

A. LOOMIS.
 COOLING SYSTEM FOR ENGINES.
 APPLICATION FILED DEC. 23, 1918.

1,329,419.

Patented Feb. 3, 1920.

2 SHEETS—SHEET 1.

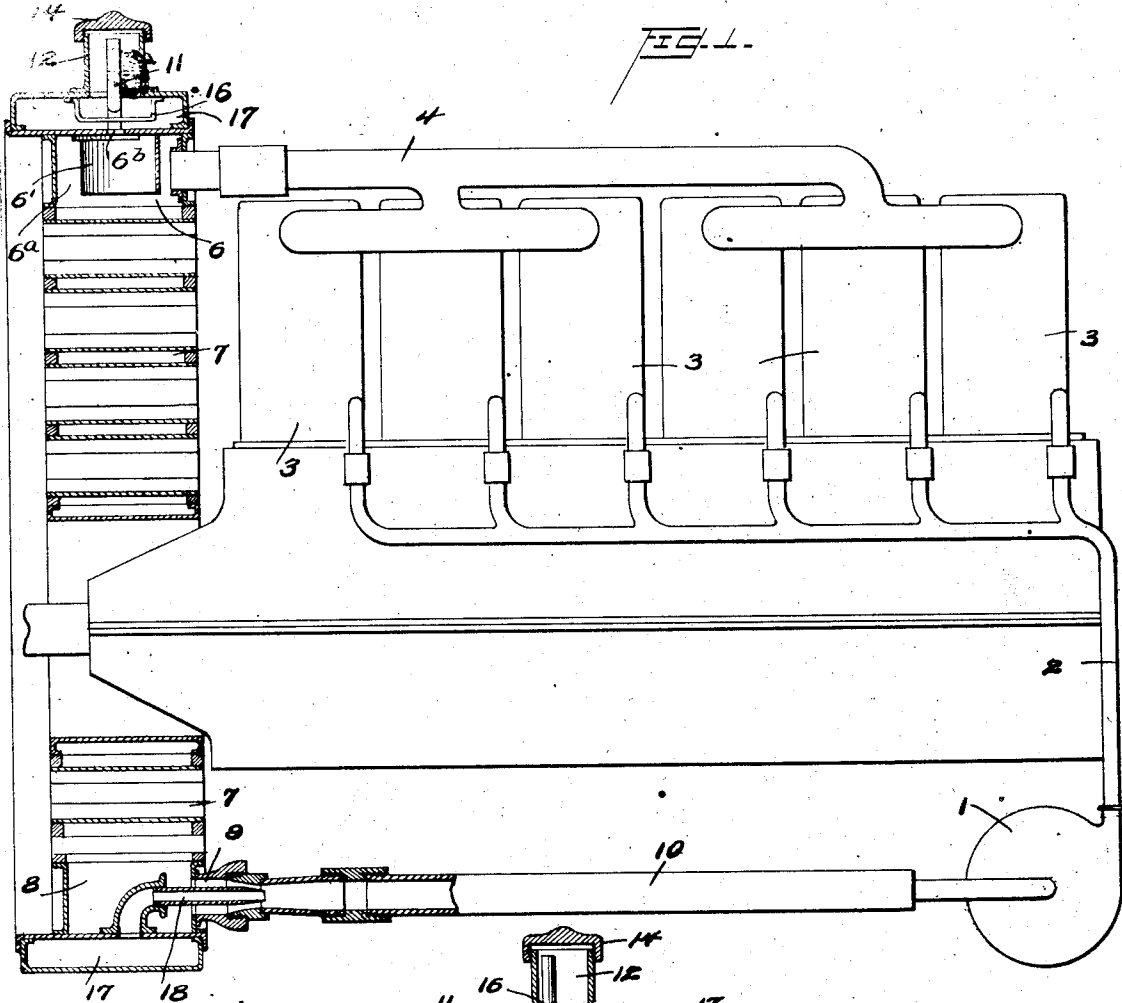


FIG. 2.

