

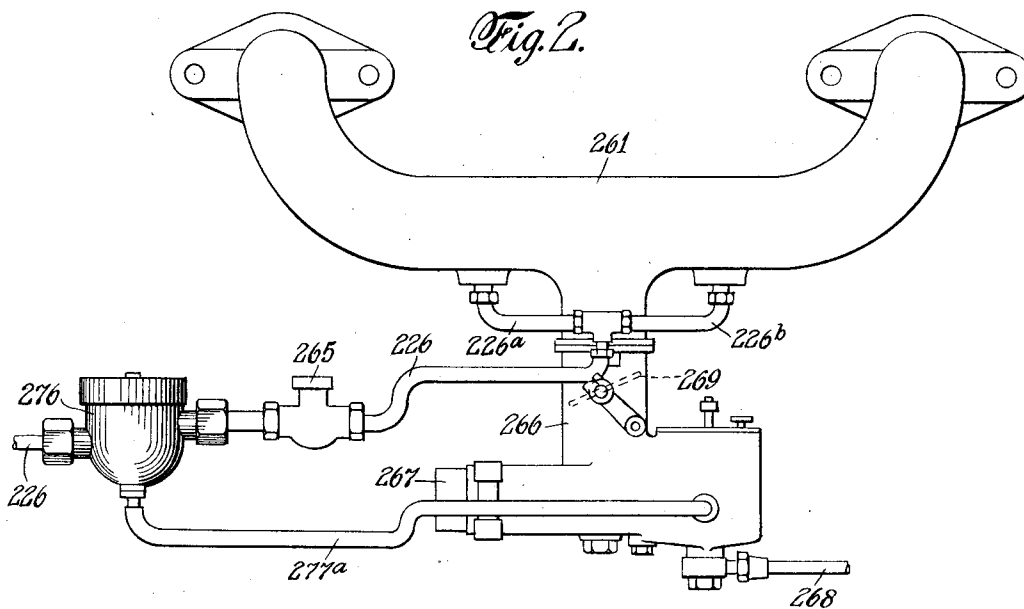
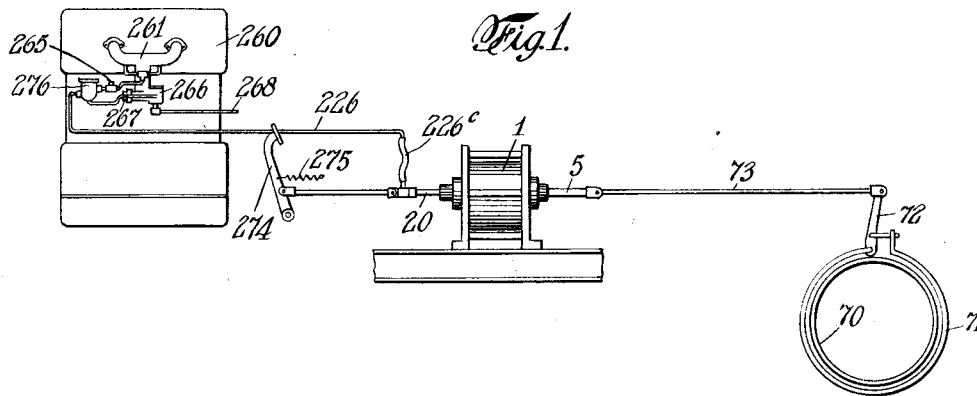
Nov. 12, 1929.

