

Sept. 27, 1949.

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2,482,864

LIQUID FUEL CARBURETOR

Filed Dec. 1, 1944

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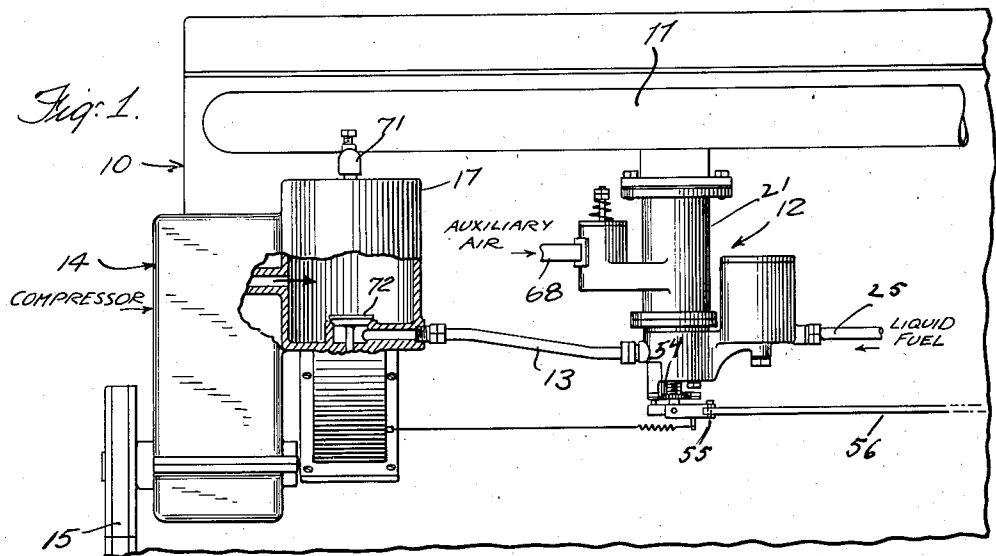
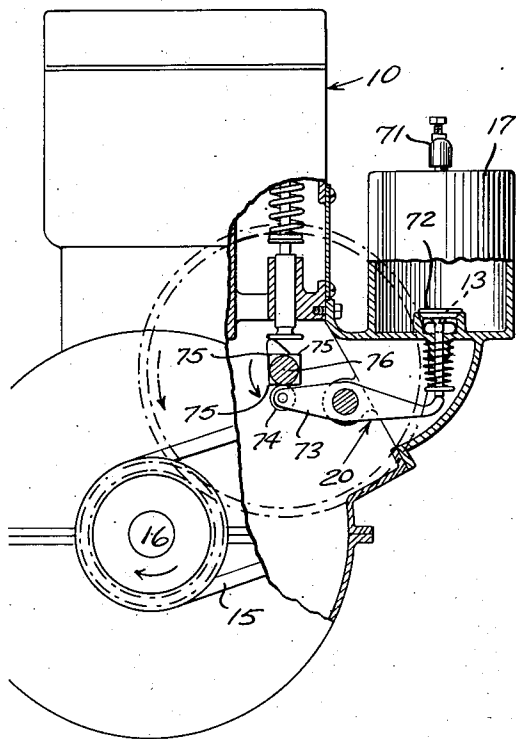
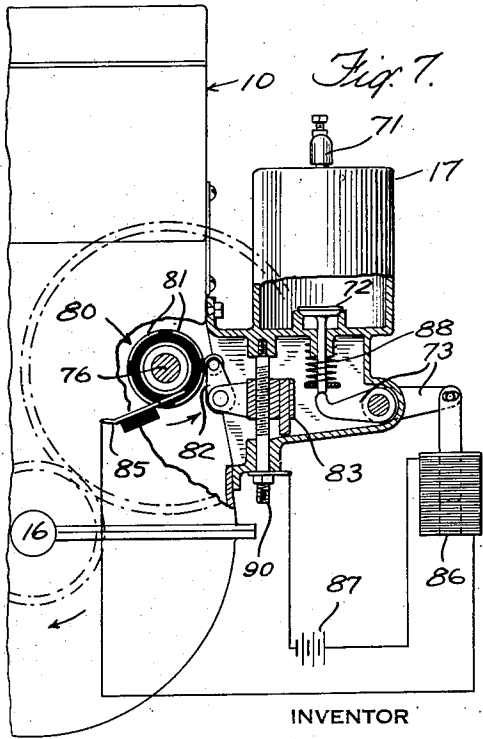


Fig. 2.



