Nov. 11, 1952 W. VAN DEN BOSCH 2,617,633

GASIFIER FOR HEAVY FUELS IN INTERNAL-COMBUSTION ENGINES

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FIG. 1.

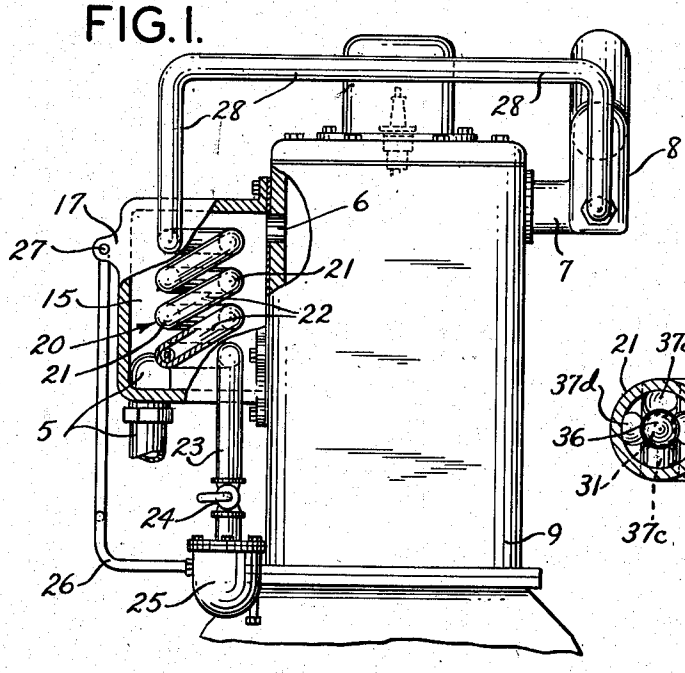


FIG. 4.

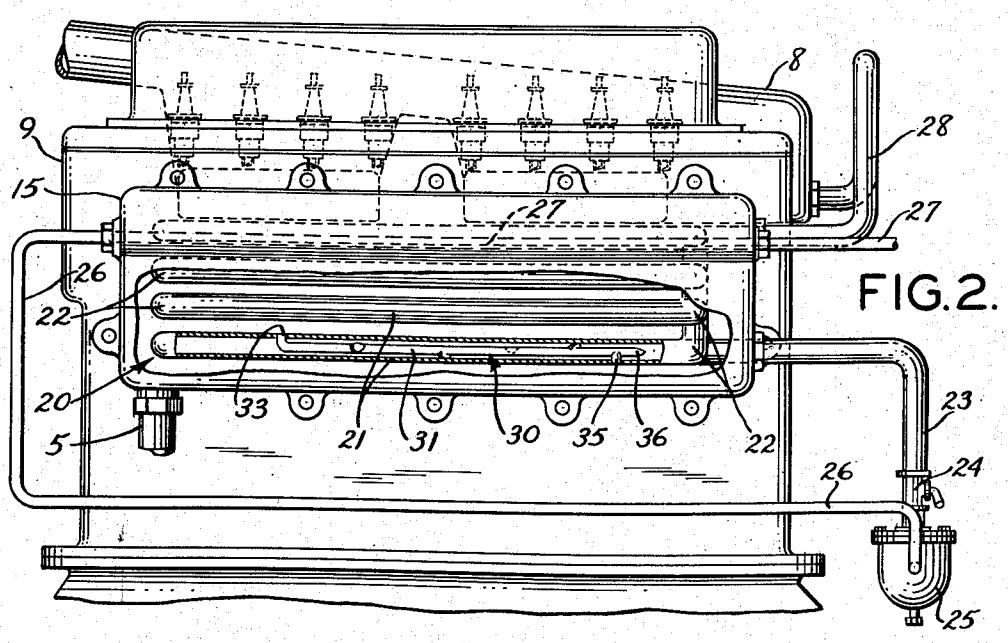


FIG. 2.

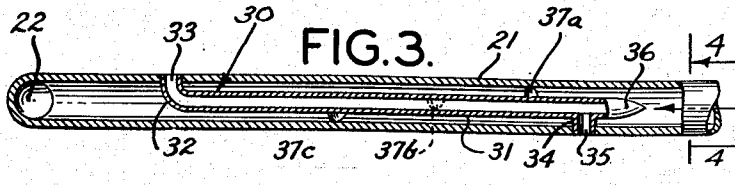


FIG. 3.

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GASIFIER FOR HEAVY FUELS IN INTERNAL-COMBUSTION ENGINES

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4 Claims. (Cl. 257—241)

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This invention relates to a device for preparing heavy (and relatively cheaper grades of) fuel for use in internal combustion engines.

