

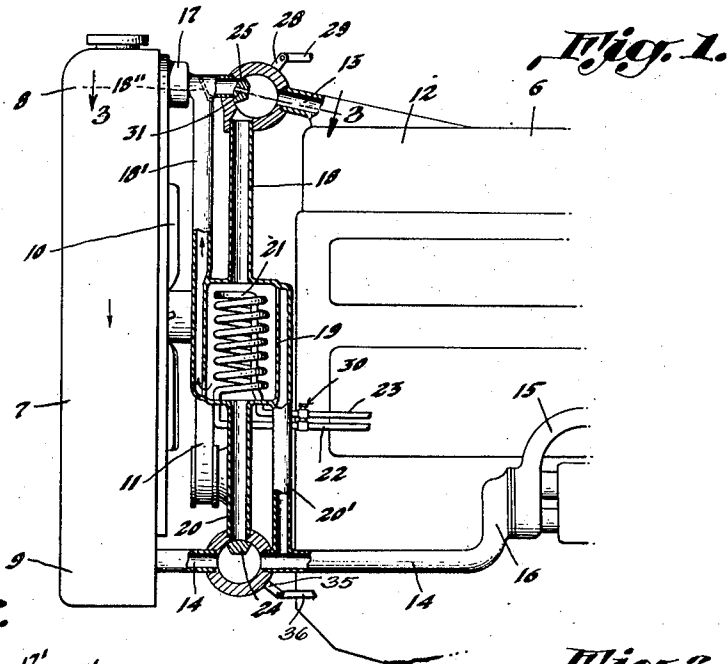
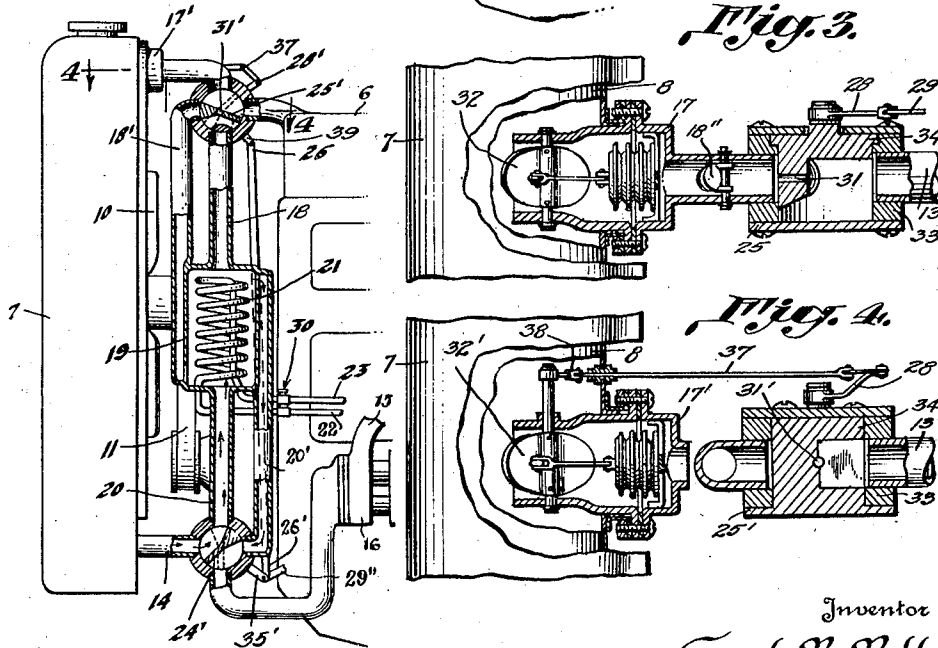
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ENGINE AND OIL TEMPERATURE CONTROL SYSTEM

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ENGINE AND OIL TEMPERATURE CONTROL SYSTEM

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18 Claims. (Cl. 123—196)

It is a primary object of the present invention to provide an improved system for the heating or cooling of the lubricating oil of internal combustion engines,—said system involving a control of the oil temperature by means utilizing the water cooling system of the engine and aiming to given an optimum oil viscosity by warming the oil in winter and cooling the oil in summer, as conditions may require. Improved thermal control of the engine temperatures may be incidentally effected.

