July 5, 1966 S. E. KIVELA 3,259,119

PRIMER ATTACHMENT FOR INTAKE MANIFOLD

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Fig. 1

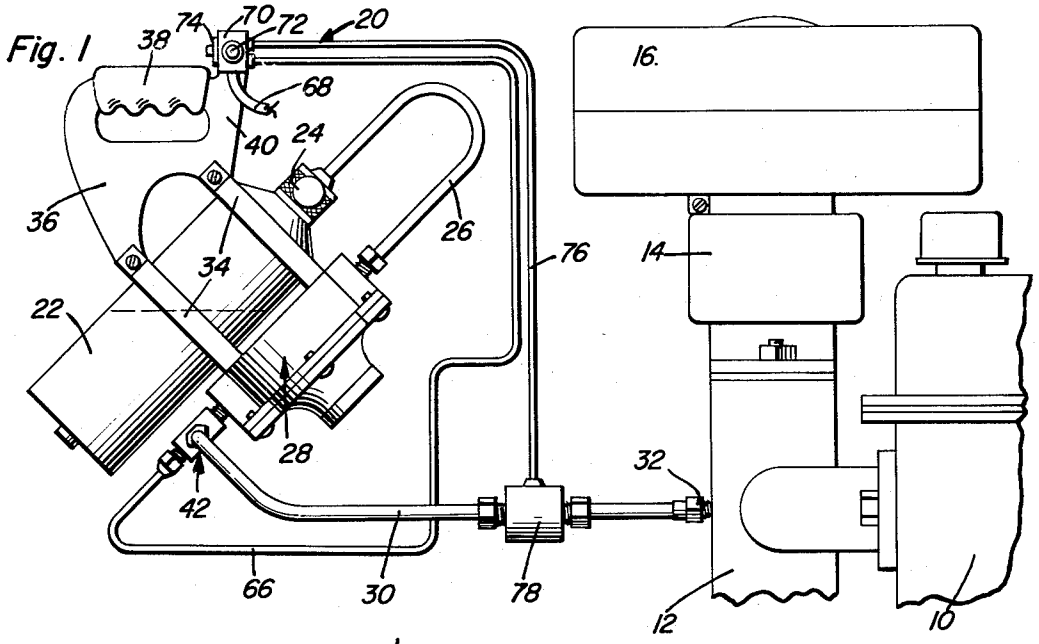


Fig. 3

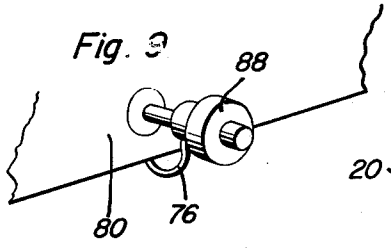
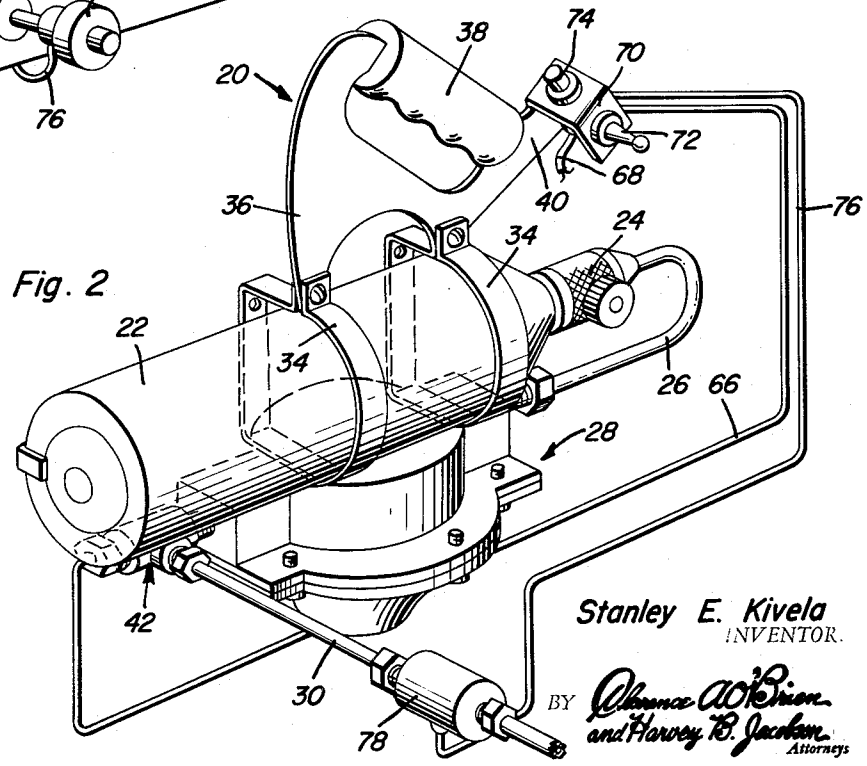


