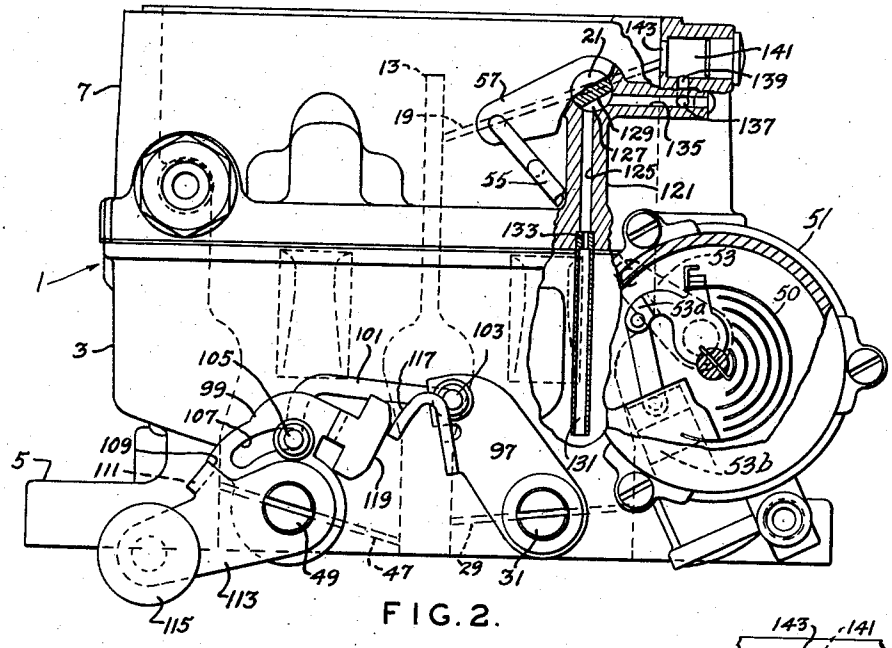


FIG. 2.

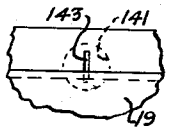


FIG. 4.

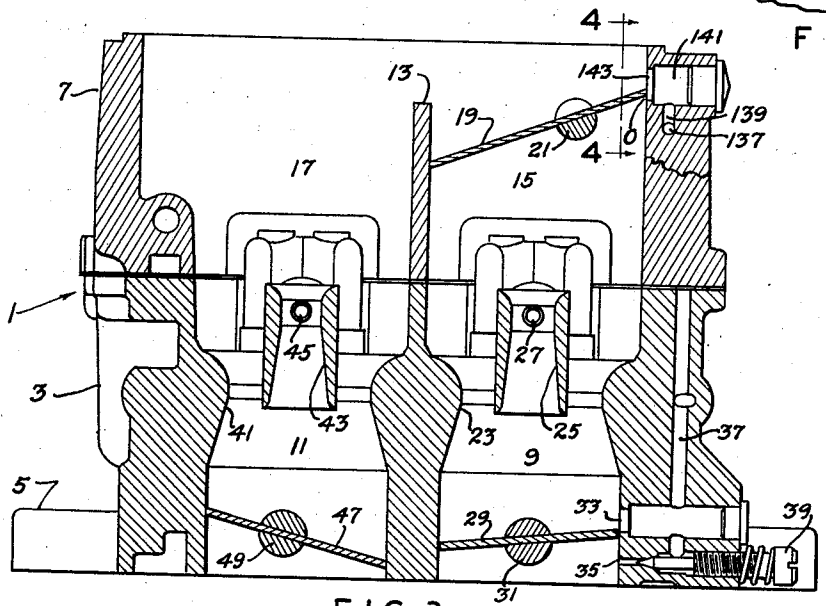


FIG. 3.

