

Feb. 21, 1933.

I. T. BENNETT

1,898,028

SHEET METAL RADIATOR

Filed June 20, 1929

3 Sheets-Sheet 1

Fig. 1.

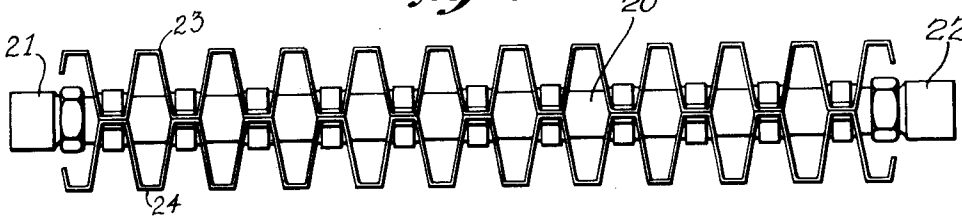


Fig. 2.

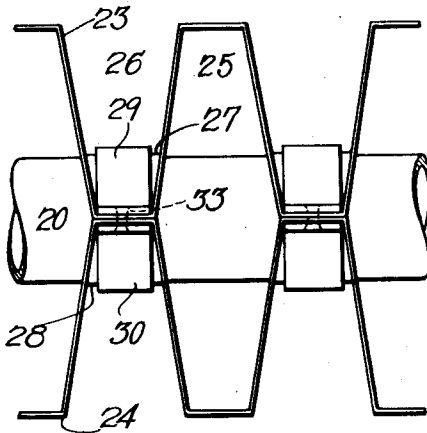


Fig. 3.

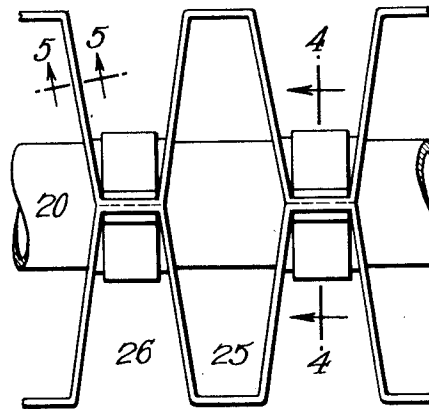


Fig. 4.

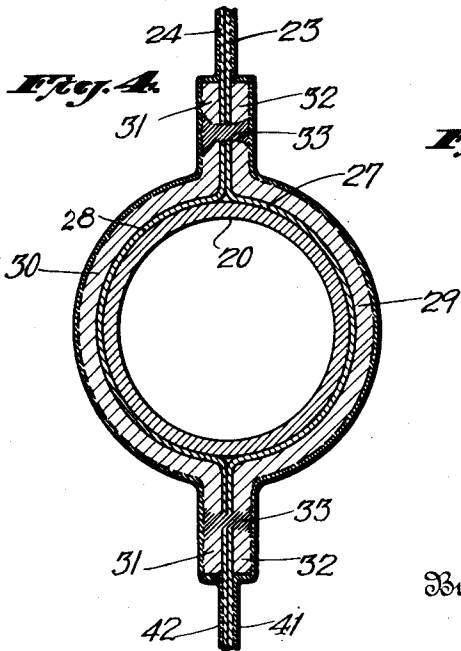
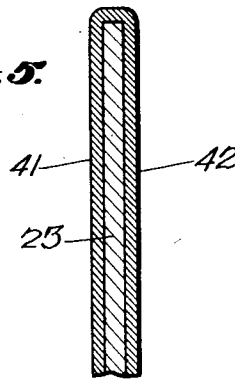


Fig. 5.



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Fig. 6.

