G. F. TROTTER.

CARBURETER FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED APR. 20, 1918.

1,377,529. Patented May 10, 1921.

3 SHEETS—SHEET 1.

Fig. 1.

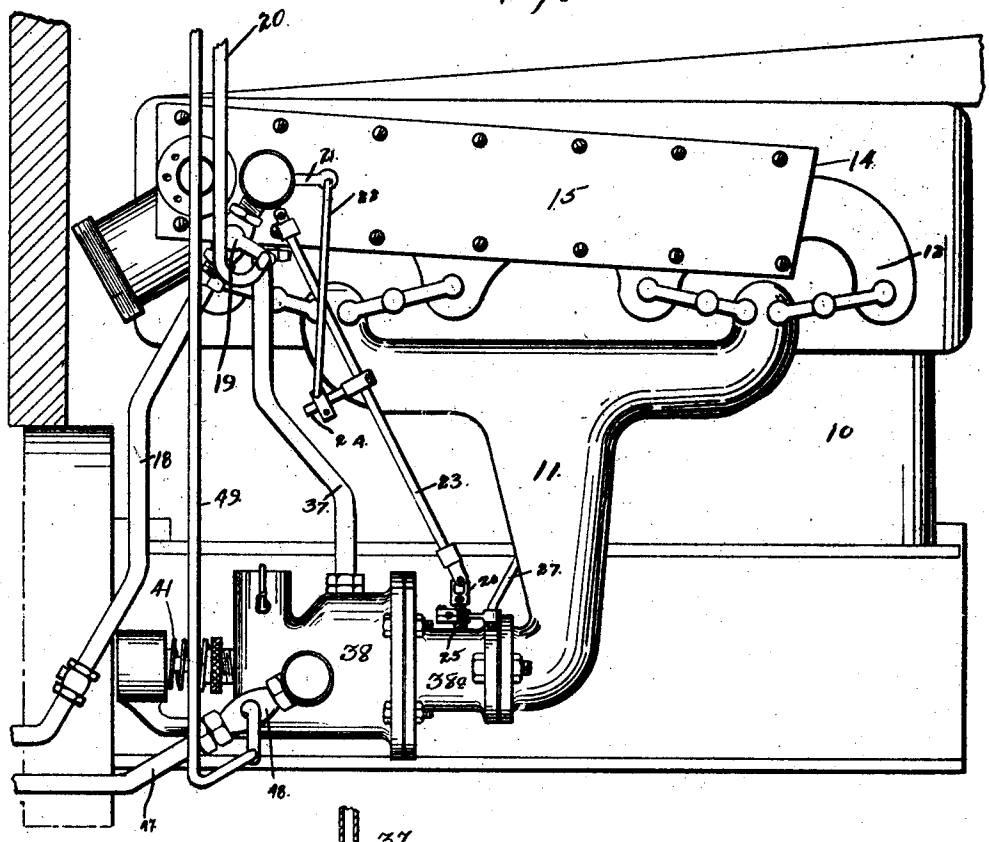


Fig. 2.

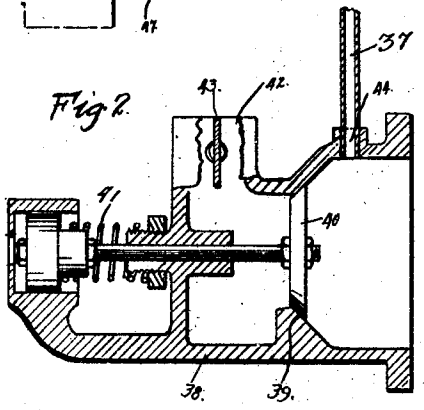
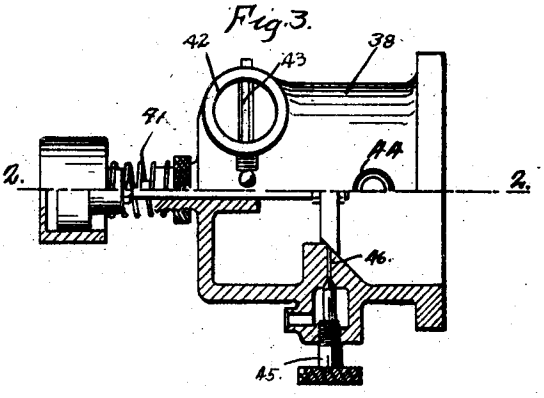


Fig. 3.



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3 SHEETS—SHEET 2.

Fig. 4.

