

July 26, 1927.

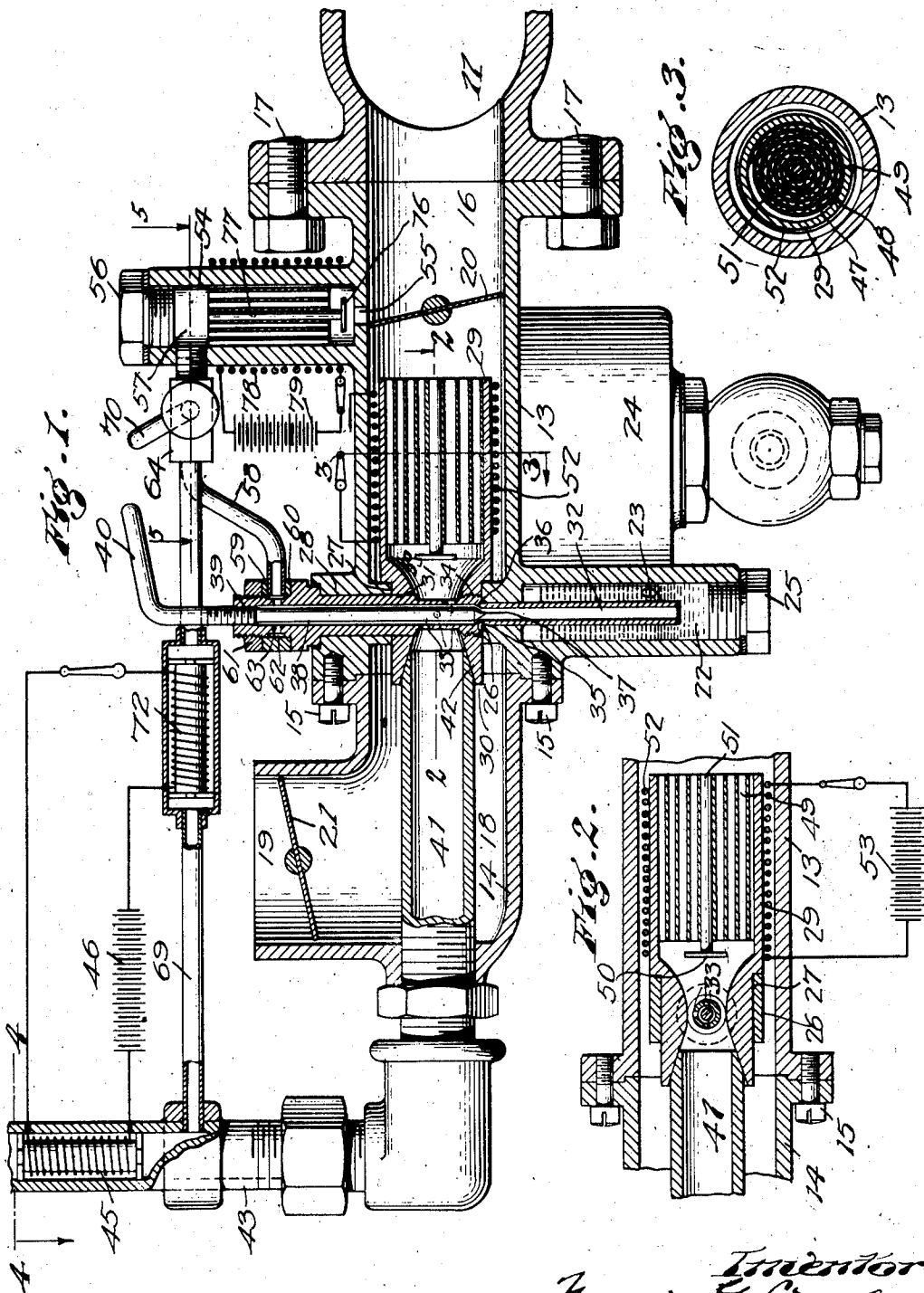
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1,637,104

CARBURETOR

Filed April 23, 1925

2 Sheets-Sheet 1



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Fig. 6.

