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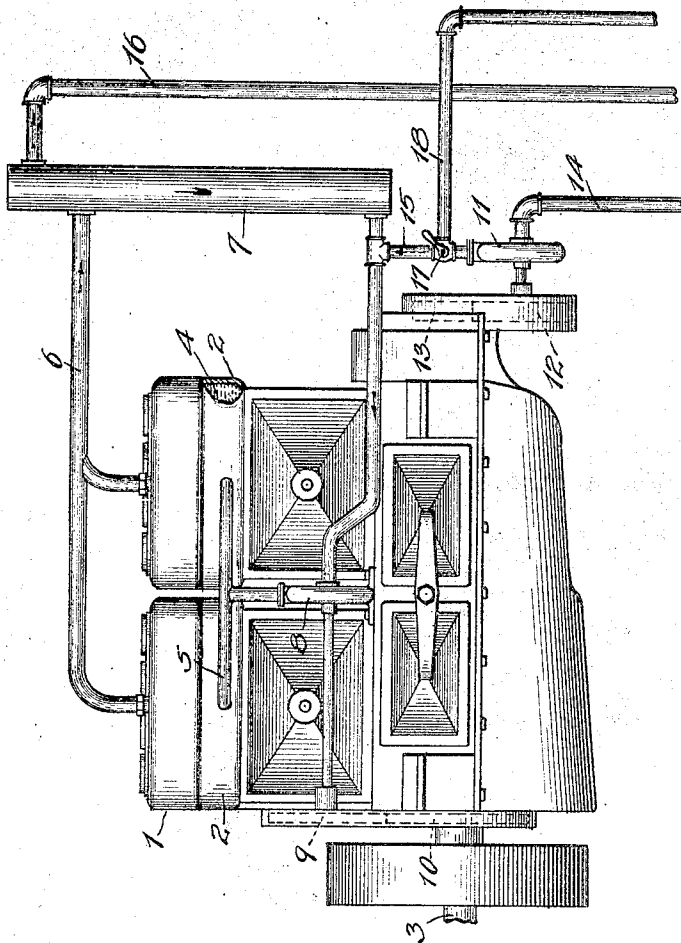
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METHOD OF AND MEANS FOR MAINTAINING THE COOLING WATER OF A MARINE
ENGINE AT A RELATIVELY HIGH TEMPERATURE

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METHOD OF AND MEANS FOR MAINTAINING THE COOLING WATER OF A MARINE ENGINE AT A RELATIVELY HIGH TEMPERATURE.

Application filed August 5, 1918. Serial No. 248,251.

To all whom it may concern:

Be it known that I, DON COLE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Methods of and Means for Maintaining the Cooling Water of a Marine Engine at a Relatively High Temperature, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, which form a part of the present specification.

My invention relates to a method of and means for maintaining the cooling water of a marine engine at a relatively high temperature.

In cooling a marine engine of the internal combustion type the desirable result to be attained is that of keeping the cylinder walls uniformly at as high a temperature as is consistent with good lubrication. So far as thermal efficiency alone is concerned it would be advisable to keep the cylinder walls heated to the temperature of the working fluid or higher, but this is not feasible in practice because of the difficulties practically encountered in lubricating the cylinder walls and the moving piston.

A compromise between these two contrary requirements must be made and it is the purpose of this invention to provide means for securing and maintaining a high even temperature which will promote the efficiency of the engine and still permit of good lubrication.

Heretofore, particularly in marine engines, it has been substantially impossible to keep the cylinders fairly warm and still prevent the formation of steam or gas pockets which have a tendency to warp or distort the cylinder walls. If the pump is operated at such a rate as to clear out the gas and steam pockets the rest of the cylinder will be cooled to too great an extent. If the pump is operated so slowly as to maintain the proper temperature of the cylinder walls, gas and steam pockets will be formed, to the detriment of the working of the engine.

