Nov. 17, 1925. 1,561,693

E. CARTER

HUMIDIFIER FOR INTERNAL COMBUSTION ENGINES

Filed July 18, 1924

Fig. 1.

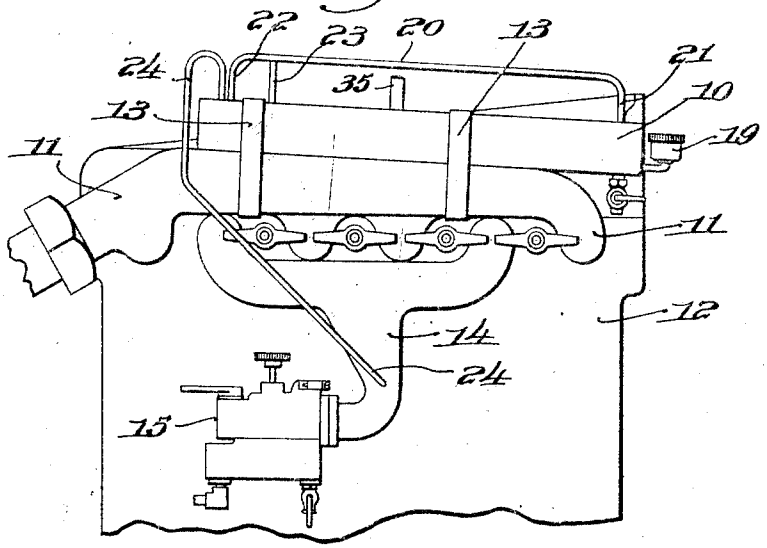


Fig. 2.

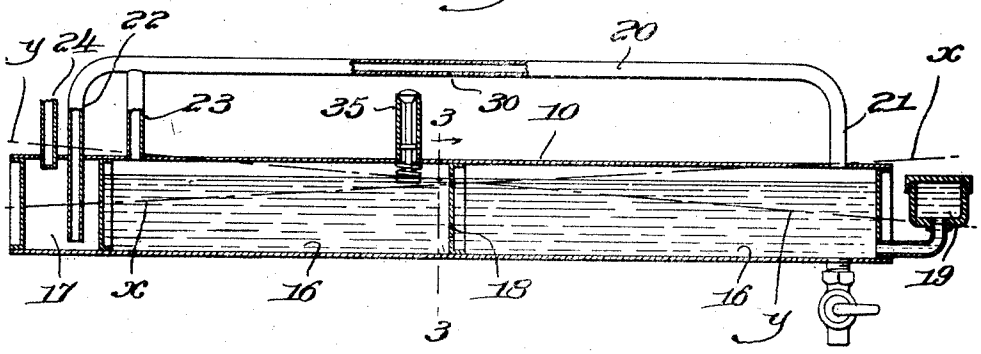
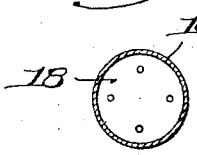


Fig. 3.



Inventor:
Ernest Carter:
by Edward F. Allen
his Atty.

Patented Nov. 17, 1925. 1,561,693

UNITED STATES PATENT OFFICE.

ERNEST CARTER, OF MELROSE HIGHLANDS, MASSACHUSETTS.

HUMIDIFIER FOR INTERNAL-COMBUSTION ENGINES.

Application filed July 18, 1924. Serial No. 726,869.

To all whom it may concern:

Be it known that I, ERNEST CARTER, a citizen of the United States of America, and a resident of Melrose Highlands, in the county of Middlesex and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Humidifiers for Internal-Combustion Engines, of which the following is a specification.

This invention relates to a humidifier for use in connection with internal combustion engines, and more particularly to one wherein steam, or vapor, is the agent employed.

An object of the invention is to produce a humidifier of simple and inexpensive structure that is readily attachable to existing engines.

Another object of the invention is to produce a humidifier of the above class having a steam or vapor generating chamber, and a steam or vapor superheating chamber through which the agent must pass on its way to the engine.