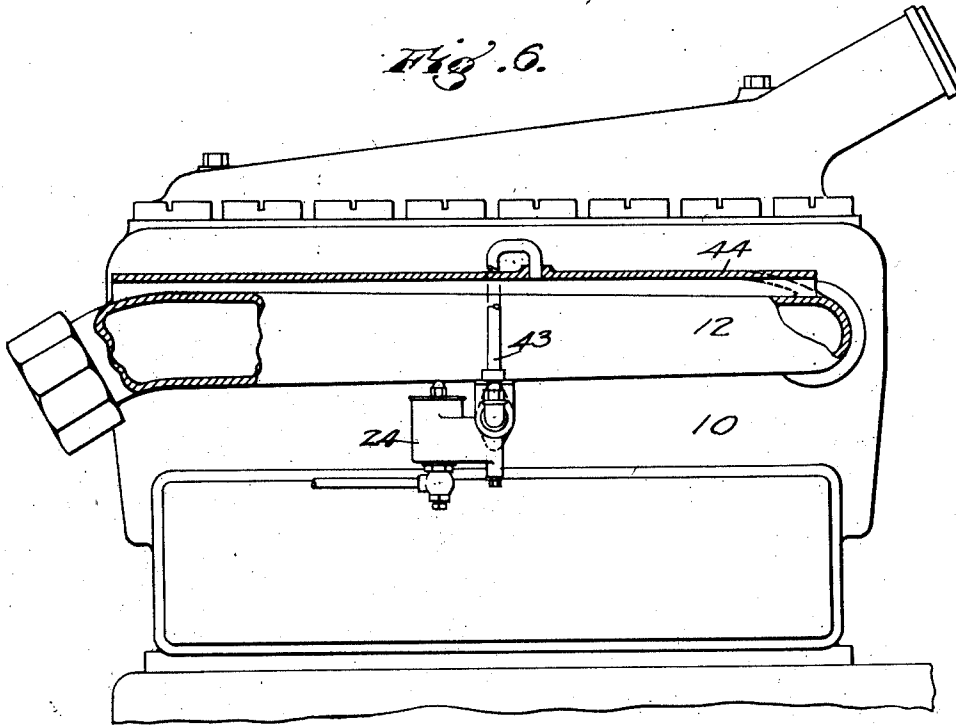


Fig. 4.

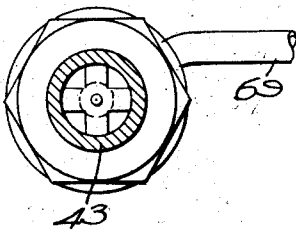
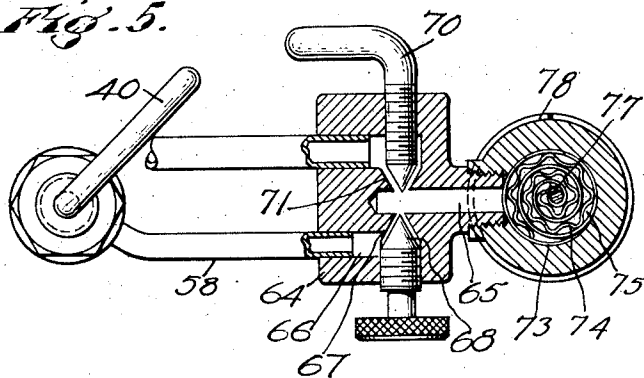


Fig. 5.



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UNITED STATES PATENT OFFICE.

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CARBURETOR.

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This invention relates to a fuel preparing device or carburetor for gas engines and has as its principal object the provision of a device of this character in which air previously heated by the exhaust of the engines or otherwise is supplied to the mixture for increasing its power producing capacity and also to provide improved means for supplying a lean mixture where the engine is running at high speed and a rich mixture when running at low speed.

In the accompanying drawings:—

Fig. 1 is a vertical longitudinal section of a fuel mixing device or carburetor embodying my invention.

Figure 2 is a fragmentary horizontal section taken on line 2—2, Fig. 1.

Figure 3 is a vertical section taken on line 3—3, Fig. 1.

Figures 4 and 5 are fragmentary horizontal sections taken on the correspondingly numbered lines in Fig. 1.

Figure 6 is a side elevation of a gas engine, on a reduced scale, showing my improved fuel mixing device applied thereto.

Similar characters of reference indicate corresponding parts throughout the several views.

The numeral 10 represents a gas engine of well known construction having an intake 11 from which the explosive mixture is conducted to the working cylinder of the engine and an exhaust or discharge conduit 12 through which the spent gases are carried away from the cylinder.

My improved fuel mixing device comprises means for producing a mixture of liquid fuel and air for running the engine at high speed, means for producing a mixture of liquid fuel and air for running the engine at low speed and means for preheating the air for mixing the same with the fuel either when running at high or low speeds.

