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E. T. CURRAN

RADIATOR

Filed Oct. 13, 1919

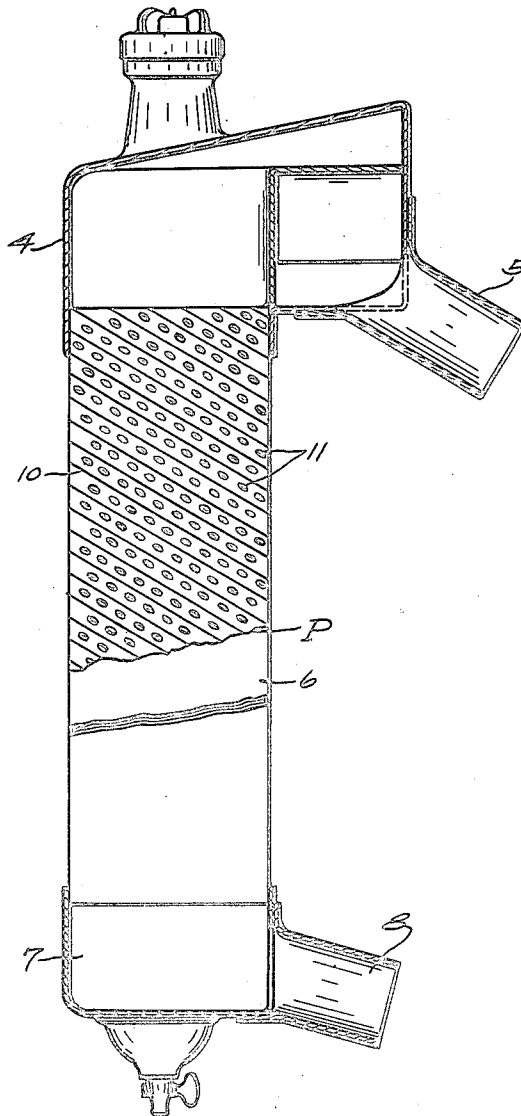


Fig. 1

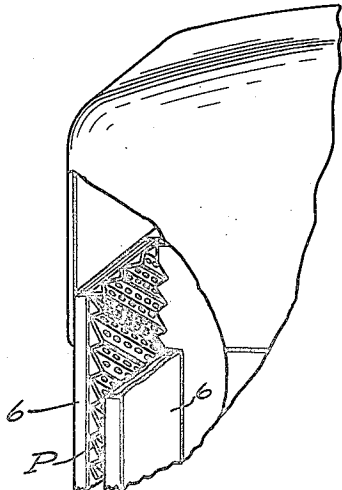


Fig. 2

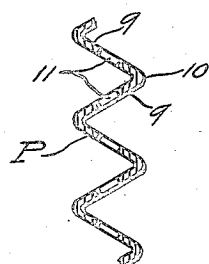


Fig. 3

INVENTOR

E. T. Curran
By J. F. Rule.
His attorney.

UNITED STATES PATENT OFFICE.

EDWARD T. CURRAN, OF DETROIT, MICHIGAN.

RADIATOR.

Application filed October 13, 1919. Serial No. 330,319.

To all whom it may concern:

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

My invention relates particularly to radiators for use with internal combustion engines or motors on automobiles, air planes and the like.

An object of the invention is to provide an arrangement of the radiating surfaces which will more efficiently transmit the heat to the air than in the constructions at present in general use. I have found that if the heat radiating surfaces are so arranged that as the radiator advances, the air strikes such surfaces at a substantial angle, a much larger percentage of heat is extracted than when the surfaces extend in the direction of movement of the radiator. I accordingly provide a series of radiating surfaces inclined to their direction of movement so that the air impinges on them at an angle and with considerable force and absorbs a large amount of heat. The surfaces are spaced to provide passageways through which the air freely passes.

A further feature of the invention consists in providing openings in the inclined radiating plates so arranged that a portion of the air in each passageway is deflected through said openings. By this means the air is agitated and caused to impinge against a larger portion of the radiating surfaces, a larger portion of the air is brought into intimate contact with the radiating surfaces, and the air strikes the edges of said openings squarely and with force; all of which results in increased efficiency.

A further object of the invention is to reduce the cost by an arrangement in which the heat radiation is largely through sheet metal radiating plates which are not brought in contact with the circulating water and which therefore may be made of comparatively inexpensive material, so that the more expensive metal, such as brass or copper is required only for the water tubes.

Other features and advantages will appear hereinafter.