Furthermore, in either event the cooling of the cylinder walls is very unequal owing to the action of the cold water entering and chilling the lower ends of the cylinders and

the action of the steam pockets and high water temperatures in the upper areas of the jacket in overheating the upper part of the cylinder walls, so that there is a decided difference of temperature between the upper and lower ends of the cylinders.

My invention aims to provide a system in which a rapid flow of the cooling medium is maintained to prevent the formation of gas and steam pockets and in which system the contact of the cold water with the cylinder walls is prevented and the cooling medium is maintained at a relatively high temperature so that the beneficial effect of uniformly hot cylinder walls may be maintained.

I secure this desirable result by maintaining a relatively rapid flow in a closed system, adding cold water to the system at one point and discharging a certain amount of the heated fluid at another point to maintain a substantially even temperature. When the cold water is injected into the system it is diluted immediately with a relatively large quantity of comparatively hot water before coming into contact with the cylinder walls, so that there is no possibility of the cylinder walls being chilled by the introduction of the cold water into the system. While I shall describe a particular embodiment of my invention in connection with a marine engine it is to be understood that the invention may appear in automobile engines or other types of apparatus requiring even cooling or a cooling at a relatively high temperature.

My invention will be more clearly understood by reference to the accompanying drawings forming a part of this specification and in which the drawings illustrate one manner of practicing my invention and is a side elevation of an internal combustion engine equipped with a cooling system in accordance with my invention.

In said drawings 1 represents an internal combustion engine which is of the marine type, the engine having cylinders 2 and a shaft 3.

The cylinders are of the water cooled type, having a water jacket 4 surrounding the cylinders and provided with a branched inlet 5 at its lower end and a branched outlet 6 at its upper end.

I provide a standpipe or down-flow pipe

7 to the upper end of which the outlet 6 connects and to the lower end of which the inlet 5 connects.

This system of pipes, together with the water space around the cylinders, forms a closed system thru which I cause the cooling medium—preferably water—to flow at a forced speed. In other words, I do not depend upon gravity or upon the heating and the cooling of the water, but I produce a rapid flow of the water thru the system by means of a circulating pump 8 which I interpose in the inlet 5. I drive this pump by power derived from the engine thru the gears 9 and 10.

The pump is driven when the engine runs and produces a constant and rapid movement of the water thru the water jacket. This rapid flow of the water prevents the accumulation of steam or air, which often accumulates in gravity systems, and thus provides a constant flow of the cooling water over the heated surfaces of the cylinders.

It is obvious that if I continue to circulate the water in the closed system without any change, the water might finally become too hot to properly cool the cylinders, consequently I provide a means for constantly adding a little cool water and removing an equal quantity of hot water, and I can regulate the quantity thus added so that I can maintain the water and the cylinders at any desired temperature. The cold water may be supplied from a radiator or a tank if desired.

For this purpose I provide a gear pump 11 driven by gears 12 and 13 by the engine, and provided with a suction pipe 14, which extends down thru the bottom of the boat and with a delivery pipe 15 connected to the inlet pipe 5.

I also provide the system with an overflow 16 connected to the stand pipe 7 a little above the connection of the outlet pipe 6 therewith.

The suction pump 11 runs all the time and draws water thru the pipe 14, forcing it into the circulating system.

I control the quantity of water flowing into the system from the force pump by a valve 17 to which I connect a by-pass pipe 18 thru which the excess water, over what I allow to enter the system, can be drained away.

The regulating valve 17 is a three-way valve and by adjusting it I can admit just sufficient water to the system to maintain the desired temperature to produce the most economical and best results. As the engine is a heat engine in which very high temperatures are produced it is obvious that the higher the temperatures of the cylinder walls, within reason, the most economical results can be produced, but in practice it has been

found that there is a practical limit to the temperature of the cooling medium, with water this is a temperature just below the boiling point, or about 200° F. for the reason that if the water becomes much hotter than this, steam is produced which tends to accumulate around the cylinders and prevent the liquid cooling medium flowing over the surfaces.

