Dec. 23, 1924. 1,520,016

E. T. CURRAN

WATER COOLER OR RADIATOR

Filed May 12, 1919

Fig. 1.

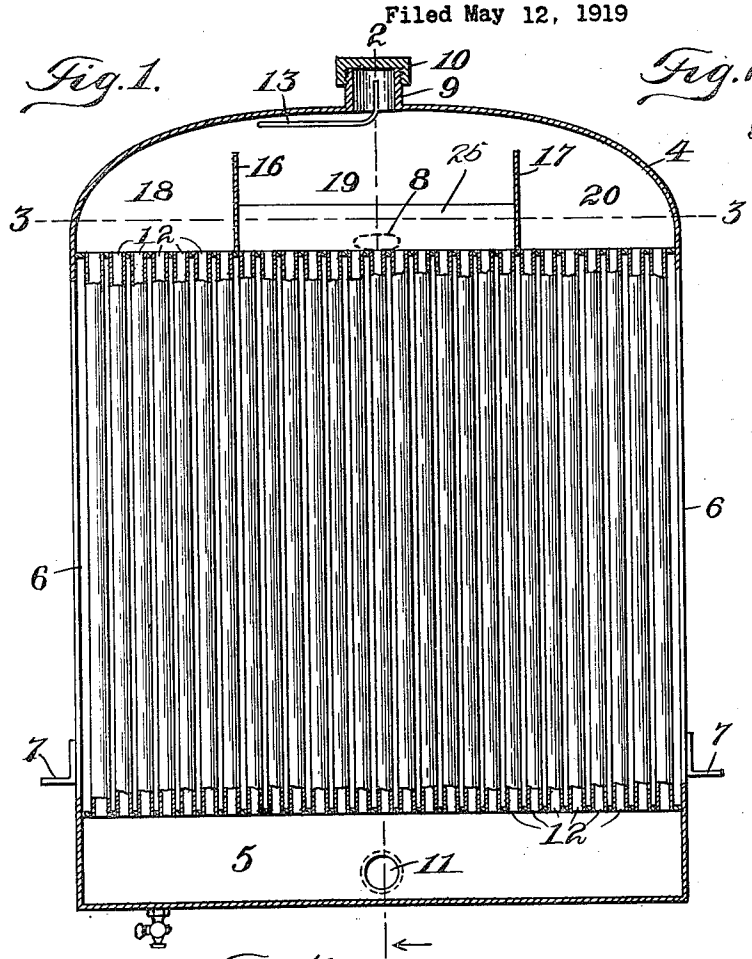


Fig. 2.

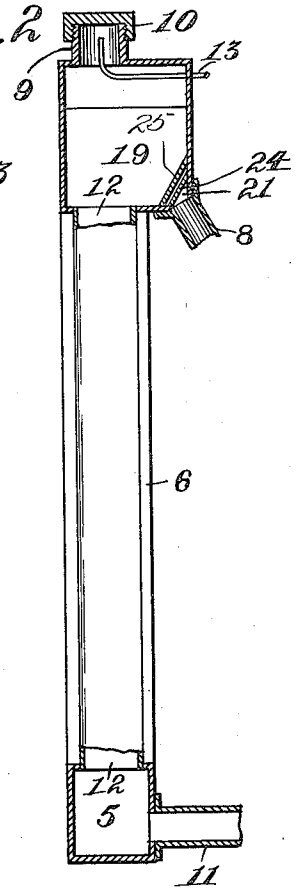
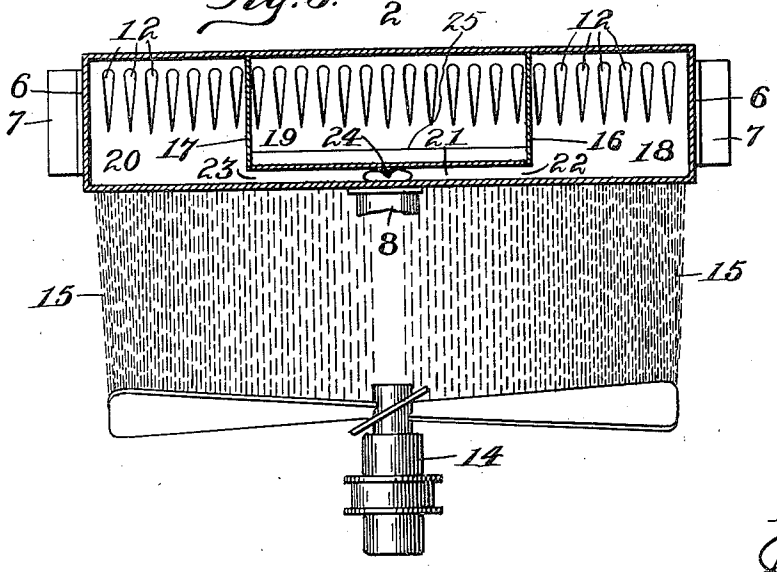


