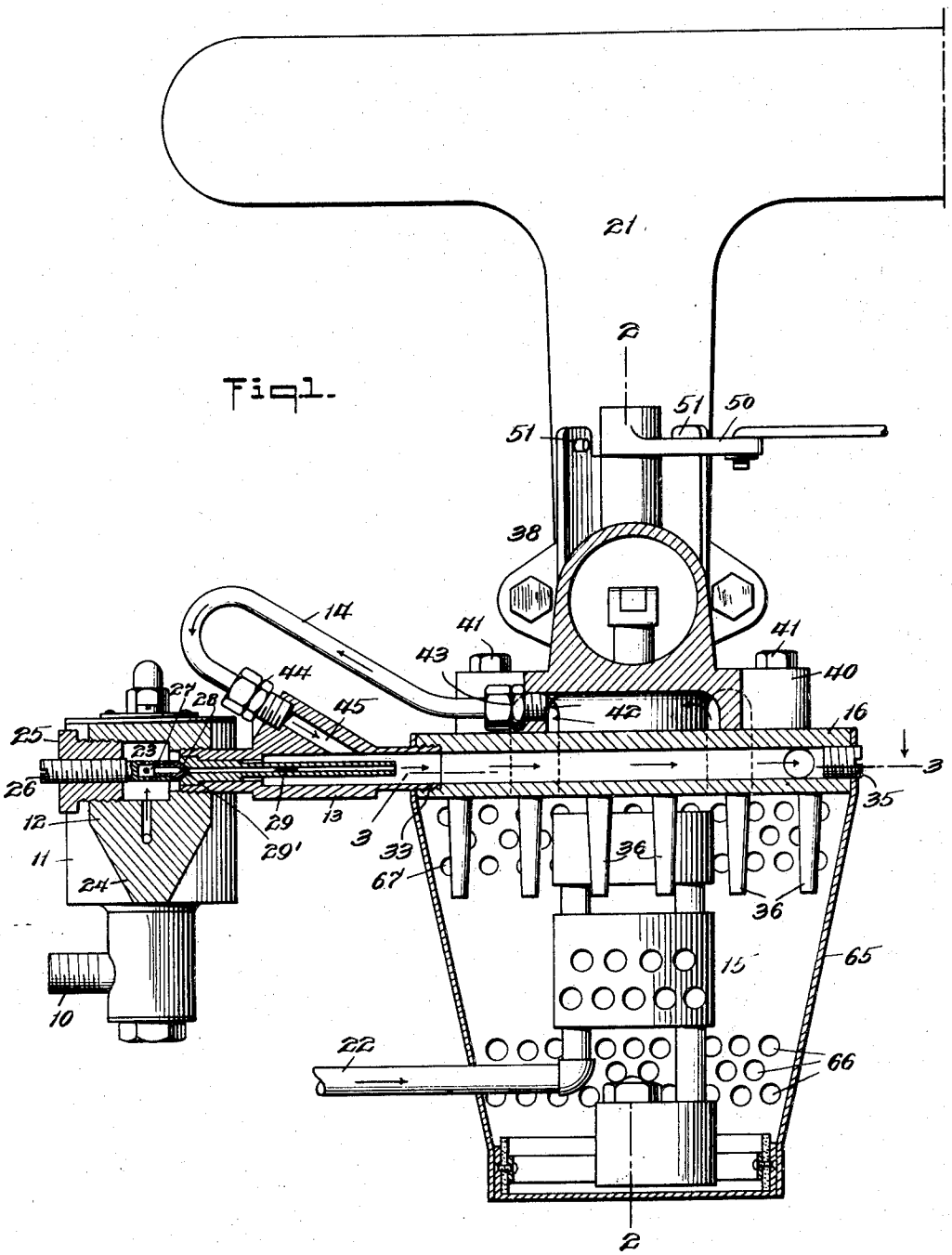
Aug. 27, 1929. E. RECTOR 1,726,455

AUTOMATIC DRY GAS CARBURETOR

Original Filed Nov. 9, 1921 2 Sheets-Sheet 1

Fig1.



