May 27, 1958 G. G. PRIMAKOFF 2,836,161

INTERNAL COMBUSTION ENGINES

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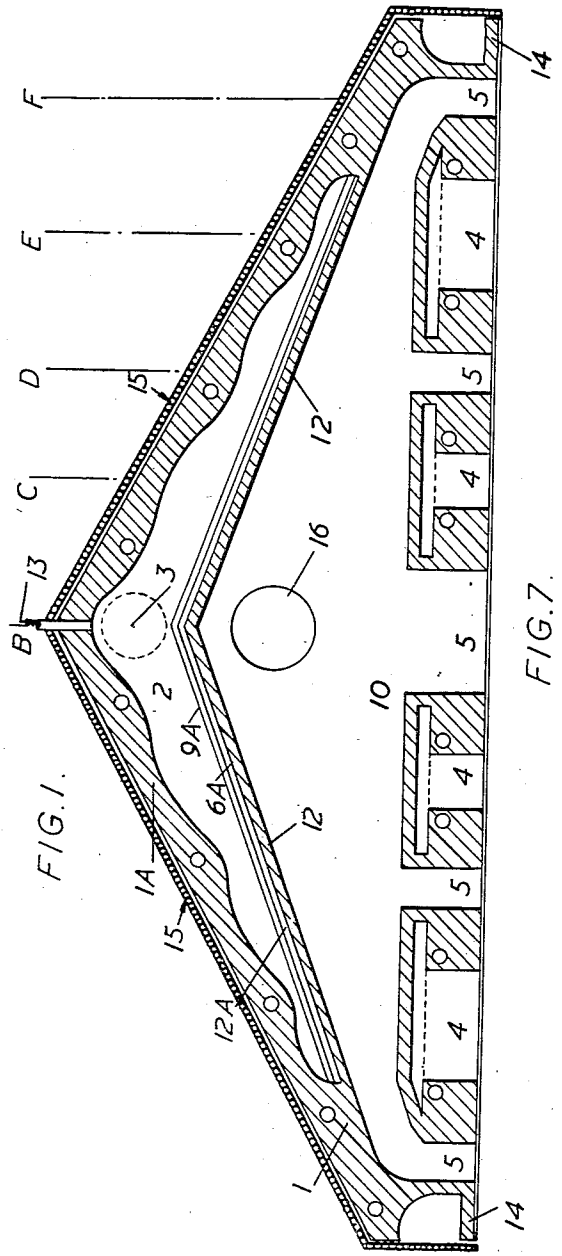

FIG. 1.

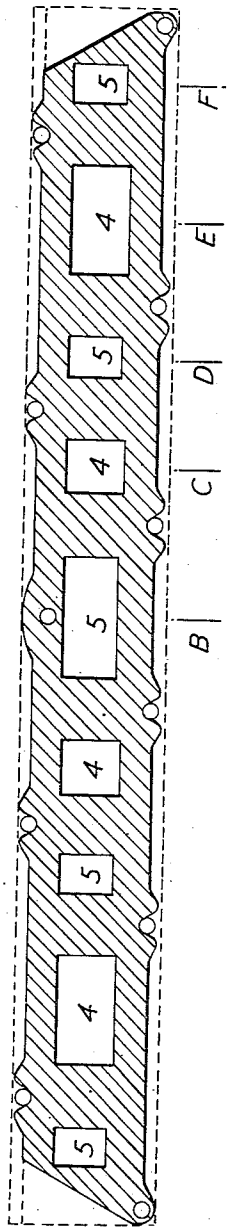

FIG. 7.

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FIG. 2.

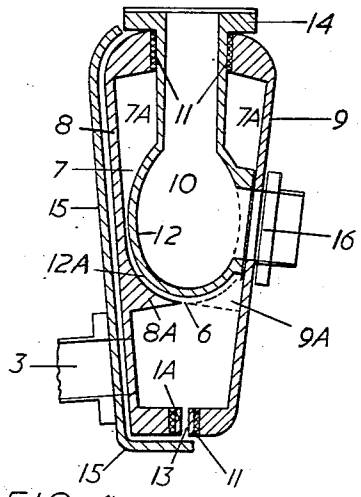


FIG. 3.