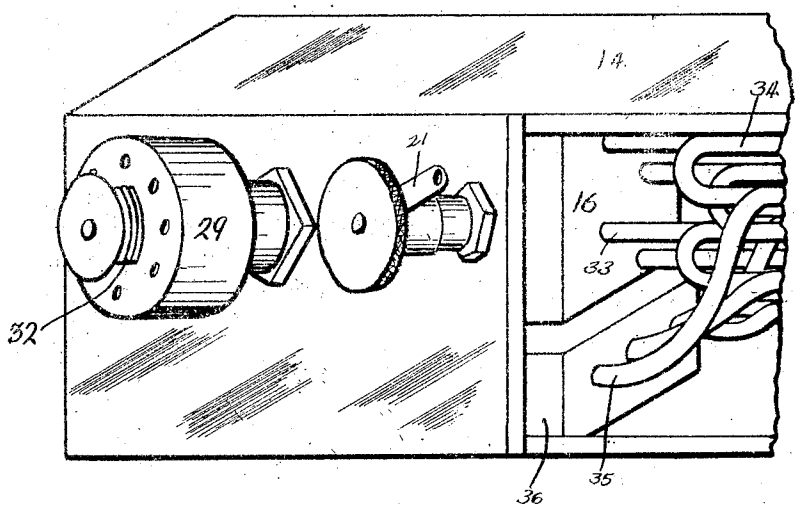
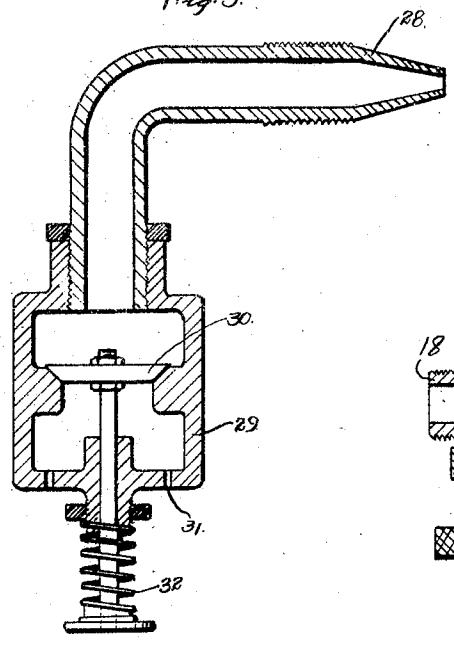


Fig. 5.



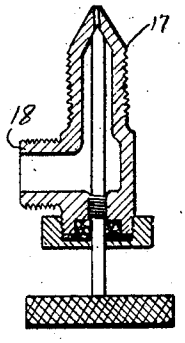


Fig. 6.

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3 SHEETS—SHEET 3.

Fig. 7

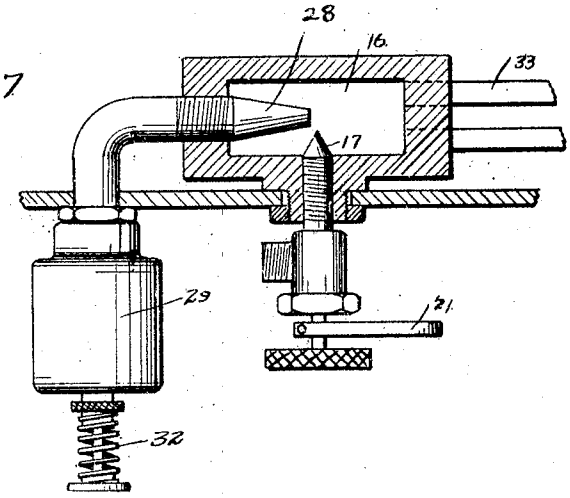
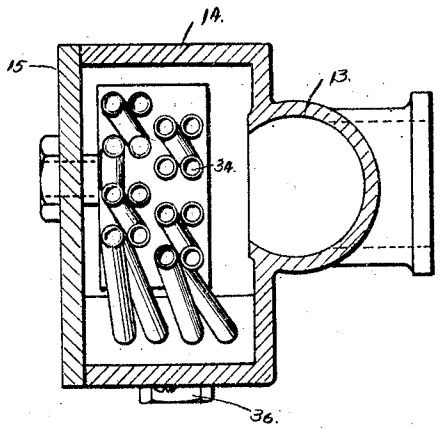


Fig. 8



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UNITED STATES PATENT OFFICE.

GEORGE F. TROTTER, OF DES MOINES, IOWA.

CARBURETER FOR INTERNAL-COMBUSTION ENGINES.

1,377,529. Specification of Letters Patent. Patented May 10, 1921.

