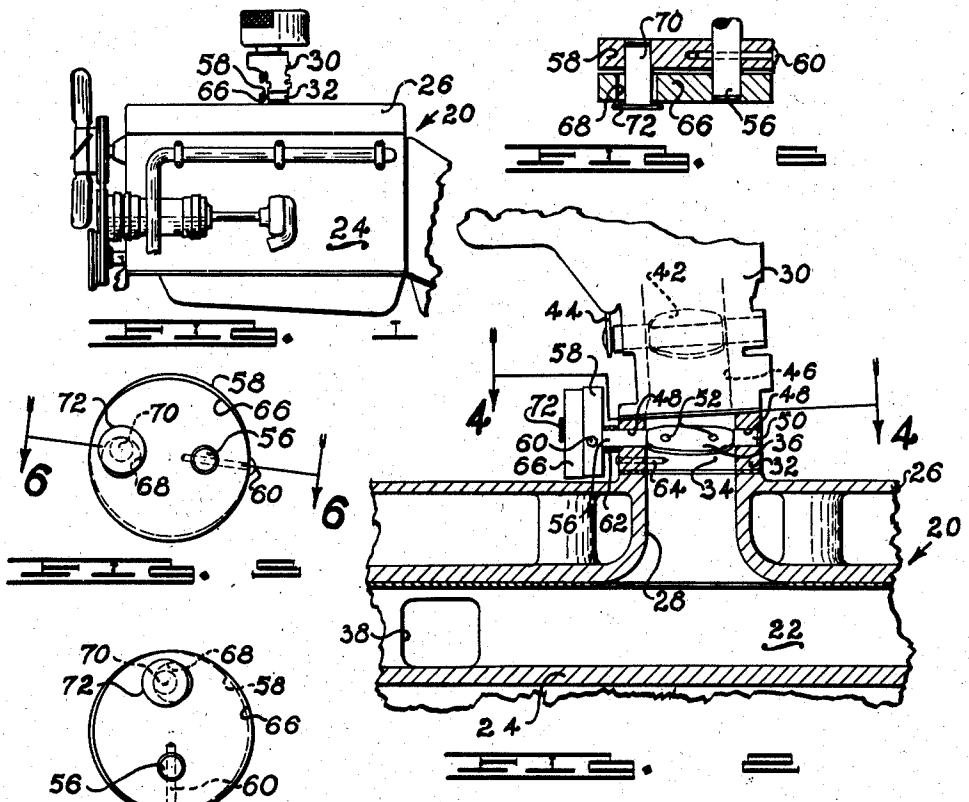
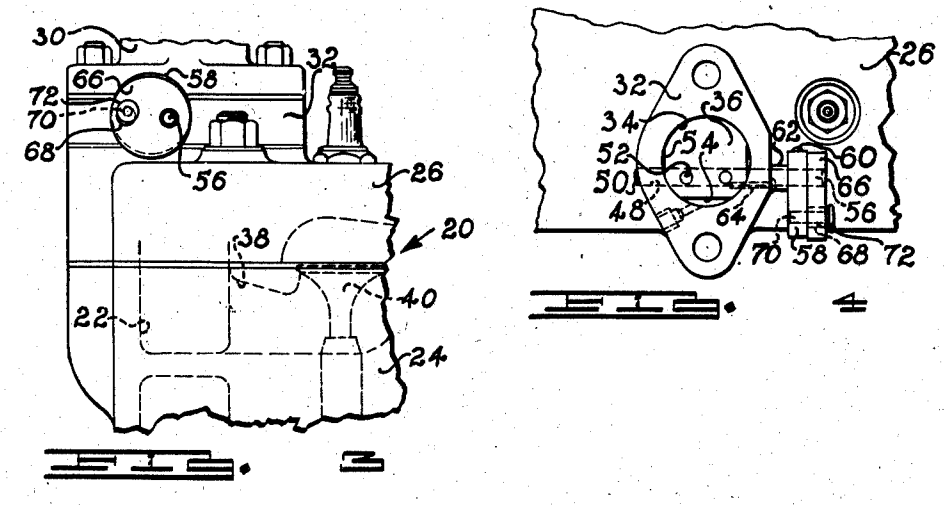
Oct. 27, 1942. M. F. MOORE ET AL 2,299,919

