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COOLING SYSTEM FOR INTERNAL COMBUSTION ENGINES.

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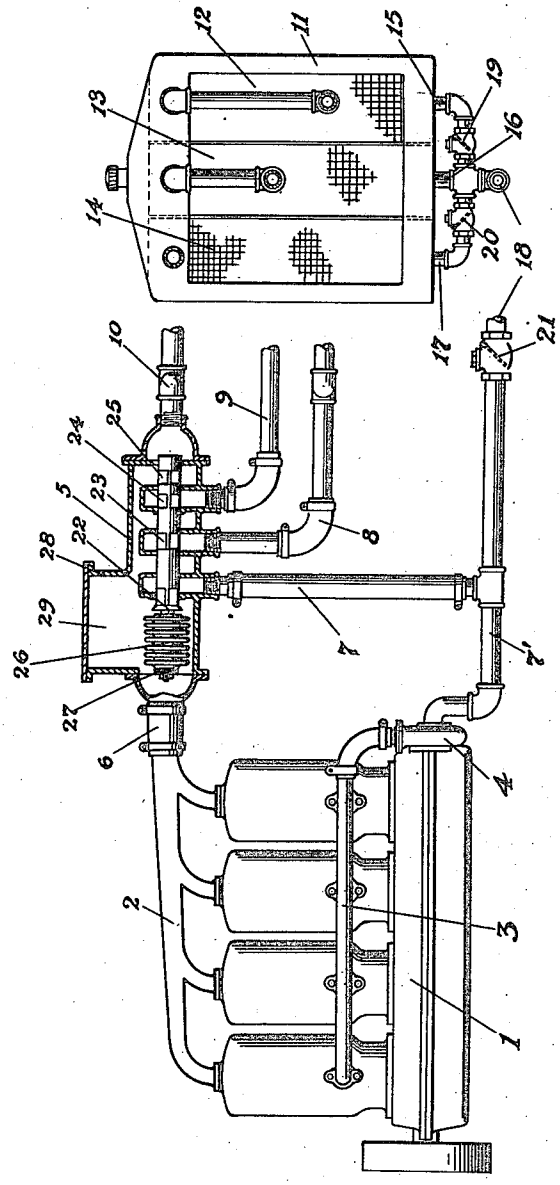


Fig. 2.

Fig. 1.

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COOLING SYSTEM FOR INTERNAL-COMBUSTION ENGINES.

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To all whom it may concern:

Be it known that I, JEAN V. GIESLER, a citizen of United States of America, and a resident of Knoxville, Tennessee, have invented a new and useful Improvement in Cooling Systems for Internal-Combustion Engines, which invention is fully set forth in the following specification.

This invention relates to a cooling system, particularly designed for cooling the parts of an internal combustion engine, and though susceptible of employment for other purposes, the invention has special utility when employed for cooling the engine of an automobile.

An object of this invention is to provide a cooling system wherein the cooling medium is maintained at an approximately uniform temperature under normal working conditions by proportioning the radiating sections of the system to the needs of the system. A further object of this invention is to provide a cooling system wherein the cooling medium is maintained at an approximately uniform temperature by automatically proportioning the radiating sections of the system to the needs of such system, as preferably determined by the temperature of the cooling medium.

Still a further object of the invention is to provide, particularly in connection with an automobile engine, a cooling system comprising means constituting radiators so controlled as to greatly lessen the liability of said radiators freezing in cold weather. Another object of the invention is to provide a cooling system for an internal combustion engine that is simple in construction and efficient in operation. Other objects will appear as the description proceeds.

Briefly stated, the invention comprises, in combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections, and unitary means for connecting and disconnecting in sequence the several radiator sections into and from the cooling system, such means being shown as comprising a plurality of connected valves controlling the admission of cooling medium to the radiator sections, said valves in turn, being preferably controlled by thermosensitive means, shown as subjected to the cooling medium. Said system may be so constructed that, upon each radiator section being cut out of the system, said section is emptied of its cooling medium.