Fig. 2



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PRIMER ATTACHMENT FOR INTAKE MANIFOLD

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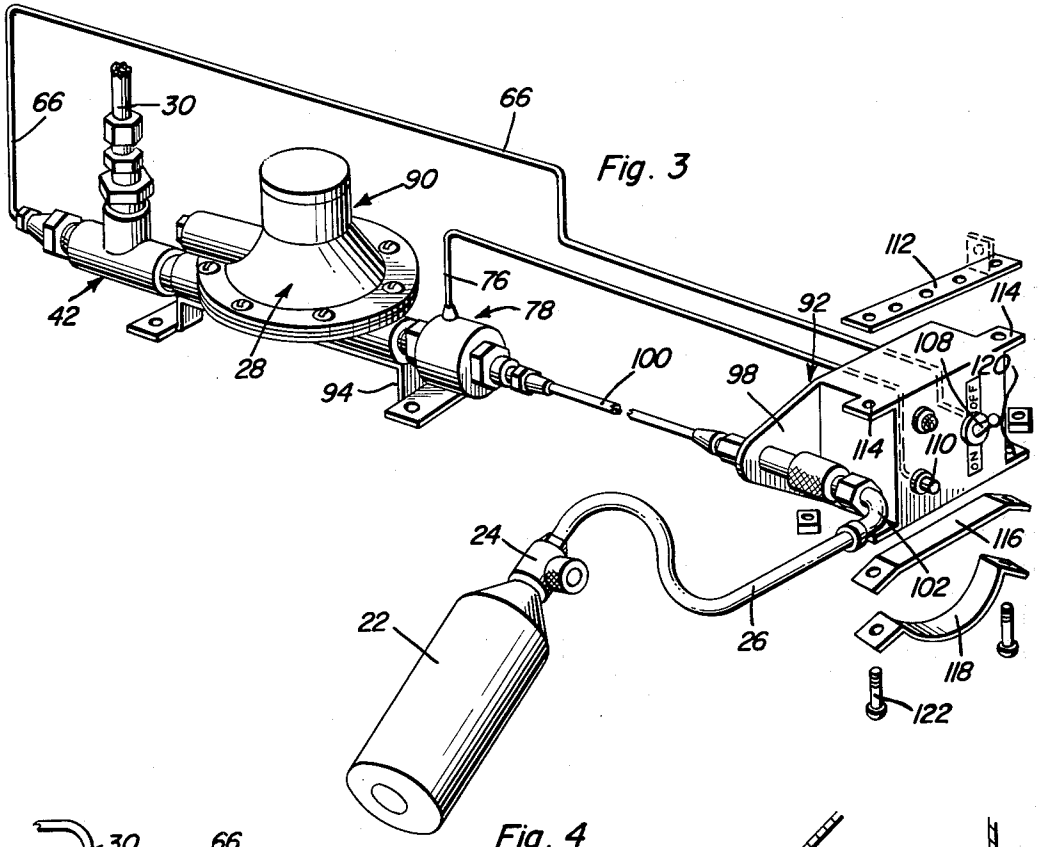