C. S. BRAGG ET AL

1,735,633

APPARATUS FOR OPERATING SUCTION ACTUATED DEVICES IN CONNECTION
WITH THE SUCTION PASSAGE OF AN INTERNAL COMBUSTION ENGINE

Original Filed Feb. 26, 1925 2 Sheets-Sheet 1



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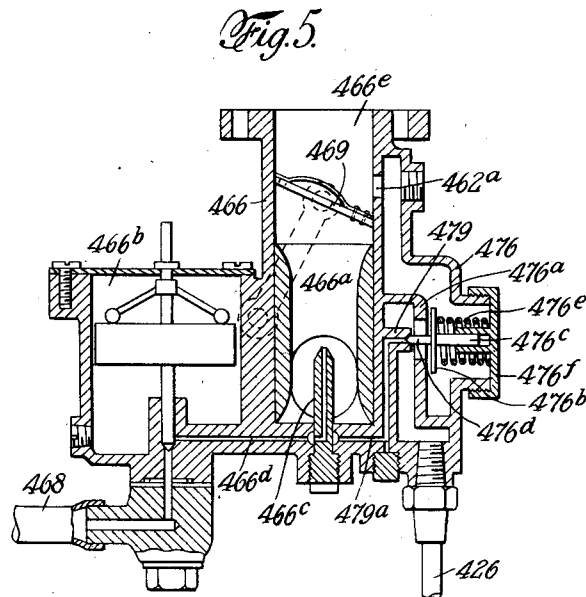
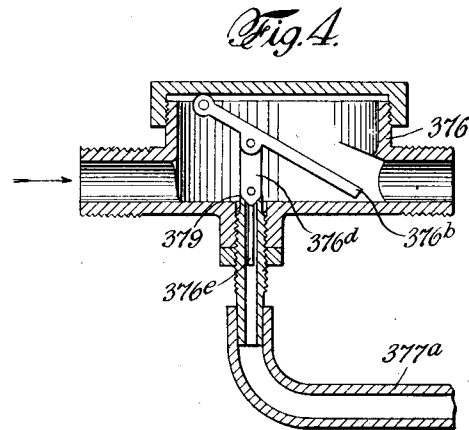
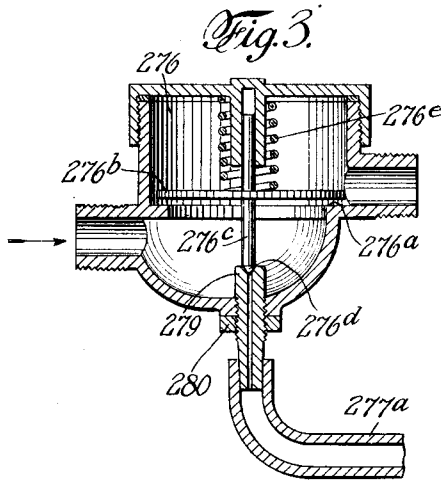
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APPARATUS FOR OPERATING SUCTION-ACTUATED DEVICES IN CONNECTION WITH THE SUCTION PASSAGE OF AN INTERNAL-COMBUSTION ENGINE

Original application filed February 26, 1925, Serial No. 11,683. Divided and this application filed June 11, 1926, Serial No. 115,164. Renewed June 20, 1929.

Our invention consists in the novel features hereinafter described, reference being had to the accompanying drawings which illustrate several embodiments of the same, selected by us for purposes of illustration and the said invention is fully disclosed in the following description and claims.

This application is a division of our former application filed in the United States Patent Office, February 26, 1925, and given Serial No. 11,683.

In the operation of vacuum brakes for automotive vehicles, it is extremely convenient to obtain the necessary suction, or partial vacuum from a suction passage of the internal combustion engine, ordinarily employed for the propulsion of the vehicle, and located between the throttle valve for controlling the supply of mixture, and the cylinder. To this end, it is convenient and desirable to connect the vacuum brake mechanism with the intake manifold of the engine. It will be understood, further, that all the air exhausted from the brake actuating mechanism and delivered into the intake manifold of the engine necessarily has a tendency to either prevent the drawing in of the proper quantity of liquid fuel from the atomizer by reduction of the partial vacuum in the suction passage, or to dilute the explosive mixture passing through the suction passage, and such dilution may in some instances bring about a mixture which will not readily ignite in the engine. In either case, the engine, if turning over idly, would be likely to stall and the admission of air into the manifold in this manner, may also materially delay the starting of the engine. For the proper operation of the vacuum brake mechanism of the vehicle, it is desirable that the air exhausted into the manifold shall be withdrawn from the brake actuating mechanism as rapidly as possible, in order to insure quick operation of the brake mechanism, and if the connection between the brake actuating mechanism and the intake manifold is restricted, for the purpose of avoiding the stalling of the engine, and delay in starting, the result will materially retard the operation of the brake mechanism.