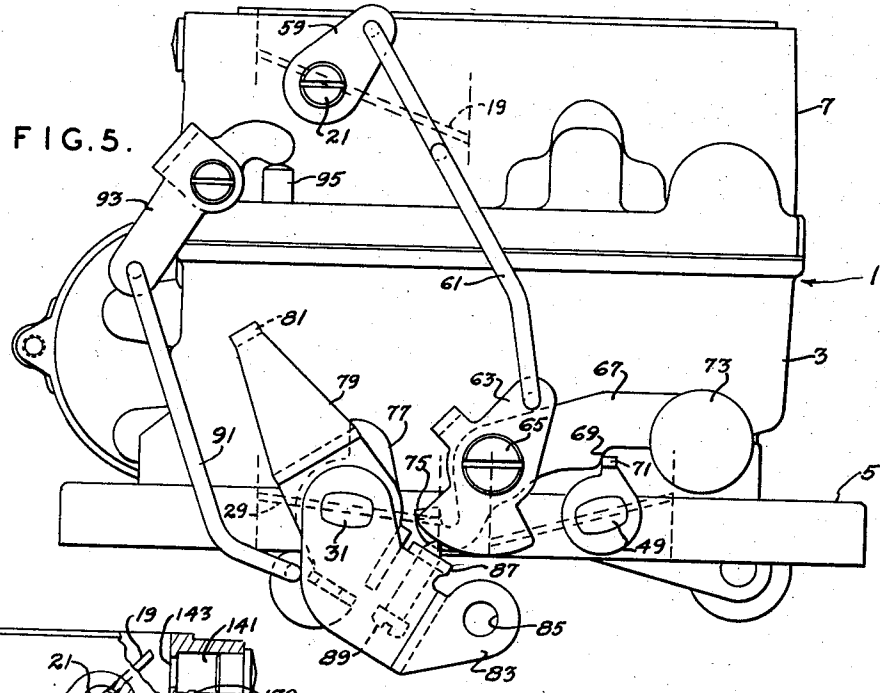
INVENTOR.
MORRIS C. BROWN
WENFORD E. HIGHLEY
BY Bertram N. Mann
ATTORNEY

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FIG. 5.



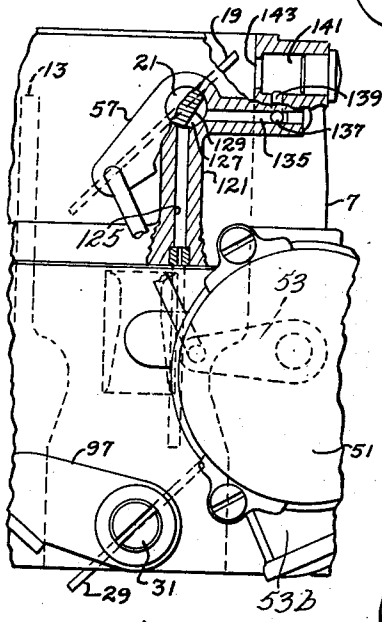


FIG. 6.

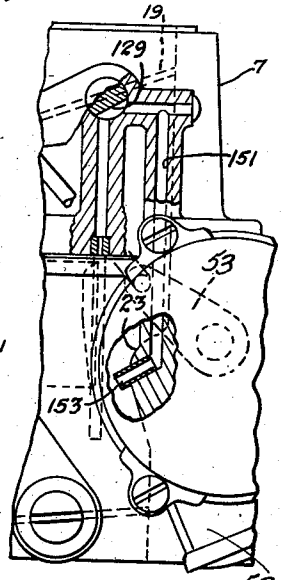


FIG. 7.

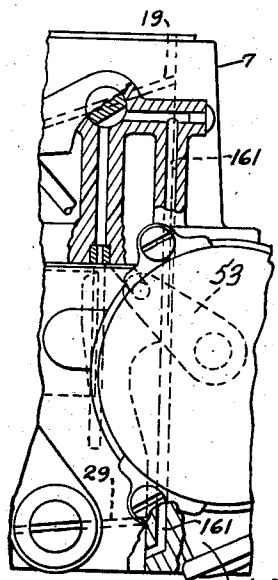


FIG. 8.

INVENTOR.
MORRIS C. BROWN
WENFORD E. HIGHLEY
BY Bertram N. Mann
ATTORNEY

United States Patent Office

2,890,032

Patented June 9, 1959

2,890,032

AUTOMATIC STARTING CARBURETOR

Morris C. Brown, Pontiac, Mich., and Wenford E. Highley, Normandy, Mo., assignors, by mesne assignments, to ACF Industries, Incorporated, New York, N.Y., a corporation of New Jersey

Application April 18, 1956, Serial No. 578,944

14 Claims. (Cl. 261—50)

This invention relates to carburetors for internal combustion engines, and more particularly to priming means for supplying priming fuel to such engines for starting purposes.

