Oct. 25, 1955 W. H. KIMBERLIN 2,721,544

HEATER FOR ENGINES

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Fig. 1

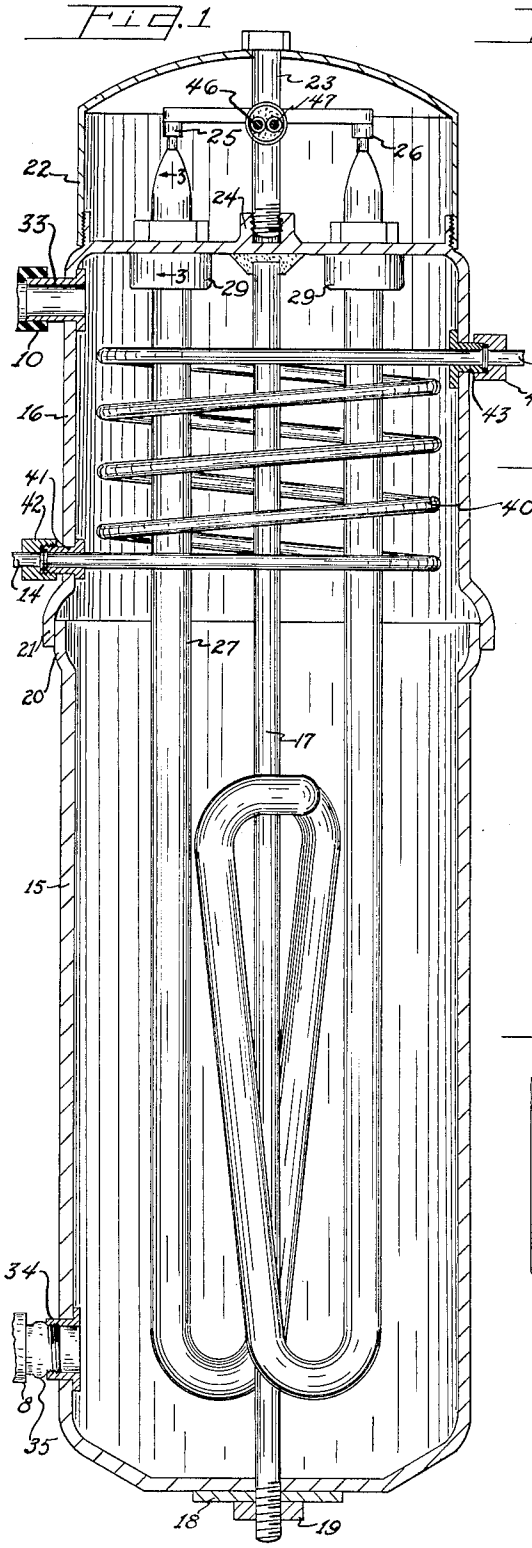


Fig. 2

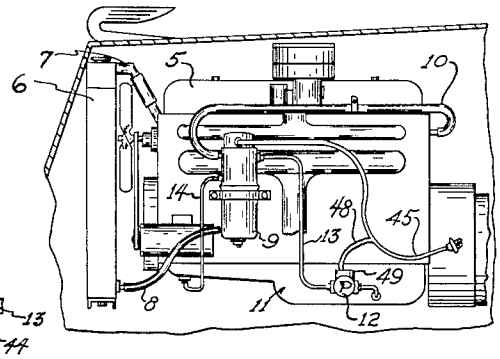


Fig. 3

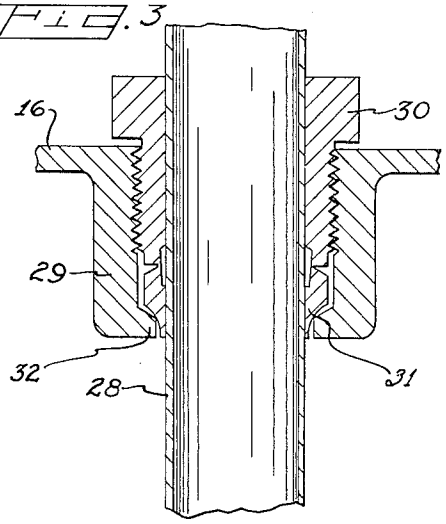
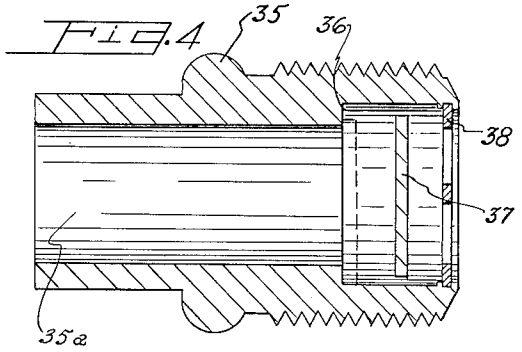


Fig. 4



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HEATER FOR ENGINES

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9 Claims. (Cl. 123—142.5)

The present invention relates to improvements in a heater for engines.