These and other objects of the invention may involve the use of novel methods and means for variably short-circuiting engine cooling water and/or the use of an oil cooler or unit in which, to vary the rate or direction of heat exchange, either warm water from an engine jacket or cool water from a radiator, or mixtures thereof, may be circulated in contact with a conduit containing lubricating oil; and the system referred to is preferably so constructed and employed as to permit a complete thermal control, without avoidable duplication of parts; but these and other features of the invention, preferred forms of which may involve the use of substantially parallel pairs of pipes connected with an intermediate receptacle, may be best appreciated by the following descriptions of illustrative embodiments of said invention, taken in connection with the appended claims and the accompanying drawing.

Figure 1 is a side elevational view, with parts which particularly pertain to the invention mainly shown in section,—the direction of circulation of water through the last-mentioned parts being appropriate to winter weather or to conditions which dictate a warming of oil.

Figure 2 is a view similar to Fig. 1, but showing optional or alternative features and an adjustment of valves and a consequent direction of circulation appropriate to summer weather or to conditions which dictate a cooling of oil.

Figure 3 is an enlarged fragmentary view mainly in section on the line 3—3 of Figure 1.

Figure 4 is an enlarged fragmentary view mainly in section on the line 4—4 of Figure 2.

In the illustrations, this system may presuppose an engine 6 and radiator 7, the latter including an upper tank 8, connected by any narrow passages (not shown but comprised in a special or usual core) to a lower tank 9,—a current of air resulting from the advance of a vehicle or the rotation of a fan 10, driven by a belt 11 or other suitable means, being relied on to cool said radiator.

The tank 8 of the radiator is shown as connected to the upper portion of a head 12, included in the engine 6, by a radiator inlet or hot water line 13; and the lower tank of the radiator is shown as connected by a radiator outlet or cooled water line 14 to a so-called cylinder inlet 15,—a centrifugal or other pump 16 being placed in one of the mentioned lines; and a thermostatically operated valve 32 may be placed in a suitable housing at 17, interposed in the water line 13, to control the flow of water to the radiator. This affords a means of restricting or preventing water circulation through the radiator while the motor is warming up,—the thermally actuated valve 32 preferably remaining closed until a suitable temperature is reached (say 120° F.) At that time the valve may open sufficiently to permit a partial water circulation; and at a slightly higher temperature (say 135° F.) this valve may be so fully opened as to permit unobstructed water circulation through the radiator.

Under severe weather conditions, as in winter, such a thermally actuated valve organization makes it possible to heat up the engine to a desired operating temperature in a comparatively short time; but this known water cooling system is pertinent to the present invention only as one or both of the mentioned pipes 13 and 14 may be placed in communication with an intermediate receptacle and/or used in a heating or cooling system, such as may now be described, for thermally conditioning a lubricant liquid.

In connection with any special or usual water cooling system of the general character referred to, as illustrated in Fig. 1, there may be provided a "parallel-pipe" or "variable-path" by-pass system including pipes 18 and 20 and a receptacle 19. As shown in the drawing, the pipe 18 is preferably connected to the radiator inlet pipe 13 on the engine side of the thermally actuated valve 32 and to the top of the receptacle 19 and the pipe 20 is preferably connected to the bottom of the receptacle 19 and to the radiator outlet pipe 14 on the radiator side of the pump 16.

