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FUEL HEATER FOR INTERNAL COMBUSTION ENGINES

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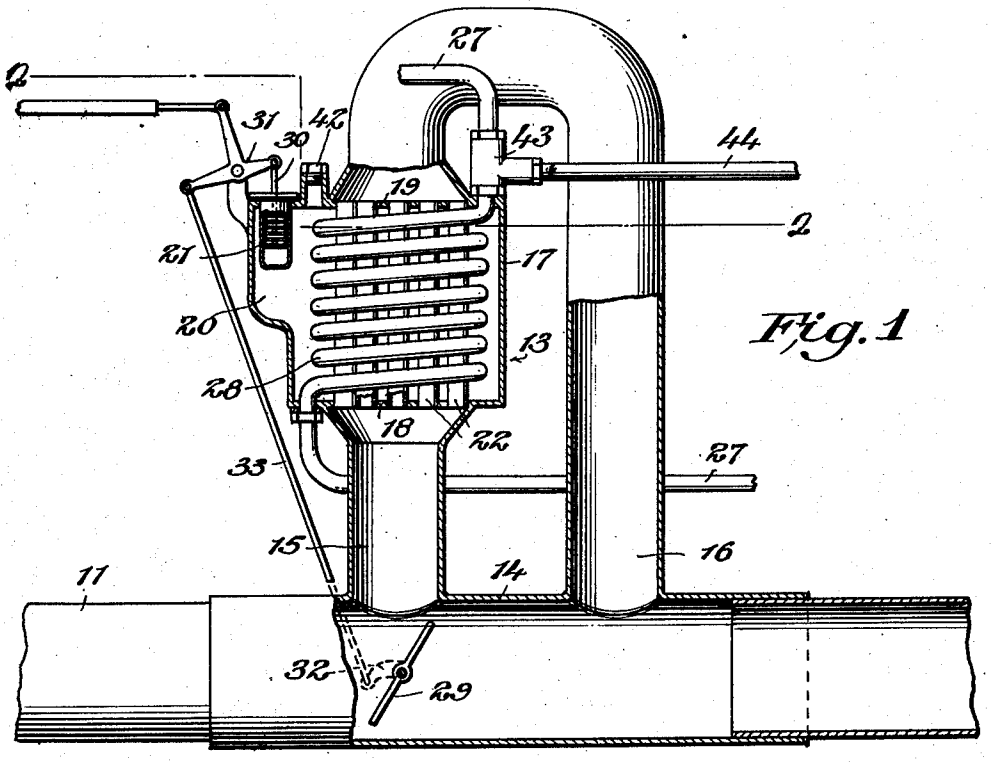

Fig. 1

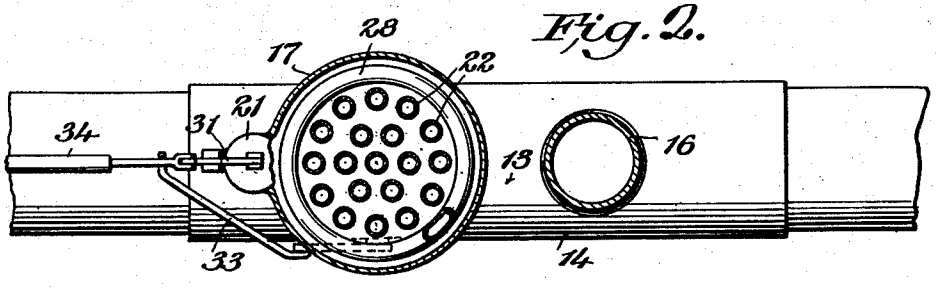

Fig. 2.

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FUEL HEATER FOR INTERNAL COMBUSTION ENGINES

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4 Claims. (Cl. 257—241)

This invention relates to fuel heaters for internal combustion engines, and has particular reference to improvements in means to adapt internal combustion engines of the type which are primarily designed to burn more or less highly refined fuels, such as gasoline, for operation by considerably heavier fuels, such as commercial fuel oil.

As in the case of my prior application, Serial No. 701,902 and in the case of my companion application, Serial No. 8,387, filed of even date herewith, the general object of the present invention is to provide simple, reliable and efficient means whereby ordinary so-called gasoline engines, such as present day automobile, truck, boat, aircraft and similar engines, may be made to operate economically and with increased power employing as fuel, commercial fuel oil.