Application filed April 20, 1918. Serial No. 229,857.

To all whom it may concern:

Be it known that I, GEORGE F. TROTTER, a citizen of the United States, and resident of Des Moines, in the county of Polk and State of Iowa, have invented a certain new and useful Carbureter for Internal-Combustion Engines, of which the following is a specification.

The objects of my invention are to provide a device of simple, durable and inexpensive construction for gasifying liquid fuel, such as kerosene, by the application of heat from the internal combustion engine, and to convert the liquid fuel into gas in measured quantities to meet the requirements of the engine to which it is applied.

A further object is to provide a device of this class in which the quantity of kerosene or the like that is being brought into position to be gasified by the heat, is accurately determined by the requirements of the engine, and drawn into the heating element by suction from the intake ports of the engine, and also in this connection to provide means whereby any of the liquid fuel that is not gasified will not enter the engine cylinders but will remain in the gas forming elements to be later gasified or vaporized by the hot gases passing through these elements to the intake ports of the engine.

A further object is to provide in a device of the kind mentioned, means whereby a fuel may be heated and vaporized or gasified, and whereby thereafter a supply of air may be mixed with said fuel and the mixture supplied to the explosive chambers of an engine.

Still a further object is to provide a device of this class especially designed to coact with the starting or priming device that employs a highly volatile liquid fuel, such for instance as gasolene, and in this connection it is my object to provide such a priming device of simple, durable and inexpensive construction, to coact with the carbureter for use in starting the engine and running it until its exhaust heat is produced in sufficient quantities for gasifying kerosene or the like.

My invention consists in the construction, arrangement and combination of the parts of the kerosene gasifying device and their particular adaptation to the gasolene priming device, and also in the construction of the gasolene priming device and its specific combination with the kerosene gasifying device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Figure 1 shows a side elevation of an internal combustion engine having my improved carbureting device applied thereto.

Fig. 2 shows a vertical, sectional view through the combined mixing chamber and gasolene priming chamber.

Fig. 3 shows a top or plan view of same, partly in section, to illustrate the gasolene priming device.

Fig. 4 shows a detail, perspective view illustrating the kerosene spraying chamber, the gasifying pipes leading from it, and the gas receiving chamber communicating with the said pipes, the wall of the heating chamber being removed.

Fig. 5 shows a detail, sectional view illustrating the valve and nozzle through which air is sucked by the exhaust of the engine to spray the kerosene.

Fig. 6 shows an enlarged, detail, sectional view illustrating the kerosene regulating needle valve.

Fig. 7 shows a detail, horizontal, sectional view illustrating the kerosene spraying chamber with portions of the kerosene gasifying pipes leading therefrom and also the kerosene supply needle valve and the nozzle for supplying air under pressure to spray the kerosene; and

Fig. 8 shows a vertical, transverse, sectional view through the heating chamber and the kerosene gasifying pipes, looking toward the kerosene spraying chamber.

Referring to the accompanying drawings, I have used the reference numeral 10 to indicate that part of the internal combustion engine shown. 11 indicates an intake manifold for the engine, and 12 indicates the terminals of the exhaust manifold communicating with the engine cylinders. Each of these terminals leads to the exhaust manifold proper 13, which is enlarged to form a rectangular casing or heating chamber 14, provided on one side with the detachable side plate 15. The exhaust manifold opens into this heating chamber 14, as clearly shown in Fig. 8.

At one end of the heating chamber 14 is the kerosene spraying chamber 16. A needle valve 17 for supplying kerosene is introduced into one side of this spraying chamber, and communicates with a kerosene

supply pipe 18 which is provided with a cut-off valve 19, said valve being controlled by a rod 20 which is extended to a point conveniently accessible to the operator. The needle valve is provided on its stem with an arm 21, which arm is connected to a rod 22. This rod 22 is operated upon the rotation of the shaft 23 through the instrumentality of the arm 24 fixed to said shaft and connected to the rod 22. This shaft 23 is rotated by means of an upright shaft 25 mounted on a suitable support and connected by a universal joint 26 with the shaft 23. This upright shaft 25 is rotated by means of a rod 27 which is arranged conveniently accessible to the operator, and is the ordinary throttle valve control rod.

Arranged in the spraying chamber 16 is a device for spraying the liquid kerosene, comprising a nozzle 28 communicating with a valve chamber 29 in which there is a normally spring-closed valve 30, the chamber being provided on one side with inlet ports 31, and the spring 32 is provided for normally seating the valve.

