June 23, 1925. 1,543,476

E. McCUTCHEON

AIR, GAS, AND VAPOR MIXER

Filed Nov. 5, 1923 2 Sheets-Sheet 1

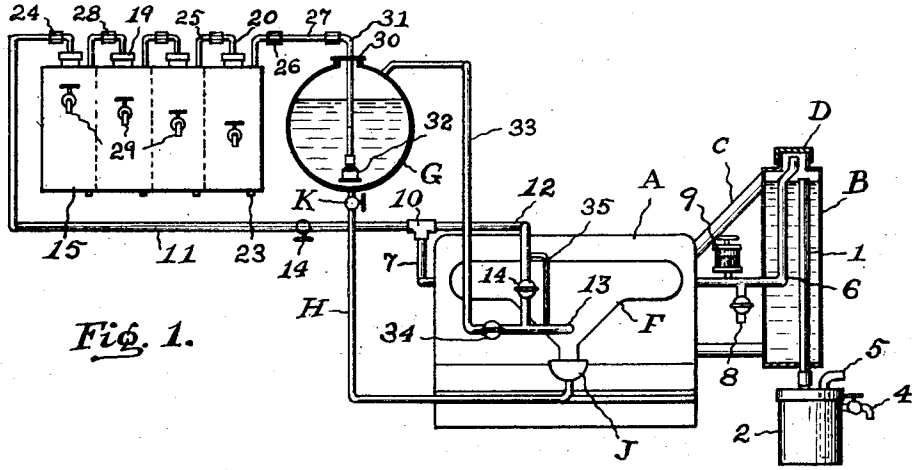

Fig. 1.

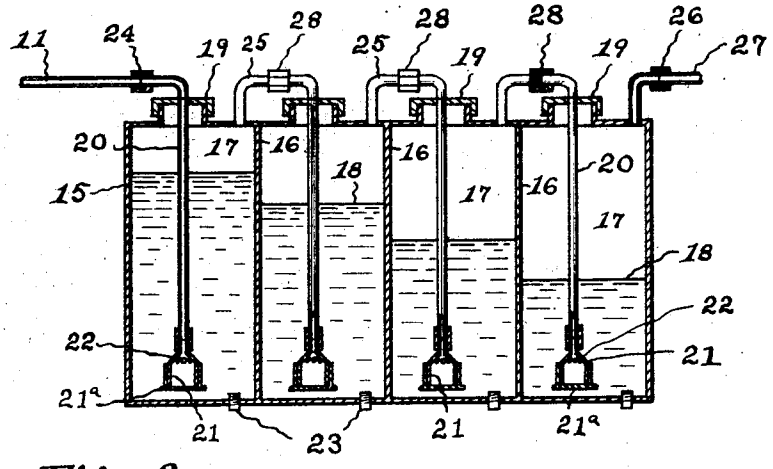

Fig. 2.

INVENTOR.

BY E. McCutcheon

Robb Robb & Hill

ATTORNEYS

June 23, 1925. 1,543,476

E. McCUTCHEON

AIR, GAS, AND VAPOR MIXER

Filed Nov. 3, 1923 2 Sheets-Sheet 2

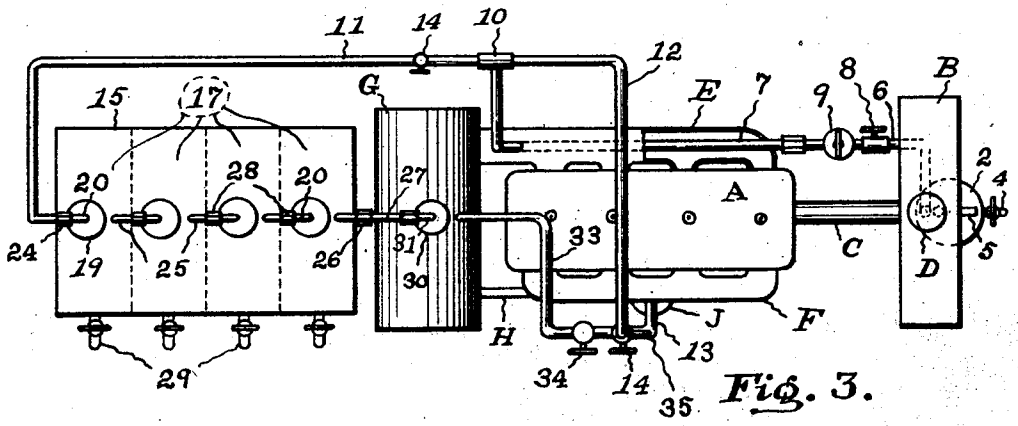

Fig. 3.

