

Jan. 20, 1931.

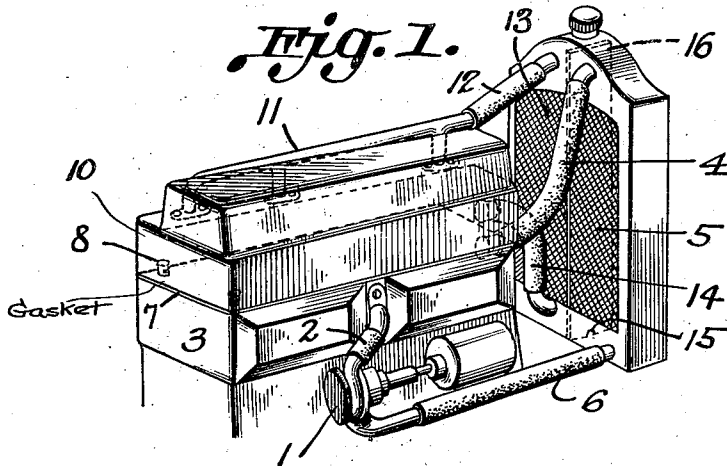
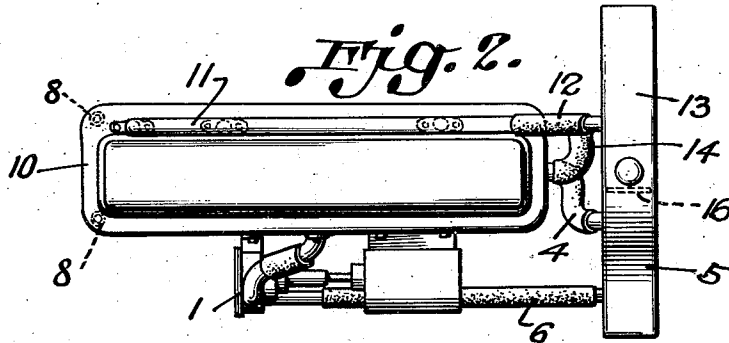
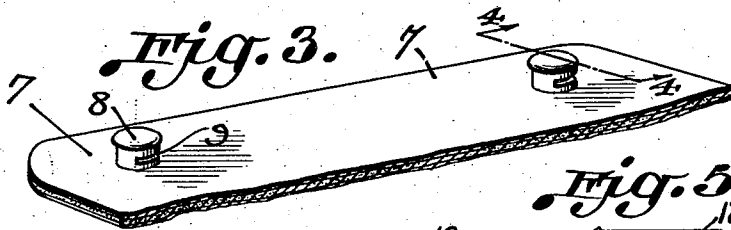
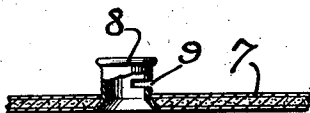
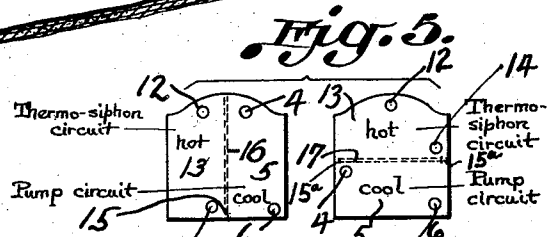
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1,789,540