In the operation of this part of the device, when a partial vacuum is created inside of the spraying chamber 16 by the suction of the engine, air is drawn into the chamber 29 through the inlet ports, and the valve 30 is thereby opened and a quantity of air is sucked through the nozzle 28, which is arranged directly adjacent to the kerosene needle valve 17, as shown in Fig. 7, so that the kerosene at the tip of said valve is sprayed throughout the interior of the spraying chamber 16.

Communicating with this spraying chamber 16 are four independent heating coils. That is to say, one end of each heating coil communicates with the spraying chamber. These ends of the coils are indicated by the numeral 33. The body portion 34 of each coil is arranged within the heating chamber 14, and the other end 35 of each coil is arranged in communication with the gas chamber 36. This gas chamber 36 communicates with a pipe 37 leading to the combined mixing chamber and priming device.

This mixing chamber and priming device comprises a casing indicated generally by the numeral 38. Near the central portion of this casing is a valve seat 39, and a valve 40 is mounted on said seat and normally held in closed position by a spring 41. On the inlet side of the valve is a port 42 in which there is arranged a butterfly valve 43, and on the opposite side of the said valve is the port 44 which receives the gas pipe 37. Arranged at the side of the casing 38 is a needle valve 45 for controlling a passage 46 which communicates with the interior of the casing 38 at the point where the valve 40 is in engagement with its valve seat. The passage 46 communicates with a gasolene supply pipe 47, which pipe is provided with a cut-off valve 48 controlled by a rod 49 arranged conveniently accessible to the operator. This casing 38 communicates with the intake manifold 11 by means of the tubular member 38^a in which is located the ordinary throttle valve controlled by the rod 27.

In practical use and assuming that it is desired to start the engine when it is cold, the operator first opens the valve 48 to permit the flow of gasolene to the needle valve 45. The valve 45 is opened and the engine is cranked and suction created in the intake manifold. This suction will open the valve 40 against its spring, and permit a rapid flow of air through the casing 38, and this will take up and vaporize the gasolene entering through the passage 46 and conduct it into the engine cylinders where it is ignited in the ordinary way.

After the engine has run for a short period of time on gasolene in this manner, the exhaust from the engine enters the heating chamber 14 and the heat becomes sufficiently intense to bring the heating coils to a red heat. Then the operator closes the gasolene valve 48 and opens the kerosene valve 19, whereupon a supply of kerosene enters the port controlled by the kerosene needle valve 17. The continued suction of the engine draws an air blast through the nozzle 28 and sprays the kerosene into the interior of the spraying chamber 16. The vaporized kerosene thus produced is drawn by suction through the heating coils and returned to the gas chamber 36, from which it flows through the pipe 37 into the intake manifold.

It has been demonstrated in practice that the amount of heat supplied to the heating coils is sufficient to thoroughly gasify the kerosene entering the intake manifold during ordinary running conditions of the internal combustion engine. It has also been demonstrated that by novel arrangement and combination of parts, the amount of gas thus produced is accurately proportioned to the requirements of the engine under all ordinary conditions, and that the gas entering the engine is extremely hot and in condition for most efficient ignition and rapid consumption within the engine cylinders. The amount of gas being supplied to the engine is at all times instantly controllable by a manipulation of the throttling rod.

One of the advantageous features of my invention is that under normal conditions a fixed gas is produced and is supplied to the engine in a hot condition and in measured quantities. However, under unusual conditions and in the event that kerosene vapor or liquid kerosene should enter the heating pipes or the mixing chamber 38, it will not enter the engine in liquid or vapor

form, but will be retained in the heating pipes, and when the engine has again started to work under normal conditions, the heated gases will again gasify, or at least vaporize, the kerosene and prevent the same from entering the engine in liquid form, which is objectionable so far as the engine lubrication is concerned.

I have found that it is advisable to use a plurality of coils, as herein shown and described, instead of using a single long coil. A single coil long enough to make the proper heating of the fuel under all conditions certain, makes too long a path for the travel of the fuel, and I have found that the plurality of coils makes it possible to sufficiently and thoroughly heat the fuel without reducing too much its speed of travel through the coils.

Another advantageous feature of the structure of my device arises from the use of the mechanism whereby the throttle valve and the kerosene control valve are simultaneously controlled by the operation of a single lever or rod. Thus when the throttle valve is opened to subject the kerosene nozzle and the air mixing device to the suction of the engine, the kerosene control valve is simultaneously opened, and in the same way when the throttle valve is closed the kerosene control valve is closed.

