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HEAVY OIL CARBURETOR AND PREHEATER

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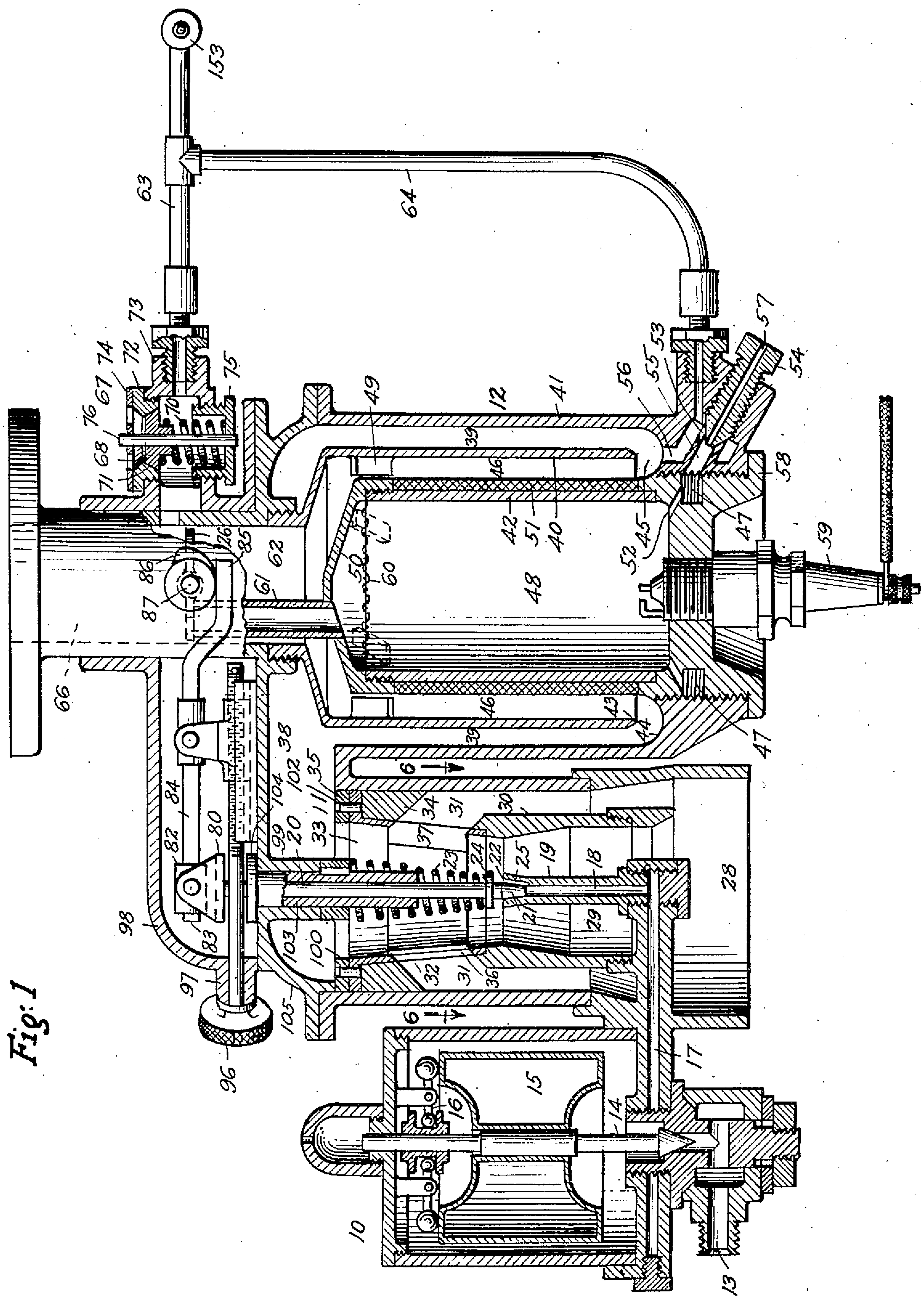

