Sept. 9, 1952 A. H. WINKLER 2,609,806

CARBURETOR

Filed March 7, 1950 3 Sheets-Sheet 1

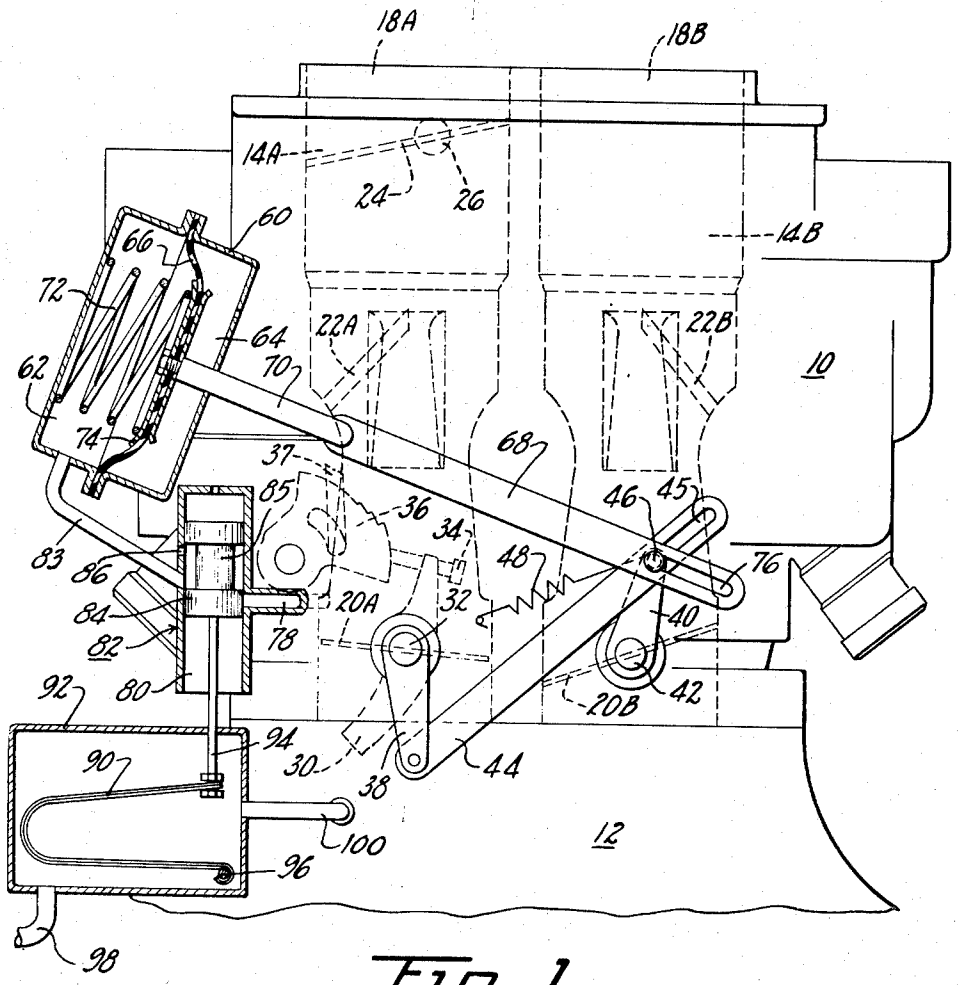

Fig. 1

INVENTOR.
ALBERT H. WINKLER
BY
M. A. Hobbs
ATTORNEY

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