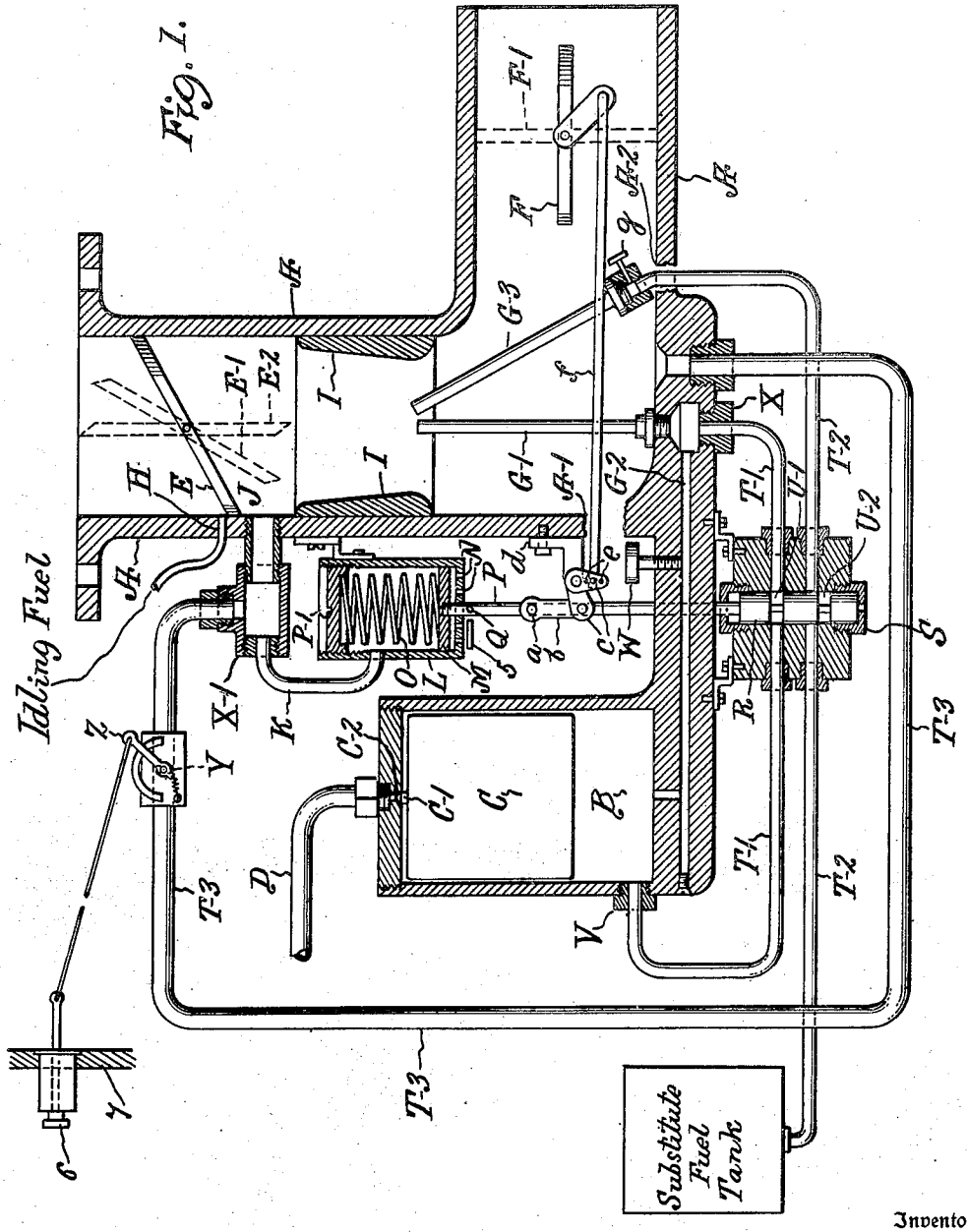
Dec. 11, 1934. R. D. WHITE 1,983,957

CARBURETOR

Filed May 25, 1933 2 Sheets-Sheet 1

Fig. 1.