Fig: 1

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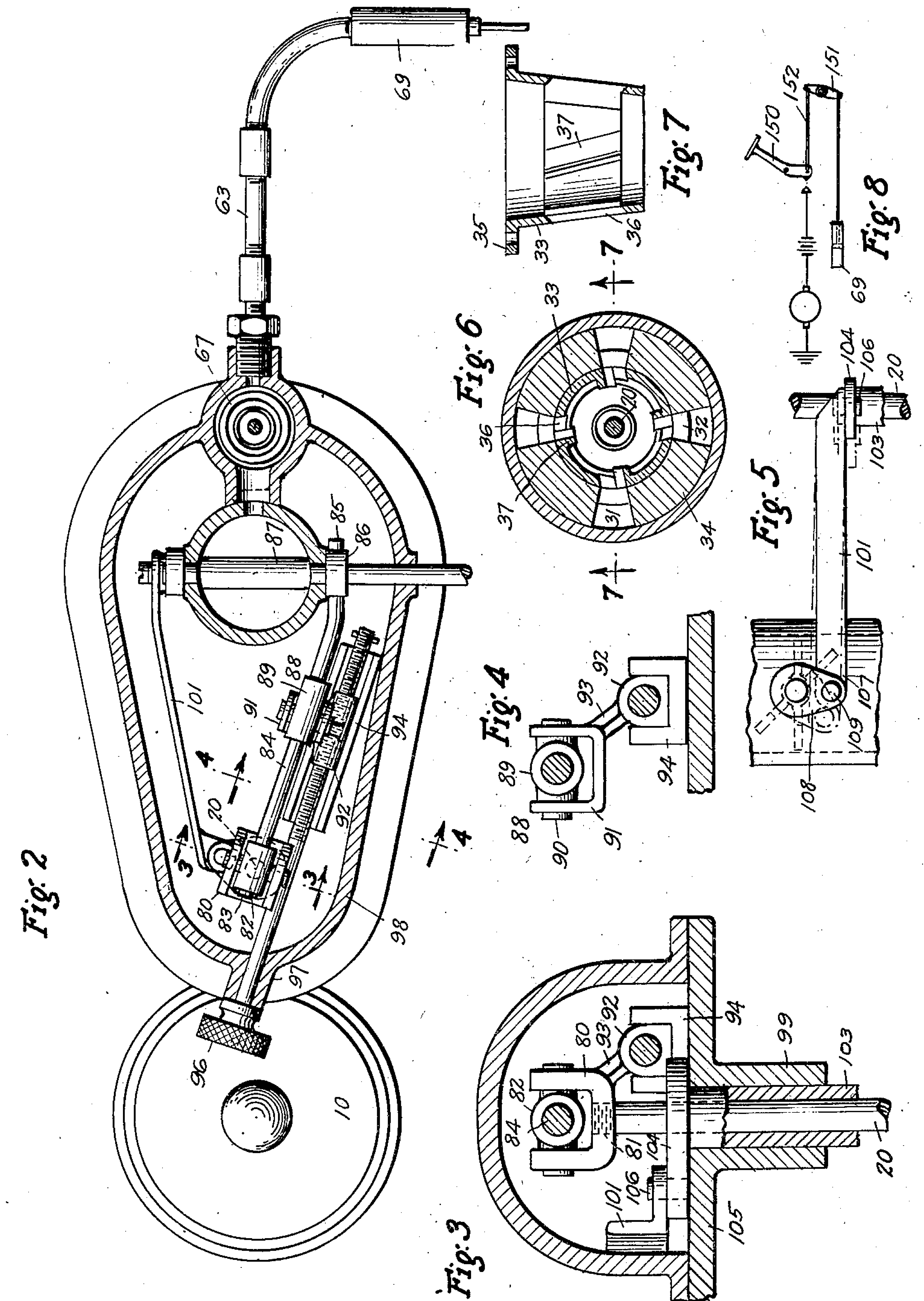

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UNITED STATES PATENT OFFICE

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HEAVY OIL CARBURETOR AND PREHEATER

Application filed November 29, 1929. Serial No. 410,363.

This invention relates to fuel preheating and vaporizing devices for internal combustion engines and contemplates, among other things, the provision of a simple and efficient fuel vaporizing mechanism which may readily be adjusted for use in connection with various types of fuels, to secure efficient commercial operation of internal combustion engines, such as automotive engines, with commercial practicability as distinguished from mere laboratory operation.

It has been found that the number of ton-miles obtainable per gallon of fuel is independent of the volatility of the fuel, but that the power derived is dependent upon the number of thermal units contained in the fuel and the effectiveness with which the thermal units are utilized. Heavier fuels should therefore be more economical than the lighter ones in proportion to the number of B. t. u.'s contained therein. It follows that since furnace oil, fuel oil, or similar heavier oil costs approximately half that of gasoline, if such comparatively heavy oils could be vaporized properly, such heavy oils should operate conventional gasoline engines at least as efficiently as the more volatile oils such as gasoline, and at a decreased cost.

Many attempts have heretofore been made to use such heavier oils in four-cycle internal combustion engines, but none of such attempts have been commercially practical for various reasons. For example, if the devices heretofore known have vaporized the oil with fair success, they have been open to the objection that they have been wasteful and inefficient, lacking flexibility of engine control due to the time interval required for proper vaporization under sudden increase in fuel feed.

They have been further inefficient due to the difficulty of starting a cold engine directly on such oil, without a supplementary high volatile fuel carburetion system such as a separate gasoline system on which the engine must be run until heated to the proper temperature, after which the heavier fuel may be fed to the engine. Further difficulties have been imperfect vaporization resulting in condensation of the fuel in the interior of the engine cylinders and consequent crank case oil dilution; power loss because of the difficulty of securing definite proportions of fuel mixtures; the production of excessive monoxide in the exhaust of the engine because of imperfect combustion caused by an excess of liquid fuel in the mixture; the loss of volumetric efficiency of the engine due to excessive heating of the mixture and consequent excessive decrease in its density; excessive detonation due to the uncertainty of the characteristics of the mixture; poor distribution to the various cylinders because of the use of wet mixtures; poor idling of the engine at low speeds and falling off of power at high speeds because of faulty distribution, resulting from condensation of fuel in the manifold; and the reduction in efficiency of the engine due to the use of wet or excessively rich mixtures necessary to prevent detonation where high gas compression was used before ignition of the mixture.