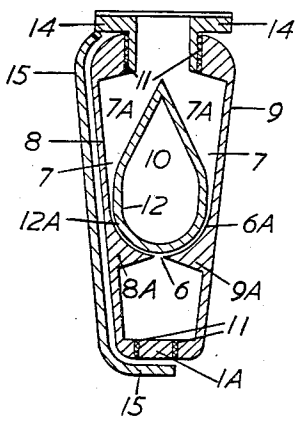


FIG. 4

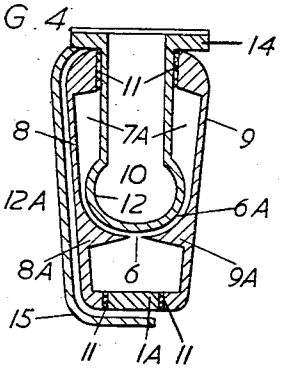


FIG. 5

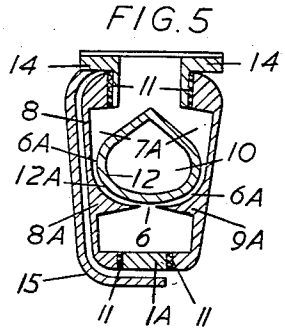
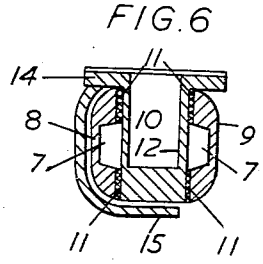


FIG. 6



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INTERNAL COMBUSTION ENGINES

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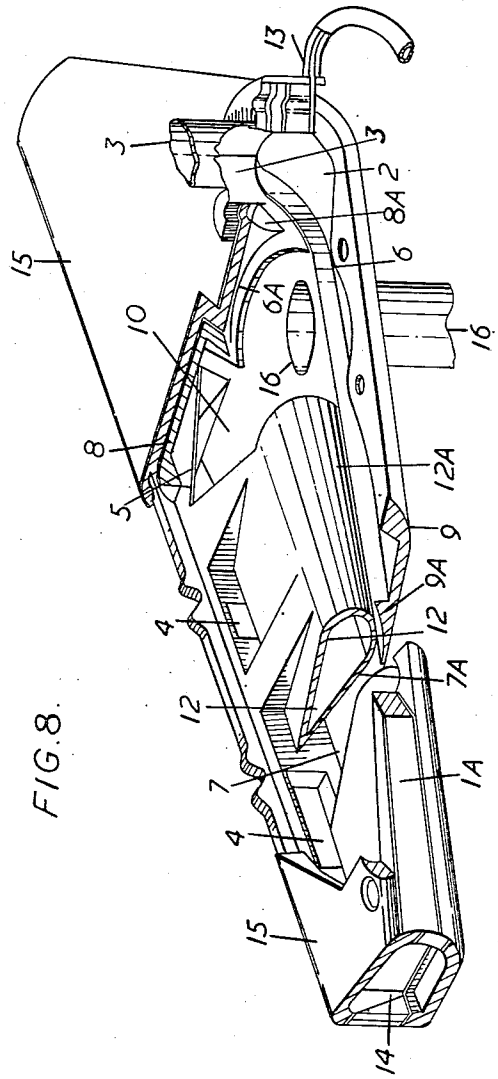

FIG. 8.

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INTERNAL COMBUSTION ENGINES

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6 Claims. (Cl. 123—122)

This invention relates to internal combustion engines and more particularly to the supply of fuel mixture to the cylinders of said engine.

One of the objects of this invention is to provide improvements in the fuel supply system such that the combustible mixture used for operating the engine should be delivered under conditions and in a manner whereby efficient combustion of the said mixture is obtained.

An important feature of the invention resides in the delivery of fuel mixture through the intake manifold where correct conditions are set up for the efficient combustion of the fuel delivered from the carburetor. The fuel mixture is converted into gaseous state and the heat of the exhaust gases of the engine is utilised for such conversion.

We are aware that it is already known to vaporise the fuel before it is introduced in the cylinders by utilising the heat from the exhaust gases which heat is supplied by one of the following means:

(*a*) The air is preheated before it enters the carburetor;

(*b*) The intake manifold is covered by a jacket through which exhaust gases are passed.

This invention has for its object to propose an improved method of and device for converting the fuel mixture into gaseous state before it is introduced into the cylinders of the engine.

It is also the object of this invention to propose means for supplying water to the fuel mixture for cooling the gases that are formed from the fuel mixture.

It is usual in internal combustion engines to provide a mixing device such as a carburetor in which the fuel and air are mixed, the respective volumes of each being controlled. The mixture is drawn into the intake manifold by suction and from the said manifold the mixture is fed to the respective cylinders with which the manifold is communicating. In engines employing the carburetor and the intake manifold, it has been impossible heretobefore, it is believed, to distribute the fuel mixture uniformly to all the cylinders.

Another object of this invention resides, therefore, in the distribution of uniform quantity of fuel mixture at substantially uniform speed simultaneously to all the cylinders of the engine.