According to our present invention, we provide the suction pipe or passage leading from the suction actuated device to the suction passage of the engine and connected thereto between the throttle valve and the engine cylinders, with a fuelizing or carbureting means located between the valve mechanism of the actuator and the suction passage, and entirely separate in its operation from the main or engine carburetor, which furnishes explosive charges to the cylinders under normal operation at all speeds and under the control of the throttle valve. This separate fuelizing or carbureting means is automatically responsive only to conditions arising in the suction pipe or passage, due to the operative or inoperative conditions of the suction actuated device, and is in no sense a part of or adjunct of the main or engine carburetor, although it may in some instances be supplied with liquid fuel therefrom, or from the same source of supply, and although it may in some instances be structurally combined with the main or engine carburetor, and we further provide automatic means operated by the passage of air through the suction pipe from the suction actuated device to the suction passage of the engine, and preferably an air inlet valve controlling a fuel valve for preventing fuel from being discharged into the suction pipe or passage, except when air is actually passing therethrough, the said air valve being normally held in a partly open position to permit small quantities of air insufficient to materially affect the operation of the engine to pass through without operating the air valve or opening the fuel valve and preventing the air valve and fuel valve from being opened by the pulsations of air from the suction actuated device in quantities sufficiently large to materially affect the operation of the engine or stall it if idling, if admitted in an unfueled condition to the suction passage, will operate the air valve to further open it and open the fuel valve to affect the fuelization of such a larger quantity of air and prevent interference with the operation of the engine by the operation of the suction actuated device.

Referring to the accompanying drawings, 100

in which we have shown several embodiments of our invention, selected by us for purposes of illustration,

Fig. 1 is a diagrammatic view showing an installation in an automotive vehicle, comprising an internal combustion engine, brake mechanism for the vehicle, and a vacuum actuated power actuator for the brake mechanism, and having our present invention embodied therein.

Fig. 2 is an enlarged view of certain parts illustrated in Fig. 1, showing the intake manifold, the main carburetor connected therewith, and the separate carburetor in the suction line from the intake manifold to the power actuator.

Fig. 3 is an enlarged sectional view of the separate carburetor shown in Fig. 2.

Fig. 4 is a view similar to Fig. 3, showing a slight modification of the separate carburetor.

Fig. 5 represents another slight modification of our invention, in which the means for supplying liquid fuel to the air withdrawn from the brake actuating mechanism is formed as a part of the main carburetor, and supplied with liquid fuel from the fluid chamber thereof.

In Fig. 1, we have illustrated our invention applied in connection with an automotive vehicle propelled by an internal combustion engine, and having a vacuum or suction operated device for operating the brake mechanism of the vehicle. In this figure, 1, represents a power actuator of the kind illustrated in our former application for Letters Patent of the United States filed January 5, 1925, and given Serial No. 506, and in our former application for Letters Patent of the United States, filed February 26, 1925, and given Serial No. 11,683, of which this application is a division. The cylinder is provided with a piston (in this instance a double acting piston) provided with a piston rod, 5, connected by a link, 73, to a brake lever, 72, for operating an ordinary brake mechanism, diagrammatically indicated in Fig. 1, and comprising in this instance a brake band, 71, and brake drum, 70, so that the movement of the piston in one direction applies the brake, and in the opposite direction, releases the brake. It will also be understood that the actuator is provided with reversing valve mechanism, which may be conveniently located in the hub of the piston, and operated by longitudinally movable valve actuating rod, 20, extending therethrough and projecting from the opposite end of the cylinder, from the piston rod, through a suitable stuffing box, said valve mechanism being so constructed as to place one end of the cylinder in communication with a suction line 226 to the intake manifold of the engine, and the other end of the cylinder in communication with the atmosphere, and vice versa, accord-

ing as the valve actuating sleeve is moved in one direction or the other. The details of the actuator and its valve mechanism form no part of our present invention, and therefore will not be particularly illustrated, described or claimed herein.

The valve actuating sleeve, 20, is operatively connected with a foot lever, or other operator operated device, indicated at 274, and provided with the retracting spring, 275. 260 represents the internal combustion engine for operating the vehicle. 266 represents the engine carburetor therefor, having the main air intake, 267, and gasoline supply pipe, 268. 269 represents the usual throttle valve of the engine.

