

Jan. 1, 1946.

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2,391,933

DUAL CARBURETOR THROTTLE CONTROL

Filed Jan. 14, 1944

4 Sheets-Sheet 1

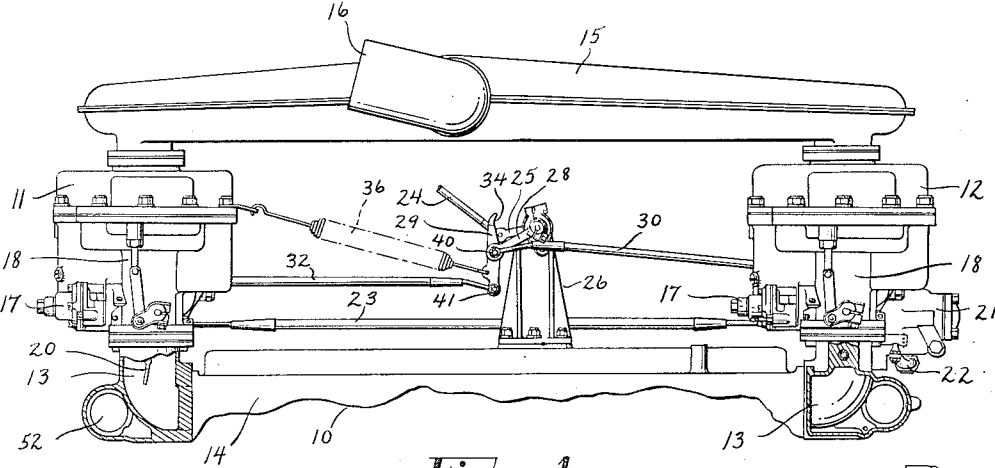


Fig. 1

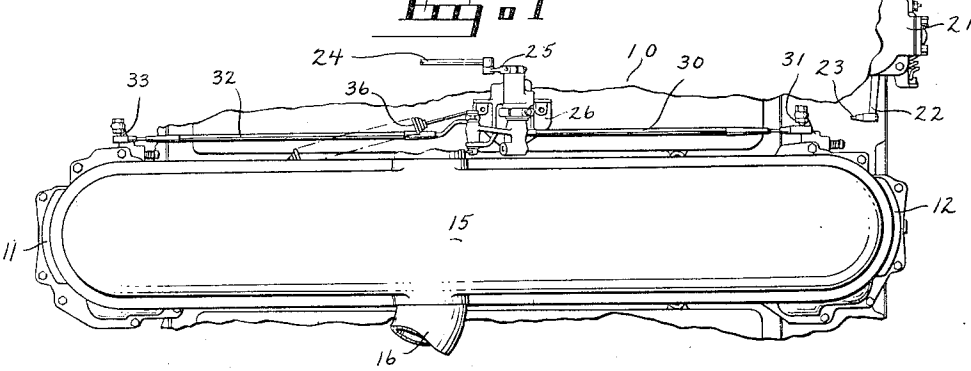


Fig. 2

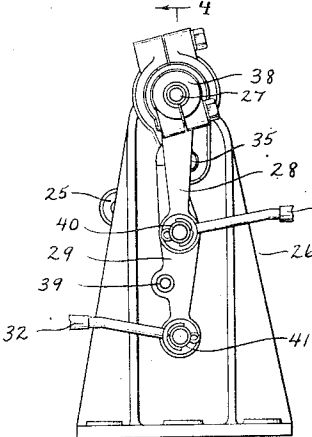


Fig. 3

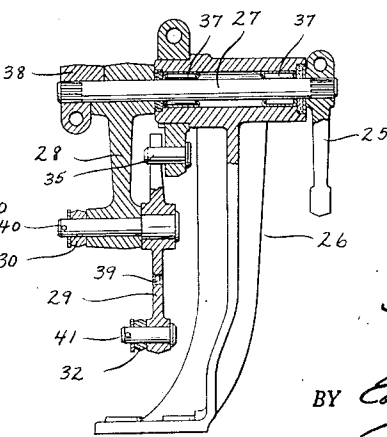


Fig. 4

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4 Sheets-Sheet 2

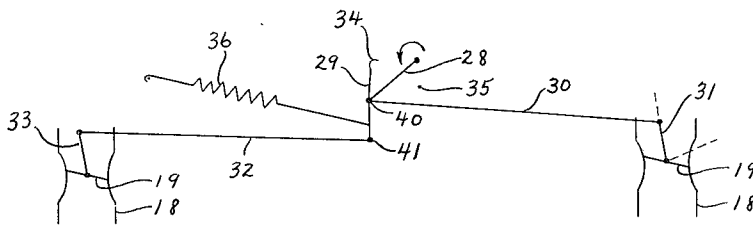