AUXILIARY THROTTLE VALVE

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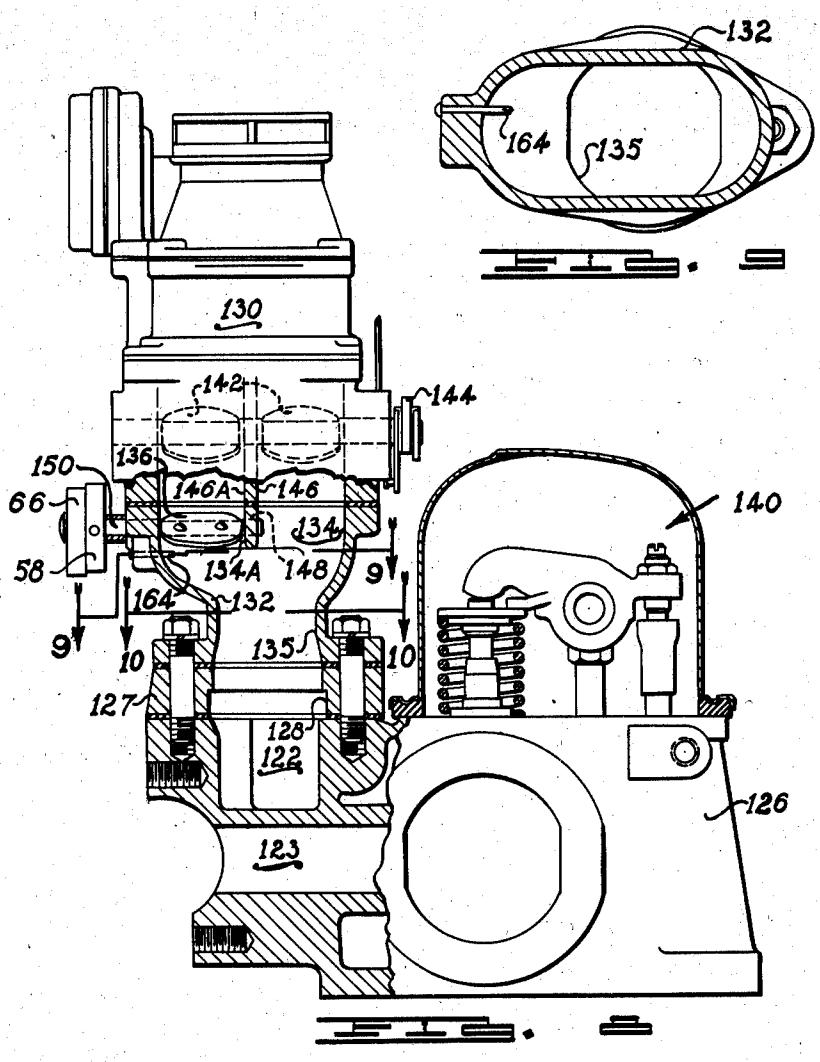
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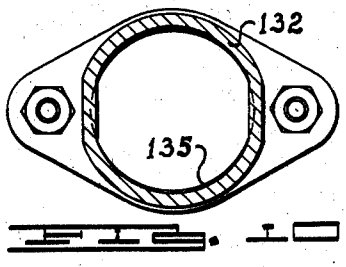
BY Carl J. Barbee
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AUXILIARY THROTTLE VALVE

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UNITED STATES PATENT OFFICE

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AUXILIARY THROTTLE VALVE

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Application July 28, 1941, Serial No. 404,292

16 Claims. (Cl. 123—119)

This invention relates to a control valve for the carburetor of an internal combustion engine and has particular reference to an auxiliary valve designed to improve the distribution of the fuel mixture to the various cylinders of the engine particularly when the engine is operating at slow speeds.