It is the particular purpose of the present invention to provide a heater which can be mounted in connection with the engines of cars, trucks, tractors and the like and utilized to keep the coolant liquid and the lubricating oil of the engine warm while the engine is standing. One of the problems in the use of internal combustion engines in the colder areas is that of keeping the engine warm enough to avoid damages when the atmospheric temperature is very low. Anti-freeze mixtures are used for coolant mixtures and much work has been done on the lubricating oils to avoid changes in viscosity due to temperature changes. These improvements have avoided to a certain degree the damages of low temperatures but they do not entirely take care of the problem. For example, if the engine is very cold it is difficult to vaporize the fuel into the compression chamber where it will be fired by the spark. An extremely cold engine also condenses water vapor that gets into the lubricant well and dilutes the lubricating oil.

According to my invention I provide a simple heater unit which is connected into the coolant liquid circulating system so as to take the liquid from the lower part of the radiator, then heat it and pass it through the coolant liquid passage ways of the engine and back to the radiator. This same heater unit is utilized in a novel manner to keep the lubricating oil warm and thus avoid the difficulties that an extremely cold lubricant will cause. The lubricant is explosive and furthermore it is damaged by extreme heat. According to my invention the lubricant is heated by the coolant liquid which in turn is heated by the heating element of the heating unit. The heat may be supplied in any well known manner, but for example of illustration, I have shown in connection with the present invention a heater of the electrical type.

The nature and advantages of my invention will appear more fully from the following description and the accompanying drawings wherein a preferred form of the invention is illustrated. The drawings and description are illustrative only, however, and are not intended to limit the invention except insofar as it is limited by the claims.

In the drawings:

Figure 1 is a sectional view taken vertically through a heater unit such as is used in my invention;

Figure 2 is a view in side elevation of an internal combustion engine with my invention embodied therein;

Figure 3 is an enlarged sectional view taken on the line 3—3 of Figure 1; and

Figure 4 is a sectional view of the check valve unit that is employed in the liquid inlet to the heater unit.

Referring now to the drawings, my invention is shown with an internal combustion engine 5 which has passages therein (not shown), for circulating a coolant liquid to carry away the heat of combustion from the cylinder heads and other parts of the engine. The liquid from the engine 5 passes to the radiator 6 through a conduit 7

and back to the engine 5 through a conduit 8, my heater unit 9, and a second conduit 10 that opens into the passages of the engine for the coolant liquid.

The engine 5 has a reservoir 11 where the lubricant for the crank case is provided. I connect a low point of the reservoir 11 to the inlet side of the pump 12. The outlet side of the pump 12 is connected by a conduit 13 to the heater unit 9 as will be described more fully. Another conduit 14 leads from the heater unit 9 to the front end of the reservoir 11.

Referring now particularly to Figure 1, the heater unit 9 is shown as comprising a lower shell portion 15 and an upper shell portion 16 which are held together by a rod 17 that is fixed to the top of the upper portion 16 and extends through the bottom of the lower portion 15. A sealing washer 18 and a nut 19 are utilized to hold the parts together. The overlapped portions 20 and 21 of the members 15 and 16 are machined and fitted together so as to make a liquid tight seal.

The upper member 16 has a cap 22 thereon which is held in place by a bolt 23 that threads into a boss 24 on the top of the chamber 16. The cap 22 houses electrical connections 25 and 26 to a heater unit 27. The heater unit 27 is an electrical unit wherein the heater wire is inside a metal tube 28. The two ends of the tube 28 pass up through bosses 29 that are provided on the member 16. Figure 3 illustrates the fashion in which a fluid tight seal is made between the tube 28 and a boss 29. The boss is threaded to receive a threaded clamping device 30. The lower end of the device 30 has a tapered portion 31 that engages the inturned flange 32 of the member 29. The portion 31 is almost completely severed from the member 30 so that when pressure is applied to the member 31 by turning the member 30 they will separate and thereafter the member 31 will not rotate, it will simply be wedged down against the flange 32 as the member 30 is tightened.

An outlet fitting 33 is provided in the upper end of the tank which is made up by the members 15 and 16. This outlet fitting is connected to the conduit 10. An inlet fitting 34 is provided at the bottom of the tank. A check valve unit 35 illustrated in section in Figure 4, is secured in the inlet fitting 34. The conduit 8 is connected to the check valve unit 35. The check valve unit as shown in Figure 4, comprises a tubular body with an enlarged recess 36 at one end which contains a flat valve disk 37 of larger diameter than the bore 35*a* of the member 35 but of smaller diameter than the recess 36. A retainer ring 38 holds the disk 37 in the recess 36. The disk 37 will permit liquid to flow into the tank through the bore 35*a*, but when the flow of liquid is reversed the disk will move against the bottom of the recess 36 and prevent liquid from flowing out of the tank.