Fig. 5

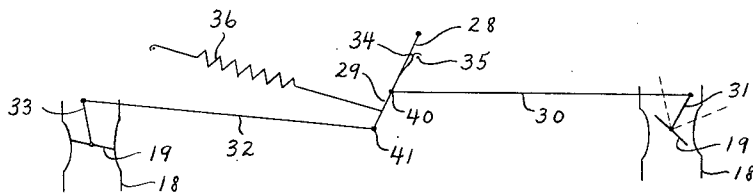


Fig. 6

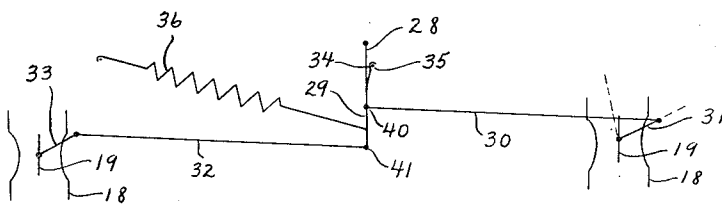


Fig. 7

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4 Sheets-Sheet 3

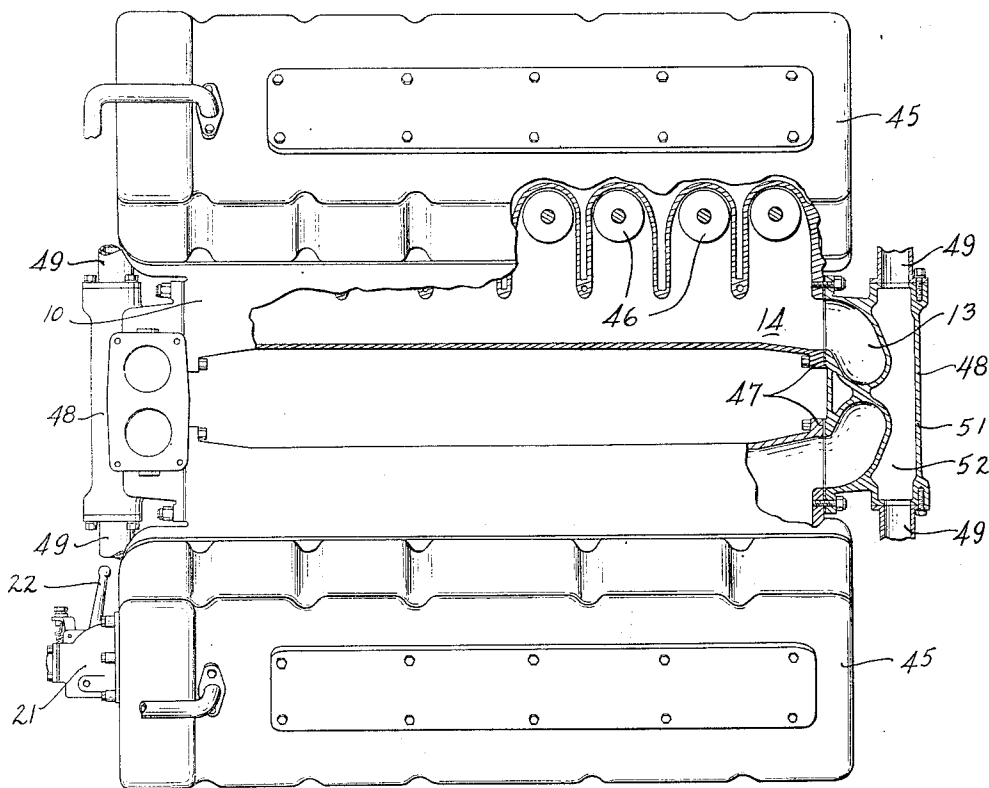


Fig. 8

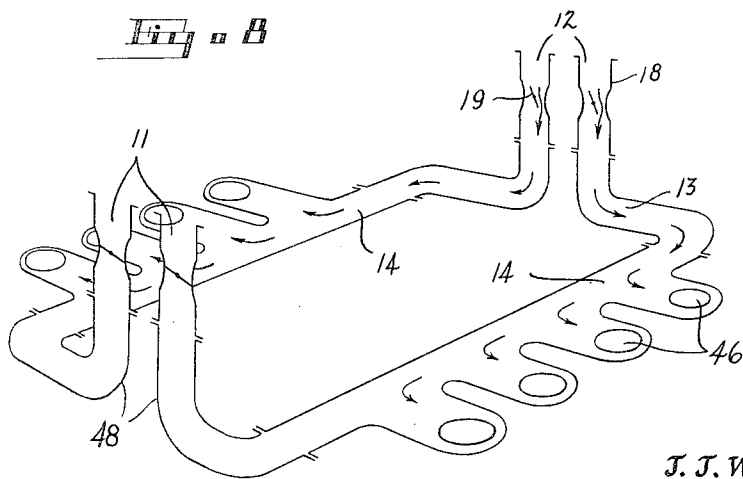


Fig. 9

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4 Sheets-Sheet 4

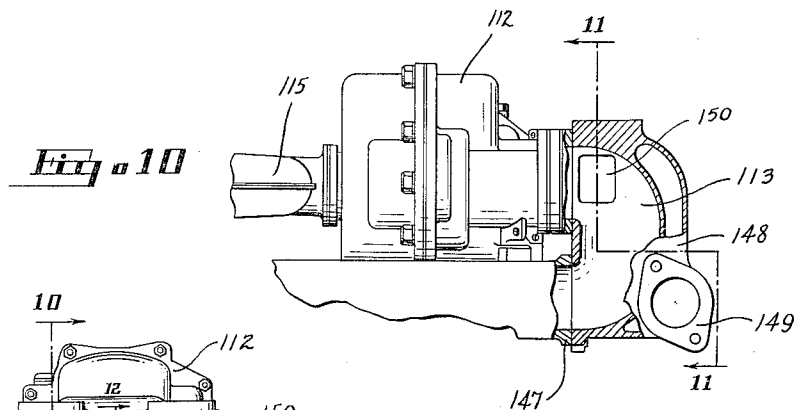
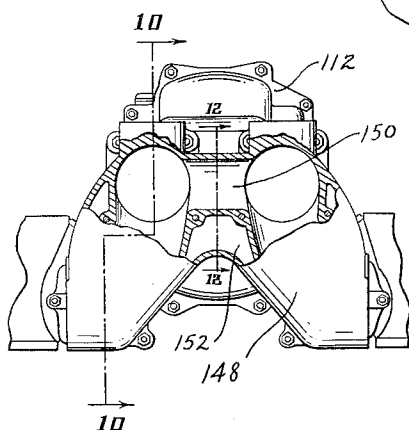
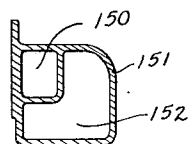


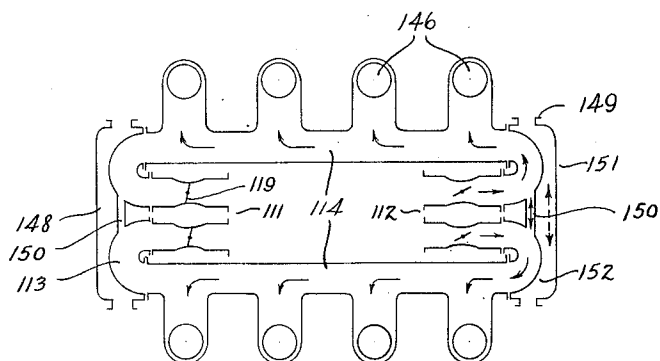
Fig. 10



Page 11



Ex. 12



11 - 13

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UNITED STATES PATENT OFFICE

2,391,933

DUAL CARBURETOR THROTTLE CONTROL

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10 Claims. (Cl. 123—127)

This invention relates to internal-combustion engines and, more particularly, to a throttle control particularly adapted to be used with engines employing a plurality of carburetors.

