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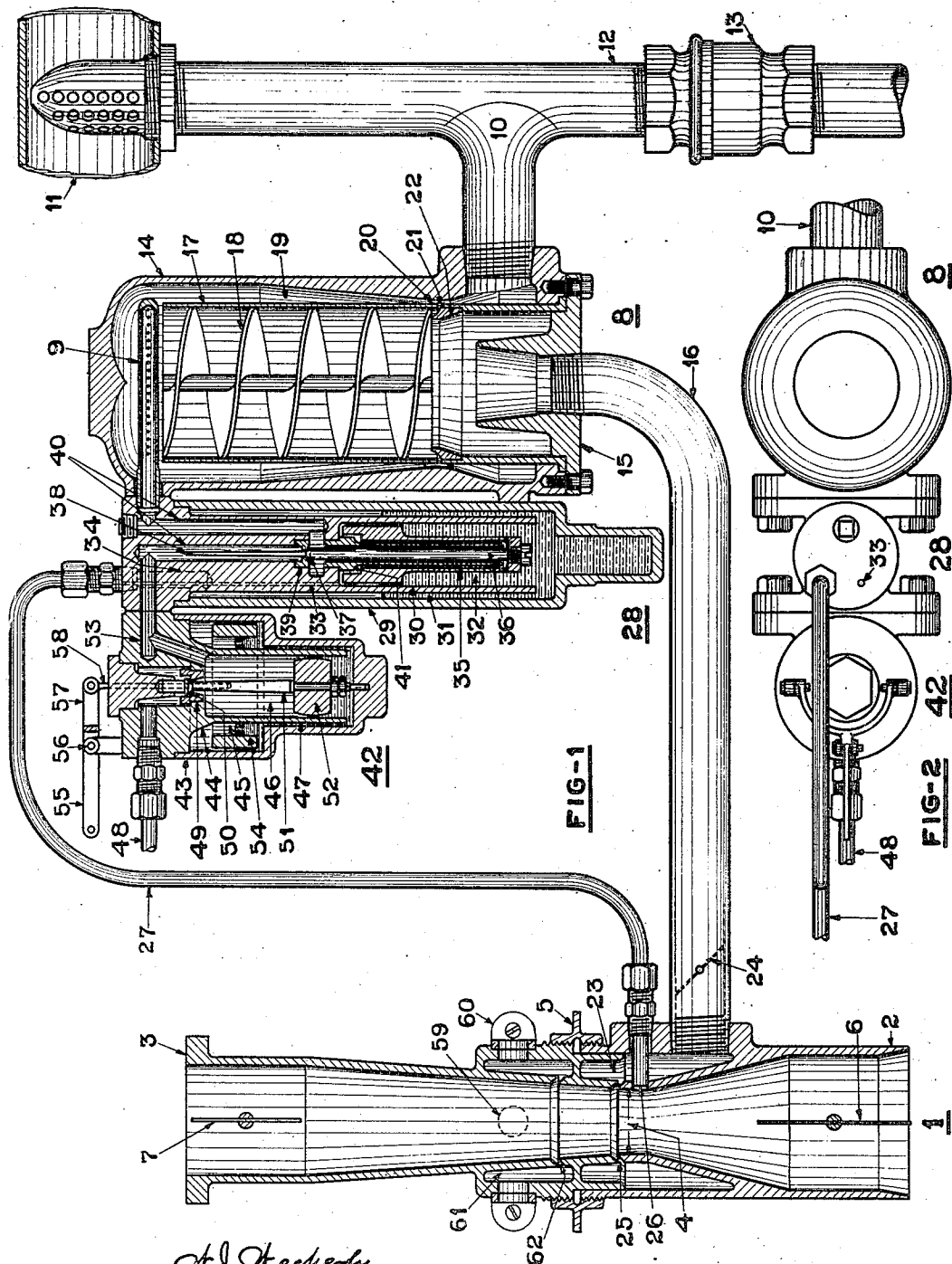
B. BANNISTER

1,465,574

CARBURETOR

Original Filed Nov. 11, 1919

2 Sheets-Sheet 1



WITNESSES:

