

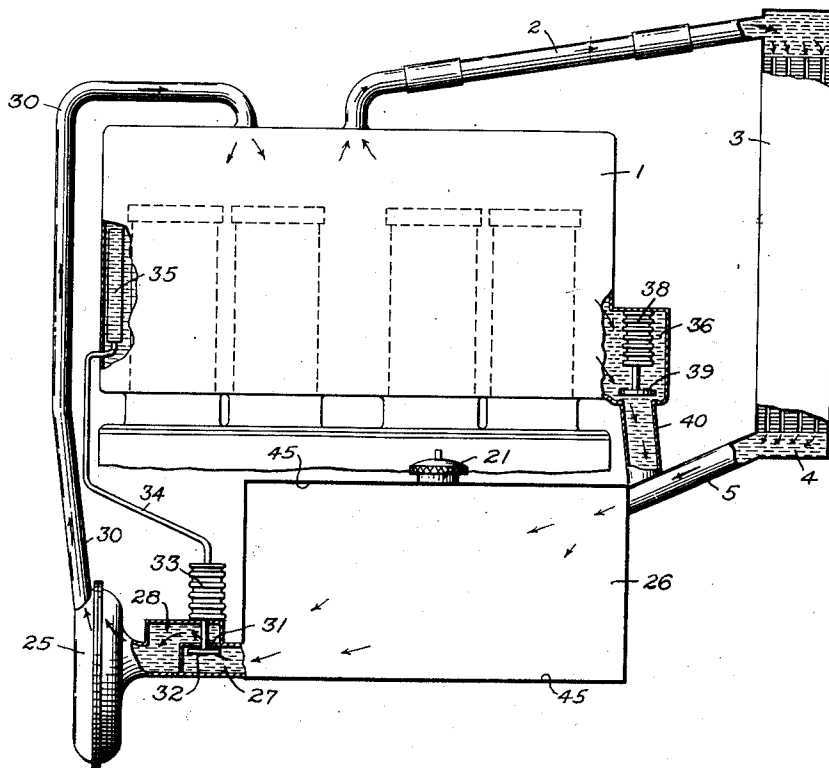
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PROCESS OF AND APPARATUS FOR COOLING INTERNAL COMBUSTION ENGINES

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PROCESS OF AND APPARATUS FOR COOLING INTERNAL-COMBUSTION ENGINES.

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This invention relates to cooling systems for an internal combustion engine, and to a method of operating the same, and has for its object to provide an apparatus and a procedure which will be comparatively inexpensive to manufacture and more efficient in operation than those which have been heretofore proposed.

With these and other objects in view, the invention consists in the novel details of construction and combinations of parts constituting the apparatus, and in the novel steps and combinations of steps constituting the process, all as will be more fully herein-after disclosed and particularly pointed out in the claims.

This application is a division of my co-pending application Serial No. 602,267, filed November 20, 1922, since matured into Patent No. 1,625,737 under date of April 19, 1927, and entitled Means and methods of cooling internal combustion engines.

Referring to the accompanying drawings forming a part of this specification, in which the figure is a diagrammatic view of an apparatus made in accordance with this invention:

1 indicates a jacket, 2 a pipe leading from said jacket to a radiator 3, 4 a tank at the lower portion of the radiator, 5 a connection with said tank 2, and 26 an additional tank or reservoir adapted to hold enough liquid to fill the entire system. 25 indicates a pump connected by the passage 27 leading from the tank 26 to the chamber 28, which in turn is connected to the suction side of the said pump 25, while the delivery side of said pump is connected by the pipe 30 to the jacket 1, as shown.

The passage 27 is connected by the port 31 to the chamber 28 and said port 31 is controlled by the valve 32, which valve is in turn controlled by the thermostatic bellows device 33. Said bellows device is in turn controlled by the pipe 34 connected with the thermostatic bulb 35 located within the jacket 1, and therefore sensitive to changes in temperature of the liquid in said jacket.

The said jacket 1 further communicates with the chamber 36, provided with the thermostatic bellows device 38 controlling the valve 39, which in turn controls the connec-

tion 40 between said chamber 36 and the said pipe 5 leading into the tank 26.