The invention, as hereinafter disclosed, involves an improvement upon the automatic choke mechanism of the carburetor shown in Coffey U.S. Patent 2,325,372 dated July 27, 1943. The automatic choke mechanism shown in this patent basically comprises a choke valve, a thermostat biasing the choke valve toward closed position, means responsive to suction in the intake manifold of the engine for opening the choke valve against the bias of the thermostat, and means for heating the thermostat from the engine exhaust to change the thermostatic bias. With the advent of recent carburetor developments, such as the multi-stage carburetor of the type commonly referred to as a four-barrel carburetor, it has become necessary to use a relatively stiff and hence relatively large thermostat to provide proper resistance to opening of the choke valve in the part-throttle range in order to obtain adequate priming for cold starting.

The principal object of this invention is to enable substantial reduction of the size of the thermostat required in an automatic choke mechanism of the class described. This is attained, according to the present invention, by providing a priming fuel passage from a source of fuel to the mixture conduit of the carburetor, the flow through this passage being controlled by a choke-operated valve in such manner that the passage is open during a portion of the range of opening movement of the choke valve and is closed when the choke is opened a predetermined amount. With this priming fuel passage, sufficient priming fuel is supplied to the mixture conduit even though suction in the mixture conduit may be reduced because of opening of the choke valve against the bias of the thermostat. Hence it is not necessary that the thermostat be made so large and stiff as to hold the choke valve strongly closed for starting, and it is possible to use a smaller thermostat than would otherwise be required. A further feature of one form of the invention is an arrangement such that the choke valve itself is used to control the admission of fuel to the mixture conduit from the priming passage during the stated portion of the range of opening movement of the choke valve to compensate for decrease in suction which results from the opening of the choke valve. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which several of various possible embodiments of the invention are illustrated,

Fig. 1 is a plan view of a four-barrel carburetor embodying the invention, certain parts being omitted;

Fig. 2 is a view in elevation of one end of the carburetor (the lower end of Fig. 1), parts being broken away and shown in section;

Fig. 3 is a vertical transverse section taken on either of the lines 3—3 of Fig. 1;

Fig. 4 is a fragmentary view taken on line 4—4 of Fig. 3;

Fig. 5 is a view in elevation of the other end of the carburetor from that shown in Fig. 2;

Fig. 6 is a fragment of Fig. 2 illustrating a moved position of parts;

Fig. 7 is a fragmentary view similar to Fig. 6 illustrating a modification, showing parts in a position corresponding to that of Fig. 2; and,

Fig. 8 is a view similar to Fig. 7 showing another modification.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, the invention is illustrated in its application to a multi-barrel, multi-stage carburetor 1 of the type commonly referred to as a four-barrel carburetor. Only so much of the construction of the carburetor as is essential to an understanding of this invention will be described herein. Reference may be made to Carlson et al. U.S. Patent 2,715,522, dated August 16, 1955, for example, for such further details as may be desired. In general, the carburetor 1 comprises a fuel bowl section 3 having a flange 5 by which it may be attached to the intake manifold of the engine on which the carburetor is used. Mounted on the fuel bowl section 3 is the usual air horn section 7. The fuel bowl section 3 is formed to provide two primary mixture conduits each designated 9 and two secondary mixture conduits each designated 11. The air horn section 7 is provided with a partition 13 dividing it to form a primary mixture conduit inlet 15 and a secondary mixture conduit inlet 17.

A choke valve 19 is provided in the primary inlet 15 for controlling the admission of air through the air horn section 7 to the two primary mixture conduits 9. The choke valve is fixed on a choke shaft 21 which extends across the air horn section 7 from one end to the other above the primary mixture conduits. Each primary mixture conduit 9 has a main venturi 23 and a primary venturi 25. As to each of the primary mixture conduits 9, a main fuel nozzle 27 opens into its primary venturi 25. It will be understood that the nozzles 27 are supplied with fuel from the fuel bowl of fuel bowl section 3 in a manner such as that shown, for example, in U.S. Patent 2,715,522.