My invention contemplates the elimination of the above-mentioned defects by means which insures the feeding of a dry gas to the engine, which properly proportions the fuel and air automatically in accordance with the amount of throttle opening necessary to secure the desired range of speeds, insures flexible control, including the acceleration and deceleration necessary in automotive engines, insures easy starting of the engine at any outside temperature without a long preliminary run on a fuel of high volatility, and provides but one movable control, that is, the throttle, whereby the metering and vaporizing operations function automatically.

In carrying out my invention, I provide for the preheating of the fuel to a temperature in excess of the greatest natural atmospheric temperatures in order to secure proper volatilization of the fuel, whereby condensation of fuel into a liquid on the way from the carburetor to the cylinder is prevented.

I further provide an accurately metered charge of air and fuel to obtain good combustion and provide for ample turbulence in the fuel to promote mechanical mixing of the fuel and air and provide further, for a high velocity of the primary air stream entering the carburetor, to lift the heavier fuel particles from the spray nozzle, and I utilize any heavy unvaporized ends that may drip off inside of my device, as fuel in the combustion chamber to supply heat, instead of passing said ends into the engine cylinder to cause carbon deposits or excessive monoxide in the exhaust.

To preheat the fuel before the introduction thereof into the engine cylinders, I prefer to use an independent heating means instead of using the exhaust gases of the engine. I am therefore able to start proper preheating as soon as the engine is cranked instead of losing time by waiting for the exhaust gases to attain proper heating temperatures. By the injection of a priming charge of a volatile fluid simultaneously above the throttle and into the combustion chamber of the heating device, I am also able to attain prompt starting of the engine without the necessity of running the engine for any appreciable period on a volatile fluid.

In that practical embodiment of my invention to which I will now refer for purposes of exemplification and illustration, my improved carburetor consists of a fuel inlet control or float chamber, a metering or primary mixing chamber which includes a venturi, a secondary mixing and heating chamber, a final mixing chamber surrounding the combustion chamber, devices for securing turbulence of the mixture, and a final heating chamber leading to the manifold.

The various objects of my invention will be clear from the above, from the description which follows, and from the drawings in which,

Fig. 1 is a vertical section of my improved device, the axes of the various chamber casings being shown aligned for purposes of simplicity of illustration.

Fig. 2 is a top plan view of the same, partly in section, and showing the auxiliary air valve, and the throttle controlled needle valve adjusting and operating mechanism.

Fig. 3 is a vertical section of the upper end of the automatic needle valve controlling means, taken on the line 3—3 of Fig. 2.

Fig. 4 is a similar view of the mounting for the adjustable pivot for the needle lifting lever.

Fig. 5 is a rear elevational view of the connection between the throttle and the auxiliary air regulating sleeve of the venturi.

Fig. 6 is a horizontal section of said sleeve and of the mixing chamber, taken on the line 6—6 of Fig. 1.

Fig. 7 is a vertical section of the sleeve detail, and

Fig. 8 is a diagrammatic view of a starting lever, showing the connection thereof to the priming means.

In that embodiment of my invention which I have illustrated by way of example, referring to Fig. 1, the float chamber of more or less the usual construction is designated generally by the numeral 10, the mixing chamber by the numeral 11, and the combustion and heating chamber generally by the numeral 12. The main fuel inlet 13 into the float chamber is controlled by the needle 14 in substantially the usual manner by means of the float 15, and the mechanism 16 operatively connecting the needle to the float for the purpose of maintaining the level of the fuel at a predetermined height.

From the float chamber 10, the fuel passes through the inlet pipe 17 into the opening 18 of the spray nozzle 19, preferably located in and coaxially with the mixing chamber 11. The upper end of the spray nozzle 19 is at substantially the same height as the predetermined level of the fuel in the float chamber, which level can be adjusted in the usual manner by the usual mechanism in the float chamber illustrated, and hence which need not be described.

The tapered end of the spray nozzle is provided with a tapered opening 22 controlled by the mixture adjusting needle 20. The needle is tapered at its lower end 21 to seat on the correspondingly tapered opening 22. For normally maintaining the tapered end 21 on its seat, a suitable spring as 23 is provided, said spring urging the collar 24, secured to the needle, downwardly. A series of circumferentially spaced slots 25 of predetermined size may be made in the sides of the opening 22 for allowing the passage past the needle of a predetermined amount of fuel, sufficient to keep the motor operating when the throttle 26 is closed, at which time the needle end 21 is seated on the sides of the spray opening 22. The needle 20 is movable upwardly from its seat to provide additional fuel as the throttle is opened, as by means of a suitable connection to the throttle which will be described more fully hereinafter, whereby the quantity of the fuel fed is made dependent upon the throttle opening.