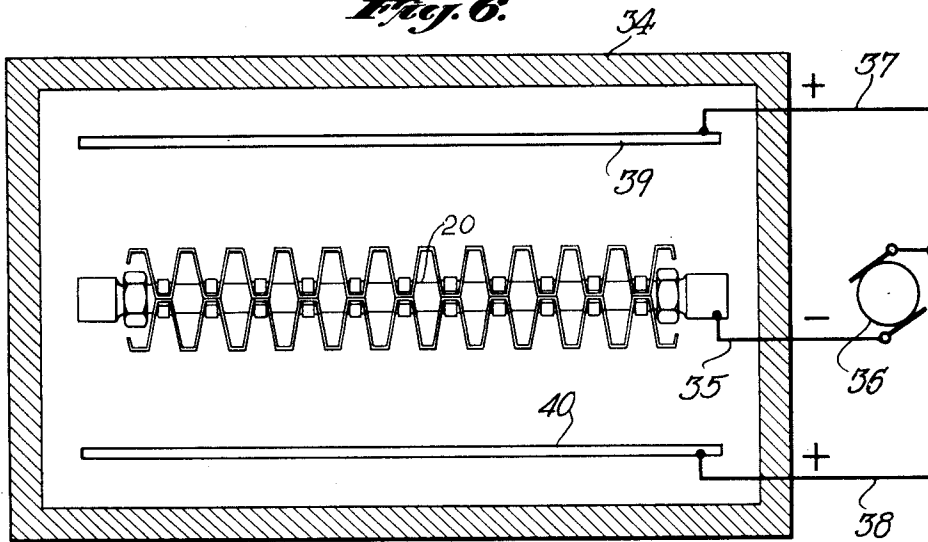


Fig. 7.

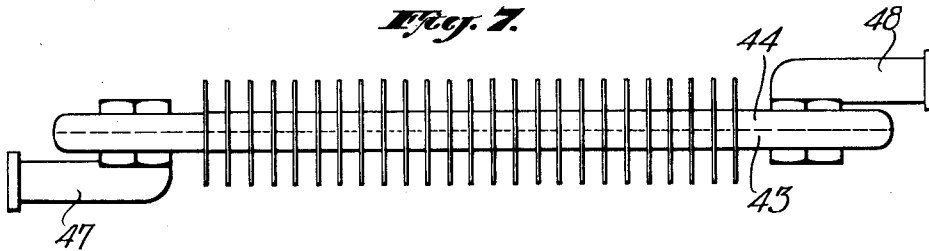


Fig. 8.

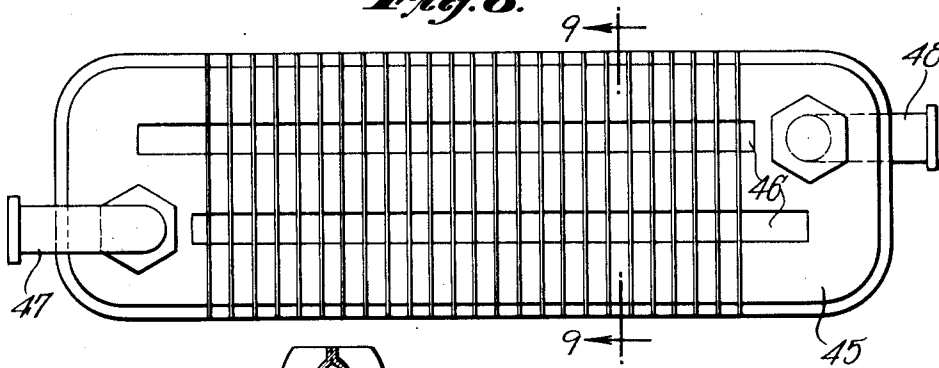
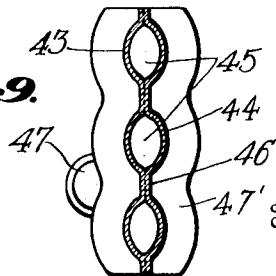


Fig. 9.



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Fig. 10.

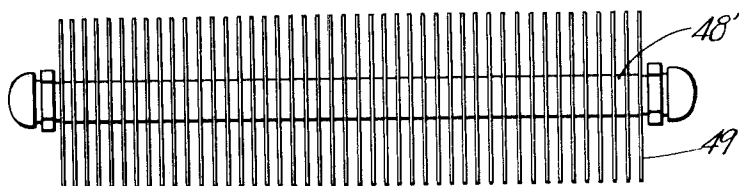


Fig. 11.