In devices as heretofore proposed for using heavy oils in internal combustion engines, various types of carburetors or vaporizers have been suggested. These arrangements function mainly on the principle of converting the liquid fuel into a vapor or mist. I have found that the unsatisfactory operation of such prior devices and their inability to handle the lower grade, less volatile oils is due to the fact that the combustible mixture enters the cylinder in the form of a mist and not as a gas. It is true that the oil particles are extremely small, but they still are in liquid form, as distinguished from a true gas.

The prime object of my invention is to produce a device which will operate upon the vaporized oil particles, coming from the heavy fuel carburetor, and convert them into gaseous form and to, additionally, thoroughly mix such gases with the air to form a readily-explosible homogeneous mix. An allied object is to provide a device which will enable the cheapest grade of heavy fuel to be used in an internal combustion engine.

For the attainment of the foregoing and such other objects as may appear or be pointed out, I have shown a preferred embodiment in the accompanying drawing, wherein:

Fig. 1 is an end view of an internal combustion engine showing the improved heavy fuel conditioner or gasifier of this invention, in association therewith, the gasifier device being partially broken away to reveal internal structures;

Fig. 2 is a front view of the engine block and gasifier, the latter being again partially broken away;

Fig. 3 is a longitudinal section through one of the "fuel-conveying ducts," more fully described in the specification; and

Fig. 4 is a cross-section taken on the line 4—4 of Fig. 3.

The engine block is designated 9 and has an intake manifold 8 connected to the individual cylinders by means of separate passages 7; the engine block has an exhaust manifold 15, the individual passages thereto from the cylinders being designated 6, Fig. 1. Whereas the intake manifold 8 is of the customary size, the exhaust manifold 15 is made much larger for the purposes of this invention, as will be described subsequently. After the exhaust gases perform their functions in the improved fuel conditions of this invention—as will be described—they leave exhaust manifold 15 through vent pipe 5, Fig. 1.

Exhaust manifold 15 is made sufficiently larger to accommodate a plurality of what I term "fuel-conveying ducts" generally designated 20, which comprise a straight duct length 21 and return

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bends 22 at each end of exhaust manifold 15. I have found the arrangement shown in the drawing as satisfactory for the purposes intended, namely, eight straight lengths 21 arranged in two vertical columns of four each, as best seen in Fig. 1. The return bends 22 are connected to the lengths 21 at each end of the exhaust manifold 15 to provide a continuous passage therethrough. One end of the fuel-conveying passage 20 is connected by the downwardly-directed pipe 23, through a shut-off valve 24, to the heavy fuel carburetor 25. The other end of fuel-conveying passage 20 is connected by the inverted U piping 28 to the intake manifold 8.

By reason of the extended passage through the straight ducts 21 and return bends 22 of the fuel-conveying passage 20, all of which is disposed within the exhaust manifold 15, the vaporized fuel from the heavy fuel carburetor is intensely heated for a prolonged time as part of the improved method of conditioning such fuel for efficient operation in internal combustion engines; as explained above, an important aspect of this conditioning is the gasifying of the mist-like fuel vapors (from carburetor 25) into a true gas, or rather explosive air mix.

In each of the straight portions 21 of the fuel conveying ducts 20, are provided what I term "inter-pass torpedoes" generally designated 30. As best seen in the enlarged detail of Fig. 3, such inter-pass torpedoes comprise a straight duct portion 31 which is bent upwardly at one end—the left end, Fig. 3—at elbow 32 to present an opening 33 through the fuel-conveyor 21. At the other (right) end of torpedo duct 31 is a downwardly-directed lateral nipple 34 which presents a second opening 35 through fuel-conveyor pipe 21. The torpedo 30 thus provides a rather extended leg-pass for the hot exhaust gases through the fuel-conveyor pipe 21, which exhaust gases enter through one of the openings 33, 35 and exit through the other opening.

One of the purposes of the inter-pass torpedoes 30 is to promote the heating of the fuel mix, which is very efficiently achieved in the improved device by reason of the circumstance that there is thus provided both a centripetal heat transfer (inwardly through the outer duct 21) and a centrifugal heat transfer (outwardly through the inner duct 31).

Another important purpose of the torpedoes 30 is to provide means for imparting a scrubbing or whirling motion to the explosive mix. This not only promotes the heating thereof and makes a more homogeneous mixture, but also has a beneficial effect upon the conditioning or gasifying of the heavy fuel. For this purpose, one end of the torpedo duct 31—the right end, Fig. 3—is provided with a pointed nose 36. The function of pointed nose 36 is to part the on-rushing gases

into an annular formation (for a purpose soon apparent). It will be understood that the torpedoes **30** are arranged in alternate directions so that the pointed nose **36** thereof faces the approaching gases; for example, the pointed nose **36** is at the right end of torpedo **31** because the fuel mix is shown to flow, in outer duct **21**, from right to left, as shown by the arrow.