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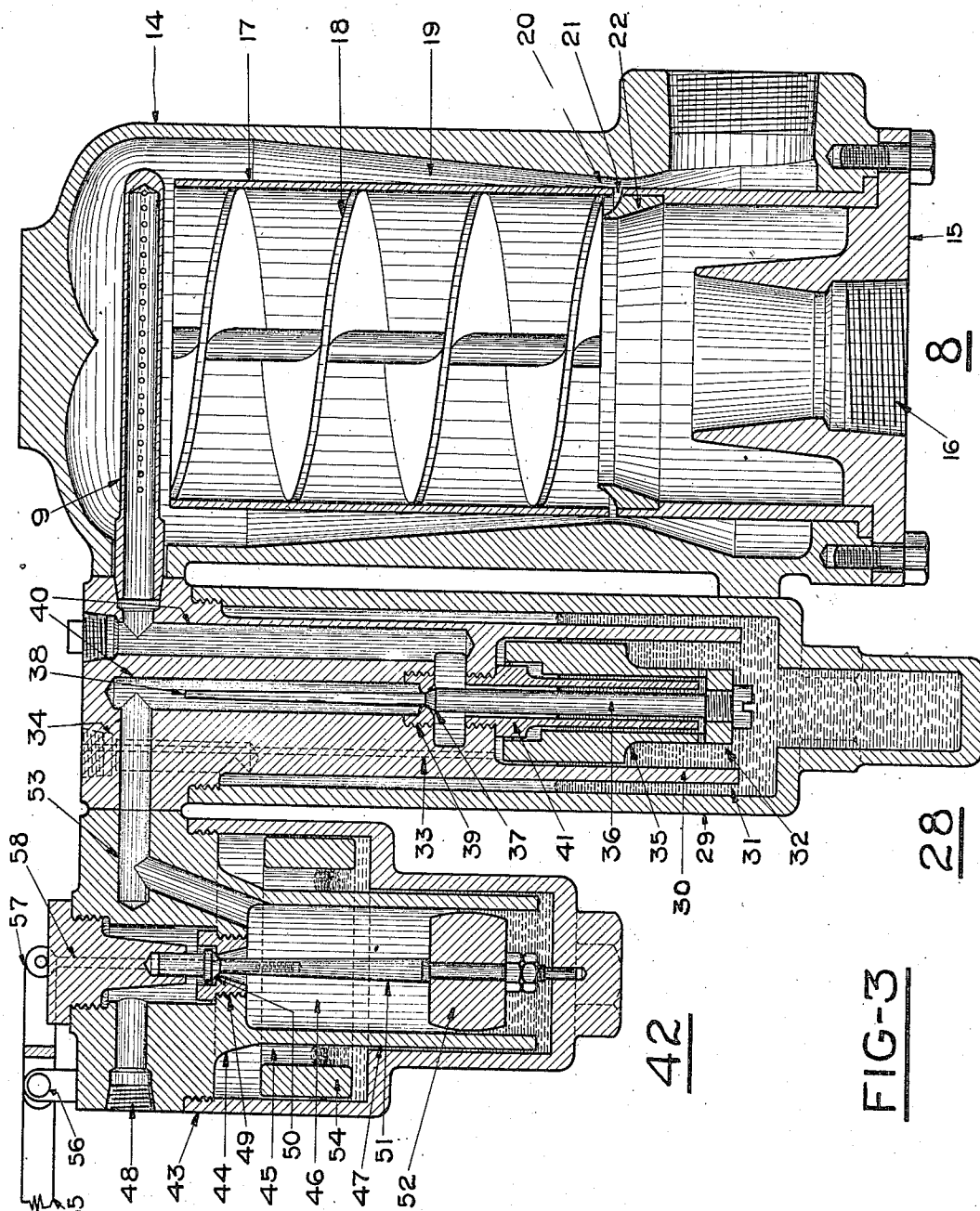
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WITNESSES: *H. J. Beckerly*  
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## UNITED STATES PATENT OFFICE.

BRYANT BANNISTER, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO BANNISTER  
MOTOR APPLIANCE COMPANY, A CORPORATION OF PENNSYLVANIA.

## CARBURETOR.

Application filed November 11, 1919, Serial No. 337,280. Renewed July 12, 1923.

*To all whom it may concern:*

Be it known that I, BRYANT BANNISTER, a citizen of the United States, and resident of Pittsburgh, Allegheny County, Pennsylvania, have invented a new and useful Improvement in Carburetors, of which the following is a specification.

This invention relates to a carburetor for use in connection with an internal combustion engine and is designed to provide improved carburetion under various fuel conditions and circumstances of use.