The present invention comprises a centralized control for two or more carburetors by means of which differential throttling of each carburetor is individually and automatically controlled through the operation of a single throttle control. This construction has particular application in engines of higher horsepower which require a number of individual carburetors and in which an interlocked control must be provided between all of the carburetors to obtain uniformity of operation. As an example, it has been found during starting that even in engines having a large volumetric capacity, the velocity of the air passing through the carburetors with the throttle open is insufficient to vaporize the fuel. It is therefore desirable to concentrate the air flow through one of the carburetors, in which case a much greater velocity can be obtained and the necessary vaporization effected.

It is therefore an advantage of the present construction that it permits the integrated operation of a number of carburetors serving the same engine and imposes on each of the carburetors different conditions of operation best suited to the particular carburetion required. Not only are the multiple carburetors controlled by the operator through a single control means, but the individual operation on the carburetors is varied according to a predesigned routine to obtain maximum efficiency. Thus, at low speed to maintain the proper air velocity through the carburetor but one throttle is opened, the other remaining closed. The flow of air is thus limited to the one carburetor open and a maximum velocity giving effective vaporization results. As the engine speed increases and the throttle, as is customary, is opened further, the second carburetor is also opened since at this time the volume of air passing through the engine is sufficiently high to insure proper velocity to both carburetors. As the engine approaches top speed it is desirable to have both the throttles entirely open, so the rate of change of the throttle position in the second carburetor is increased. The throttles in both carburetors attain fully open positions at substantially the same time. This is most desirable for the reasons stated; and, in the present instance, is achieved by mechanism which is simple, compact and extremely dependable.

The present construction, as shown, is adapted

particularly to an eight-cylinder V-type engine in which one carburetor is disposed at either end thereof between the banks, and the controlling links extend between them. However, it is equally applicable to other cylinder arrangements and, indeed, in any installation in which an integrated control of a number of carburetors is desired.

A further advantage resides in the novel form of carburetor mounting which permits interchangeable use of horizontal or vertical carburetors—a feature of importance in military practice where overall height of an engine, as reflected in the silhouette of the vehicle using it, must be considered.

With these and other objects in view, the invention consists in the arrangement, construction and combination of the various parts of the improved device, described in the specification, claimed in the claims and illustrated in the accompanying drawings, in which:

Figure 1 is an elevation of a portion of an engine showing the carburetor and control arrangement.

Figure 2 is a partial plan view corresponding to Figure 1.

Figure 3 is an elevation on an enlarged scale of the central linkage control shown in open position.

Figure 4 is a sectional view taken substantially on the line 4—4 of Figure 3.

Figures 5, 6, and 7 are schematic diagrams showing successive stages in the operation of the linkage control.

Figure 8 is a complete plan view corresponding to that shown in Figure 2 with the carburetors, headers and control linkage removed.

Figure 9 is a schematic perspective showing gas distribution in an independent form of manifold-folding.

Figure 10 is a partially sectioned elevation, taken on the line 10—10 of Figure 11, of an alternative method of carburetor mounting.

Figure 11 is an elevation partly sectioned on the line 11—11 of Figure 10, showing the alternative form of carburetor mounting.

Figure 12 is a sectional view taken on the line 12—12 of Figure 11.

Figure 13 is a schematic plan view showing the gas flow in an interconnected form of manifold-folding.