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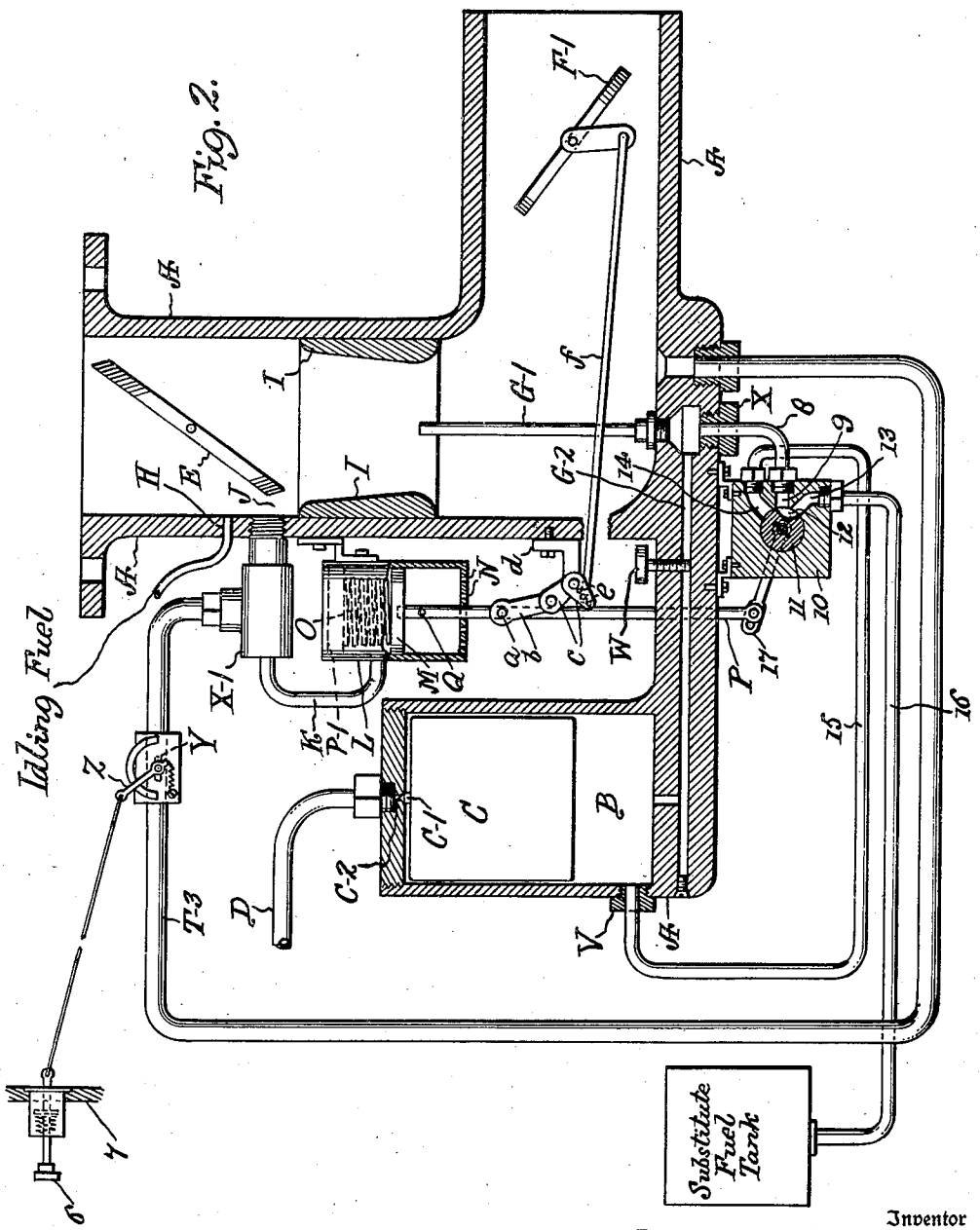
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Fig. 2.



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UNITED STATES PATENT OFFICE

1,983,957

CARBURETOR

Richard Drace White, New York, N. Y.

Application May 25, 1933, Serial No. 672,881

10 Claims. (Cl. 261—50)

The present invention relates to the burning in explosive engines designed to operate on fuels of certain definite catalytic qualities other gaseous fuels of different catalytic qualities, and to burning these latterly mentioned fuels in conjunction with the fuel for which the engines were specifically designed; preserving, at the same time the delivery of quick acceleration, quick pick up of power and assured delivery of full power which is ordinarily obtained only by the use of the fuel for which the engines were specifically designed.