A throttle valve 29 is provided in each primary mixture conduit 9 below the main venturi 23. The throttle valves for both conduits 9 of the four-barrel carburetor are fixed on a throttle shaft 31 which extends across both these conduits. Adjacent one edge of each throttle 29 are the usual idle ports 33 and 35 which are supplied with fuel via a passage indicated at 37. The port 35 is controlled by an adjustable needle valve 39 in known manner.

Each secondary mixture conduit 11 has a main venturi 41 and a primary venturi 43. A fuel nozzle 45 opens into the primary venturi 43. This is supplied with fuel from the fuel bowl in a manner such as that shown, for example, in U.S. Patent 2,715,522. A secondary throttle valve 47 is provided in each secondary mixture conduit 11 below the main venturi 41. The secondary throttle valves for both conduits 11 of the four-barrel carburetor

are fixed on a shaft 49 which extends across both these conduits.

A choke mechanism housing is indicated at 51 (see Figs. 1 and 2). This contains a suction and temperature-responsive mechanism of the character shown in the Coffey U.S. Patent 2,325,372. This mechanism includes a thermostat 50 engaging a control arm indicated at 53*a* within the housing 51 and fixed to a rotatable shaft which also has fixed thereto an arm 53 outside the housing. The center of the thermostatic spring 50 is fixed with respect to the housing 51. The arm 53 is connected by means of a link 55 to an arm 57 fixed on one end of the choke shaft 21 projecting out of air horn section 7. Also illustrated is a conventional suction motor 53*a* responsive to intake manifold suction to hold open the choke valve slightly when the engine starts running. Fixed on the other end of the choke shaft 21 (at the other end of the air horn section 7) is an arm 59 (see Fig. 5). Arm 59 is connected by means of a link 61 to a fast idle cam lever 63 pivoted on the outside of fuel bowl section 3 at 65.

Also pivoted at 65 is a latch 67. The lower edge of this latch is formed with a shoulder 69 adapted for engagement by a dog 71 fixed on the end of the secondary throttle shaft 49 shown in Fig. 5. The latch 67 is biased to rotate clockwise as viewed in Fig. 5 by a weight 73 at its right end. Its left end is formed with a finger 75 adapted for engagement by an arm 77 formed integrally with a lever 79 fixed on the end of the primary throttle shaft 31 shown in Fig. 5. At the end of the lever 79 is an inturned lug 81 adapted to engage the fast idle cam lever 63 when the primary throttles 29 are fully opened, so as partially to open the choke valve 19 for unloading purposes. The primary throttle shaft 31 also carries an actuating lever 83 provided with a hole 85 for connection of an actuating rod (not shown). A lug 87 on the lever 83 has an idle set screw 89 threaded therein for adjusting the closed position of the primary throttles 31. Lever 83 is connected by a link 91 to one end of a pivoted lever 93 adapted to operate the plunger 95 of an accelerating pump (not shown).

An arm 97 is fixed on the end of the primary throttle shaft 31 projecting out of the end of the fuel bowl section 3 at which the housing 51 is located (see Fig. 2). An arm 99 is rotatable on the end of the secondary throttle shaft 49 shown in Fig. 2. A link 101 has one end pin-connected to arm 97 at 103 and its other end 105 received in a slot 107 in arm 99. This provides a lost-motion connection between arms 97 and 99. An edge portion of the arm 99, indicated at 109, is arranged in abutting relation with an inturned lug 111 on an arm 113 secured to the secondary throttle shaft 49. Arm 113 carries a weight 115 for biasing the secondary throttles 47 closed. The secondary throttles are velocity operated, i.e., unbalanced to open against the closing bias of the weight 115 in response to suction in the secondary mixture conduits 11 posterior to the secondary throttles. A cam 117 on the arm 97 is engageable with a cam follower 119 on the arm 99.