In Fig. 2 we have illustrated an enlarged view of the intake manifold, 261, and adjacent parts, and have shown one embodiment of our invention whereby the air withdrawn from the actuator in effecting the operations thereof, is mixed with liquid fuel to form an explosive mixture before it enters the intake manifold, for the purpose of preventing the dilution of the explosive charge and interference with the operation of the engine, as before set forth. As shown in Figs. 1 and 2, 226 indicates the suction pipe, which is connected at one end with the actuator, being in this instance connected with the hollow valve actuating sleeve, 20, by a flexible portion, 226^c, the other end of the pipe, 226, being connected with the intake manifold of the engine between the usual throttle valve, 269, and the cylinders of the engine. In this suction pipe, 226, is located a separate carburetor, indicated at 276, provided with a fuel injecting nozzle, 279, connected with a supply of liquid fuel. In this instance it is shown connected by a pipe, 277^a, with a float chamber of the engine carburetor, but it may obviously have a separate fuel supply, if desired. The suction pipe, 226, is in this instance provided with branch pipes, 226^a and 226^b, communicating with the intake manifold, 261, on opposite sides of the central, vertical pipe, leading from the main carburetor, although this is not essential, and the suction pipe, 226, is provided with a check valve, 265, which is preferably located between the separate carburetor, 276, and the intake manifold. The chamber of the separate carburetor is provided with a valve seat 276^a through the opening in which the air withdrawn from the suction actuated device must pass, on its way to the manifold, and above this seat is located a disc valve, 276^b, provided with a guiding stem, 276^c, mounted in a suitable guide, in this instance secured to the top of the separate carburetor and carrying a needle valve, 276^d, normally held in engagement with a valve seat in the nozzle, 279, by a spring, 276^e, and also by the weight of the valve or disc, 276^b, when the parts are mounted in horizontal position, as indicated in Figs. 1, 2 and 3. We prefer to have the nozzle, 279,

adjustable longitudinally of its axis in the carbureting device, and it is shown as threaded and screwed into a threaded aperture in the bottom of the separate carbureting device, and held in adjusted position by a set nut, 280. This nozzle is preferably adjusted to such a position that when the needle valve, 276^a, is in closed position, the air valve, or disc, 276^b, will be held slightly off of its seat, as indicated in Fig. 3, and in fact is never permitted to directly engage its seat. The position of the jet or nozzle, 279, is so adjusted as to permit the amount of air to pass through, which can be assimilated in the intake manifold without stalling the motor while idling, without admitting liquid fuel from the nozzle, 279. If more than this amount of air is passed into the manifold, the disc or valve, 276^b, will be raised, with the needle valve, opening the jet and permitting the air to pick up sufficient fuel from the nozzle to form an explosive mixture. The space, which is always maintained between the metal disc or air valve, 276^b, and its seat, also permits of a certain amount of pulsation of the air in either direction, without opening the jet valve, 276^a. Experiments have shown that such pulsations take place in the intake manifold and in the pipe, 226, and are specially noticeable in a four cylinder motor when fully throttled, and without this provision for holding the disc or valve at all times slightly off of its seat, a vibration of the valve and the consequent opening and closing of the needle valve would result.

In Fig. 4 we have illustrated another slightly modified form of the separate carbureting device similar to that shown in Fig. 3, and comprising a chamber, or casing, 376, provided with a pivoted valve, 376^b, having pivoted thereto a gasoline valve, 376^a, engaging a seat in the upper end of an adjustable nozzle, 379, connected by a pipe, 377^a, with the float chamber of the engine carburetor, or other liquid fuel supply. The gasoline valve, 376^a, is provided with a pivoted depending stem, 376^c, for insuring the seating of said gasoline valve. This device operates in exactly the same manner as the device illustrated in Figs. 1, 2, and 3. The nozzle, 379, is so adjusted as to hold the pivoted air valve, 376^b, in such position that it does not completely prevent the passage of air through the chamber, 376, thus permitting the passage of a small quantity of air therethrough, insufficient to stall the engine, while idling, without opening the gasoline valve. When larger amounts of air are passed through the casing, 376, the valve, 376^b, will be opened, thereby opening the gasoline valve, 376^a, and permitting the air to take up sufficient amount of fuel to form an explosive mixture. It will be understood that this device illustrated in Fig. 4, will be used in conjunction with an ordinary check valve similar to that illustrated in Figs. 1 and 2.