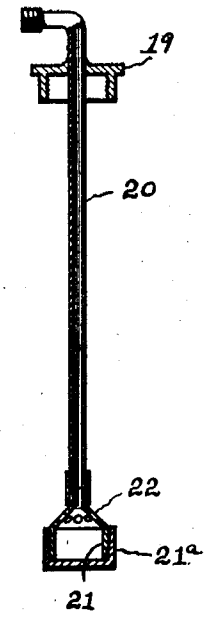

Fig. 4.

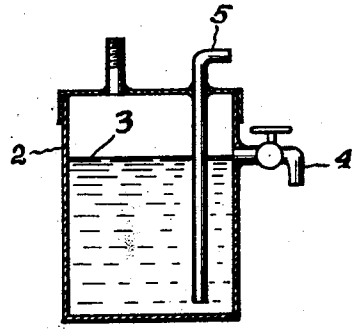

Fig. 5.

INVENTOR.

BY E. McCutcheon

Robb Robb & Hale

ATTORNEYS

Patented June 23, 1925. 1,543,476

UNITED STATES PATENT OFFICE.

EVERETT McCUTCHEON, OF CLEVELAND, OHIO.

AIR, GAS, AND VAPOR MIXER.

Application filed November 3, 1923. Serial No. 672,682.

To all whom it may concern:

Be it known that I, EVERETT McCUTCHEON, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Air, Gas, and Vapor Mixers, of which the following is a specification.

The present invention relates to an explosive mixture producing apparatus for use in connection with internal combustion engines, and has for its object to provide a device of this character which embodies novel features of construction whereby a highly efficient mixture is supplied to the engine cylinders with the result that a maximum amount of power can be obtained from the engine with a minimum fuel consumption.

Further objects of the invention are to provide a device of this character which is comparatively simple and inexpensive in its construction, which can be utilized in connection with any of the conventional types of internal combustion engines now in use, which will produce almost perfect combustion in the engine cylinders with practically no carbon accumulations and without the discharge of soot, smoke or unconsumed fuel through the exhaust, and which will enable the engine to be started easily at all times.

With the above and other objects in view, the invention consists in certain combinations and arrangements of the parts as will more fully appear as the description proceeds, the novel features thereof being pointed out in the appended claims.

For a full understanding of the invention reference is to be had to the following description and accompanying drawings in which,

Figure 1 is a side elevation of an air, gas and vapor mixture producing device which is constructed in accordance with the invention, showing the same as associated with a conventional form of internal combustion engine.

Figure 2 is an enlarged vertical sectional view through the fuel container.

Figure 3 is a top plan view of the complete device, showing it as associated with an internal combustion engine.

Figure 4 is an enlarged view of one of the inlet pipes and trap device which is utilized in connection with each of the fuel chambers or compartments.

Figure 5 is an enlarged sectional view through the filter which is associated with the radiator and through which the air supply is drawn.

Corresponding and like parts are referred to in the following description and indicated on all of the views of the drawings by like reference characters.

Referring to the drawings, which illustrate one of many possible embodiments of the invention, the reference character A designates in a diagrammatic manner an internal combustion engine which may be of any conventional type. The engine is provided with a water cooling system and the usual radiator B is also shown in a diagrammatic manner, said radiator having the usual connections C with the engine to provide for the circulation of water or cooling fluid. There is a filling opening at the top of the radiator which is normally closed by the cap D. Associated with the engine is an exhaust manifold E and an inlet manifold F. The usual fuel or gasoline tank is indicated at G, and a fuel supply pipe H leads from the bottom of this tank to a carburetor J which is associated with the inlet manifold F. These parts are all of the well known and conventional construction and no claim to novelty is based thereon. The fuel supply pipe H is provided with a valve K, and this valve is closed to prevent the feeding of fuel to the carburetor and disable the carburetor when the present invention is applied to the engine. In fact, the device of the present invention takes the place of the carburetor and effectively mixes the air, gas and vapor so that they are supplied directly to the engine without the necessity of passing through the carburetor J. The carburetor J might be omitted when equipping a new engine with the invention.