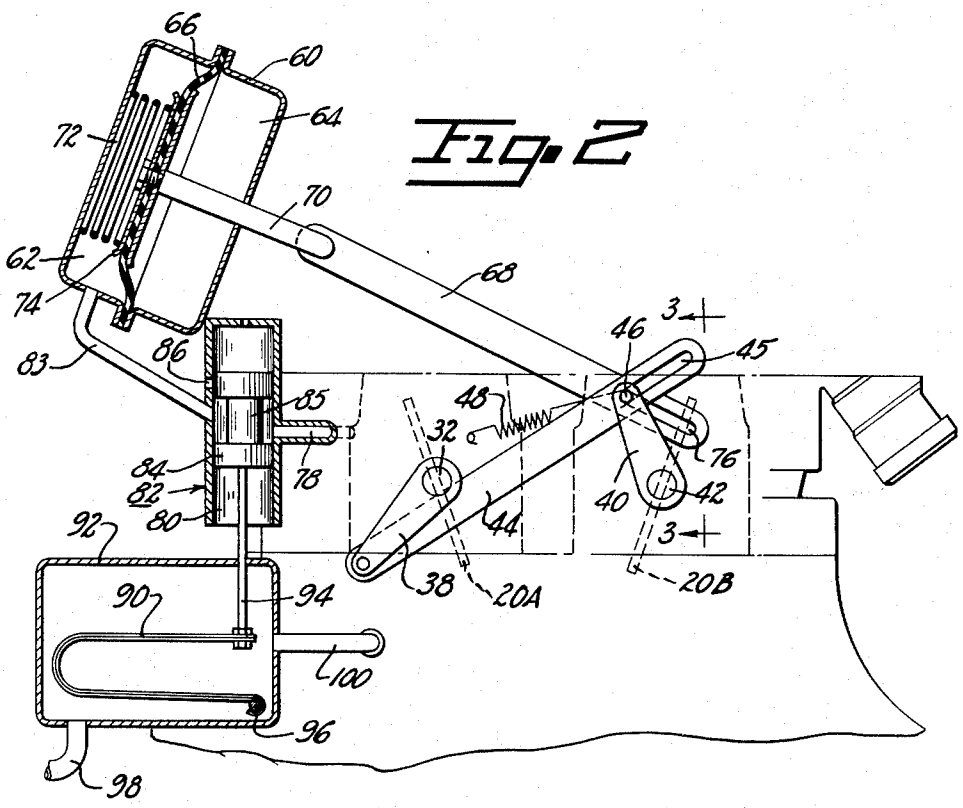

Fig. 2

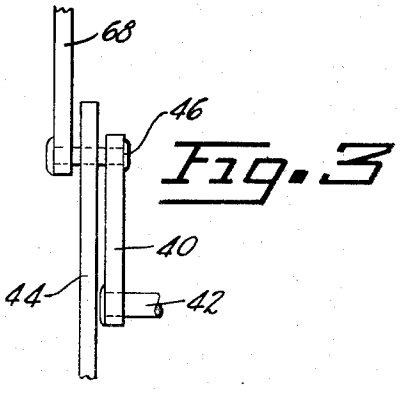

Fig. 3

INVENTOR.
ALBERT H. WINKLER
BY
M. A. Hobbs
ATTORNEY

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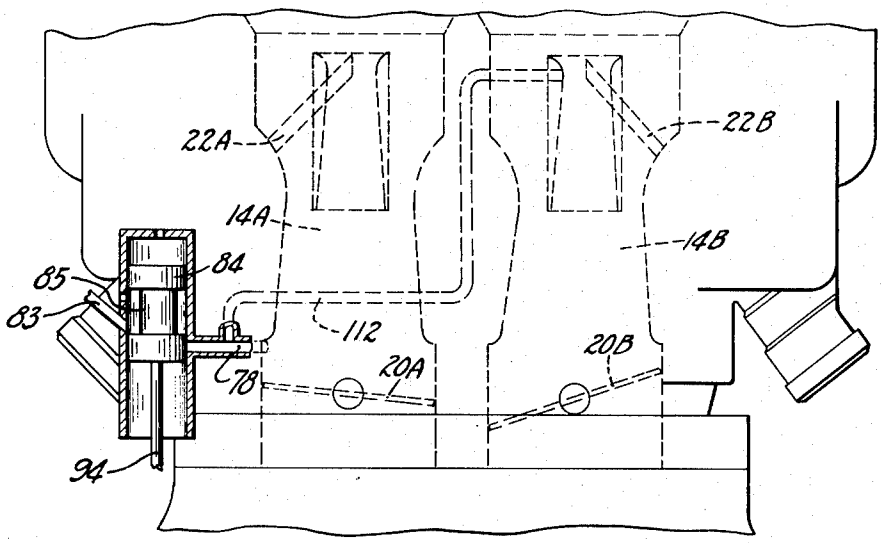