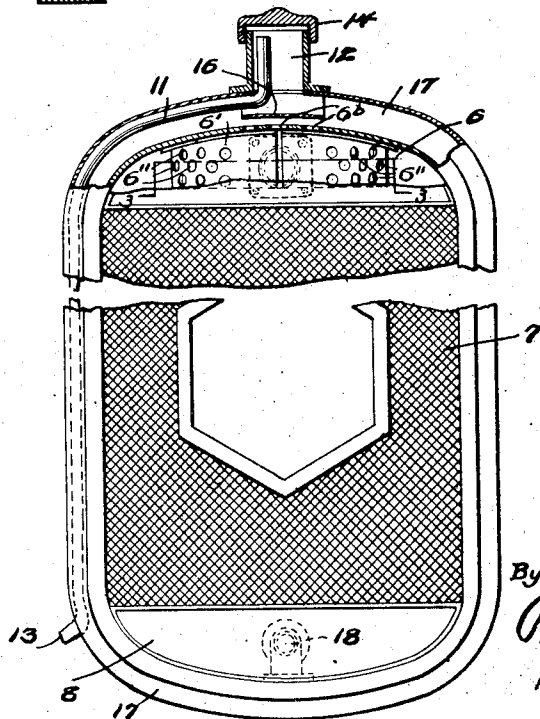
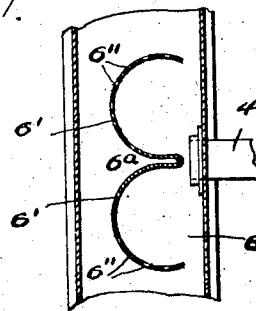


FIG. 3.



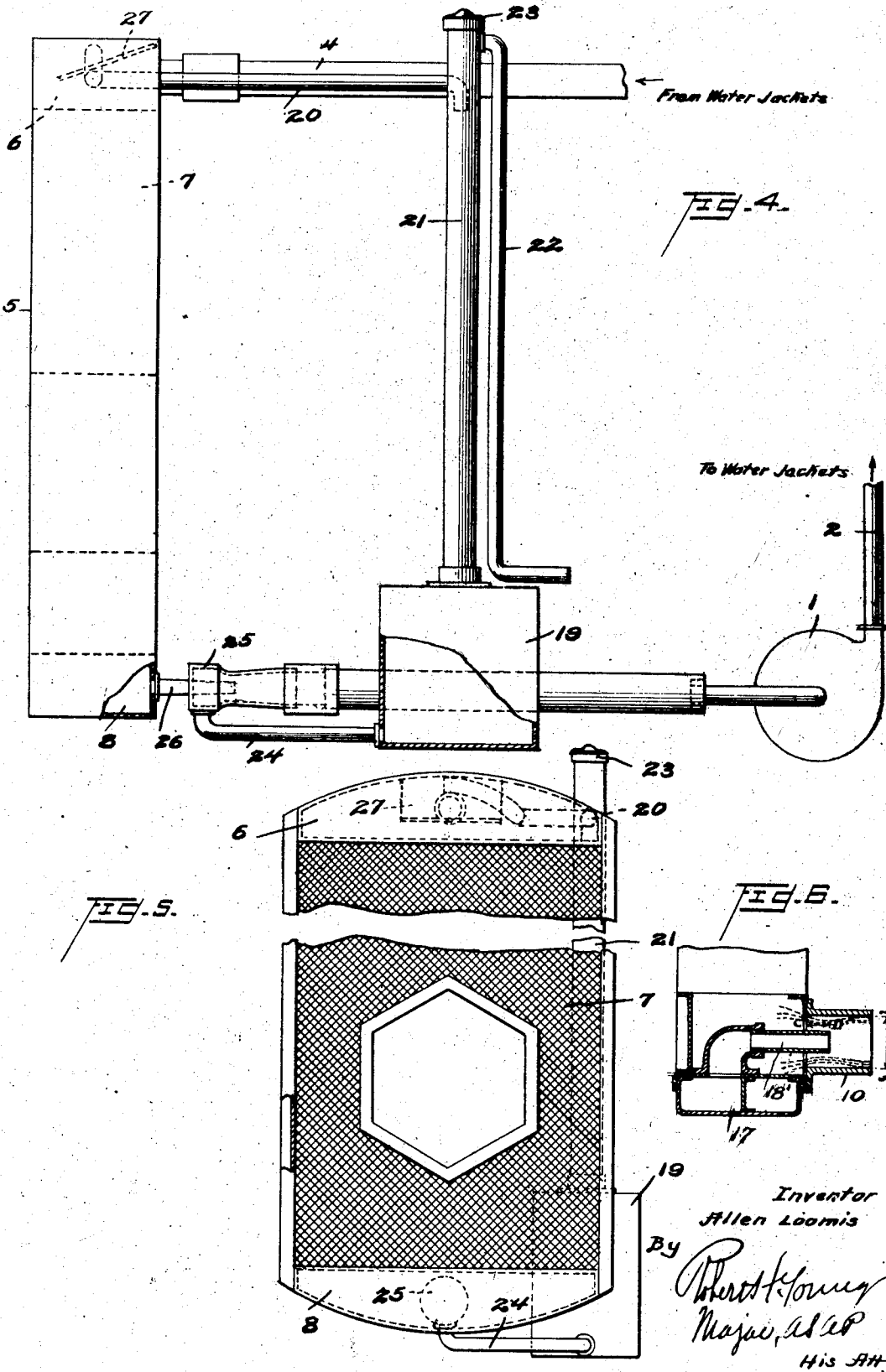
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UNITED STATES PATENT OFFICE.