The invention is capable of receiving a variety of mechanical expressions, one of which for the purposes of illustration has been shown on the accompanying drawings and will be described hereinafter, but it is to be expressly understood that the selected embodiment is for purposes of illustration only, and is not to be construed as a definition of the limits of the invention, reference being had to the appended claims for that purpose.

Referring to the drawings,

Fig. 1 is an elevation, partly in section, of an embodiment of the present invention and showing an engine and a portion of its cooling system, omitting the means constituting radiators;

Fig. 2 is a transverse section of said cooling system, showng the means constituting radiators in elevation, and constituting a continuation of Fig. 1 represented on a plane transverse thereto.

In the form illustrated in the drawings, 1 represents any preferred form of internal combustion engine, here shown as a four-cylinder engine such as is commonly employed on automobiles. As is usual, the cylinders of the engine are provided with jackets constituting cooling chambers through which may be circulated a cooling medium, such as water. Leading from the upper ends of the jackets is a manifold 2 providing outlets for the jackets, while a manifold 3 provides the cooling medium from the several inlets for the cooling medium to the several jackets. 4 is a conventional or any suitable circulating pump for forcing the cooling medium through the system. While it is preferred that a circulating pump be employed, it is to be understood that, as respects certain features of my invention, the pump may be omitted and the circulation of the cooling medium through the system secured by the thermo-siphon principle.

Means are provided in the cooling system for the radiation of heat taken up by the cooling medium in passing through the jackets. According to the present invention,

this means is so constructed as to be proportioned to the needs of the system, preferably automatically by the control of the admission of the cooling medium to successive sections of the radiating means by a thermosensitive device desirably subjected to such medium. In the form shown a valve casing 5 is connected to the manifold 2 by any suitable connection such as represented at 6. Leading from the valve casing 5 are a plurality of passages or conduits 7, 8, 9 and 10. Conduit 7 is connected to the pipe 7′ leading to the pump 4, while conduits 8, 9 and 10 are respectively connected to separate compartments constituting radiators. While these separate radiators may be provided in a variety of ways, in the illustrated embodiment of this invention a radiator casing 11 is divided interiorly into three separate radiator sections 12, 13 and 14, respectively connected with said conduits 8, 9 and 10. The term "radiator sections" will hereafter be used to designate generically a plurality of means constituting radiators, whether such means be constituted by a plurality of separate radiators, a radiator subdivided into a plurality of separate sections, or otherwise. These radiator sections are provided with individual outlet conduits 15, 16 and 17, respectively leading therefrom and connected with a common return conduit 18 forming an extension of the pipe 7′ leading to the pump 4. Each of the pipes 15, 16 and 17 may be provided with a check-valve, as illustrated at 19 and 20, and the return conduit 18 may be also provided with a check-valve at 21, for a reason that will appear hereinafter.

Means are provided for controlling the admission of the cooling medium to the several conduits 7, 8, 9 and 10. In the form shown, this means comprises a valve 22 which controls the admission of the cooling medium to the conduit 7, and a plurality of valves 23, 24 and 25 which respectively control the admission of the cooling medium to the conduits 8, 9 and 10. While these valves have been shown as piston valves, it is to be understood that any other suitable type of valve may be employed. The several valves 22, 23, 24 and 25 are preferably arranged in coaxial relation and integrally connected to constitute a single valve member, whereby the several valves may be operated simultaneously. These valves are so constructed and arranged that when valve 22 is wide open, valves 23, 24 and 25 are closed. Upon movement of the unitary valve member toward the right, as viewed in Fig. 1, valve 22 will be moved toward closed position by successive increments, while valves 23, 24 and 25 will be moved to consecutively open the conduits 8, 9 and 10 respectively to admit of cooling fluid to the radiator sections 12, 13 and 14 respectively. When valves 23, 24 and 25 are wide open, valve 22 is entirely closed.