The radiator B is provided with an overflow pipe 1 through which the water from the radiator overflows after a predetermined level is reached therein. The lower end of this overflow pipe 1 communicates with the top of a filtering chamber 2. This chamber is partially filled with water, as indicated at 3, and the level of the water is determined by an outflow cock 4 at one side thereof. The valve of the cock 4 is opened when the radiator is being filled with water, so that the overflow water from the radiator will fill the filtering chamber 2 up to the lever of the cock. The valve of the cock 4 is then closed and remains closed during the opera-

tion of the device. An air intake pipe 5 extends through the top of the filtering chamber 2 and terminates at a point near the bottom thereof. The air which is drawn through this intake pipe will thus be caused to bubble upwardly through the water in the filtering chamber 2 before it passes through the overflow pipe 1 of the radiator into the air space at the top of the radiator.

The air is warmed somewhat during its passage through the radiator and mingles or mixes with the water vapor or steam in the radiator. An air and vapor outlet pipe 6 leads from the air space in the top of the radiator to a pipe 7 which extends through the exhaust manifold E of the engine, with the result that the mixture of air and vapor is highly heated by the exhaust gases. The intake end of this vapor pipe 6 is shown as extending into the neck of the filling opening of the radiator, so that it will be well above the level of the water within the radiator, and water in the liquid state will not pass over through the same.

The vapor pipe 6 is provided with a drain cock 8 and an oil feeding well 9. The drain cock is opened when the radiator is being filled with water, so that any water which may enter the vapor pipe will be discharged through the drain cock and not be carried through the system of pipes into the fuel containers. The drain cock is closed when the engine is in normal operation. The oil feeding well or cup 9 is set to discharge a drop of oil into the pipe at periodic intervals. One drop of cylinder oil about every ten minutes has been found to give satisfactory results. This oil tends to prevent rusting and corrosion of the pipes, and also undoubtedly assists in the lubrication of the engine cylinders and also forms a small part of the explosive mixture which is supplied to the engine cylinders.

The heating pipe 7 which extends through the exhaust manifold, branches at its discharge end, being shown in the present instance as provided with a T fitting 10. One of the branch pipes 11 leads from the T fitting 10 to the fuel container, while the other branch 12 leads to the mixture inlet pipe 13 through which the mixture enters the inlet manifold F of the engine. Both of these branch pipes 11 and 12 are provided with valves 14 which enable the passage of the air and water vapor through the same to be controlled.

The fuel container 15 is subdivided by the partitions 16 into a plurality of separate compartments 17, each of which contains a supply of a volatile fuel medium such as gasoline, the liquid fuel being indicated at 18. Each of the compartments 17 is provided with a filler opening which is normally closed by a removable cap 19. An inlet pipe 20 is carried by each of the caps 19 and extends downwardly to a point near the bottom of the compartment. A suitable trap 21 is fitted upon the lower end of each of the inlet pipes 20, the top of the trap being formed with a series of openings 22 through which the air and vapors mixed therewith will emerge and bubble upwardly through the liquid fuel to the space at the top of the compartment. Any dust, dirt or impurities will be collected in the trap, and the bottom 21^a of each of the traps is in the form of a removable cup member which can be unscrewed so that the traps can be readily cleaned out at any time. The bottom of each of the compartments is provided with a drain opening which is normally closed by a removable plug 23.