Placed in or extending through the receptacle 19 is shown an oil-containing heat-exchange member in the form of a conduit or coil 21, one end 22 of which may be connected with an oil pump or other source, not shown, the other end 23 being used for oil delivery by connecting the same in any suitable manner with a lubricant reservoir or a pressure lubricating system for the engine 6; and although, as a matter of convenience of illustration, the heat exchange receptacle 19 of the mentioned unit is shown opposite fan 10,

said unit may be placed in any suitable position, functionally between the hot water pipe 13 and the cooled water pipe 14,—vertically or horizontally, as may prove most practical in a given installation.

At the junctions of the pipes 18 and 20 with the lines 13 and 14, there are located control valves 25 and 24. Each of the valves 25 and 24 consists of a cylindrical housing 33 in which there is located a rotary control member 34. The valves may be operated either separately or concurrently and either manually or automatically through arms (28, 35) connected to the control members. In the embodiment of the invention shown in Figures 1 and 3, the valves are adapted to be operated manually and separately from any suitable point in the vehicle through rods 29, 36 which are connected to their operating arms 28 and 35. In the embodiment of the invention shown in Figures 2 and 4, the valves are adapted to be operated automatically and concurrently by the thermostat which controls the valve 32' through links 37 which connect an arm 38 on the shaft of the valve 32' to the operating arm 28' of the valve 25' and a link 26—26' which connects a second arm 39 on the control member 34' to the operating arm 35' of the valve 24'.

To complete the mentioned variable-path or parallel-pipe by-pass system, return pipes 18' and 20', serving as simultaneous or alternative outlets for the intermediate receptacle 19, are shown as extending substantially parallel with the mentioned pipes or lines 18 or 20, and as respectively connected with the water lines 13 and 14 at or beyond the valves 25 and 24; and the inner ends thereof respectively open into the ends of the receptacle 19 at points remote from the respective connections of the pipes 18 and 20 therewith,—this relationship being favorable to the alternative modes of circulation respectively illustrated in the drawing.

As to these modes of operation, it should be understood that in severe cold weather, especially at starting, the thermostatic valve 32 may be practically or entirely closed; and the valve 25 in the line 13 will then be so opened that warm water will flow down the by-pass line 18 through the intermediate receptacle 19 and will be permitted to descend through the by-pass return line 20',—thence advancing through pump 16 and line 15 back into the water jackets of engine 6. This will allow the water to circulate rapidly, promptly warming the engine (and the oil, if coil 21 is provided) to a desired temperature. As this temperature is reached, the thermostat valve 32 opens, and the water, now warm enough to oppose descent through return line 20', flows or may be forced increasingly in the direction indicated by the arrows in Fig. 1,—to be so cooled by the radiator 7 as to maintain an even and favorable temperature in both engine and oil. A certain portion of the water or other engine-cooling liquid advanced through the line 18 to the receptacle 19 may still return by way of the by-pass return line 20',—the changes here referred to being both gradual and automatic and requiring no manipulation of valves 24 and 25 except as one season or condition of operation succeeds another.

In summer time, or under other high temperature conditions, the valve 25 or 25' being so turned as to close by-pass 18 and to open the direct line to radiator 7, the valve 24 or 24' is so positioned as to permit circulation in the path indicated by the arrows in Figure 2. Water cooled by the air blast passing through the ra-

diator 7 is then upwardly advanced through by-pass 20 and into the receptacular element 19 of the oil tempering or other intermediate unit and is permitted to exit through the by-pass 20'.