Fig. 3.



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UNITED STATES PATENT OFFICE.

EDWARD T. CURRAN, OF DETROIT, MICHIGAN.

WATER COOLER OR RADIATOR.

Application filed May 12, 1919. Serial No. 296,311.

To all whom it may concern:

Be it known that I, EDWARD T. CURRAN, a citizen of the United States, residing in the city of Detroit, in the county of Wayne and State of Michigan, have invented new and useful Improvements in Water Coolers or Radiators, of which the following is a specification.

This invention relates to radiators for cooling liquid, such as the cooling medium, usually water, circulating through the jacket of an internal combustion engine, and it is the principal object of the invention to provide a radiator in which the heat radiating surface of the radiator is automatically increased and decreased by and in accordance with the rise and fall in the temperature of the liquid being cooled.

In radiators of this character a reservoir or tank is in circulation with the outlet of the jacket of the engine to receive the heated liquid from said jacket, and said reservoir is connected to a second reservoir or tank, which has an outlet connected with the inlet of the jacket of the engine, by a series of juxtaposed tubular passages to conduct the liquid in thin streams from one reservoir to the other to cool the same. Experience has shown that the cooling of the liquid is more effective in its passage through the lateral tubular passages or at the ends of the radiator. To faciliate the cooling of the liquid in its circulation through the passages means are provided, usually a rotary fan, to draw air through the spaces between and against the tubular passages. This fan is located in the rear of the radiator to rotate on an axis coaxial with the center of the radiator with result that considerable more air is drawn against and through the spaces between the tubes at the lateral ends of the radiator and still further increasing the cooling efficiency of such tubular passages and the liquid passing therethrough.

It is a further object of the invention to so construct and arrange the radiator that the incoming heated liquid or water from the jacket of the engine is directed to and caused to flow or circulate through the passages at the lateral portions of the radiator only when the liquid is at a low temperature, comparatively speaking, and to increase the radiating surface for the liquid by and in accordance with a rise in temperature of the liquid by causing the liquid to also flow or circulate through the tubular passages at the central portion of the radiator.

With this object in view I have shown in the drawing accompanying and forming a part of this specification an embodiment of my invention, in which Figure 1 is a front elevation partly in section.

Figure 2 is a sectional side elevation taken on the line 2—2 of Figure 1 looking in the direction of the arrows; and

Figure 3 is a sectional plan view taken on the line 3—3 of Figure 1, and showing a fan in relation to the radiator and in dash lines diagrammatically indicating the direction and volume of air drawn through the radiator by the fan at different points of the radiator.

Similar characters of reference designate like parts throughout the different views of the drawing.