The wall of the air horn section 7 of the carburetor illustrated in Figs. 1–6 is provided at the end where the choke mechanism housing 51 is located with a vertical rib 121 in the vertical plane of the choke shaft 21 and along the primary inlet side with a horizontal rib 123. The vertical rib 121 has a vertical passage 125 extending from its lower end to a cylindrical valve chamber 127 coaxial with the choke shaft 21. The choke shaft extends through this chamber 127 and the portion of the choke shaft within the chamber is formed as a valve member as indicated at 129. An induction tube 131 extends down into the fuel bowl from the lower end of the passage 125 below the level of fuel in the fuel bowl. The upper end of the tube 131 has a restriction 133. The horizontal rib 123 has a horizontal passage 135 extending from the valve chamber 127 at right angles to the choke shaft. It also has a horizontal passage 137 extending parallel to the choke shaft along the primary inlet side of the air horn section 7. Passage 137 has connections such as indicated at 139 to two chambers 141 which open into the primary inlet through ports 143. The ports 143 are preferably elongated in longitudinal direction with respect to the primary inlet 15 and their location in relation to the choke valve 19 is such that when the choke valve is fully closed, the edge of the choke valve is located adjacent the posterior (lower) ends of the ports 143 so that there is only a small opening (indicated at O in Fig. 3) from each chamber 141 to the primary inlet 15.

The valve member 129 is so formed and so phased in its position with respect to the choke valve 19 to provide for communication from passage 125 to passage 135 during a portion of the opening movement of the choke valve and to block passage 125 when the choke valve is opened beyond a predetermined limit short of full opening. For example, the valve member may be formed and phased to block passage 125 when the choke valve is angled three-quarters open.

Operation of the embodiment of the invention shown in Figs. 1–6 is as follows:

Upon starting the engine, assuming that the thermostat 50 in housing 51 is cold and that choke valve 19 is hence fully closed, initial opening movement of the primary throttles 29 creates a suction in the primary inlet 15 posterior to the choke valve and will induce a flow of fuel for priming purposes from the fuel bowl through the tube 131 and passages 125, 135, 137 and 139 (valve 129 being open) to the chambers 141 and from chambers 141 through the small openings 0 between the edge of the fully closed choke valve and the lower ends of ports 143 to the primary inlet 15. If the choke valve should be drawn open by suction against the resistance of the choke thermostat 50 in housing 51, responsive to opening movement of the primary throttles 29, with consequent reduction of suction in the primary inlet 15, the ports 143 are opened wider to the inlet 15 posterior to the choke valve to maintain the flow of priming fuel despite the decrease in suction. When, after the engine has been started, the choke thermostat 50 in housing 51 is heated and moves the choke valve to its fully open position (see Coffey U.S. Patent 2,325,372 for full details of this operation), the valve member 129 blocks the passage 125 to cut off the flow of priming fuel. As above explained, cut-off of flow of priming fuel occurs when the choke valve is opened, for example, to three-fourths of its range.

Since the fuel induction passage constituted by the tube 131 and passages 125, 135, 137 and 139 provides for induction of fuel from the fuel bowl to the mixture conduit even though the choke valve may open, it is apparent that the thermostat 50 in the housing 51 is relieved of the function of holding the choke valve strongly closed for cold starting. Hence a smaller thermostat may be used than would be required in a carburetor without such a passage.

The choke valve 19, the primary throttles 29 and the secondary throttles 47 are shown closed in Figs. 2, 3 and 5. The secondary throttles 47 are locked against opening by engagement of the dog 71 with the shoulder 69 of latch 67 (see Fig. 5). The arm 99 occupies a position between the lug 111 on arm 113 and the cam 117 on arm 97 (see Fig. 2). The end 105 of link 101 is located at the right end of the slot 107 in arm 99, as viewed in Fig. 2.

To open the primary throttles 29, the lever 83 is swung clockwise as viewed in Fig. 5 by the actuating rod (not shown). This rotates the primary throttle shaft 31, lever 79 and the primary thottles 29 clockwise as viewed in Fig. 5, and rotates the arm 97 counterclockwise as viewed in Fig. 2. The latch 67 remains in the Fig. 5 locking

position, holding the secondary throttles against opening, until the arm **77** on lever **79** engages the finger **75** on the latch and rotates the latch counterclockwise as viewed in Fig. 5 far enough for the dog **71** to escape from the shoulder **69**.

