

Oct. 31, 1933.

E. F. TILLEY

1,932,610

RADIATION DEVICE

Filed Oct. 25, 1932

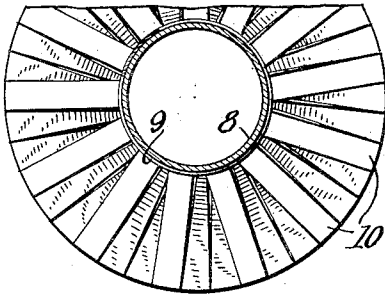


Fig. 1.

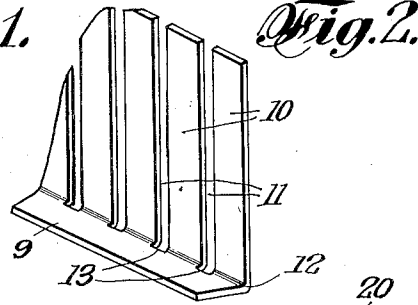


Fig. 2.

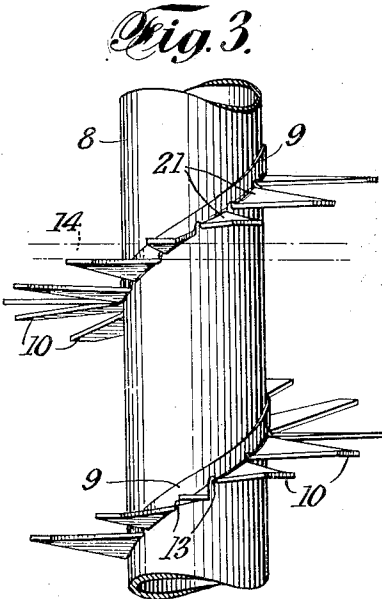


Fig. 3.

Fig. 4.

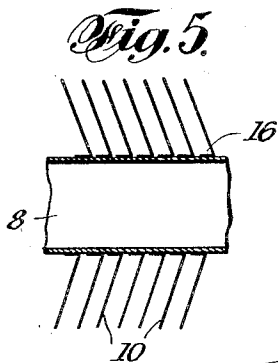
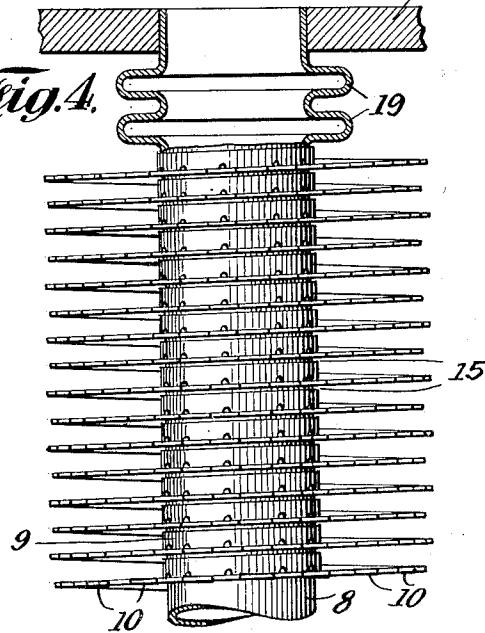


Fig. 5.

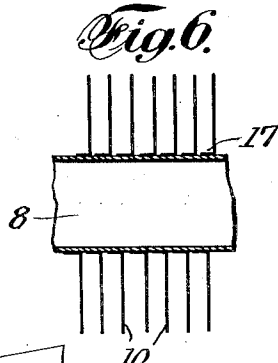


Fig. 6.

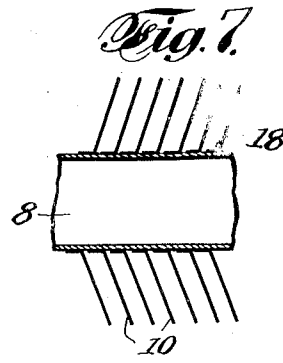


Fig. 7.

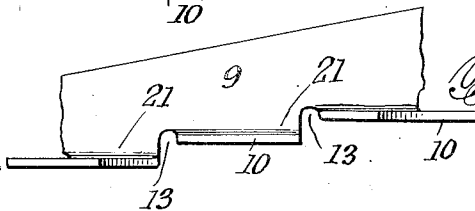


Fig. 3a.

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1,932,610

RADIATION DEVICE

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Application October 25, 1932. Serial No. 639,416

4 Claims. (Cl. 257-263)

This invention relates to heat transmission broadly, whether the flow of heat be from hot to cold or from cold to hot.

The objects of the invention are to increase the thermal efficiency and to provide a simple, practical, inexpensive and readily manufactured form of construction, suitable for many uses in the fields of heating, cooling, air conditioning, etc.

The foregoing and other desirable objects are attained by the novel features of construction, combinations and relations of parts particularly described and hereinafter broadly claimed.

The drawing accompanying and forming part of the specification illustrates certain practical embodiments of the invention, but with the understanding that the actual physical structure may be modified as regards this disclosure, all within the true intent and broad scope of the claims.

Fig. 1 is a broken sectional view of one form of the invention.

Fig. 2 is an enlarged broken detail of the strip member which is spiralled about the tube to form the extended radiating surface.

Fig. 3 is a broken side view illustrating the application of the strip member to the conducting tube. Fig. 3a is a fragmentary detail, illustrating the feature of twisting the fins.

Fig. 4 is a broken part sectional view of the strip spiralled in more compacted form on the tube and the latter connected with the header or support by an expansion joint.

Figs. 5, 6 and 7 are broken sectional details, illustrating various modifications in the angle of the radiating fingers.