The present day internal combustion engine, particularly as installed in automative vehicles, is designed in such a way that the intake manifold which distributes the fuel mxture to the various cylinders of the engine is highly efficient while the engine is running at relatvely hgh speeds; however, when the engine is running at slow speeds and under load, as when the automobile is climbing a hill or being accelerated from slow speed, the distribution of the fuel to the various cylinders is apt to be faulty. This is due, in part, to the fact that the proper vaporization of fuel depends upon the degree of vacuum in the intake manifold and also upon the velocity of the incoming air. The degree of vacuum in the manifold is determined by the amount of air sucked in by the cylinders and the throttle opening through which this air must pass at slow speeds. The pistons do not draw in as great a quantity of air at low speeds as at high speeds and with the throttle valve wide open, there is very little differential of pressure existing between the atmosphere and the intake manifold. This results in a low degree of vacuum in the manifold and poor distribution to the various cylinders.

Generally, this invention provides an auxiliary valve in the intake passage to the manifold, which valve has an unbalanced area so that the incoming air tends to open the valve. The action of the air on the valve is balanced somewhat by a balance weight tending to close the valve. In order to prevent the valve and balance weight from assuming a period of oscillation in which the valve periodically opens and closes the passage, a dampener weight is attached to the balance weight in such a manner as to have a different period of oscillation tending to dampen oscillations of said valve.

It is an object of this invention to provide means for increasing the degree of vacuum in an intake manifold during slow speed operation of an engine.

It is another object of this invention to provide means for automatically restricting the throttle opening of a carburetor to obtain a more efficient vacuum in the intake manifold.

It is another object of this invention to provide means for restricting the inlet to an intake manifold, which means is automatically adjustable according to the amount of air being drawn into the manifold.

It is another object of this invention to provide means for dampening the action of an automatic throttle valve so that the valve does not fluctuate.

It is another object of this invention to provide an auxiliary throttle valve which is biased toward a closed position against the atmospheric pressure tending to open the valve.

Other objects and advantages of this invention will be apparent from a consideration of the following description and claims and the attached drawings, of which there are two sheets, and in which—

Figure 1 represents a side elevation of an internal combustion engine having the auxiliary valve installed thereon;

Figure 2 represents a vertical longitudinal view partially in section through the intake manifold and throttle opening of the engine shown in Figure 1;

Figure 3 represents an end elevation of the carburetor and engine showing the auxiliary valve in closed position;

Figure 4 represents a plan view of the auxiliary valve with the carburetor removed and is taken along a plane indicated generally by the line 4—4 in Figure 2 and looking in the direction of the arrows;

Figure 5 represents an enlarged end view of the balance weights shown in Figures 1 through 4 and showing the weights in a position corresponding to the closed position of the auxiliary valve;

Figure 6 represents a sectional view taken along a plane indicated by the line 6—6 in Figure 5 and looking in the direction of the arrows;

Figure 7 represents an end view of the balance weights shown in Figures 1 through 6 and showing the weights in a position corresponding to the open position of the auxiliary valve;

Figure 8 represents a transverse vertical view partially in section showing the auxiliary valve as installed in a modified form of carburetor and engine;

Figure 9 represents a sectional view taken along a plane indicated by the line 9—9 in Figure 8 and looking in the direction of the arrows; and

Figure 10 represents a sectional view taken along a plane indicated by the line 10—10 in Figure 8 and looking in the direction of the arrows.