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AUTOMATIC DRY GAS CARBURETOR

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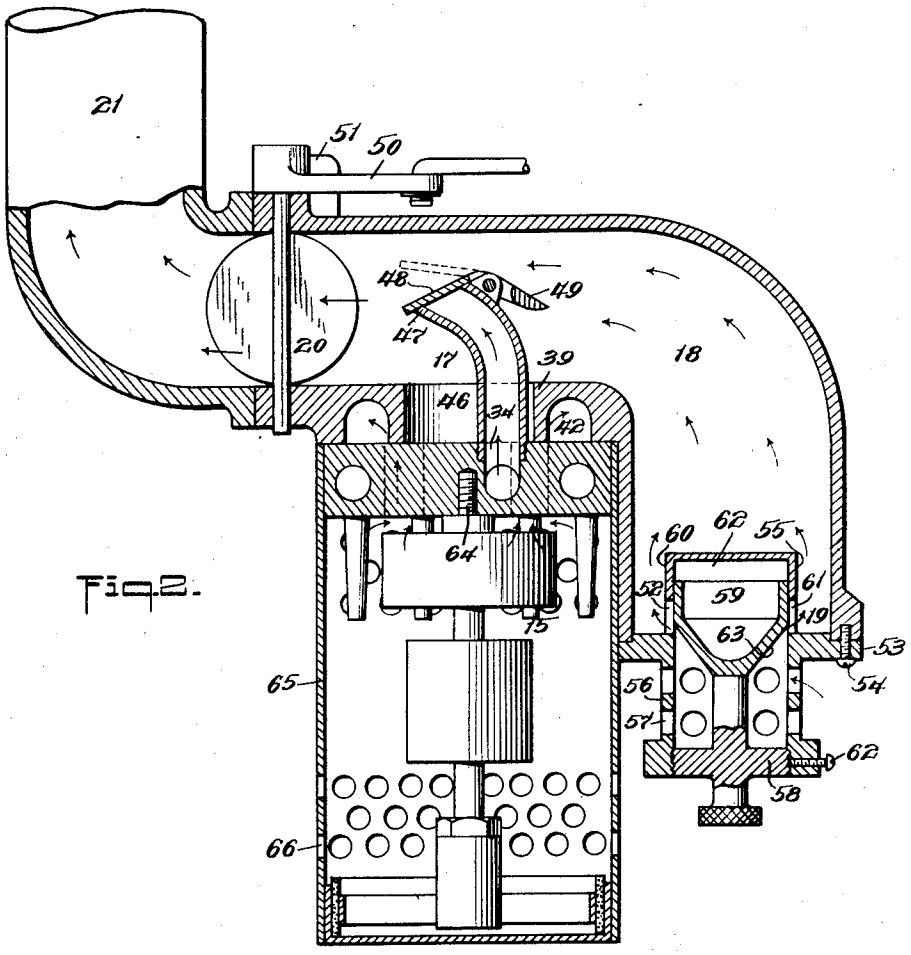


Fig 2.

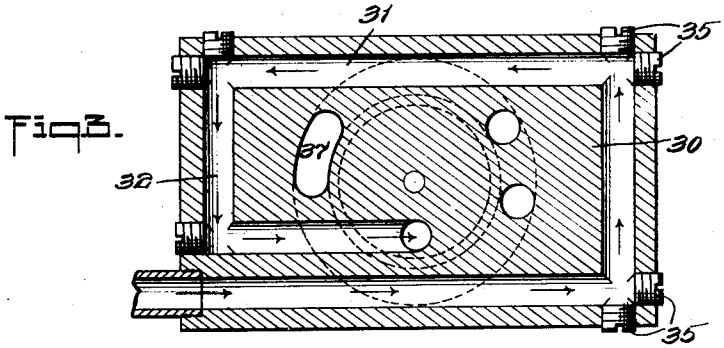


Fig 3.

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UNITED STATES PATENT OFFICE.

ENOCH RECTOR, OF NEW YORK, N. Y., ASSIGNOR TO RECTOR GASIFIER COMPANY, OF WAUKESHA, WISCONSIN, A CORPORATION OF WISCONSIN.

AUTOMATIC DRY-GAS CARBURETOR.

Application filed November 9, 1921, Serial No. 513,917. Renewed October 11, 1926.

The invention relates in general to an improved method for producing an explosive hydrocarbon gas mixture for use as a fuel in internal combustion engines and the invention specifically relates to the formation of such a fuel from a hydrocarbon liquid, such as kerosene, which is not readily vaporized.