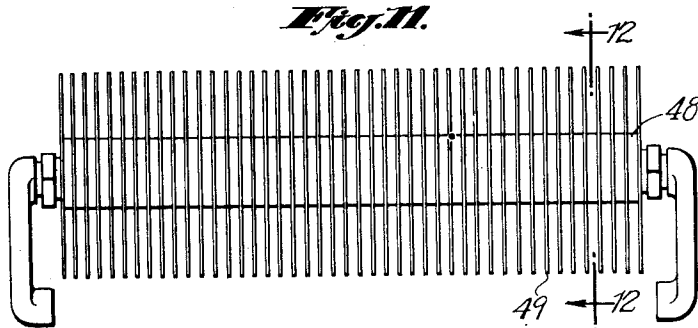


Fig. 12.

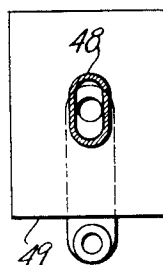


Fig. 13.

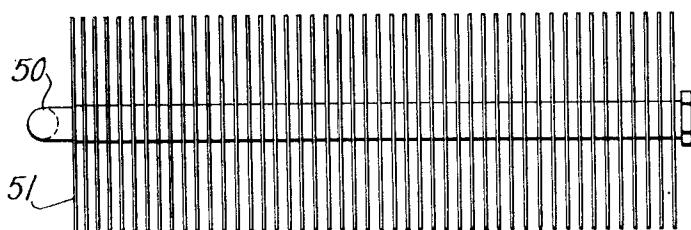


Fig. 14.

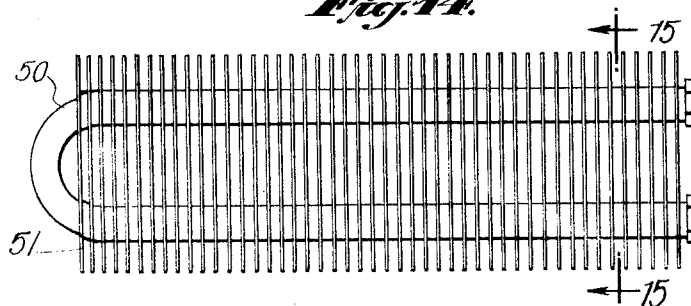
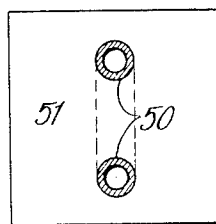


Fig. 15.



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UNITED STATES PATENT OFFICE

IRVING T. BENNETT, OF BROOKLYN, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO METROPOLITAN ENGINEERING COMPANY, OF BROOKLYN, NEW YORK, A CORPORATION OF NEW YORK

SHEET METAL RADIATOR

Application filed June 20, 1929. Serial No. 372,298.

This invention relates to sheet metal radiators and their methods of construction. Heretofore in constructing sheet metal radiators of the type shown in Murray application, Serial No. 338,677, filed February 7, 1929, for example, for which type the methods of construction of my invention are particularly adapted, a tube of copper is used for containing the steam or other heating fluid in order to obtain a high heat conductivity and to avoid corrosion. On this tube are secured copper sheets suitably bent to form vanes of high conductivity and to form air channels through which air may circulate in contact with the heat conducting vanes. To enable the copper sheets to be bent to the desired shape without breaking, a hot or cold rolled sheet of pure copper as, for example, of electrolytic copper, is required. The necessity for using sheets or plates of this quality of copper adds considerably to the cost of the radiator.

An object of my invention is to provide a radiator structure and method of construction for radiators of the above type that will enable less costly materials to be used without sacrificing the conductivity and heat distributing properties and other desirable characteristics attained by the use of sheet copper.

Other objects of the invention are to provide a simple and effective means for forming a radiator by metallic sheet material and to provide a method in which a radiator of any desired thickness of heat conducting walls may be easily formed from relatively thin metal.