It has been, in general, difficult, particularly with the less volatile grades of fuel, to completely vaporize the fuel prior to its introduction into the cylinders of an internal combustion engine. This is a marked disadvantage since both thorough vaporization of the fuel and its thorough diffusion through the oxygen supporting combustion, are necessary for securing complete combustion of the fuel. But little mixture of the fuel with the supporting charge or diffusion therethrough, occurs after the combustible charge enters the cylinders, as it is then in a substantially quiescent condition.

The attempt to overcome this difficulty by preheating the air for the combustible charge has been only partially successful. A reason for this lack of complete success is that the temperature to which such air is raised is not in general, sufficiently high to secure complete vaporization within the time available, and, in winter particularly, a considerable period of time elapses after starting the engine before the air reaches a substantially effective temperature. Preheating the air has further, the deleterious effect of decreasing the density of the combustible charge, thereby tending to decrease the efficiency and available power of the engine.

Other attempts to secure complete vaporization have often led to an increase in air velocity through the mixing chamber. This results in a drop in pressure through the carburetor, and a consequent loss in compression and available power.

It is a well known fact that an internal combustion engine will operate most satisfactorily with a comparatively rich mixture for low speeds, and a mixture becoming leaner as the engine speed increases. Such regulation should be accurate and should be automatic within the carburetor,

Variations in temperature cause variations in the viscosity of the fuel, which directly influence the rate of fuel flow. Thus a variation in temperature of 50 degrees Fahrenheit may result in a variation of as much as 35 per cent in the viscosity of the fuels most commonly employed. Failure to provide ready regulation for such variations in viscosity will therefore, frequently result in inconvenience because of a retarded flow of fuel, or in waste, because the fuel orifice has been set to secure a full flow at low temperatures.

One object of the present invention is, therefore, to insure complete vaporization of fuels of widely varying properties, and to secure thorough admixture of such vaporized fuels with the air of the combustible charge and their diffusion through such air, before the charge enters the engine cylinder.

Another object of the invention is to effect such vaporization, admixture and diffusion, not only during normal running of the engine, but also after the first few explosions therein.

Another object of the invention is to secure maximum density of the combustible charge, thus contributing to high compression within the cylinder of the engine and maximum power.

Another object of the invention is to control the weight of fuel supplied by the weight of air supplied; and in conjunction, to provide automatically operating means for graduating the increase or decrease of fuel thus supplied, and thus vary the ratio of fuel to air according to the engine requirements.

Another object of the invention is to provide a regulation for correcting variations in fuel flow caused by variations in the viscosity of the fuel.

In the accompanying drawings, Fig. 1 is a vertical sectional view of the device; Fig. 2 is a plan view of a portion thereof; and Fig. 3 is a vertical section, on an enlarged scale, of the vaporizer, fuel flow controller, and pressure regulator of the device.

In the accompanying drawings, the numeral 1 designates a Venturi tube, adapted for use as a fuel and air mixer, and comprising the inlet cone 2, the outlet cone 3, and the constricted portion or throat 4. The inlet and outlet cones 2 and 3 are connected by means of a right and left hand screw-

threaded collar 5, and are provided respectively with the choke valve 6 and the throttle valve 7.

It will be understood that the outlet cone 3 of the mixing tube 1 is, in use of the device, connected with the intake manifold of an internal combustion engine.

According to the well known principle of the Venturi tube; as air passes through the tube, its static fluid pressure will be greatest at the mouth of the inlet cone, its velocity greatest and static pressure least at the throat 4, while the velocity decreases and the static pressure is again increased as it passes through the outlet cone.

Prevaporized fuel for later admixture with air, is furnished by the vaporizer 8, in which a liquid fuel is vaporized and a rich mixture formed by admixing the fuel with a small quantity of heated gas, as for example, exhaust gases from the engine.

Fuel is introduced into the upper portion of the vaporizer, preferably by means of a perforated fuel pipe 9. Exhaust gases enter the vaporizer by way of a conduit 10 communicating with the exhaust pipe 11 of the engine. The conduit 10 has a branch 12 leading to the atmosphere through check valve 13 for preventing the exhaust gases from building up in the vaporizer a pressure greatly in excess of atmospheric.

