July 4, 1961 T. F. CRAMER 2,990,822

SECONDARY THROTTLE GOVERNOR ASSEMBLY

Filed Nov. 10, 1958 2 Sheets-Sheet 1

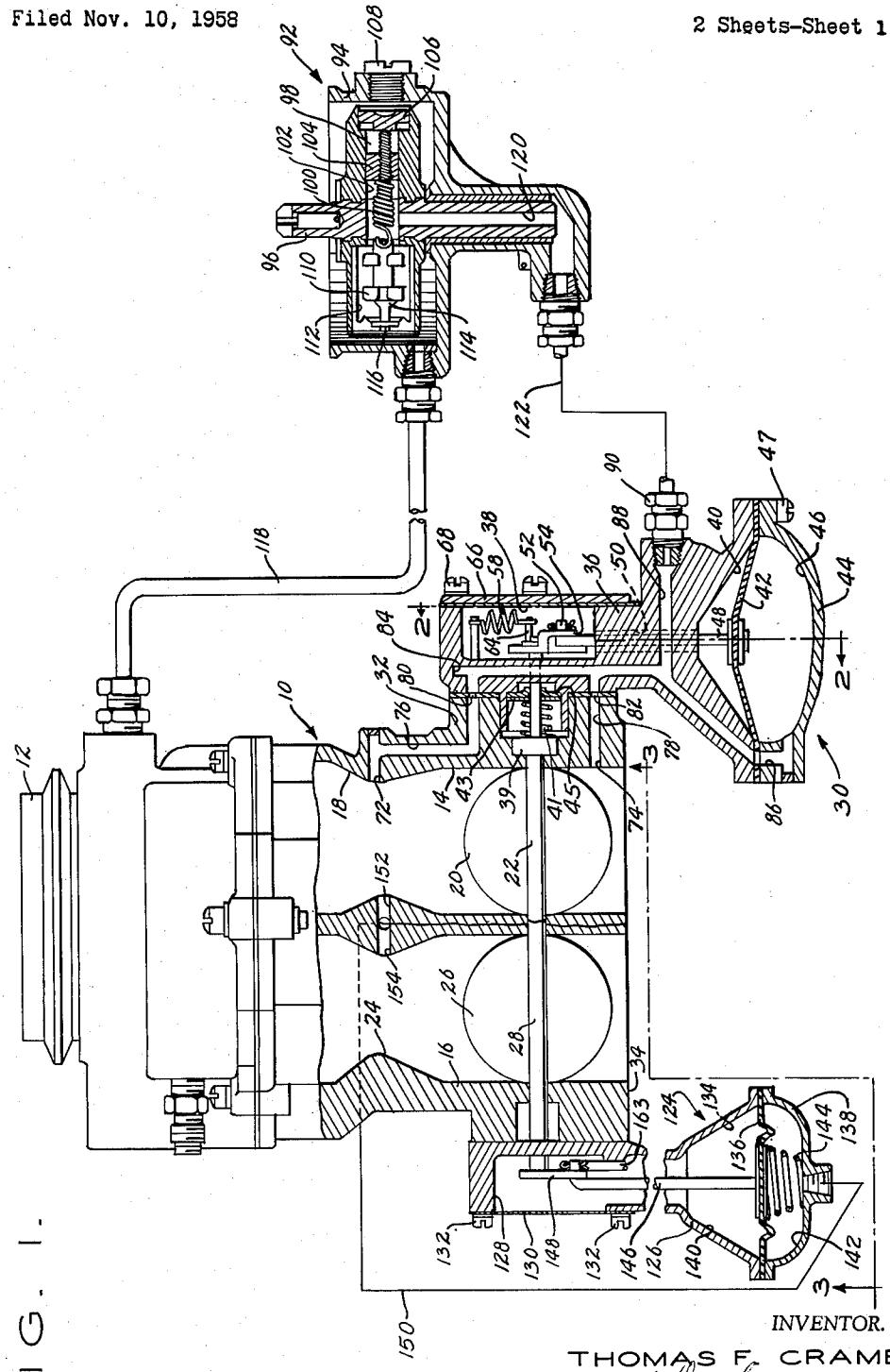


FIG. 1.

INVENTOR.
THOMAS F. CRAMER
BY Whittemore, Hulbert & Belknap
ATTORNEYS

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FIG. 2.