Initial use of pipes 18 and 20' in winter is favorable not only to a rapid and uniform heating of the engine cylinders but to a prompt thermal conditioning of the oil at starting, in cold weather; and the valves 24 and 25 may be so constructed as to effect any desired degree of closure, varying the direction of flow and passing either a part or all of the water through the container 19 in advance of its entering the radiator or its return to the engine jacket. As an extra precaution, to prevent descent of hot water therethrough at any time, pipe 18' may be provided with an upwardly opening valve 18'', and it should be noted that the valves 24, 25 may be set, from time to time, and optionally locked in the illustrated positions or in positions which partially or completely close the alternative exits therefrom; and the showing, in Figures 2 and 4, of an interconnection, as by a rod 26—26', between arms 35', 39 on valves 24' and 25', should be understood as pertinent to but one of many types of mechanism available for a remote control. Valves 24 and 24' should be understood to be alike in that, within the limits of permitted movement, they can never prevent circulation through pipes 13, 20 and 15, although capable of closing the entrance to pipe 20 in winter; but valve 25' may differ from valve 25 in that it may, by closing entrances to both of the substantially parallel pipes 18 and 18' under summer or under other high-temperature conditions of operation, obviate all risk that pump 16 shall ever draw hot water, in an undesired manner, through the heat exchange unit comprising receptacle 19, or its equivalent. It will be seen that a forward movement of the lever 28' (through an arc of about 45°) may be, in the form of the invention shown in Figures 2 and 4, sufficient to assure a circulation of the "winter" or "starting" type, as suggested by arrows in Fig. 1; and, without shift of valve 24, valve 25 may, if desired, be separately subjected to a thermostatic readjustment as the engine heats up.

Although the foregoing description has included specific details of but two embodiments of the present invention, it should be understood not only that the term "water" is herein applied to any engine cooling liquid and that the present showing is essentially diagrammatic but that various features of this invention might be independently employed; and also that numerous modifications might easily be devised,—all without the slightest departure from the scope of the present invention.

Although Figures 2 and 4 show such an interconnection between arm 28' and the thermostatically operated valve 32' as to render contraction of the thermostat, when cold, effective to shift valves 24' and 25' toward "winter" positions such as are suggested in dotted lines in Fig. 2, it will be obvious that means such as the rods 29, 36, 37 and/or 29' may be employed either for remote manual manipulation or to render a valve or valves responsive to pressures or to temperatures such as those of water and/or oil within the engine 6,—or even to vary a circulation therein. Means such as a known type of by-pass valve at 30 may permit the oil to be automatically or otherwise shunted past the heat exchange unit until said unit is warmed to a suitable tempera-

ture to assure a maximum lubricating effect in the oil as delivered to bearings or to a reservoir; and the provision of steam-passing pores, as at 31, 31' in valves 25, 25', is an obvious safety precaution.

I claim:

1. In a thermal control system for an engine provided with lubricating means: a radiator connected with said engine by a pipe for heated engine-cooling liquid and a pipe for cooled engine-cooling liquid; an intermediate receptacle; connections between the pipes and the receptacle whereby liquid from either of the pipes may be passed through the receptacle means, associated with said receptacle, for effecting a heat exchange between liquid from said pipes and a lubricant liquid; and means for so varying the flow of one of said liquids through said receptacle as to vary the rate of such heat exchange,—said connections including by-pass pipes to and from said pipe for heated liquid.

2. In a thermal control system for an engine provided with lubricating means: a radiator connected with said engine by a pipe for heated engine-cooling liquid and a pipe for cooled engine-cooling liquid; an intermediate receptacle; connections between the pipes and the receptacle whereby liquid from either of the pipes may be passed through the receptacle means, associated with said receptacle, for effecting a heat exchange between liquid from said pipes and a lubricant liquid; and means for so varying the flow of one of said liquids through said receptacle as to vary the rate of such heat exchange,—said connections including by-pass pipes to and from said pipe for cooled liquid.

3. In a thermal control system for an engine provided with lubricating means: a radiator connected with said engine by a pipe for heated engine-cooling liquid and a pipe for cooled engine-cooling liquid; an intermediate receptacle; connections between the pipes and the receptacle whereby liquid from either of the pipes may be passed through the receptacle means, associated with said receptacle, for effecting a heat exchange between liquid from said pipes and a lubricant liquid; and means for so varying the flow of one of said liquids through said receptacle as to vary the rate of such heat exchange,—said connections including by-pass pipes to and from said pipe for heated liquid and a valve for varying the flow therethrough.

