Nov. 28, 1933. J. G. VINCENT 1,936,698

INTERNAL COMBUSTION ENGINE

Filed July 6, 1931

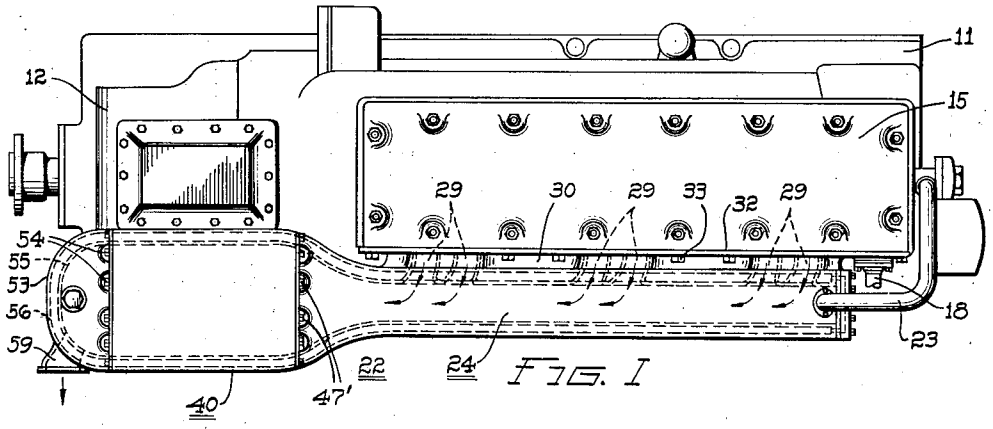

FIG. 1

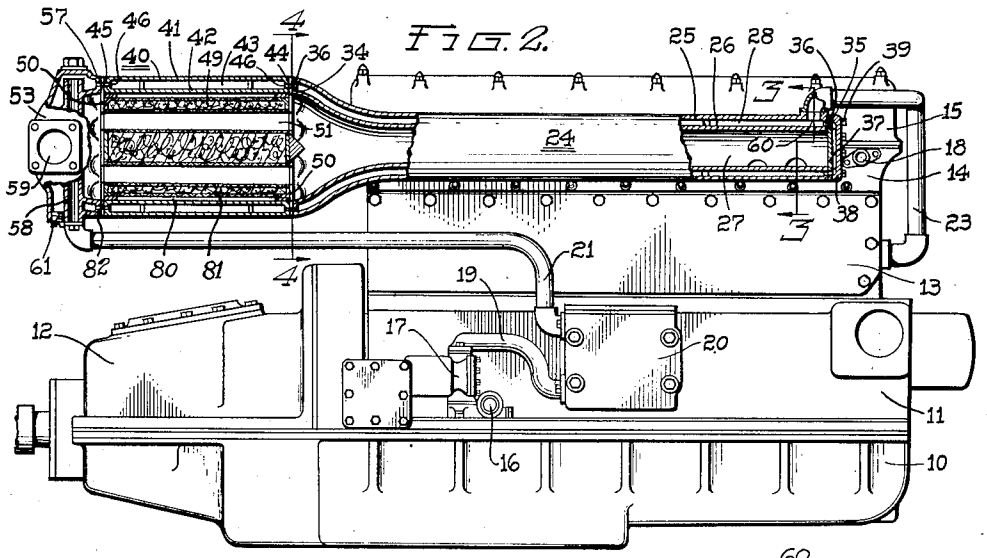

FIG. 2.

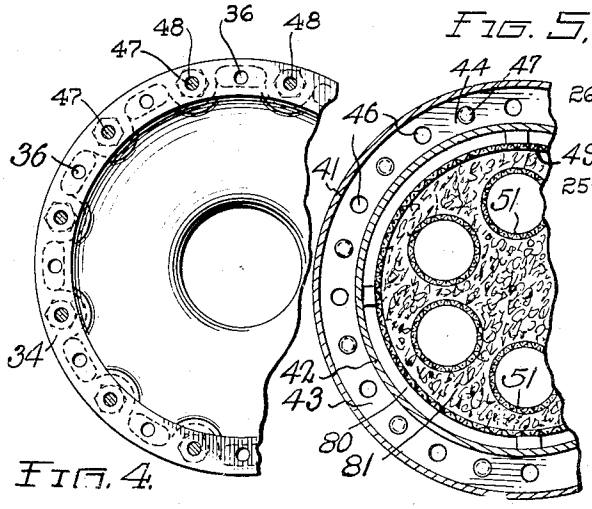

FIG. 4.

FIG. 5.

