July 14, 1953 M. F. ANDERSON 2,645,570

CARBURETOR ADAPTER

Filed March 13, 1950 2 Sheets-Sheet 1

Fig. 1.

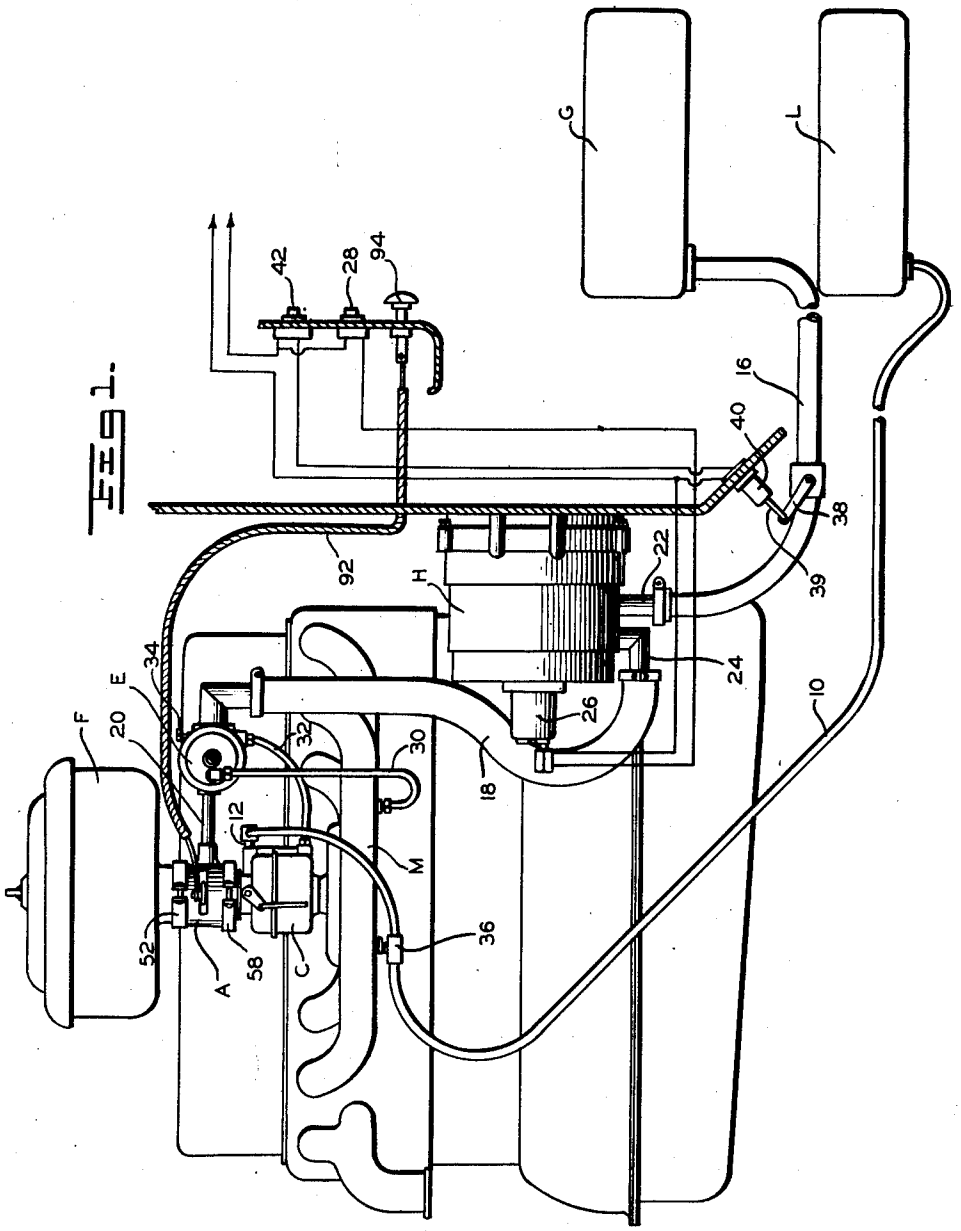

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