Feb. 16, 1937. E. BLAIR 2,071,106

OIL TEMPERATURE REGULATOR

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Fig. 1.

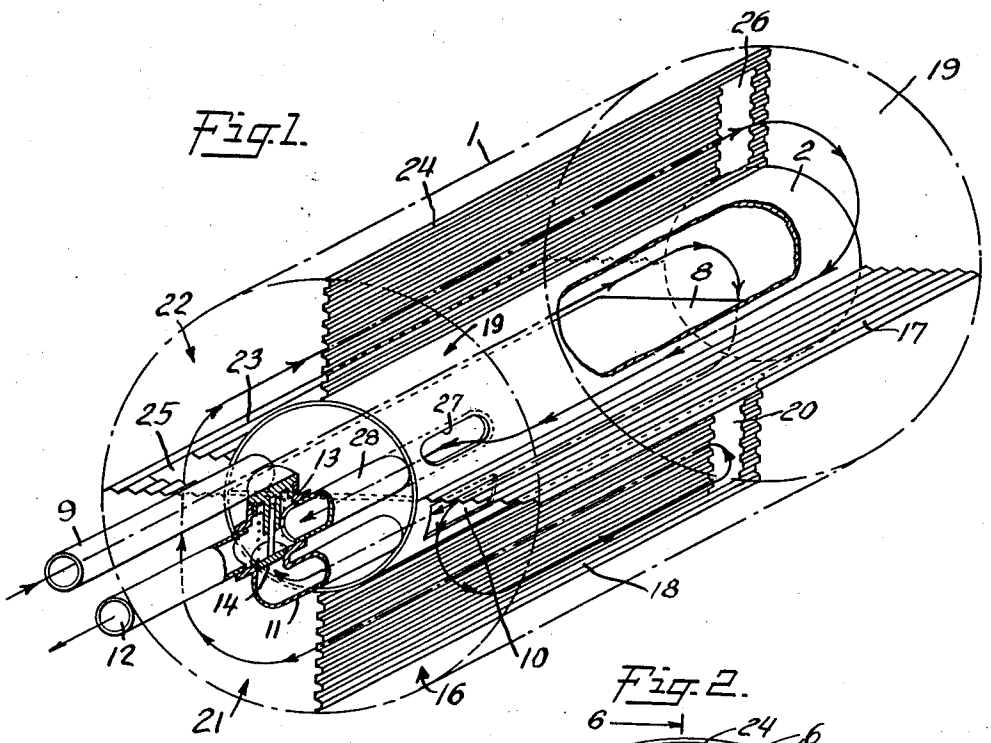


Fig. 2.

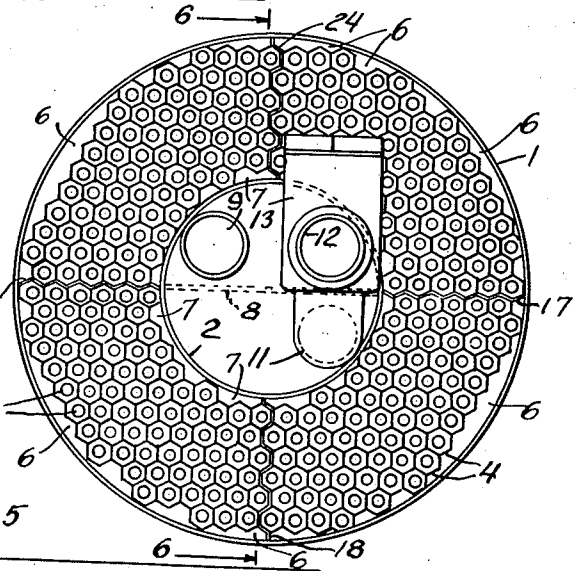


Fig. 4.

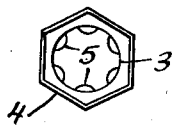
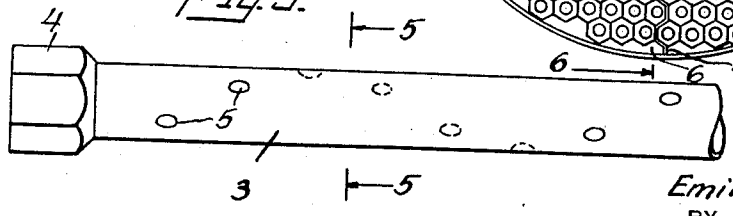


Fig. 5.



Fig. 3.



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Fig. 6.