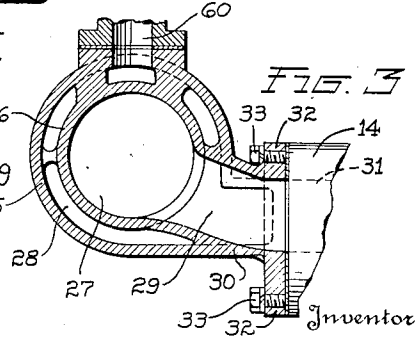

FIG. 3

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INTERNAL COMBUSTION ENGINE

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4 Claims. (Cl. 60—31)

This invention relates to internal combustion engines and more particularly to exhaust manifolding.

An object of the invention is to provide a new and novel form of heat transfer system for an internal combustion engine in which a water cooling system and an exhaust manifold are related to lower the temperature of the exhaust and to raise the temperature of the cooling water before it passes into the engine.

Another object of my invention is to provide a novel form of water-jacketed exhaust manifold in which a muffler is included.

A further object of the invention is to provide a novel form of exhaust manifold which is made up of a plurality of water-jacketed sections which can be readily assembled or separated.

Still another object of the invention is to provide a water-jacketed exhaust manifold in which a muffler is detachably associated.

A still further object of the invention is to provide a water-jacketed exhaust manifold for internal combustion engines which is compact and symmertical in form and which includes a muffler.

Other objects of the invention will appear from the following description taken in connection with the drawing, which forms a part of this specification, and in which:

Fig. 1 is a top plan view of an engine having my invention incorporated therewith;

Fig. 2 is a side elevation of the same with the exhaust manifolding partially in section;

Fig. 3 is a sectional view of a manifolding, taken on line 3—3 of Fig. 2;

Fig. 4 is a sectional view of the manifolding, taken on line 4—4 of Fig. 2;

Fig. 5 is a transverse sectional view through the muffler.

Referring now to the drawing by characters of reference, 10 indicates the lower half of a crank case, for an engine arranged with the cylinders in line, which extends the full length of the engine and has secured thereon an upper crank case section 11 and a rear transmission housing 12. Mounted on the upper crank case section is a cylinder block 13 having the head block 14 secured thereon. A cover plate 15 is arranged upon the top of the head block. The engine illustrated is of the Diesel four-cycle water-cooled type; however, my invention can be associated with any form of water-cooled engine.

When the engines of the above type are used as the power plant in a boat, the cooling system is usually associated so that the cooling medium for the engine is drawn from the water adjacent the boat. The engine illustrated in the drawing is adapted to be utilized for marine purposes, and a conduit 16 is arranged at one side thereof so that it communicates with the water adjacent the boat and leads to an engine driven pump 17. Extending from the head block is a conduit 18 through which water passes back into the water adjacent the boat after it has passed through the engine cooling system. Insofar as the engine cooling system is concerned it can be of the usual type wherein water flows through the cylinder and head blocks.

A conduit 19 leads from the water pump into the housing 20 while a conduit 21 leads from the housing 20 to the exhaust manifold indicated generally at 22, and a conduit 23 leads from the exhaust manifold into the cylinder block so that the temperature of the water passing into the cylinder block will be raised and the exhaust will be maintained at a low temperature. The oil cooling system for the engine leads through the housing 20 and is arranged in a conventional manner such that heat from the oil flowing therethrough will be absorbed by the cooling water passing through the housing.

The exhaust manifold structure is preferably associated with the side of the engine on which the water pump is arranged and is of a compact symmetrical design. A plurality of sections are arranged in axial alignment and they are detachably secured together to form the water-jacketed exhaust manifold. The section 24 is cylindrical in form throughout the major portion of its length which is substantially coextensive with one side of the engine and gradually increases in diameter adjacent its rear end. This section is preferably formed with a pair of parallel walls 25 and 26 which form an interior chamber 27, for receiving exhaust gas from the engine cylinders, and an outer chamber 28 through which cooling water flows. This section is formed with ports 29 which extend through the outer chamber and the neck 30 providing connections with the exhaust ports 31 leading through the side of the head block 14. The end of the neck is formed with flanges 32 which are detachably secured by bolts 33 to the side of the head block and form the fastening means between the engine and the manifold structure. The spaces at the ends of the wall 26 are open, but the section is formed with end walls 34 and 35 intermediate the walls 25 and 26, such walls being provided with a plurality of openings, as

indicated at 36, to permit flow of water therethrough.

A front section is detachably secured to the one end of the manifold section 24 and comprises a plate 37 and a head 38. The plate 37 closes the front end of the chamber 27 and is provided with openings which register with the openings 36 in the wall 35. The head 38 is formed with a recess which provides an end chamber beyond the plate 37 so that circulation of water around the end of the manifold is thereby provided for. This end section is detachably secured to the forward end of the section 24 by means of bolts as indicated at 39.