The invention also relates to a certain improved mechanical instrumentality for practicing the method, which instrumentality will be referred to hereinafter as a combined vaporizer and carburetor.

The invention in the form selected for specific disclosure contemplates the vaporizing of a complex heavy hydrocarbon, such for instance as kerosene, by subjecting the same to a heat treatment to vaporize the liquid and combining the gaseous hydrocarbon thus produced with air to provide a fuel of the general character of such fuels usually employed in internal combustion engines. A theoretically ideal fuel of the type disclosed requires certain characteristics which are somewhat contradictory. It is of course required that the air supplied to the fuel per unit charge contain that amount of oxygen which is sufficient to combine with and consume all of the combustible fuel present without excess of surplus air. This requirement definitely fixes the proportion of fuel to air necessary to form the ideal mixture. It is a further requirement of fuel supplied to an internal combustion engine that there be provided the highest possible amount of gaseous combustible fuel in the smallest possible conducting space and in this way increase the volumetric capacity of the explosive chamber. This means maximum density in the gas which goes to make up the explosive mixture and therefore the gas should be as cold as is practically possible. This requirement for a reduced temperature is also necessary in order to prevent detonation or premature explosion in the engine supplied with the fuel.

Detonation is undoubtedly caused by high temperatures in the exploding gas, and perhaps, by the physical condition of the combustible gas, such as a close association of the fuel particles. This situation therefore requires a low temperatured and a thorough dilution of gas charge to separate the combustible particles and in this way defeat detonation tendencies.

On the other hand a certain relatively high temperature is necessary to completely vaporize the liquid hydrocarbon fuel and this is particularly true of the heavy hydrocarbon complexes which resist ready vaporization.

Accordingly, the primary object of the method feature of the present disclosure is to provide a simple and easily practiced method for affecting the vaporization of heavy hydrocarbon liquid in such a way that complete volatilization of all of the hydrocarbon complexes is attained under circumstances which will permit the formation of the fuel gases at relatively low temperatures compared to the volatilizing temperatures heretofore regarded as necessary.

Another object incidental to the primary object is to apportion the resulting gas to cold, and therefore dense, atmospheric air in such a way that the final aerated mixture fed to the engine shall be of maximum density and therefore of high volumetric efficiency; that it shall be at sufficiently high temperature to avoid condensation, and at the same time shall be of sufficiently low temperature and with relatively great distances between the combustible particles so that the engine will be free of detonation or knocking effects when the charge is fired.

Broadly, I attain this object by subjecting the liquid hydrocarbon to a two-step heat treatment to volatilize the same. In the first step a stream of the liquid fuel is mixed with a hot inert gas, such as the products of combustion from an oil burner, and which inert gas apparently has the effect of vaporizing some of the low hydrocarbon complexes. During the second stage the vaporized hydrocarbon complexes, the inert gas, and the heavy hydrocarbon complexes are subjected to an intense heat treatment of relatively short duration. It is the present belief that during this second step the previously formed hydrocarbon complexes and the later formed hydrocarbon complexes are thoroughly mixed in with the inert gas which has the effect of separating the combustible particles under conditions unfavorable to any incidental oxidization. This heat treatment is regulated so that when the mixture of combustible and incombustible gases is discharged into the air conduit to mix with the proper proportion of air necessary to sup-

port combustion, some of the heat from the hot gases is given up to the air but the resulting mixture of air fuel is cautiously maintained within that narrow range of temperature which will prevent both condensation and detonation.

Referring to the mechanical features of the disclosure the primary object is to provide an instrument for practicing the above outlined method economically and efficiently and at the same time to provide a structure which can be cheaply and readily constructed.

Another of the objects of the mechanical features of the invention is to provide in a carburetor a simple structure for attaining an automatic metering of gaseous fuel to air so that at the different throttle conditions of the engine supplied thereby, there will be provided a proper apportioning of fuel to air to give the proper mixture and at the requisite temperature best suited to the demands of the engine at its different speeds.

As a refinement of this general object it is a further desideratum to provide for a sequential operation of the fuel and air controlling valves so that when the controlling throttle valve is moved into or towards a closed position, there will be supplied an abnormally lean mixture and, contrarily, whenever the throttle valve is moved into or towards an open position there will be supplied, momentarily, an abnormally rich mixture of fuel.