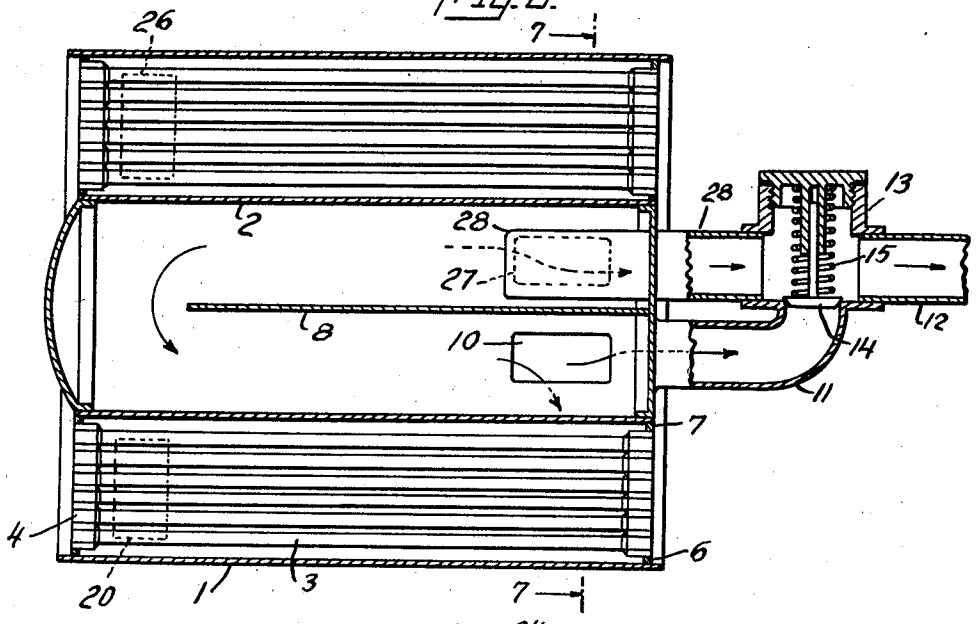
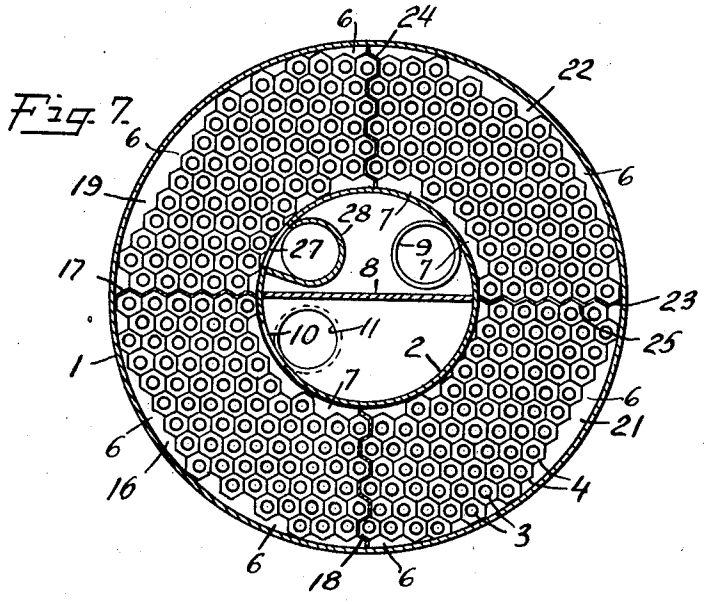


Fig. 7.



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OIL TEMPERATURE REGULATOR

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Application March 11, 1935, Serial No. 10,350

7 Claims. (Cl. 257—236)

This invention relates to heat exchangers and more particularly to apparatus suitable for use as an oil temperature regulator for internal combustion engines and similar devices.

It has heretofore been proposed to provide an apparatus to be used as an oil temperature regulator in the form of a radiator in which the oil used for lubricating an internal combustion engine or other apparatus is circulated around the tubes of the radiator and cooled by air flowing through them, When an engine is first started, the oil is cold and cooling is undesirable. It has therefore been proposed to direct the oil around the radiator by means of an automatic valve until the temperature reaches the point where cooling is desirable. The viscosity of the cold oil is such that it will not flow through the restricted space between the radiator tubes and this property is relied upon to build up a pressure by means of which an automatic valve is opened.