My invention provides, further, for accomplishing this without the use of any medium of control other than the customary movement of the accelerator valve as is regularly done when using the regular fuel alone.

The vast majority of automotive engines are designed to burn gasoline—(this product is known by a variety of other names, such as naptha, petrol, essence, benzina, etc.). It has become desirable however, and is becoming more and more desirable, to find a means of burning, at least in part, certain other fuels of similar but different qualities as regards volatilization or combustion. Many attempts have been made to burn some of these fuels, notably kerosene and alcohol, with the equipment regularly supplied for burning gasoline. In some cases the new fuel has been completely substituted for gasoline. In others it has been introduced into the gasoline tank in varying ratios to the content of regular gasoline. In both cases certain inconveniences have been encountered. In the former case starting the cold engine has been greatly obstructed, quick acceleration, quick delivery of moderate power and delivery of full power has been handicapped. In the case where the fuels have been mixed in the same tank their different specific gravities causes them to separate into layers. This is especially true of alcohol which has an affinity for water, which it picks up to further hamper satisfactory delivery of those qualities of quick pickup of power, quick acceleration, and delivery of full power which are most to be desired in automotive engines.

Although capacity to deliver on demand these desiderata is a prerequisite of a satisfactory automotive engine, it is a known fact that in a vast proportion of the operation of automotive engines the demand for these qualities is absent. In an automobile when travelling at moderate speeds, little power is demanded and there is little variation in the demand for power. My invention provides for the automatic substitution of some other fuel than that for which the engine was specifically designed at these powers, preserving however the instant and automatic shift to the more responsive fuel, gasoline, when greater power is demanded or when the engine idles.

In my present invention there is no change in the method of carrying and distributing regular fuel. The fuel which I propose to substitute at the moderate power above described, I propose to carry in a separate tank and to provide separate distribution of it until it enters the carburetor. I furthermore provide that this substitute fuel shall not be delivered to the engine except when the engine is operating at moderate power. (From 15 to 45 miles per hour ordinarily.)

Through the operation of this invention the regular fuel is automatically shut off at moderate power delivery and the substitute fuel fed to the engine until the demand for power changes, at which time the regular fuel is automatically provided to the engine.

If full power or nearly full power (as on a hill in an automobile) is demanded, or if the engine slows down to idling speed, the substitute fuel is automatically shut off and the regular fuel is returned to supply.

With the foregoing and other objects in view, the invention will be more fully described hereinafter and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views,

Figure 1 is a fragmentary cross section taken through a carburetor constructed according to the present invention, and

Figure 2 is a similar view showing the parts in a different position.

Referring to the accompanying drawings, Figure 1 shows the invention as mounted on a typical carburetor. A, A, A is a cross section of the body of the carburetor. The body is cut away at A—1 and A—2 to present a clearer conception of the device and its functioning. B is the float chamber which contains C, the float on which is carried the needle valve C—1, fitting into the orifice C—2, leading from the pipe D, which ordinarily supplies fuel to the engine. The throttle valve is shown in the closed position E; at the partly open position E—1; and at the full power position E—2. The choke F is shown open; F—1 shows the position of the choke when closed. The main jet through which the principal supply of fuel comes when the engine is running

loaded or partly loaded is numbered G—1. The details of construction are not indicated in the drawings since they vary considerably in their ways of arriving at the same end. A canal G—2 connects this jet with the float chamber B. The orifice through which fuel is brought when the engine is idling is marked H. The connection of this orifice with the fuel supply is not shown. There are other attachments on all carburetors in common use such as compensators, plunger pumps, etc., which are designed to give livelier acceleration, better economies, or other advantages, but their functions are in no wise affected by the operation of this invention and they are therefore not shown in the drawings. The venturi, common to all carburetors, is marked I, I.

The action of the typical carburetor is, broadly speaking, the same in all cases. The control is contained in a throttle valve, E, E—1, E—2 on the accompanying drawings. When the engine is idling the throttle is closed, being at position E. Fuel enters by the orifice H. A partial vacuum exists in the area between the throttle and the engine and because of this vacuum enough air filters past the throttle valve to render the mixture of air and fuel entering the engine "rich". In increasing the power delivery the throttle is opened, passing successively to the positions E—1 and E—2 and through the various intermediate positions, not indicated. When the throttle is wide open, E—2, the delivery of full power is obtained. As the throttle is opened the suction in the manifold extends itself past the throttle and draws fuel from the jet G—1, the amount of fuel drawn depending on the strength of the suction coming past the throttle.