For providing a main air inlet past the spray nozzle and thereby causing the stream of entering air to atomize the liquid fuel discharged from the nozzle, the bottom of the mixing chamber is left open as at 28, whereby the main or primary air stream enters the interior space 29 of the venturi 30, vaporizing the sprayed fuel to saturation, and atomizing the remainder of the fuel.

The venturi is arranged preferably concentrically about the spray nozzle 19, and is made of two sections. It is arranged inside of the outer wall of the chamber 11, dividing said chamber into two concentric compartments. The outer compartment comprises the circumferentially spaced passages 31 communicating with the inner compartment when allowed to do so, through the adjustable slots 32 which may be entirely closed, if desired, by means soon to be described. It will be seen, therefore, that while the main stream of air enters the interior 29 of the venturi, other streams of air, capable of accurate adjustment as the volume, may also be allowed to enter the venturi through the passages 31 and the slots 32 as the throttle opening is increased. For adjusting the effective area of the passage 31, the effective size of the slots 32 are adjusted.

For this purpose, I prefer to provide a preferably conical shell as 33 forming the upper Venturi section flanged at its upper end 35 to rest on the closing portion 34 of the lower Venturi section. The shell 33 is provided with a series of slots as 36 therein (Fig. 6). At one edge of each of said slots, I provide a guide vane or plate 37, preferably inclined to the axis of the venturi, so that the air entering through the slots 36 is agitated and given a whirling motion to promote turbulence. Said vanes also divert the stream of air mixed with fuel passing up through the interior 29 of the venturi, to give said stream a whirling motion. The shell 33 is normally positioned so that the slots 32 are closed when the throttle is closed, but the shell is so connected to the throttle by means to be described hereinafter, that as the throttle opens, the shell is rotated to correspondingly open the slots 32, so that auxiliary air is admitted above the spray nozzle in the interior of the upper Venturi section to thin the otherwise rich mixture. The mixture is thus accurately metered in the proper proportions conducive to substantially complete varporization and combustion.

From the venturi 30, the mixture passes, under the influence of the engine suction, into the passage 38 communicating with the annular passage 39, which is formed by the arrangement of a substantially cylindrical wall 40 between the outer or casing wall 41 of the heating and combustion chamber 12 and the inner wall 42 thereof. The length of the wall 40 is such that the lower end 43 thereof is arranged in spaced relation to the bottom 44 of the annular passage 39. A well as 45 is thereby provided at the bottom of the passage 39 into which any liquid globules in the mixture may be deposited as said liquid accumulates on and drips off the end 43, when it passes said end into the inner annular passage 46. It will be noted that the inner passage 46 communicates with the outer passage 39 through the well 45 whereby the mixture is forced to change its direction and whereby any globules of liquid which may have been carried along in the mixture, are freed therefrom and accumulate in the well 45. From said well, a portion of the atomized mixture is diverted into the annular passage 55, from which it is injected into the interior 48 of the combustion chamber in a manner which will be soon pointed out.

The wall 40 is provided with a series of combined spacers, heat conductors, and vanes 49, preferably inclined to the axis of said wall and serving not only to agitate and to impart a whirling motion to the mixture passing thereby, but also, to maintain the top 50 of the combustion chamber 48 in its proper position, and having the additional function of conducting heat from the wall 42 to the wall 40. That portion of the wall 42 below the top 50 may, if desired, be covered with a suitable thickness 51 of heat insulating material such as a sheet of asbestos, or a winding of asbestos cord, or a lagging of asbestos fibre to control the temperature, as desired.

A minute quantity of fuel and air mixed in the proper proportions to form a properly burning mixture, to maintain constant heat in the chamber 48, is directed from the main stream of mixture to said chamber through a series of spaced openings 52 communicating with the annular passage 47 which, in turn, communicates with the passage 53, the effective area of said passage 53 being adjusted by the hollow needle 54. At the right of the bottom part of the combustion chamber, as viewed in Fig. 1, the passage 47 communicates with the well 45 through the passages 53, 55 and 56, whereby the mixture diverted into the well 45 is injected into the chamber 48 through the openings 52 by the engine suction, together with the stream of entering air passing through the passage 57 in the needle 54.

For ease in construction, assembly and disassembly, and for cleaning purposes, I prefer to make the lower part or bottom 58 of the combustion chamber of a separate piece of material screwed into the lower part of the wall 41 and provided with the annular passage 47 and the openings 52. Preferably centrally arranged in said bottom 58 is the spark plug 59, receiving current through the wire shown from a suitable source not shown, but in a manner which is well known in the art and need not be described. Similarly, the top 50 of the combustion chamber is made of a separate piece threaded to the wall 42 and serving to hold the flame screen 60 removably in position. An outlet pipe or stack as 61 is secured to said top 50 and extends up to the throttle 26 to allow the hot gases to leave the combustion chamber and to mix with the heated fuel mixture. Said mixture, after passing the outside of the wall 40 and thereby being partly heated at a first stage, enters the passage 46, is heated further at the second stage by the wall 42 and on striking the vanes 49, is agitated, being given a whirling motion and further heated.