In Fig. 5 we have illustrated another slight modification of our invention, in which the separate carbureting device is constructed as an integral part of the engine carburetor while operating independently thereof. In this figure the engine carburetor body is indicated at 466, provided with the usual Venturi tube, 466^a, float chamber, 466^b, gasoline feed pipe, 468, connected therewith, and having the usual atomizing nozzle, 466^c, connected by passage, 466^d, with the float chamber. At one side of the carburetor is a separate carbureting chamber, indicated at 476, having a partition therein, provided with an aperture, indicated at 476^a, the said chamber being provided with a separate nozzle, 479, connected by a passage 479^a, with the passage, 466^c, leading from the float chamber, the said nozzle being provided with a seat for a needle valve, 476^a, on a longitudinally movable stem, 476^c, working in a guide in a removable cap, 476^t, and carrying a disc or valve, 476^b, which is acted upon by a spring, 476^e, in a direction to close the needle valve. The valve, 476^b, is held slightly off of its seat in the partition in said chamber, so as not to completely close the aperture, 476^a, by the engagement of the needle valve with its seat. 426 represents the suction pipe from the actuator or other vacuum operated device, which is connected with the chamber, 476, on the side of the partition opposite that occupied by the disc or valve, 476^b, and the upper portion of the chamber, 476, is provided with an aperture, 462^a, communicating with the discharge passage, 446^c, of the engine carburetor, between the throttle valve, here indicated at 469, and the cylinder ports or valves, said passage communicating directly with the intake manifold of the engine. The operation of the device illustrated in Fig. 5 is exactly the same as that previously described with reference to Figs. 1, 2, 3 and 4, and need not be repeated.

It will be seen that in all the forms of our present invention, we employ in the connecting passage, or suction line, between the suction actuated device and the intake manifold of the internal combustion engine with which it is connected, a separate carburetor supplied with liquid fuel, in this instance from the float chamber of the main carburetor and provided with an injector nozzle normally closed by a needle valve operatively connected with an automatic air valve for controlling the needle valve, the said air valve being normally held partly open so that the passage of small quantities of air through the suction pipe, from the suction actuated device to the intake manifold of the engine, which would not materially disturb the proportions of the explosive mixture passing from the engine carburetor to the engine, will not cause the separate carburetor to function. When, however, any material quantity of air is withdrawn from

the suction actuated device by the suction in the manifold, which would have the effect, if admitted to the manifold, of materially altering the composition of the explosive mixture passing therethrough from the engine carburetor, and affect the operation of the engine or stall it if idling, or delay the starting of the engine, the automatic air valve will be opened, thereby at the same time opening the fuel control needle valve and permitting this larger quantity of air to take up liquid fuel from the nozzle of the automatic carburetor, carbureting the air so that it is admitted into the intake manifold as explosive mixture, and mixes with the explosive mixture passing therethrough from the engine carburetor with the result that the operation of the engine is not interfered with. This effectively prevents the slowing down of the engine, the stalling of the engine if idling, and delay in starting the engine, which might otherwise result from the operation of the suction actuated device. It will also be seen that in all the forms shown there is no danger of flooding the separate carburetor as the needle valve is normally held in closed position when the suction actuated device is not in operation or when such small quantities of air are being withdrawn therefrom as can be readily assimilated into the explosive mixture passing from the engine carburetor without affecting the normal operation of the engine.

We prefer to arrange the separate carburetor, as shown, so that the discharge orifice of its liquid injector nozzle will be slightly above the liquid level of the fuel supply. In the drawings, for example, Figs. 1, 2 and 5, in which the separate carburetor derives its supply from the float chamber of the engine carburetor, the separate carburetor is preferably located as shown, so that its discharge nozzle is above the level of the liquid in the float chamber of the engine carburetor. This prevents the flow of fuel through the nozzle at any time when the motor is not running, or in case the needle valve should be held open improperly at any time.

While we have shown our invention applied in connection with a suction actuated device for operating brake mechanism, it is to be understood that it is applicable to the operation of a suction actuated device in connection with the intake manifold of an internal combustion engine as the source of suction for operating other mechanisms.

What we claim and desire to secure by Letters Patent is:—

1. The combination with an internal combustion engine provided with a suction passage, an engine carburetor connected therewith, for normally supplying the explosive charges to the engine at all speeds, and a

throttle valve controlling said passage located between the carburetor and the engine cylinders, of a suction actuated device, a suction connection therefrom connected to said suction passage between the throttle valve and the engine cylinders and subjected at all times to the maximum rarification in the suction passage, means for introducing fuel into said suction connection between the valve mechanism of the suction actuated device and the suction passage of the engine, operating independently of the engine carburetor, and provided with a normally closed valve, and automatic regulating means operated by the passage of air through said suction connection from the suction actuated device and attached to said fuel valve for opening said valve when air is passing from the suction actuated device through said suction connection in sufficient quantities to materially effect the operation of the engine if not fuelized, and to maintain said valve in closed position at all other times when the engine is in operation.