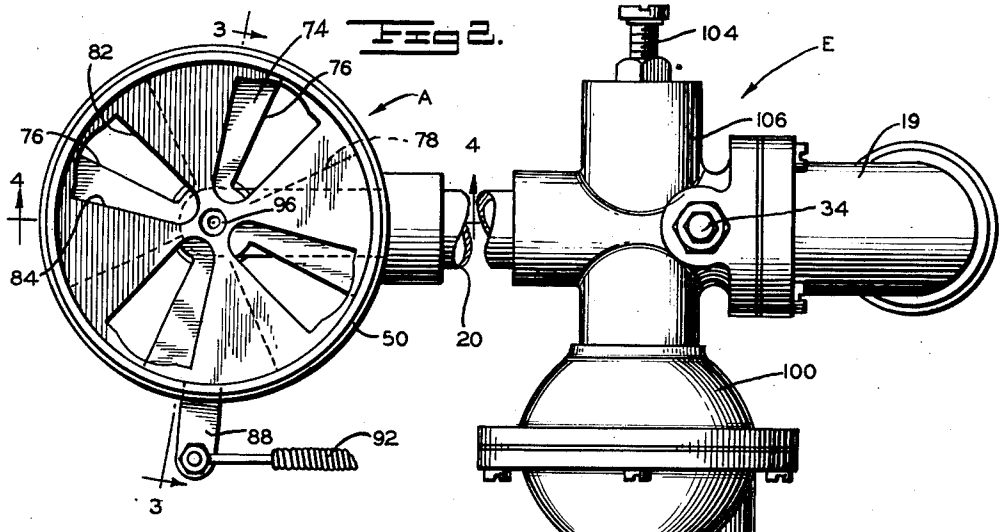
Fig 2.



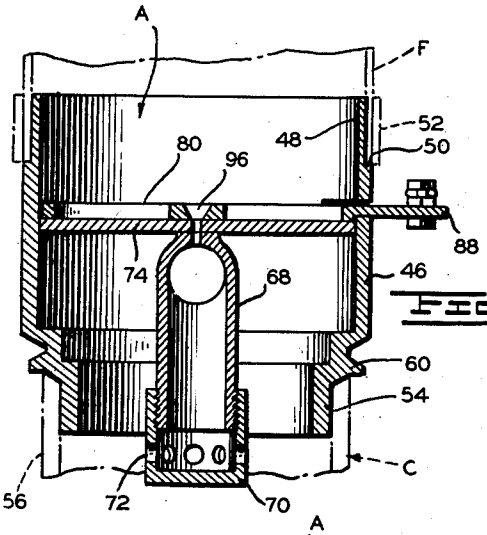


Fig 3.

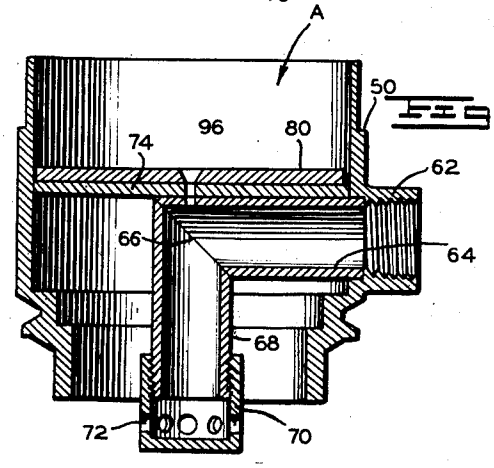


Fig 4.