The primary surface is provided by a tube 8, carrying the heating or cooling medium and the secondary or extended surface is provided by a strip 9, wound helically about the tube and having radiating fins 10 projecting therefrom.

Details of the secondary radiating member will be clear from Fig. 2, where the fin portions are shown as integral extensions from one edge of the base strip, bent up at right angles thereto and separated from each other by cuts 11, extending down past the line of bend 12, in the form of notches or indentations 13, in the true edge of the base strip.

The projecting fins or fingers 10 being wholly separate from each other and the extension of the cuts into the edge of the base strip enable the base strip to be coiled down in close flat engagement with the tube or pipe as indicated particularly in Fig. 3 and, since the separate fins

are no limitation to the bending of the base strip, these fins may be made just as long as is efficient for heat transmission purposes.

The fins may be angled in various ways. Thus in Fig. 3, the ends of the fins are shown as twisted out of parallelism with the edges of the strip and into substantial parallelism with each other in the final form, so as to form between them the substantially parallel air passes indicated at 14. This has the effect of breaking up the cross flow of air into multitudinous parallel strata, practically without retarding the flow and therefore without consuming useful energy.

The strip may be coiled upon the tubing in as closely or as widely separated convolutions as considered desirable. In a preferred construction however, the coils of the base strip are laid in spaced relation as indicated at 15, Fig. 4, to leave space for solder or tinning material, which may be employed to form a solid metal-to-metal seal between the edges of the base strip and the supporting tube.

The outstanding fins may be bent bodily at an acute angle as at 16, in Fig. 5, to overlie the base strip; stand out at a right angle from the base strip as at 17 in Fig. 6; or be bent at an obtuse angle as at 18 in Fig. 7, away from the base strip. These are merely examples however and it will be understood that the fins may be otherwise angled, curved or sloped to meet different requirements or provide different characteristics.

The fins may be made as long as needed for greatest efficiency in the transfer of heat and because of this possible high transfer rate, special expansion connections between the tubes and the header or supporting structure are desirable. In Fig. 4, the tube is shown as having a plurality of expanded cross corrugations 19 therein, adjacent the end, where it is connected with the header or supporting structure 20, so that it may expand or contract as required, without breaking or injuriously affecting the joint with the header.

In prior constructions employing a continuous strip helically wound on the primary surface, the depth or extent of the fin has been limited by the maximum stretch of the metal. In the present invention there is no such limitation and the fins can be made of any desired length, or the tube may be of any desired size or shape. The desirable combination of large tube and long fins is possible, the same forming an ideal assembly for concealed or open radiation for domestic purposes.

In cooling and refrigeration work the formation of the separate fins prevents frosting from

blocking the passage of air and when the fins are angled on a downward slant, any moisture flows to and drops off the ends of the fins, thus automatically clearing the primary member.

5 The use of the new radiation device in fan systems, where power consideration is important, is particularly advantageous because of the minimum flow resistance offered by the fins. Thus with the invention, more rows of tubes may be
10 used without consuming more power than heretofore used with a lesser number of tubes having continuous fins. This splitting of the air into multitudinous generally parallel thin layers thus both reduces the impedance and increases the heat transfer.

15 The serrations 13 in the edge of the base strip prevent tearing of the strip as it is tightly wound upon the tube and aid in the twisting of the fins from the inclined or helical lines of the base strip to the generally parallel position in line with the
20 air flow.

In practical manufacturing operations the strips, after being slotted at 11, 13, may be formed through a die to the generally L-shaped position
25 shown in Fig. 2 and in the helical winding of the base strip on the tube, the fins may be twisted transversely near their junction with the tube, as at 21, in Figs. 3 and 3a across from the inner edge of one serration to the outer edge of the next
30 adjoining indentation. The fins then form a series of substantially flat parallel blades for cutting the air into thin parallel layers without turbulence or breaking the flow.

The indentations in the edge of the base strip
35 may be made as deep or as shallow as considered desirable. Deeper indentations permit wider fins and allow for more abrupt twist at the root of the fins with the base strip. This twisting of the fins gives them an added longitudinal stiffness
40 making it possible to use relatively thin sheet material and keep the fins as long as desirable for practical efficiency.

What is claimed is:

1. An extended surface radiation unit consisting of a coiled strip with indentations in one edge of the same and angularly projecting radiating fins between said indentations and aligned at one edge with the inner portion of said indentations and at the opposite edge with the outer edge of an adjoining indentation. 80

2. A heat radiation device, comprising in combination with a tube, a narrow base strip wound helically in close flatwise engagement with said tube and having indentations in one edge of the same and angularly projecting radiating fins between said indentations, said fins being each aligned at one edge with the inner portion of one of said indentations and aligned at the opposite edge with the outer portion of the next adjoining indentation and thereby positioned substantially parallel to cut an air stream flowing past the tube in multitudinous parallel thin layers. 85 90

3. In a heat radiation device, the combination of a tubular member and an extended surface unit, comprising a narrow base strip wound in flatwise engagement on said tubular member and having elongated fins projecting angularly from one edge of the same, said fins being separated from each other by notches extending into the edge of the base strip between said fins and said fins being twisted transversely of their length across from the notch at one side to the notch at the opposite side of the same into substantial parallelism with each other to cut an air stream flowing past the tubular member into multitudinous parallel thin layers. 95 100 105

4. A heat radiation device, comprising in combination with a tube, a narrow base strip wound helically in close flatwise engagement with said tube and having one edge substantially continuous and the other edge formed with notches therein and having radiating fins projecting angularly therefrom between said notches and a bonding material between the tube and said notched edge portion of the finned strip. 110 115

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