2. The combination with an internal combustion engine provided with a suction passage, an engine carburetor connected therewith for normally supplying the explosive charges to the engine at all speeds, and a throttle valve controlling said passage and located between the carburetor and the engine cylinders, of a suction actuated device, a suction connection therefrom connected to said suction passage between the throttle valve and the engine cylinder and subjected at all times to the maximum rarification within the suction passage, means for introducing fuel into said suction connection operating independently of the engine carburetor, located between the valve mechanism of the suction actuated device and the suction passage of the engine, and comprising among its members a fuel nozzle, a needle valve therefor, and a movable air valve operatively connected with said needle valve and adapted to be opened by the passage of air from the suction actuated device and constructed to hold said needle valve normally closed when the engine is running and the suction actuated device is inoperative, to prevent the discharge of fuel from said nozzle, and to effect the opening of said needle valve when air is passing through said suction connection from the suction actuated device to the suction passage of the engine in sufficient quantities to materially interfere with the operation of the engine if not fuelized, to fuelize said air and prevent interference with the operation of the engine or stalling it if idling by the operation of the suction actuated device.

3. The combination with an internal combustion engine provided with a suction passage, an engine carburetor connected therewith for normally supplying the explosive charges to the engine at all speeds, and a throttle valve controlling said passage and

located between the carburetor and the suction passage, of a suction actuated device, a suction connection therefrom connected to said suction passage between the throttle valve and the engine cylinders and subjected at all times to the maximum rarification in the suction passage, means for introducing fuel into said suction connection operating independently of the carburetor between the valve mechanism of the suction actuated device and the suction passage of the engine, and comprising among its members a fuel nozzle, a needle valve therefor, an air inlet valve in said suction connection operatively connected with the fuel valve and holding it in closed position to normally prevent the discharge of fuel from said nozzle, said air valve being normally maintained in a partially open position to permit the passage of small quantities of air through said suction connection and to accommodate pulsations in the suction passage without opening said fuel valve and adapted to be operated by the passage of air through said suction connection from the suction actuated device to the suction passage, in sufficient quantities to materially interfere with the operation of the engine if not fuelized, to open said fuel valve and effect the fuelization of said air to prevent interference with the operation of the engine or stalling it if idling by the operation of the suction actuated device.

4. The combination with an internal combustion engine provided with a suction passage, an engine carburetor connected therewith for normally supplying the explosive charges to the engine at all speeds, and a throttle valve controlling said passage, and located between the carburetor and the suction passage, of a suction actuated device, a suction connection therefrom connected to said suction passage, between the throttle valve and the engine cylinders and subjected at all times to the maximum rarification in the suction passage, means for introducing fuel into said suction connection operating independently of the carburetor, between the valve mechanism of the suction actuated device and the suction passage of the engine, and comprising among its members a fuel nozzle, a needle valve therefor, an air inlet valve in said suction connection operatively connected with the fuel valve and holding it in closed position to normally prevent the discharge of fuel from said nozzle, said air valve being normally maintained in a partially open position to permit the passage of small quantities of air through said suction connection and to accommodate pulsations in the suction passage without opening said fuel valve and adapted to be operated by the passage of air through said suction connection from the suction actuated device to the suction passage in sufficient quantities to materially interfere with the operation of the en-

gine if not fuelized, to open said fuel valve and effect the fuelizing of said air to prevent interference with the operation of the engine or stalling it if idling by the operation of the suction actuated device, and means for regulating the extent of opening of said air valve in the normal position thereof, to regulate the quantity of air which will be allowed to pass through said suction connection without being fuelized.

5. The combination with an internal combustion engine provided with a suction passage, an engine carburetor connected therewith for normally supplying the explosive charges to the engine at all speeds, and a throttle valve controlling said passage, and located between the carburetor and the suction passage, of a suction actuated device, a suction connection therefrom connected to said suction passage, between the throttle valve and the engine cylinders, and subjected at all times to the maximum rarification in the suction passage, means for introducing fuel into said suction connection operating independently of the carburetor, between the valve mechanism of the suction actuated device and the suction passage of the engine, and comprising among its members a fuel nozzle, a needle valve therefor, an air inlet valve in said suction connection operatively connected with the fuel valve and holding it in closed position to normally prevent the discharge of fuel from said nozzle, said air valve being normally maintained in a partially open position to permit the passage of small quantities of air through said suction connection and to accommodate pulsations in the suction passage without opening said fuel valve and adapted to be operated by the passage of air through said suction connection from the suction actuated device to the suction passage in sufficient quantities to materially interfere with the operation of the engine if not fuelized, to open said valve and effect the fuelizing of said air to prevent interference with the operation of the engine or stalling it if idling by the operation of the suction actuated device, and means for adjusting the needle valve seat longitudinally with respect to the needle valve to adjust the extent of opening of the said air valve when the latter is in its normal position, and the needle valve is closed.

