

Feb. 28, 1928.

1,660,609

G. FORNACA

INTERNAL COMBUSTION ENGINE

Filed Dec. 23, 1924

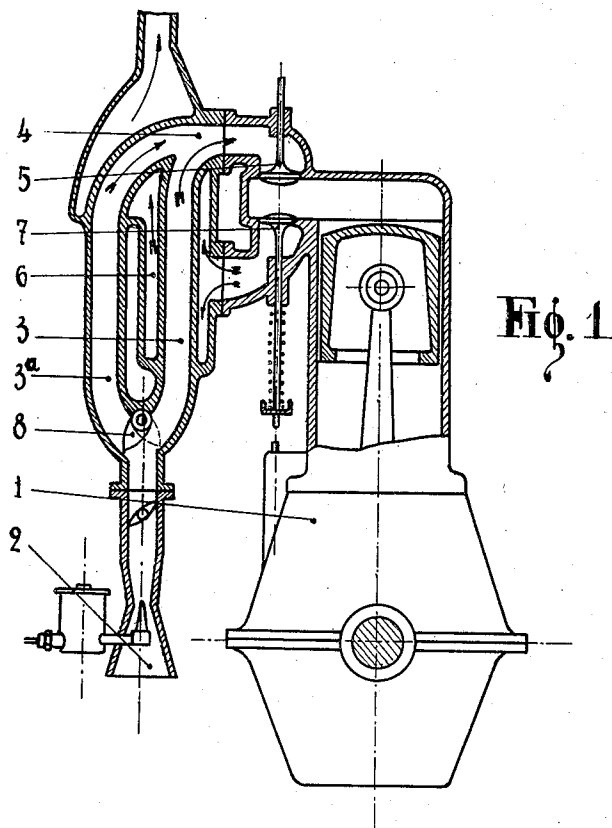


FIG. 1

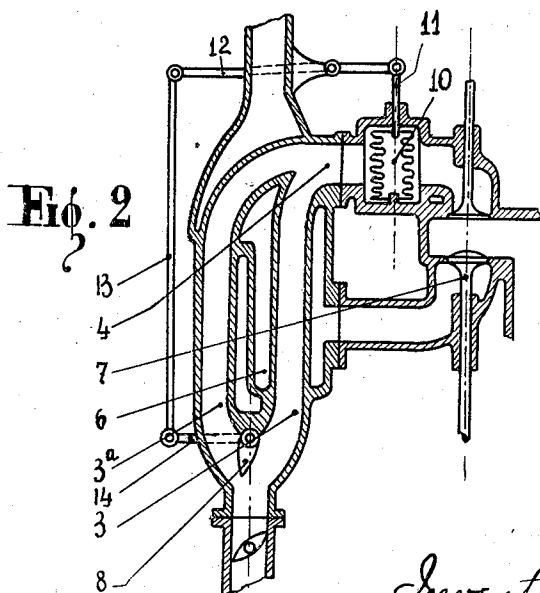


FIG. 2

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INTERNAL-COMBUSTION ENGINE.

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In the operation of internal combustion engines of the usual type (low compression and electric ignition) on heavy fuel, the mixture is generally pre-heated by causing the exhaust gases to circulate around the inlet pipe and thus produce vaporization of the fuel previously sprayed by the carburettor.

It has been found in practice that such engines operating on heavy fuel are far from flexible and present many disadvantages in operation due to the fact that sometimes the mixture is insufficiently heated and burns badly, leaving a carbon residue which settles on the sparking plugs and valves and gives rise to irregular running and even to stoppage of the engine; and sometimes, especially in prolonged operation and during hot weather, the heating is excessive and the engine gives a low efficiency and is subject to premature ignition which seriously imperils the strength of the parts and also causes irregular running which may make it necessary to stop the engine.

For this reason it has already been proposed to provide a double inlet pipe one branch of which is adapted to be heated by the exhaust gases, together with a valve whereby the combustible mixture can be directed through either branch. It has also been proposed to provide means whereby the intensity of heating of the mixture can be regulated, either by hand or automatically by thermostatic action, during the actual running of the engine to suit the requirements and conditions of the engine.

The object of the present invention is to provide means whereby the intensity of heating of the mixture can be regulated in a perfectly rational way and during the actual running of the engine to suit the requirements and conditions of the engine. Said means comprise a double inlet pipe, one branch of which is arranged to be traversed externally preferably over its entire length by the products of combustion, while the other branch is arranged to be heated only over a portion of its length, and a valve by which the gaseous mixture can be directed through either of said branches or through both as required to obtain the proper amount of heating.