Figures 1 through 4 illustrate an internal combustion engine 20 of the L-head type having an

intake manifold 22 formed in the upper surface of the motor block 24 which is covered by the head 26. The head 26 defines an intake port 28 through which the air and fuel mixture from a single throat carburetor 30 is admitted into the manifold 22. The carburetor 30 is separated from the head 26 by a spacer block 32 which defines a passage 34 within which is mounted the auxiliary valve 36. From the manifold 22 the fuel and air mixture is conducted to the several cylinders of the engine through suitable intake passages, one of which is illustrated at 38 and which are controlled by valves 40 (see Figure 3).

The carburetor 30 is provided with a throttle valve 42 which is controlled by a lever 44 and functions to open and close the throat 46 of the carburetor. The carburetor itself may be of any suitable design known to the automotive art today.

Considering the function of the auxiliary valve 36 and the spacer block 32 in greater detail, attention is called to the fact that the spacer block 32 is slightly wedge shaped so that the carburetor tilts toward the front of the engine (see Figure 2). This construction is employed due to the fact that the engine of an automobile is usually tilted toward the rear of the automobile and the forward tilt of the carburetor relative to the engine results in the carburetor assuming a generally vertical position when installed in the automobile.

The walls of the spacer block 32 about the passage 34 define the aligned apertures 48 which extend longitudinally of the engine and form journals for the shaft 50 on which the auxiliary valve 36 is secured by means of the pins 52. Attention is called to the fact that the valve 36 is cut away as at 54 (see Figure 4) so that it will not completely close the passage 34 even in its entirely closed position.

The shaft 50 extends forwardly of the spacer block 32 as at 56 and has the eccentric balance weight 58 secured thereto as by the pin 60. A short sleeve 62 is used to space the balance weight from the forward wall of the spacer block 32. It will be noted that the balance weight 58 is eccentric with respect to the axis of the shaft 50 and that the auxiliary valve 36 is mounted eccentrically with respect to the shaft 50 on the opposite side of the shaft from the balance weight 58. This positions the center of area or center of pressure of the valve 36 at a point offset from the axis of the shaft and on the opposite side of the shaft from the balance weight 58. It will thus be apparent that the eccentric position of the balance weight 58 will tend to maintain the valve 36 in closed position while the center of pressure of the valve 36, being under the differential pressure existing between the atmosphere and the intake manifold, will tend to swing the valve and shaft to open position. Thus when the engine is operating at slow speed and is drawing in a relatively small amount of air and fuel, the balance weight 58 will function to urge the valve 36 toward a closed position. Most of the air and fuel passing from the carburetor to the intake manifold will thus be forced to pass through the restricted passages formed by the cut away portions 54 of the valve, thus increasing the velocity of the mixture and resulting in more efficient distribution to the various cylinders.

As the speed of the engine increases, the suction in the manifold 22 will increase the pressure differential between the manifold and the throat 46 of the carburetor and this increased pressure differential acting upon the center of pressure of the auxiliary valve 36 will gradually overbalance the eccentric weight 58 and swing the auxiliary valve 36 into its open position, thus leaving the intake passages 46, 34 and 28 solely under the control of the main throttle valve 42. A pin 64 extends through the wall of the spacer block 32 below the auxiliary valve to prevent the weight from swinging past a vertical or fully open position so that the valve and balance weight may not become overcentered to a position where the balance weight would tend to close the valve from the wrong side, in which position it would not seat due to the eccentricity of the shaft 50. The auxiliary valve 36 and balance weight 58 function to automatically vary the restriction of the intake passage in accordance with the speed of the engine to restrict the passage at low engine speeds regardless of the throttle valve opening.

It will be noted that the forwardly extending end 56 of the shaft 50 extends through the balance weight 58 and has mounted thereon a dampener weight 66. The dampener weight is generally concentric with respect to the balance weight 58 but is free to rotate relative to the end 56 of the shaft 50. The dampener weight 66 defines an aperture 68 through which extends a pin 70 secured to the balance weight 58. It will be noted that the pin 70 is of considerably smaller diameter than the diameter of the aperture 68 so that the dampener weight 66 may have limited rotation on the shaft 50 relative to the balance weight 58. The enlarged head 72 of the pin 70 prevents the dampener weight from sliding off of the shaft 50.