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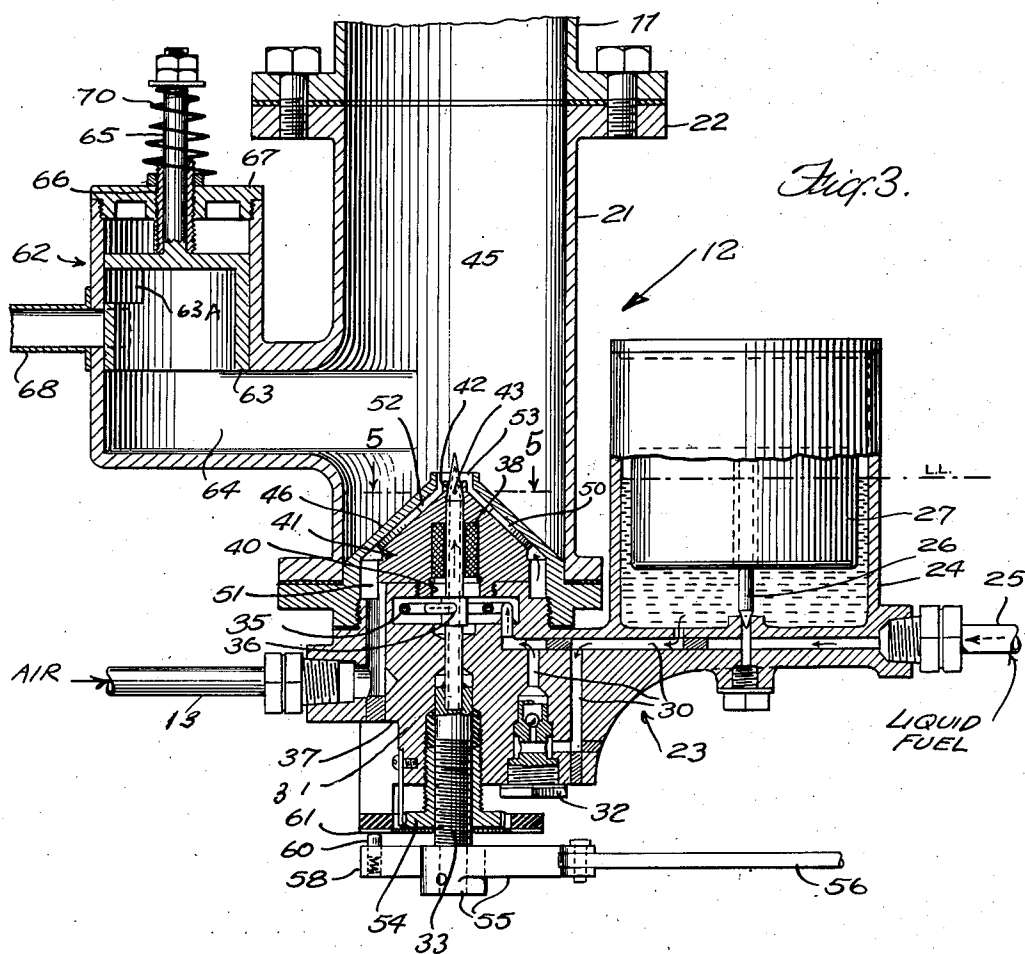
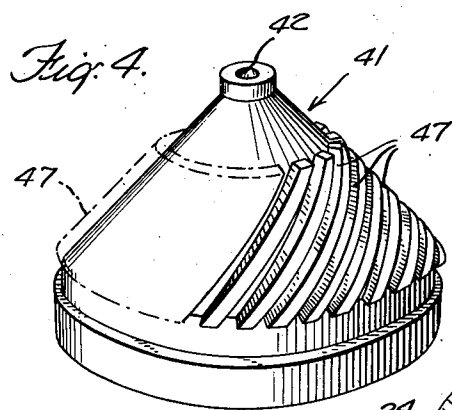
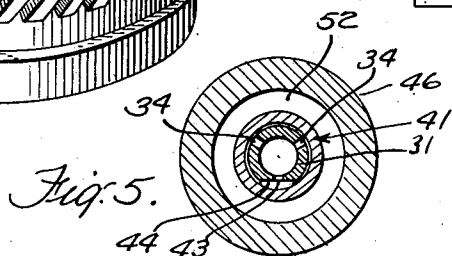
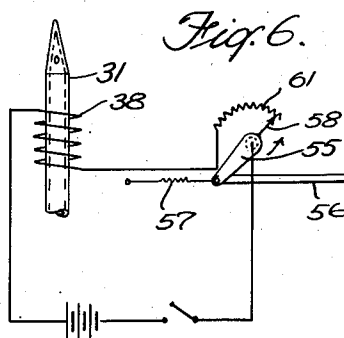
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Filed Dec. 1, 1944