The upper end of the inlet pipe 20 for one of the end compartments is detachably connected by a suitable union 24 to the pipe 11. An outlet pipe 25 leads from the top of each of the compartments and the outlet pipe of the final compartment is connected by a union 26 to a pipe 27, while the other outlet pipes are connected by unions 28 to the inlet pipes 20 of adjacent compartments. The air and vapor mixture is thus caused to pass successively through the several compartments of the fuel container and to bubble upwardly through the gasoline or liquid fuel in each of the compartments. As the air bubbles upwardly through the gasoline a portion of the gasoline is volatilized and mixed with the air, so that the mixture becomes richer or more saturated with the gasoline vapor as it passes through the successive compartments. The level of the gasoline in the compartments through which the air passes becomes successively lower, as is shown quite clearly by Fig. 2, and as the level of the gasoline becomes lower a larger space remains in the top of the compartment, the large space at the top of the final compartment providing in effect a fuel mixing chamber and rendering it comparatively easy to withdraw the gaseous mixture for use in the engine. In order to facilitate the maintenance of the gasoline at the proper levels in the respective compartments, overflow cocks 29 are provided at one side of the fuel container. The overflow cock for each of the compartments is set at the proper level for the gasoline in that compartment. When the caps 19 are removed from the filling openings of the compartments the said compartments can be filled with gasoline until there is an overflow through the cocks 29. The operator then knows that the gasoline has reached the desired level within the compartment, whereupon he can discontinue the filling operation and close the overflow cock 29.

Where the device of the invention is applied to an internal combustion engine al-

ready in use, the fuel tank G which is ordinarily provided for the engine may be utilized as a final fuel compartment. The cap 30 for the filling opening of the gas tank is provided with an inlet pipe 31, having a construction identical with that of the inlet pipes 20 for the compartment 17. A trap 32 which is identical with the traps 21 may be provided at the lower end of the inlet pipe 31. The upper end of the inlet pipe 31 is connected to the pipe 27 and the mixture from the final compartment in the fuel container 15 is conveyed to the bottom of the gas tank G and caused to bubble upwardly through the liquid fuel therein.

A mixture supply pipe 33 leads from the top of the fuel tank G to the mixture inlet pipe 13 which is connected to the inlet manifold. There is a valve 34 interposed in the length of the mixture supply pipe 33, so that the passage of the mixture therethrough can be properly controlled.

It has been previously mentioned that the branch vapor pipe 12 leads from the T fitting 10 to the mixture inlet pipe 13, and the final mixture received from the fuel container 15 and tank G thus has a further amount of warm air and water vapor supplied thereto through the pipe 12, the water vapor and warm air serving to render the mixture extremely combustible so that it can be easily ignited within the cylinder and will produce a powerful explosion without depositing any carbon in the engine. The quantity of warm air and vapor supplied to the final mixture through the pipe 12 is adapted to be controlled by the valve 14, although there is a by-pass 35 around this valve so that a minimum quantity of warm air and vapor is supplied to the final mixture even when the valve 14 is closed.

All of the air for the mixture is taken in through the filtering chamber 2 which will remove most of the dust and solid particles therefrom and prevent them from reaching the engine cylinders, even though the atmosphere in which the engine is operating may be heavily laden with dust. The filtered air from the filter is initially warmed in the radiator and mixed with the steam and water vapor which normally accumulates in the air space at the top of the radiator. This air and water vapor is thoroughly heated as it passes through the hot pipe 7 of the exhaust manifold, and a portion of this heated air and water vapor is conveyed through the branch pipe 12 and supplied to the final fuel mixture as it enters the intake manifold. The greater portion of the heated air and water vapor mixture is conveyed through the pipe 12 to the fuel container 15, where it is successively carried to the bottom of the several fuel compartments and permitted to bubble upwardly through the liquid fuel therein, with the result that it is thoroughly saturated with the vapors of the volatilized fuel before it reaches the final chamber or fuel tank, and is conveyed by the mixture supply pipe 33 to the mixture inlet pipe 13. The apparatus thus provides for a most efficient mixing of the warm air, water vapor and liquid fuel, with the result that the mixture can be easily ignited within the engine cylinders and will produce powerful explosions therein. The device has been found to be extremely economical in the use of fuel and the engine can be operated at high efficiency and maximum power with a small fuel consumption. The perfect combustion of the fuel mixture within the engine cylinders prevents deposits of soot and carbon, and the exhaust gases are not mixed with clouds of black or dark colored smoke, as is usually the case where the combustion within the engine is imperfect. The presence of the highly heated water vapor in the mixture also tends to prevent carbon deposits in the engine.