After passing said vanes, the mixture enters the throttle zone 62, being further heated by the stack 61 and the top portion of the combustion chamber.

The third and final stage of heating is provided by injecting the hot gases resulting from combustion in the chamber 48 into the mixture as it passes the throttle 26.

An opening of the proper size is made in the throttle 26 to feed a sufficient amount of the mixture to properly start the engine and to maintain operation of the engine at idling speeds, and also to create sufficient suction in the combustion chamber to maintain ignition therein. It will be noted that all of the mixture leaving the venturi or metering or mixing chamber 11 must pass by the heated wall 40, around the bottom of said wall and up past the heated asbestos covering 51, then over the top of the combustion chamber and past the stack before reaching the manifold zone 66, and that the mixture is thereby thoroughly heated during its passage and mechanically mixed with the air to provide a complete mechanical mixture of fuel and air. It will further be seen that any excess liquid fuel which may possibly be present in the form of globules will become dislodged from the mixture in passing around the lower end of the wall 40 and will drain into the well 45, being injected into the combustion chamber under suction of the engine and the consequent high velocity of the air entering through the needle passage 57, and that the mixture of fuel and air so injected into the combustion chamber may be carefully proportioned so as to burn properly to supply the heat for vaporization of the fuel mixture. It will further be seen that any unburned fuel condensing in the well 45 after the engine ignition is cut off, readily drains off through the hollow needle passage 57.

A priming fluid of comparatively high volatility such as gasoline, is preferably used to start the operation of my improved device, particularly when the engine is cold. The injection of said fluid may be entirely automatic, requiring no attention on the part of the operator. Said fluid is injected simultaneously above the throttle 26 and into the combustion chamber by any suitable form of priming pump, shown diagrammatically at 69, Fig. 8, and operatively connected to the engine starting lever 150 as by means of the lever 151 and the link 152. A suitable check valve as 153 may be interposed between the pump 69 and the priming line 63 to prevent feed of priming fluid except for starting purposes. A branch as 64 of the priming line 63 leads to the diverted fuel passage 56. The priming line has interposed therein, the auxiliary air valve designated generally by the numerals 67 and serving to supply cool air to the mixture in any desired proportions just before the mixture enters the engine cylinders. Said valve consists of the valve head 68 supported on the spindle 76 and urged by the spring 70 against its seat 71. The seat 71 is preferably conical in shape and is formed on the nut 72 screwed into the casing extension 73 which carries the priming line 63. The upper end of the spindle 76 is guided by the member 74 while the lower end of said spindle is guided by the nut 75.

It will be seen that at comparatively high engine speeds, the valve head 68 is drawn downwardly against the action of its spring 70 and admits additional air above the throttle to cool the heated mixture and to promote volumetric efficiency at high engine speeds.

For starting purposes, a small quantity of priming fluid such as gasoline injected by the pump 69, on the operation of the starting lever 150, into the line 63, enters the manifold zone 66 above the throttle and simultaneously enters the space 48 of the combustion chamber. As the engine is cranked, fuel mixture is also drawn into the combustion chamber and forms a readily ignitible mixture with the priming fluid, which burns to heat the mixture drawn from the mixing chamber 11 into the combustion chamber passages. The priming fluid injected into the manifold zone 66 above the throttle 26, and in advance of the fuel mixture, tends to reach the engine cylinder slightly in advance of the mixture, and being highly volatile, ignites immediately in the engine cylinders, followed immediately by the heated mixture.

It will be understood that while the time intervals involved are extremely small, yet the injection simultaneously of priming fluid above the throttle and into the combustion chamber has proved to be efficient in starting cold engines and is an important factor aiding in making my device commercially operative. The engine is cranked simultaneously with the injection of the priming fluid, and a heated ignitible mixture introduced into the engine cylinders an inappreciable time after cranking of the engine is begun.

The proportions of air and fuel fed to the engine may be adjusted with extreme accuracy by means of my improved mechanism. This I accomplish by controlling the vertical movement of the needle 20 from its seat 21.