Fig. 4

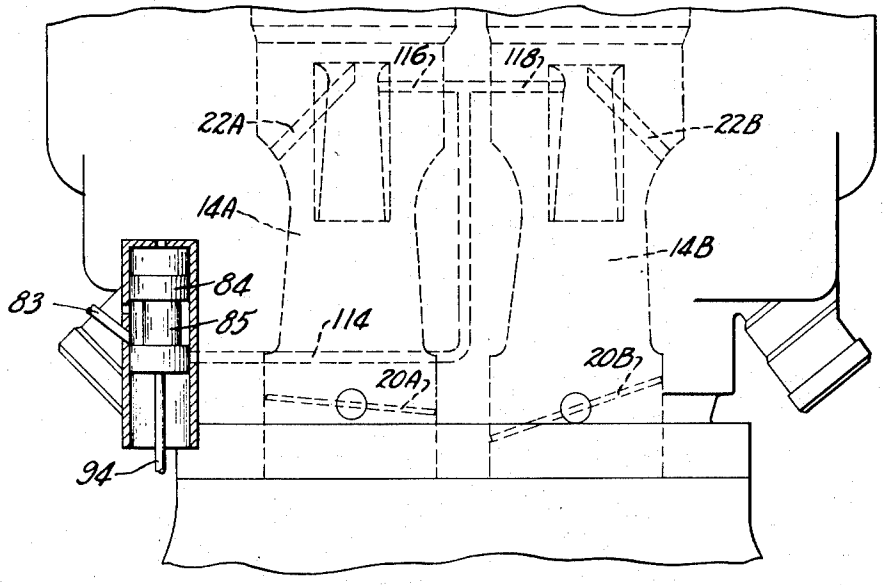

Fig. 5

INVENTOR.
ALBERT H. WINKLER
BY
M. A. Hobbs
ATTORNEY

Patented Sept. 9, 1952

2,609,806

UNITED STATES PATENT OFFICE

2,609,806

CARBURETOR

Albert H. Winkler, Elmira, N. Y., assignor to Bendix Aviation Corporation, South Bend, Ind., a corporation of Delaware

Application March 7, 1950, Serial No. 148,197

19 Claims. (Cl. 123—127)

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The present invention relates to carburetors for internal combustion engines, and more particularly to carburetors of the multiple stage type for automotive engines.

In the operation of a multiple stage carburetor having primary and secondary induction systems, only the primary system is employed at lower engine speeds so that relatively high air velocities will be maintained in the induction passage to give a greater effective suction for fuel delivery and thus a more positive control over fuel metering and distribution during the period of relatively low air flow. With the acceleration of the engine to the higher speed ranges, the secondary induction system becomes operative to increase the volume of fuel-air delivery sufficiently to obtain maximum power output and speed of the engine. One of the principal objects of the present invention is to provide a mechanism responsive to air pressures and movement of the throttle in the primary induction system for controlling the throttle in the secondary induction system.

Another object of the invention is to provide a carburetor having a primary and a secondary induction system wherein the secondary system is controlled in response to pressure and throttle position in the primary system and to air flow in the secondary system.

Another object of the invention is to provide a multiple stage carburetor having a mechanism actuated by pressure in the primary system for controlling the secondary system, and a temperature responsive means for controlling the pressure actuated means.

Another object is to provide a multiple stage carburetor of the aforesaid type wherein the secondary induction system remains ineffective during the warm-up period of the engine.

Still another object of the invention is to provide a carburetor having primary and secondary induction systems with a choking device in the primary system, wherein the secondary system remains ineffective while the choking device is effective.

Additional objects and advantages will become apparent from the following description and accompanying drawings, wherein:

Figure 1 is a side elevation of a multiple stage carburetor showing certain elements of the control mechanism for the secondary induction system in cross-section;

Figure 2 is a partial side elevation of a multiple stage carburetor showing portions of the control mechanism of the secondary induction

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system in cross-section as in Figure 1, but in a different operative position;

Figure 3 is a detail view of a part of the control mechanism for the secondary induction system; and

Figures 4 and 5 are modified arrangements of my invention.