2 Sheets-Sheet 2



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2,482,864

LIQUID FUEL CARBURETOR

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Application December 1, 1944, Serial No. 566,116

11 Claims. (Cl. 123—131.)

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My invention relates to liquid carburetor devices and more particularly of the type for use in internal combustion engines. One of the objects of this invention is to provide an apparatus of the above mentioned character which will be capable of high efficiency of operation. Another object is to provide an apparatus of the above mentioned character in which variable speeds of an internal combustion engine may be dependently achieved without sacrifice of economy of operation. Another object is to provide a device of the above mentioned character in which the liquid fuel is converted into a gas and super-charged into the power plant in proper proportions depending upon the requirements of the engine. A further object is to provide an air control means which controls the air supply in measured amounts prior to the opening of the intake valves in any one of the cylinders. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combination of elements, arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings two of the various possible embodiments are shown by the way of illustration, in which Fig. 1 is a view in side elevation, with certain parts broken away of an internal combustion engine with the carburetor apparatus embodying the present invention.

Fig. 2 is a front end view with certain parts broken away of an air control mechanism shown in Fig. 1.

Fig. 3 is an enlarged vertical section view of my carburetor device embodying the invention.

Fig. 4 is an enlarged perspective view of a part of my carburetor device shown in Fig. 3.

Fig. 5 is an enlarged sectional view taken on line 5—5 of Fig. 3 showing the nozzle construction of my carburetor device.

Fig. 6 is a wiring diagram showing a heater and manual control diagrammatically.

Fig. 7 is an end view similar to Fig. 2 embodying a modified form of my invention.

Referring to the drawings, for a more detailed description of the invention, in Fig. 1 of the drawings there is shown an outline of an engine 10 having the usual intake manifold 11 to which is secured the carburetor apparatus 12. Adjacent to the carburetor and connected thereto, as by means of a conduit or pipe 13, is a compressor or pump unit 14 driven by a belt 15 from a crank-

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shaft 16 of the engine 10. Integral with the pump unit 14 and communicating therewith is an air reservoir 17, and the associated valve mechanism, generally indicated at 18, which will be more fully described hereinafter.

Referring now to Fig. 3, the carburetor 12 comprises a body or casing 21 provided with the usual flange 22 for securing same to the intake manifold 11 referred to above. The lower end of the casing 21 has attached thereto, as by means of screws, not shown, the carburetor unit, generally indicated at 23, and is provided with the usual float chamber 24 for controlling the flow of fuel from the supply pipe line 25 by means of the conventional needle valve 26 which is controlled by the usual float 27 actuating the needle valve by well known means, not shown. The fuel is thus held at the proper operating level.

Communicating with the float chamber 24 is a passage 30 which feeds the fuel to a hollow needle or fuel nozzle 31, hereinafter referred to as a fuel nozzle. The passage is provided with a ball check valve generally indicated at 32 to prevent the return of fuel to the float chamber 24.

The fuel nozzle 31 takes the form of a tube for the passage of fuel and is vertically and centrally disposed in the lowermost part of the cylindrical body 21. The lower end of the tube forming the fuel nozzle is secured to a threaded shank 33 and the upper tapered end is provided with a series of holes 34, and not necessarily limited to three in number as shown in Fig. 5. The fuel nozzle is further provided, intermediate of its ends, with a flexible connection 35 the inner end of which is connected at 36 and communicating with the passage in the fuel nozzle. The outer end of the flexible connection 35 is brazed or otherwise secured within the passage 30, in the casting 37. This provides a flexible connection for the fuel nozzle for reasons to be pointed out hereinafter.