The mechanism illustrated for this purpose may consist of a fork as 80 secured to the upper end of the needle as at 81 and carrying a pivoted bearing as 82. Supported by said bearing is one end 83 of a suitable rod 84, the other end 85 of which is operated by a suitably shaped cam 86 secured to the throttle shaft 87. An adjustable pivot or fulcrum 88 is interposed between the ends 83 and 85 of the needle lifting rod 84. Said fulcrum may consist of a sleeve 89 provided with extensions 90 which are mounted in the fork 91. The fork is in turn secured to the slidable bearing 92 as by means of the arm 93. The rod

84 is supported by the slidable sleeve 89 to allow relative movement therebetween whereby the position of the sleeve 89 along the rod may be changed. The bearing 92 may be suitably shaped for support by the guideway 94. For adjusting the position of the bearing 92 and of the sleeve 89, said bearing is internally threaded to engage the micrometer adjusting screw 96 mounted as at 97 in one end of the casing 98. It will be seen that on rotation of the micrometer adjusting screw 96, the bearing 92, the arm 93, the fork 91 and the sleeve 89 are moved as a unit in the proper direction relatively to the guideway 94 and the rod 84, without moving the rod 84, and that the fulcrum for said rod is thereby changed in position. The lever arms of the rod 84 are thereby changed in length so that the upward movement of the end 83 of said rod against the action of the spring 23 and together with the needle 20, may be varied by the screw 96 for any given angular movement of the throttle shaft cam 86. The higher the volatility of the fuel used, the nearer the sleeve 89 is positioned to the end 83 of the rod 84 so that the needle is raised a smaller amount for any given rotation of the cam 86.

Since the thread of the adjusting screw 96 is of fine pitch, extremely small movements may be imparted to the fulcrum 88, and an extremely fine variation of the relation between the cam profile lift and the needle movement may be attained, to produce most efficient operation of the engine on the particular type of fuel supplied.

At high engine speeds, not only must more fuel be fed to the engine by the means just described, but more air in proportion should be mixed with the fuel. The air entering the inside passage 29 of the venturi 30 passes at comparatively high velocity through the constricted portion of the venturi and past the top 21 of the spray nozzle 19, and thereby aspirates the liquid fuel from the passage 18 into the air stream at all engine speeds. The additional air needed for high engine speeds is provided by the passage 31 and the slots 32 and 36 heretofore mentioned. The amount of such additional air is automatically controlled by a mechanical interlock between the throttle shaft and the sleeve 33.

Said interlock includes a cross bar 100 secured to the flange 35 of the shell 33 as by means of the pins 102 and secured also to the sleeve 103 arranged about the upper part of the needle 20. Said sleeve is supported by the bearing 99 projecting from the top 105 of the mixing chamber 11, the sleeve projecting through said top. At the upper end of the sleeve 103 is secured a suitable crank as 104, which is in turn secured to one end of the arm 101 as by means of the pin 106. The other end 107 of the arm 101 is secured to the crank 108 as at 109, said crank being suitably secured to the throttle shaft 87.

It will be seen that as the throttle shaft is rotated to open the throttle, the arm 101 rotates the crank 104 and therethrough, rotates the sleeve 103 which, in turn, rotates the cross bar 100 and the shell 33 to open the slots 32. The operation is reversed as the throttle is closed and the slots 32 for admitting auxiliary air are thereby also closed.

The operation of my improved device is as follows:

The starting pedal or lever being actuated by the operator, priming fluid is injected simultaneously above the throttle 26 and into the combustion space 48 of the combustion chamber. At this time, the engine is being turned over by the starting device, creating suction in the manifold zone 66 and in the throttle zone, through the passages 46 and those connected thereto, and in the combustion chamber, while a spark is created at the gap of the spark plug 59. The priming fluid in the combustion chamber mixed as it is with air drawn in through the passage 57 and the diverted atomized fuel drawn in through the openings 52 is ignited and the walls 42, 51 and 40 substantially instantaneously heated.

Air at this time passes into the mixing chamber 11 through the main air opening 28, while fluid passes from the float chamber 10 through the spray nozzle 18 and is atomized through the needle slots 25 and mixed with the entering air. The vanes 37 of the venturi mechanically mix the air with the fuel by creating turbulence therein even if the slots 32 and 36 are closed by the shell 33. The mixture is drawn about the heated walls 39 and 51 and further agitated by means of the inclined vanes 49, then passing through the throttle zone 62 and into the manifold.

The hot gases of combustion at the same time pass through the combustion chamber space 48 through the stack 61 and mix with the heated mixture, thereby aiding to prevent detonation. Just before the mixture reaches the cylinders, the suction created in the manifold draws the priming fluid in vaporized form into the cylinders to provide a quickly ignitible mixture, whereafter the heated mixture mixes with the hot gases and operation of the engine becomes continuous.

It will be seen that no parts need be manipulated when the engine is started excepting the starting lever ordinarily used for that purpose; that the engine may be started cold since heating of the mixture is substantially instantaneous, and the priming fluid provides a readily ignitible mixture; that a single priming charge only is necessary; and that by reason of the automatic needle adjusting mechanism and the automatic air adjusting mechanism for high speeds, the required flexibility of control is provided; that the mechanism can be adjusted accurately for many types of fuels of different volatility; that the proper turbulence is given the mixture for thorough mixing and for feeding a dry gas.