ALLEN LOOMIS, OF DETROIT, MICHIGAN.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ALLEN LOOMIS, a citizen of the United States, residing at Detroit, State of Michigan, have invented certain new and useful Improvements in Cooling Systems for Engines, of which the following is a specification.

My invention relates to improvements in the cooling system of engines, and has for its object the provision of means for a rapid circulation of the cooling medium without the disadvantages which result from such circulation with the systems now in use. A further object of the invention is to provide means to prevent the pressure in the pipe carrying the cooling medium from the radiator to the fluid forcing means from falling below atmospheric. Another object of the invention is to provide means to prevent the loss of the cooling medium and to return it to the cooling system when it has escaped from the regular course of the flow through the cooling system. A still further object is to provide means to prevent cavitation of the water in the fluid forcing means.

In the accompanying drawing my invention is shown, for the purpose of illustration only, for it is applicable to other engines, as applied to an internal combustion engine. In the drawings, Figure 1, is a side elevation of an internal combustion engine and cooling system showing the radiator and pipes in section. Fig. 2 is a front view of the radiator with the upper header and part of the radiator in section. Fig. 3 is a section on line 3—3 of Fig. 2, Fig. 4 is a fragmentary view of a modified form of my invention showing parts of the cooling system in side elevation and parts in section. Fig. 5 is a front elevation of the radiator of Fig. 4. Fig. 6 is a vertical section of a modification.

Referring to the drawings, 1 indicates any of the usual types of pump used to force the liquid through the cooling system of an internal combustion engine. The pipe 2 conveys the fluid to the cylinder jackets 3 of the engine from which it is conveyed by the pipe 4 to the radiator 5 where it enters the upper header 6.

In order to properly distribute the hot water from the water jackets to all parts of the header 6, and also to provide a relatively quiet spot in the mass of water to allow the steam and water to rise and es-

cape, baffle plates of any desired form may be used. There are here shown a pair of semi-circular, vertically disposed baffles 6', 6' joined in front of the end of pipe 4, as shown in Fig. 3, to direct the water to the right and left. Each baffle is provided with a plurality of holes 6'', 6'' for the passage of water therethrough.

The air and steam present in the water collects in the relatively quiet space 6^a between the two baffles.

Above the space 6^a the header 6 is provided with a plurality of holes 6^b for the escape of air, steam or water, into the expansion tank 17 to be described below. These holes should not be too large or too numerous, else an undue amount of water would escape therethrough with the air or steam.

From the header 6 the water passes through the radiator cells 7 to the bottom header 8, from which it is carried by outlet pipe 9 to the pump suction pipe 10. An overflow pipe 11, the upper end of which is placed in the radiator filling thimble 12 carries the steam to the atmosphere and discharges it at 13. The radiator is closed by the usual form of screw cap 14. Above these openings are suitable baffles 16 to prevent the water and steam escaping directly through the overflow pipe 11. Around the radiator is an expansion tank 17. All the water which overflows through the openings 6^b and all the condensed steam pass around either side of the radiator tubes to the bottom of the tank where it is conveyed by a nozzle 18 into the suction pipe 10 leading to the pump. That portion of the suction pipe in which the nozzle from the expansion tank extends is in the form of a venturi.