While one particular embodiment of the air, gas and vapor mixing device has been shown and described for illustrative purposes, it will be understood that many modifications and changes can be made in the details of construction without departing from the spirit of the invention and the scope of the claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent of the United States is,

1. The combination with an internal combustion engine and its usual fuel supply tank, of an auxiliary fuel container subdivided by partitions into a plurality of independent compartments, an intake pipe leading to the bottom of each of the compartments, the intake pipe of an end compartment being in communication with the atmosphere, connections between the upper portions of the compartments and the intake pipes of adjacent compartments, an intake pipe extending downwardly into the fuel supply tank of the engine and connected to the opposite end compartment of the auxiliary reservoir, air or air and gas being adapted to pass downwardly through the intake pipes and bubble upwardly through the liquid fuel, and a mixture pipe leading from the fuel supply tank of the engine to the intake of the engine.

2. A device of the character described, including a liquid fuel chamber provided at the top thereof with a filler opening, a removable cap for the filler opening, an air intake pipe carried by the said cap and adapted to extend downwardly to the bottom of the fuel chamber, and a dust trap carried by the lower end of the intake pipe, the intake pipe and dust trap being removable with the cap and air being adapted to flow downwardly through the intake pipe

and bubble upwardly through the liquid fuel in the chamber.

3. A device of the character described, including a series of liquid fuel containing compartments provided with filler openings, removable caps for the filler openings, air intake pipes carried by the caps and extending downwardly into the compartments, an outlet pipe at the top of each of the compartments, the intake pipe of an end compartment being open to the atmosphere, a fuel supply pipe leading from the outlet pipe of the opposite end compartment, and detachable connections between the other outlet pipes and the intake pipes of adjacent compartments.

4. A device of the character described, including a liquid fuel chamber provided with a filling opening, a quickly removable cap for closing the filling opening, an air intake pipe carried by the cap and extending to the bottom of the chamber, a dust trap carried by the lower end of the pipe and provided with openings through which the air is adapted to emerge and bubble upwardly through the liquid fuel, and an outlet pipe leading from the top of the chamber.

5. A device of the character described, including a series of liquid fuel containing compartments provided with filler openings, removable caps for the filler openings, intake pipes carried by the caps and extending downwardly into the compartments, an outlet pipe at the top of each compartment, the outlet pipes and intake pipes of adjacent compartments having end portions which are brought into registry when the filler caps are in position, and nipples detachably connecting the said outlet pipes and intake pipes.

6. A device of the character described, including a series of liquid fuel containing compartments, means for causing air to successively enter the bottom of the compartments and bubble upwardly through the liquid fuel therein, and means for obtaining successively lower levels of the liquid fuel in the compartments from the compartment which the air initially enters to the final compartment from which the air and mixture is drawn.

7. The combination with an internal combustion engine, including a water cooling system and radiator, of means for withdrawing air and water vapor from the radiator, means for heating the air and water vapor, means for mixing a portion of the said heated air and water vapor with volatilized liquid fuel to produce an explosive mixture, a mixture inlet pipe conveying the said mixture to the engine, a vapor pipe leading a portion of the heated air and water vapor to the mixture inlet pipe, a valve for the vapor pipe, and a by-pass extending around the valve.

8. The combination with an internal combustion engine, including a water cooling system and radiator, said radiator having an over-flow pipe, and having an air space in the top thereof which is normally closed, an air filter associated with the over-flow pipe, means for drawing air and vapor from the air space of the radiator, the over-flow pipe then serving as an air inlet pipe, and means for mixing the said air and water vapor with a volatilized liquid fuel to produce an explosive mixture which is supplied to the engine.

9. The combination with an internal combustion engine, including a water cooling system and radiator, said radiator having an over-flow pipe, a filtering chamber applied to the lower end of the over-flow pipe and adapted to receive water therefrom, an outlet controlling the level of water in the chamber, an air inlet pipe leading to the bottom of the chamber, means for withdrawing air and water vapor from the radiator, and means for mixing the said air and water vapor with a volatilized liquid fuel to produce an explosive mixture for the engine.

In testimony whereof I affix my signature.

EVERETT McCUTCHEON.