It is obvious that as I admit cold water from the suction pump, it will become mingled with the other water in the system as it passes thru the circulating pump 8 and the water jacket of the engine, and as the quantity which I thus add is relatively small, it will not cool any one part of the cylinder too much. It is also obvious that as I admit water the level of the water in the standpipe 7 will be raised and as the overflow pipe 16 is connected to the highest point of the system, only hot water will flow out of the overflow, and the quantity of hot water which is thus extracted from the system will be in exact accordance with the quantity of cold water which I add.

By adjusting the valve 17 I have full and complete control of the temperature of the water in the circulating system.

It is to be understood that the pipes 14, 16 and 18 are connected to a radiator for automobile practice. A large tank of water may be provided instead of a radiator or instead of being connected with the water overboard.

As many modifications of my invention will readily suggest themselves to one skilled in the art, I do not limit or confine my invention to the specific structures or steps herein shown and described.

I claim:

1. In a cooling system for marine internal combustion engines, a pump driven by the engine for circulating a quantity of cooling water proportional to the speed of the engine in a complete circuit, another pump also driven by the engine for injecting cold water into the circuit of the first pump in quantities proportional to the speed of the engine, overflow connections for said complete circuit, and adjustable by-pass means for predetermining the ratio of the effective capacities of the pumps.

2. In a marine engine for propelling a boat, an internal combustion cylinder having a water jacket surrounding the same, intake and discharge ports for said jacket, a discharge pipe connected to said discharge port, an intake pipe connected to said intake port, a standpipe connecting said discharge and intake pipes, said pipes forming a closed non-heat radiating circuit for circulating a substantially closed column of water through said jacket, said circuit having a non-cooling function and being adapted to circulate a predetermined quantity of water from the

discharge port of said jacket to said inlet pipe at substantially the temperature of discharge from said jacket, a pump driven by said engine and connected in said inlet pipe
5 for creating a forced circulation through said circuit, a second pump driven by said engine for continuously injecting a small quantity of relatively cold water into said circuit, said pump discharging into said inlet pipe and being adapted to inject cold water into said pipe during all periods in the normal operation of the engine, the intake port of said second pump being adapted to have connection through the hull of
15 the vessel with the surrounding body of water, a by-pass pipe connected to the discharge end of said second pump, a regulating valve for controlling the rate of injection into said circuit and the by-pass flow through said by-pass pipe, and an overflow pipe connecting with said stand pipe at a level higher than the level of said discharge pipe, said overflow pipe being adapted to continuously discharge a predetermined
25 quantity of hot water outside of the hull of said vessel.

3. In a cooling system for marine internal combustion engines, a pump driven by the engine for circulating a quantity of cooling
30 water proportional to the speed of the engine in a complete circuit, another pump also driven by the engine for injecting cold

water into the circuit of the first pump in quantities proportional to the speed of the engine, overflow connections for said complete circuit, and manually adjustable by-pass means for predetermining the ratio of the effective capacities of the pumps.

4. In a cooling system for marine internal combustion engines, a pump driven by the engine for circulating a quantity of cooling water proportional to the speed of the engine in a complete circuit, another pump also driven by the engine for injecting cold water into the circuit of the first pump in
45 quantities proportional to the speed of the engine, and an overflow connection for said complete circuit.

5. In a cooling system for marine internal combustion engines, two engine driven
50 pumps, one of said pumps operating to circulate cooling water through a complete circuit including the engine, the other pump operating to take in water through the hull of the vessel and discharge it again outside
55 of the hull of the vessel, and a three-way valve interconnecting the circuits of said pumps, said valve being manually adjustable to predetermine the ratio in which said two pumps supply cooling water to the engine.

In witness whereof I hereunto subscribe my name this 1st day of August, A. D. 1918
DON COLE.