COOLING SYSTEM FOR INTERNAL COMBUSTION ENGINES

Filed Oct. 4, 1929

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

*Fig. 6.*

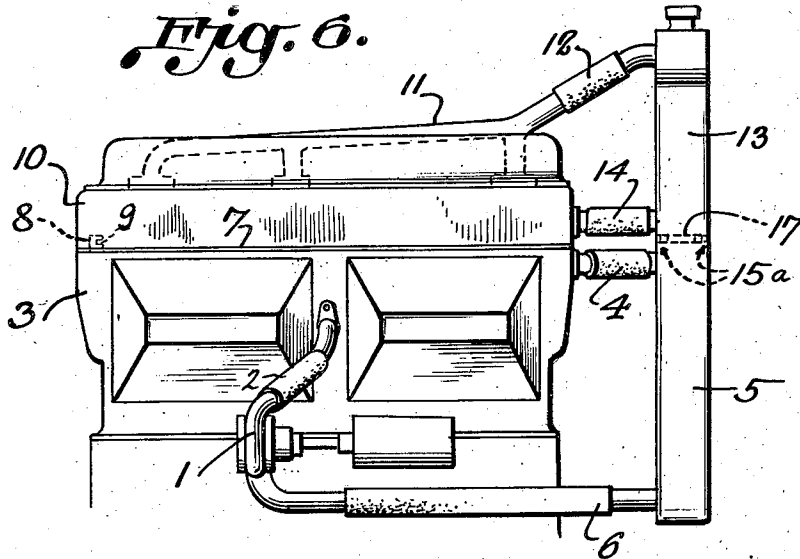


*Fig. 7.*

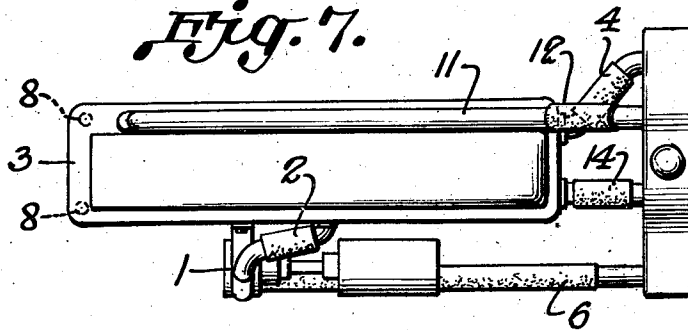
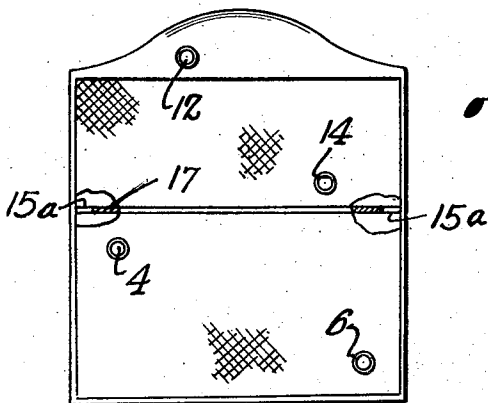


*Fig. 8.*



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## UNITED STATES PATENT OFFICE

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## COOLING SYSTEM FOR INTERNAL-COMBUSTION ENGINES

Application filed October 4, 1929. Serial No. 397,279.

The object of my invention is to provide an improved cooling system for an internal combustion engine; and to provide a novel combination of a thermo-siphon system and force or pump system whereby the temperature of the cylinder block may be maintained at a desired temperature and the temperature of the cylinder head maintained at a different desired temperature. It is also an object of my invention to provide a system that will be more efficient than either of the two systems used singly, and which will facilitate operating of the engine in cold weather. I attain these and other objects of my invention by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of my invention applied to an internal combustion engine;

Fig. 2 is a top plan of same;

Fig. 3 is a detail view of the gasket partition 7, with a portion of same broken away;

Fig. 4 is a detail sectional view on line 4—4 of Fig. 3;

Fig. 5 is a diagrammatic view of the form of the invention having a vertical radiator partition (at the left), and a similar diagrammatic view of a preferred form of the invention having a horizontal radiator partition (at the right), and

Fig. 6 is a side elevation of the preferred form of my invention having a horizontal partition through the radiator;

Fig. 7 is a top plan view of same; and

Fig. 8 is a front elevation with portions of same broken away.

Like characters of reference designate like parts in each of the several views.

Referring to the accompanying drawings, I provide a radiator which is separated into two chambers or sections 5 and 13 by a suitable partition, such as the vertical partition 16, as shown in Fig. 1, or the horizontal partition 17, as shown diagrammatically in Fig. 5 (at the right) and Figs. 6, 7 and 8. I provide a force or pump system of cooling for the cylinder block which system is connected with the radiator section 5; and I also provide a thermosyphon cooling system for the cylinder head which is connected with the

section 13 of the radiator. In the drawings, there is illustrated a suitable pump 1 connected by conduit 2 with the cylinder block 3. The cylinder block in turn is connected by conduit 4 with the radiator section 5; and the radiator section 5 in turn is in communication from its bottom portion with the cylinder pump through the conduit, 6, thus providing a complete circulating system of the pump or force feed type.

Connected with the radiator section 13 is the thermosyphon system, consisting of the manifold 11 which communicates with the cylinder head 10 and with the radiator section 13 through the pipe 12. A return conduit 14 extends from the bottom of the radiator section 13 to the cylinder head 10. I provide a gasket partition 7 separating the cylinder block 3 from the cylinder head 10. This gasket partition is provided with the caps 8 which in turn have the slots 9, thereby providing small communicating passages between the cylinder block and cylinder head.