Referring to Figures 1 and 8, 10 indicates an engine block; 11 and 12 are carburetors at each end of the block communicating through the ducts 13 with the engine intake manifolds indi-

cated at 14, which in this case run interiorly of the banks 45 of the V-type engine. The engine intake manifolds 14 are formed integrally in the block casting and comprise two independent channels communicating with a pair of valves 46 at each cylinder and having a face plate 47 at each end to which may be attached the carburetor adapters 48 or 148. It is thus apparent that, so far as the block is concerned, the two manifolds are entirely distinct and separate. The exhaust manifolds, which are not shown in the views chosen, are of conventional design located on the outer side of the cylinder banks. They lead to the usual muffler but do have, as an additional feature, connections 49 leading from each exhaust manifold at the front and rear of the engine to the adapters 48 or 148. The carburetors 11 and 12 are supplied with air from the header 15 running longitudinally of the engine and which has passageways 16 leading to air cleaners of other source of air not here shown in detail. The carburetors 11 and 12 are the type usually used on high capacity engines having a pump 17 and main throttle valve of the butterfly type in the throat 18 (the butterfly valve 19 not being shown in Figures 1 or 2 but indicated schematically in Figures 5, 6 and 7). The ducts 13 leading from the carburetor are also equipped with a governor controlled butterfly valve 20 operated from a governor 21 driven from one of the engine camshafts and effective through the arm 22 and the conventional rocker arm construction not shown in detail. A link 23 extends from the governor controlled butterfly 20 of the carburetor 11 to the similar butterfly valve in the carburetor 12, so that both of the governor controlled butterfly valves occupy the same position at all times.

The main throttle butterfly valves 19 are operated in any conventional manner from adjacent the operator's position in the vehicle through the motion of an appropriate pedal or lever which is transferred through the usual linkage (not shown) to a rod 24 reciprocable in response to the operator's control and pivoted to a crank 25 splined on the shaft 27 journaled in the central control 26 in needle bearings 37. As best seen in Figure 4, a second crank 28 is carried on the shaft 27 at the opposite end thereof, its rotation being controlled by the adjustable abutment 38 splined to the shaft. A lever 29 and the link 30 leading to the crank 31 controlling the main butterfly valve 19 on the carburetor 12, are pivotally mounted at the end of second crank 28. The link 32 leading to the crank 33 controlling the main butterfly valve 19 of the carburetor 11 is pivoted to the lower end of the lever 29. The upper end of the lever 29 has a slight hook 34 and in certain positions of engagement rests against the fixed pin 35 carried on the central control 26. A spring 36 extending from the eye 39 on the lever 29 normally urges the lever 29 and its associated cranks and links to a position in which the main butterfly valves 19 in both carburetors are closed.

In operation, the driver either by a pedal or lever control imparts reciprocation to the reciprocable rod 24 when the throttle is to be opened. This motion is transmitted to the crank 25 and the shaft 27, and impels rotation of the second crank 28 in a counterclockwise direction. This motion is directly transmitted to the link 30 since it is pivoted to the end of the second crank 28 and also occasions combined rotation and revolution of the lever 29 about the crank pivot 40 at the end of second crank 28 and about the shaft 27, respectively. The urging of the spring 36 on

the lever 29 coupled with the rotation of crank 28 imparts this motion. The effect of this is that the link pivot 41 remains substantially stationary and only the link 30 is actuated to open the main butterfly valve 19 in the carburetor 12 during the initial rotation of the crank 28. This is indicated as occurring between Figures 5 and 6. However, as rotation of the cranks 25 and 28 continues, and the rotation and revolution of the lever 29 follows in response to it, the hook 34, as the upper end of the lever 29, comes to rest against the fixed pin 35 on the central control 26. This stage is illustrated in Figure 6. Continued rotation of the cranks 25 and 28 no longer effects any movement of the lever 29 other than rotation about the pin 35 as a center. This is indicated as occurring between Figures 6 and 7. Therefore, as the rotation of the cranks 25 and 28 continues, the rotation of the lever about the fixed pin 35 imparts longitudinal movement to the link 32 leading to the crank 33 of the carburetor 11 and opens the main butterfly valve 19 in that carburetor. However, it will be noted that due to the differential attachment of the links 30 and 32 on the lever 29, the rate of opening of the main butterfly valve 19 in the carburetor 11 is twice that at which the throttle valve 19 and the carburetor 12 were opened.

Following this linkage, it will be noted that it is effective, starting with both of the throttle valves closed, to initially open the throttle valve in carburetor 12 at a certain rate while keeping the throttle in carburetor 11 closed. Thereafter, when the control has been operated through about half its range, the throttle valve in the carburetor 11 begins to open but at a rate of approximately twice that imparted to the valve in carburetor 12. Continued operation of the control completes the opening of both the throttle valves at substantially the same time, as shown in Figure 7. When the throttle control is released the operation described is reversed.