This object is attained by providing normally closed gravity actuated valves for both the fuel and air intakes and further providing a dash-pot mounting for the air controlling valve so that it will be enertially controlled and in this way delay its opening and closing movements following a prompt movement of the fuel valve into its opening or closing movement.

Still another object of the invention is to provide a combined vaporizer and carburetor the several parts of which can be designed as units, each complete in itself and organized so as to be readily assembled and demounted for repair and substitution of worn parts.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one form of mechanism embodying my invention, and the invention also consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawings:—

Figure 1 is a vertical sectional view taken through a preferred embodiment of the mechanical parts of the invention and illustrating a device by means of which the method may be practiced. In this figure the burner element is shown in elevation and with the device is shown in position to discharge into the intake manifold of an internal combustion engine;

Figure 2 is a view similar to the showing in Figure 1 but taken at right angles to the showing in that figure and taken on the line 2—2 of Figure 1; and

Figure 3 is a horizontal sectional view taken through the gas generator element shown in the preceding figures, and taken on line 3—3 of Figure 1.

In the following description and in the claims, parts will be identified by specific names for convenience of expression but they are intended to be as generic in their application to similar parts as the art will permit.

In general it will be understood that liquid fuel supplied from a suitable source indicated symbolically by the supply pipe 10 is passed through a float control member 11 and through an adjustable metering device 12 into an aspirator 13 where it meets hot products of combustion discharged from a gas conduit 14 supplied from a burner 15 which heats a vaporizer 16 into which the aspirator discharges. The vaporizer discharges through a valve control fuel nozzle 17 into a fuel aerating conduit or mixing chamber 18. The conduit 18 is closed at one end by an air controlling valve 19 and is provided with a throttle valve 20 at the opposite end which discharges into the engine manifold 21. The float control 11, aspirator 13, vaporizer 16, the casting containing the air conduit 18 and the burner 15 are each separate units which can be readily assembled to form the complete vaporizer and carburetor and which can be readily disassembled to facilitate repairs and substitution of parts.

In the present disclosure the supply of fuel leading to the vaporizer through the pipe 10 and the supply of fuel leading to the burner through its supply pipe 22 are shown to be separate in order to feature the situation where it is required that a slight pressure be maintained on the line leading to the burner to maintain the activity of the same, while such a pressure is not required of the stream leading to the vaporizer. However, it is within the scope of this disclosure to supply both the vaporizer and its burner from a single source as is suggested in my Patent No. 1,425,339, granted August 8th, 1922.

The float control member 11 is of conventional form and is illustrated solely for the purpose of showing that a supply of cold liquid fuel such as a heavy complex hydrocarbon, (kerosene) may be supplied to the metering chamber 23 formed in an extension block 24 projecting from one side of the member 11. The block 24 is drilled hori-

zontally therethrough and the portions of the bore so formed on opposite sides of the chamber 23 are threaded to accommodate a closing nut 25 in one end of the bore and to receive the liquid receiving end of the aspirator 13 at the other end of the bore. The nut 25 carries a metering tube 26 threaded therethrough and accessible from the outside of the nut so that the tube may be moved longitudinally without withdrawing the nut. The inner end of the tube is provided with a T-passageway 27 and terminates at its end in a conical nose 28 which fits into a similarly shaped countersunk seat at the end of a long insert tube 29 in the aspirator and which insert tube constitutes the part of the aspirator which carries the five streams of liquid fuel. The nose 28 constitutes a jet and is provided with an extremely fine outlet 29′ which insures the projection of a fine stream of the liquid fuel. It is believed that the liquid is atomized as it passes through the jet into the relatively larger bore of the tube 29. Where it is desired to vary the amount of liquid fuel supplied through the open passageway 27 the nut 25 is removed and another tube with a different size discharge vent is substituted therefore.

The vaporizer 16 is in the form of a flat rectangular metal block 30 which is drilled from its four sides as shown in Figure 3 to provide straight passageways 31 connected to form a single fuel conducting passageway 32 leading from the discharge end 33 of the aspirator to its discharging port 34 opening upwardly adjacent the center of the block, as shown in Figure 2. The ends of each of the passageways 31 are closed by means of screw plugs 35, the removal of which permits of ready access to the passageways for the purpose of cleaning the same. It is a feature of this disclosure that the fuel in its movement through the passageway 32 is whipped about the bends formed by each passageway 31 opening into the next adjacent passageway at sharp angles, such as the right angles shown at Figure 3.