Fig. 3

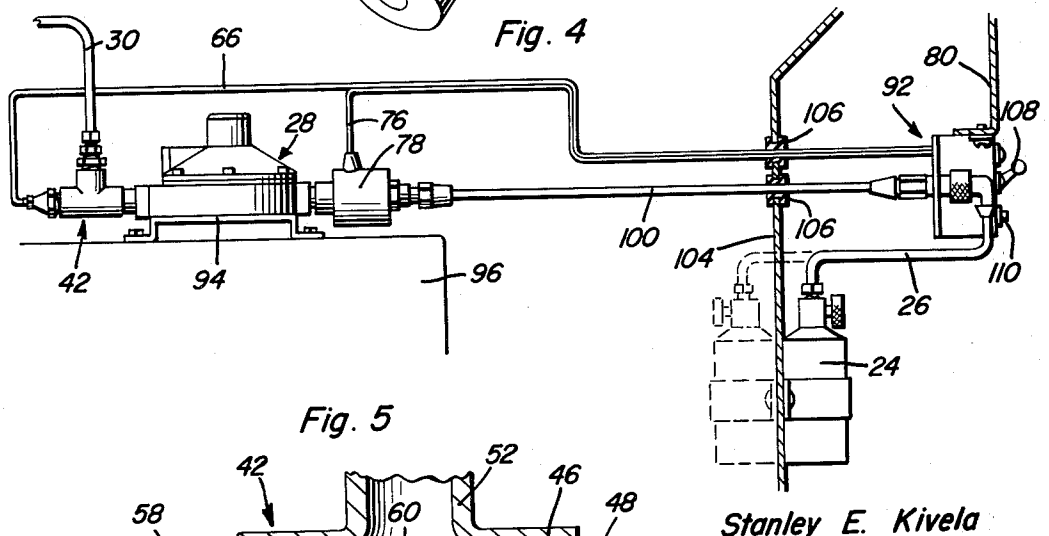
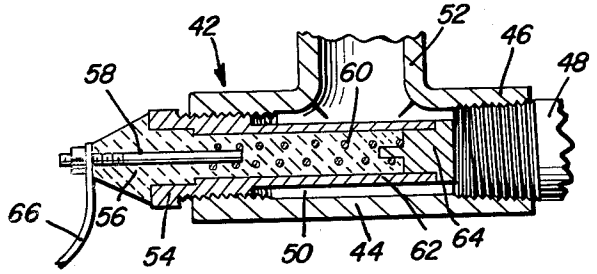


Fig. 4

Fig. 5



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PRIMER ATTACHMENT FOR INTAKE MANIFOLD