The valve may be operated by hand or by an automatic arrangement controlled by the temperature of the inlet gases measured at a point near the inlet valve.

The appended drawing shows two examples of the invention.

Fig. 1 is an elevation (partly in section) of an internal combustion engine embodying one form of the invention.

Fig. 2 is a similar view of a modified form including an automatic control device for the aforesaid valve.

In the drawing, the reference 1 denotes the engine from the carburettor 2 of which leads a double inlet pipe having branches 3 and 3^a which join at 4 near the inlet valve 5. The branch 3 is jacketed over the greater portion of its length by a casing 6 which has the double function of a mixture heater and muffler for the waste gases, discharged from the cylinder past the valve 7. This branch 3 forms an annular chamber in the casing 6 and as it extends across and in front of the exhaust port of the engine it constitutes a baffle for the exhaust gases issuing from said port and at the same time operates to distribute said gases in the annular chamber. The branch 3^a, however, is traversed externally by the exhaust gases only over a short length so that the heating to which it is subjected is much less intense. As the upper end of branch 3^a passes through the upper part of casing 6 it also constitutes a baffle for the exhaust gases in the annular chamber and operates to retard the movement of the gases from the latter to the exhaust port of the casing. The inlet port in the side of casing 6 is arranged substantially between the ends of the annular chamber so that the gases from the exhaust port of the engine in meeting the first baffle or branch 3 expands towards both ends of said chamber and as the movement of the gases towards the exhaust port of the casing 6 is retarded by the second baffle or branch 3^a both an effective heating of the branch 3 and an effective retarding of the gases are obtained.

At the lower junction of the branches 3 and 3^a is arranged a valve 8 which allows the gaseous mixture to be directed into either of the branches or into both in different proportions in order to pre-heat it to the required degree.

On starting the engine, when the carburettor is fed with petrol, the valve 8 is set to direct the gaseous mixture through the branch 3^a, no heating being necessary at this stage.

When changing over from petrol to heavy fuel (naphtha) the valve 8 is set in such

manner that the gaseous mixture passes entirely through the branch 3 in order to obtain the most intense heating.

As soon as the engine is hot enough a part of the gaseous mixture is directed along the branch 3^a, thus reducing the total heating to a variable extent to suit the engine conditions and the external temperature.

In order to counterbalance its progressive heating during the continued operation of the engine, gradual reduction is made of the quantity of gaseous mixture passing through the branch 3 and during hot weather said branch may be closed completely.

The valve 8 may be operated by hand in any convenient manner, or if it is desired to save the driver trouble there may be provided a suitable automatic control, an example of which is shown in Fig. 2.

In this case a thermostat 10 is arranged in the inlet pipe at the upper junction 4 of the branches 3, 3^a, the same being capable of expanding appreciably under the action of heat and being connected, by a rod 11, to a lever 12 whose other arm is coupled, by a link 13, with a lever 14 fixed on the spindle of the valve 8.

It is evident that the position of the valve 8 depends in this case on the temperature of the place in which the thermostat 10 is situated and that an increase of temperature will cause a displacement of the valve 8 in a direction to choke the branch 3. The result is easily obtained, therefore, of a constant temperature of the gaseous mixture passed into the cylinder independently of

the outside temperature and the temperature conditions of the engine.

What I claim is:

The combination with a combustion engine having inlet and exhaust ports arranged one above the other on the same side of the engine, and a carburetter disposed below said ports, of a casing, constituting a mixture heater and muffler, having a port on one side communicating with the exhaust port of the engine and an exhaust port communicating with the atmosphere, a conduit connecting the carburetter with the inlet port of the engine and having a bifurcated portion between its ends, one branch of the bifurcated portion extending substantially throughout its length through the casing and forming an annular chamber therein, said branch passing in front of the engine exhaust port, constituting a baffle for the gases issuing from the latter and thereby distributing said gases in the annular chamber, the other branch of the bifurcated portion of the conduit having its upper portion passing through the upper part of the casing and communicating with the first named branch at the upper end of the latter, and constituting a baffle for the exhaust gases in the annular chamber between the latter and the exhaust port of the casing, and a by-pass valve arranged at the bifurcation point adjacent the carburetter.

In testimony that I claim the foregoing as my invention, I have signed my name.

GUIDO FORNACA.