Adequate heat is provided to insure vaporization, as well as ample air speed past the spray nozzle to insure picking up the fuel, and that the heavy unvaporized ends which may drip off the heating wall are utilized as fuel in the combustion chamber to supply heat instead of passing to the engine where carbon deposits or excessive monoxide in the exhaust may result, and that no such ends can accumulate to retard later starting or operation.

It will also be seen that as the combustion need not be complete in the combustion chamber, the gases passing through the stack 61 into the mixture may be compared to producer gas to some extent, and contribute heating due to the high temperature thereof before said gases enter the engine cylinders, and also, because said gases burn with the fresh charge when compressed at the end of the compression stroke and ignited in the engine cylinders.

It will further be seen that loss of power resulting from otherwise reduced volumetric efficiency caused by supplying hot gas mixture, is minimized by the admission of cool air to the mixture in any desired proportions just as the mixture enters the engine cylinders.

It will be understood that while I have shown a specific embodiment of my invention, I do not wish to be understood as limiting myself thereto but intend to claim my invention as broadly as may be permitted by the state of the prior art and the terms of the appended claims.

I claim:

1. In mechanism of the character described, a float chamber, an independent fuel and air mixing chamber including a venturi having an air passage in the interior thereof, a spray nozzle coaxially arranged therein, and an air passage closed at its upper end surrounding the venturi and communicating only with the interior thereof, means responsive to the throttle opening for controlling the feed of fuel through the spray nozzle, a combustion chamber independent of the float chamber and the mixing chamber, and a passage for leading the mixture from the mixing chamber about the combustion chamber for heating the mixture.

2. In mechanism of the character described, a float chamber for controlling the liquid fuel level, a fuel and air mixing chamber comprising a venturi dividing said chamber into substantially an inner air passage, and a concentric outer air passage closed at one end, a needle valve arranged coaxially of the inner chamber, and an adjustable slotted member interposed between the inner and outer passages for opening and closing communication from the outer to the inner passage, a combustion chamber for generating heat to heat the mixture, a passage leading from the end of the venturi about said combustion chamber, means for diverting a portion of the mixture to the interior of the combustion chamber, a throttle valve, means for introducing hot gases from the combustion chamber into the mixture at a point above the throttle valve, and priming means for simultaneously injecting priming fluid into the combustion chamber and into the mixture at a point above said throttle valve.

3. In mechanism of the character described, a combustion chamber, a wall arranged concentrically of said chamber for providing a passage for mixed air and fuel, means for diverting a portion of the fuel from said passage into the interior of said chamber, means for igniting said diverted portion for heating the walls of the combustion chamber and thereby heating the mixture in said passage, inclined vanes on the wall of said passage for agitating the mixture during the movement thereof and for conducting heat from the combustion chamber to said passage wall.

4. In mechanism of the character described, means for maintaining a constant fuel level, independent means for spraying liquid fuel and mixing the fuel with air including a venturi, a throttle valve, means for diverting and igniting a portion of the fuel for supplying heat to the mixture before said mixture passes the throttle valve, means for injecting hot gases into the mixture as the mixture passes said valve, and means for simultaneously injecting priming fluid above said valve and into the heat supplying means.

5. In mechanism of the character described, means for atomizing fuel and mixing the fuel with air, a combustion chamber, means for diverting a portion of the fuel mixture into said combustion chamber, means connecting the mixing means and said combustion chamber for circulating the fuel mixture about the combustion chamber and thereby heating the mixture, means for agitating the mixture during its passage past the combustion chamber, and means for injecting hot gases from the combustion chamber into the mixture before the mixture leaves the mechanism.

6. In mechanism of the character described, means for directing fuel and air in the form of a mixture towards a combustion chamber, a combustion chamber, means receiving heat from the combustion chamber for heating the mixture, a throttle valve, and means for simultaneously injecting priming fluid into the mixture at a point past the throttle valve and into the combustion chamber.

7. In mechanism of the character described, a combustion chamber having a series

of spaced passages opening thereinto, an annular passage communicating with said spaced passages and adapted to receive fuel mixture, and means for injecting priming fluid into said annular passage, adjusting means for said passage serving also to admit air into said passage, and ignition means in said chamber.

8. In mechanism of the character described, a combustion chamber, a removable wall spaced from the wall of said chamber and concentric therewith, vanes on said wall for agitating the mixture passing said wall, for spacing said wall from the wall of the combustion chamber, and for conducting the heat to said removable wall from the combustion chamber wall, said wall being of less height than the wall of said chamber to provide a well at the bottom thereof, a passage communicating with said well and the interior of said chamber, and means for adjusting the effective size of said passage, for allowing the entrance of air thereinto, and for draining said well of material accumulating therein.

9. In mechanism of the character described, a combustion chamber, and heat supplying means for a mixture passed about said chamber, comprising a wall arranged concentrically about said chamber and of less height than that of said chamber, and vanes projecting from said wall towards said chamber for changing the direction of the mixture passing thereby, and for conducting the heat from the chamber to said wall.