In the embodiment of the invention shown in the drawing I have illustrated a radiator which is adapted for use in connection with motor vehicles to cool the cooling fluid, such as water, for the engine, and comprising a reservoir 4 in which to receive the heated liquid to be cooled, and a reservoir 5 for the cooled liquid, said reservoirs being arranged in superposed and spaced relation and rigidly connected by side members 6 to form the usual rectangular open frame structure, the side members having supporting brackets 7 secured thereto. The reservoir 4 has an inlet 8 located at the rear and bottom and centrally between the ends, which is adapted to be connected in water circulation with the outlet of the water jacket of the engine. Said reservoir also has a filler opening 9 which is closed by a removable cap 10. The reservoir 5 has an outlet 11 which is adapted to be connected in water circulation with the inlet of the engine water jacket.

To cool the water the reservoir 4 is connected with the reservoir 5 by a series of passages to permit the water to flow from the reservoir 4 in a plurality of thin streams.

These passages comprise tubes 12 of suitable shape in cross section, but are preferably of the shape shown in Figure 3, and arranged in juxtaposed alinement within the side members 6 with the upper ends of the

tubes connected to the bottom of the reservoir 4 and at their lower ends with the top of the reservoir 5 to lead the water from the reservoir 4 to the reservoir 5. The usual outlet pipe 13 is also provided, said pipe passing through the rear of the reservoir 4 with the end having the inlet opening extending up into the tubular portion in which the filler opening for the radiator is located, whereby to drain any overflow of water from the radiator due to the expansion of the water by the heating of the same.

As is well known a water cooled internal combustion engine will operate at its highest efficiency when the cooling fluid is maintained at a substantially even temperature, and that the temperature of the water is varied with the varying speeds at which the engine is operated, and it is an object of the present invention to provide means to automatically increase or decrease the circulating area of the heat radiating or emitting surface of the radiator by and in accordance with the varying engine speeds and consequent variable temperatures of the water.

Furthermore, experience has shown that water passing through the passages 12 adjacent the sides 6 will cool more quickly and efficiently than the water passing through the tubes centrally of the radiator, and that the cooling efficiency of the passages or tubes decreases the further they are in from the sides 6, with the passages or tubes in the middle or center of the radiator having the lowest cooling efficiency. The cooling efficiency of the lateral tubes is further increased by a rotary fan, shown in a general way at 14, Figure 3, usually located in the rear of the radiator and operative to draw air through the spaces between and against the tubes, the greatest volume of air being drawn through the spaces between the lateral tubes, which gradually decreases and is at a minimum in a line with the axis of rotation of the fan, as shown in a diagrammatic manner by the dash lines 15 in Figure 3.

To increase and decrease the heat radiating surface means are provided to cause the heated water entering the reservoir 4 to flow and circulate only through the lateral tubes when the water is at a low temperature and to automatically increase the circulating area or outflow of the water from the reservoir 4 by and in accordance with the rise in temperature of the water entering said reservoir. To cause this increase and decrease in the water circulation a plurality of partitions or dams extend transverse and up from the bottom of the reservoir 4 and preferably to adjacent the top, these dams being shown in the present instance as two in number 16 and 17 separating the reservoir 4 into three chambers 18, 19 and 20 having communication with each other over the top of the partitions or dams. The inlet 8 for the heated water has outlets in a bifurcation 21 to lead or direct the incoming water into the lateral chambers 18 and 20, as at 22 and 23, (Figure 3). The bifurcated outlet is formed by a plate 25 extending downward and forward from the rear wall to the bottom of the reservoir 4, as clearly shown in Figure 2, and between the partitions 16, 17 with the outlets 22, 23 to the chambers 18, 20 through openings in the partitions. This plate has a wedge shaped member 24 extending transversely thereof (Figures 2 and 3) with the apex of the wedge in line with the axis of the inlet pipe 8 and against which the incoming water through the pipe 8 strikes thus not only deflecting the water to opposite sides through the passage 21 but also breaking its force and lessening its agitation.

In operation the radiator is filled with water to a point below the top of the partitions 16, 17. As the engine is started and with the water at a comparatively low temperature due to the slow engine speed, or due to climatic conditions, the water will be discharged from the engine jacket to the chambers 18, 20 and the water will only circulate through the tubes communicating with said chambers. However, as the temperature of the water rises and causes a consequent expansion of the same due to the increased engine speed, and the tubes communicating with the chambers 18, 20 are no longer sufficient to cool the heated and expanding water, the water, on account of said expansion will spill over the tops of the partitions 16, 17 into the chamber 19 and such water will circulate through the tubes communicating with said chamber 19 to the reservoir 5.