As shown in Figs. 1 and 2, the radiator partition 16 is positioned at one side of the radiator cap, and a small passage 15, as shown in Fig. 1, is provided in the bottom of the radiator partition 16; or when a form of the invention is used in which a horizontal partition 17 is utilized, as shown in the small diagrammatic view at the right of Fig. 5, and Figs. 6, 7 and 8. I provide similar passages 15<sup>a</sup> at each end of the said partition 17 having a function similar to that of passage 15 of the form of the apparatus having the vertical partition for the passage of water between sections 5 and 13 at a slow rate.

Heretofore it has been the usual practice in cooling motors to have a single water jacket around the cylinders and valves, the water entering the lower part of the cylinder block and being emitted through ports from the cylinder block into the cylinder head and then into the radiator for cooling. In such a system the cylinder block and cylinder head have almost the same temperature. This is a situation which is not calculated to attain the most efficient operation of the motor. In such an ordinary cooling system

a motor will develop the most power at a certain temperature due to the fact that as the temperature rises the combustion improves, while on the other hand as the temperature rises in the cylinders the efficiency of that part of the motor decreases due to the fact that the film of oil on the cylinder walls and pistons is too thin when hot to thoroughly lubricate or seal the piston rings to maintain proper compression.

In my new system the cylinder head is maintained at a temperature approximately 75 degrees hotter than the temperature maintained in the cylinder block. This is due to the fact that a thermo-syphon system which cools the cylinder head normally maintains a higher temperature than a pump or force system such as is used by me in cooling the cylinder block. Consequently I have a hot cylinder head and a well-cooled cylinder block and thereby obtain a higher motor efficiency. A further advantage attained is that the engine is easier to operate in cool weather due to the fact that the cylinder block and head are both warmed up more quickly than in the old system, with the result of better acceleration, and more efficient performance of the engine. This is due to the fact that with my system the pump 1 forces the water through conduit 2 into block 3 and thence through the ports 8 and 9 into the cylinder head 10 from which it flows through the conduit 14 to the bottom of the radiator section 13 and thence through passage 15 to the other radiator section 5 and thence back through conduit 6 to the pump 1. This path of circulation continues for a short time. As soon as the thermo-system from the cylinder head gets hot the circulation changes. The water flows through the manifold 11 and conduit 12 into radiator section 13 and thence through conduit 14 back to the cylinder head 10 while part of the water flows through the passage 15 into the radiator section 5 at the bottom and through the force feed or pump cooling system.

My preferred form of the invention is shown diagrammatically in the small view at the right of Fig. 5, and in Figs. 6, 7 and 8 the radiator partition 17 being disposed horizontally to divide the radiator into the section 13 which is connected by the conduits 12 and 14 with the thermo-syphon part of the system while the radiator section 5 is connected by the conduits 4 and 6 with the force or pump part of the cooling system. The mode of operation is the same or equivalent to that in the form of invention illustrated with the vertical partition 16 except that I provide two small passages 15\* at each end of the horizontal partition 17 which have a function similar to the small passage 15 at the bottom of the vertical partition 16. This construction is believed to be somewhat

more efficient than the one illustrated in detail by reason of the shorter pipes or conduits which can be used with it. Also in this form the cooler section of the radiator is at the bottom and the warmer section at the top, thus making use of the natural tendency of the hot water to rise.

What I claim is:

1. In a cooling system for an internal combustion engine, the combination of a thermo-syphon cooling system connected with the cylinder head, a force feed cooling system connected with the cylinder block, and a gasket partition substantially separating the cylinder block and the cylinder head and reducing the water circulation between same.
2. In a cooling system for an internal combustion engine, the combination of two cooling systems, one of said cooling systems being connected with the cylinder head and the other of said systems being connected with the cylinder block, the system connected with the cylinder block being arranged to constantly maintain its temperature substantially lower than the temperature of the cylinder head, whereby to increase the operating efficiency of the engine.
3. In a cooling system for an internal combustion engine, the combination of a thermo-syphon cooling system connected with the cylinder head, a force feed cooling system connected with the cylinder block, a gasket partition disposed between the cylinder block and the cylinder head, said partition having small ports to permit a limited water circulation, a radiator having a partition dividing it into sections, the thermo-syphon system being connected with one of the sections and the force feed system being connected with the other section, and means for the passage of water to a limited extent from one section to the other.
4. In a cooling system for an internal combustion engine, the combination of a thermo-syphon cooling system connected with the cylinder head, a force feed cooling system connected with the cylinder block, a gasket partition disposed between the cylinder block and the cylinder head, said partition having small ports to permit a limited water circulation, a radiator having a horizontal partition dividing it into sections, the thermo-syphon system being connected with the upper section and the force feed system being connected with the lower radiator section, and passages for a limited flow of water from one section to the other.

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