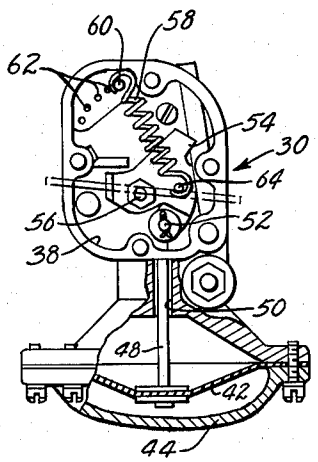


FIG. 4.

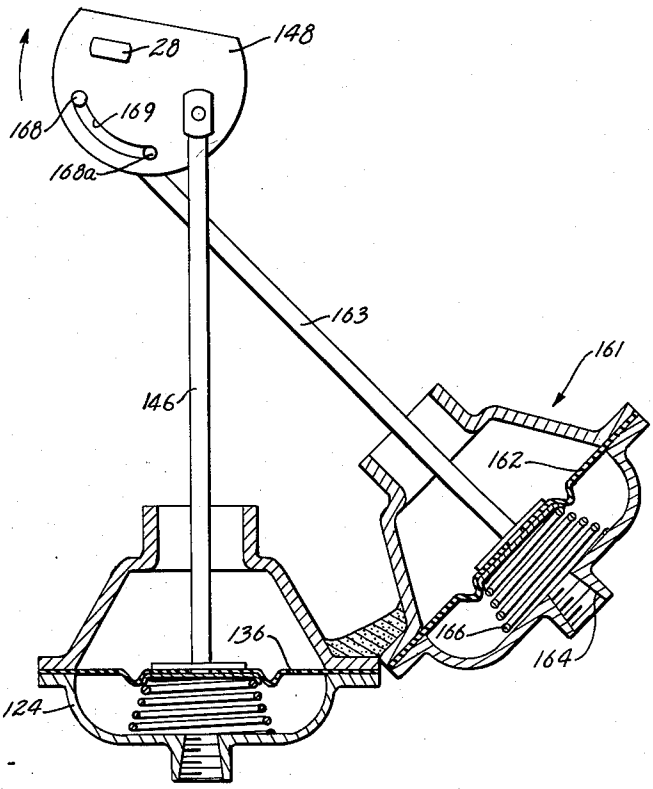
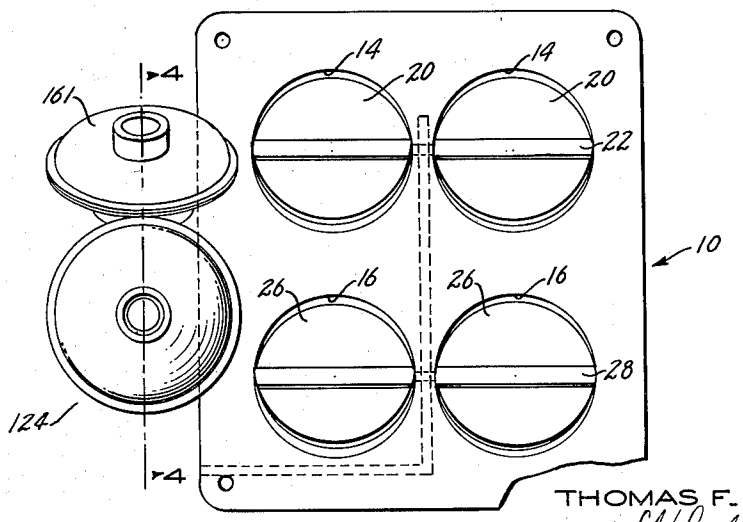


FIG. 3.



INVENTOR.
THOMAS F. CRAMER
BY Whittemore, Hulbert & Belknap
ATTORNEYS

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SECONDARY THROTTLE GOVERNOR ASSEMBLY

Thomas F. Cramer, Warren, Mich., assignor to Holley Carburetor Company, Van Dyke, Mich., a corporation of Michigan

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13 Claims. (Cl. 123—103)

This invention pertains to a secondary throttle governor assembly and more particularly to apparatus for providing an override actuation of the secondary throttle in a multiple-stage carburetor for an internal combustion engine during engine governing.

A multiple-stage carburetion system comprises an operator-controlled primary throttle plate assembly and a venturi vacuum controlled secondary throttle plate assembly which is operable to supply additional fuel mixture flow to the combustion chambers at high speeds.