Referring more specifically to the drawings, and to Figure 1 in particular, a multiple stage carburetor generally designated by numeral 10 is shown mounted on an intake manifold 12 of an internal combustion engine (not shown) and contains a primary induction system 14A and a secondary induction system 14B, including induction passages 18A and 18B, throttles 20A and 20B and main discharge jets 22A and 22B, respectively. The two systems are provided with separate idle systems, fuel inlet valves and float chambers and are adapted to discharge the fuel-air mixture directly into intake manifold 12. A single accelerating pump (not shown), which may be either a mechanical or a vacuum type pump, is adapted to discharge into the primary induction system as the primary throttle is opened. In the present carburetor only the primary induction system is controlled by a choke valve 24, preferably of the unbalanced type, mounted in the air inlet of the induction passage 18A on a shaft 26, said choke valve being controlled either by a manual means or by an automatic choking device having a thermostatic element and a vacuum actuated means.

The throttle valve 20A of the primary induction system is manually actuated by the operator through lever 30 mounted on one end of throttle shaft 32 and is regulated in the degree of closing by a stop screw 34 on said lever and a fast idle cam 36 controlled through a linkage (shown in part at 37) by a choke control mechanism. The throttle valve 20B of the secondary induction passage is controlled by the primary throttle valve through a linkage consisting of a lever 38 mounted rigidly on one end of throttle shaft 32, a lever 40 mounted rigidly on one end of throttle shaft 42 of the secondary throttle valve 20B and a lever 44 interconnecting the free ends of levers 38 and 40. A one-way connection consisting of a slot 45 and a pin 46 is provided between levers 40 and 44 so that the primary throttle valve can not positively open the secondary throttle valve. A spring 48 urges lever 40 in the direction to follow lever 44 as the latter lever moves in the valve opening direction.

In order to prevent the secondary throttle valve from opening until the air flow through

the primary induction passage has become substantial, a spring loaded mechanism responsive to the pressure in the primary induction passage urges the secondary throttle valve toward closed position until the pressure in the primary passage has decreased to a predetermined value. This mechanism consists of a unit 60 having two chambers 62 and 64 separated by a flexible diaphragm 66 connected by levers 68 and 70 with lever 40 and urged in the direction to close throttle valve 20B by a spring 72 reacting between a wall of chamber 62 and diaphragm 66, said spring having a greater effective force urging valve 20B closed than spring 48 has in urging said valve open. A member 74 for stiffening the central portion of diaphragm 66 serves as a seat and retainer for one end of spring 72. A one-way connection consisting of a slot 76 and pin 46 is provided between levers 40 and 68 so that the pressure responsive unit 60 cannot positively open the secondary throttle valve. Lever 68 in conjunction with lever 44 determines the degree to which the secondary throttle valve can be opened by spring 48. Before throttle valve 20B can be opened, both levers 44 and 68 must be retracted.

Chamber 62 is connected with the primary induction passage at a point above the leading edge of the throttle valve 20A, i. e. on the air inlet side of the throttle valve, by a conduit 78, a cylinder or chamber 80 of a valve, generally designated 82, and a conduit 83. A piston 84, having an annular recessed portion 85 in the central part thereof permits communication between conduits 78 and 83 when it is in its lowered position, as shown in Figure 2, and interrupts communication between the two conduits when it is in its raised position, as shown in Figure 1. When the piston is raised, a port 86 in the side wall of cylinder 80 permits ambient air or air from the air filter at the entrance of the induction passages to pass through cylinder 80 and conduit 83 to chamber 62 to relieve any vacuum in said chamber so that spring 72 can move levers 68 and 70 in the direction to close and to hold closed throttle valve 20B. When the piston is in its lowered position, which is the position assumed during normal engine operation, conduits 78 and 83 are fully opened and port 86 is fully closed so that manifold vacuum will be transmitted to chamber 62 to urge diaphragm 66 and levers 68 and 70 in the direction to permit spring 48 to open throttle valve 20B, as throttle valve 20A is opened. The point at which conduit 78 joins the primary induction passage may be varied from one installation to another to obtain certain operating characteristics of the carburetor, but it is preferable that this point is so located in relation to the throttle valve that the throttle valve must be opened a substantial distance, for example about half-way, before the vacuum becomes effective to actuate diaphragm 66.