While a variety of means may be employed for actuating the unitary valve member to cut the respective radiator sections into and out of the system, a preferred means comprises a single thermostat 26, preferably in the form of an expansible and collapsible vessel, charged with a volatile fluid and subjected to the cooling medium as it flows through the valve casing 5. One end wall of the expansible and collapsible vessel is fixedly mounted, as indicated at 27, while the opposite and movable end wall is connected in unitary relationship with the valve member comprising the valves 22, 23, 24 and 25.

The cooling system is also preferably so constructed that each radiator section may be emptied as soon as circulation of the cooling medium therethrough is prevented. In the form shown the valve casing 5 is provided with an enlargement 28 constituting a chamber 29 of a capacity equal to the combined capacity of the several radiator sections 12, 13 and 14 and the conduits leading thereto, whereby when any or all of the valves 23, 24 and 25 are closed the continued operation of pump 4 will withdraw all of the cooling medium from the respective radiator sections disconnected from the system as well as the conduits leading thereto, the chamber 29 then constituting a storage reservoir for the cooling medium so withdrawn. This reservoir, however, may be situated in any other suitable position in the system.

In operation, when the engine is first started, the cooling medium will be at a temperature below that which is most efficient for the working of the internal combustion engine. Thermosensitive member 26 will then be contracted, valve 22 will be wide open, and valves 23, 24 and 25 entirely closed. The cooling medium will be circulated, by the pump 4 when such is employed, to pass through manifold 3, the jackets of the engine cylinders, manifold 2, connection 6, valve casing 5, conduit 7 which constitutes a by-pass around the radiator sections, and pipe 7′ to the pump. As no radiator section is included in the circuit of the cooling medium, its temperature will rise rapidly until it reaches that predetermined degree which is considered most efficient for the operation of the engine. Thereafter, as the temperature of the cooling medium rises, thermosensitive member 26 will expand in proportion to the increase in temperature, closing valve 22 by successive increments and opening valve 23 to admit the cooling medium through conduit 8 to radiator section 12, said medium returning through the outlet 15 of such section through the pipe 18 to the pump. A further increase in the temperature of the cooling medium will open in sequence valves 24 and 25 to admit the cool-

ing medium through the respective conduits 9 and 10 to the respective radiator sections 13 and 14, from which the cooling medium returns through the conduits 16 and 17 respectively and pipe 18 to the pump.

When any one or all of the valves 23, 24 and 25 are closed, the pump will withdraw the cooling medium from the interior of the corresponding radiator section or sections, the check-valve in the conduit leading from such section or sections preventing the flow of the cooling medium back into the same. Thereby, when a radiator section is not connected into the circulating system, the cooling medium is entirely withdrawn therefrom, preventing freezing of the cooling medium within such section.

Therefore it will be apparent that a means has been provided whereby the cooling system comprises a plurality of radiating sections which may be thermostatically controlled to proportion the sections connected into the system to the needs of the system, preferably as determined by the temperature of the cooling medium therein, and also whereby the respective radiator sections may be emptied of the cooling medium when not connected into said system.

While the system has been shown as comprising three radiator sections and a by-pass therearound, it is to be understood that under some conditions the by-pass may be omitted, and that a lesser or larger number of radiator sections may be employed in accordance with the use to which the system is to be put.

While the illustrated embodiment has been described with considerable detail, it is to be expressly understood that the invention is not restricted thereto but is capable of receiving a variety of mechanical expressions, some of which will readily suggest themselves to those skilled in the art, while certain features thereof are capable of use without other features thereof. Reference is therefore to be had to the claims hereto appended for a definition of the limits of the invention.

What is claimed is:

1. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections, and unitary means for consecutively connecting and disconnecting a plurality of said sections into and from said cooling system.

2. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections, and a single thermosensitive means for consecutively connecting and disconnecting a plurality of said sections into and from said cooling system.

3. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections, and a single means controlled by the temperature of the cooling medium for consecutively connecting and disconnecting a plurality of said sections into and from said cooling system.

4. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections, a by-pass, and means for shutting off said by-pass by consecutive increments and for simultaneously connecting consecutive radiator sections into said system.

5. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections, a by-pass, and thermosensitive means for shutting off said by-pass by consecutive increments and for simultaneously connecting consecutive radiator sections into said system.

6. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections, a by-pass around said sections, a valve controlling said by-pass, valves for each of said sections, and means for opening or closing said by-pass valve and simultaneously and consecutively respectively closing or opening the valves for said sections.

7. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections, a by-pass around said sections, a valve controlling said by-pass, valves for each of said sections, and a thermostat operatively connected to said valves to open or close said by-pass valve and simultaneously and consecutively respectively closing or opening the valves for said sections.

8. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections, a by-pass around said sections, a valve for controlling the flow of the cooling medium through said by-pass, a valve for controlling the flow of cooling medium through each of said sections, and means for closing or opening said valve controlling said by-pass and simultaneously respectively opening or closing said valves controlling said sections.

9. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections, a by-pass around said sections, a valve for controlling the flow of the cooling medium through said by-pass, a valve for controlling the flow of cooling medium through each of said sections, and thermosensitive means for closing or opening said valve controlling said by-pass and simultaneously respectively opening or closing said valves controlling said sections.

10. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections adapted to be connected into said cooling

system, means controlling the flow of cooling medium through each of said sections, and means for operating said controlling means in sequence to add successive radiator sections to said system while maintaining a full circulation of said cooling medium through the section or sections already connected into said system.

11. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections adapted to be connected into said cooling system, means controlling the flow of cooling medium through each of said sections, and thermosensitive means for operating said controlling means in sequence to add successive radiator sections to said system while maintaining a full circulation of said cooling medium through the section or sections already connected into said system.

12. A cooling system for internal combustion engines comprising a plurality of radiator sections, means for consecutively connecting successive sections into said system while maintaining a circulation of the cooling medium through the section or sections already connected into said system, and a thermostat subjected to the temperature of the cooling medium for operating the aforesaid means.

13. A cooling system comprising means for circulating a cooling medium, a plurality of radiator sections adapted to be connected into said system, a valve controlling the flow of cooling medium through each of said sections, and thermosensitive means for consecutively effecting the opening and closing of said valves.

14. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections, and a single valve member adapted by successive increments of movement to admit the flow of cooling medium to consecutive radiator sections while maintaining the flow of cooling medium through the section or sections already connected into said system.

15. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections, a single valve member adapted by successive increments of movement to admit the flow of cooling medium to said radiator sections while maintaining the flow of cooling medium through the section or sections already connected into said system, and thermosensitive means for operating said valve member.

16. In combination with an internal combustion engine a cooling system therefor comprising a plurality of radiator sections, means for consecutively connecting said radiator sections into said system and consecutively cutting said sections out of said system, and means whereby the cooling medium consecutively is automatically withdrawn from each section when said section is cut out of the system.

17. In combination with an internal combustion engine, a cooling system therefor comprising a plurality of radiator sections, means for consecutively connecting said radiator sections into said system and consecutively cutting said sections out of said system, thermosensitive means controlling said last-named means, and means whereby the cooling medium is automatically withdrawn from each section when said section is cut out of the system.

18. In combination with an internal combustion engine, a cooling system therefor comprising a plurality of radiator sections, a reservoir in said system for storing cooling medium, means for determining the number of said sections connected into said system, and means whereby the cooling medium is withdrawn from each section and stored in said reservoir when said section is cut out of the system.

19. In combination with an internal combustion engine, a cooling system therefor comprising a plurality of radiator sections, a reservoir in said system for storing cooling medium, means for determining the number of said sections connected into said system, thermosensitive means for operating said last-named means, and means whereby the cooling medium is withdrawn from each section and stored in said reservoir when said section is cut out of the system.