The annular formation resulting from the presence of the centrally-disposed torpedo **31** and eased by the pointed nose **36** is given a whirling motion by a plurality of radial blades **37***a*, **37***b*, **37***c*, and **37***d*. For facility in illlustration, four radial blades are shown, longitudinally spaced along the length of duct **31** and angularly disposed 90° from one another. It is clear that a greater or lesser number of radial blades may be provided set angularly at other than 90°. Such radial blades, **37***a*, **37***b*, etc. impart a whirling or scrubbing motion to the gases which effectively promote their conditioning (gasifying) enabling low-grade fuels to be used in internal combustion engines.

The heavy fuel is brought to the carburetor **25** through a pipe **26** which has a length **27** thereof, see Fig. 1, which passes through the wall of the exhaust manifold **15**, more particularly, through an enlarged boss **17**, Fig. 1, provided for that purpose. The liquid fuel is pre-heated to enhance vaporization in carburetor **25**. However, the liquid fuel cannot be brought to too high a temperature; for this reason, preheating is achieved by placing the pipe **27** in the (outer) wall of the exhaust manifold and not directly in the path of the exhaust gases.

I claim:

1. In a heat exchange device, a casing having an inlet in its top portion for receiving exhaust flames and gases from an internal combustion engine, and an outlet for said exhaust products in the bottom thereof, a fuel conveyor duct arranged horizontally in said casing and having a fuel inlet at one end and a fuel outlet at its other end, a hollow torpedo unit arranged in the fuel conveyor duct and spaced from the inner wall thereof, the forward end of the unit being closed and pointed, the rear end of the unit being open and terminating in a laterally disposed elbow that extends through an opening in the top of the fuel duct, a laterally extending nipple formed adjacent the closed pointed end of the unit and extending through an opening formed in the bottom of the fuel duct, said elbow and nipple providing means to permit the circulation of the exhaust products in the casing into and out of the hollow unit, and radially extending blades arranged on the exterior of the unit at spaced intervals, coacting with the pointed nose of the unit for effecting a whirling action to be imparted to the fuel entering the duct.

2. In a heat exchange device, an elongated casing, having an inlet in its top portion for receiving exhaust flames and gases from an internal combustion engine, and an outlet for said exhaust products in the bottom thereof, a fuel conveying duct arranged in the casing and comprising a series of horizontally disposed vertically spaced pipes connected together in communicating relation at their respective ends, and adapted to be heated by the exhaust flames and gases in the casing, a fuel supply connected to the lowermost pipe, a fuel discharge connected to the uppermost pipe, a tube arranged in each pipe and spaced from the inner wall thereof, the leading end of each tube being closed and pointed, the other end of the tube being open and disposed laterally and extending through the top wall of the respective pipe, a nipple extending laterally from the bottom of each tube and extending through an opening in the bottom wall of the respective pipe whereby the exhaust flames and gases in the casing may circulate into and out of the respective tubes, and fins extending radially from the outer wall of each tube and coacting with the pointed nose of each tube for dispersing and effecting a whirling action to be imparted to the fuel entering the pipes.

3. In a heat exchange device, an elongated casing having an inlet in its top portion for receiving exhaust flames and gases from an internal combustion engine, and an outlet for said exhaust products in the bottom thereof, a fuel conveying duct arranged in the casing and comprising a plurality of horizontally disposed vertically spaced pipes, the adjacent pipes being connected together in communicating relation at their respective ends, a fuel supply connected to the end of the lowermost pipe, a gaseous fuel discharge extending from one end of the uppermost pipe of the fuel conveying duct, said pipes adapted to be heated exteriorly by the exhaust flames and gases passing through the casing, an elongated tube arranged in each pipe and spaced from the inner wall thereof and from the ends of each pipe, the leading end of each tube being closed and pointed, the other end of each tube being open and extending laterally through the top wall of the respective pipe, a nipple extending laterally from the bottom of each tube and extending through the bottom wall of the respective pipe, whereby the exhaust flames and gases in the casing may circulate into and out of the respective tubes for additionally heating the fuel passing through the pipes during the upward-flow of the fuel through the pipes.

4. In a heat exchange device of the character described in claim 3 wherein blades extend radially from the outer wall of each tube and are arranged at spaced intervals and coacting with the pointed nose of each tube for dispersing and effecting a whirling action to be imparted to the fuel entering and passing through the pipes.

WIEBE VAN DEN BOSCH.

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