Also, as in the case of my aforesaid prior and companion applications, the present invention has in view to provide means whereby an ordinary carburetor employed in conjunction with an ordinary gasoline engine may be used, without change, for the atomization of relatively heavy fuel, such as commercial fuel oil. To accomplish this purpose it is necessary that the relatively heavy fuel oil be heated prior to its atomization by the carburetor. Accordingly, the general object of the present invention is to provide a highly efficient, yet cheap and simple means to utilize exhaust gases flowing from the engine to rapidly raise the temperature of the fuel oil to the desired operating temperature, whereby the engine may be operated on the fuel oil within the shortest practicable period of time after the engine has been started, it being understood in this connection that in starting the engine, gasoline or equivalent light fuel is used.

With the foregoing and other objects in view, the invention consists in the novel features of construction, combination and arrangement of parts as will be hereinafter more fully described, illustrated in the accompanying drawing and defined in the appended claims.

In the drawing, wherein like characters of reference denote corresponding parts in the different views:—

Figure 1 is an enlarged side view, partly in section and partly in elevation, of the fuel oil heating means.

Figure 2 is a horizontal section on the line 2—2 of Figure 1.

Referring to the drawing in detail, 11 designates, generally, the exhaust conduit of an internal combustion engine.

At 13 is designated, generally, a fuel oil heating unit which includes a main pipe section 14 interposed in the exhaust conduit and forming a part thereof, in lieu of a removed section of said conduit, and which further includes a U-shaped branch comprising two spaced, connected pipe sections 15 and 16 communicating with the main pipe 14 at points spaced longitudinally therealong.

Forming part of the branch pipe section 15 which is disposed nearer the engine as regards the flow of exhaust gases through the exhaust conduit 11, is an enlarged chamber 17 which is closed at its ends by plates 18 and 19 and which is formed at one side, preferably near its top, with an enlargement or pocket 20 in which is mounted a thermostat 21 of any suitable type.

Extending through the chamber 17 is a plurality of tubes 22 which, at their ends, extend through the plates 18 and 19 and thereby afford communication between the portions of the pipe section 15 at either end of said chamber. Consequently, exhaust gases may flow from the exhaust conduit through the tubes 22 to effect heating of the body of liquid with which said chamber is filled.

The chamber 17 is filled with any suitable liquid having a high flash point, and a fuel oil supply line 27 enters said chamber, preferably at the bottom thereof, and within said chamber is wound or coiled as at 28, preferably spirally upward, around the tubes 22 and leaves said chamber preferably at or near the top thereof. Consequently, since said coil 28 is submerged in the liquid contained within said chamber, and since the liquid is heated by the exhaust gases, the oil flowing from the source of supply through the coil 28 to the carburetor also is heated.

The purpose of the unit 13 is not only to heat the fuel oil prior to its delivery to the engine carburetor, but to maintain said oil within a predetermined temperature range, within which range it is best adapted for operating the engine A. The temperature of the liquid in the chamber 17 is, of course, affected by the temperature of the air surrounding said chamber. Moreover, the volume of exhaust gases flowing through the exhaust conduit 11 varies with changes in the speed of the engine A. Therefore, in order to maintain the fuel oil within a predetermined temperature range, the volume of exhaust gases which flow through the unit 13 must be varied. Accordingly, an exhaust gas deflector member 29 is pivotally mounted within the main pipe section 14 of the unit 13 at a point near the end of the branch pipe section 15 which opens

into said main pipe section, and is swingable between two extreme positions, in one of which it permits substantially unimpeded flow of exhaust gases through the exhaust conduit and does not deflect such gases through the branch pipe 15, and in the other of which it serves to deflect a considerable volume of the exhaust gases through the branch pipe 15 and the tubes 22 of the chamber 17. In intermediate positions of said deflector member a greater or lesser volume of exhaust gas is deflected through the branch pipe 15 as is, of course, obvious.