The underside of the block is provided with depending, solid metal heat conducting studs 36 which act to provide relatively extensive heat receiving areas for absorbing, retaining, storing and conducting heat to the bottom of the vaporizer. It will be understood that in the operation of the device the burner 15 will generate heat of sufficient intensity so that it will act on the studs to heat the same even to an incandescent heat at their lower ends.

The solid central portion of the block is also drilled vertically to provide a plurality of vertically extending passageways 37 which are opened at their lower ends to receive at least a part of the products of combustion discharged from the burner 15. The bottom of the casting 38 which includes the conduit 18 is in the form of a relatively thick plate 39 which as shown in Figure 1 extends beyond the outline of the air conduit to form securing flanges 40. Bolts 41 pass through the flanges and extend into the vaporizer so as to suspend the vaporizer from the casting 38. The plate 38 is provided with an annular passageway 42 opened at its bottom and encircling the upper end of the passageways 37 as shown in dotted lines in Figure 3. The passageway 42 thus acts to collect the products of combustion discharged through the passageways 37. The hot inert gas conduit 14 is demountably secured at one end by means of a coupling 43 to receive the collected products of combustion from the passageway 42. The other end of the tube 14 is similarly connected by means of a coupling 44 to discharge into the angularly disposed gas passageway 45 of the aspirator 13. The tube 29 is of such a length that its liquid discharging end is positioned beyond the discharging end of the passageway 45.

By this construction the liquid fuel discharged through the tube 29 is not only drawn therefrom by the engine suction acting through the fuel conduit but also is projected by the ejector action of the inert gas forced through the aspirator.

The discharge port 34 of the vaporizer is provided with the fuel nozzle 17 which is in the form of an L-shaped tube with one end screwed into the port 34. The nozzle extends upwardly through a centrally positioned opening 46 in the plate 39 and has its discharge end 47 positioned relatively close to the throttle valve 20 and discharging in the direction towards the manifold. A weighted valve 48 is pivotally connected to the nozzle and normally closes the same to intercept the passage of fuel. It is desirable that the valve 48 have a weight nearly sufficient to close the nozzle and for this purpose the valve is provided with a counterweight 49 which almost balances the weight of the valve thus permitting the valve to open whenever the pressure in the nozzle is slightly greater than the pressure external thereto in the air conduit. When the valve is in the full open position as shown in dotted lines in Figure 2, the weight contacts with the upper side of the nozzle to limit any abnormal opening movement of the valve.

The throttle valve 20 is positioned between the fuel nozzle and the outlet and this valve is controlled as is usual in such devices by means of a control arm 50. The arm is limited in its opening and closing movement by means of stops 51.

The lower air intake end of the conduit 18 is provided with a closure 52 and includes a centrally positioned outstanding flange 53 demountably secured to the lower end of the

conduit by bolts 54. The closure includes a cylinder 55 which extends partially within and partially to the outside of the flange 53. The exteriorly projecting portion 56 of the barrel is provided on the side thereof with a plurality of air intakes 57. The lower end of the barrel is internally threaded to receive an externally adjustable seat 58 for receiving a weighted valve 59 slidably mounted within the upper portion 60 of the barrel which extends within the air conduit. The valve is of the weighted type and controls air intake ports 61 opening through the portion of the barrel within the conduit. It will be understood that the seat is adjusted into any desired position and is locked in this position by means of a set screw 62. With the seat 58 in adjusted position and the valve seated thereon the opening through the ports 52 will be regulated to give the desired extent of opening in that position in which the engine is idling with the throttle valve nearly closed. The upper end of the barrel constitutes a dash-pot 62 which acts to retard the upward or unseating movement of the valve when moving into position to unclose the ports 61. The lower end of the valve is frusto-conical to provide a tapered surface 63 so disposed that, as the valve is raised due to the reduction of pressure within the air conduit as the result of the reduced pressure in the engine manifold, progressively more area of air openings will be provided than would be the case if the lower end of the valve were a true cylinder.