The general organization of the above described means comprises a main tubular or hollow body having a rear section 13 and a front section 14 which have their opposing ends detachably connected by screws 15. The interior of the rear section 13 forms an outlet or mixing chamber 16 which communicates with the fuel intake 11 of the engine to which the rear end of the rear body section is connected by screws 17, and the interior of the front section 14 forms an air chamber 18 which is provided at its front end with a laterally extending air inlet 19

through which the external air is admitted directly to the carburetor. Within the rear part of the mixing chamber is arranged a throttle valve 20 preferably of the usual butterfly type whereby the supply of combustible mixture from the main vaporizing means to the engine is controlled, and within the inlet 19 of the air chamber is arranged a choke or air controlling valve 21 of usual construction for controlling the direct supply of air to the carburetor.

On the underside of the rear body section of the carburetor near the front end of the same is arranged a transfer chamber 22 which has its lower end connected by a passage 23 with the lower part of a float controlled liquid fuel supply chamber 24 which receives fuel from any suitable source and delivers the same to the transfer chamber. The lower end of the latter is normally closed by a screw plug 25 which affords access to the chamber and the parts within it for cleaning and inspection.

Extending across the front part of the mixing chamber 16 and preferably formed with the rear body section 13 is a vertical post or bridge 26 which is provided with a horizontal longitudinal opening 27 which is axially in line with the rear and front sections of the tubular body. An assembly opening 28 extends vertically from the top to the bottom of the rear body section, through the post 26 and into the upper end of the transfer chamber 22 and intersecting the longitudinal opening 27, as shown in Figs. 1 and 2.

Arranged axially within the central part of the rear body section 13 in front of the throttle valve 20 is the casing 29 of a main vaporizer which is preferably of tubular form and provided at its front end with a reduced choke tube 30 which projects forwardly through the opening 27 in the post and has a vertical assembly opening 31 which intersects the passage through the neck and registers with the assembly opening 28 in the body and post.

The numeral 32 represents the tubular fuel nozzle which extends downwardly through the assembly opening 28 in the rear body section, the assembly opening in the choke tube and terminates at its lower end near the bottom of the transfer chamber. On its central part the fuel nozzle is provided with a reduced part which is arranged with the passage of the choke tube and pro-

vided with a plurality of jet openings 33 leading laterally from the bore of the nozzle to its periphery within the choke tube. Below its jet openings the fuel nozzle is provided with an external screw thread 34 which engages with an internal screw thread on the adjacent part of the choke tube and below its screw thread the fuel nozzle is provided with a downwardly facing shoulder 35 bearing against a co-operating shoulder on the adjacent part of the post 26. Within the bore of the fuel nozzle below its jet openings the same is provided with an upwardly facing valve seat 36 toward which a needle valve 37 is relatively movable for controlling the flow of liquid fuel from the supply through the fuel nozzle. The needle valve is formed on the lower end of a valve stem 38 which is arranged with the fuel nozzle and is connected near its upper end with the nozzle by a screw joint 39 so that by turning this stem through the medium of a handle 40 at its upper end the needle valve may vary the size of the passage through the nozzle and thus regulate the amount of fuel which is supplied to the carburetor for a mixture with air to produce the desired combustible mixture for the engine.

Air is supplied to the front or inlet end of the choke tube through a supply conduit having an inner delivery section 41 arranged axially within the front section of the body and connected at its inner end by a tapering joint 42 with the inlet of the choke tube and an outer receiving section 43 which may take air from any suitable source but preferably from a hood 44 arranged over the exhaust pipe of the gas engine, as shown in Fig. 6, so that the air which is supplied to the fuel nozzle will be heated before mingling the same with the liquid fuel and thereby promote combustion of the mixture and increasing the amount of power derived from the same.

During normal running of the engine at high speed the throttle and choke valves 20 and 21 are wide open whereby the suction of the engine pistons causes the liquid fuel to be drawn from the source of supply outwardly through the jet openings 33 in the nozzle which liquid joins the air in the choke tube which is supplied in a previously heated condition and thereby effects the first dilution of the liquid fuel. As this liquid fuel mixed with an initial amount of air escapes from the rear end of the vaporizing casing 29 the same is further mixed with air which is supplied from the external atmosphere by the conduit 18 and its lateral branch 19 whereby a mixture of the liquid fuel and air is obtained which is in condition for exploding in the cylinders of the engine and operating the same.