The thermostat 21 is, as aforesaid, immersed in the body of liquid contained with the chamber 17 and therefore operates in response to changes in the temperature of said body of liquid. In the present instance, said thermostat is illustrated as being of the expansible and contractible bellows type and as including a rod 30 which extends exteriorly of the chamber 17 and which is longitudinally movable with expansion and contraction of the thermostat. On a bracket carried by the chamber 17 is intermediately pivoted a lever 31 which is connected at one end with the rod 30 and at its other end to an arm 32 on the deflector member 28 by a rod of link 33. Consequently, in response to variations in the temperature of the liquid within the chamber 17, the deflector member 28 is actuated to vary the amount of the exhaust gases which pass through the tubes 22 of the chamber 17 and which are effective to heat the oil passing through the coil 28 to the carburetor. In this connection, the arrangement is, of course, such that with rise in the temperature of the liquid, and consequently the oil, above a predetermined point the deflector member 28 is actuated to deflect a lesser volume of exhaust gases through the chamber 17, and with fall of the temperature of the liquid, and consequently the oil, below said point the deflector member is actuated to deflect a greater volume of exhaust gases through said chamber. Thus, the unit 13 is effective to maintain the oil supplied to the carburetor within a predetermined temperature range which, for most efficient operation of the engine, may be, for example, between 250° F. and 270° F.

The chamber 17 is provided with a filling opening which is normally closed by a plug 42, and in said plug may conveniently be embodied a suitable valve to relieve said chamber of any pressure which may develop therein. Moreover, the heavy fuel line 27 preferably is provided with a pressure relief valve 43 to guard against the development of excessive pressure in said line, said valve being placed in said line at a suitable point between the coil 28 and the engine carburetor. From said valve a drain line 44 preferably leads to the heavy fuel tank, although it may lead to any other suitable point.

From the foregoing described considered in connection with the accompanying drawing, it is believed that the construction, operation and advantages of the invention will be clearly understood. It is desired to point out, however, that while certain specific embodiments of the invention have been illustrated herein, the same may be embodied in various other mechanical structures within the spirit and scope of the invention as defined in the appended claims.

I claim:—

1. A unit for utilizing hot gases to heat a liquid, said unit comprising a pipe section to be interposed in a hot gas conducting conduit, a liquid containing chamber, a plurality of hot gas conducting tubes extending through said chamber, a hot gas delivery conduit leading from said pipe section to adjacent ends of said tubes and a hot gas return conduit leading from the other ends of said tubes to said pipe section for circulation of hot gases through said tubes to heat the liquid contained in said chamber, and a conduit for the liquid to be heated extending through said chamber and maintaining the liquid therein separated from the liquid in the chamber.

2. A unit for utilizing hot gases to heat a liquid, said unit comprising a pipe section to be interposed in a hot gas conducting conduit, a liquid containing chamber, a plurality of hot gas conducting tubes extending through said chamber, a hot gas delivery conduit leading from said pipe section to adjacent ends of said tubes and a hot gas return conduit leading from the other ends of said tubes to said pipe section for circulation of hot gases through said tubes to heat the liquid contained in said chamber, and a conduit for the liquid to be heated extending through said chamber and maintaining the liquid therein separated from the liquid in the chamber, said conduit for the liquid to be heated being coiled within said chamber about the hot gas conducting tubes extending therethrough.

3. A unit for utilizing hot gases to heat a liquid, said unit comprising a pipe section to be interposed in a hot gas conducting conduit, a liquid containing chamber, a plurality of hot gas conducting tubes extending through said chamber, a hot gas delivery conduit leading from said pipe section to adjacent ends of said tubes and a hot gas return conduit leading from the other ends of said tubes to said pipe section for circulation of hot gases through said tubes to heat the liquid contained in said chamber, a conduit for the liquid to be heated extending through said chamber and maintaining the liquid therein separated from the liquid in the chamber, and a hot gas deflecting element within said pipe section operable to vary the amount of hot gases circulated from said pipe section through said hot gas conducting tubes.

4. A unit for utilizing hot gases to heat a liquid, said unit comprising a pipe section to be interposed in a hot gas conducting conduit, a branch conduit of substantially U-shape including a pair of legs communicating with said pipe section, a liquid containing chamber interposed in one of the legs of said branch conduit, a plurality of tubes extending through said chamber for flow of hot gases therethrough, and a conduit for the liquid to be heated extending through said chamber and maintaining the liquid therein separated from the liquid in the chamber, said conduit for the liquid to be heated being coiled within said chamber about the hot gas conducting tubes extending therethrough.

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