In the embodiment shown in the drawings, the position of piston 84 is controlled by a U-shaped bimetallic thermostatic element 90 disposed in a housing 92 and connected at one end to piston 84 by a stem 94 and secured at the other end to a fixed pin 96. In this arrangement heated air from a stove or the like, not shown, adjacent the exhaust manifold of the engine is drawn by manifold vacuum through tube 98 around thermostat 90 and housing 92 and thence through a tube 100 to the intake manifold 12. When the engine is cold, the tines of the thermostat tend to separate as shown in Figure 1, raising piston 84 to the position wherein conduit 78 is fully closed and port 86 is fully open. As the engine becomes warm, the tines move toward one another, lowering piston 84 to the position shown in Figure 2 wherein port 86 is fully closed and conduit 78 is fully open so that, as the primary throttle valve is opened, manifold vacuum in the primary induction passage is transmitted through conduit 78, into the recessed portion of piston 84, through conduit 83 to chamber 62, thereby causing diaphragm 66, levers 68 and 70, to move in the direction to permit valve 20B to open.

In the operation of the present carburetor, starting with the engine cold, the choke valve 24 closed, and the piston 84 in its raised position, as shown in Figure 1, spring 72 through levers 68 and 70 and 40 maintains the secondary throttle valve 20B in its closed position regardless of the position of the primary throttle valve 20A. During the warm-up period, the primary induction system is the sole source of fuel-air mixture for the engine irrespective of the speed thereof. As the engine becomes warm, the heated air drawn from the stove around the exhaust manifold passes through housing 92, heating thermostat 90, and causing it to move piston 84 downwardly to open conduit 78. The choke valve, which may be controlled by an automatic type device, also is gradually opened as the engine becomes warm. After the engine has become fully warm, the opening movement of the primary throttle valve moves lever 38 in a clockwise direction and lever 44 in the direction to permit spring 48 to open secondary throttle valve 20B. The secondary throttle valve remains closed until the primary throttle valve has been opened sufficiently to permit manifold vacuum to pass through conduit 78, around the recessed portion of piston 84 and through conduit 83 to chamber 62, wherein said vacuum causes diaphragm 66 and levers 68 and 70 to move in the valve opening direction. Thus, with levers 44 and 68 retracted, spring 48 urges lever 40 counterclockwise, opening the secondary throttle valve 20B, thereby providing an increased flow of fuel-air mixture for the higher engine speeds and power output. When the primary throttle valve 20A is moved toward closed position to a point where the manifold vacuum is no longer transmitted through conduits 78 and 83 to chamber 62, spring 72 moves diaphragm 66 and levers 68 and 70 in the direction to close throttle valve 20B.

In Figures 4 and 5, modified arrangements of my invention are shown. These arrangements are provided to eliminate the tendency of the suction transmitted through conduit 78 to decrease as the secondary throttle valve 20B is opened, lowering the suction in the primary induction system. In the first arrangement, a branch conduit 112 connects conduit 78 with the venturi of the secondary induction system so that the suction created by air flow through said system will compensate for the decrease in suction in the primary system. In the second arrangement, conduit 114, having branch conduit 116 to the venturi of the primary induction system and branch conduit 118 to the venturi of the secondary induction system, has been substituted for conduit 78 of Figures 1 and 2 to utilize air flow through the two systems to control the secondary throttle valve instead of utilizing the suction adjacent the primary throttle valve.

Many other modifications may be made in the

present device without departing from the scope of the present invention. For example, valve 82, which may be of any other suitable type, may be controlled by the thermostat controlling the choke valve. Further, while only one induction passage for each system is shown, each system may include a plurality of induction passages containing throttle valves actuated by a control mechanism such as that shown in the drawings.

I claim:

1. A carburetor for an internal combustion engine composing a primary induction passage having a throttle therein, a secondary induction passage having a throttle therein urged in the opening direction, a linkage between said throttles for limiting the opening movement of said secondary throttle in accordance with the position of the primary throttle, and a means responsive to a depression in pressure in said primary induction passage for limiting only the opening movement of said secondary throttle in accordance with the degree of said depression.

2. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle therein, a secondary induction passage having a throttle therein, a resilient means for urging the secondary throttle from substantially fully closed to fully opened position, a linkage between said throttles for limiting the opening movement of said secondary throttle in accordance with the position of the primary throttle, a resilient means having a greater inherent force than said first mentioned resilient means for urging said secondary throttle in the closing direction, and a means responsive to a depression in pressure in said primary induction passage for varying the effective force of said second mentioned resilient means in accordance with the degree of said depression.

3. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle therein, a secondary induction passage having a throttle therein, a yieldable means for urging the secondary throttle in the opening direction, a linkage between said throttles for limiting the opening movement of said secondary throttle in accordance with the position of the primary throttle, a control means responsive to a depression in pressure in the carburetor for limiting the opening movement of said secondary throttle in accordance with the degree of said depression, and a temperature responsive means for regulating said control means.

4. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle therein, a secondary induction passage having a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage between said throttles for limiting the opening movement of said secondary throttle in accordance with the position of the primary throttle, a resilient means having a greater inherent force than said first mentioned resilient means for urging said secondary throttle in the closing direction, a control means responsive to a depression in pressure in said carburetor for varying the effective force of said second mentioned resilient means in accordance with the degree of said depression, and a means responsive to engine temperature for regulating said control means.

5. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle and choke therein, a secondary induction passage having a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage between said throttles for limiting the opening movement of said secondary throttle in accordance with the position of the primary throttle, a means responsive to a depression in pressure in the carburetor for limiting the opening movement of said secondary throttle in accordance with the degree of said depression, and a means responsive to temperature for holding said secondary throttle in closed position when said choke is effective to restrict the flow of air through the primary induction passage.

6. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle therein adapted to be manually actuated, a secondary induction passage having a throttle therein, a yieldable means for urging the secondary throttle in the opening direction, a linkage between said throttles for limiting the opening movement of said secondary throttle in accordance with the position of the primary throttle, and a means responsive to engine suction on the air intake side of the primary throttle in the proximity thereof for limiting only the opening movement of said secondary throttle in accordance with the degree of said suction.

7. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle therein adapted to be manually actuated, a secondary induction passage having a throttle therein, a resilient means for urging the secondary throttle from substantially fully closed to fully opened position, a linkage between said throttles for limiting the opening movement of said secondary throttle in accordance with the position of the primary throttle, a resilient means having a greater inherent force than said first mentioned resilient means for urging said secondary throttle in the closing direction, and a suction responsive means for varying the effective force of said second mentioned resilient means in accordance with the degree of engine suction on the air intake side of the primary throttle in the proximity thereof.

8. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle therein adapted to be manually actuated, a secondary induction passage having a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage between said throttles for limiting the opening movement of said secondary throttle in accordance with the position of the primary throttle, a control means responsive to engine suction on the air intake side of the primary throttle in the proximity thereof for limiting the opening movement of said secondary throttle in accordance with the degree of said suction, and a means responsive to engine temperature for rendering said control means ineffective when the engine is cold.

9. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle therein adapted to be manually actuated, a secondary induction passage having a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage between said throttles for limiting the opening movement of said secondary throttle in accordance with the position of the primary throttle, a resilient means having a greater inherent force than said first mentioned resilient means for urging said secondary throttle in the closing direction, a suction responsive means for

varying the effective force of said second mentioned resilient means in accordance with the degree of engine suction on the air intake side of the primary throttle in the proximity thereof, and a means responsive to engine temperature for rendering said suction responsive means ineffective when the engine is cold.

10. A carburetor for an internal combustion engine compirsing a primary induction passage having a venturi and a throttle therein adapted to be manually actuated, a secondary induction passage having a venturi and a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage between said throttles for limiting the opening movement of said secondary throttle in accordance with the position of the primary throttle, and a means actuated by suction in the venturis of the primary and secondary induction passages for limiting only the opening movement of said secondary throttle in accordance with the degree of said suction.

11. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle therein adapted to be manually actuated, a secondary induction passage having a venturi and a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage between said throttles for limiting the opening movement of said secondary throttle in accordance with the position of the primary throttle, and a means responsive to engine suction on the air intake side of the primary throttle in the proximity thereof and to suction in the venturi of the secondary induction passage for limiting only the opening movement of said secondary throttle.

12. A carburetor for an internal combustion engine comprising a primary induction passage having a venturi and a throttle therein adapted to be manually actuated, a secondary induction passage having a venturi and a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage between said throttles for limiting the opening movement of said secondary throttle in accordance with the position of the primary throttle, a control means actuated by suction in the venturis of the primary and secondary induction passages for limiting the opening movement of said secondary throttle in accordance with the degree of said suction, and a means regulated by a temperature responsive element for rendering said control means ineffective when the engine is cold.

13. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle therein adapted to be manually actuated, a secondary induction passage having a venturi and a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage between said throttles for limiting the opening movement of said secondary throttle in accordance with the position of the primary throttle, a control means responsive to engine suction on the air intake side of the primary throttle in the proximity thereof and to suction in the venturi of the secondary induction passage for controlling the said secondary throttle, and a means regulated by a temperature responsive element for rendering said control means ineffective when the engine is cold.

14. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle therein, a secondary induction passage having a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage connecting the primary and secondary throttles and having a one-way connection therein to permit the secondary throttle to close independently of the primary throttle, a chamber having a movable wall, a linkage connecting said wall with the secondary throttle and having a one-way connection therein to permit the secondary throttle to close independently of said movable wall, a yieldable means adapted to urge said wall in the direction to close the secondary throttle, and a conduit connecting said chamber with the primary induction passage on the air intake side of the throttle adjacent thereto.

15. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle therein, a secondary induction passage having a venturi and a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage connecting the primary and secondary throttles and having a one-way connection therein to permit the secondary throttle to close independently of the primary throttle, a chamber having a movable wall, a linkage connecting said wall with the secondary throttle and having a one-way connection therein to permit the secondary throttle to close independently of said movable wall, a yieldable means adapted to urge said wall in the direction to close the secondary throttle, and a conduit connecting said chamber with the primary induction passage on the air intake side of the throttle adjacent thereto and with the venturi in the secondary induction passage.

16. A carburetor for an internal combustion engine comprising a primary induction passage having a venturi and a throttle therein, a secondary induction passage having a venturi and a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage connecting the primary and secondary throttles and having a one-way connection therein to permit the secondary throttle to close independently of the primary throttle, a chamber having a movable wall, a linkage connecting said wall with the secondary throttle and having a one-way connection therein to permit the secondary throttle to close independently of said movable wall, a yieldable means adapted to urge said wall in the direction to close the secondary throttle, and a conduit connecting said chamber with the venturis in the primary and secondary induction passages.

17. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle therein, a secondary induction passage having a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage connecting the primary and secondary throttles and having a one-way connection therein to permit the secondary throttle to close independently of the primary throttle, a chamber having a movable wall, a linkage connecting said wall with the secondary throttle and having a one-way connection therein to permit the secondary throttle to close independently of said movable wall, a yieldable means adapted to urge said wall in the direction to close the secondary throttle, a conduit connecting said chamber with the primary induction passage on the air intake side of the throttle adjacent thereto, a valve means in said conduit,

and a means responsive to engine temperature for controlling said valve.

18. A carburetor for an internal combustion engine comprising a primary induction passage having a throttle therein, a secondary induction passage having a venturi and a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage connecting the primary and secondary throttles and having a one-way connection therein to permit the secondary throttle to close independently of the primary throttle, a chamber having a movable wall, a linkage connecting said wall with the secondary throttle and having a one-way connection therein to permit the secondary throttle to close independently of said movable wall, a yieldable means adapted to urge said wall in the direction to close the secondary throttle, a conduit connecting said chamber with the primary induction passage on the air intake side of the throttle adjacent thereto and with the venturi in the secondary induction passage, a valve means in said conduit, and a thermostatic means for closing said valve when the engine is cold.

19. A carburetor for an internal combustion engine comprising a primary induction passage having a venturi and a throttle therein, a secondary induction passage having a venturi and

a throttle therein, a resilient means for urging the secondary throttle in the opening direction, a linkage connecting the primary and secondary throttles and having a one-way connection therein to permit the secondary throttle to close independently of the primary throttle, a chamber having a movable wall, a linkage connecting said wall with the secondary throttle and having a one-way connection therein to permit the secondary throttle to close independently of said movable wall, a yieldable means adapted to urge said wall in the direction to close the secondary throttle, a conduit connecting said chamber with the venturis in the primary and secondary induction passages, a valve means in said conduit, and a thermostatic means for closing said valve when the engine is cold.

ALBERT H. WINKLER.

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