The burner 15 is a complete unit in itself and is suspended from the underside of the vaporizer by screwing a stud 64 from the burner into the underside of the vaporizer. The burner illustrated is of a self generating type and is intended to discharge an intensely hot flame against the vaporizer. The burner is enclosed within a burner casing 65 and is provided on the side with air intake openings 66 and adjacent its upper end with vents 67 for discharging whatever products of combustion that are not discharged through the conduit leading to the aspirator, previously described.

While the member 16 has been referred to both as a vaporizer and a gas generator element, the latter term is considered more correct. As previously stated, this gas generator element or plate is heated to a high temperature by the burner and by the products of combustion from the burner which flow through the passageway 31. These hot products of combustion, which flow inwardly about the aspirator tube 29, act to meter the discharge or aspiration of the fine stream of fuel into passageway 31. As the fuel is discharged from the aspirator it is atomized and the fuel particles are thoroughly intermixed with the products of combustion. This mixture is then subjected to a heat treatment at a high temperature during its flow through member 16, and the fuel particles are, in large part, converted into gases which are fixed, the heavier and less volatile constituents of the fuel being vaporized. This mixture of gases and vaporized fuel, which has been found to be highly efficient for internal combustion engines, is then mixed with atmospheric air and drawn into the engine cylinders in the manner described. I thus provide a method by which the heavier hydrocarbons, are converted in large part into gases some of which are fixed, this being accomplished by a cracking process which is carried on continuously during withdrawal of the gases and vapors from the gas generator 16. A further advantage of my method, when applied specifically to internal combustion engines, is that the products of combustion from the burner are used to regulate or meter the discharge of the fuel into the gas generator acting to initially heat and atomize the liquid fuel, and assuring proper regulation of the volume of gases available for fuel in the engine in accordance with requirements.

In the present disclosure there has been featured the use of a burner for supplying the heat necessary to vaporize those hydrocarbons which are vaporized only under difficulty, but it is herein suggested that the burner may be omitted and heat supplied from some other source. For instance, in those cases where a readily volatilizable hydrocarbon is used, such as gasoline, the vaporizer herein disclosed may be positioned on the exhaust manifold of the engine supplied thereby and the heat from this exhaust will be ample to vaporize the light hydrocarbon. In this case the exhaust gases can be utilized to actuate the aspirator and it is merely necessary that the aspirator be open directly into the exhaust manifold of the engine.

It is further obvious in the case where a readily vaporizable fuel such as gasoline is used, that the aspirator can discharge directly into the air conduit and in this way the vaporizer as well as the burner herein disclosed can be omitted. Again the advantages of mixing an inert gas with combustible fuel before they are mixed with the combustion supporting air can be attached simply by causing the inert gas pipe to discharge into a conventional form of carburetor a a point adjacent the usual fuel discharging nozzle.

In operation and assuming that the throttle valve is closed, that the burner has been lit, that the fuel valve is closed, and that the air controlling valve is closed or almost so, the device is then in its normal condition ready for operation.

By means of a suitable valve control (not shown) fuel is admitted past the float con-

trol into the chamber 23 and the controlling throttle valve 20 is moved into or towards an open position. The actively disposed burner will at this time be heating the studs and discharging products of combustion through the several passageways and thence into the aspirator. The hot products of combustion passing through the aspirator on their way to the vaporizer will act mechanically on the fine stream of liquid hydrocarbon to atomize or break up the same into fine particles in case they have not been entirely atomized by their passage through the vent 29', and will act further to discharge the hydrocarbon in whatever may be its state into the vaporizer. It is believed that the hot products of combustion acting directly on the atomized fuel will provide certain of the lighter complexes of the hydrocarbon in those cases where a heavy complex hydrocarbon, such as kerosene, is used. The partially vaporized fuel, with the inert gas which forms the products of combustion, pass into the vaporizer where they are intensely heated by the direct action of the burner. Here again it is not certain as to just what takes place within the vaporizer, but it is believed that all of the hydrocarbon complexes are completely vaporized and that there is a thorough mixing of the resulting combustible gases with the non-combustible, inert gas. It is further believed that the conduction of the gases about the angled passageways in the vaporizer tends further to insure a complete mixing of the combustible and non-combustible gases which tends to defeat detonation when the gases are fired in an internal combustion engine.