The function of the dampener weight 66 is to prevent the balance weight 58 and auxiliary valve 36 from vibrating or reaching a period of oscillation in which a series of fuel charges are admitted to the intake manifold periodically. It will be noted that the balance weight and auxiliary valve acting alone would have a tendency to open long enough to reduce the pressure differential between the manifold 22 and carburetor throttle 46 and then close until the pressure differential is again built up. This cycle would have a definite period which would cause the valve to oscillate and the dampener weight is designed to act as a freely oscillating mass having a different frequency of oscillation than the period of the combined auxiliary valve and balance weight 58 to dampen the oscillations of the auxiliary valve. Thus when a sudden opening of the throttle valve 42 tends to rapidly open the auxiliary valve 36, the dampener weight 66 will lag behind the balance weight 58 until the pin 70 strikes the side of the aperture 68 and picks up the dampener weight and retards the opening movement of the auxiliary valve. The inertia of the dampener weight causes it to lag behind the balance weight when the auxiliary valve is closing and thus retards the closing of the valve.

Thus the auxiliary valve 36 will restrict the intake passage between the carburetor 30 and the intake manifold 20 while the engine is operating at slow speed and thus increase the velocity of the air and fuel mixture but will automatically swing into an open position while the engine is operating at high speed and will not interfere with the high speed operation of the engine. The dampener weight 66 functions to prevent oscillations in the valve 36 as was explained above.

In the modified form of the invention illustrated in Figures 8 through 10, there is shown the head portion 126 of a valve-in-head type of

engine. The head 26 carries the usual valve-in-head type of valve mechanism indicated generally at 140 and has the intake manifold 122 formed along the upper surface thereof. The exhaust passages 123 are formed in the head 126 below the intake manifold 122, each of which communicate with the combustion chamber space (not shown) within the head. The intake manifold 122 is closed by a cover plate 127 which defines a passage 128 corresponding to the passage 28 through the head 26 of the L-head type of engine.

The carburetor 130 is of a dual type having two throats 146 and 146A, each of which are controlled by the throttle valves 142 mounted upon a single shaft and operated by the lever 144.

The spacer block 132 which separates the carburetor from the cover plate 127 is shaped to form dual passages 134 and 134A which communicate at their upper ends with the dual throats 146 and 146A of the carburetor and which merge in the lower portion of the spacer block into a single passage 135 communicating with the passage 128 in the cover plate 127.

The walls of the passage 134A define aligned apertures 148 which act as journals for the shaft 150 on which is mounted the auxiliary valve 136. The shaft 150 extends forwardly of the spacer block 132 and has mounted thereon the balance weight 58 and dampener weight 66 which are the same as the balance weight and dampener just described in the first form of the invention. A pin 164 extending through the wall of the spacer member 132 prevents the auxiliary valve 136 from swinging past a fully vertical or open position.

With the dual carburetor 130 having the dual passages 146 and 146A, the auxiliary valve 136 operates to close the passage 146A in the same manner in which the auxiliary valve 36 closes the port 34 in the first form of the invention. Thus at slow speeds the engine illustrated in Figure 8 will be supplied with fuel mainly through the passages 146 and 134 while at high speeds the auxiliary valve 136 will open the other passages 146A and 134A to increase the intake area. The auxiliary valve 136 functions in much the same manner as the valve 36 in the first form of the invention to restrict the area through which the intake mixture passes, thus increasing its velocity at slow engine speeds and bettering the distribution to the various cylinders. The valve 136 automatically assumes an open position at high engine speeds so as not to interfere with the normal operation of the carburetor.