A cylindrical manifold section 40 is arranged to align with the rear end of the section 24 and is of the same cross sectional dimension as the end portion of the section 24. This section is preferably formed as a casting which includes an outer wall 41 and an inner wall 42 forming an inner chamber 80 and an outer chamber 43. The ends of the inner wall are joined with the outer wall by transverse walls 44 and 45, each of which is provided with a plurality of apertures as indicated at 46. The forward wall 44 is detachably secured to the rear wall 34 of the section 24 by means of studs 47 and nuts 47'. The openings 46 in the wall 44 are arranged to register with the openings 36 in the wall 34. These abutting walls are also formed with openings 48 which extend intermidate the openings 46 and 36 for the reception of the studs 47.

The section 40 is adapted to receive a muffler so that exhaust gases passing therethrough will contact therewith. This muffler is preferably cylindrical in form and of a design such that it can be moved endwise into and from the manifold section within the wall 42. The muffler consists essentially of a cylindrical shell 49 having end plates 50 which carry a plurality of tubes 51 formed of wire or perforated metal. The space in the muffler between the walls 49 and 50 and the tubes 51 is filled with some suitable sound deadening material 81.

A rear section 53 is detachably secured to the wall 45 of the section 40 by means of bolts 54 and this section is also of a similar cross section as that of section 40. This section is provided with a pair of spaced walls 55 and 56 which form a water jacket therebetween, and the end wall 57 encloses the water jacket chamber and is provided with a plurality of openings 82 which register with the openings 46 in the wall 45 to establish communication with the chamber 43. A tube 58 extends through the bottom of this end cover casting and projects to a point adjacent the top thereof so that when the conduit 21 is fastened in communication with this tube, water will flow therefrom into the upper portion of the jacket chamber. The wall 56 is substantially semicircular in outline and forms a chamber which is in open communication with the interior of the wall 42 in the section 40, and leading to the exterior of the end section from this recess portion of the end section is an exhaust outlet port 59. The conduit 23 is connected to an outlet port 60 formed in the forward end of the wall 25 of the section 24. A drain outlet in the end section 53 is closed by the plug 61.

It will be seen that the water-jacketed exhaust manifold is formed of a plurality of detachable axially aligned sections and that there is an interior exhaust chamber extending substantially the full length thereof which is entirely surrounded by a chamber through which water of the cooling system passes from one end to the other prior to entering into the cylinder wall. The structure is compact and can be readily associated or removed from the engine as a unitary structure. A muffler is incorporated as a part of the manifold and arranged so that it can be readily detached or assembled therewith when the end section 53 is removed from the section 40. This manifold design including the muffler is compact, symmetrical and readily associated with or removable from the engine.

Although the invention has been described in connection with a specific embodiment, the principles involved are susceptible to numerous other applications which will readily occur to persons skilled in the art. The invention is therefore to be limited only as indicated by the scope of the appended claims.

What I claim is:

1. In an exhaust manifold for combustion engines, a pair of axially aligned cylindrical sections having spaced walls and inlet ports leading into the interior chamber, end sections having a double wall with the space therebetween in communication with the space between the double walls of the cylindrical sections, water connections leading to and from the space between the walls, the inlet water connection qpening above the water space between the walls, and an exhaust outlet connection leading from the space interior of the inner wall of one of the end sections.

2. In an internal combustion engine, an exhaust manifold structure comprising a gas receiving section, a gas outlet section, said sections being secured end to end and formed of double walls providing an inner gas passage surrounded by a water chamber, an end section closing the open end of the receiving section, a water outlet leading from the receiving section, an end section secured to the open end of the outlet section and having separated chamber portions, one of said chamber portions being open to the exhaust gas passage and the other chamber portion being open to and coextensive with the water chamber in the outlet section, a water inlet tube extending into the water chamber portion of the end section, said tube opening above the water chamber in the receiving section, and an exhaust outlet leading from the exhaust chamber portion in the end section.

3. In an internal combustion engine, an exhaust manifold structure comprising a gas receiving section, a gas outlet section, said sections being secured end to end and formed of double walls providing an inner gas passage surrounded by a water chamber, an end section closing the open end of the receiving section, a water connection leading from the receiving section, an end section secured to the open end of the outlet section having a water chamber and an interior gas chamber, one of said chambers being open to the exhaust gas passage and the other chamber being open to the water chamber in the outlet section, a water connection connected with the water chamber of the end section associated with the outlet section, and an exhaust chamber in the end section.

4. In an internal combustion engine, an exhaust manifold structure comprising a tubular gas receiving section, a tubular gas outlet section, said sections each having an end wall arranged in abutting relation with registering openings therethrough, said sections also having double walls providing an inner gas passage surrounded

by a water chamber, some of the openings in the abutting end walls of said sections establishing communication between the water chambers, bolts extending through other openings in the abutting end walls to secure the sections together axially, an end section closing the open end of the receiving section, a water outlet leading from the receiving section, an end section secured to the open end of the outlet section and having separated chamber portions, one of said chamber portions being open to the exhaust gas passage and the other chamber portion being open to and co-extensive with the water chamber in the outlet section, a water connection extending into the water chamber of the outlet end section, and an exhaust outlet leading from the exhaust chamber in the outlet end section.

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