Instead of preheating the air which passes the jet openings of the fuel nozzle by taking

this air from the vicinity of the exhaust conduit this preheating may be accomplished by means of an electric heater 45 arranged in the receiving section 43 of the air supply conduit or other passage through which this air passes before reaching the fuel nozzle, this heater being supplied with current from an electric source which is conventionally indicated at 46 in Fig. 1.

For the purpose of promoting the vaporization of the liquid fuel after the same joins the initial air supplied by the central conduit 41, 43 main vaporizing means are provided which preferably consist of a cellular core which is arranged within the vaporizer casing 29 and which consists of a flat sheet of metal 47 and a corrugated sheet of metal 48 rolled together and placed in the casing 29, as shown in Figs. 1, 2 and 3. A plurality of longitudinal cells or passages 49 are thus formed within the vaporizer casing upon the surfaces of which the saturated preliminary mixture of liquid fuel and air is deposited after leaving the fuel nozzle, and choke tube, thereby accelerating the vaporization of liquid fuel and effecting an intimate mixture of the same with the air so that the fuel is finely and evenly distributed throughout the air and the combustible quality of the mixture is uniform throughout the entire body of the same, thereby insuring the maximum yield of power from the same when exploded in the gas engine.

For the purpose of producing a distribution of mixture over all parts of the main vaporizer a baffle 50 is arranged in front of the cellular core so as to cover the central part of the same, this baffle being supported by a rod 51 which is supported on the central part of this vaporizer core.

If desired the fuel mixture may be heated as it passes through the main vaporizer within the casing 29 which can be effected by means of a heating coil 52 surrounding this casing and adapted to be connected with an electric current source such as 53 which heating means may be used either in connection with or independent of the primary heating coil 45 and the hood 44 over the exhaust pipe as circumstances may require.

When the choke valve 21 is closed the mixture which passes to the engine is very rich inasmuch as the liquid fuel has only been diluted by the initial air supplied by the central conduit 41, 43, which mixture is best suited for starting the engine. After the engine has been started the choke valve 21 is opened so that external air enters the body and mixes with the partly diluted mixture at the rear end of the main vaporizer whereby the liquid fuel is further diluted so that it is lean and in condition for running the engine economically at high speed.

Means are also provided for supplying a mixture of increased richness to the engine while the throttle is closed and the engine is running at low speed which means are constructed as follows:—

The numeral 54 represents a by-pass chamber from which a combustible mixture is delivered to the rear part of the rear body section 13 through a by-pass opening 55 which is arranged immediately in rear of the throttle valve 20 in the closed position of the latter, whereby fuel will be supplied indirectly from the fuel supply nozzle to the engine by the by-pass means during slow speed running instead of directly from the fuel supply nozzle when the throttle valve is open. This by-pass chamber is closed at its top by means of a screw plug 56 and near its top the same has an inlet 57 through which liquid fuel taken from the fuel supply nozzle and mixed with air is introduced. This liquid fuel is conducted by a by-pass pipe 58 which has its inlet end connected with the fuel supply nozzle and its outlet end connected with the by-pass chamber. The connection between the by-pass pipe and the fuel nozzle is preferably effected by a coupling ring 59 secured to the by-pass pipe and mounted on the upper end of the fuel nozzle between an upwardly facing shoulder 60 thereon and a clamping nut 61 having a screw connection therewith, said fuel nozzle having an annular channel 62 on its periphery within the ring 59 and a plurality of radial openings 63 leading from the bore of the fuel nozzle to this channel, whereby communication will be constantly maintained between the fuel nozzle and the by-pass pipe regardless of the relative rotary position of the parts. The connection between the outlet end of the by-pass pipe and the by-pass chamber preferably includes a valve mechanism which permits of regulating the flow of liquid fuel from the fuel nozzle to the by-pass chamber. The valve mechanism for this purpose, as shown in the drawings, preferably comprises a valve casing 64 having an outlet 65 communicating with the inlet of the by-pass chamber, an inlet 66 connecting with the outlet of the by-pass pipe, a valve seat 67 arranged between the inlet and outlet 66 and outlet 65, and a needle valve 68 having a screw connection with the valve casing and movable toward and from the seat 67.

Additional air is supplied to liquid fuel as it enters the by-pass chamber by means of an air by-pass pipe 69 which has its inlet end preferably connected with the outer section 43 of the air supply pipe while its delivery end is connected with the valve casing 64 and communicates with the outlet 65 thereof through the medium of a port which can be regulated by a needle valve 70 having a screw connection with said valve cas-

ing and movable toward and from a valve seat 71 around said port.