In the modified form of the invention shown in Fig. 4, instead of the annular expansion tank, I provide an expansion tank 19 in which the water and condensed steam which overflows from the upper header is collected. The pipe 20 carries air and steam and any water forced into it to the pipe 21 connected with the expansion tank. At the top of this pipe is an overflow pipe 22 similar to the pipe 11, disclosed in Fig. 1. The filling thimble at the top of this pipe is closed as usual by a cap 23. The water is conveyed from expansion tank 19 by pipe 24 to a chamber 25 in which there is a nozzle 26 leading from the bottom header to the pump suction pipe. This pump suction

pipe is in the form of a venturi at the point where the water from the expansion tank and the radiator enters it. A baffle 27 is arranged as shown to aid in distributing the hot water through the header.

Referring now to the modification shown in Fig. 6, there is shown a construction where the venturi of Fig. 1 is dispensed with. The water rushing into the pipe 10 forms however, a vena contracta as shown by the dotted lines, which, with relation to the nozzle or pipe 18' located therein, acts like a venturi to suck the water out of the expansion tank 17.

Experiment has shown that most efficient results are obtained when the pipe 18' projects into the pipe 10 a distance substantially equal to one-half the diameter of the pipe 10, or in other words, where $CD = \frac{1}{2}AB$.

It is well-known that a rapid flow of water through the cooling system greatly increases the efficiency of the system. This increase in the rapidity of the flow is usually obtained by increasing the size and speed of the pump. Experience has shown, however, that when the speed of the pump is increased beyond a certain point, the pressure in the pump suction pipe is reduced below atmospheric when air leaks develop. The air which enters the pump suction pipe produces at least two bad results. First, there is cavitation of the water in the pump which reduces its efficiency. Second, this air when passing around the cylinder becomes highly heated and when carried to the upper header expands to such an extent that considerable water is thrown out of the header and escapes through the overflow pipe. My invention prevents the air entering the suction pipe from the outside for the pressure there is kept above atmospheric by the nozzle and venturi which act as an injector for the water which has collected in the expansion tank. My invention also takes all the water which has escaped from the upper header and returns it to the cooling system for effective work.

The rapid flow of water through the cooling system which it is possible to maintain by the use of my invention also results in a greater dissipation of heat than may now be obtained; it prevents the relatively cool film of water next to the walls of the radiator cells and the hotter center ribbon of water which has been found to exist in the present cooling system, and makes possible the use of a radiator with a greater depth of core than is now used.

What I claim is:

1. In a cooling system for engines, a cooling jacket, fluid forcing means connected to said jacket, a radiator connected to said jacket, a chamber connected with said radiator, a connection between said chamber and said fluid forcing means, a connection be-

tween said radiator and said fluid forcing means, and means in said cooling system to separate air and steam from the liquid in said system.

2. In a cooling system for engines, a cooling jacket, fluid forcing means connected to said jacket, a radiator connected to said jacket, a connection between said radiator and said fluid forcing means, an annular chamber around said radiator and connected therewith, and a connection between said chamber and said fluid forcing means.

3. In a cooling system for engines, a cooling jacket, fluid forcing means connected to said jacket, a radiator connected to said jacket, a connection between said radiator and said fluid forcing means, an annular chamber around said radiator and connected therewith, and a connection between said chamber and said fluid forcing means consisting of a nozzle and a Venturi tube.

4. In a cooling system for engines, a cooling jacket, a pump connected to said jacket, a radiator connected to said jacket, a fluid chamber, a connection between said fluid chamber and said radiator, a connection between said radiator and said pump, a connection between said fluid chamber and said pump, and means in said cooling system to separate air and steam from the liquid in said system.

5. In a cooling system for engines, a cooling jacket, a pump connected to said jacket, a radiator connected to said jacket, a fluid chamber, a connection between said fluid chamber and said radiator, a connection between said fluid chamber and said pump, said connection consisting of a nozzle and a venturi, and means in said cooling system to separate air and steam from liquid in said system.