Filed April 17, 1964 3 Sheets-Sheet 3

Fig. 6

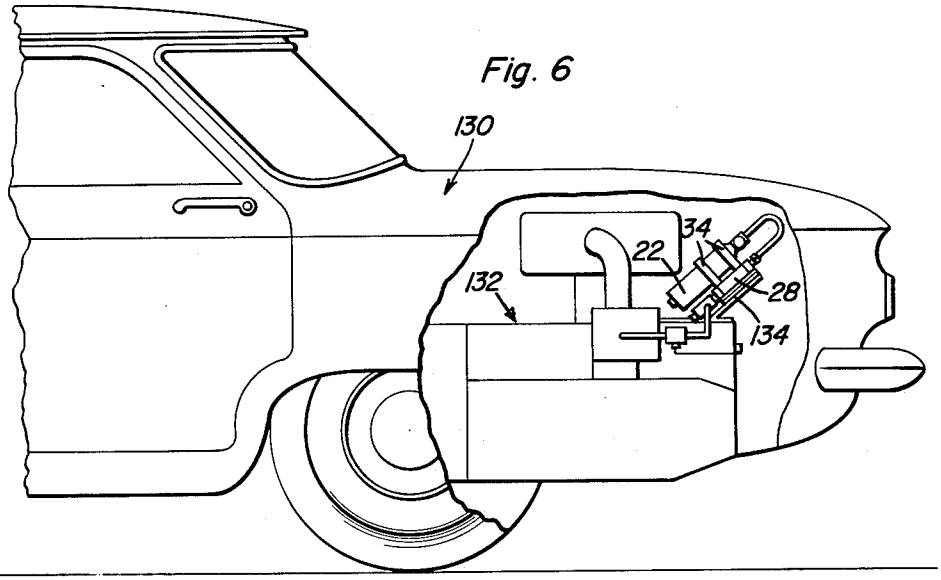


Fig. 7

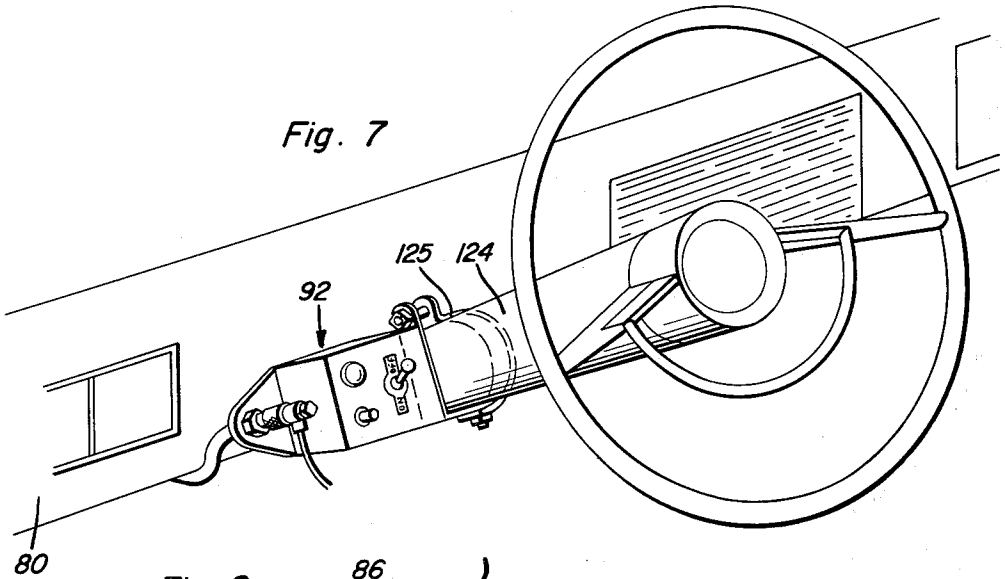
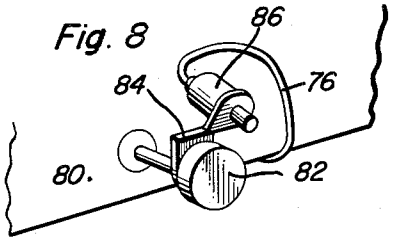


Fig. 8



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3,259,119

PRIMER ATTACHMENT FOR INTAKE MANIFOLD

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15 Claims. (Cl. 123—187.5)

This invention comprises a novel and useful primer attachment for an intake manifold and more particularly pertains to a device for supplying an auxiliary combustible fuel mixture to the intake manifold of conventional internal combustion engines and particularly for the purpose of facilitating the starting of such engines especially under adverse cold weather conditions.

When internal combustion engines of the type supplied with a combustible fuel mixture from a carburetor are operated under extremely cold weather conditions, difficulty is frequently encountered in the initial starting of such engines and during their warming up period owing to the difficulty of properly vaporizing the liquid fuel under conditions of extremely low temperatures. Further, under such conditions it requires greater power to operate the pistons of the engines during this warming up period.

Consequently, it is the primary purpose of this invention to provide an attachment which may be applied either temporarily or permanently to the intake manifold of internal combustion engines for the purpose of supplying a highly volatile second source of fuel which is readily vaporized and readily ignited under conditions of extremely low temperatures and which will supply considerably increased power to the engine during the starting and warming up period thereof.

It is a further object of the invention to provide a means which will greatly facilitate the starting of internal combustion engines especially under unusual adverse conditions such as extremely cold weather when using liquid fuels having relatively poor starting properties and the like.

It is a further object of the invention to provide a device which will facilitate the starting of internal combustion engines by supplying thereto an extremely volatile fuel such as bottled butane or propane mixtures and the like.

Still further, it is an object of the invention to provide a priming attachment for internal combustion engines which will supply thereto a priming or starting fuel developing the maximum power during the starting operation.

Another important object of the invention is to provide a priming attachment wherein the condition of the priming or supplemental fuel supplied to the engine may be readily controlled to obtain the optimum performance thereof throughout the starting operation.

Still another object of the invention is to provide a portable priming attachment of light weight including a replaceable container of priming fuel and which attachment may be quickly applied to internal combustion engines as desired and may be readily removed therefrom when its services are no longer required and which shall be safe in its use.

A still further object of the invention is to provide a priming attachment for internal combustion engines which may be easily installed upon various types of internal combustion engines and motor vehicles.

Yet another object of the invention is to provide a priming fuel device for supplying a more powerful and more easily ignitable starting fuel for cold internal combustion engines.

An additional important object of the invention is to provide a device for supplying a low temperature starting, more powerful and highly volatile compressed gas fuel together with means to preheat the priming fuel to

compensate for its temperature drop resulting from its loss of pressure during its introduction into an internal combustion engine intake manifold.