The upper part 16 of the tank carries a coil 40 which is spaced from the heater unit 27 and which is connected by suitable fittings 41—42 to the conduit 14, and other suitable fittings 43—44 to the conduit 13.

In the device shown the heating unit 27 is supplied with current from any suitable source by an electric cord 45, the two wires 46 and 47 of which are shown in section in Figure 1. The cord 45 also supplies current to a second cord 48 that leads to a motor 49 to operate the pump 12. The supply for operating the heater and the pump may be any ordinary electrical outlet. In cases where current is not available to operate the heater unit 27, a combustion type heater can be used and in that case current would only be needed to operate the pump 49. Such current could be drawn from the battery of the vehicle.

It is believed that the operation of the device described hereinbefore will be clear from the foregoing description. Briefly the operation is as follows:

When the engine 5 is at rest and the cord 45 is connected to a source of electric current, the heating unit 27 will supply heat to the interior of the tank which will of course always be full of the coolant liquid because it is so mounted to be below the normal level of liquid in the radiator 6. The pump 12 will of course pump oil from the crank case or reservoir 11 through the coil 40. As the liquid in the tank heats up it is forced upwardly through the conduit 10 into the engine. The device actually operates in a sort of pulsating manner. Initially as the liquid heats up the valve 37 will be closed since the liquid tries to expand in both directions. As soon as the liquid is above a certain temperature it will have expanded enough to force some liquid through the engine passage ways into the radiator. This raises the level of liquid in the radiator and unbalances the coolant system so as to permit the valve 37 to open. The cooler liquid in the bottom of the radiator will move into the tank past the valve 37 and the valve will again close due to the back pressure of the liquid as it is heated. The liquid in the tank is thus flowing upwardly around the coil 40 and heats the oil by circulating through the coil without any possibility of bringing the oil to a dangerous temperature. The coolant liquid and the lubricating oil of the engine are thus kept in a relatively warm condition so that the engine may be started readily at any time. The damages of suddenly heating up a part of the engine while the remainder thereof is at an extremely low temperature are avoided.

Having thus described my invention, I claim:

1. The combination with an internal combustion engine, having passages therein for circulation of a liquid coolant and having a radiator connected to said passages, said engine having a lubricant well, of a heating unit comprising a tank mounted alongside the engine, means to heat the tank, a conduit connecting the lower part of the radiator to the lower part of the tank, a check valve in the conduit operable to prevent flow of the coolant liquid from the tank to the radiator but permitting flow of coolant liquid from the radiator to the tank, a conduit connecting the upper part of the tank to said passages, a coil in the tank, and means to pump lubricant from the lubricant well through said coil.

2. The combination with an internal combustion engine having passages therein for circulation of a liquid coolant and having a radiator connected to said passages, said engine having a lubricant well, of a heating unit comprising a tank mounted alongside the engine, a heating element in said tank, a conduit connecting the lower part of said radiator to the lower part of said tank, a check valve in the conduit operable to prevent flow of the coolant liquid from the tank to the radiator, but permitting flow of the coolant liquid from the radiator to the tank, a conduit connecting the upper part of the tank to said passages, a coil in the upper portion of the tank encircling and spaced from the heating element, a pump, and conduits connecting the coil, the pump and the lubricant well, whereby the pump circulates lubricant from said well through the coil.

3. The combination with an internal combustion engine having passages therein for circulation of a liquid coolant, said passages having inlet and outlet openings, and having a radiator connected directly to said outlet opening, of a heating unit comprising a tank mounted alongside the engine, a heating element in said tank, a first conduit connecting the lower part of said radiator to the lower part of said tank, a second conduit connecting the upper part of the tank to said inlet opening to said passages, and a check valve in said first conduit operable to prevent flow of the coolant liquid from the tank to the radiator, but permitting flow of the coolant liquid from the radiator to the tank and thence to said inlet opening.

4. The combination with an internal combustion engine having passages therein for circulation of a liquid coolant, said passages having an inlet and an outlet opening, and having a radiator the upper portion of which is connected directly to the outlet opening for said passages, of a heating unit comprising a tank mounted adjacent said engine, a heating element in said tank, openings in said tank, a first conduit connecting the lower part of said radiator to one of said openings, a second conduit connecting another one of said openings in said tank to the inlet opening of said passages in said engine, and a check valve in said first conduit operable to prevent flow of coolant liquid from the tank to the radiator but permitting flow of the coolant liquid from the radiator to the tank and thence to said inlet opening.