A further object of the invention is to produce a humidifier of the above class of a construction whereby provision is made to prevent the accidental flow of water or other liquid from the generating chamber into the steam or vapor superheating chamber.

A still further object of the invention is to provide means whereby a continuous flow of steam or vapor, from the generating chamber to the superheating chamber, may take place to thereby ensure the delivery of a supply thereof to the superheating chamber in instances where the invention is applied to motor vehicles wherein the level of the generator is not stable but varies as the vehicle traverses hilly country.

An object of the invention is to provide means for filling the generating chamber, said means being of such arrangement as to permit of the maximum quantity of liquid entering the said chamber, whereupon the said means functions as an overflow device whereby an overload of the said chamber cannot take place.

Another object of the invention is to produce a humidifier that is attachable to a heated portion of an engine, such for instance as the exhaust manifold, and of such construction that both the generating and superheating chambers thereof contact with such portion for the purpose of absorbing heat therefrom for their particular uses.

Other objects of the invention will be further pointed out in the specification and claims hereinafter given.

Of the drawings:

Figure 1 represents a portion of a well-known engine in side elevation, having the invention applied thereto.

Figure 2 is an enlarged view of the device as seen in Figure 1, portions thereof being broken away.

Figure 3 is a section on the line 3—3 Figure 2.

Like characters represent like parts throughout the several figures of the drawings.

Referring to the drawings:

The drawings herewith represent the invention in a convenient form for application to at least one well-known type of internal combustion engine, but it will be understood that changes might be made therein to adapt it to other types without departing from its spirit and scope.

In the present instance the combined generating and superheating chambers are contained in a tank-like device 10, shown as secured to the exhaust manifold 11 of an engine 12 by means of straps 13; the said engine being also provided with an intake manifold 14 to which at the lower end is attached the carburetor 15 of any usual or suitable type or make.

The tank 10 is made of such a length as to contact with the manifold 11 for the greater portion of its length, to thereby take advantage of heat radiating therefrom, and is divided into two chambers 16 and 17.

The steam or vapor generating chamber 16 is divided approximately midway of its length by a perforated partition or baffle plate 18, and has a filling attachment 19 so arranged with respect to the height of the tank 10 as to limit the amount of liquid to be poured into the said chamber 16.

The chamber 17 is preferably located at the left end of the tank 10 which conveniently brings it into contact with the hottest part of the manifold 11, and is connected to the chamber 16 by means of the main pipe 20, one end of which taps into the tank 10 at the right adjacent the end thereof as at 21, the other end 22 tapping into and extending nearly to the bottom of said chamber 17.

Adjacent the left end of the chamber 16 is a short pipe 23, which taps into the main

pipe 20, and forms a second outlet in said chamber 16 for steam or vapor generated therein.

Leading from the chamber 17 is a pipe 24 which taps into the intake manifold 14 and preferably at the smallest diameter thereof, which in the present instance is adjacent the carburetor 15.

Upon starting the engine 12 the manifold 11 becomes heated and transmits heat to the tank 10, in the chamber 16 of which water or other liquid has been previously placed.

Close contact of the tank 10 and the manifold 11 causes the liquid to become hot even to the boiling point, thereby generating steam or vapor which is ultimately drawn into the engine 12 mingling with the explosive mixture.

It has been found that moist air when mixed with the explosive charge, and when properly controlled, aids materially in obtaining the ideal condition, or perfect combustion, and by so doing greatly eliminates the formation of carbon in the engine, and results in economy in the use of fuel.

It has also been found that steam or vapor is more effective as a humidifier than cool liquid even when finely sprayed or atomized, and it has been further discovered that dry or superheated steam is even more effective than saturated steam or vapor.

It is, therefore, an object of this invention to produce a humidifier which generates and thereafter superheats steam prior to its entry into the engine.

To accomplish this the tank 10 is, as before stated, divided into two chambers 16 and 17, the chamber 16 containing water or other liquid which by reason of heat radiated from the manifold 11 is caused to give off a more or less saturated steam or vapor.