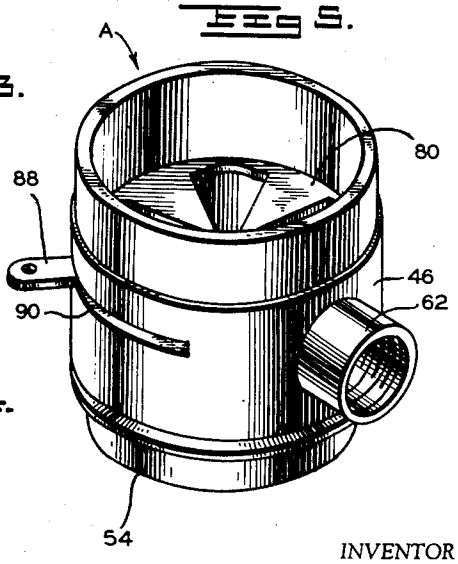


Fig 5.

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CARBURETOR ADAPTER

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3 Claims. (Cl. 48—180)

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The present invention relates to an adapter which may be usefully employed with the engines of motor vehicles such as motor cars, trucks, tractors, and similar power units, to permit the selective use of normally gaseous hydrocarbon fuels such as butane and propane in substitution for the normally liquid hydrocarbon fuel such as gasoline which is ordinarily used.

A principal object of the invention is to provide such an adapter which may be connected between the ordinary air filter and carburetor of a motor vehicle to permit selective use of either the gasoline type of propane type fuel, while employing the ordinary carburetor commonly used on the vehicle without modification thereof and without the necessity of providing an additional carburetor, as has been suggested in prior art solutions of this problem.

Further objects of the invention include the provision of an intake fuel system using such an adapter which permits easy starting, supply of air to the carburetor for maximum smoothness of operation and maximum power, increased economy in the use of the fuel, and immediate adjustment from the dashboard of the vehicle to compensate for engine load and altitude.

A particular object of the invention is to provide such an adapter having an adjustable air intake or shutter at the intake end of the adapter where it connects with the air filter, permitting instant adjustment from the dashboard of the vehicle of the air which passes through the adapter to the carburetor, in order to provide a mixture of fuel and air yielding maximum efficiency and increased smoothness of operation as well as added power when necessary. Specifically, the adapter comprises a hollow tubular body having means at one end for direct connection with the air filter and means at its opposite end for direct connection with the ordinary carburetor of the vehicle or engine, an inlet pipe extending through the side wall of the adapter which terminates in a central nozzle having openings which discharge the propane type fuel into the center of the adapter while providing for movement of the air from the filter in the space around the nozzle to entrain the fuel discharged therefrom, and a control shutter for the air received from the filter located in the adapter immediately upstream of the nozzle, whereby the quantity and motion of the air from the filter may be regulated in accordance with the type of fuel which is being used, and in order to compensate for other conditions as referred to herein. A further important feature of the adapter

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of this invention is the provision of an opening into the fuel pipe in the adapter immediately behind or upstream of its nozzle, whereby an additional quantity of air may be initially mixed with fuel before it reaches the nozzle in order to obtain the better fuel and air mixture.

While the prior art has suggested systems wherein the propane type gas is delivered into the air stream between the filter and the ordinary carburetor, such systems have not been successful in adapting the equipment for efficient use of either gasoline type or propane type fuel because no provision has been made in such a system for the selective control of the quantity and motion of the air passing the point of discharge of the propane type fuel in order to provide a proper mixture which may be varied in accordance with variable conditions of load, altitude, and the like.

The present invention provides for adjusting air to proper combustion efficiency, and gives, under normal conditions, an air fuel ratio of approximately 14%.

A further object of the invention is to provide a system wherein the adapter of the present invention is associated with fuel control devices of a character generally well-known in the art so that an efficient fuel supply system is provided capable of use with either the gasoline type or propane type fuel.

While I have shown the adapter device of a design intended to fit carburetors of well-known types, it will be understood that the design of the adapter, particularly in respect to its connections, may be varied in order to adapt it for attachment between air filters and carburetors of various types.