The vaporizer comprises an outer casing 14, a base or closure member 15, from which a conduit 16 leads to the mixing tube, and a tubular member or shell 17 within which is closely fitted the helix 18. Between the outer casing 14 and shell 17 is the annular chamber 19, which has a restricted portion, or throat, 20, adjacent the lower extremity of the shell; opening 21 being provided from the interior of the shell into the chamber 19 at this point. The effect of the restriction is to increase the gas velocity at this point, with a resultant lowering of static pressure, which in turn produces a tendency for the mixture within the shell to pass through opening 21 into the rapidly moving stream of hot gas. The deflecting ring 22 is located adjacent this opening 21.

Gases entering the vaporizer pass upwardly through the annular chamber 19 and downwardly through the interior of the shell 17, vaporizing and becoming thoroughly commingled with the fuel during passage along the helix 18 therein.

As the composition of the liquid fuel is seldom uniform, certain fractions or constituents thereof have higher boiling points than others and consequently must be subjected to higher temperatures in order to effect their vaporization. It is desirable that substantially all the fuel be vaporized, and also, in general, desirable that the mixture of gas and fuel should be delivered at a temperature as low as is consist-

ent with complete vaporization. The vaporizer effects this purpose by subjecting the higher boiling fractions of the fuel to a higher temperature than the lower boiling fractions or constituents.

As the gas and fuel pass downwardly along the helix 18, the vaporized fractions of the fuel being lightest in weight, follow the inner path of the helix and pass out through conduit 16. The heavier, and as yet, unvaporized fractions, are thrown outwardly by centrifugal force into direct contact with the shell 17, which is surrounded by the stream of incoming gas in the annular chamber 19. A further portion of the fuel is thus vaporized.

Any fractions of the fuel which resist vaporization at the temperature of the shell 17, flow down the shell in a helical path, and arrive at the lower extremity thereof in a liquid state. At this point, some dense mixture and any fuel still remaining liquid, is directed by the deflector ring 22 away from the conduit 16, through the opening 21 into the restricted portion, or throat, 20 of the annular chamber 19, and thus into the stream of hot gases which have not yet given up heat in the vaporization of fuel. The heaviest fractions are thus vaporized.

The fuel in the rich mixture of fuel and gas passing to the mixing tube is thus in a completely vaporized state, so the conditions are most favorable for its complete commingling with and diffusion through the air in the mixing tube itself.

The conduit 16 for the rich mixture discharges into an annular chamber 23 surrounding the entrance cone and throat of mixing tube 1. A butterfly valve 24 may, if desired, be provided in the conduit 16 to regulate or cut off the flow of the rich mixture to this chamber. From the annular chamber 23, the rich mixture enters the mixing tube by way of the annular port 25. The annular form of port 25 facilitates the mixing of the rich mixture with air in the tube by permitting the mixture to enter the tube throughout its entire periphery at this point. The port 25 is formed by a gap between the entrance cone 2 and outlet cone 3 of the mixing tube. The area of port 25 is thus regulable by varying the position of entrance cone 2 relative to outlet cone 3. This regulation is obtained by providing the entrance cone 2 and outlet cone 3 with oppositely pitched threads, so that rotation of the screw-threaded collar 5 will cause rectilinear movement of the cone 2.

Regulation of the port 25, which controls the quantity of rich mixture entering the mixing tube, determines the percentage or quantity of exhaust gas in the combustible mixture; since the flow of fuel to the vaporizer is controlled by other means.

During combustion certain fuels crack to

form secondary products which are of a detonatable character and burn so rapidly that an engine knock is produced. This phenomenon can often be prevented by the addition of a certain amount of an inert gas. It is, therefore, advantageous that the quantity of exhaust gas in the mixture be under control.

Special means are provided for controlling the flow of fuel to the vaporizer, so that this flow may be varied according to the engine requirements. The weight of air passing throat 4 of the mixing tube 1 determines the weight of fuel supplied to the vaporizer. To this end, pilot opening 26 at the throat 4 is connected by means of tubing 27 to the fuel flow controller 28, for transmitting to the fuel flow controller variations in static pressure at the throat 4.

The fuel flow controller comprises a casing member 29 and inner member 30, which latter is recessed to provide an inverted cup. The casing 29 serves as a container for mercury into which the member 30 is partially submerged to form a concentric U-tube, which comprises the annular outer chamber 31 as one leg thereof, and the chamber 32, within the cupped portion of the inner member 30, as its other leg. The inner chamber 32 is in communication with the atmosphere by way of vent 33, while the outer annular chamber is in communication with the throat 4 of the mixing tube through duct 34 to which the tubing 27 leads.