Located just above the flexible connection and surrounding the fuel nozzle 31 is a heating element 38. This heating element is received in a bore 40 in an air cone 41 which is threaded into the casting 37. The upper end of the air cone is counterbored to provide a seat 42 for the fuel nozzle. The seat is complementary to the tapered end of the fuel nozzle and co-acting therewith to normally close all holes 34, except hole 43, which is provided with a cut-away portion 44, as shown in Fig. 5. This effectively allows fuel to pass from within the fuel nozzle to the mixing chamber 45, formed by the above mentioned cylindrical body 21, thus enabling the engine 10 to idle when the fuel nozzle is fully seated against

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the conical seat 42. The air cone 41 is further provided with a conical cap 46 which with the spiral grooves 47 form spiral passages 50, communicating with an annular passage 51 which receives compressed air from the above mentioned conduit 13. The upper end of the spiral passages 50 fall short of the apex of the cone, forming a conical chamber 52. The conical cap 46 at its apex is provided with a cylindrical bore 53 which, surrounding the fuel nozzle, forms an annular mixing chamber, and an effective one, because of the change of the direction the compressed air must take, and the turbulent motion of the compressed air, is given, by the spiral passages 50.

Both the fuel and the compressed air are heated to desired temperatures by the properly designed heating element 38, and associated parts, thus, as the liquid fuel passes through the fuel nozzle, and at a point substantially above the heating element, the fuel is transformed into vapor. This vaporized fuel, upon further mixing with the preheated compressed air, constitutes a fuel highly superior to those produced by methods now in common use.

The foregoing treatment of the fuel therefore, in light of this development, presents a vapor fuel of very desirable characteristics.

Upon being transformed into heat energy in the combustion chamber of an internal combustion motor complete combustion is attained regardless of the R. P. M. of the engine.

To regulate the R. P. M. of the engine above the idling speed, the fuel nozzle 31 is arranged to turn on its vertical axis, and for this purpose an internally packed gland nut 54 is provided through which passes the threaded shank 33 co-operating with internal threads of the gland nut 54. Secured to the lower and projected end of the shank 33 is an arm 55 whose forked end is secured to a rod 56, the other end of which is connected to the usual foot accelerator, not shown. Thus it will be seen, that upon the respective movements of the arm 55 the fuel nozzle is caused to operate up and down in a semi-spiral motion in accordance to the pitch of the threads on the shank 33. The flexible connection 35 allows for both the axial rotation of the fuel nozzle and also the movement in the vertical plane thereof, without impairing the flow of fuel to the fuel nozzle. A tension spring 57 is used to return the arm 55 to the original or idling position diagrammatically shown in Fig. 6.

An extension 58, diametrically opposed to the arm 55, is provided with a spring pressed contact 60 which contacts turns or windings 61 of a resistance unit mounted securely on the casting 37. The purpose of the variable resistance is to control the heat created in the heating element 38 in order to adapt it to the fuel requirement of the internal combustion engine 10. For example: when the engine is idling the vaporized fuel requirement is low, therefore, the maximum resistance in the circuit is necessary, to control the amount of heat imparted to the liquid fuel, and thereby control the heat of vaporization, as required by the engine. This position of the extension 58 for the minimum vapor requirement, is shown in Fig. 6. Now, as the arm 55 is turned in the direction of the arrow the flow of vapor is increased through the unseating of the fuel nozzle which brings the auxiliary holes 34 into operation, as best shown in Fig. 5. At the same time as the number of turns in the resistance are cut the temperature in the heating element is raised to a

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point where the increased heat of vaporization is commensurate with the requirements of the increase in the fuel.

The design of the fuel nozzle 31 may be so proportioned, with respect to the air pressure and pipe 13, as well as the spiral air passages 50, conical chamber 52 and cylindrical chamber 53, that an operative proportion of air and vapor is accomplished under varying operating conditions, the most efficient proportion being produced at the normal usual speed of the engine. It may be remarked that the engine may be a stationary one where the proportion may be regulated once only and practically permanently. It also is to be noted that the regulating valve may be inserted into the compressed air line 13, and the same may be connected with the fuel control means, as it is well known in this art, whereby an increase or a reduction in the fuel fed will cause an increase or a reduction in the quantity of air introduced into my device. This regulating valve has been omitted from the drawings for the sake of clearness, and also because it is a usual well known device in this art. There may be temporary phases in the operation of the engine when secondary air may be needed. For such exceptional condition, an auxiliary air valve, generally indicated at 62, see Fig. 3, is provided, which takes the form of an inverted cup 63. It operates in a cylindrical extension integral with, and communicating, as by means of an air passage 64, with the mixing chamber 45. Extending up from the valve cup 63 and secured thereto is a shank 65 projecting through an adjustable bushing 66 threaded into a closure cap 67. This bushing limits the upward travel of the valve, which in the closed idling position, shown in Fig. 3, cuts off the auxiliary air supply passage 68. A spring 70 surrounding the shank 65 is adjustable, as by means of nuts threaded on the shank, and serves to adjust the pressure which retains the valve against the above mentioned bushing 66. Thus the secondary air which may be preheated before entering the carburetor is closed off by the valve 63 until under certain operating conditions the air within the mixing chamber 45 drops below atmospheric pressure in which case the valve 63 moves down and opens the passage 68, by the aperture 63a.