Upon the stated counterclockwise rotation of the arm **97**, the cam **117** on this arm moves downward past the follower **119** on arm **99**, and the end **105** of link **101** slides from the right end of the slot **107** in arm **99** to the left end of the slot. The cam **117** clears the follower **119** somewhat prior to release of the latch **67**. Upon further counterclockwise rotation of the arm **97** the link **101** is dragged to the right, thereby freeing the arm **99** for clockwise rotation. This frees the secondary throttles **47** for opening against the bias of weight **115** in response to suction. However, even if the secondary throttles do not open under suction, arm **97** may continue to rotate counterclockwise upon further opening of the primary throttles due to the lost motion of the end **105** of the link **101** in slot **107** and the capability of arm **99** to rotate relative to the secondary throttle shaft. Assuming that the secondary throttles do open, the degree of opening is controlled by the primary throttles because of the engagement of the lug **111** on arm **113** with the edge portion **109** of arm **99**, and the engagement of the left end of the slot **107** with the end **105** of link **101**.

Upon return of the primary throttles to the closed position, lever **79** rotates counterclockwise and arm **97** rotates clockwise back to the positions shown in Figs. 5 and 2. Arm **97** acts through engagement of the cam **117** with the follower **119** on arm **99** and through the link **101** to rotate the arm **99** counterclockwise, and arm **99** acts through engagement of its edge portion **109** with lug **111** on arm **113** to return the secondary throttles to closed position. Upon such closure, the dog **71** reaches the position shown in Fig. 5, and the finger **75** on the latch **67** is released from the arm **77** on lever **79** so that the latch drops into locking position with respect to the dog **71**, thereby locking the secondary throttles against opening.

When the choke valve is closed, the secondary throttles will normally be locked closed, but full opening movement of the primary throttles releases the latch **67**, permitting the secondary throttles to open, and opens the choke valve simultaneously therewith.

The secondary throttle mechanisms are similar to those shown in the copending coassigned applications of Harold A. Carlson and Olin J. Eickmann entitled Secondary Stage Throttle Control for Multi-Stage Carburetor, Serial No. 582,421, filed April 26, 1956, now Patent No. 2,836,404, dated May 27, 1958, and of Leland B. Read entitled Latching Secondary for Two-Stage Carburetor, Serial No. 593,519, filed June 25, 1956, to which reference may be made for further detail.

Fig. 7 shows a modification differing from the construction shown in Figs. 1–6 in that the fuel induction passage, instead of opening into the primary inlet, opens into the main venturi **23**. In Fig. 7 the fuel induction passage is generally designated **151**, and it is shown to be provided with a nozzle **153** projecting into the main venturi **23**. Operation of the modification shown in Fig. 5 corresponds to that of the modification shown in Figs. 1–4 except, of course, that the nozzle **153** is always fully open to the main venturi, and not under control of the choke valve **19**, except as regards the valve portion **129** of the latter.

Fig. 8 shows a modification differing from the construction shown in Figs. 1–7 in that the fuel induction passage, generally designated **161**, instead of opening into the primary inlet or the main venturi, opens into the primary mixture conduit 9 posterior to the primary throttle **29**. Operation of the modification shown in Fig. 8 corresponds to that of the modification shown in Fig. 7 except, of course, that the passage **161** is subject to suction posterior of the primary throttle.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. In a carburetor having a mixture conduit and a choke valve on a choke shaft for controlling the admission of air to the mixture conduit, resilient means resisting opening movement of said choke valve and being of a strength to permit said choke valve to open sufficiently during cranking of an associated engine to reduce the suction in said mixture conduit below that required for normal starting, means providing a fuel passage for flow of fuel from a source to the mixture conduit, one end of said choke shaft being formed as a value and extending into a valve chamber formed in said fuel passage means, said last-named valve being formed for variably opening the passage during a portion of the range of opening movement of the choke valve and for blocking the passage when the choke valve is opened beyond a predetermined limit short of full opening, thereby permitting the use of a weaker resilient means.