In engines having governing systems wherein at governed speed the primary throttle plate is automatically adjusted to restrict the fuel mixture flow to the combustion chambers, the subsequent movement of venturi-operated secondary plate is delayed and very quick, causing a compensating opening of the primary plate. The secondary plate in turn opens slightly due to the increased flow through the primary venturi and repeated alternate adjustments or hunting of the primary and secondary plates result. This invention successfully prevents hunting by providing means for closing the secondary throttle more nearly together with the closing of the primary throttle and before the secondary throttle actuating means reacts to the change of air flow through the primary air intake so that there is no resulting repeated adjusting or hunting.

Structure for accomplishing this includes a governor vacuum responsive diaphragm which is attached to a rod having a lateral pin extending from an end thereof which is engageable with an arcuate slot in the secondary throttle lever. The usual secondary throttle actuating means is also connected to the lever and the pin is positioned so that during normal throttle operation it does not interfere with lever movement. However, during a governing action, the pin is moved against a slot end to urge the lever and the throttle to a closed position more nearly together with the closing of the primary throttle thereby eliminating the suddenness of movement of the throttle plate which would otherwise be imparted by the usual throttle actuating means.

It is therefore an object of this invention to provide means to override the secondary throttle actuating means during a governing action in order to avoid a sudden movement or surge of the secondary throttle that would initiate hunting.

Another object of this invention is to provide an engine vacuum responsive diaphragm with a lost motion connection to the secondary throttle that permits unrestricted throttle movement until a governing action at which time the diaphragm will actuate the throttle to a closed position to avoid a sudden or quickened throttle movement.

A further object is to provide a governor vacuum responsive diaphragm which has connected thereto a pin carrying arm with the pin engageable in an arcuate slot of the secondary throttle lever with said pin positioned so that normal throttle movement is unrestricted but during a governing action said pin will engage an end of the slot and override the conventional throttle control to close the throttle in a relatively moderate movement.

These and other objects and advantages will become more apparent when a preferred embodiment is discussed in connection with the drawings, in which:

FIG. 1 is a side elevational view with portions thereof in cross section of a four-barrel carburetor embodying the invention;

FIG. 2 is a side elevational view, with portions thereof in cross section, taken on the plane of line 2—2 of FIG. 1 and looking in the direction of the arrows;

FIG. 3 is a view of the underside of the primary and secondary air intakes and the diaphragm assemblies for actuating the secondary throttle along a line 3—3 of FIG. 1; and

FIG. 4 is a section taken along 4—4 of FIG. 3 and illustrates the two diaphragm assemblies for actuating the secondary throttle.

Referring now to FIG. 1, a four-barrel carburetor **10**, of the type referred to above and having an air intake **12**, is sectioned to expose one of the primary barrels **14** and one of the secondary barrels **16**. The primary barrel **14** is provided with a restriction or venturi throat **18** and a conventionally operated throttle plate **20** mounted on the shaft **22** which extends through the other primary barrel in which is mounted a throttle plate identical to plate **20**. The secondary barrel **16** is also provided with a venturi throat **24** and a throttle plate **26** mounted on the shaft **28** which extends through the other secondary barrel in which is mounted another secondary plate.

While a particular four-barrel carburetor is shown for purposes of illustration, it will be apparent that the invention is equally applicable to two-barrel or other multi-stage carburetors.

A vacuum device **30**, commonly referred to as a governor diaphragm assembly is mounted on the boss **32** extending from the carburetor throttle body **34**. The assembly **30** includes a body **36** formed to provide recesses **38** and **40**. The recess **40** is covered by means of a flexible diaphragm **42** which is secured to the body **36** by means of a cover member **44** formed to provide an air-tight chamber **46** of which the flexible diaphragm **42** forms a wall. The cover member may be secured by any suitable means such as screws **47**.

As shown by FIGS. 1 and 2, the diaphragm **42** has secured to the center thereof in the conventional manner a rod **48** passing through passage **50** in the body **36** and having a laterally extending end **52** pivotally secured to the lever **54** which is rigidly secured to the end **56** of the primary throttle shaft **22** extending into the chamber **38**. The shaft **22** is mounted in an anti-friction bearing **39**, and a spring **41** is disposed between the bearing **39** and the steel and leather washers **43** and **45** to provide a seal. A tension spring **58** attached between the adjustable pin **60**, mounted in one of the holes **62** in the body **36**, and the fixed pin **64**, secured to the lever **54**, tends to hold the primary throttle plate **20** in the open position. An atmospherically vented cover plate **66** may be secured by screws **68** to housing **36**, thereby protecting the mechanism within chamber **38**.