This method of control produces a certain phenomenon, viz., the mixture is rich when the engine is idling, it is lean at intermediate powers and is again rich when the engine is delivering full power. This is an essential desideratum in the functioning of all carburetors and my invention is designed to function without interfering with this requirement.

There is a further phenomenon that is inherent to all carburetors: When the engine is idling, the throttle being closed, a strong vacuum persists, as I have pointed out, in the area between the throttle and the engine. This vacuum does not extend in any measure past the throttle because of the throttle being closed. When, however, the throttle is partially opened, as at E—1, this vacuum, extends in major strength to the area, J. When the throttle is further opened, as to the position E—2 or thereabouts, the vacuum in this area J practically disappears, the air to supply it being furnished liberally from the area in and beyond the venturi. The functioning of my invention is derived from the presence of vacuum in the area J, when the engine is operating at moderate power and its absence at other times.

My invention consists of a combination of a tube "K" connecting the area J in the carburetor, with a cylinder L, which encloses a piston, M, which piston will be motivated when the vacuum appears and disappears in the area J, it being communicated through the tube "K" to the area inside the cylinder on one side of the piston; of perforations N in the walls or envelope of the cylinder permitting air from the atmosphere to penetrate into the space in the cylinder on the side of the piston opposite to the area into which the vacuum from the tube K is admitted; of a spring O, which retains the piston at one end of cylinder when there is no suction being admitted to the cylinder, and, when such suction exists, balances the movement of the piston against the strength of the suction; of a cap, P—1, screwed into the end of the piston at the end opposite to that where the piston is designed to remain when the invention is in operation, which cap is threaded on its periphery to engage in corresponding threads in the wall of the cylinder providing a longitudinal motion which will vary the tension on the spring O; of a shaft P fitted with a hole Q, into which may be placed a pin 5, which will then forbid the movement of the piston, and therefore the functioning of the invention, regardless of the conditions as regards vacuum heretofore dealt with; of the connecting of this shaft to a two-way valve R designed to place its passages U—1 or U—2 opposite the ends of the tubes T—1 or T—2 depending on the position of the piston P; of a stop S to limit the movement of the valve in one direction and a similar stop to limit it in the other; of a tube T—1, T—1 leading from the supply of regular fuel, the float chamber, to the entrance to the regular main jet G—1; of a tube T—2, T—2 leading from the supply of substitute fuel to the entrance to the substitute jet; of a stop valve W whereby the flow of ordinary fuel through its regular canal to the main jet may be arrested, permitting it to flow to the main jet only through the tube T—1 and this only when the position of the two-way valve R permits it; of a connection X which permits ordinary fuel passing through the tube T—1, to flow to the main jet G—1; of a substitute jet G—3 fitted with a needle valve *g* controlling the passage of fuel through the substitute jet, connected with the tube T—2, through which the substitute fuel may pass when the position of the two-way valve R permits it; of a tube T—3 combined with a fitting X—1, which either surrounds the tube K or is adjacent to it, opening into the area J heretofore referred to; the other end of the tube T—3 being connected with the carburetor area inside the choke F preferably just beneath the tips of the jets G—1, and G—2; of a valve Y fitted into the tube T—3 which, through a combination of levers or other motivating device 6, connected with the lever Z, may either be kept closed, or partially or fully opened, thus controlling the flow of air through the tube T—3; of an axle *a* in the shaft or piston rod P which carries a connecting link *b* which is connected by a pin with a rocker arm *c* supported by a bracket *d* fixed to the wall A of the carburetor body; of a series of holes *e* drilled into the longitudinal axis of one arm of the rocker arm *c* into any one of which holes may be fitted one end of the rod *f* which connects at its other end with the actuating arm of the choke F.

The valve Y may be opened and closed by an attachment similar to the choke operator, which device 6 is represented as mounted upon the dash or instrument board 7 of the vehicle.