It will thus be seen that our auxiliary valve provides better distribution in an engine at slow speed with open throttle without interfering with the high speed operation of the engine and that the valve is operable in either single or dual carburetors and that it will not fluctuate or reach a period of oscillation which will cause rough operation of the engines. Further, the auxiliary valve is easily installed in a simple spacer member so that it may be used with any type of carburetor or manifold, the particular carburetors and manifolds shown being used for illustrative purposes only. It will also be readily understood that the auxiliary valve could be build directly into the carburetor without departing from the theory of our invention.

While we have described our invention in some detail, we intend this description to be an example only and not as a limitation of our invention, to which we make the following claims.

We claim:

1. In combination with a manifold for an internal combustion engine, means defining an inlet to said manifold, an unbalanced valve positioned in said inlet, means biasing said valve toward closed position, and inertia means for impeding movement of said valve and biasing means either toward open or closed position of said valve.

2. In combination with a manifold for an internal combustion engine, means defining an inlet to said manifold, an unbalanced valve positioned in said inlet, means biasing said valve toward closed position, and other means operably associated with said valve and said first mentioned means and arranged to resist movement of said valve toward either open or closed position.

3. In combination with the intake manifold of an internal combustion engine, means defining an inlet to said manifold, a valve positioned in said inlet and arranged to be swung from an open to a closed position, means permitting a relatively small amount of air to pass said valve in its closed position, means supporting said valve along a line offset from the center of pressure thereof, biasing means attached to said last mentioned means and arranged to urge said valve toward its closed position, and a freely oscillatable mass carried by said valve and said biasing means.

4. In combination with an internal combustion engine having a carburetor arranged to admit an air and fuel mixture into said engine, an auxiliary valve positioned between said carburetor and said engine, said valve being biased to a closed position and eccentrically mounted so that increased suction in said engine tends to open said valve, biasing means associated with said valve and tending to move said valve toward closed position, and other biasing means movable with said valve and arranged to oppose the action of said first mentioned biasing means after said valve has moved through a fixed distance.

5. In combination with an internal combustion engine having an intake manifold and a carburetor having a throat, means supporting said carburetor on said engine and defining a passage between said throat and said manifold, an auxiliary valve positioned in said passage, a shaft supported by said means and supporting said valve within said passage and eccentrically of the center of pressure of said valve, balancing means attached to said shaft tending to bias said valve toward closed position, and other balancing means rotatable relative to said shaft and having a lost motion connection therewith for lifting rotation therebetween.

6. In combination with an intake manifold for an internal combustion engine, means defining an inlet to said manifold, an unbalanced valve positioned in said inlet, balancing means connected to said valve tending to swing said valve to closed position, said valve and balancing means forming a unit oscillatable about an axis, and dampening means pivotally supported on said unit and being eccentric with respect to its pivot.

7. In combination with an internal combustion engine having an intake manifold and a carburetor having a throat, means supporting said carburetor on said engine and defining a passage between said throat and said manifold, an

auxiliary valve positioned in said passage, a shaft supported by said means and supporting said valve within said passage along a line offset from the center of pressure of said valve, balancing means attached to said shaft tending to bias said valve towards closed position, and a dampening weight freely oscillatable relative to said balancing means and arranged for the transfer of energy therebetween.

8. In combination with an intake manifold for an internal combustion engine, means defining an inlet to said manifold, a carburetor arranged to admit a mixture of air and fuel to said inlet, a throttle valve for controlling said carburetor, an auxiliary valve positioned in said inlet between said throttle valve and said manifold, said auxiliary valve being unbalanced so as to be swingable to open position under the influence of the pressure differential existing between said carburetor and said manifold, a balance weight associated with said valve and opposing the action of said pressure differential on said valve, and a dampener weight associated with said balance weight and valve and arranged to oscillate therewith but at a different frequency.

9. In combination with an intake manifold for an internal combustion engine, a carburetor having a plurality of passages communicating with said manifold, operator controlled valves in said passages, and an unbalanced valve movable in one of said passages between said throttle valve and said manifold, said unbalanced valve being biased toward closed position.