It will be obvious that by my construction and arrangement there is provided a radiator in which the circulating and cooling area of the radiator is automatically increased and decreased in accordance with the varying temperatures of the water due to the varying engine speeds or climatic conditions.

Having thus described my invention, I claim:

1. In a radiator, tanks, a series of liquid conducting passages to connect said tanks in circulation, and liquid inlet means arranged in one of said tanks to cause the liquid when at a low temperature to flow through a portion of the pasageways only and by a rise in temperature to flow through all of said passageways.

2. In a radiator a series of juxtaposed liquid circulating passageways, tanks open to the ends of said tubes, and means in one of said tanks to cause the liquid when at a low temperature to flow through a part of

the passageways at each end of the series of passageways and by a rise in temperature to flow through all of said passageways.

3. In liquid cooling radiators, a reservoir for the liquid to be cooled and a reservoir to receive the cooled liquid and having an outlet; a series of passages connected at opposite ends to said reservoirs to conduct the liquid from the reservoir for the heated liquid to the other reservoir; and inlet means to the reservoir for the heated liquid arranged to cause the liquid to flow from said reservoir through only a portion of the connected passages when at a low temperature and to flow from said reservoir through all of the passages by a rise in temperature and expansion of the liquid.

4. In liquid cooling radiators a reservoir for the cooled liquid having an outlet; a reservoir to receive the heated liquid to be cooled separated into a plurality of communicating chambers; passageways to conduct the liquid from said chambers to the reservoir for the cooled liquid; and inlet means to the reservoir for the heated liquid arranged to direct the liquid to certain of the chambers therein and the flow of liquid from said chambers through the passageways communicating therewith to the reservoir for the cooled liquid when the liquid is at a low temperature, and cause the liquid to enter all of the chambers by a rise in temperature and expansion of the liquid and the flow thereof through all of the passageways to the reservoir for the cooled liquid.

5. In liquid cooling radiators, a reservoir for the heated liquid to be cooled; a reservoir for the cooled liquid having an outlet; juxtaposed vertical tubes connected at opposite ends with the reservoirs; and vertical dams extending transversely and from the bottom to adjacent the top of the reservoir for the heated liquid, to separate said reservoir into chambers communicating at the top; and an inlet to direct the heated liquid to the outermost of said chambers.

6. In liquid cooling radiators, a reservoir for the heated liquid; a series of circulating passages leading from said reservoir and at all times open to said reservoir; an inlet to said reservoir; means in said reservoir to direct the incoming liquid to the lateral portions of the reservoir for the heated liquid; and means in said reservoir to cause the liquid when at a low temperature to flow through the circulating passages leading from the lateral portions of said reservoir and to circulate through all of the passages by a rise in temperature of the liquid.

7. In a liquid cooling radiator, a reservoir for the heated liquid to be cooled; a series of juxtaposed liquid circulating passages leading from said reservoir; partitions to separate the reservoir into a series of transverse chambers having communication with each other over the top of the partitions; and inlet means arranged to direct the heated liquid to the outer chambers.

8. In a liquid cooling radiator, a reservoir for the heated liquid to be cooled; a reservoir for the cooled liquid having an outlet; a series of juxtaposed liquid circulating passages leading from the bottom of the reservoir for the heated liquid to the top of the reservoir for the cooled liquid; transverse partitions extending up from the bottom to adjacent the top of the reservoir for the heated liquid to separate said reservoir into a series of chambers having communication over the top of the partitions; and inlet means to said reservoir having outlets to the lateral chambers to direct the incoming liquid to said chambers.

Signed at the city, county and State of New York, this 24th day of April, 1919.

EDWARD T. CURRAN.