One of the important features of my invention is the provision of means for thoroughly heating and gasifying, or at least vaporizing, the fuel with the admixture of a comparatively small amount of air, and the subsequent addition or admixture of a larger amount of air to the heated fuel. Under ordinary conditions the fuel is gasified, and thereafter the addition of cold air will not again reduce the fuel to liquid form. There is an important advantage in thus heating the fuel first and afterward adding the cool air. If the air is mixed with the fuel at the time of heating, it will be seen that the air is then expanded with the fuel. Where the cool air is added to the fuel after the latter has been heated, I have found it easier to add the proper quantity of air on account of the fact that the air when thus added to the fuel is not expanded. When the cool air is thus added to the fuel which has been gasified, the air has no important effect on the fuel, except to cool it, and it does not again condense the fuel; and even where the fuel has been simply vaporized, I find that there is no substantial condensation of the fuel in a device of this kind.

I claim as my invention:

1. In a device of the class described, the combination of a heating chamber, means for introducing heat from an internal combustion engine into the heating chamber, a spraying chamber adjacent to the heating chamber, a gas chamber adjacent to the spraying chamber, and designed to communicate with the inlet manifold of an engine, a pipe communicating at one end with the spraying chamber, and having its body portion extended through the said heating chamber, and having its other end communicating with the said gas chamber, and means for introducing fuel such as kerosene into the spraying chamber.

2. In a device of the class described, the combination of a heating chamber, means for introducing heat from an internal combustion engine into the heating chamber, a spraying chamber adjacent to the heating chamber, a gas chamber adjacent to the spraying chamber, and designed to communicate with the inlet manifold of an engine, a pipe communicating at one end with the spraying chamber, and having its body portion extended through the said heating chamber, and having its other end communicating with the said gas chamber, and means for introducing fuel such as kerosene into the spraying chamber, said means including a valve arranged for manual adjustment, a nozzle adjacent to the valve, one end of the nozzle being open to the air, and a spring-closed valve within the nozzle, whereby the suction from the engine through the gas pipe will cause a spray to pass through said nozzle and over the kerosene valve, for the purposes stated.

3. In a device of the class described, the combination of a heating chamber, means for introducing heat from an internal combustion engine into the heating chamber, a spraying chamber adjacent to the heating chamber, a gas chamber adjacent to the spraying chamber, and designed to communicate with the inlet manifold of an engine, a pipe communicating at one end with the spraying chamber, and having its body portion extended through the said heating chamber, and having its other end communicating with the said gas chamber, means for introducing fuel such as kerosene into the spraying chamber, a mixing chamber communicating with the gas pipe, an intake manifold communicating with one end of the chamber, a valve seat within the chamber, a spring-closed valve on said seat, said valve chamber being provided with an opening on the side of the valve chamber opposite the intake manifold, and means for regulating the passage of air through said opening.

4. In a device of the class described, the combination of a heating chamber, means for introducing heat from an internal combustion engine into the heating chamber, a spraying chamber adjacent to the heating chamber, a gas chamber adjacent to the spraying chamber, and designed to communicate with the inlet manifold of an engine, a pipe communicating at one end with the spraying chamber, and having its body por-

tion extended through the said heating chamber, and having its other end communicating with the said gas chamber, means for introducing fuel such as kerosene into the spraying chamber, a mixing chamber communicating with the gas pipe, an intake manifold communicating with one end of the chamber, a valve seat within the chamber, a spring-closed valve on said seat, said valve chamber being provided with an opening on the side of the valve chamber opposite the intake manifold, and means for regulating the passage of air through said opening, said gas pipe being introduced into said mixing chamber between the valve therein and the intake manifold.

5. In a device of the class described, the combination of a gasifying chamber, and a combined mixing chamber and priming device comprising a casing, a valve seat within the casing, a spring-closed valve on the valve seat, an intake manifold communicating with one end of the casing, said casing having an air inlet opening on the side of the valve opposite the intake manifold, said casing also having an opening to receive said gas pipe on the side of the valve adjacent the intake manifold, and a gasolene priming valve introduced into said casing adjacent to the valve seat.

6. In a device of the class described, the combination of a gasifying chamber, and a combined mixing chamber and priming device comprising a casing, a valve seat within the casing, a spring-closed valve on the valve seat, an intake manifold communicating with one end of the casing, said casing having an air inlet opening on the side of the valve opposite the intake manifold, said casing also having an opening to receive said gas pipe on the side of the valve adjacent the intake manifold, and a gasolene priming valve introduced into said casing adjacent to the valve seat, said gasolene inlet valve opening being normally closed by said valve when seated.

Des Moines, Iowa, April 11, 1918.

GEORGE F. TROTTER.