March 28, 1944. G. P. BRADLEY 2,345,233

ENGINE COOLING APPARATUS

Filed Jan. 22, 1943

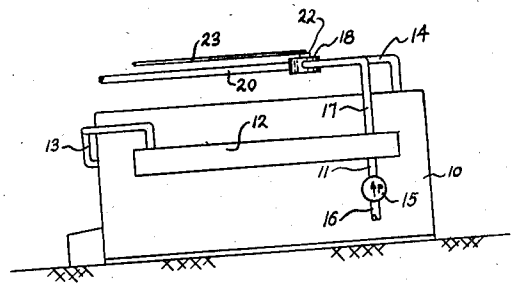


Fig. 1.

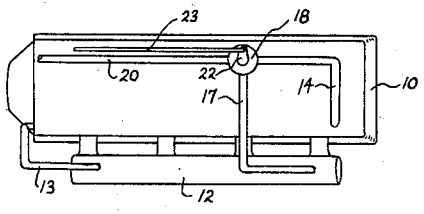


Fig. 2.

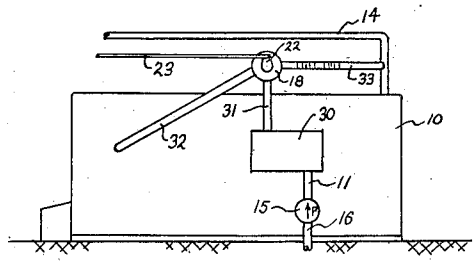


Fig. 3.

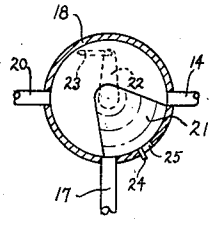


Fig. 4.

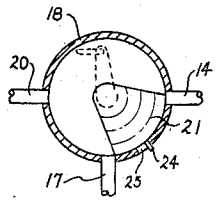


Fig. 5.

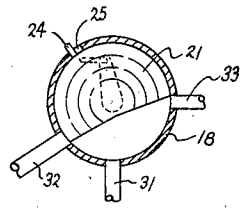


Fig. 6.

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ENGINE COOLING APPARATUS

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3 Claims. (Cl. 123—170)

This invention relates to apparatus for cooling internal combustion engines.

An object of the present invention is the provision of apparatus for regulating the temperature of the cooling medium circulating through the cooling systems of internal combustion engines.

Another object is the provision of apparatus particularly for marine engines which may be set so that the operating temperature of the engine is maintained at the point at which it functions best.

Another object is the provision of apparatus for the purpose described which may be adjusted while the engine is running.

A further object is the provision of apparatus designed to prevent the cooling system of a marine engine from draining when it is not in use.

A still further object is the provision of engine cooling apparatus by means of which the amount of cooling medium circulating through the engine jacket may be reduced without interfering with the operation of the pumping means.

With these and other objects in view, the present invention consists essentially of cooling apparatus for internal combustion engines having jackets through which a cooling medium may be circulated, comprising inlet means for directing a cooling medium into the jacket of an engine, outlet means for removing the medium from the jacket after it has circulated therethrough, and means for by-passing at least some of the medium directly from the inlet means to the outlet means, as more fully described and illustrated, by way of example, in the following specification and the accompanying drawing, in which

Figure 1 is a diagrammatic side elevation of an engine jacket or block with one form of cooling apparatus,

Figure 2 is a plan view thereof,

Figure 3 is a view similar to Figure 1 illustrating an alternative form of cooling apparatus,

Figure 4 is an enlarged sectional view of the valve used in Figures 1 and 2,

Figure 5 is a view similar to Figure 4 with the valve set in a different position, and

Figure 6 is an enlarged sectional view of the valve used in Figure 3.

Referring more particularly to Figures 1 and 2, 10 represents the jacket or block of a marine engine to which a cooling medium, usually water, is directed in any suitable manner. A pipe 11 may be connected directly to the water inlet of the jacket or, as shown, it may be connected to an exhaust manifold 12 of well-known construction having a suitable water jacket, in which case a pipe or hose 13 connects said manifold to the inlet. The pipe 11 alone or with the manifold 12 and the pipe 13 form inlet means for directing water into the jacket to be circulated therethrough. An outlet pipe 14 extends from the top of the jacket and forms an outlet for the water. Suitable means, such as a pump 15, is connected to the pipe 11 for circulating water through the jacket and out through the pipe 14. A pipe 16 extends from the pump outside the boat (not shown) in which the engine is mounted or, if it is a recirculating system, this pipe may be connected to the pipe 14.

A by-pass pipe 17 extends from the inlet means to the outlet pipe 14 in order that at least some of the water may be by-passed around the jacket. The amount of water by-passed depends upon the size of the pipe 17, although it is preferred to make this pipe substantially the same size as the pipe 11 and to provide a valve 18 at the juncture of the pipes 14 and 17, with another pipe extending from said valve. Actually, the pipe 20 is merely a continuation of the pipe 14.

The valve 18 has a valve segment 21 rotatably mounted therein and operable by means of a lever 22 outside the valve. If desired, an operating rod 23 may be connected to the lever 22. The segment 21 is of such size that the pipe 20 is always open, while the pipe 14 is always at least partially open. The segment is located so that it may be turned to open pipe 17 and close pipe 14, and vice versa. The more one pipe is opened, the more the other pipe is closed, see Figures 4 and 5. Any suitable means may be provided for preventing the pipe 14 from being completely shut off, such as, for example, a pin 24 projecting outwardly from the segment through a slot 25 formed in the casing of the valve, whereby the pin, by striking the ends of the slot, limits the extremities to which the segment may be moved.