In the drawings:

Figure 1 is a schematic showing in the nature of a vertical sectional view through the engine hood illustrating the arrangement of the important parts of the system in a generally schematic manner;

Figure 2 is the top plan view of the adapter and the associated economizer-accelerator unit, the filter being omitted to show the adjustable air regulating shutter in the adapter. The air regulating shutter of the adapter is shown in position for the use of the propane type fuel;

Figure 3 is a vertical sectional view through the adapter taken along the line 3—3 of Figure 2 and indicating the manner of directly connecting the adapter between the filter and the carburetor;

Figure 4 is a vertical sectional view through

the adapter taken along the line 4—4 of Figure 2;

Figure 5 is a perspective view of the adapter showing the air regulating shutter in an adjusted position for the use of the gasoline type fuel.

It will be understood that the important features of the invention are in the construction and operation of the adapted unit, and this unit is illustrated and described in detail. The remaining elements of the system are in general conventional except in certain aspects of their cooperation with this particular adapter, and therefore, these remaining elements are only generally described with reference to a prior art patent illustrative of the many which teach the construction and operation of such elements.

In Figure 1, a conventional carburetor is shown at C, same being located on and connected with the conventional intake manifold M of the engine. The usual air filter is shown at F and in a conventional motor design, this filter would be attached directly on and to the conventional carburetor C. In the present invention, however, the filter has been detached from the carburetor and the novel adapted unit A of the invention is inserted and connected therebetween, it being understood, however, that the important feature of improvement in the arrangement of parts just described resides in the air intake adjustment features of the adapter unit A when assembled in the system in the manner referred to.

The ordinary gasoline supply tank is shown at L, while the supply tank for the normally gaseous hydrocarbon fuel such as propane or butane is shown at G.

Extending from the gasoline type tank L is the usual supply line 10 which delivers this fuel to the carburetor in the usual manner as at 12. Extending from the propane type fuel tank G is a pipe 16 for delivering this fuel through a number of agencies which are in themselves well-known in construction and operation, and which are only generally described herein, these agencies including a heat exchanger unit H and an economizer-accelerator unit E. There is a supply pipe or hose 18 for this fuel between the heat exchanger H and the economizer E, and a short pipe 20 serves to deliver this fuel from the economizer E into the adapter A and to its nozzle, as will be hereinafter described.

The heat exchanger H may be of a type now available on the market which operates in a manner generally described in the patent to Hanson 2,240,846, May 6, 1941, although this patent does not necessarily describe the specific type of unit illustrated in the drawings and now available on the market. In general, the heat exchanger is provided with mechanisms between its inlet 22 and its outlet 24 for heating the fuel, as by passing it through the coils 7 described in the Hanson patent, as well as diaphragm control regulating devices for controlling the flow of the fuel as described in the same patent. For quick starting, the heat exchanger and regulating unit may be provided with a solenoid primer arrangement 26 electrically operated from the push button 28 on the dashboard, this arrangement generally illustrated performing the same priming function as the equivalent device 52 shown in Figure 2 of the said Hanson patent.

The economizer-accelerator unit E is also of a type generally described in the said Hanson patent, having a valve member controlling the passage for flow of fluid therethrough, which valve member is controlled by a diaphragm responsive to the vacuum condition in the intake manifold as referred to in the said Hanson patent, reference being made to the valve member 44, diaphragm 45, and intake manifold pipe connection 51 of the said Hanson patent. In the system of the present application, the connection between the diaphragm control chamber and the intake manifold which is the equivalent of line 51 of Figure 2 of the Hanson patent is indicated at 30.

In addition to the elements of the economizer-accelerator unit disclosed in the said Hanson patent, I provide an auxiliary fuel line 32 between the inlet end E (upstream of its control valve) and the carburetor C (downstream of the ordinary throttle or butterfly valve) for supplying a small amount of fuel for idling at low speeds, and the quantity of such fuel supply is controlled by a conventional needle valve within the unit regulated by a low speed idling screw 34, the adjustment of which determines the idling speed in a manner as will be understood by those skilled in the art.

