June 11, 1929. G. H. PHELPS ET AL 1,716,459

RADIATOR

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Fig. 1.

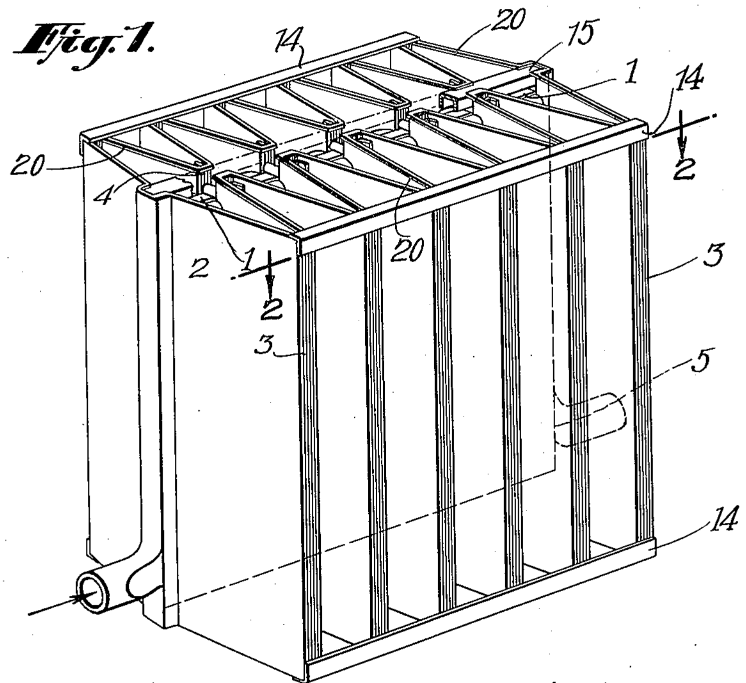

Fig. 2.

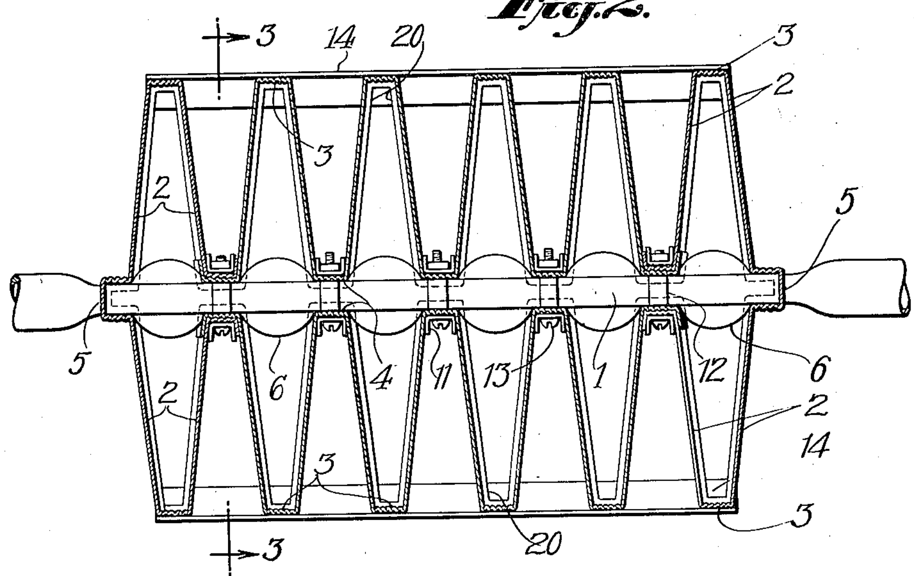

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Fig. 4.

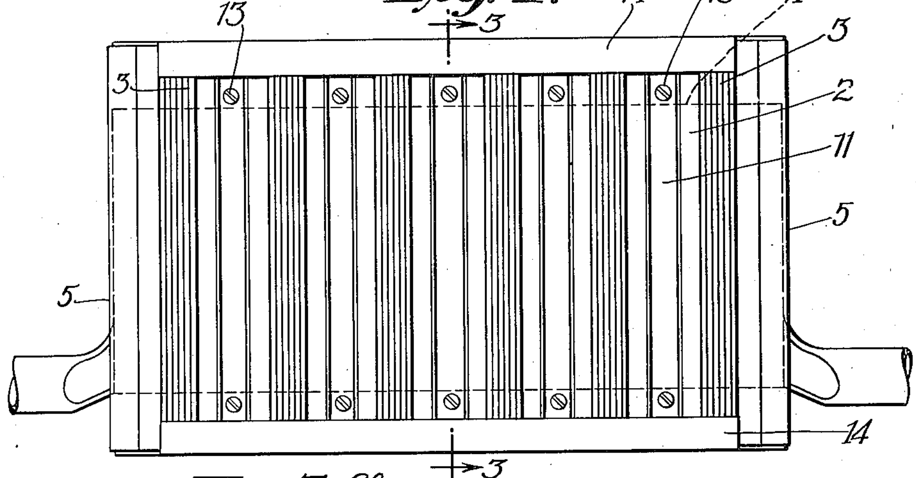


Fig. 3.