In operation, the pump 15 directs water through the pipe 11, manifold 12 and pipe 13 into the jacket 10, whence it is discharged through the pipe 14, valve 18 and pipe 20. The valve 18 may be operated by means of the lever 22 to regulate the amount of water passing through the jacket and the by-pass pipe 17. In this way, the running temperature of the engine may be raised or lowered as desired. The more

water that passes through the by-pass 17, the higher the operating temperature of the engine and vice versa. It is preferable to prevent the pipe 14 from being completely closed regardless of the temperature in order to bleed the block circulating system of either air or possibly steam and permit a safety flow of coolant through the block system. It is also preferable to prevent the pipe 17 from being completely closed regardless of the temperature in order to permit an air bleed across the highest point of the system, thereby destroying the syphoning action tending to drain the block when the engine is stopped. This also applies in the event of water pump failure.

As a rule, the manufacturer specifies the temperature at which the engine performs best. The engine may be run at a normal operating speed until it is properly warmed up. Then the control valve is used to direct more or less water through the jacket until the water reaches and maintains the desired temperature. The valve may be set in this position. This operation may be repeated any time it is found necessary to regulate the normal temperature of the water. It will be noted that any reduction of the amount of water flowing through the jacket does not interfere with the pump since the total volume of water therefrom passes through the jacket and the by-pass.

Figures 3 and 6 illustrate an alternative form of the invention. In this case, the pipe 11 may be connected directly to the control valve 18 located above the top of the jacket, or, as shown, it may be connected to any known type of oil cooler 30, which, in turn, is connected to the valve by a pipe 31. Another pipe 32 connects the valve to the water inlet of the jacket 10 while a by-pass pipe 33 connects said valve to the outlet pipe 14. The pipe 11, with or without the cooler 30 and pipe 31, and the pipe 32 form inlet means for directing water into the jacket. The pipes 11, 31 and 32, or 11 and 32 actually form a continuous pipe with a portion thereof between its ends elevated above the top of the jacket. In this alternative, the valve segment 21 is larger than that of Figures 4 and 5. This segment is of such size and is so arranged that the inlet pipe 31 is always open, while the pipes 32 and 33 are controlled to regulate the amount of water flowing therethrough in relation to each other. The pin 24 in its slot 25 prevents the pipe 32 from being completely shut off. With this arrangement, the total amount of water provided by the pump 15 is proportioned between the engine jacket and the by-pass 33 to control the running temperature in the jacket, as described above and with all the advantages there set out.

This form of the invention has another advantage. The pipe 32 extends from the water inlet of the jacket up to the valve 18 above the top thereof so that the water cannot drain from the jacket when the engine is not functioning, thus insuring a supply of water in the jacket when the engine is started. This is an important feature in marine engines, because often the water drains out of a jacket and when the engine is started, the cylinder head and walls become overheated before the cold water first hits them. This commonly results in a cracked engine head.

Although engines having a single block or jacket have been referred to throughout this specification, it is to be understood that this includes engines having individually jacketed cylinders.

From the above, it will be seen that means have been provided for circulating a cooling medium through the jacket of an engine which may be adjusted to maintain the operating temperature of the engine at a desired point, and which prevents the jacket from draining when it is not in use.

Various modifications may be made in this invention without departing from the spirit thereof or the scope of the claims, and therefore the exact forms are to be taken as illustrative only and not in a limiting sense, and it is desired that only such limitations shall be placed thereon as are disclosed in the prior art or are set forth in the accompanying claims.

What I claim my invention is:

1. Cooling apparatus for internal combustion engines having jackets through which a cooling medium may be circulated, comprising an inlet pipe connected to the jacket of an engine, a portion of said pipe between the ends thereof being elevated above the top of the jacket, an outlet pipe extending from the jacket, pumping means for directing a cooling medium through the inlet pipe, the jacket and the outlet pipe, and a by-pass pipe connecting the elevated portion of the inlet pipe to the outlet pipe, whereby at least some of the cooling medium may pass through the by-pass pipe instead of the jacket.

2. Cooling apparatus for internal combustion engines having jackets through which a cooling medium may be circulated, comprising an inlet pipe connected to the jacket of an engine, a portion of said pipe between the ends thereof being elevated above the top of the jacket, an outlet pipe extending from the jacket, pumping means for directing a cooling medium through the inlet pipe, the jacket and the outlet pipe, a by-pass connecting the elevated portion of the inlet pipe to the outlet pipe, and valve means at the juncture of said pipes for regulating the amount of cooling medium passing through the jacket and the by-pass pipe.

3. Cooling apparatus for internal combustion engines having jackets through which a cooling medium may be circulated, comprising an inlet pipe connected to the jacket of an engine, a portion of said pipe between the ends thereof being elevated above the top of the jacket, an outlet pipe extending from the jacket, pumping means for directing a cooling medium through the inlet pipe, the jacket and the outlet pipe, a by-pass pipe connecting the elevated portion of the inlet pipe to the outlet pipe, valve means at the juncture of said pipes for regulating the amount of cooling medium passing through the jacket and the by-pass pipe, and means on the valve means for preventing the medium from being completely shut off from the jacket.

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