The orifice **72** at the primary venturi throat **18** and the orifice **74** below the primary throttle plate **20** are connected by means of the passages **76** and **78** having fixed restrictions **80** and **82** respectively with the passage **84** in the body member **36** and the passage **86** in the cover member **44** which lead to the chamber **46**. A passage **88** connecting with passage **84** terminates in an opening in the body **36** adapted to receive a threaded fitting **90**.

Located at any desired position on the engine is a governor valve assembly **92** comprising a stationary housing **94** adapted to be mounted on the engine and containing a shaft **96** driven in any suitable manner in proportion to engine or vehicle speed. Mounted for rotation with the shaft **96** is a laterally extending sleeve **98** having a spring **100** mounted within the axial passage

102 in the sleeve by attachment at one end to the internally threaded member 104, which is keyed in passage 102. Spring 100 is adjustable axially of sleeve 98 by turning the adjustment screw 106 which is reached by removing the access screw 108. The other end of the spring 100 is secured to the governor weight 110 movable axially within the chamber 112 against the spring 100 and having at the free end thereof a valve 114 adapted to close the orifice 116 when the weight 110 is forced outwardly due to the rotation of the shaft 96 and the sleeve 98 in accordance with engine speed. The engine or vehicle speed at which the orifice 116 will be closed is dependent, of course, upon the adjustment of the spring 100. It is apparent, also, that some other governor valve structure may be employed.

A vacuum balancing air bleed is provided through assembly 92 to chamber 46 when orifice 116 is uncovered. Conduit 118 between the air intake 12 of the carburetor 10 and the housing 94 and conduit 122 between the housing 94 and the passage 88 in the body 36 are provided so that when the engine or vehicle is operating at a speed insufficient to close the orifice 116, engine vacuum will draw clean air through the conduit 118, into the housing 94, through the orifice 116 and into the chamber 112, through the passage 102 and the axial passage 120 in the shaft 96 and thence through the conduit 122 to the governor diaphragm assembly 30. When the engine reaches governed speed, the orifice 116 is closed and the air bleed through conduit 122 is cut off. When this occurs, vacuum in the chamber 46 urges the diaphragm 42 downwardly, as in FIG. 2, against the spring 58 to close the primary throttle plates 20.

A secondary throttle diaphragm assembly 124 is mounted at the opposite side of the throttle body 34. This assembly comprises a body 126 having a recess 128 vented to the atmosphere through a plate 130 secured by screws 132 and a recess 134 closed by a flexible diaphragm 136 which is secured to the body 126 by means of a cover 138 formed to provide oppositely disposed chambers 140 and 142 between which the flexible diaphragm 136 forms a movable wall. The chamber 142 contains a compression spring 144 positioned between the cover 138 and the rod 146, which is secured to the center of the diaphragm 136, so that the spring 144 urges the rod 146 upwardly to rotate the lever 148 secured rigidly to the secondary throttle shaft 28 counterclockwise, and close the secondary throttle plates 26. A conduit 150 extending between the chamber 142 and the vacuum passages 152 and 154 opening to the primary and secondary venturi throats 18 and 24 enables primary and/or secondary venturi vacuum to evacuate the chamber 142 and displace the diaphragm 136 downwardly, as in FIGURE 1, against the spring 144 to open the secondary throttle 26. The spring 144 is selected so that the secondary throttle plate 26 will be open at any predetermined venturi vacuum.

The structure described above, or its equivalents, is well known in the art, and proper governing action depends upon the particular complete closing of the throttle plates 20 and 26 when the engine or vehicle has reached a predetermined governing speed so as to diminish or cut off the flow of motive fluid to the engine. However, in the case of dual carburetion as described above, the automatic closing of the secondary throttle plates 26 lags behind that of the primary throttle plates 20, particularly at governed engine speeds at which time the secondary plates 26 may not be fully open so that linkage (not shown) usually effective to positively close the secondary plates 26 with the primary plates 20 does not come into operation. While this is tolerable in the normal function of the dual carburetor, e.g. during acceleration, it is highly objectionable for the purposes of governing. This causes hunting, since the primary throttle plates have to first close farther than would otherwise be required to compensate for the open secondary plates and then open when the secondary plates finally close.

In order to remedy this objection, additional means, shown in FIGURES 3 and 4, for actuating the secondary throttle is provided. Diaphragm assembly 161 is welded to assembly 124 and circumferentially supports spring actuated diaphragm 162 which has attached thereto and moves with a diaphragm rod 163. An engine vacuum source, such as manifold vacuum or governor vacuum, is applied to port 164 for moving the diaphragm against its spring 166 to an actuated position during a governing action.