The present invention is an improvement over devices heretofore used for this purpose. In the present invention I provide a central chamber to which the oil is delivered from the engine or other apparatus and this central chamber is surrounded by a radiator. During normal operation, after the engine has been started and the oil has become heated, the provision of an apparatus consisting of a central chamber surrounded by a radiator is more efficient than constructions heretofore employed. Oil is always present in the central chamber and this chamber therefore acts as a heating unit to soften the congealed oil in the radiator core and permit its passage therethrough. A greater volume of heat is available and the central chamber is entirely surrounded by the cooling system causing greater exchange of heat when desired. Furthermore, the provision of a central heating chamber eliminates a loss of heat to the surrounding atmosphere as occurs when a so-called warming jacket is arranged around the outside of a radiator. In the operation of the device, oil is delivered from the engine to the central heating chamber and this central chamber communicates with the outlet pipe through a valve which is adapted to be actuated by the pressure existing in the central chamber when the oil is of such a viscosity that it will not flow through the radiator section. The central chamber communicates with the surrounding radiator so that when the viscosity of the oil is low the oil may flow from the central chamber in the restricted spaces between the tubes of the radiator section. From the outlet end of the radiator section the oil passes to the return pipe.

In the accompanying drawings I have shown one form of the invention. In the drawings:

Fig. 1 is a diagrammatic view with the radiator tubes removed showing the two paths of travel of the oil or other fluid;

Fig. 2 is an end elevation of the apparatus;

Fig. 3 is a detailed view of one of the radiator tubes;

Fig. 4 is an end elevation thereof;

Fig. 5 is a sectional view on line 5—5 of Fig. 3;

Fig. 6 is a horizontal, sectional view of the apparatus on line 6—6 of Fig. 2; and

Fig. 7 is a transverse, sectional view on line 7—7 of Fig. 6.

Referring to the drawings the apparatus consists of an outer casing 1 which is shown as circular but which may be of any desired shape. Within the outer casing is arranged a central chamber 2. As shown the central chamber is concentric with the outer casing but it may be arranged eccentrically, if desired. The space between the outer casing 1 and the central chamber forms the radiator section of the apparatus and is adapted to receive a nest of radiator tubes 3. The detailed construction of the tubes is shown in Figs. 3 to 5 of the drawings. As shown, each tube consists of a thin walled cylinder, preferably formed of copper. In order to permit easy nesting of the tubes and to provide restricted passages between and around them, the ends of the tubes are provided with enlarged hexagonal heads 4, which cooperate with each other when the tubes are arranged in nested form to form passages in the spaces between the body portions of the tubes. The tubes may be provided with indentations 5 to give turbulence to the liquids which flow through and around the tubes. The hexagonal heads 4 are of such size that a plurality of the tubes may be assembled with the adjacent sides of the hexagonal heads soldered to each other and the body portions of the tubes spaced from each other as desired. A nest is formed of the proper shape and inserted in the outer casing 1. Inserts 6 may then be soldered

between the outer tubes of the nest and the inner surface of the outer casing 1, and similar inserts 7 may be soldered between the nest and the outer surface of heating chamber 2.

The central chamber 2 is preferably provided with a horizontal baffle 8 so that oil or other fluid flowing into the upper portion of the chamber flows the full length of the chamber and returns to pass out through an exhaust arranged in the lower half of the chamber.

Referring to Fig. 1 of the drawings the oil enters the central chamber through an inlet pipe 9 communicating with the upper half of the central chamber as shown in Fig. 7. The oil then flows to the opposite end of the central chamber as indicated by the arrows in Fig. 1 and returns to the front end in Fig. 1 in the lower portion of the central heating chamber. The wall of the central heating chamber is provided with an opening 10 by means of which communication is established between the central chamber and the radiator section of the apparatus. The front wall of the lower half of the chamber 2 is also provided with an outlet pipe 11. This pipe communicates with a main return pipe 12 through a valve casing 13. As shown a valve 14 is arranged in this casing and is adapted to be held in closed position by a spring 15. The radiator section of the apparatus is provided with a plurality of baffle plates which cause the oil to follow a circuitous path through the radiator section before being returned to the pipe 12. As shown the lower adjacent section 16 of the radiator section which communicates with the central chamber through the opening 10 is separated from the other sections by a horizontal baffle plate 17 and a vertical baffle plate 18. The horizontal baffle plate 17 extends the full length of the casing and separates the section 16 from the adjacent upper section 19. The vertical baffle 18 is provided with an opening 20 at the end of the apparatus remote from the opening 10 so that the oil after flowing through the space surrounding the tubes of the radiator section 16 may pass through this opening as indicated by the arrows into the other or remote lower section 21 of the radiator. The other half of the radiator is divided into sections 21 and 22 by a baffle 23 and the upper section 22 is separated from the upper section 19 by a baffle 24. The baffle 23 is provided with an opening 25 at the end remote from the opening 20 so that the oil travels substantially the full length of the radiator section 21 between the tubes before passing from the radiator section 21 to the radiator section 22. Likewise the baffle 24 is provided with an opening 26 at the end remote from the opening 25 so that the oil travels substantially the full length of the apparatus through the radiator section 22 before passing through the opening 26 into the radiator section 19. The radiator section 19 is provided with an opening 27 through the wall of the central chamber communicating with the interior of a pipe 28 which enters the central chamber but does not communicate therewith. As shown in Fig. 6, this pipe 28 is connected to the valve casing 13 and permits direct communication from the radiator section 19 to the return pipe 12.