6. In a cooling system for engines, a cooling jacket, a pump connected to said jacket, a radiator connected to said jacket, an annular fluid chamber around said radiator, a connection between said fluid chamber and said radiator, a connection between said radiator and said pump and a connection between said fluid chamber and said pump.

7. In a cooling system for engines, a cooling jacket, a pump connected to said jacket, a radiator connected to said jacket, an annular fluid chamber around said radiator, a connection between said fluid chamber and said radiator, a connection between said radiator and said pump, and a connection between said fluid chamber and said pump, said connection consisting of a nozzle and a venturi.

8. In a cooling system for engines, a cooling jacket, a pump connected to said jacket, a radiator connected to said jacket, an annular fluid chamber around said radiator, a connection between said fluid chamber and said radiator, a connection between said

radiator and said pump, a connection between said chamber and said fluid forcing means, and a second fluid forcing means in said connection.

9. In a cooling system for engines, a cooling jacket, a pump connected to said jacket, a radiator connected to said jacket, an expansion tank, a connection between said tank and said radiator, a connection between said radiator and said pump, said connection consisting of a nozzle and a venturi, a chamber surrounding said nozzle, and a connection between said expansion tank and said chamber.

10. In a cooling system for engines, a cooling jacket, a pump connected to said jacket, a radiator connected to said jacket, a header associated with the radiator, a fluid chamber around said radiator, a connection between said fluid chamber and said radiator, a connection between said radiator and said pump and a connection between said fluid chamber and said pump.

11. The combination as claimed in claim 10, in combination with means located in said header to distribute water to the radiator and to provide a relatively quiet space to permit the rise of air or steam.

12. In a cooling system for engines, a cooling jacket, a pump connected to said jacket, a radiator connected to said jacket, an expansion chamber connected to said radiator, connecting means between said radiator and said pump and connecting means between said expansion chamber and said first-mentioned connecting means, whereby the passage of fluid through the first mentioned connecting means causes passage of fluid through the second mentioned connecting means.

13. In a cooling system for engines, a cooling jacket, a pump connected to said jacket, a radiator connected to said jacket, an expansion chamber connected to said radiator, connecting means between said radiator and said pump, a nozzle leading from said expansion chamber and opening into said connecting means.

14. The combination as claimed in claim 13, said nozzle projecting into said connecting means a distance substantially equal to one-half the diameter of said connecting means.

15. In a cooling system for engines, a cooling jacket, fluid forcing means connected to said jacket, a radiator connected with said

jacket, a chamber connected with said radiator, a connection between said chamber and said fluid forcing means, a connection between said radiator and said fluid forcing means and means in said cooling system located between said jacket and said chamber to separate air and steam from the liquid in said system.

16. In a cooling system for engines, a cooling jacket, fluid forcing means connected to said jacket, a radiator connected with said jacket, a chamber connected with said radiator, a connection between said chamber and said fluid forcing means, a connection between said radiator and said fluid forcing means and means in said cooling system located between said jacket and said radiator to separate air and steam from the liquid in said system.

17. In a cooling system for engines, a cooling jacket, fluid forcing means connected to said jacket, a radiator connected with said jacket, a chamber connected with said radiator, a connection between said chamber and said fluid forcing means, a connection between said radiator and said fluid forcing means and means in said cooling system located between said jacket and said chamber and consisting of one or more baffles, to separate air and steam from the liquid in said system.

18. In a cooling system for engines, a cooling jacket, fluid forcing means connected to said jacket, a radiator connected with said jacket, a chamber connected with said radiator, a connection between said chamber and said fluid forcing means, a connection between said radiator and said fluid forcing means and means in said cooling system located between said jacket and said chamber and consisting of one or more curved baffle plates, to separate air and steam from the liquid in said system.

19. In a cooling system for engines, a cooling jacket, fluid forcing means connected to said jacket, a radiator connected with said jacket, a chamber connected to said jacket, a connection between said chamber and said radiator, a header in said radiator, means in said header to separate air and steam from the liquid in said system, a connection between said chamber and said fluid forcing means, and a connection between said radiator and said fluid forcing means.

In testimony whereof I affix my signature.
ALLEN LOOMIS.