In order to provide for alternate use of either the gasoline type or the propane type fuel, the line for the former has a shut-off valve 36 therein, and the line for the propane type fuel has a suitable closure type valve which may be operated by an arm 38 of conventional type which may in turn be controlled by a solenoid 40 operated from a push button 42 on the dashboard of the vehicle. While I have shown the valve 36 as being merely of a manual type, it will be understood that any well-known remote control means may be provided for operating this valve from the dashboard, such as the electric push button control arrangement just referred to. It is within the contemplation of the invention that the valves 36 and 38 may be simultaneously controlled from the same agency, i. e., by any mechanical or electrical arrangements which would provide for the closing of one valve simultaneously with the opening of the other valve.

From the above description, it will be understood that the valve 38 may be closed and the valve 36 opened to operate the engine on ordinary gasoline type fuel from the tank L. This fuel enters the carburetor C in the usual manner at 12 and air is drawn through the filter to the carburetor for mixture with the gasoline type fuel in the usual manner, and the construction of the adapter A is such that this conventional operation of the system is not interfered with by the presence of the adapter. When it is desired to use the propane type fuel or to shift to that type fuel, the valve 36 is closed and the valve at 38 is opened, whereupon the propane type fuel is supplied from the tank G to the adapter A through the inlet pipe 20, and there intimately mixed with air from the filter F whose quantity and motion is regulated by means in the adapter A which will hereinafter be described in more detail. Of course, it will be understood that any necessary means for conditioning the propane type fuel, such as the heat exchanger-regulator unit H and the economizer-accelerator E may be employed in the system of supply of the propane type fuel as may be necessary and desirable for the efficient performance of the adapter mechanism A and delivering the fuel to the carburetor.

As illustrated in Figures 2 through 5, the adapter comprises a tubular body 46 having a re-

duced upper end 48 forming a shoulder 50, whereby this end of the adapter may be inserted into a corresponding depending sleeve on the lower end of the filter to provide a tight sliding fit. The lower end of the filter may be clamped around the upper end of the adapter by any suitable clamping means such as a strap 52 whose ends are bolted or otherwise tightly secured together as indicated in Figure 1.

At the lower end of the adapter, there is a depending reduced sleeve 54 which similarly enters the upper tubular end 56 of the carburetor, and this connection may be tightened by such means as a similar strap 58 as indicated in Figure 1. A shoulder 60 having a lower tapered surface may serve to limit the degree of insertion of the lower end of the adapter into the tubular portion of the carburetor.

At a mid-point along the side wall of the tube 46, a threaded connection 62 is provided, and from this connection, a pipe 64 extends inwardly to the center axis of the adapter, said pipe being welded or secured in any other suitable manner to the wall 46 of the adapter. At point 66 at the center of the adapter, the pipe 64 is formed with a downward bend thus providing a further pipe portion 68 which depends axially toward the bottom of the adapter, and at the lower end of this pipe portion, a hollow threaded nut 70 is carried, said nut being closed at its lower end and provided with a plurality of discharge ports or nozzle orifices 72 through which fuel is discharged outwardly and then carried downwardly by the movement of air through the adapter from the filter to the carburetor. It will be apparent from Figures 3 and 4 that the fuel nozzle is separated by an annular space on the inside wall of the adapter, whereby the air being drawn from the filter to the carburetor is permitted to flow downwardly around the nozzle and entrain the fuel which is being discharged from the nozzle ports 72.

Just above the pipe portion 64, the interior of the adapter is partially closed by a plate 74 which is generally of the configuration of a Maltese cross, said plate having four cut-out portions defined by sets of radial edges 76 and 78, as indicated in Figure 2. Mounted for turning movement above the plate 74 is a similarly formed plate 80, and it has openings of the kind described, defined by radial edges 82 and 84, likewise indicated in Figure 2.