6. The combination with an internal combustion engine provided with a suction passage, an engine carburetor connected therewith for normally supplying the explosive charges to the engine at all speeds, and a throttle valve controlling said passage and located between the carburetor and the suction passage, of a suction actuated device, a suction connection therefrom connected to said suction passage between the throttle valve and the engine cylinders and subjected at all times to the maximum rarification in

the suction passage, means for introducing fuel into said suction connection operating independently of the carburetor, between the valve mechanism of the suction actuated device and the suction passage of the engine, and comprising a separate carburetor provided with a fuel nozzle, a normally closed needle valve therefor, an air valve for throttling the passage of air through said suction connection and said separate carburetor attached to the needle valve and normally maintained in partly opened position, yielding means for maintaining said air valve and fuel needle valve in their respective normal positions, said air valve operating automatically to normally prevent the admission of fuel into said suction connection, and permitting the passage of air therethrough in small quantities insufficient to effect the operation of the engine and to accommodate pulsations in the suction passage without opening said fuel valve and to open said fuel valve and effect the fuelization of larger quantities of air passing from the suction actuated device to the suction passage of the engine to prevent interference with the operation of the engine or stalling it if idling, by the operation of the suction actuated device.

7. A vacuum control system for motor vehicles including an internal combustion engine having an intake manifold, a fuel mixing valve closed to the atmosphere and open to the intake manifold, a vacuum actuated power device connected thereto, and valve mechanism for establishing and maintaining a predetermined vacuum in said power device by means of the vacuum in said manifold.

8. A vacuum control system for motor vehicles including an internal combustion engine having an intake manifold, a fuel mixing valve closed to the atmosphere and open to the intake manifold, a vacuum actuated power device connected thereto having a movable member, and valve mechanism for moving said member a predetermined distance and maintaining it in said position by means of the vacuum in said manifold.

9. A vacuum control system for motor vehicles including an internal combustion engine having an intake manifold, a fuel mixing valve closed to the atmosphere and open to the intake manifold, a vacuum actuated power device and a valve mechanism connected thereto, the latter placing the vacuum actuated power device in communication with the said fuel mixing valve or with the atmosphere.

10. A vacuum control system for motor vehicles including an internal combustion engine having an intake manifold, a fuel mixing valve closed to the atmosphere and open to the intake manifold, a vacuum actuated power device connected thereto having a movable member, and valve mechanism for

moving said member a predetermined distance and maintaining it in said position by means of the vacuum in said manifold, said valve mechanism including means for permitting said member to return to its normal position through the medium of atmospheric pressure.

11. A vacuum control system for motor vehicles including an internal combustion engine having an intake manifold, brakes, a fuel mixing valve closed to the atmosphere and open to the intake manifold, a vacuum actuated power device connected thereto having a movable member mechanically connected to said brakes, and valve mechanism for moving said member a predetermined distance and maintaining it in said position by means of the vacuum in said manifold, said valve mechanism including means for permitting said member to be returned to its normal position through the medium of atmospheric pressure.

12. A vacuum system for motor vehicles including an internal combustion engine having an intake manifold, a fuel mixing valve closed to the atmosphere and open to the intake manifold, a vacuum actuated power device connected to said mixing valve, and valve mechanism in the connections between the vacuum actuated power device and said mixing valve for establishing and maintaining a predetermined vacuum in said power device by means of the vacuum in the manifold.

13. A vacuum system for motor vehicles including an internal combustion engine having an intake manifold, a fuel mixing valve closed to the atmosphere and open to the intake manifold, a vacuum actuated power device, means for operatively connecting said vacuum actuated power device with said mixing valve and through the mixing valve with said intake manifold, said means including valve mechanism, and an operator operated part for said valve mechanism.

In testimony whereof we affix our signatures.

CALEB S. BRAGG.
VICTOR W. KLIESRATH.