10. In combination with an intake manifold for an internal combustion engine, a carburetor having a plurality of passages communicating with said manifold, operator controlled valves in said passages, an auxiliary valve in one of said passages, said auxiliary valve having an unbalanced area tending to swing toward open position under the influence of a pressure differential thus imposed between said manifold and said carburetor, and means biasing said auxiliary valve toward closed position.

11. In combination with the intake manifold of an internal combustion engine, a carburetor defining a plurality of intake passages communicating with said manifold, operator controlled valves in said passages, one of said passages being controlled solely by its operator controlled valve, and an auxiliary valve having an area unbalanced about its support positioned in the other of said passages.

12. In combination with the intake manifold of an internal combustion engine, a dual carburetor for said engine defining a pair of throats communicating with said manifold, positively controlled throttle valves in each of said throats, a floating valve positioned in one of said throats and arranged to be unbalanced toward open position by the pressure differential between said manifold and the atmosphere about said carburetor, a balance weight associated with said floating valve and arranged to bias said floating valve toward closed position, and a dampening weight associated with said balance weight and arranged to oscillate independently therefrom.

13. In combination with the intake manifold of an internal combustion engine, a dual carburetor for said engine defining a pair of throats communicating with said manifold, positively controlled throttle valves in each of said throats, a floating valve positioned in one of said throats and arranged to be unbalanced toward its open position by the pressure differential between said manifold and the atmosphere about said carburetor, a balance weight associated with said floating valve and arranged to bias said floating valve to closed position, a dampening weight associated with said balance weight and arranged to oscillate relative thereto, and means for transmitting energy between said dampening weight and said balance weight, the passages of said carburetor merging into a single passage before entering said manifold.

14. In combination with the intake manifold of an internal combustion engine, a dual carburetor defining a pair of throats controlled by throttle valves, a supporting member for said carburetor defining a pair of passages communicating with said throats, said passages merging into a single passage communicating with said manifold, an auxiliary valve positioned in one of said pair of passages, a shaft journaled in said supporting member said valve being supported by said shaft at a point offset from the center of pressure of said valve, a balance weight secured to said shaft, said weight being eccentrically mounted on the opposite side of said shaft from said center of pressure of said auxiliary valve, a dampener weight pivotally supported by said shaft and eccentric with respect thereto, and a lost motion connection between the eccentric portions of said balance weight and dampener weight.

15. In combination with the intake manifold of an internal combustion engine, a dual carburetor defining a pair of throats, throttle valves controlling the passage of air through said throats, a supporting member for said carburetor defining a pair of passages communicating with said throats, said passages merging into a single inlet communicating with said manifold, an auxiliary valve positioned in one of said passages, a shaft journaled in the walls of said first passage, said valve being supported by said shaft at a point offset from the center of pressure of said valve, a balance weight secured to said shaft, said weight being eccentrically mounted on the opposite side of said shaft from the center of pressure of said auxiliary valve, and a stop associated with said valve whereby said valve is prevented from swinging past its full open position.

16. In combination with the intake manifold of an internal combustion engine, a carburetor having an operator controlled throttle valve, a support for said carburetor defining an inlet to said manifold, an auxiliary valve positioned in said inlet and forming a partial closure therefor, a shaft journaled in the walls of said inlet and supporting said auxiliary valve along a line offset from the center of pressure of said valve, stop means associated with said valve to prevent its swinging past a wide open position, a balance weight secured to said shaft and having its center of mass positioned on the opposite side of said shaft from the center of pressure of said valve, a dampener weight pivotally supported about said shaft and having its center of mass positioned on the opposite side of said shaft from the center of pressure of said valve, and means limiting the angle through which said dampener weight may rotate relative to said shaft.

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FLOYD F. KISHLINE.

CERTIFICATE OF CORRECTION.

Patent No. 2,299,919. October 27, 1942.

MEADE F. MOORE, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 60, claim 5, for "lifting" read --limiting--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 12th day of January, A. D. 1943.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)