Referring to Figs. 1, 2, the pump unit 14, and the air reservoir 17, including the associated valve mechanism generally indicated at 20, will now be described.

In order to have a supply of air under pressure for use in the carburetor 12 an air reservoir 17 is provided, which receives air from a compressor 14. An adjustable relief valve 71 is located at the top of the reservoir and when set, a predetermined air pressure is obtained. The reservoir is further provided with a poppet valve 72 which controls the amount of compressed air to be used in the carburetor. The poppet valve is opened by a rocker arm 73, the inner end of the arm carrying a cam roller 74. Four cam lobes 75 mounted for rotation on the conventional engine cam shaft 76 actuate the rocker arm. Thus it will be seen that the cam shaft 76 will rotate once for two revolutions of the engine crankshaft 16, and opens the poppet valve 72 four times during its revolution, that is, once for each suction stroke of a four cylinder, four stroke cycle engine. For engines having more or less cylinders, the number of cam lobes 75 will be increased or reduced according to the case.

It will be understood that the engine is not

limited to four cylinder engines but also applicable to any multi-cylinder type, irrespective of their firing order, and also includes two stroke cycle engine.

Referring to the modification shown in Fig. 7 an electrical means is provided for activating the poppet valve 72. This takes the form of a commutator 80 secured to the engine cam shaft 76 and rotated therewith. Contacts 81 are spaced equidistant apart and insulated one from the other. Contact 81 co-operates with a contact arm 82 pivotally mounted on an adjustable bracket 83. A collector ring 84 co-acts with a contact brush 85 which in turn is wired electrically to a solenoid 86. The other end of the circuit is grounded through the engine to the bracket 83 and thence to the contact arm 82. A battery 87 provides the energy to actuate the solenoid 86. A rocker arm 73 operates poppet valve 72, as in the first embodiment.

The operation of the poppet valve is similar to that shown in Fig. 2 and the contacts 81, four in number, correspond to the four cam lobes 75 in the above mentioned Fig. 2.

Thus one revolution of the commutator 80 will send four impulses through the solenoid 86 energizing same which through the rocker arm 73 opens the poppet valve 72. A spring 88 returns the poppet valve to its seat closing the air supply to the engine when the solenoid is de-energized.

The cycle of operation is the same for this modified form as for the form previously described. However it differs in respect to the adjustment of the contact arm 82 which is done by a threaded shank 89. Adjustment can be achieved to retard or advance the opening and closing of the poppet valve.

It will be seen from the herein specification in connection with the drawings, that I provided a device of the character in view, in which the intake of a liquid fuel into a combustion device, and particularly into an internal combustion engine, is greatly improved over the methods now in use. The liquid fuel being exposed through a needle valve or the like, to a stream of compressed air, will be provided with means for more perfect combustion not known or used before, and particularly will this combustion be effected in view of the perfect mixing due to the whirling turbulent motion imparted to the compressed air.

These factors, obviously, also will greatly aid in the vaporization of the fuel.

The blowing of the compressed air may be entirely timed to the work cycle of the engine, and the mixture may also be pre-prepared, a reserve amount of it may be ready for the intake of the engine, another factor for more efficient operation.

I provide a minimum amount of feeding of fuel even when the motor is idling, in which case at present the combustion is very imperfect, while with my device, it will receive ample oxygen and the engine will run with the least consumption of fuel and with more perfect combustion.

I also provide heating means for the liquid fuel preliminary to the mentioned blowing in, mixing, and vaporizing of it, another factor for more perfect operation, and also provide simple regulation of the amount of fuel fed, and provide means to simultaneously and automatically adjust the heating to the amount of the fuel.