20. In combination with an internal combustion engine, a cooling system therefor comprising a complete circuit through which the cooling medium may circulate, a plurality of radiator sections adapted to be cut into and out of said system to proportion the radiating surface to the temperature of the cooling medium, and thermosensitive means for consecutively cutting said radiator sections into and out of said system to respectively increase and decrease the radiating surface.

21. In combination with an internal combustion engine, a cooling system therefor comprising a complete circuit through which the cooling medium may circulate, a plurality of radiator sections adapted to be cut into and out of said system to proportion the radiating surface to the temperature of the cooling medium, means whereby the cooling medium is withdrawn from each section when cut out of the system, and thermosensitive means for cutting said radiator sections into and out of said system.

22. In combination with an internal combustion engine, a cooling system therefor comprising a plurality of radiator sections, a by-pass around said sections, and automatic means for closing and opening said by-pass by consecutive increments and simultaneously connecting and disconnecting con-

secutive radiator sections into and from said system.

23. A cooling system for internal combustion engines comprising a plurality of radiator sections available at all times for effecting the cooling of the heated medium as it comes from the engine jacket, valve mechanism for controlling the flow of cooling medium through said sections, and means for operating said valve mechanism to control the flow of cooling medium through the respective sections and to connect and disconnect the respective sections into and from said cooling system.

24. A cooling system for internal combustion engines comprising a plurality of radiator sections, valve mechanism for controlling the flow of cooling medium through said sections, and thermosensitive means responsive to the temperature of said cooling medium for operating said valve mechanism to control the flow of cooling medium through the respective sections and to connect and disconnect the respective sections into and from said cooling system.

25. A cooling system for internal combustion engines comprising a plurality of radiator sections, a by-pass around said sections, and automatic valve mechanism for controlling the flow of cooling medium through said by-pass and the respective radiator sections and for connecting and disconnecting the respective sections into and from said cooling system.

26. A cooling system for internal combustion engines comprising a plurality of radiator sections, a by-pass around said sections, a valve for controlling the flow of cooling medium through said by-pass, valves for controlling the flow of cooling medium through said radiator sections and for connecting and disconnecting said sections into and from the cooling system, and a thermostat for simultaneously operating said valves.

27. A cooling system for internal combustion engines comprising a plurality of radiator sections and automatic valve mechanism for connecting and disconnecting the respective sections into and from the cooling system, said valve mechanism also operating to control the volume of cooling medium flowing through each of said sections when it is connected into said system.

28. In combination with an internal combustion engine, a cooling system therefor comprising a plurality of radiator sections, a by-pass, valve mechanism for closing said by-pass by consecutive increments and simultaneously connecting consecutive radiator sections into said system, and thermosensitive means controlled by the temperature of the cooling medium for operating said valve mechanism.

29. In combination with an internal combustion engine, a cooling system therefor comprising radiating means, means whereby the cooling effect of successive sections of said radiating means may be brought into operation additively, and a single means controlled by the temperature of said cooling medium for operating the aforesaid means.

30. The combination with an internal combustion engine having a cooling chamber, of a radiator comprising a plurality of compartments, means establishing successive communication with said compartments, conduits establishing communication between said radiator and the cooling chamber of said engine, and common actuating means whereby said compartments may be consecutively cut out of operative communication with said cooling chamber.

31. The combination with an internal combustion engine having a cooling chamber, of a radiator comprising a plurality of compartments, means establishing communication with said compartments, conduits establishing communication between said radiator and the cooling chamber of said engine, common actuating means whereby said compartments may be consecutively cut out of operative communication with said cooling chamber, and means coacting with said last-named means for automatically emptying the compartments as they are cut out of operative communication with the cooling chamber.

In testimony whereof I have signed this specification.

JEAN V. GIESLER.