2. In a carburetor having a fuel bowl, a mixture conduit having an inlet, a choke valve in said inlet for controlling the flow of air into the mixture conduit responsive to opening and closing movement of said choke valve, means providing a fuel induction passage from below the level of fuel in the bowl to a port in the inlet for induction of fuel from the bowl to the inlet, and said port being adjacent the upstream edge of said choke valve when said choke valve is closed for variably controlling flow through said passage responsive to movement of said edge past said port.

3. In a carburetor having a fuel bowl, a mixture conduit having an inlet, and a suction responsive choke valve in said inlet on a choke shaft for controlling the admission of air to the mixture conduit, resilient means resisting opening movement of said choke valve and being of a strength to permit said choke valve to open sufficiently during cranking of an associated engine to reduce the suction in said mixture conduit below that required for normal starting, means providing a fuel induction passage from below the level of fuel in the bowl to the inlet for induction of fuel from the bowl to the inlet, one end of said choke shaft being formed as a valve and extending into a valve chamber formed in said induction passage means, said last-named valve being formed for opening the passage during a portion of the range of opening movement of the choke valve and for blocking the passage when the choke valve is opened beyond a predetermined limit short of full opening, thereby permitting the use of a weaker resilient means.

4. In a carburetor having a mixture conduit provided with an inlet and a choke valve in said inlet for controlling the admission of air to the mixture conduit, resilient means resisting opening movement of said choke valve and being of a strength to permit said choke valve to open sufficiently during cranking of an associated engine to reduce the suction in said mixture conduit below that required for normal starting, means providing a fuel passage for flow of fuel from a source to the inlet, said passage opening into the inlet through a port adjacent an edge of said choke valve, said choke valve traversing said port during opening movement of the choke valve to control the flow of fuel through said port.

5. In a carburetor having a mixture conduit provided with an inlet and a choke valve in said inlet for controlling the admission of air to the mixture conduit, means providing a fuel passage for flow of fuel from a source to the inlet, and a valve in said passage movable with

the choke valve, the latter valve being open during a portion of the range of opening movement of the choke valve and closing when the choke valve is opened beyond a predetermined limit short of full opening, said passage opening into the inlet through a port traversed by the choke valve as the choke valve opens.

6. In a carburetor having a mixture conduit provided with an inlet and an unbalanced choke valve in said inlet on a choke shaft for controlling the admission of air to the mixture conduit, a resilient thermostat yieldably resisting opening movement of said choke valve, and means providing a fuel passage for flow of fuel from a source to the inlet, one end of said choke shaft being formed as a valve and extending into a valve chamber formed in said passage means, said last-named valve being formed for opening the passage during a portion of the range of opening movement of the choke valve and for blocking the passage when the choke valve is opened beyond a predetermined limit short of full opening, said passage opening into the inlet through a port which is elongated in longitudinal direction with respect to the inlet and which is so located in respect to the choke valve that, when the choke valve is closed, an edge portion of the choke valve is located adjacent the posterior end of the port, and, as the choke valve opens, said port is opened wider to the inlet posterior to the choke valve.

7. In a carburetor having a fuel bowl, a mixture conduit having an inlet, and a choke valve in said inlet for controlling the admission of air to the mixture conduit, means providing a fuel induction passage from below the level of fuel in the bowl to the inlet for induction of fuel from the bowl to the inlet, and a valve in said induction passage movable with the choke valve, said induction passage valve being open during a portion of the range of opening movement of the choke valve and closing when the choke valve is opened beyond a predetermined limit short of full opening, said passage opening into the inlet through a port traversed by the choke valve as the choke valve opens.

8. In a carburetor having a fuel bowl, a mixture conduit having an inlet and a choke valve in said inlet on a choke shaft for controlling the admission of air to the mixture conduit, means providing a fuel induction passage from below the level of fuel in the bowl to the inlet for induction of fuel from the bowl to the inlet, one end of said choke shaft being formed as a valve and extending into a valve chamber formed in said induction passage means, said last-named valve being formed for opening the passage during a portion of the range of opening movement of the choke valve and for blocking the passage when the choke valve is opened beyond a predetermined limit short of full opening, said passage opening into the inlet through a port which is elongated in longitudinal direction with respect to the inlet and which is so located in respect to the choke valve that, when the choke valve is closed, an edge portion of the choke valve is located adjacent the posterior end of the port, and as the choke valve opens, said port is opened wider to the inlet posterior to the choke valve.