As is well known, movement of the engine pistons, not shown, at certain times draws into the engine an explosive charge, generally consisting of mixed air and gas, through the intake manifold 14 from the carburetor 15.

This same action, in the present instance, causes a draft to be made upon the steam formed in the chamber 16 which, however, is obliged to pass through the superheating chamber 17 before reaching the engine 12.

It is intended that the chamber 17 shall be of such capacity as to hold in reserve a sufficient supply of superheated steam for several charges, to thereby ensure a quantity of dry steam for each charge.

Viewing Figure 1, let it be assumed that the engine shown therein is mounted on a vehicle that is standing on level ground, and that the right end thereof is toward the front of the vehicle.

At this time there is a visible forward and downward pitch to the tank 10 due to the inclined top of the manifold 11, and consequently the liquid or water line in the said chamber 16 would assume an angle with respect to the tank 10, approximated by the line *x—x;* Figure 2.

Under this condition steam drawn into the engine from the chamber 17 will be replaced by a like quantity of saturated or partly saturated steam drawn from the chamber 16 through the pipes 23, 20, and 22; this condition also existing when the vehicle is traveling down hill as at that time the pipe 21 will be practically sealed by the liquid and little or no steam will be drawn through it.

When the vehicle is traveling up hill the water or liquid line will assume an angle with the tank approximating the line *y—y* and at that time the pipe 23 will have been sealed and steam will be drawn from the chamber 16 through the pipes 21, 20, and 22 to the chamber 17.

It will be readily seen that with the above arrangement the angularity of the water line with respect to the tank need not be taken into consideration as a supply of steam may be drawn from the chamber 16 by either the pipe 23 or 21, as the case may be.

The main pipe 20 is purposely removed a considerable distance from the tank 10 in order to prevent the possibility of liquid overflow from the chamber 16 to chamber 17, and has a vent 30 therein which prevents the formation of a vacuum in the chambers 16 and 17.

A safety valve as conventionally illustrated at 35 may be mounted on tank 10 to relieve the pressure in the chambers 16 and 17 if so desired.

It is known that humidifiers have been used wherein saturated steam or vapor has been led into the engine from one source or another, but it is not known that superheated steam has ever been used in this connection, therefore, it is not intended to limit this invention to the precise construction shown as it will be understood that changes might be made in the generating and superheating chambers without departing from the spirit and scope of the invention.

Having described my invention I claim:

1. A humidifier for internal combustion engines comprising a tank having a steam generating chamber and a steam superheating chamber horizontally arranged and separated by a partition and in contact with a heated portion of an engine; said generating chamber having a plurality of outlets so arranged each with respect to the other that said chamber may assume an angular position causing the liquid therein to substantially seal one of said outlets while the other is unsealed and operative and arranged to conduct steam to said heating chamber.

2. A humidifier for internal combustion

engines comprising a tank having two compartments therein, one of which is arranged to receive liquid for the purpose of generating vapor, and the other for the purpose of superheating vapor generated in said first compartment; means to communicate between the said compartments, said means comprising a pipe having an end entering said second compartment to nearly the bottom thereof, and an end tapped into said first compartment adjacent one end thereof, and a branch from said pipe tapped into said first compartment at the other end thereof to thereby form vapor outlets removed from each other, whereby said tank may assume an angular position and the liquid therein caused to seal one of said outlets while the other outlet is free to perform its intended function.

3. A humidifier for internal combustion engines comprising a tank having a steam generating chamber and a steam superheating chamber, said generating chamber having a steam outlet at each end thereof whereby one of said outlets will be operative regardless of the angularity of said tank and the level of the liquid therein; a main outlet pipe into which said outlets deliver, said main outlet being tapped into said superheating chamber and terminating adjacent the bottom thereof; means to supply liquid to said generating chamber, said means also forming an overflow whereby an oversupply of liquid is prevented from entering said generating chamber.

Signed by me at Boston, Massachusetts, this 14th day of July, 1924.

ERNEST CARTER.