While I have shown preferred embodiments of my invention, it is to be understood that changes and variations may be resorted to in the elements, construction or use of my invention, and

I reserve my rights to such changes, variations and uses, as are within the spirit of this specification and the scope of the claims hereunto appended. I also may offer the following remarks:

It may be noted that in the drawings the pump and the compressed air reservoir 17 are shown as being relatively small compared to the engine to which they are attached. However, I do not want it to be understood that such proportion is the one used in the actual practice of my invention. The drawing is only a diagram and has been made with a view of clarity of showing. Those versed in this art, if they desire to practice this invention, will be able to make the pump and the compressed air reservoir of such size, delivery, capacity, and pressure, as will be required by the engine in view. It also will be understood that more than one pump cylinder may be operated by the engine feeding it to one sufficiently large reservoir 17 or possibly even each into a separate reservoir, which then may jointly feed into the compressed air line 13.

What I claim as new and want to protect by Letters Patent of the United States, is:

1. In a liquid fuel carburetor, a needle valve, having a bore connected with a source of liquid fuel, said bore having communicating openings for the exit of the fuel at the end of the valve, a hollow member surrounding said end of the valve, means to feed a compressed oxidizing medium under pressure, like air, through said hollow member, whereby said medium will carry and vaporize the fuel passing through said exit opening, and will be thoroughly mixed with it, said device feeding the ready fuel mixture into the intake manifold of an internal combustion engine, means to normally close the communication between the source of said compressed oxidizing fluid medium and said device, and means actuated by an element of said engine to intermittently permit the passing of said compressed fluid medium through said device, in accordance with the operation of the engine.

2. In a liquid fuel carburetor, a needle valve, having a bore connected with a source of liquid fuel, said bore having communicating openings for the exit of the fuel at the end of the valve, a hollow member surrounding said end of the valve, means to feed a compressed oxidizing medium under pressure, like air, through said hollow member, whereby said medium will carry and vaporize the fuel passing through said exit openings and will be thoroughly mixed with it, said device feeding the ready fuel mixture into the intake manifold of an internal combustion engine, means to normally close the communication between the source of said compressed oxidizing fluid medium and said device, and means actuated by an element of said engine to intermittently permit the passing of said compressed fluid medium through said device, in accordance with the operation of the engine, said element of the engine being a shaft therein, and said means to intermittently permit access of the compressed fluid medium to the device including a cam operated by said shaft, a valve normally closing the conduit between the source of the compressed fluid and the device, and a lever adapted to open said valve at desired phases of the cam operation.

3. In a liquid fuel carburetor, a needle valve, having a bore connected with a source of liquid fuel, said bore having communicating openings for the exit of the fuel at the end of the valve, a hollow member surrounding said end of the valve,

means to feed a compressed oxidizing medium under pressure, like air, through said hollow member, whereby said medium will carry and vaporize the fuel passing through said exit openings and will be thoroughly mixed with it, said device feeding the ready fuel mixture to an internal combustion engine, means to normally close the communication between the source of said compressed oxidizing fluid medium and said device, electrical means to open said conduit at desired intervals in accordance with the operation of the engine, and a rotating intermittent switch device on said engine to close the electric circuit for the electrical device at said desired intervals.

4. In a liquid fuel converter device, a needle valve, having a bore connected with a source of liquid fuel, said bore having communicating openings for the exit of the fuel at the end of the valve, a hollow member surrounding said end of the valve, means to feed a compressed oxidizing medium under pressure, like air, through said hollow member and over said openings, whereby said medium will carry and vaporize the fuel passing through said exit openings, and will be thoroughly mixed with it, said device feeding the ready fuel mixture into the intake manifold of an internal combustion engine, means to normally close the communication between the source of said compressed oxidizing fluid medium and said device, and means actuated by an element of said engine to intermittently permit the passing of said compressed fluid medium through said device, in accordance with the operation of the engine.