9. In a carburetor having a fuel bowl, a mixture conduit having a venturi, and a choke valve on a choke shaft for controlling the admission of air to the mixture conduit, resilient means resisting opening movement of said choke valve and being of a strength to permit said choke valve to open sufficiently during cranking of an associated engine to reduce the suction in said mixture conduit below that required for normal starting, means providing a fuel induction passage from below the level of fuel in the bowl to the venturi for induction of fuel from the bowl to the venturi, one end of said choke shaft being formed as a valve and extending into a valve chamber formed in said induction passage means, said last-named valve being formed for opening the passage during a portion of the range of opening movement of the choke valve and for blocking the passage when the choke valve is opened beyond a predetermined limit short of full opening, thereby permitting the use of a weaker resilient means.

10. In a carburetor having a fuel bowl, a mixture conduit, a throttle, and a choke valve for controlling the admission of air to the mixture conduit, resilient means resisting opening movement of said choke valve and being of a strength to permit said choke valve to open sufficiently during cranking of an associated engine to reduce the suction in said mixture conduit below that required for normal starting, means providing a fuel induction passage from below the level of fuel in the bowl to the mixture conduit posterior of the throttle for induction of fuel from the bowl to the mixture conduit, and means responsive to initial opening movement of the choke valve for controlling flow through said passage to permit a sufficient flow of fuel to said mixture conduit for starting, thereby allowing the use of a weaker resilient means.

11. In a carburetor having a fuel bowl, a mixture conduit, a throttle, and a choke valve for controlling the admission of air to the mixture conduit, resilient means resisting opening movement of said choke valve and being of a strength to permit said choke valve to open sufficiently during cranking of an associated engine to reduce the suction in said mixture conduit below that required for normal starting, means providing a fuel induction passage from below the level of fuel in the bowl to the mixture conduit posterior of the throttle for induction of fuel from the bowl to the mixture conduit, and a valve in said induction passage movable with the choke valve, said induction passage valve being open during a portion of the range of opening movement of the choke valve and closing when the choke valve is opened beyond a predetermined limit short of full opening to permit a sufficient flow of fuel to said mixture conduit for starting, thereby allowing the use of a weaker resilient means.

12. In a carburetor having a fuel bowl, a mixture conduit, a throttle, and a choke valve on a choke shaft for controlling the admission of air to the mixture conduit, resilient means resisting opening movement of said choke valve and being of a strength to permit said choke valve to open sufficiently during cranking of an associated engine to reduce the suction in said mixture conduit below that required for normal starting, means providing a fuel induction passage from below the level of fuel in the bowl to the mixture conduit posterior of the throttle for induction of fuel from the bowl to the mixture conduit, one end of said choke shaft being formed as a valve and extending into a valve chamber formed in said induction passage means, said last-named valve being formed for opening the passage during a portion of the range of opening movement of the choke valve and for blocking the passage when the choke valve is opened beyond a predetermined limit short of full opening, thereby permitting the use of a weaker resilient means.

13. In a carburetor having a mixture conduit, a constant level fuel chamber, a throttle, a choke valve for controlling the admission of air to the mixture conduit, resilient means resisting opening movement of the choke valve, a main fuel system, an idle port and a supply passage therefor, an auxiliary fuel system including a fuel passage connecting the fuel chamber and the mixture conduit, and means responsive to initial opening movement of the choke valve for controlling the flow through said fuel passage to permit a sufficient flow of fuel to said mixture conduit for starting.

14. In a carburetor having a mixture conduit, a constant level fuel chamber, a throttle, a choke valve for controlling the admission of air to the mixture conduit, resilient means resisting opening movement of the choke valve, a main fuel system, an idle port and a supply passage therefor, an auxiliary fuel system including a fuel passage connecting the fuel chamber and the mixture conduit, and valve means responsive to a portion of the opening movement of the choke valve for opening said fuel passage to supply a priming mixture, said valve means blocking the

fuel passage when the choke valve is moved beyond a predetermined limit.

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