According to this invention the improved method of supply or distributing fuel mixture to the cylinders is characterised by that the fuel mixture from the carburetor is first lead into an inlet chamber which chamber has a restricted outlet passage and through this outlet passage the fuel mixture is led into a second inlet chamber and at the area of the said outlet passage, the fuel mixture is converted into a gaseous state, the heat at the passage being supplied by the exhaust gases of the cylinders, the fuel mixture in gaseous state being then supplied to the cylinders of the internal combustion engine.

According to another feature of this invention the total area of the outlet passage from the first inlet chamber to the second inlet chamber is not less than the opening

of the intake fuel pipe from the carburetor leading into the said first inlet chamber.

The construction and structure of the inlet manifold and the exhaust gases outlet manifold have been modified in accordance with this invention. The inlet and the exhaust manifolds are so combined into a single body that the heat from the exhaust manifold can be utilised and this body for the purpose of convenience is referred to as a composite manifold.

The composite manifold according to this invention consists of a body including three chambers, a first fuel inlet chamber having an opening in its wall for receiving the fuel mixture from the carburetor, a second fuel inlet chamber communicating with the first chamber through a narrow outlet passage or slit, a third chamber housed within the second chamber and placed adjacent to the said slit, said third chamber communicating with the exhaust ports of the cylinders and having an outlet for exhaust gases, the second chamber having inlet ports on the opposite side of the said slit, said ports being connected to the inlet ports of the cylinders.

The invention will now be more fully described with reference to the accompanying drawings in which:

Fig. 1 shows sectional plan of the combined or composite inlet and exhaust manifold;

Figs. 2, 3, 4, 5 and 6 show respectively sections at BB, CC, DD, EE and FF of the composite manifold.

Fig. 7 shows the end view of the composite manifold.

Fig. 8 shows a perspective view partly in section.

Referring to the drawings, 1 shows a casting for the composite manifold body and in this is included the first inlet chamber 2 which has a fuel inlet opening 3 to receive the fuel mixture from the carburetor (not shown). The chamber 2 extends along the length of the engine and particularly up to the inlet ports 4 in the body opening into the respective cylinders (not shown). The embodiment shows by way of illustration a composite manifold for a six cylinder automobile engine in which the inlet ports at the ends feed two cylinders. 5 are the exhaust outlet ports in the body 1 and these receive the hot spent gases from the cylinders.

The chamber 2 is completely closed except for the fuel inlet opening 3 and a restricted passage or slit 6 from the said chamber. The passage 6 is in the form of a continuous or interrupted slit and its dimensions are such that the total area of said passage 6 is not less than the area of the inlet opening 3. The area of the passage or slit 6 is preferably equal to or slightly larger than the area of the inlet opening 3. The slit 6 is formed by projections or guides 8A and 9A of two covers 8 and 9 for the composite manifold as will be clear from the sections at CC and EE respectively.

When the engine is running, the fuel is drawn by suction through the carburetor and then through the inlet pipe which normally leads to the inlet manifold. In this case the fuel mixture first enters the first fuel inlet chamber 2 and then through the slit 6 enters a second fuel inlet chamber 7 and from the said chamber 7 it is drawn into the cylinders of the engine through inlet ports 4.

The second chamber 7 includes the exhaust gases chamber 10 and according to a preferred feature the body or manifold 12 for this chamber is so positioned or located within the chamber 7 as to allow the fuel mixture to contact the outer surface of the said manifold as soon as the fuel mixture is drawn through the slit 6 and whereby the mixture gets vaporised. The round shaped walls 12A of the exhaust gases chamber are adjacent to the narrow slit 6 so that as the fuel mixture is drawn by suction through the first inlet chamber said mixture comes immediately in contact at the said slit 6 with the heated surface of the walls 12A of the third chamber whereby the fuel mixture is converted into gaseous state and in

such state drawn into the area of larger section marked 7A in the second fuel inlet chamber 7.

Sections at CC and EE will illustrate that the exhaust gases chamber is made in the shape of a falling liquid drop or pear shaped in section so that the fuel mixture drawn from the passage 6 by the suction of the engine immediately contacts a major area of the surface of the said body 12 thereby ensuring complete vaporisation. The converging shape of the body 12 affords easy flow to the gases into the enlarged section 7A of the second chamber 7 and consequently into the cylinder of the engine through the inlet ports 4.

As already described above, the chamber 7 is formed by the covers 8 and 9 and the passage or slit 6 is formed by guides 8A and 9A which are shaped in conformity with the shape of the body 12 of the exhaust chamber 10. The fuel mixture first contacts the body 12 immediately at the outlet mouth of the slit 6 and is directed along the narrow clearance 6A so that an intimate contact ensuring complete vaporisation is established.