The operation of the invention is as follows: Consider the engine idling; the throttle will be at the position E, the choke at the position F; the arresting pin will be removed from the hole Q; and the stop valve W will be closed, forbidding the ordinary fuel to course through the canal G—2. There being no vacuum present in the area J, the device will remain inactive. The engine burns the regular fuel. To increase the power delivery of the engine to moderate power, the throttle is opened to approximately the po-

sition E—1. Quick acceleration and pick up of power is afforded by the operation of the auxiliary devices common to all modern carburetors, the functions of which are in no wise affected by the operation of this device. Upon opening the throttle to the position E—1, the suction previously confined to the area between the throttle and the engine invades the area J and persists as long as the engine operates at moderate power. The suction in the area J is communicated to the cylinder L causing the piston M to move against the spring O displacing the two-way valve R until the cut-away portion U—1 moves away from its juxtaposition with the ends of the tube T—1, which tube is provided to carry ordinary fuel, thus effectively shutting off the flow of ordinary fuel to the main jet G—1. At the same time the cut-away portion U—2 of the two-way valve R comes into juxtaposition with the ends of the tube T—2, permitting the flow of substitute fuel to the substitute jet G—3 which fuel is then burned in the engine in the place of the ordinary fuel ordinarily supplied through the jet G—1. This condition will persist as long as the engine continues at moderate power.

When, in order to obtain high power delivery, the throttle is opened to the position E—2, the vacuum in the area J fails, the spring O forces the piston back to its original position, the regular fuel is provided for burning and the substitute fuel shut off, this condition being best adapted to high power delivery.

The same sequence occurs if the engine reduces from moderate power delivery to idling speed.

Furthermore, as long as the vacuum pervades in the area J it is communicated into the tube T—3, and, if the valve Y is open, draws air through the tube T—3 from the area inside the choke. If any fuel has dropped from the jet tips it is sucked into the engine through this means and is effectively used. In any event, air in quantity varied by means of the valve Y is admitted to mix with the substitute fuel, should such additional air be required for perfect combustion.

Now with some substitute fuels the best ratio of air to fuel is less than that required for the regular fuel. In that case in addition to closing completely the valve Y, the rod *f* will be connected at one end with the operating lever of the choke and at the other one of the holes *e* in the rocker arm *c*, whereby the movement of the piston rod P will close the choke by an amount depending on which hole in the rocker arm *c* is utilized.

By selecting the proper hole the air content of the mixture while the substitute fuel is being used may be brought to that which is most effective for burning that particular fuel. When, through the reversed movement of the piston rod P, the regular fuel is placed in supply, the choke will automatically be returned to the open position.

With regard to Figure 2, a single ordinary jet G—1 is employed and the supplemental jet G—3 is dispensed with. The single jet G—1 is connected by a pipe 8 with a port 9 in a valve block or casing 10 which is provided with a rotary plug valve 11 having a cut-away portion 12. This cut-away portion 12 is of sufficient circumferential area to embrace both the port 9 and either the port 13 or the port 14 in accordance with the position of the plug valve 11. The port 14 is connected by a pipe 15 with the float chamber and receives the standard fuel such as gasoline; while the opposed port 13 is connected by a pipe 16 with the substitute fuel tank. The plug valve 11 is moved by means of an arm 17 connected to the plunger rod P.

The action of the device is such that when the plunger M is elevated by operation of the motor suction, the cut-away portion 12 of the plug valve 11 spans the ports 9 and 13 permitting of the supply of the substitute fuel.

When, however, the throttle valve is either fully closed or in the open position or substantially open position then the plunger M is allowed to descend as previously described whereupon the cut-away portion 12 of the plug 11 embraces the ports 9 and 14 thus placing the standard fuel supply in communication with the carburetor jet G—1.

By the employment of this invention, a variety of fuels may be burned in an explosive engine in connection with the fuel for which the engine was specifically designed. For example, a low-test gasoline may be burned in connection with the high test gasoline at considerable saving in expense of operation. Alcohol, kerosene, or heavier oil may similarly be burned. And this without violating the desirable qualities of quick pick-up, quick delivery of increased power, and full delivery of full power that are only present when the fuel for which the engine was designed is available upon command.

The important point in the invention lies in tapping the area close up to the edge of the throttle when the throttle is closed.