An end of rod 163 is provided with a laterally extending pin 168 which is inserted in an arcuate slot 169 formed in actuating lever 148. Lever 148 is shown in FIGURE 4 in a throttle-closed position and moves clockwise for a throttle-open position. Since the pin 168 is at the leftward end of the slot it will not interfere with the clockwise movement of lever 148 to an open position and lever 148 is free to turn until the pin 168 is engaged with the opposite slot end at which point the secondary throttle will be wide open.

During a governing action, a vacuum pressure will be supplied through port 164 to draw diaphragm 162 against spring 166 and move pin 168 rightwardly until it reaches position 168*a* and during this time the pin will be acting against the slot end to move lever 148 in a counterclockwise direction closing the secondary throttle more nearly together with the closing of the primary throttle plate to prevent the sudden secondary throttle closing which results in hunting.

While either manifold or governor vacuum may be used to actuate diaphragm 162 in assembly 161, it has been found that the governer vacuum is less sensitive to slight changes in engine load and speed and therefore is very desirable as a vacuum source. Of course, other means responsive to governing action may be used to actuate the rod 163 and pin 168 to move throttle lever 148 and close the secondary throttle before the undesired surge.

If desired, of course, all or any part of the structure shown herein may be incorporated into a single, compact, carburetor unit adapted for placement in a vehicle engine compartment.

The drawings and the foregoing specification constitute a description of the improved secondary throttle govenor assembly in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. Supplementary throttle plate control means for an internal combustion engine carburetor comprising a carburetor body having a throttle barrel formed therein, a throttle plate pivotally mounted in said throttle barrel, first means for moving the throttle plate in response to engine demands to supply sufficient engine intake fuel mixture flow, and second means for controlling the closing of said throttle plate independently of said first means during a selected engine operating condition which is a function of speed.

2. Supplementary throttle plate control means for an internal combustion engine carburetor, comprising a carburetor body having primary and secondary throttle barrels each having throttle plates mounted therein, first means for moving the secondary throttle plate in the secondary throttle barrel in response to engine demands to supply sufficient engine intake fuel mixture flow, speed responsive means to close said secondary throttle plate during engine governing to prevent throttle plate hunting, said speed responsive means comprising an engine vacuum actuated rod having a lost motion connection with said secondary throttle plate, whereby said secondary throttle plate is free to move from open to close positions until said rod is actuated at which time said rod

will override said first means to move said secondary throttle plate to a closed position.

3. A multiple-stage carburetor for an internal combustion engine comprising primary and secondary barrels, primary and secondary throttle plates located respectively in said barrels, a speed governor for actuating said primary throttle plate, a lever connected to the secondary throttle plate, means for moving said lever in response to engine demands, an engine vacuum actuated rod connected to said lever to close said secondary throttle plate during engine governing to prevent throttle plate hunting, said lever having an arcuate slot formed therein, said engine vacuum actuated rod having a pin inserted in said slot and movable therealong, said pin being positionable in said slot so that said means can operate said secondary throttle plate through the entire range of throttle plate movement until said engine vacuum actuated rod is vacuum operated to override said means and close said secondary throttle plate.

4. A multiple-stage carburetor for an internal combustion engine comprising primary and secondary throttle barrels, primary and secondary throttles located respectively in said barrels, a speed governor for actuating said primary throttle, first means responsive to an engine condition which is a function of engine load and speed for actuating said secondary throttle, and means responsive to engine vacuum to override said first means and close said throttle during engine governing.

5. Supplementary throttle plate control means for an internal combustion engine carburetor comprising a carburetor body having a throttle barrel formed therein, a throttle plate pivotally mounted in said barrel, first means operatively connected to said throttle plate for moving the throttle plate in response to engine demands to regulate engine fuel mixture flow, speed responsive means operatively connected to said throttle plate to close said throttle plate independently of said first means, the connections of said first means and speed responsive means with said throttle plate being movable relative one another so that said first means can move said throttle plate through an operative range until said speed responsive means is actuated to close said throttle plate.

6. A multiple-stage carburetor for an internal combustion engine comprising primary and secondary barrels, primary and secondary throttles located respectively in said barrels, a speed governor for actuating said primary throttle, means responsive to an engine condition which is a function of engine load and speed for actuating the secondary throttle, and supplementary speed responsive throttle control means for closing said secondary throttle during selected speed conditions.