When, therefore, the static pressure at the throat 4 is decreased below atmospheric pressure by flow of air therethrough, this reduction of pressure will be communicated to the chamber 31 and will cause the level of mercury to rise therein. This, in turn, is accompanied by a proportionate drop in the level of the mercury in the inner chamber 32. Any subsequent increase in, or reduction of the static pressure at the throat 4, will cause respectively a raising or lowering of the level of mercury in the chamber 32.

A float 35 is floated by the mercury in chamber 32. The float 35 carries a stem 36, having thereon the disk or face 37 and metering pin 38, arranged to close, or regulate the area of an orifice in bushing 39 located in fuel duct 40. Fuel duct 40 leads to the fuel supply pipe 9 of the vaporizer. A sleeve 41 surrounds the stem 36 and prevents the escape of fuel into any space above the float 35. This construction prevents irregularity in fuel flow, which might be caused by the direct action of the float if a fuel space or chamber existed above the float.

The quantity of mercury in the fuel flow controller is such that with no air flow through throat 4, the level of mercury in

chamber 32 will cause the valve disk 37 to be seated. The initial lowering of the mercury level under an impulse from the throat 4 serves to unseat the disk or face 37 and permit a flow of fuel through the orifice or bushing 39, and around the metering pin 38. The pin 38 is so designed that any further lowering in the level of mercury will increase the area for the flow of fuel around the pin.

In the use of the carburetor, the initial partial opening of throttle valve 7, causing the passage of a relatively small amount of air past throat 4, serves to unseat the valve disk 37 and permit fuel to pass to the vaporizer 8. Increased flow of air past throat 4 will then tend to further withdraw metering pin 38, and thus increase the area for the flow of fuel.

It will be understood that a relatively great fuel flow may be obtained initially, if so desired, by operating the choke valve 6 to increase the pressure drop at throat 4 disproportionately to the weight of air passing therethrough.

It will be seen that the degree of variation of mercury level in the inner chamber 32 is proportional to the weight of air passing through the throat 4, except for the deviation caused by the lessening density of the air with increased velocity.

This deviation is taken into account and compensated for by the design of the metering pin, which is further determined by the requirement that the proportion of fuel to air decrease with increased flow of air through throat 4. As shown the metering pin is smoothly tapered; but it will be understood that this form is illustrative only, and that the design of the metering pin is subject to other considerations, such as the nature of the engine and nature of the fuel with which the carburetor is to be used, in order that it may, in all cases, meet the requirements stated above. The combustible mixture when the engine is started is thus rich, and becomes progressively leaner as the throttle opening and the engine speed are increased.

In order that the flow of fuel through the fuel orifice in the fuel flow controller may be accurately regulated, it is desirable that means be provided for maintaining substantially constant pressure under which fuel is supplied to the fuel flow controller. The pressure regulator 42 shown is a preferred form of such device.

The pressure regulator 42 comprises a casing member 43 and an inner member 44, which latter is recessed to provide an inverted cup therein. These members together form the outer mercury containing chamber 45 and the inner, or pressure, chamber 46 in communication with the outer chamber by way of the narrow annular passage 47,

The pressure chamber 46 may receive fuel from the fuel supply pipe 48 by way of an orifice in the bushing 49, against the outer face of which seats the valve disk 50, which is on a stem 51 carried by a float 52 within the pressure chamber 46. From the chamber 46 leads the fuel duct 53, which is in communication with the duct 40 in the fuel flow controller.

The high mercury level in chamber 45 produces a force tending to raise the valve disk 50 from its seat and permit fuel to pass into chamber 46. In the absence of fuel pressure in this chamber, the valve will be fully unseated, and will remain in position to permit free passage of fuel through the orifice in bushing 49. As fuel enters the chamber 46, there is built up therein a pressure tending to force downwardly the level of mercury in the chamber and cause the valve disk 50 to more closely approach the seat in bushing 49. The normal position of the valve disk during the flow of fuel through supply pipe 48 is therefore a short distance from its seat. It will be understood that the pressure in chamber 46 is at all times lower than that in the fuel supply pipe. Adjustment is provided whereby the pressure under which fuel exists in and passes from the fuel chamber 46 may be readily regulated.