4. In a thermal control system for an engine provided with lubricating means: a radiator connected with said engine by a pipe for heated engine-cooling liquid and a pipe for cooled engine-cooling liquid; an intermediate receptacle; connections between the pipes and the receptacle whereby liquid from either of the pipes may be passed through the receptacle means, associated with said receptacle, for effecting a heat exchange between liquid from said pipes and a lubricant liquid; and means for so varying the flow of one of said liquids through said receptacle as to vary the rate of such heat exchange,—said connections including by-pass pipes to and from said pipe for heated liquid and an alternative outlet from said receptacle to said pipe for cooled liquid.

5. In a thermal control system for an engine provided with lubricating means: a radiator connected with said engine by a pipe for heated engine-cooling liquid and a pipe for cooled engine-cooling liquid; an intermediate receptacle; connections between the pipes and the receptacle whereby liquid from either of the pipes

may be passed through the receptacle means, associated with said receptacle, for effecting a heat exchange between liquid from said pipes and a lubricant liquid; and means for so varying the flow of one of said liquids through said receptacle as to vary the rate of such heat exchange,—one of said pipes being provided with means automatically restricting the flow therethrough at low temperatures.

6. In a thermal control system for an engine provided with lubricating means: a radiator connected with said engine by a pipe for heated engine-cooling liquid and a pipe for cooled engine-cooling liquid; an intermediate receptacle; connections between the pipes and the receptacle whereby liquid from either of the pipes may be passed through the receptacle means, associated with said receptacle, for effecting a heat exchange between liquid from said pipes and a lubricant liquid; and means for so varying the flow of one of said liquids through said receptacle as to vary the rate of such heat exchange,—said connections including substantially parallel pairs of pipes.

7. In a thermal control system for an engine provided with lubricating means: a radiator connected with said engine by a pipe for heated engine-cooling liquid and a pipe for cooled engine-cooling liquid; an intermediate receptacle; connections between the pipes and the receptacle whereby liquid from either of the pipes may be passed through the receptacle means, associated with said receptacle, for effecting a heat exchange between liquid from said pipes and a lubricant liquid; and means for so varying the flow of one of said liquids through said receptacle as to vary the rate of such heat exchange,—said connections including substantially parallel pairs of pipes and at least one pipe of one pair being provided with adjustable means for varying the flow therethrough.

8. In a thermal control system for an engine provided with lubricating means: a radiator connected with said engine by a pipe for heated engine-cooling liquid and a pipe for cooled engine-cooling liquid; an intermediate receptacle; connections between the pipes and the receptacle whereby liquid from either of the pipes may be passed through the receptacle means, associated with said receptacle, for effecting a heat exchange between liquid from said pipes and a lubricant liquid; and means for so varying the flow of one of said liquids through said receptacle as to vary the rate of such heat exchange,—said connections including substantially parallel pairs of pipes and at least two of said pipes being provided with means for varying the flow therethrough the change of season.

9. In a thermal control system for an engine provided with lubricating means: a radiator connected with said engine by a pipe for heated engine-cooling liquid and a pipe for cooled engine-cooling liquid; an intermediate receptacle; connections between the pipes and the receptacle whereby liquid from either of the pipes may be passed through the receptacle means, associated with said receptacle, for effecting a heat exchange between liquid from said pipes and a lubricant liquid; and means for so varying the flow of one of said liquids through said receptacle as to vary the rate of such heat exchange,—said connections including substantially parallel pairs of pipes and at least one of said pipes being provided with means, subject to remote control, for varying the flow therethrough.

10. In combination, a liquid cooled internal combustion engine, a lubricating system therefor, a liquid cooling radiator, and means for effecting an interchange of heat between engine lubricant and engine cooling liquid flowing from the engine to the radiator.