In the accompanying drawings,—Figure 1 is a sectional elevation of a radiator constructed in accordance with the principles of

my invention, parts being broken away. Figure 2 is a fragmentary front perspective view. Figure 3 is a detail section of a portion of a heat radiating plate.

The radiator may form a part of a water cooling system for an internal combustion engine, for example, on an automobile, air plane, or other vehicle. The radiator is surmounted by a tank 4 into which the heated water enters through an intake pipe 5 at the rear of the tank. The water flows downward from the tank through flat sheet metal tubes 6, into a lower compartment 7 and through a pipe 8 back to the engine. The tubes 6 form a series of vertical channels, said series extending across the radiator, the tubes being spaced apart for the passage of air.

Corrugated sheet metal heat radiating plates P are interposed between the tubes 6. Each of these plates is made from a single sheet of metal, rolled or stamped into a corrugated or zigzag shape, but in the assembled radiator said plate comprises, in effect, a series of individual plates or walls 9, each bridging the space between two adjacent tubes 6. These plates 9 have lines of contact with the tubes along the bends 10, being preferably soldered to the tubes along said lines. The corrugations instead of being horizontal, or in other words, extending in the direction in which the radiator moves, are inclined downwardly and rearwardly. It will be seen that each two adjoining plates 9 and adjoining wall of the tube 6, form a downwardly and rearwardly inclined air passage.

As the radiator advances, the air impinges against the radiating surfaces of the plates 9 with considerable force owing to their inclination to the direction of movement. In this way a larger proportion of the air is brought into intimate contact with the radiating surfaces and a larger amount of heat is absorbed than is possible with radiating surfaces extending in the direction of their movement.

To further increase the efficiency, holes 11 are punched or otherwise formed in the plates. A portion of the air passes through these holes from one channel to another. This causes an agitation and cross currents of air which strike the radiating surfaces and further increase their efficiency. Moreover the air strikes with force directly

against the edges of the holes so that the heat is rapidly abstracted from the adjacent metal.

5 The angle at which the corrugations are placed may vary considerably, depending largely on the speed at which the radiator is designed to move through the air. As the cooling effect due to the inclined placing of the corrugations is intensified by an in-
10 creased velocity, the desired results are obtained by placing the plates at a small angle when the speed is great, as for example, in an air plane which travels at a high speed. The angle may thus be small to avoid ex-
15 cessive resistance. Conversely, for a slowly moving vehicle the angle of inclination should be much greater.

With the air passages inclined downward and rearward as shown, the air in passing
20 therethrough exerts a certain lifting force on the radiator. This is ordinarily an advantage, but if desired, this may be neutralized by having the corrugations of every other plate P for example, slant rearwardly
25 and upwardly.

As the radiating plates P do not come in contact with the circulating liquid, they may be made of tinned plate or other comparatively inexpensive sheet metal, while the
30 water tubes may be made of brass or other metal adapted for such purpose. The cost of materials is thus much less than where the entire radiator is made of brass or other metal suitable for water tubes.

35 Modifications may be resorted to within the spirit and scope of my invention.

What I claim is:—

1. A radiator for vehicles comprising in
40 combination, a series of spaced water tubes, and interposed corrugated perforated sheet metal plates providing air passages inclined to their direction of movement with the vehicle.

2. A radiator comprising in combination, a series of spaced water tubes, and zigzag
45 plates extending along the tubes and forming therewith inclined air channels extending transversely of the tubes, said plates each being formed with a multiplicity of perforations forming air passages between
50 adjacent channels.

3. In a radiator, a series of vertical water tubes, and interposed sheet metal plates, said plates being bent zigzag, with the bends extending from front to rear of the radiator,
55 whereby there is provided a multiplicity of air channels extending from front to rear through the radiator, said channels being inclined to the horizontal so that as the radiator advances the air is caused to strike
60 the walls of said channels at an angle, said plates each being formed with a multiplicity of perforations forming air passages between adjacent channels.

4. In a radiator, the combination of a
65 series of flat sheet metal tubes spaced apart, the longitudinal direction of said tubes being perpendicular to the normal direction of movement of the radiator and the flat sides of the tubes being parallel to said direction
70 of movement, and heat radiating plates bridging the spaces between said tubes and forming air passages extending from front to rear through the radiator, said plates being arranged at an angle to the said direc-
75 tion of movement and provided with openings for the passage of air from one of said air passages to another.

Signed at Detroit in the county of Wayne and State of Michigan this 4th day of Octo-
80 ber A. D. 1919.

EDWARD T. CURRAN.

Witnesses:

JOHN KELLEY,
HARRY F. LACEY.