The passageway in the vaporzier is purposely made relatively short so as to minimize the time element during which the gases are subjected to the intense heating action of the burner. The parts are so constructed and proportioned that the complete vaporization of all of the liquid fuel is assured and at the same time care is exercised that the resulting temperature of the gases, when they are combined with the cold air as hereinafter described, shall be sufficiently high to minimize any tendency of the gases condensing before they are fired in the engine. At the same time the parts are proportioned to assure a temperature of the resulting fuel in the engine lower than the temperature at which such a gas will detonate.

It will be understood that there is as usual a pressure condition in the engine manifold which causes a reduction of pressure in the air conduit slightly below the external atmospheric pressure. With one form of device constructed in accordance with the disclosure herein, the pressure within the discharge nozzle is slightly less than the pressure in the air conduit. This difference in pressures will of course cause the fuel valve to open from the full line into or towards the dotted line position shown in Figure 2 and thus permit the forciful ejection of the hot mixture of combustible and non-combustible gases into the air conduit 18. The fuel mixes with the air present and the mixture passes the open throttle into the engine manifold. At the same time the slightly excessive external air pressure will act on the air controlling valve to raise the same from the position shown in Figure 2 thus more fully uncovering the air inlet ports and permit the passage of air past the valve into the air conduit as indicated by the arrows in Figure 2. The cold air will mix with the fuel discharged from the nozzle and will be discharged therewith into the engine manifold as is well known in carburetor structures.

Should the throttle valve be moved into or towards a closed position so as to shut off or reduce the supply of fuel to the engine, the fuel valve will promptly tend to close, thus either entirely intercepting the supply of fuel from the nozzle or to intercept the flow in the same proportion as the throttle valve is closed.

Due to the dash-pot action of the air control valve the air valve will tend to move towards its closing position much slower than the corresponding closing movement of the fuel valve 48 so that at least momentarily there will be an excessively lean mixture of fuel supplied to the engine.

On the contrary, and assuming that the throttle, the fuel valve and the air control valve are closed, or almost closed, and that the throttle valve is suddenly opened or moved towards a more fully opened position. Here again the air valve will tend to resist rapid movement into its fully opened position while the engine suction is fully effective immediately upon the relatively light fuel valve. This will cause the fuel valve to move promptly into a wide opened or more fully opened position thus admitting a relatively rich charge to the engine. In this way it will be understood that normally the proportion of air to fuel admitted to the engine will be that ratio which will most closely approach the theoretical amount necessary to effect complete combustion of the combustible gas present, but that in throttling down the engine there will be momentarily fed to the engine an abnormally lean mixture, and on the contrary when the throttle is thrown open there will be, at least momentarily, an excessively rich mixture supplied to the engine.

As soon as the air valve has had an opportunity to assume its proper position it will act automatically to regulate that amount of air which is necessary to supply

the requisite amount of oxygen to meet the fuel demands from the engine.

As the pressure in the engine manifold is lowered the tendency of the air to rush past the fuel controlling valve is increased with a resulting vacuous condition at the upper side of the fuel valve. The fuel valve is therefore controlled not only by the pressure of the fuel in the fuel conduit, but also by the velocity of the air passing into the engine manifold. Therefore the fuel valve responds to variations in fuel demands from the engine.

With increase in suction effect on the manifold acting through the fuel conduit, there is a resulting pull on the products of combustion and a draft past the burner is created. In this way the activity of the burner is controlled by the reduced pressure condition. While the invention features an entire avoidance of combustion and resulting precipitation in the fuel gases it is, of course, appreciated that this desideratum is an ideal condition and that in actual practice some slight condensation even under extremely high temperature conditions cannot be avoided.

Having thus described my invention, I claim:

1. In a device of the class described, the combination of four fabricated units each complete in itself and secured together to form a complete marketable article, one of said units constituting a vaporizer, the second unit constituting a burner for heating the vaporizer, the third unit constituting an aspirator discharging into the vaporizer and provided with means for receiving a stream of liquid fuel and provided with means for receiving products of combustion from the burner and the fourth unit constituting an air conduit having a discharge opening at one end, an air controlling valve at the other end, said vaporizer having a valve controlled discharge nozzle opening into the air conduit.