The operation of the device will be apparent from the foregoing description. When the engine is first started and the oil is cold, its viscosity is such that it will not flow freely through the spaces between the tubes 3 in the radiator section. The oil thus accumulates in the central chamber and builds up a pressure. The valve 14 can be set to open at any predetermined pressure to permit the oil to pass directly from the central chamber 2 through the pipe 11 to the return pipe 12. As the engine operates the oil becomes heated and its viscosity lowers. When the oil becomes thin enough to flow freely through the sections of the radiator, it follows the circuitous path heretofore outlined through the four sections 16, 21, 22, and 19, flowing substantially the full length of the apparatus in each section and effecting a very efficient heat interchange between the hot oil and air flowing through the tubes 3. This decreases the pressure in the central chamber and permits the valve 14 to close under the pressure of the spring 15. This prevents the hot oil from being returned without cooling from the chamber 2 directly to the engine or other parts being lubricated. After the oil has flowed through the radiator sections, it passes through the opening 27 into the pipe 28 and thence into the return pipe 12.

It will be apparent that the apparatus provides very efficient means for regulating the temperature of the oil of an internal combustion engine or other apparatus in which the oil is heated during use. The construction is simple and by providing the radiator section on the outside surrounding the central chamber 2 more efficient heat interchange is obtained. Furthermore, by providing the valve at the far end of the chamber 2 more efficient action is obtained than is obtained in similar devices where a bypass valve is provided at the inlet through which the oil when cold is by-passed around the radiator section.

I claim:

1. A device of the character described comprising a chamber, a radiator surrounding said chamber, an inlet and an outlet connected to said chamber, a check valve arranged between said chamber and said outlet, one of the walls of said chamber having a passage communicating with said radiator adjacent said outlet, and a connection between said radiator and said outlet.

2. A device of the character described comprising a chamber having an inlet and an outlet arranged so that fluid flows through said chamber from said inlet to said outlet, a check valve arranged in said outlet, a radiator surrounding said chamber, said radiator communicating at its inlet end with said chamber adjacent said outlet, and a connection between said radiator and said outlet.

3. A device of the character described comprising a chamber, a radiator surrounding said chamber, baffles arranged in said radiator, an inlet and an outlet communicating with said chamber, a check valve arranged between said chamber and said outlet, the wall of said chamber having a passage communicating with said radiator adjacent said outlet and a connection between said radiator and said outlet, said baffles being arranged so that fluid passing through said radiator flows through a circuitous passage in said radiator.

4. A device of the character described comprising a chamber, an inlet pipe connected thereto, a baffle member arranged in said chamber, an outlet connected to said chamber adjacent said inlet pipe but on the opposite side of said baffle plate whereby fluid entering said chamber flows from the inlet to the opposite end and returns to the outlet, a check valve between said cham-

ber and said outlet, a radiator surrounding said chamber and communicating therewith adjacent the connection of said outlet to said chamber, a plurality of baffles arranged in said radiator to cause the fluid to flow through said radiator in a circuitous passage and a connection between said radiator and said outlet.

5. A device of the character described comprising a central chamber, a radiator surrounding said chamber, a feed pipe and a discharge pipe communicating with said chamber at points remote from each other, a check valve arranged between said discharge pipe and said chamber, a port connecting the inlet end of said radiator with said chamber adjacent said discharge pipe, and a connection between said radiator and said discharge pipe.

6. A device of the character described comprising a chamber, a feed pipe communicating with said chamber, a discharge pipe, a radiator surrounding the chamber and having an inlet communicating with the outlet end of the chamber and an outlet communicating with said discharge pipe, a connection between said chamber and discharge pipe, and a check valve arranged in said connection.

7. A device of the character described comprising a chamber, an inlet connected to the chamber, a restricted outlet communicating with said chamber, an unrestricted outlet communicating with the chamber, and a check valve arranged in said second outlet.

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