Upon closing the throttle valve for slowing down the engine by reducing the fuel supply the delivery of fuel directly from the nozzle to the intake manifold will be cut off and instead of liquid fuel escaping from the nozzle through its jet openings liquid fuel will be drawn from the lower end of the nozzle to the top thereof and conducted thence through the fuel by-pass pipe, by-pass chamber and by-pass port to the intake manifold. At the same time added air will be drawn from the nozzle air pipe through the auxiliary air pipe 69 into the by-pass chamber in which latter the fuel and air mix preparatory to entering the intake manifold.

The air for the by-pass is preferably withdrawn from the nozzle air pipe 43 in rear or below the electric heater 45 so that the air will be heated either electrically or by contact with the exhaust pipe before reaching the intake. This air may however, be heated additionally to or independently of the exhaust pipe and electric heater 45 by means of an electric heater 72 arranged in the air by-pass pipe 69 and receiving its electric current supply from the electric source 46 or elsewhere.

Vaporization of the fuel mixture may also be effected by means of a vaporizer in the by-pass chamber consisting preferably of a cellular core formed of a flat sheet of metal 73 and a corrugated sheet of metal 74 rolled together and forming a plurality of longitudinal cells or passages 75, as shown in Figs. 1 and 3, through which the fuel mixture passes and is rapidly and thoroughly mixed so that its ingredients are evenly and uniformly distributed throughout the mass and thus promote complete combustion and attain greater efficiency. The fuel is compelled to spread over the entire surface of the vaporizer and thus increase the capacity of the same by employing a baffle 76 which is arranged below the lower end of the by-pass vaporizer opposite the central part of its core and supported by a rod 77 secured in the center of the respective core, as shown in Figs. 1 and 3.

As the fuel and air pass through the by-pass chamber and the vaporizer therein the same may be heated by any suitable means, for example, by an electric heating coil 78 surrounding the by-pass chamber and adapted to be connected with an electric current source 79.

When the throttle valve 20 is closed and liquid fuel is drawn from the lower end of the fuel nozzle to the upper end thereof the air supplied by the nozzle air pipe 41 and 43 instead of passing through the main vaporizer shell 29 is now drawn inwardly through the jet openings 33 into the fuel nozzle where it joins the rising liquid fuel

and becomes mixed therewith on its way to the by-pass pipe and chamber, and intake. It will therefore be noted that when the engine is running at high speed the liquid fuel passes outwardly through the jet openings 33 and when the engine is running at low speed the air passes from the choke tube inwardly through these jet openings.

To insure a strong pull on the jet openings from the top of the fuel nozzle the upper openings 63 are of greater capacity than the lower jet openings 33, thereby supplying abundant fuel to the engine while running at slow speed.

By using vaporizers in the manner indicated a greater amount of heated air can be mixed with the fuel and thereby effects a saving in consumption of fuel for a given output of power.

Owing to the increased richness of the mixture when the throttle is closed to slow down the engine and keeping the mixture dry or well distributed by means of the vaporizer in the by-pass chamber carbonization of the fuel is prevented as well as all engine troubles usually following in the train of carbonization.

I claim as my invention:—

1. A carburetor comprising a tubular body, having a mixture outlet, a main air inlet, a bridge across the interior of said body and provided with an opening, and a fuel chamber arranged in line with said bridge, a choke tube arranged within the opening of said bridge, a fuel nozzle passing through said body, bridge and choke

tube and having the inlet at its lower end arranged within said fuel chamber and provided within said choke tube with jet openings and an air supply tube communicating with said choke tube, said fuel nozzle having a screw connection with said choke tube.

2. A carburetor comprising a tubular body having a mixture outlet, a main air inlet, a bridge across the interior of said body and provided with an opening, and a fuel chamber arranged in line with said bridge, a choke tube arranged within the opening of said bridge, a fuel nozzle passing through said body, bridge and choke tube and having the inlet at its lower end arranged within said fuel chamber and provided within said choke tube with jet openings, and an air supply tube communicating with said choke tube, said fuel nozzle having a valve seat, and a needle valve movable toward and from said seat.

3. A fuel preparing device comprising a tubular body having an inlet and an outlet, a throttle valve arranged in the outlet of said body, a fuel nozzle having jet openings in its side which communicate with the interior of said body in front of said throttle valve and provided at its upper end with lateral outlet openings and a shoulder below said openings, a collar surrounding said outlet openings, a screw nut on said nozzle engaging said collar, and means for conducting fuel from said nozzle to said body in front of the throttle valve including a pipe which connects with said collar.

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