11. The invention claimed in claim 10 plus means for conducting engine cooling liquid from the engine to the radiator so that it is not brought into heat exchanging relation with the engine lubricant.

12. In combination, a liquid cooled internal combustion engine, a lubricating system therefor, a liquid cooling radiator, means for effecting an interchange of heat between engine lubricant and engine cooling liquid flowing from the radiator to the engine, means for conducting engine cooling liquid flowing from the radiator to the engine through the first specified means, means for conducting engine cooling liquid from the radiator to the engine so that it is not brought into heat exchanging relation with the engine lubricant, and a single means for advancing engine cooling liquid through the second and third specified means.

13. The combination with an internal combustion engine which is provided with a temperature regulating system which includes two passages in one of which fluid is adapted to be maintained at a higher temperature than in the other and which is provided with a lubricating system, of means for regulating the temperature of the lubricant including a heat exchanger through which lubricant is adapted to flow, and connections between the two passages and the heat exchanger whereby fluid from either of the passages may be passed through the heat exchanger in heat exchanging relation to the lubricant, the connections including a pair of passages connecting the heat exchanger and one of the first-mentioned passages and a pair of passages connecting the heat exchanger and the other of the first-mentioned passages.

14. The combination with an internal combustion engine which is provided with a temperature regulating system which includes two passages in one of which fluid is adapted to be maintained at a higher temperature than in the other, of means for maintaining a temperature differential between the fluids in the two passages, a heat exchanger, and connections between the two passages and the heat exchanger whereby fluid from either of the passages may be passed through the heat exchanger, the connections including a pair of passages connecting the heat exchanger

and one of the first-mentioned passages and a pair of passages connecting the heat exchanger and the other of the first-mentioned passages.

15. In combination, a liquid cooled internal combustion engine, a lubricating system therefor, a liquid cooling radiator, means for effecting an interchange of heat between engine lubricant and engine cooling liquid flowing from the engine to the radiator, and means for effecting an interchange of heat between engine lubricant and engine cooling liquid flowing from the radiator to the engine.

16. In combination, a liquid cooled internal combustion engine, a lubricating system therefor, a liquid cooling radiator, means for effecting an interchange of heat between engine lubricant and engine cooling liquid flowing from the engine to the radiator, means for conducting engine cooling liquid from the engine to the radiator so that it is not brought into heat exchanging relation with the engine lubricant, means for effecting an interchange of heat between engine lubricant and engine cooling liquid flowing from the radiator to the engine, and means for conducting engine cooling liquid from the radiator to the engine so that it is not brought into heat exchanging relation with the engine lubricant.

17. In combination, a liquid cooled internal combustion engine, a lubricating system therefor, a liquid cooling radiator, means for effecting an interchange of heat between engine lubricant and engine cooling liquid flowing from the radiator to the engine when the engine lubricant requires cooling, and means for conducting engine cooling liquid from the radiator to the engine so that it is not brought into heat exchanging relation with the engine lubricant.

18. In combination, a liquid cooled internal combustion engine, a lubricating system therefor, a radiator for cooling engine cooling liquid, means for cooling engine lubricant which includes means for effecting an interchange of heat between engine lubricant and engine cooling liquid and means for conducting engine cooling liquid flowing from the radiator to the engine therethrough, means for conducting engine cooling liquid from the radiator to the engine so that it is not brought into heat exchanging relation with the engine lubricant, and a valve for directing engine cooling liquid flowing from the radiator to the engine through the first specified means when the temperature of the lubricant is relatively high.

FRANK N. NUTT.

CERTIFICATE OF CORRECTION.

Patent No. 2,070,091.

February 9, 1937.

FRANK N. NUTT.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 58, claim 8, for the article "the" read with; page 4, second column, strike out all of lines 28 to 37 inclusive, comprising claim 17, and for the claim now numbered "18" read 17; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of April, A. D. 1937.

Leslie Frazer

Acting Commissioner of Patents.

(Seal)