5. The combination with an internal combustion engine having passages therein for circulation of a liquid coolant, said passages including an inlet and an outlet opening, and having a radiator the upper portion of which is connected directly to the outlet opening of said passages, of a heating unit comprising a tank mounted adjacent said engine, a heating element in said tank, openings in said tank, a first conduit connecting the lower part of said radiator to one of said tank openings, a second conduit connecting said inlet opening of said engine passages to another one of said tank openings, and a check valve in said first conduit operable to prevent flow of coolant liquid from the tank to the radiator but permitting flow of the coolant liquid from the radiator to the tank and thence to said passages, said check valve including a disc, a seat portion and a restraining member, said disc being positioned approximately perpendicularly to the longitudinal axis of said first conduit where it enters said tank, said seat portion having an inside diameter smaller than the diameter of said disc whereby said disc may bottom on said seat portion to check the flow of coolant out of said tank, and said restraining member extending inwardly of said valve structure for preventing excessive movement of said disc away from said seat portion.

6. The combination with an internal combustion engine having passages therein for circulation of a liquid coolant, said passages including an inlet and an outlet opening, and having a radiator the upper portions of which are connected directly to the outlet of said passages, of a heating unit comprising a tank mounted adjacent said engine, a heating element in said tank, the volume of said tank being relatively small with reference to the heat dissipation of said heating element so as to cause the coolant in the tank to expand, input and output openings in said tank, a first conduit connecting the lower part of said radiator to said input opening, a second conduit connecting the inlet opening of said engine passages to said tank output opening, a check valve in said first conduit permitting flow of coolant liquid from the radiator to the tank and thence to said engine passages, but operable to prevent flow of the coolant liquid from the tank to the radiator when the coolant expands in response to said action of said heating element whereby, upon operation of said heating element, said coolant is caused to flow from said engine in pulses into said tank through said input opening to be heated by said heating element and then out of said tank through said output opening back to said engine.

7. Apparatus adaptable for heating the coolant in an internal combustion engine having coolant circulation passages, including an inlet and an outlet opening, and a radiator the upper portion of which is connected directly to said outlet opening, comprising, in combination, a tank, a heating element in said tank, the volume of said tank being relatively small with reference to the heat dissipation of said heating element so as to cause the coolant in the tank to expand, input and output openings in said tank for the passage of coolant therethrough, said input opening being connected to the lower portion of said radiator, said output opening being connected to said inlet opening and a check valve in said input opening to allow the flow of coolant into said tank through said

input opening but operable to prevent the flow of coolant out of said tank through said input opening when the coolant expands in response to said action of said heating element whereby, upon operation of said heating element, said coolant is caused to flow from said radiator in pulses into said tank through said input opening to be heated by said heating element and then out of said tank through said output opening back to said engine.

8. Apparatus adaptable for heating the coolant in an internal combustion engine having coolant circulation passages, including an inlet and an outlet opening, and a radiator the upper portion of which is connected directly to said outlet opening, said apparatus being adapted to supply heated coolant in pulses to said coolant circulation passages and through said passages to said radiator, comprising in combination, a tank, a heating element in said tank, openings in said tank for the passage of coolant therethrough, one of said tank openings being connected to the lower portion of said radiator, another of said tank openings being connected to the inlet opening to said passages, and a check valve in said one opening to allow the flow of coolant from said radiator into said tank through said one opening and thence to said engine passages, but operable to prevent the flow of coolant out of said tank through said one opening when said coolant expands in response to the heat generated by said heating element, said check valve comprising a tube-like structure having first and second portions, said first portion having an inside diameter smaller than the inside diameter of said second portion, said second portion having a disc positioned therein approximately perpendicularly to the longitudinal axis of said tube-like structure and containing a restraining member to prevent excessive movement of said disc away from said first portion, the diameter of said disc being greater than the inside diameter of said first portion.

9. Apparatus adaptable for heating the coolant in an internal combustion engine having coolant circulation

passages, including inlet and outlet openings, and a radiator, the upper portion of which is connected directly to said outlet openings, said apparatus being adapted to supply heated coolant in pulses to said coolant circulation passages and through said passages to said radiator, comprising, in combination, a tank, an electrical resistance heating element in said tank and encased in metal tubing formed so as to traverse the length of said tank at least twice, openings in said tank for the passage of coolant therethrough, one of said tank openings being connected to the lower portion of said radiator, another of said tank openings being connected to said inlet opening, and a check valve in said one opening to allow the flow of coolant from said radiator into said tank through said one opening and thence to said engine passages but operable to prevent the flow of coolant out of said tank through said one opening when said coolant expands in response to the heat generated by said heating element.

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