This linkage arrangement is particularly adapted to the present intake manifold arrangement and permits different intake arrangements which are facilitated by the carburetor adapters 48 and 148, referred to above. Two such arrangements are shown in Figures 9 and 13. In Figure 9, two completely independent intake systems are provided—one for each bank. The carburetors used are of dual construction so that each manifold, in effect, has a separate carburetor at each end and there is no intercommunication between the two. However, the linkage provided is effective on both manifolds to the same extent, so that both are controlled simultaneously and equally, and the performance of each bank is identical. This equality is always difficult to achieve with a conventional carburetor installation, due to the unequal demands imposed on the manifold supply by successive intake cycles. When, on the other hand, the balance between carburetors is changed successively, starving of certain cylinders is unavoidable in the usual arrangement. But in the present instance, by providing substantially separate manifolding in combination with simultaneous control, this difficulty is avoided. The word "substantially" is used advisedly since Figure 13 shows a modification in which a conduit 150 is provided between the individual manifolds 114 at each end. These conduits 150 are open at all times at both ends of the engine—note that the position of the valve 119 on the carburetor 111 does not affect flow through the conduit 150 at that end. However, the orifice

area of the conduit 150 is substantially less than that of the duct 113 and the conduit opens in a plane longitudinally aligned with the direction of air flow, so that the charge leaving the carburetor is directed primarily into the respective manifold. The prime functions of the conduit are to permit some equalization between the manifolds, particularly at the ends thereof adjacent carburetor 111 when the valves 119 are closed, and to assist in the preheating of the charge.

It will be noted that the adapters 48 or 148 have a jacket 51 or 151 defining a chamber 52 or 152 which is connected at opposite ends by 49 or 149 with the exhaust manifolds. This arrangement utilizes the relative surge effects in the two exhaust manifolds to preheat the charge passing through the ducts 13 or 113. This provides a self-regulating source of heat since at higher speeds when the temperature of the exhaust gases might be unduly high for preheating, the volume of gas passing through the chamber 52 or 152 is lowered by diminution in the surge effect. However, at very low speeds the available heat might be inadequate for this purpose unless provision is made for maximum utilization. This is encouraged by the conduit 150 which holds a portion of the charge at somewhat lower velocity than obtains in the ducts 113 adjacent a large volume of exhaust gas (the relative quantities being apparent from Figure 12) achieving a superheating effect. It will be apparent that this will be most effective at low speeds of operation, and particularly at the end of the motor adjacent carburetor 111 at which there is no direct flow of the charge through the ducts 113, as the valves 119 are restricted.

Another consideration of some importance is the flexibility in motor arrangement permitted. The overall height of the engine is frequently a limiting factor in obtaining the low vehicle silhouette often required in ordnance equipment. The present disclosure shows an alternative method of mounting carburetors on a standard engine block through the medium of interchangeable adapters. Figure 1 shows the normal mounting in which the carburetors 11 and 12 are disposed vertically and attached to a 90° adapter 48 secured to the face plate 47. Figure 10 indicates a low silhouette mounting in which the carburetor 112 is disposed horizontally between the banks and attached to a 180° adapter 148 secured to the face plate 147. In other respects, the interconnecting linkage (not shown) is identical with that of Figures 1-7, and air is supplied through the header 115. The compactness of this arrangement will be evident from Figure 11 and the fact that the adapters are interchangeable widens the field of use of the engine without requiring basic structural changes.

Under usual conditions, the header 15 or 115 should be of substantial capacity, and experience indicates that the device works best when a common header supplying both carburetors is used rather than with independent air cleaners and sources for each. Attention is also directed to the compactness of the device and the manner in which alternative arrangements may be installed on a V-type engine without interfering with any of the numerous accessories which are always required in high-powered engines of this type. A further consideration is that a minimum of parts are required in the device and they may be constructed ruggedly so as to insure dependable op-

eration under all conditions. At the same time, a precise differential control of both carburetors is obtained.