I claim:

1. In a carburetor having throttle and choke valves and a nozzle, main and substitute sources of fuel, and means for placing the nozzle in communication with the main fuel source at idling and high-speed positions of the throttle and with the substitute fuel source at intermediate speed positions of the throttle, said means being operable by the absence and presence of suction in the space just behind the throttle valve when in the closed position and connecting means connecting said first named means with the choke to actuate the choke simultaneously therewith.

2. In a carburetor having throttle and choke valves and jet means, main and substitute sources of fuel, a fuel valve to place said jet means in communication either with the main or substitute fuel sources, and actuating means for said fuel valve operable by the absence and presence of suction in the space just behind the throttle valve when in closed position and connecting means connecting said actuating means with the choke whereby to operate the choke simultaneously therewith.

3. In a carburetor having a throttle valve and jet means, main and substitute sources of fuel, and automatic means for placing said jet means in communication with the main fuel source when the motor is idling or operating under heavy load or speed and in communication with the substitute fuel source when the motor is running at intermediate speed, said means being operable by the absence and presence of suction in the space just behind the throttle valve when in the closed position and connecting means connecting said automatic means with the choke to operate the choke simultaneously therewith.

4. In a carburetor having throttle and choke valves and jet means, main and substitute sources of fuel, a two-way fuel valve, and means operable by the absence and presence of suction in the space just behind the throttle valve when in closed position to move the fuel valve to place

either the main or substitute fuel source in communication with the jet source and simultaneously to vary the amount of opening of the choke valve without affecting the regularly employed compensating, boosting and accelerating means.

5. In a carburetor having throttle and choke valves and jet means, main and substitute sources of fuel, a two-way fuel valve connected to both sources and to said jet means, a vacuum-controlled device in connection with the space behind the throttle valve when in closed position for operating said fuel valve to connect either fuel source separately with the jet means, and a connection between said device and choke valve for moving the latter toward a closed position when the substitute fuel supply is cut in.

6. In a carburetor having a throttle valve and jet means, main and substitute sources of fuel, a two-way fuel valve connected to said sources and to the jet means, a vacuum cylinder in connection with the carburetor space just back of the throttle valve in the closed position of the latter, and a plunger in the cylinder connected to the fuel valve and means connecting the choke with said plunger to operate said choke simultaneously therewith.

7. In a carburetor having a throttle valve and jet means, main and substitute sources of fuel, a two-way fuel valve connected to said sources and to the jet means, a vacuum cylinder perforated at its lower portion and having its upper portion connected to the carburetor space just behind the closed position of the throttle valve, a plunger in the cylinder, adjustable spring means tending to move the plunger down in the cylinder, and a plunger rod connecting said plunger with the fuel valve and means connecting the plunger rod with the choke to operate said choke simultaneously with the movement of the rod.

8. In a carburetor having a throttle valve and jet means, main and substitute sources of fuel, a two-way fuel valve connected to said sources and to the jet means, a vacuum cylinder perforated at its lower portion and having its upper portion connected to the carburetor space just behind the closed position of the throttle valve, a plunger in the cylinder, adjustable spring means tending to move the plunger down in the cylinder, a plunger rod connecting said plunger with the fuel valve, and mechanical connections between said plunger rod and choke valve for moving the latter toward a closed position when the substitute fuel is cut in.

9. In a carburetor having a throttle and jet means, main and substitute sources of fuel, a fuel valve connecting with the jet means and the fuel sources, a vacuum motor for operating said fuel valve, a connection between said motor and the carburetor space just behind the closed position of the throttle valve, a pipe from below the jet means to said connection, and a valve to control flow through said pipe and means connecting the choke with said motor to operate said choke simultaneously with the operation of said motor.

10. In a carburetor having a throttle valve and a nozzle, main and substitute sources of fuel, communicating means between said nozzle and the respective sources of fuel, a double valve disposed in said communicating means, and automatically operable means for selectively moving said double valve to a plurality of positions in which communication is established between the nozzle and the main fuel source and between the nozzle and the substitute fuel source, said automatically operable means being actuated by the absence and presence of suction in the space just behind the throttle valve when in closed position and means connecting the choke with said automatically operable means to operate the choke simultaneously therewith.

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