The upper plate 80 may be rotated about its axis which coincides with the central axis of the adapter by means of a handle 88 which extends through a slot 90 in the side wall 46 of the adapter casing.

It will be apparent that the openings in the upper plate 80 may be adjusted with respect to the openings in the lower plate 74 in such manner as to completely expose the openings in the lower plate 74 for maximum flow of air or to selectively reduce the flow opening by progressively closing these ports up to a point where the ports may be substantially completely closed. In Figure 2, the upper plate is shown adjusted to a relationship where the ports are almost half way open, a condition appropriate for the use of the propane type fuel under certain conditions. In Figure 5, the upper plate 80 is shown adjusted to a position where the ports through the lower plate are substantially completely open, a condition suitable for the use of the gasoline type fuel under appropriate conditions. As shown in both Figures 1 and 2, the operating arm 88 for the adjustment of the upper shutter plate may be moved back and forth as desired by an appropriate means well-known in the art including a flexible cable 92 which leads to a push and pull button 94 on the dash board of the vehicle.

As a result of experiments carried on over a period of time, I have demonstrated that an opening 96 drilled through the center of plates 80 and 74 and into the upper end of the pipe 64 centrally of the adapter and thus into the fuel supply, will, as a result of the air drawn through this opening, give a substantially better fuel and air mixture when the equipment is adjusted for the use of the propane type fuel. I have found that such an opening does not affect the performance of the system when gasoline is used. The size of this opening may vary in relation to the size of the engine.

Referring to Figure 2, and as previously stated, the operation of the economizer-accelerator unit E is generally well understood in the art and is described in such prior patents as Hanson 2,240,846, May 6, 1941. The unit includes an enlarged diaphragm chamber 100, and the diaphragm therein is engaged by a spring which is adjusted against the diaphragm by an adjusting screw 102, which performs a function similar to the screw 47 of Figure 2 of the said Hanson patent. At the opposite end of the housing of the unit, there is a screw 104 which performs a function similar to the screw 48 in Figure 2 of the Hanson patent. Within the hollow main portion 106 of the unit, there is a valve member mounted for movement transversely across the passage through which the fuel flows toward the adapter A, this valve member being carried on a stem which is connected for movement with the diaphragm, the valve member and its stem being constructed and arranged for operation in a manner generally similar to the valve member 44 and the stem 50 shown in Figure 2 of the said Hanson patent.

Thus, as in the Hanson patent, the valve member in this unit is adapted to variably obstruct the fuel passage through the unit, the position of the valve being controlled by the diaphragm to which the valve member is connected by means of an integral stem, the diaphragm of course being influenced by its spring as previously referred to. The working strength of this spring is designed to change the position of the valve member from a "lean mixture" setting to a "rich mixture" setting at a predetermined change of vacuum in the line 30 which connects into a chamber on one side of the diaphragm at the connecting point 108. The valve member is positioned for the two settings referred to by the adjusting screws 102 and 104, as is well known in the art. The adjusting screw 104 may be termed a full-load power adjusting screw, while the screw 102 may be termed a cruising or economy adjusting screw for reasons which will be apparent to those skilled in the art. As previously stated, the screw 34 controls a needle valve on the upstream side of the main body of the unit E, so that an adjustment may be made to determine the quantity of gas which may by-pass the main part of the unit E and the adapter to enter the carburetor C beyond the throttle butterflies, through the pipe 32.

The operation of the system including the novel control type adapter unit will be apparent from the above. The normally gaseous hydrocarbon fuel is stored in a tank such as G, and it is conveyed through the line 16 to the heat exchanger-

regulator unit H of any design known in the art and suitable for this purpose. This fuel, which is stored in liquid form in the tank G under considerable pressure, is pressure reduced in the unit H and is there vaporized, and it is delivered as a vapor through the pipe 18. This vapor is acted upon in the unit E in a manner well-known in the art, the adjustment of the screw 104 preventing too wide an opening of the control valve in this unit and thus too great a flow or too rich a mixture to the adapter A, while the adjustment of the screw 102 permits an elastic operation of the diaphragm in the unit E to permit sufficient fuel for any desired cruising speed.