Some changes may be made in the arrangement, construction and combination of the various parts of the improved construction without departing from the spirit of the invention, and it is the intention to cover by the claims such changes as may be reasonably included within the scope thereof.

The invention claimed is:

1. In an internal-combustion engine, a pair of carburetors, a throttle valve in each said carburetor, a throttle control, crank means operated by said throttle control, a first link attached to said crank means and to the throttle valve in one said carburetor to operate said throttle valve on operation of said throttle control, a lever attached at a point intermediate its ends to said crank means, a second link attached to one end of said lever, the other end of said second link attached to the throttle valve in the other said carburetor, spring means rendering said second link inoperative during the initial period of rotation of said crank, and means engaging the other end of said lever and effective during the remaining portion of rotation of said crank to impart motion to said second link so arranged that both said throttle valves are completely opened at substantially the same time.

2. In an internal-combustion engine, a pair of carburetors, a common header supplying air to said carburetors, a throttle valve in each said carburetor, a throttle control, crank means operable through said throttle control, a first link pivoted to said crank means and effective on rotation thereof to open the throttle valve in one of said carburetors, a lever attached at a point intermediate its ends to said crank means, a second link attached to one end of said lever and to the throttle valve in said other carburetor, resilient means urging said lever to rotate substantially about the point of attachment of said lever and said second link during initial period of rotation of said crank, and a fixed means engaging the other end of said lever on continued rotation of said crank, said lever thereafter pivoting about said engaging means and operating said second link to open the throttle valve in said other carburetor.

3. The structure of claim 2 which is further characterized in that the respective points of attachment of said crank and said second link on said lever and the point of engagement with said fixed means are so arranged that both said throttle valves attain the fully open position substantially simultaneously.

4. In an internal-combustion engine of the V-type, an intake manifold arranged adjacent each bank of said V and in communication with the cylinders therein, a carburetor means at each end of each manifold supplying a charge to a duct leading thereto, a valve in each carburetor means regulating the charge delivered therefrom to said manifolds, and interlocking control means for said valves effective to open the valve at one end of each manifold while initially holding the valve at the other end of each manifold closed.

5. In an internal-combustion engine of the V-type, an independent intake manifold arranged adjacent each bank of said V and in communication with the cylinders therein, a carburetor means at each end of each manifold supplying a charge thereto, a valve in each carburetor

means regulating the charge delivered therefrom to said manifolds, and interlocking control means for said valves effective to open the valve at one end of each manifold while initially holding the valve at the other end of each manifold closed and thereafter opening said valves at the other end at an accelerated rate as compared to said valves at the one end so that all valves are opened completely at substantially the same time.

6. The structure of claim 5, which is further characterized in that conduits are provided between said manifolds at adjacent ends thereof, said conduits being located between said cylinders and said valves in said carbureting means, the cross-sectional area of said conduit being substantially less than the cross-sectionaal area of said duct.

7. In an internal-combustion engine of the V-type, an intake manifold arranged adjacent each bank of said V, an adapter at each end of said engine having a pair of ducts communicating with the ends of said manifolds, carburetor means mounted on each adapter and including an independent carbureting chamber in communication with each said duct, a valve regulating the charge delivered from each said chamber to its respective duct and thence to said manifolds, and an interlocking control means for said

valves effective to open the valves regulating the charge delivered to the ducts in one said adapter while initially holding closed the valves regulating the charge delivered to the ducts in the other said adapter.

8. The structure of claim 7 which is further characterized in that a conduit is formed in said adapter intermediate and connecting the ducts therein, said conduit being substantially smaller in cross-sectional area than said ducts.

9. The structure of claim 7 which is further characterized in that a conduit is formed in said adapter intermediate and connecting the ducts therein, a jacket is formed around said conduit, and connections at opposite ends of said jacket lead to the exhaust manifolds on the respective banks of said engine.

10. The structure of claim 7 which is further characterized in that said adapter extends through an arc of 180°, said carburetor means mounted thereon extending horizontally therefrom inwardly of the engine, said carburetor means at each end of said engine aligned with a header extending therebetween, said carburetor means and said header being located between the banks of said engine.

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