10. In mechanism of the character described, a combustion chamber, a pair of communicating inlet passages thereto, a hollow needle for adjusting the effective sizes of said passages at the juncture thereof, for admitting air to said chamber and for draining material accumulating in said passages.

11. In mechanism of the character described, a fuel mixing chamber for atomizing fuel and mixing it with air comprising a casing, a conical Venturi section arranged concentrically within and spaced from the inner surface of said casing and having spaced slots therein terminating at the conical wall of the section, a slotted rotatable conical Venturi section open at the ends thereof to allow the passage therethrough of the mixture, and arranged with its outer face in contact with the conical wall of the first-mentioned section, an inclined vane at an edge of each of the slots of the rotatable section, said Venturi sections separating said chamber into an outer compartment closed at one end thereof, and an inner compartment, a spray nozzle arranged coaxially of the Venturi sections in the inner compartment, and means for rotating said slotted Venturi section for adjusting the areas of the slots between the outer and the inner compartments, and for thereby controlling the quantity of air admitted to the venturi from the outer compartment.

12. The combination with a spray nozzle, of a venturi arranged concentrically thereabout, said venturi comprising a stationary section and a slotted rotatable section having its outer face adjacent the inner face of the stationary section for controlling the quantity of air admitted to the interior of the venturi through the slots of said slotted section.

13. In a venturi, a first stationary section, a second slotted movable section, an inclined vane at an edge of each of the slots of the slotted section. a casing surrounding said sections and spaced therefrom for providing an outer compartment communicating with the interior of the movable section only when the slots of said movable section register with the outlet of said compartment, a throttle, and means for operatively connecting the throttle to the movable section for opening communication between said compartment and the interior of said movable section as the throttle is opened.

14. The method of atomizing and vaporizing liquid fuel for conditioning a mixture of fuel and air for ignition in an internal combustion engine, comprising atomizing the liquid fuel by injecting a primary air stream thereinto to give a high velocity to the atomized fuel, heating the fuel mixture at a first stage, abruptly changing the direction of the fuel mixture to deposit the liquid globules therein, diverting a portion of the mixture, igniting the diverted portion of the fuel and the deposited globules for heating the mixture, heating the mixture at a second stage after the change in direction therein, agitating the mixture during the second stage of heating and injecting the hot gases of the ignited diverted portion of the fuel into the mixture to provide a third stage of heating.

15. The method of conditioning fuel for ignition in an internal combustion engine, comprising spraying the fuel and mixing it with air, varying the amount of air and fuel in accordance with the throttle opening, diverting a portion of the mixture, igniting the diverted portion of the mixture and thereby heating the mixture, and agitating the fuel during the heating thereof.

16. The method of conditioning fuel for ignition in an internal combustion engine comprising atomizing liquid fuel, mixing the atomized fuel with varying quantities of air dependent on the throttle opening, diverting a portion of the mixture, injecting priming fluid into the diverted portion of the fuel and simultaneously at a point in advance of the fuel, igniting the priming fluid and the diverted portion of the fuel for heating the mixture, and thereby conditioning it for ignition while the priming fluid injected in advance of the mixture is drawn

to the engine cylinders for combustion in advance of the heated mixture.

17. In mechanism of the character described, a float chamber, a throttle, means including a venturi automatically adjustable in response to operation of the throttle, for controlling the mixture of air and fuel, a well for receiving part of the fuel, a combustion chamber for heating the remainder of the fuel, a passage connecting the well with the interior of the chamber, and means for injecting priming fluid above the throttle and through the passage simultaneously.

18. In mechanism of the character described, a combustion chamber, heat conducting means including a wall arranged concentrically about the chamber for heating a combustible fuel mixture a passage for the mixture, surrounding the chamber, said passage being heated by said means, and means for conducting fuel condensing from said mixture to the combustion chamber and igniting the fuel so conducted to produce heat.

19. In mechanism of the character described, means for heating a fuel mixture including a combustion chamber, vanes for creating turbulence in said mixture while it is being heated, a throttle valve beyond the chamber, and means for simultaneously injecting priming fluid beyond the throttle valve and into the chamber.

20. In mechanism of the character described, a combustion chamber, a passage for fuel mixture about the chamber to heat the mixture, and means in the passage for creating turbulence in the mixture during the heating thereof.

21. In mechanism of the character described, a combustion chamber, a passage for fuel mixture about the chamber to heat the mixture, means in the passage for creating turbulence in the mixture during the heating thereof, and a second passage connecting the first-mentioned passage to the chamber and thereby diverting part of the mixture into the chamber.

22. In mechanism of the character described, passages for mixing fuel and air, adjustable means for varying the effective sizes of said passages in response to a variation of throttle opening, means for heating the mixture, means for diverting liquid parts of the mixture into the heating means, and means for controlling and adjusting the proportion of air supplied to the diverted liquid part.

23. In mechanism of the character described, a throttle valve, a combustion chamber on one side of the valve, means for simultaneously injecting priming fluid into the chamber and on the other side of the valve, and an air valve interposed between the throttle valve and the injecting means.

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