11 shows the packing material between the covers 8 and 9 and the composite body 1.

It will be noticed that the fuel mixture first enters the chamber 2 and from the said chamber it leaves through the slit 6 where it is converted into gaseous state and it then enters the second inlet chamber 7. In this chamber the fuel mixture is in complete gaseous state and, therefore, its distribution to the respective cylinders is uniform. The quality of the fuel gas fed to all the cylinders is also uniform so that by virtue of this construction the conditions created are such as to result in even distribution of uniform quality of fuel in gaseous state simultaneously to all the cylinders.

By the use of the device the fuel mixture which is converted into gaseous state will travel at a uniform rate of speed and will, therefore, be simultaneously supplied in uniform required volume to each of the cylinders in the engine.

The wall 1A of the composite manifold and the exhaust manifold or body 12 can be made integral with each other as shown in the embodiment. The chambers 2 and 7 are formed by the help of upper and lower covers 8 and 9 and by the help of guides 8A and 9A, the narrow slit or passage is formed 6 and clearances 6A are formed. This construction is important to the successful functioning of the device.

14 shows the flanges by which the composite manifold is connected to the engine.

15 shows a fibre glass cover.

13 shows a water pipe connection leading into a water tank (not shown). A small predetermined quantity of water is also drawn into the charge by suction. The quantity of water can, however, be controlled by any convenient known means. The use of water is recommended to cool the gaseous fuel mixture whereby the efficiency of the engine is improved.

The device herein proposed will afford effective vaporisation of the fuel for the internal combustion engine.

As fuel enters into the combustion chamber in the form of gas it cannot seep into oil sump in the form of fuel, even if firing has not taken place in the cylinder due to some reason. The gas will find its exit through the usual air outlet in the oil chamber. This factor will prevent contamination of the oil in the oil chamber and keep the oil clean longer, which in turn will prolong the life of the engine.

I claim:

1. In combination with internal combustion engines a device for supplying the combustible mixture from the carburettor to the cylinders of the engine which comprises a composite body including three chambers viz: a first fuel inlet chamber having an opening in its wall for receiving the fuel mixture from the carburettor, a second fuel inlet chamber communicating with the first chamber through a narrow outlet passage or slit, a third chamber housed with the second chamber and placed adjacent to the said slit, said third chamber being adapted to communicate with the exhaust ports of the cylinders and having an outlet for exhaust gases, the second chamber having inlet ports communicating with the inlet ports of the cylinders.

2. In combination with an internal combustion engine a device as claimed in claim 1 in which the total area of the passage or slit from the first inlet chamber to the second inlet chamber is not less than the opening of the carburettor fuel mixture outlet pipe or the fuel mixture inlet pipe to the first fuel inlet chamber.

3. In combination with an internal combustion engine a device for supplying the combustible mixture from the carburettor to the cylinders of the engine which comprises a composite body including three chambers viz: a first fuel inlet chamber having an opening in its wall for receiving the fuel mixture from the carburettor, a second fuel inlet chamber communicating with the first chamber through a narrow outlet passage or slit, a third chamber, housed with the second chamber and placed adjacent to the said slit, said third chamber being adapted to communicate with the exhaust ports of the cylinders and having an outlet for exhaust gases, the second chamber having inlet ports communicating with the inlet ports of the cylinders, and wherein the composite body is formed by top and bottom covers and an exhaust manifold body with a wall of the first inlet chamber whereby the first fuel inlet and the second fuel inlet chambers and the exhaust chamber, and the slit are respectively formed.

4. In combination with an internal combustion engine a device as claimed in claim 3 in which the top and the bottom covers have guides in the form of projections at their inside which projections combinedly form the outlet passage from the first fuel inlet chamber to the second fuel inlet chamber.

5. In combination with an internal combustion engine a device for supplying the combustible mixture from the careburettor to the cylinders of the engine which comprises a composite body including three chambers, the first fuel inlet chamber, a second fuel inlet chamber and an exhaust chamber within the second fuel inlet chamber, said body with the three chambers being formed by a single casting with top and bottom covers, said single casting comprising a wall of the first inlet chamber and the exhaust manifold, the covers having guides in the form of projections at their inside which projections combinedly form the outlet passage or slit from the first fuel inlet chamber to the second fuel inlet chamber, the section of the exhaust manifold being in the shape of a drop in its section, the larger area surface of said exhaust manifold being close to the exhaust outlet passage or slit.

6. In combination with an internal combustion engine a device as claimed in claim 3 in which packing material is provided between the top and bottom covers and the body.

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