A further object of the invention is to provide a device for supplying a second combustible fuel mixture to a conventional internal combustion engine mixture either as a substitute for or to supplement the main, first or primary fuel supply of the engine especially during starting and warming up periods of the engine.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a schematic view in elevation of a portable form of the primer attachment of this invention shown connected to the intake manifold of an internal combustion engine;

FIGURE 2 is a perspective view of the portable primer attachment of FIGURE 1 certain parts being shown in phantom therein and with the device removed from the engine;

FIGURE 3 is a perspective view, partially exploded of a second form of the primer attachment having a control unit adapted for mounting upon the dash or steering column of an automotive vehicle;

FIGURE 4 is a diagrammatic view in elevation showing the primer attachment of FIGURE 3 installed in a front engine vehicle;

FIGURE 5 is an enlarged detail view in vertical longitudinal section of the fuel preheater unit of the devices of FIGURES 1 and 3;

FIGURE 6 is a side elevational view, parts broken away, and showing an installation of the primer attachment in a rear engine vehicle;

FIGURE 7 is a detail view in perspective showing the control unit of the primer attachment mounted upon the dash and steering column of an automotive vehicle; and

FIGURES 8 and 9 are detail views in perspective of the control button of the attachment mounted upon the choke control of a motor vehicle.

In its broadest aspects the present invention consists of a means for supplying a combustible fuel mixture to the intake manifold of an internal combustion engine, either as an alternate source of fuel or as a supplemental fuel to the main fuel suply of the engine for the purpose of facilitating the starting and the warming up operation of the engine. The device supplies an additional or second fuel to the engine intake manifold which has greatly superior properties as to its volatility or ability to vaporize under extremely low temperatures and further develops from its combustion a considerably greater power than that of the conventional or main or first combustible fuel mixture of the engine. The present invention relates to a means to facilitate the introduction of the second or auxiliary fuel into the intake manifold and the same principles of the inveniton are embodied in both a portable easily applied or removed priming and starting attachment for an internal combustion engine or an installation which may be permanently incorporated into the engine and vehicle structure to perform the same functions.

Considering first FIGURE 1 it will be observed that a portion of the internal combustion engine is indicated generally by the numeral **10**, the same including an intake manifold **12** of any conventional design and to which is shown connected a first source of combustible fuel mixture such as the carburetor **14** having the conventional air filter or air cleaner **16** attached to its throat. The attachment of this invention is indicated generally by the numeral **20** and consists of a source of a second, more volatile and relatively more powerful fuel under pressure

than the primary fuel supply to the carburetor 14. In the embodiment illustrated there is shown a container 22 in which is stored the second fuel under pressure such as butane, propane or a mixture, under considerable pressure. Usually fuels of this nature are stored under liquid conditions under pressure and as they are discharged from the container during use they are vaporized as the pressure thereon is reduced. The container 22 is shown provided with a customary valved outlet fitting or cap 24 and the connecting conduit 26 communicates the outlet of the fitting 24 with a conventional type of pressure reduction valve assembly indicated generally by the numeral 28. A delivery conduit 30 conducts the second fuel discharged from the source 22 to the pressure reduction valve assembly 28 and by means of a quick detachable connection as at 32 delivers the second fuel into the intake manifold 12 downstream of the carburetor 14 or upon omission of the air cleaner 16 may deliver the second fuel directly into the throat of the carburetor. It is also within the purview of this invention to introduce the auxiliary fuel into the engine in various manners. Thus it might be introduced by a suitable inlet connection into the windshield wiper suction line which connects to the intake manifold of the engine.

Referring more specifically to FIGURE 2 it will be noted that the pressure reduction valve assembly 28 is provided with a pair of releasable straps or clamps 34 which embrace the container 22 and rigidly but releasably secure the container to the pressure reduction valve assembly. The support means of the attachment includes in addition to the clamp 34 a plate-like member 36 comprising a handle having a handgrip element 38 thereon together with a projecting arm 40 provided for a purpose to be subsequently set forth.

By means of the handle 36, the entire attachment 20 may be readily moved from place to place and may be quickly connected to an intake manifold 12 when its services are necessary to start an engine as for example under extremely cold weather conditions and the like. When its services are no longer required, the quick detachable connection 32 may be disengaged from the manifold and a suitable plug or other means employed to close the manifold from the atmosphere in order that the engine may operate upon its original and first fuel source alone.