It will be understood that the propane type fuel requires less air than the gasoline type fuel, and therefore, the shutters in the adapter unit A are capable of adjustment to reduce the amount of air flowing to the carburetor, for instance, the flow of air is reduced by the restricted adjustment of Figure 2 as compared with the wide open adjustment for maximum flow of air as illustrated in Figure 5 when the gasoline type fuel is being used. In view of the permissible and delicate adjustment of the shutters, the adapter can handle flow of vapor over a great variation in engine horsepower. As previously stated, the size of the opening 96 in the adapter may vary with the size of the engine.

The air which is sucked into the adapter when the propane type fuel is being used assumes a whirling motion and it mixes with the fuel delivered from the nozzle in the adapter as this fuel is sucked into the adapter during the operation of the engine. The control of the shutters in the adapter A is only generally indicated as a push and pull handle 94 on the dashboard which can be moved in and out to position the shutters at any adjustment desired. Any suitable indicia may be provided on the dashboard to indicate the degree of opening of the shutters. For instance, appropriate markings on the handle 94 or on any equivalent mechanical or other arrangement provided on the dashboard may be employed to indicate the richness of the mixture.

I claim:

1. A unitary adapter for use on motor vehicle engines to regulate the supply of air from the air filter to the carburetor when normally gaseous hydrocarbon fuel is being delivered to the carburetor of the engine in place of the ordinary normally liquid hydrocarbon fuel, comprising a tubular casing for conveying air therethrough from the air filter to the carburetor and having means at its opposite ends for connecting it between the outlet of the filter and the inlet of the carburetor, said adapter having a first disk fixed thereon adjacent to its filter end with a plurality of radially extending slots therethrough and a second disk with similar slots mounted for rotation in said casing adjacent said first disk, said

slots being thereby arranged for selective partial registration with one another to impart a regulated whirling motion to the air passing through said casing, said adapter having an inlet pipe on the downstream side of said disks and extending inwardly from its side wall and axially downwardly therefrom for the supply of the normally gaseous fuel, said pipe terminating in a nozzle having radially disposed orifices therein for discharging said fuel centrally of said adapter and in a direction transverse of the flow of air therethrough, said nozzle being spaced from the interior wall of said adapter providing an annular air space for the flow of air around and past said nozzle as regulated by the relative adjustment of said disks.

2. A construction in accordance with claim 1 wherein said disks have air openings extending centrally therethrough and wherein said inlet pipe has an air opening which registers in closed communication with the central air openings through said disks.

3. A unitary adapter for use on motor vehicle engines to regulate the supply of air from the air filter to the carburetor when normally gaseous hydrocarbon fuel is being delivered to the carburetor of the engine in place of the ordinary normally liquid hydrocarbon fuel, comprising a tubular casing for conveying air therethrough from the air filter to the carburetor and having means at its opposite ends for connecting it between the outlet of the filter and the inlet of the carburetor, said adapter having a first disk fixed thereon adjacent to its filter end with radially extending slots therethrough and a second disk with similar slots mounted for rotation in said casing adjacent said first disk, said slots being thereby arranged for selective partial registration with one another to impart a regulated whirling motion to the air passing through said casing, said adapter having an inlet pipe on the downstream side of said disks and extending inwardly from its side wall and axially downwardly therefrom for the supply of the normally gaseous fuel, said pipe terminating in a nozzle for discharging said fuel into the flow of air therethrough, and an opening in said inlet pipe at a point upstream of said nozzle to provide for the mixture of air with the normally gaseous fuel before it is discharged from said nozzle.

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