This regulating means comprises a ring 54, in the outer chamber 45 of the regulator, and partially submerged in the mercury therein. It will be apparent that a further submergence of this ring will increase the height of the column of mercury, while raising the ring will lessen the height of this column. By raising or lowering this ring, the force tending to unseat the valve disk 50 against the pressure in chamber 46 may be decreased or increased respectively. The ring 54 is adjusted by means of the lever arm 55, fulcrumed at 56 and operating through yoke 57 to raise or lower the operating rods 58 which are secured to the ring.

The regulation thus provided is of great value in varying the pressure under which fuel is delivered to compensate for changes in the viscosity of the fuel; since a liquid fuel, even though uniform in quality, will change greatly in viscosity with changes in temperature. A drop in temperature will thus decrease the rate of flow through the feed jet of a carburetor, or through a fuel feed orifice such as that in the fuel flow controller of the present device; thus causing engine trouble, through failure to secure a sufficient fuel supply. If a carburetor, on the contrary, be adjusted for a sufficient flow of fuel at a low temperature, and high viscosity, a rise in temperature will thus ordinarily result in a wasteful use of fuel and an overrich mixture necessitating further adjustment interiorly of the carburetor.

The pressure regulator is not only useful in connection with the other elements of the present device, but may also be employed in connection with carburetors of various types to provide a ready adjustment compensating for changes in fuel viscosity.

The mixing tube 1 of the carburetor may, desirably, be provided with auxiliary air supply means. Such means are shown as air inlet ports 59, the effective area of which may be varied by means of a perforated rotatable ring 60. The ports 59 open into annular chamber 61, which in turn is in communication by way of annular port 62 with the interior of the outlet cone 3 of the mixing tube.

The carburetor above described provides for supplying to an engine, a mixture completely prepared for combustion, and provides means for accurately controlling the quality and quantity of the combustible mixture, under varying conditions and engine speeds.

It also provides means for preheating a rich mixture to be commingled with a substantially cool air charge, thereby increasing the compression and power output of the engine over systems in which the entire quantity of air, or the entire quantity of combustible mixture, is preheated.

It further provides means for suppressing the explosion in a cylinder for the prevention of explosion knocks. It will be understood that if the nature of the fuel utilized is such that this phenomenon is not likely to occur, a relatively small quantity of air may be used for preheating the fuel, instead of the exhaust or other inert gas which provides the additional suppressing effect.

As a number of modifications may be made in the form and arrangement of the apparatus without departing from the spirit of the invention, no limitations, other than those contained in the appended claims, are to be imposed upon the scope of the invention.

What I claim is:

1. The method of carburetion which comprises vaporizing a liquid fuel by the heat of gas from an engine exhaust, subjecting the higher boiling constituents of the fuel separately from the lower boiling constituents thereof to the heat of the exhaust gas while at its highest temperature, forming a physical mixture of vaporized fuel and exhaust gas, and commingling such mixture with air to form a combustible mixture.

2. The method of carburetion which consists in the vaporization of a liquid fuel by the heat of an inert gas at a high temperature which comprises as steps in vaporization raising the temperature of relatively high boiling constituents of the fuel by conduction of heat from the gas while the latter

is at its highest temperature, bringing the heaviest constituents of the fuel into direct contact with the gas while in such condition, and vaporizing the lighter constituents of the fuel by admixture of such gas after it has given up heat in vaporizing the heavier constituents; commingling the rich mixture of inert gas and fuel thus formed with air to form a combustible mixture, and proportioning the quantity of the rich mixture of inert gas and fuel in the combustible mixture in accordance with the air charge therein.

3. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, an external fuel vaporizer in communication with said mixing tube, and a fuel flow controller comprising a fluid containing U-tube one leg of which is in communication with the throat of the mixing tube, and means in said fuel flow controller arranged to control flow of fuel therethrough to the fuel vaporizer in accordance with variations of fluid level in said U-tube.

4. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, an external fuel vaporizer in communication with said mixing tube, a fuel flow controller comprising a fluid containing U-tube one leg of which is in communication with the throat of the mixing tube, and valve means in the other leg of the U-tube for regulating the flow of fuel therethrough to the fuel vaporizer.

5. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, an external fuel vaporizer in communication with said mixing tube, a fuel flow controller comprising a U-tube one leg of which is in communication with the throat of said mixing tube, means in said fuel flow controller arranged to control flow of fuel therethrough to the fuel vaporizer in accordance with variations of fluid level in said U-tube, and means for regulating the pressure under which fuel is delivered to said fuel flow controller.

6. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, an external fuel vaporizer in communication with said mixing tube, a fuel flow controller comprising a fluid containing U-tube one leg of which is in communication with the throat of the mixing tube, valve means in the other leg of the U-tube for regulating the flow of fuel therethrough to the fuel vaporizer, and means for regulating the pressure under which fuel is delivered to said fuel flow controller.

7. In a carburetor, a fuel vaporizer having fuel and gas inlet connections and comprising an outer casing, a shell within said casing and forming therewith an inner

chamber and an outer chamber having a restricted portion therein, said shell being provided with openings adjacent said restricted portion, and a helix in said inner chamber.

8. In a carburetor, a fuel vaporizer comprising an outer casing, a shell within said casing and forming therewith an inner chamber and an outer chamber having a restricted portion therein, said shell being provided with openings therethrough adjacent said restricted portion, and means for bringing higher boiling constituents of the fuel into direct contact with the inner surface of said shell.

9. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, an external fuel vaporizer in communication with said mixing tube, a fuel flow controller comprising a fluid containing U-tube one leg of which is in communication with the throat of the mixing tube, means in said fuel flow controller arranged to control flow of fuel to the fuel vaporizer in accordance with variations of fluid level in said U-tube, and means in said mixing tube for regulating the quantity of rich mixture admitted thereto.

10. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, an external fuel vaporizer in communication with said mixing tube, a fuel flow controller comprising a fluid containing U-tube one leg of which is in communication with the throat of the mixing tube, valve means in the other leg of the U-tube for regulating the flow of fuel therethrough to the fuel vaporizer, and means in said mixing tube for regulating the quantity of rich mixture admitted thereto.

11. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, an external fuel vaporizer in communication with said mixing tube, a fuel flow controller comprising a U-tube one leg of which is in communication with the throat of said mixing tube, means in said fuel flow controller arranged to control flow of fuel therethrough to the fuel vaporizer in accordance with variations of fluid level in said U-tube, means in said mixing tube for regulating the quantity of rich mixture admitted thereto, and means for regulating the pressure under which fuel is delivered to said fuel flow controller.

12. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, an external fuel vaporizer in communication with said mixing tube, a fuel flow controller comprising a fluid containing U-tube one leg of which is in communication with the throat of the mixing tube, valve means in the other leg of the U-tube for regulating the flow of fuel therethrough to the fuel vaporizer, means in said mixing tube for regulating the quan-

tity of rich mixture admitted thereto, and means for regulating the pressure under which fuel is delivered to said fuel flow controller.

13. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, a fuel flow controller arranged to be acted upon by impulses arising from variations in pressure at the throat of said mixing tube and arranged to automatically control the supply of liquid fuel to said mixing tube; and a pressure regulator comprising a fluid containing U-tube having a float in one leg of said tube and means for regulating the fluid level in the other leg thereof, controlling the pressure under which fuel enters said fuel flow controller.

14. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, a fuel vaporizer in communication therewith, a fuel flow controller arranged to be acted upon by impulses arising from variations in pressure at the throat of the mixing tube and arranged to automatically control the supply of liquid fuel to said vaporizer; and a pressure regulator comprising a fluid containing U-tube having a float in one leg of said tube and means for regulating the fluid level in the other leg thereof, controlling the pressure under which fuel enters said fuel flow controller.

15. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, an external fuel vaporizer in communication with said mixing tube; a fuel flow controller comprising a fluid containing U-tube one leg of which is in communication with the throat of the mixing tube, and means in said fuel flow controller arranged to control flow of fuel therethrough to the fuel vaporizer in accordance with variations of fluid level in said U-tube; and a pressure regulator comprising a fluid containing U-tube having a float in one leg of said tube and means for regulating the fluid level in the other leg thereof, controlling the pressure under which fuel enters said fuel flow controller.

16. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, an external fuel vaporizer in communication with said mixing tube; a fuel flow controller comprising a fluid containing U-tube one leg of which is in communication with the throat of the mixing tube, and valve means in the other leg of said U-tube for regulating the flow of fuel therethrough to the fuel vaporizer; and a pressure regulator comprising a fluid containing U-tube having a float in one leg of said tube and means for regulating the fluid level in the other leg thereof, controlling the pressure under which fuel enters said fuel flow controller.

17. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, a fuel vaporizer in communication therewith, a fuel flow controller arranged to be acted upon by impulses arising from variations in pressure at the throat of the mixing tube and arranged to control the supply of liquid fuel passing to said vaporizer, means in said mixing tube for regulating the quantity of rich mixture admitted thereto; and a pressure regulator comprising a fluid containing U-tube having a float in one leg of said tube and means for regulating the fluid level in the other leg thereof, controlling the pressure under which fuel enters the fuel flow controller.

18. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, an external fuel vaporizer in communication with said mixing tube, a fuel flow controller comprising a fluid containing U-tube one leg of which is in communication with the throat of the mixing tube, valve means in the other leg of the U-tube for regulating the flow of fuel therethrough to the fuel vaporizer; and a pressure regulator comprising a fluid containing U-tube having a float in one leg of said tube and means for regulating the fluid level in the other leg thereof, controlling the pressure under which fuel enters said fuel flow controller.

19. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, a fuel vaporizer in communication with said mixing tube and with a source of heated gas, and a fuel flow controller in direct communication with the throat of said mixing tube and arranged to be acted upon by impulses arising from variations in pressure at the throat of said mixing tube for automatically controlling the supply of liquid fuel to said vaporizer; said vaporizer being arranged to cause a physical admixture of fuel and heated gas.

20. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, a fuel vaporizer in communication with said mixing tube and with an engine exhaust, and a fuel flow controller in direct communication with the throat of said mixing tube and arranged to be acted upon by impulses arising from variations in pressure at the throat of said mixing tube for automatically controlling the supply of liquid fuel to said vaporizer; said vaporizer being arranged to cause a physical admixture of fuel and exhaust gas.

21. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, a liquid fuel supply conduit, and a fuel flow controller in said fuel supply conduit having its interior in

direct communication with the atmosphere and with the throat of the mixing tube; whereby impulses arising from variations in pressure at the throat of the mixing tube are transmitted directly to the fuel flow controller for automatically controlling the flow of liquid fuel.

22. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, a liquid fuel supply conduit, a fuel flow controller in said fuel supply conduit having its interior in direct communication with the atmosphere and with the throat of the mixing tube, whereby impulses arising from variations in pressure at the throat of the mixing tube are transmitted directly to the fuel flow controller for automatically controlling the flow of liquid fuel; and means for regulating the pressure under which fuel is delivered to said fuel flow controller.

23. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, a fuel vaporizer in communication therewith, a liquid fuel supply conduit to said vaporizer, and a fuel flow controller in said fuel supply conduit having its interior in direct communication with the atmosphere and with the throat of the mixing tube, whereby impulses arising from variations in pressure at the throat of the mixing tube are transmitted directly to the fuel flow controller for automatically controlling the flow of liquid fuel to the vaporizer.

24. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, a fuel vaporizer in communication therewith, a liquid fuel supply conduit to said vaporizer, and a fuel flow controller in said fuel supply conduit having its interior in direct communication with the atmosphere and with the throat of the mixing tube, whereby impulses arising from variations in pressure at the throat of the mixing tube are transmitted directly to the fuel flow controller for automatically controlling the flow of liquid fuel to the vaporizer; means in said mixing tube for regulating the quantity of rich mixture passing from the vaporizer to the mixing tube; and means for regulating the pressure under which fuel is delivered to the fuel flow controller.

25. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, a fuel vaporizer in communication therewith, a liquid fuel supply conduit to said vaporizer, a fuel flow controller in said fuel supply conduit having its interior in direct communication with the atmosphere and with the throat of the mixing tube; whereby impulses arising from variations in pressure at the throat of the mixing tube are transmitted directly to the fuel flow controller for automatically controlling the flow of liquid fuel to the vaporizer; and means in said mixing tube for regulating the quantity of rich mixture passing from the vaporizer to the mixing tube.

26. A carburetor comprising an induction and mixing tube having a constricted portion or throat therein, a fuel vaporizer in communication therewith, a liquid fuel supply conduit to said vaporizer, a fuel flow controller in said fuel supply conduit having its interior in direct communication with the atmosphere and with the throat of the mixing tube, whereby impulses arising from variations in pressure at the throat of the mixing tube are transmitted directly to the fuel flow controller for automatically controlling the flow of liquid fuel to the vaporizer; means in said mixing tube for regulating the quantity of rich mixture passing from the vaporizer to the mixing tube; and means for regulating the pressure under which fuel is delivered to the fuel flow controller.

In witness whereof, I hereunto set my hand this 10th day of November, 1919.

BRYANT BANNISTER.

Witnesses:

G. W. ALSTON,  
R. H. BROWNLEE.