It is well known that when a volatile fluid such as propane or butane is dispensed from a container under pressure to a pressure reduction valve assembly that the temperature of the fuel is lowered as its pressure decreases when it passes through the various restrictions in its passage system on its way to the intake manifold. When it is desired to overcome this undesirable feature, an optional preheating means which is indicated generally by the numeral 42 is interposed between the pressure reduction valve assembly 28 and the conduit 30. Although the heating means specifically disclosed is disposed internally of the fuel supply conduit, it may alternatively be of the external type, if desired. Moreover, under certain conditions as in mild weather, the pre-heating means may be found to be unnecessary and may be omitted. Referring now to FIGURE 5 of the drawing it will be observed that the preheating means 42 is preferably in this installation in the form of a T-fitting 44 having at one end of the head of the T an internally threaded boss 46 receiving a threaded nipple 48 by which the discharge from the pressure reduction valve assembly 28 is delivered into a preheating chamber 50 disposed within the housing of the fitting 44. The stem of the T consists of a tubular boss 52 to which the conduit 30 is connected and by which the preheated second fuel is delivered from the device to the intake manifold of the internal combustion engine.

Disposed in the other end of the head of the T-fitting 44 is an externally threaded bushing or sleeve 54 in which is mounted a dielectric body 56. Disposed in this body is a terminal 58 to which an electric resistance coil 60 is connected, the sleeve-like lower end 62 of the member 54 being closed as by a closure plug 64.

The member 54 and its contents constitutes a heating element or unit which is disposed in and extends throughout the length of the preheating chamber 50 so that the incoming second fuel mixture from the nipple 48 of the pressure reduction valve assembly 28 will be preheated before it is discharged through the boss 52 and the conduit 30 into the internal combustion engine intake manifold 12.

An electric connector as at 66 connects the terminal 58 with any suitable source of electrical current, as for example an electric supply lead 68, see FIGURES 1 and 2, which may be connected to any suitable source of electric current. A control unit shown at 70 is conveniently mounted upon the extending portion 40 of the handle 36 and serves to mount two switches, one of which having the switch control element 72 controls the flow of electric current to the preheater unit 42 and the other having a switch control element 74 is connected to an electric conductor 76 which energizes and activates a conventional-type solenoid valve indicated at 78 and which is shown interposed in the conduit 30 between the preheater 42 and the intake manifold 12 and a quick detachable connection 32. Inasmuch as the solenoid valve 78 may be of any conventional well known design, a description of its construction and operation, is deemed to be unnecessary for the purposes of this invention. In some instances the solenoid control valve may alternatively be interposed between the container 22 and the pressure reduction valve assembly 28 or between the latter and the preheater unit 42.

As so far described the operation of this form of the invention will now be readily understood. When its services are desired, the portable attachment 20 is operatively connected to an engine intake manifold by connecting a quick detachable coupling 32 to the manifold which has been previously prepared to receive the same. The switch control element 72 is then actuated to energize the preheater unit 42. Thereupon the manually operated control unit 24 is opened to emit the second fuel contained by the tank 22 to the pressure reduction valve assembly 28 from whence it is preheated by the unit 42 and then passes through the conduit 30 to the control valve 78. Manipulation of the element 74 then causes this valve to open whereupon the volatile fuel is supplied to the internal combustion engine manifold so that when the engine has started its operation the highly volatile thoroughly vaporized and relatively more powerful combustible of the second fuel supply will effect starting and running of the engine during its warm-up period. After the engine has been started and warmed up sufficiently, the second fuel supply is cut off by the valve 24, the remaining fuel exhausted from the line and the quick detachable connection 32 is disengaged and the device is then removed from the engine which will function in its normal conventional manner.

In the portable form of the invention disclosed in FIGURES 1 and 2, it is more convenient to mount the control unit 70 upon the handle 36 of the support means of the attachment. It is of course possible, however, to position the control unit upon other places remote from the preheater and solenoid valve controlled thereby as upon various portions of a vehicle at the convenience of the driver thereof. FIGURES 8 and 9 disclose such alternative positioning thereof wherein a portion of a vehicle dash is shown at 80. In FIGURE 8, the customary choke control button shown at 82 has mounted thereon a supporting bracket 84 by means of which the finger-operated control switch 86 is mounted, the latter being connected to the previously mentioned conductor 76 for energizing the solenoid valve 78.

Similarly, as shown in FIGURE 9, there is mounted upon the dash a control switch 88 which likewise is connected to the conductor 76.