With these and other objects in view, the invention comprises a structure and method described in the following specification and claims. The various features of the invention are illustrated in the accompanying drawings in which—

Fig. 1 is a plan view or upper end view of a Murray type of radiator formed in accordance with my invention;

Fig. 2 is a detail end view of a Murray type of radiator having vanes formed of relatively thin poorly conducting metal;

Fig. 3 is a similar view of a portion of the

radiator shown in Fig. 2 having the thickness and heat conducting capacity increased in accordance with my invention;

Fig. 4 is a section of a portion of the radiator taken on line 4—4 of Fig. 3;

Fig. 5 is a cross-section of a portion of a vane after the thickness has been built up in accordance with my invention;

Fig. 6 is a diagrammatic plan view of an electrolytic apparatus for building up the thickness and heat conductivity of the radiator vanes;

Figs. 7, 8 and 9, 10, 11 and 12 and 13, 14 and 15, are plan, elevation and sectional views of modified form of radiators formed in accordance with my invention.

Referring more particularly to Figs. 1 to 6 of the accompanying drawings, the radiator comprises a tube or number of tubes 20 for containing the heat medium and provided with suitable unions or couplings 21 and 22 at their ends. On opposite sides of the tube 20 are fastened corrugated sheets 23 and 24 of thin sheet metal which may be of iron, steel, brass or any other suitable metal. The sheets 23 and 24 are to serve as a support or skeleton for deposits of copper and may, therefore, be made of the thinnest metal that will withstand the handling in the subsequent operations of the process.

The sheets 23 and 24 are so corrugated as to form a number of internal passages 25 separated by external channels 26. The metal sheets at the contacting or inner parts of the groove 26 are curved as shown at 27 and 28 of Fig. 4 to encircle the tube 20. The encircling portions 27 and 28 of the metal sheets 23 and 24 are then tightly clamped on the tubes 20 by means of semi-cylindrical straps 29 and 30 having diametrically opposed flanges 31 and 32 respectively, welded to each other through the sheets 23 and 24. There is thus formed a radiator having very thin vanes of very low and ineffective heat conducting and distributing capacity.

On these vanes and all exterior surfaces of the radiator there is then deposited a relatively thick layer of copper sufficient to give the vanes the required heat conducting

and distributing property. This layer of copper may be applied in any suitable manner. In the preferred form of construction it is applied electrolytically by placing the entire radiator in an electrolytic bath 34 and connecting it through a conductor 35 to the negative poles of a generator 36. The positive poles are connected through wires 37 and 38 to copper anodes 39 and 40 respectively, on opposite sides of the radiator.

The bath is of any suitable copper solution, such as copper sulphate, capable of forming a sufficiently dense adherent deposit of copper on the radiator. For this purpose the refined copper anodes commonly used for the production of electrolytic copper may be employed. In this manner the supporting sheets 23 and 24 of brass, iron or steel, may be built up to any desired thickness in which the main part of the metal will be a highly conducting copper. For example, a supporting sheet of a thickness of five-one-thousandths of an inch might be built up to a final thickness of one-eighth or one-quarter of an inch, or more; the bulk of the thickness being of copper for which the relatively inexpensive anode copper may be employed.

The deposit of copper may take place on the surface of the vane nearest the anodes or by suitably selecting the dimensions of the radiator and using an electrolyte of sufficient throwing power; the copper may be deposited on both sides of the foundation sheet of metal. In the latter case a cross-section of the built up metal would be as shown in Fig. 5 with the inner or foundation sheet 23 or 24 covered on each side with a relatively thick deposit of copper 41 and 42.

Figs. 7, 8 and 9 show the heat containing tube formed of two metal sheets 43 and 44 corrugated to form channels 45 when placed face to face and soldered on contacting surfaces 46. The heat medium containing channels 45 are connected at opposite ends of the radiator to inlets and outlets 47 and 48. On the outer surface of the sheets 43 and 44 are soldered heat radiating vanes 47' of thin sheet iron or brass, or other relatively inexpensive metal.

Upon the structure thus formed, a layer or deposit of copper is deposited electrolytically by making the radiator structure a cathode, as shown in Figs. 1 to 6.