2. In a device of the class described, the combination of five fabricated units each complete in itself and secured together to form a complete marketable article, one of said units constituting a vaporizer, the second unit constituting a burner for heating the vaporizer, the third unit constituting an aspirator discharging into the vaporizer and provided with means for receiving products of combustion from the burner and the fourth unit constituting an air conduit having a discharge opening at one end, an air controlled valve at the other end, said vaporizer having a valve controlled discharge nozzle opening into the air conduit and the fifth unit constituting an adjustable means for metering the supply of liquid fuel fed to the aspirator.

3. In a device of the class described, the combination of a casting constituting an air conduit adapted to be secured to the manifold of an internal combustion engine, said conduit provided with a valve for controlling the admission of air to the other end, a vaporizer suspended from the casting and having an outlet opening into the conduit, means for securing the vaporizer to the casting, a burner for heating the vaporizer, said burner being suspended from the vaporizer and an aspirator carried by the vaporizer and discharging into the same.

4. In a device of the class described, the combination of a vaporizer, a burner for heating the same, an aspirator discharging into the vaporizer, a conduit for conducting a portion of the products of combustion discharged from the burner to the aspirator and means for feeding liquid fuel to the aspirator.

5. In a device of the class described, the combination of a vaporizer, a burner for heating the same, as aspirator discharging into the vaporizer, a conduit for conducting a portion of the products of combustion dis charged from the burner to the aspirator, means for feeding liquid fuel to the aspirator and an air conduit leading from the generator and discharging into the air conduit.

6. In a device of the class described, the combination of a vaporizer, a burner for heating the same, an aspirator for discharging a mixture of liquid fuel and an inert gas into the vaporizer there to be subjected to the direct heating action of the burner.

7. In a device of the class described, the combination of a vaporizer, a burner for heating the same, an aspirator for discharging a mixture of liquid fuel, and inert gas into the vaporizer there to be subjected to the direct heating action of the burner and means for mixing cold air with the hot gases discharged from the vaporizer.

8. In a device of the class described, the combination of a series of elements coacting to form a fuel conduit, said elements consisting in order of a liquid fuel metering means, an aspirator, a vaporizer, a discharge nozzle, a part of an air conduit, and an inert gas conduit including in order, means for generating a hot inert gas and a conduit leading from said means to the aspirator.

9. In a device of the class described, the combination of a series of elements coacting to form a fuel conduit, said elements consisting in order of a liquid fuel metering means, an aspirator, a vaporizer, a discharge nozzle, and a part of an air conduit and means for supplying said aspirator with hot products of combustion, said means including a burner for heating the vaporizer and a conduit supplied by the burner and leading to the aspirator.

10. In a device of the class described, the

combination of a vaporizer, a burner below the vaporizer for heating the same, an aspirator discharging into the vaporizer, means for supplying liquid fuel to the aspirator, said vaporizer provided with a vertically extending passageway extending therethrough, a conduit leading from the upper end of said passageway for conducting to the aspirator the products of combustion which pass through the passageway from the burner.

11. In a device of the class described, the combination of a vaporizer, a burner below the vaporizer for heating the same, an aspirator discharging into the vaporizer, means for supplying fuel to the aspirator, said vaporizer provided with a plurality of passageways extending upwardly therethrough, a conduit leading from the upper ends of the passageways to the aspirator to supply the same with hot products of combustion from the burner, a plurality of heating studs depending from the vaporizer for conducting heat to the same whereby the hot products of combustion from the burner will pass along the studs to heat the same as the hot products of combustion pass into the passageways on their way to the aspirator

12. A method of treating liquid fuel, consisting in metering the fuel by an inert gas, subjecting the resulting mixture to heat treatment in the absence of air, the taking off the resultant products.

13. A method of treating liquid fuel for use in producing a combustible mixture to be used in an internal combustion engine operating under variable load, which consists in metering the fuel by an inert gas and maintaining the metering gas at an approximately uniform temperature, subjecting the resultant mixture to heat treatment in the absence of air, and taking off the resultant products.

Signed at New York city, in the county of New York and State of New York this 5th day of November A. D. 1921.

ENOCH RECTOR.

CERTIFICATE OF CORRECTION.

Patent No. 1,726,455. **Granted August 27, 1929, to**

ENOCH RECTOR.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 7, line 32, claim 12, for the article "the" second occurrence, read "and"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 1st day of October, A. D. 1929.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)