The operation of this device is as follows:

The thermostat 32 is so set that when the liquid is below a temperature of say 140° F., the valve 32 will be closed. The engine being started and the temperature of the liquid in the tank 26 being below 140° F., no liquid can be passed in the jacket, because said valve 32 is closed. Accordingly, the jacket will rapidly heat up, until through the expansion of the liquid in bulb 35, said valve 32 opens, thus permitting the pump 25 to pass liquid through pipe 30 into the jacket until said liquid itself rises to a temperature above 140° F. When this occurs, the valve 39 will close, and the jacket itself be filled with liquid. The continued action of the pump 25 will now force liquid out of the jacket, through pipe 2, radiator 3, and pipe 5 back into said tank 26. The surplus heat being thus dissipated as before, the cooled liquid will continue to be circulated through said radiator until the jacket temperature falls below the predetermined temperature of 140° F. When this occurs, the valve 32 will again close and the valve 39 open, so that the liquid will rapidly drain from the jacket 1 past the valve 39 and through the connection 40 back into said tank 26.

It will thus be seen that both the jacket and the radiator are substantially empty of liquid while the engine is running when the temperature is below a predetermined degree, so that the radiator can not freeze and the jacket can be heated up and the engine started in a minimum of time.

It will further be observed that liquid is excluded from both radiator and jacket until a predetermined temperature has been reached in the jacket, and that this temperature may be made almost anything desired within reason. In prior devices, in so far as I am aware, it has not been possible to exclude the liquid from the jacket until a predetermined temperature is reached, but only from the radiator. Therefore, this invention possesses an advantage over the prior procedures in that the jacket in this case being entirely empty of liquid, will heat up very much more rapidly than in the prior cases, due to the fact that metal has a lower specific heat than liquid, and accordingly, the engine can be

brought to its operating temperature in a very much shorter interval than has been the case heretofore.

Another advantage that resides in this device is due to the fact that the liquid stored in the tank 26 is at substantially the predetermined temperature that is set for the jacket, so that when it is introduced into the jacket it is usually in its warm condition, and especially when the tank is heat insulated as at 45 as it is intended to be.

A further advantage possessed by this invention resides in the fact that each of the valves 32 and 39 may be operated by hand or one of them may be automatically operated, and in the other operated by hand. Stated in other words, by simply attaching a suitable connection to said valves not shown, and leading said connection to the dash-board of an automobile or to the cockpit of a flying machine, the predetermined temperature that is to be maintained in the jacket 1 may be changed at will. This is often of considerable advantage when the loads on the engine suddenly increase or decrease, and it is likewise of considerable advantage under other circumstances which are well known to those skilled in the art.

Still another advantage in this system resides in the fact that the thermostat 33 may be so set for example that its valve 32 will open at a higher temperature than that above disclosed or, say, at 180° F., while the thermostat 38 may be so set that its valve 39 will open at a lower temperature than that above stated, or, say, at 100° F. With such an arrangement of thermostats, the operator may keep the jacket full of water or other liquid until the temperature falls below 100° F. when it will be automatically drained into the tank below. On the other hand, the higher setting of the valve 32 will insure that the temperature of the jacket, while the engine is running, will always fall below 180° the moment the jacket liquid drops below said point, for the valve 32 will in that case act to close off the fluid and the temperature in the jacket will immediately rise. The tank 26 being heat insulated as at 45, the liquid will never freeze during the coldest weather, and the jacket and radiator being both normally empty of water when the engine is idle, they cannot freeze so that under all circumstances, the engine may be started for operation in the coldest climates, and within a minimum of time.

It is obvious that those skilled in the art may vary the details of construction, as well as the arrangement of parts, and also the mode of operation of this system, without departing from the spirit of the invention, and therefore I do not wish to be limited to the foregoing disclosure except as may be required by the claims.

What is claimed is:

1. In a cooling system for an internal combustion engine, the combination of a jacket; a radiator; a tank disposed below said jacket and radiator; connections leading from the bottom of said radiator and from said jacket directly to said tank and adapted to keep said radiator and jacket empty of liquid while the temperature of said jacket is below a predetermined point when the engine is operating; and means for automatically passing liquid into said jacket when the engine is running and the temperature of said jacket is above another predetermined point.

2. In a cooling system for an internal combustion engine, the combination of a jacket; a radiator; automatic means comprising a tank and a pair of thermostatically controlled connections disposed below said jacket and radiator, for keeping said jacket and radiator empty of liquid while the temperature of said jacket is below a predetermined point and when the engine is operating; and means for automatically passing liquid into said jacket when the engine is running and the temperature of said jacket is above said point.