Figs. 11, 12 and 13 show a single heat conveying tube 48' of elliptical cross-section on which are mounted thin sheet metal vanes 49 to which the copper is later deposited to form the heat conducting metal.

In Figs. 13, 14 and 15 a single U-shaped tube 50 is used on which are threaded and secured spaced plates 51 of thin non-conducting metal, and the entire structure then

built up and thickened by the electrolytic deposition of copper.

Various other modifications may be made by those skilled in the art without departing from the invention as defined in the following claims.

1. A radiator of the type described which comprises a tubular heat containing element and sheet metal vanes on said element for conducting heat outwardly therefrom, said vanes being formed of a thin backing of relatively poorly conducting metal and a relatively thicker layer of metal of high conductivity.

2. A radiator of the type described which comprises a tubular heat containing element and sheet metal vanes on said element for conducting heat outwardly therefrom, said vanes being formed of a thin backing of relatively poorly conducting metal and a relatively thicker copper layer.

3. A radiator of the type described which comprises a tubular heat containing element and sheet metal vanes on said element for conducting heat outwardly therefrom, said vanes being formed of a thin backing of relatively poorly conducting metal and a relatively thicker deposit of metal of high conductivity.

4. A radiator of the type described which comprises a tubular conduit for heating medium, a pair of metallic sheets on opposite sides of said tube bent to form corrugations transverse to the length of said tubes and rounded at its inner ridges to fit said conduit and a deposit of copper on the exposed surfaces of said sheets.

5. A radiator of the type described which comprises a tubular conduit for heating medium, a pair of metallic sheets on opposite sides of said tube of relatively low heat conductivity bent to form corrugations transverse to the length of said tubes and rounded at its inner ridges to fit said conduit and a deposit of metal of relatively high heat conductivity on the exposed surfaces of said sheets.

6. A method of forming sheet metal radiators which comprises forming vanes of thin sheet metal of low heat conductivity on a heat containing passage and then forming a relatively thick layer of highly conductive metal on said vanes.

7. A method of forming sheet metal radiators which comprises forming vanes of thin sheet metal of low heat conductivity on a heat containing passage and then forming a relatively thick deposit of highly conductive metal on said vanes.

8. A method of forming sheet metal radiators which comprises forming vanes of thin sheet metal of low heat conductivity on a heat containing passage and then forming a relatively thick layer of copper on said vanes.

9. A method of forming sheet metal radiators which comprises forming vanes of thin sheet metal of low heat conductivity on a heat containing passage and electrolytically depositing a relatively thick layer of a high conductive metal on said vanes.

10. A method of forming sheet metal radiators which comprises forming vanes of thin sheet metal of low heat conductivity on a heat containing passage and electrolytically depositing a relatively thick layer of copper on said vanes.

11. A heat radiating vane for a tubular heating element, said vane comprising a thin backing of relatively poorly conducting metal having surfaces to fit said heating element, and having a relatively thicker layer of metal of high conductivity on said backing.

12. Heat radiating vanes for a heating element which comprises a thin backing of relatively poorly conducting metal having surfaces to fit said heating element and surfaces extending from said heating element, and a relatively thicker layer of metal of high conductivity on said backing, the thickness of said layer decreasing at increasing distances from said heating element.

13. Heat radiating vanes for a heating element, said vanes comprising a thin backing having surfaces to fit said heating element and surfaces extending therefrom, and a relatively thicker layer of a deposited metal of high conductivity on said backing.

14. A method of forming heat radiating vanes for radiators which comprises shaping a thin metal backing to form surfaces to fit a heating element and surfaces extending therefrom, and depositing a layer of a more highly heat conducting metal on the exposed surfaces of said vanes.

15. A method of forming heat radiating vanes for radiators which comprises shaping a thin metal backing to form surfaces to fit a heating element and surfaces extending therefrom, and electrolytically depositing a layer of a more highly heat conducting metal on the exposed surfaces of said vanes.

In witness whereof, I have hereunto signed my name.

IRVING T. BENNETT.