5. In a liquid fuel converter device, a needle valve, having a bore connected with a source of liquid fuel, said bore having communicating openings for the exit of the fuel at the end of the valve, a hollow member surrounding said end of the valve, means to feed a compressed oxidizing medium under pressure, like air, through said hollow member and over said openings, whereby said medium will carry and vaporize the fuel passing through said exit openings, and will be thoroughly mixed with it, said device feeding the ready fuel mixture into the intake manifold of an internal combustion engine, means to normally close the communication between the source of said compressed oxidizing fluid medium and said device, and means actuated by an element of said engine to intermittently permit the passing of said compressed fluid medium through said device, in accordance with the operation of the engine, said element of the engine being a shaft therein, and said means to intermittently permit access of the compressed fluid medium to the device including a cam operated by said shaft, a valve normally closing the conduit between the source of the compressed fluid and the device, and a lever adapted to open said valve at desired phases of the cam operation.

6. In a liquid fuel converter device, a needle valve, having a bore connected with a source of liquid fuel, said bore having communicating openings for the exit of the fuel at the end of the valve, a hollow member surrounding said end of the valve, means to feed a compressed oxidizing medium under pressure, like air, through said hollow member and over said openings, whereby said medium will carry and vaporize the fuel passing through said exit openings, and will be thoroughly mixed with it, said device feeding the ready fuel mixture to an internal combustion engine, means to normally close the communica-

tion between the source of said compressed oxidizing fluid medium and said device, electrical means to open said conduit at desired intervals in accordance with the operation of the engine, and a rotating intermittent switch device on said engine to close the electric circuit for the electrical device at said desired intervals.

7. In a device, as set forth in claim 4, said compressed fluid medium being fed before the suction stroke of the engine, whereby the mixture will be ready in said intake manifold at the start of the suction stroke in any of the cylinders of the engine.

8. In a liquid fuel converter device, a needle valve, having a bore connected with a source of liquid fuel, said bore having communicating openings for the exit of the fuel at the end of the valve, a hollow member surrounding said end of the valve, means to feed a compressed oxidizing medium under pressure, like air, through said hollow member and over said openings, whereby said medium will carry and vaporize the fuel passing through said exit openings, and will be thoroughly mixed with it, said device feeding the ready fuel mixture into the intake manifold of an internal combustion engine, means to normally close the communication between the source of said compressed oxidizing fluid medium and said device, and means actuated by an element of said engine to intermittently permit the passing of said compressed fluid medium through said device, in accordance with the operation of the engine, said element of the engine being a shaft therein, and said means to intermittently permit access of the compressed fluid medium to the device including a valve normally closing the conduit between the source of the compressed fluid and the device, and means between said shaft and said valve adapted to open said valve when desired.

9. In a liquid fuel converter device, a needle valve, having a bore connected with a source of liquid fuel, said bore having communicating openings for the exit of the fuel at the end of the valve, a hollow member surrounding said end of the valve, means to feed a compressed oxidizing medium under pressure, like air, through said hollow member and over said openings, whereby said medium will carry and vaporize the fuel passing through said exit openings, and will be thoroughly mixed with it, said device feeding the ready fuel mixture to an internal combustion engine, means to normally close the communication between the source of said compressed oxidizing fluid medium and said device, electrical means to open said conduit at desired intervals in accordance with the operation of the engine, and a switch device on said engine to operate said electrical means at said desired intervals.

10. In a liquid fuel converter device, means to feed liquid fuel to the same, means to feed compressed oxidizing medium under pressure, like air, through said device whereby said medium will carry and vaporize the fuel fed to the device and will be thoroughly mixed with it, said device feeding the ready fuel mixture into the intake manifold of an internal combustion engine, means to normally close the communication between the source of said compressed oxidizing fluid medium and said device, and means actuated by an element of said engine to intermittently permit the passing of said compressed fluid medium through said device, in accordance with the operation of the engine.

11. In combination, with an internal combus-

tion engine, having an intake manifold, of a fuel mixture preparing and feeding device, comprising a source of oxidizing gaseous medium compressed under pressure, a fuel feeding element, a fuel carburetor, means to blow said oxidizing medium under pressure through said carburetor in sufficient quantity for the total requirements of fuel mixture for operating the engine, and means in said carburetor to cause the fuel to be atomized by and mixed with said medium, and a connection from said carburetor to the manifold of the engine, whereby sufficient fuel mixture will be produced and introduced into the manifold before and independently of the suction stroke of the engine, means to intermittently stop and start the blowing of said oxidizing medium, said means being controlled by an element in the engine in accordance with its operation, said controlling means in the engine for intermittent operation of the oxidizing medium being electrical.

GUSTAV NEMNICH.

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