Reference is now made to FIGURES 3 and 4 which show the principles of the invention embodied in a more or less permanent installation upon an engine and a motor vehicle.

The attachment in the form shown in FIGURE 3 is indicated generally by the numeral **90**. It includes the pressure reduction valve assembly **28**, the preheating means or preheater unit **42** and the solenoid valve **78**, the same electric conductors to the preheater and the solenoid valve being shown at **66** and **76**. In this form of the invention, however, there is provided a control unit indicated generally by the numeral **92** and this unit together with the second fuel container **22** and the solenoid valve and preheater unit are assembled in a somewhat different relationship.

Referring to FIGURE 4 it will be observed that there is provided a U-shaped bracket **94** secured to the underside of the pressure reduction valve assembly **28** by means of which the latter is attachably secured upon the engine block **96** of any conventional type internal combustion engine mounted in the motor vehicle or if preferred in the engine compartment. The conduit **30**, by which the vaporized second fuel after being preheated by the unit **42**, is shown, this conduit communicating with the intake maniflod, not shown, in the same manner as that set forth in connection with FIGURES 1 and 2. However, the solenoid valve **78** is now disposed on the inlet side of the pressure reduction valve assembly **28** so that it constitutes, as in the preceding form, the regulating or control valve for supplying the fuel.

Referring again to FIGURE 3 it will be observed that the control unit **92** consists of a housing having a projecting and apertured flange **98** upon which flange is mounted and through which flange extends a connecting conduit **100**. The latter in turn is secured as by an elbow fitting **102** with the conduit **26** connected to the container **22** which is portable in this embodiment. As shown in FIGURE 4 the latter may be conveniently mounted upon the firewall **104** of a motor vehicle with the control unit **92** being disposed within the body of the motor vehicle and preferably recessed beneath the dash **80** thereof. Suitable grommets **106** serve to permit passage of the connecting conduit **100** therethrough and also the conduits **66** and **76** to the preheater **42** and the solenoid valve **78**.

Referring again to FIGURE 3 it will be observed that the control unit **92** includes the control switch element **110** to which the solenoid conductor **76** is attached and also a switch control element **108** to which the preheater conduit **66** is connected. The control unit may be mounted upon any convenient portion of the vehicle, being illustrated as carried by the steering column.

A clamping bracket **112** is secured to apertured projecting lugs **114** upon the housing of the control unit **92** and further clamping elements including a member **116** and a clamping member **118** cooperate with the apertured lugs **120** on the bottom side of the housing of the control unit and by means of fasteners **122** may be utilized to detachably mount the control unit upon the steering column of a motor vehicle. As shown in FIGURE 7, the steering column **124** may constitute a convenient means for supporting the control unit **92**, which is secured to the column **124** either by the bracket clamp **118** on the underside of the housing or the clamping means **125** at one end of the housing. Where the attachment is more or less permanently installed in a vehicle as in FIGURES 3 and 4, the necessary supply of current for the preheater unit **42** and the solenoid valve **78** may be obtained by suitable connection to the vehicle storage battery, not shown.

The operation of this form of the invention insofar as the starting and warming up of an internal combustion engine is concerned is identical with that previously described, the chief difference residing in the location and structure of the control unit **92**, the location of the container **22** containing the second fuel supply and the association of the solenoid valve assembly and of the preheater unit **42** with the pressure reduction valve assembly **28**.

In FIGURE 6 there is shown still another application of the invention in which the numeral **130** indicates a conventional type of automotive vehicle having its internal combustion engine **132** disposed in the rear portion thereof. Either of the two preceding forms of the invention shown in FIGURES 1, 2 or FIGURES 3 and 4 may be employed with the engine **132**. However, in FIGURE 6 there is shown a modified installation arrangement. For this purpose, a mounting bracket **134** is suitably mounted upon the engine **132**, or if desired in the engine compartment, and upon the bracket is supported the pressure reduction valve assembly **28** and by means of the fastening clamps **34**, there is similarly supported the second fuel container **22** in the manner previously described. The operation of this form of the invention is identical to that previously described and either the portable arrangement of FIGURE 1 and its control means or the more permanent installation of FIGURE 3 with the control unit **92** of the alternative control arrangement shown in FIGURES 8 and 9 may be employed.

FIGURE 7 discloses a somewhat different mounting of the control unit from that of FIGURES 3 and 4. Here, the control unit is shown secured by its clamps to the steering column of the vehicle and against the vehicle **80**. This arrangement provides a somewhat more convenient disposition of the control means for the device.