7. A multiple-stage carburetor for an internal combustion engine comprising a carburetor body having primary and secondary throttle barrels each having throttle plates mounted therein, first means for moving the secondary throttle plate in the secondary throttle barrel in response to engine demands to supply sufficient engine intake fuel mixture flow, speed responsive means to close said secondary throttle plate during engine governing to prevent throttle plate hunting, said speed responsive means comprising a speed responsive rod having a lost motion connection with said secondary throttle plate, whereby said secondary throttle plate is free to move from open to close positions until said rod is actuated at which time said rod will override said first means to move said secondary throttle plate to a closed position.

8. A multiple-stage carburetor for an internal combustion engine comprising primary and secondary barrels, primary and secondary throttle plates located respectively in said barrels, a speed governor for actuating said primary throttle plate, a lever connected to the secondary throttle plate, means for moving said lever in response to engine demands, an engine vacuum actuated arm connected to said lever to close said secondary throttle plate during engine governing to prevent throttle plate hunting, said lever having an arcuate slot formed therein, said arm having a pin inserted in said slot and movable therealong, said pin being positionable against one end of said slot so that said means can operate said secondary throttle plate through the entire range of throttle plate movement until said arm is vacuum operated to move said pin against the other end of the slot to override said means and close said secondary throttle plate.

9. A multiple-stage carburetor for an internal combustion engine comprising primary and secondary throttle barrels, primary and secondary throttle plates located respectively in said barrels, venturi means for developing a vacuum in said throttle barrels, a speed governor for actuating said primary throttle, a lever connected to the secondary throttle plate, said venturi means being operatively connected to said lever to move said lever in response to engine demands, an engine vacuum actuated arm connected to said lever to close said secondary throttle plate during engine governing to prevent throttle hunting, said lever having an arcuate slot formed therein, said arm having a pin inserted in said slot and movable therealong, said pin being positionable in said slot so that said means can operate said secondary throttle plate through the entire range of throttle plate movement until said arm is vacuum operated to override said means and close said secondary throttle plate.

10. A multiple stage carburetor for an internal combustion engine comprising primary and secondary barrels, primary and secondary throttle plates located respectively in said barrels, a speed governor for actuating said primary throttle plate, first means responsive to an engine condition which is a function of engine load and speed for actuating the secondary throttle plate, suplementary speed responsive throttle control means to close said secondary throttle plate during selected speed conditions, said supplementary control means comprising a speed responsive rod having a lost motion connection with said secondary throttle plate, whereby said secondary throttle plate is permitted to move from open to close positions until said rod is actuated so that said rod will override said first means to move said secondary throttle plate to a closed position.

11. In an engine carburetor having a throttle plate, actuating means for controlling the position of said throttle plate, said actuating means including a movable wall connected to said throttle plate to adjust its position, and supplementary throttle plate control means for closing said throttle plate at a predetermined engine vacuum condition, said supplementary throttle plate control means comprising a vacuum actuated rod having a lost motion connection with said throttle plate, said throttle plate being free to be moved by said actuating means from a closed position to an open position until the aforesaid predetermined vacuum condition has been attained to actuate said rod, at which time said rod will override said actuating means to move said throttle plate to a closed position.

12. An engine carburetor comprising a body having primary and secondary throttle barrels, each having throttle plates mounted therein, first means for moving the secondary throttle plate in the secondary throttle barrel in response to engine demands to supply sufficient fuel mixture thereto, second means for closing said secondary throttle plate during a predetermined engine vacuum condition to prevent throttle plate hunting, said second means comprising a vacuum actuated rod having a lost motion connection with said secondary throttle plate, said secondary throttle plate being free to move between open and closed positions until the aforesaid predetermined engine vacuum condition has been attained to actuate said rod, at which time said rod will override said first means to move said secondary throttle plate to a closed position.

13. A multi-stage carburetor for an internal combustion engine comprising a body with primary and second-

ary induction passages therethrough and having respective primary and secondary throttle plates therein controlling the flow of combustible mixtures to said engine, a venturi formed within said primary induction passage, means for manually controlling the position of said primary throttle plate, vacuum responsive means for controlling the position of said secondary throttle plate, said vacuum responsive means comprising a housing having a movable wall therein operatively connected to said secondary throttle plate, and supplementary control means operatively connected to said secondary throttle plate for controlling the closing of said throttle plate independently

of said vacuum responsive means during a selected engine condition which is a function of speed.

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