3. In a cooling system for an internal combustion engine, the combination of a jacket; a radiator; automatic means comprising a tank disposed below said jacket and radiator and a connection including a thermostatically controlled valve for keeping said jacket and radiator empty of liquid when the engine is idle; and means for automatically passing liquid into said jacket when the engine is running.

4. In a cooling system for internal combustion engines, the combination of a jacket; a radiator; connections between said jacket and radiator; connections between said radiator and jacket adapted to convey a cooling liquid to said jacket, comprising a tank disposed below said jacket and radiator and thermostatically controlled means adapted to exclude said liquid from said jacket until a predetermined temperature has been reached in said jacket; and automatically controlled means independent of said last named means for emptying said jacket at a temperature below said predetermined point.

5. In a cooling system for internal combustion engines, the combination of a cooling circuit comprising a jacket, radiator, and a tank disposed below said jacket and radiator; thermostatically controlled means for excluding said liquid from said jacket until a predetermined jacket temperature has been reached; and additional thermostatically controlled means for emptying said jacket into said tank when another predetermined jacket temperature is attained.

6. In a cooling system for internal combustion engines, the combination of a jacket; a pump; a radiator; a tank disposed below

said jacket and radiator; a connection between said tank and pump; a thermostat and valve controlling said connection; a connection between said pump and jacket; a connection between said jacket and radiator; a connection between said radiator and tank; and a thermostatically controlled connection by which said jacket may be emptied into said tank, the arrangement being such that said jacket and radiator may be automatically kept empty of liquid while the jacket temperature is below a predetermined point and when the engine is running, and liquid may be automatically supplied to said jacket and radiator when the jacket temperature rises above said point.

7. The method of maintaining an efficient operating temperature range in a heated internal combustion engine jacket which consists in supplying thereto and withdrawing therefrom cooling fluid when the jacket temperature has respectively risen to a point in one predetermined range and fallen below a point in a second and lower predetermined range; and extracting heat from said fluid.

8. The method of cooling an internal combustion engine provided with a cooling jacket which consists in controlling the supply of cooling fluid to said jacket through one predetermined range of temperature controlling the withdrawal of said fluid from said jacket through another predetermined range of temperature without cooling directly from said jacket; and subjecting said fluid to a cooling action between said temperature ranges.

9. The method of cooling an internal combustion engine provided with a cooling jacket which consists in heating said jacket to a predetermined temperature while empty, then passing cooling liquid into and out of said jacket, separately controlling said inflow and outflow according to the temperature of the engine within an efficient operating range.

10. The method of cooling an internal combustion engine provided with a cooling jacket which consists in heating said jacket to a predetermined temperature while empty, then passing cooling liquid into and out of said jacket, independently controlling said inflow and outflow according to the temperature of the engine within an efficient operating range.

11. The method of cooling an internal combustion engine provided with a cooling

jacket which consists in heating said jacket to a predetermined temperature while empty, then passing cooling liquid into and out of said jacket, separately and independently controlling said inflow and outflow according to the temperature of the engine within an efficient operating range.

12. The method of maintaining an efficient operating temperature range in the jacket of an internal combustion engine which consists in heating said jacket while substantially empty to a temperature in one predetermined range; filling said jacket with liquid when said temperature is reached; withdrawing said liquid from said jacket when the temperature thereof has reached a point in another predetermined range below said first named predetermined range; and extracting heat from said liquid.

13. The method of maintaining an efficient operating temperature range in the jacket of an internal combustion engine which consists in heating said jacket; supplying liquid to said jacket when the temperature thereof reaches a point in one predetermined range; withdrawing said liquid from said jacket when the temperature thereof has reached a point in another predetermined range below said first named predetermined range; and extracting heat from said liquid.

14. The method of cooling an internal combustion engine provided with a cooling jacket which consists in controlling the supply of cooling fluid to said jacket through one predetermined range of temperature; controlling the withdrawal of said fluid from said jacket through another predetermined range of temperature without cooling directly from said jacket; and subjecting said fluid to a cooling action outside said jacket between said temperature ranges and during the heating of said engine.

15. The method of cooling a heated internal combustion engine provided with a cooling jacket which consists in controlling the supply of cooling fluid to said jacket during said heating through one predetermined range of temperature; controlling the withdrawal of said fluid from said jacket during said heating through another predetermined range of temperature without cooling directly from said jacket; and subjecting said liquid to a cooling action during said heating outside said jacket within said ranges.

In testimony whereof I affix my signature.
WELLINGTON W. MUIR.