Where advantageous, a heat insulating jacket or coating may be applied to the heater **42** or to any other portions of the invention.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. An internal combustion engine of the type having an intake manifold with a fuel and air mixing means connected thereto and supplying a first combustible fuel mixture and an attachment connected to said manifold and supplying thereto a second enriched combustible fuel mixture, said attachment including a source of a second fuel under pressure, a conduit means connected to said source and to said intake manifold, a pressure reduction valve assembly in said conduit means disposed between and connecting said second fuel source to said intake manifold, preheating means disposed in said conduit means and between said pressure reduction valve assembly and said intake manifold and applying heat to said second fuel prior to its introduction into said intake manifold to compensate for the temperature reduction of said second fuel during its passage through said pressure reduction valve assembly, a control valve disposed in said conduit means and regulating the flow of said second fuel into said intake manifold and fuel control means connected to said control valve.

2. The combination of claim **1** including heat control means connected to said preheating means regulating the heat applied thereby to said second fuel.

3. The combination of claim **1** wherein said preheating means is electrically operated, a solenoid control valve regulating the flow of said second fuel into said intake manifold, electric controls for and disposed remote from said preheating means and said solenoid valve.

4. The combination of claim **1** wherein said preheating means comprises a housing having a heating unit disposed therein, said pressure reduction valve assembly and said conduit communicating with said housing.

5. The combination of claim **1** wherein said second fuel source comprises a container having a volatile fuel stored therein under pressure, support means removably

but fixedly securing said container to said pressure reduction valve assembly.

6. A portable auxiliary fuel attachment for internal combustion engines of the type having an intake manifold with a first fuel combustible mixture connected thereto, said attachment comprising a source of a second fuel under pressure, a conduit having a quick-detachable communication with said intake manifold, a pressure reduction valve assembly connecting said second fuel source to said conduit, preheating means disposed between said pressure reduction valve assembly and said intake manifold and applying heat to said second fuel prior to its introduction into said intake manifold to compensate for the temperature reduction of said second fuel during its passage through said pressure reduction valve assembly, said preheating means being electrically operated, a solenoid control valve regulating the flow of said second fuel into said intake manifold, electric controls for and disposed remote from said preheating means and said solenoid valve.

7. A portable auxiliary fuel attachment for internal combustion engines of the type having an intake manifold with a first fuel combustible mixture connected thereto, said attachment comprising a source of a second fuel under pressure, a conduit having a quick-detachable communication with said intake manifold, a pressure reduction valve assembly connecting said second fuel source to said conduit, preheating means disposed between said pressure reduction valve assembly and said intake manifold and applying heat to said second fuel prior to its introduction into said intake manifold to compensate for the temperature reduction of said second fuel during its passage through said pressure reduction valve assembly, said preheating means comprising a housing having a heating unit disposed in heat exchange relation therewith, said pressure reduction valve assembly and said conduit communicating with said housing.

8. The combination of claim 7 wherein said second fuel source comprises a container having a volatile fuel stored therein under pressure, support means removably but fixedly securing said container to said pressure reduction valve assembly.

9. The combination of claim 8 wherein said support means includes clamps on said pressure reduction valve assembly releasably embracing said container, said handle being secured to said clamps.

10. The combination of claim 9 wherein said preheating means is electrically operated, a solenoid control valve regulating the flow of said second fuel into said intake manifold, electric controls for and disposed remote from said preheating means and said solenoid valve, said electric controls being mounted upon said handle.

11. The combination of claim 1 including a support means having a carrying handle, said second fuel source comprising a container having a volatile fuel stored therein, means securing said container to said handle for portability therewith, control means for regulating said preheating means and control means for said control valve both mounted upon said support means.

12. The combination of claim 11 wherein said pressure reduction valve assembly is mounted upon said support means.

13. The combination of claim 12 wherein said preheating means is mounted upon and carried by said pressure reduction valve assembly.

14. The combination of claim 1 including a support means having a carrying handle, said second fuel source comprising a container adapted to have a volatile fuel stored therein, means securing said pressure reduction valve assembly to said container and mounting both upon said support means, said preheating means being mounted upon said pressure reduction valve assembly.

15. The combination of claim 14 including control means for regulating said preheating means and control means for said control valve both mounted upon said handle.

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