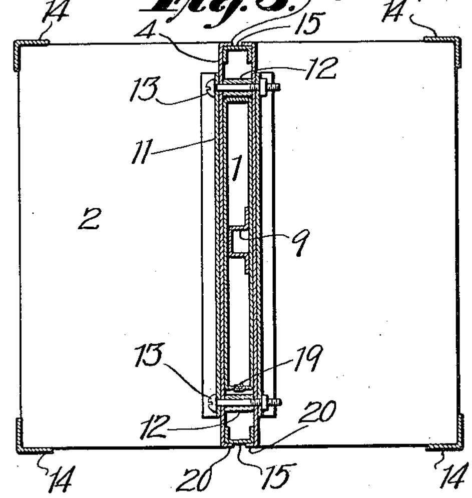


Fig. 5.

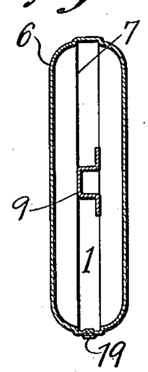


Fig. 7.

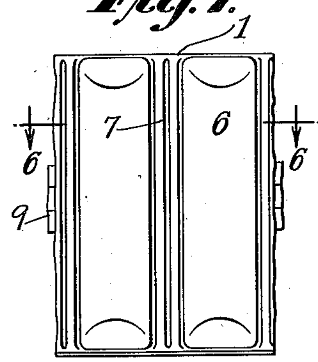


Fig. 6.

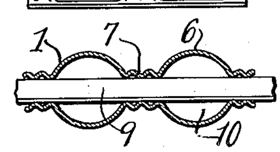


Fig. 8.

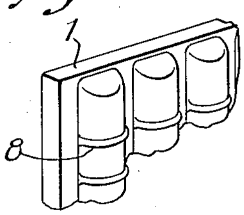


Fig. 9.

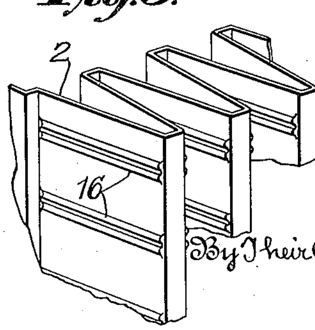
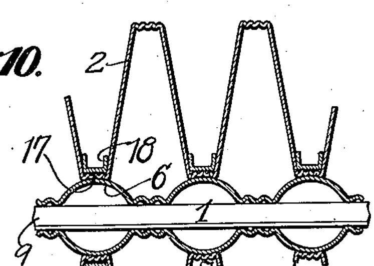


Fig. 10.



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UNITED STATES PATENT OFFICE.

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RADIATOR.

Application filed February 14, 1925. Serial No. 9,185.

In the application of Thomas E. Murray No. 725,559 there is described a radiator of great economy and efficiency with a chamber for the heating medium and a sheet metal radiating structure at the sides of the chamber, using thin copper for the chamber and the radiating structure and making the chamber itself exceptionally thin. The present invention aims to provide certain improvements in radiators of the same general type; which improvements, however, are applicable also in large part to radiators of other types.

The accompanying drawings illustrate embodiments of the invention.

Fig. 1 is a perspective view of a radiator;

Fig. 2 is a horizontal section of the same on the line 2—2, of Fig. 1;

Fig. 3 is a vertical section on the line 3—3 of Fig. 2;

Fig. 4 is a side elevation of the same;

Fig. 5 is a vertical section of the chamber;

Fig. 6 is a cross-section thereof on the line 6—6 of Fig. 7;

Fig. 7 is a side elevation thereof;

Figs. 8 and 9 are fragmentary perspective views of modifications in detail;

Fig. 10 is a view similar to Fig. 6 illustrating another modification.

Referring to the embodiments of the invention illustrated, from which the usual valves and other accessories are omitted, steam or other heating medium is carried in a narrow, generally rectangular, chamber illustrated separately in Figs. 5, 6 and 7.

The sides of the chamber are engaged by a radiating structure which conducts the heat out into the surrounding air, and is shaped to provide vertical passages or flues for facilitating circulation of the heated air. The chamber is indicated as a whole at 1. The radiating structure at each side comprises plates 2 extending laterally, connected at their outer and inner ends respectively by longitudinally extending plates 3 and 4. Preferably the chamber and the radiating structure are made of extremely thin copper or cuprous metal. The plates 3 and 4 are corrugated vertically to strengthen them and provide increased surface. The radiating structure extends along both sides of the chamber and around the ends thereof. It may be made in one or more sections united along vertical edges. I prefer to use for this part of the apparatus electrically deposited plates of copper having a slightly rougher surface than ordinary rolled plates and thus giving a better radiating surface to the air. Plates of this sort are commercially available in a size which will permit the stamping in one piece of a section comprising four pairs of connected lateral plates 2, as shown in Fig. 2. Separate pieces are used to extend from the edges thereof around the ends of the chamber. Assuming the radiator of a size including six pairs of lateral plates in its length the end plates are lapped over the side plates, bent into lateral fins 2 and then bent as at 5 to pass around the ends of the chamber. The inner portions 4 of the radiating structure are united to the chamber in any way which will provide a good transmission of heat such as by soldering or welding.

The chamber 1, while generally rectangular in section, has its sides shaped to provide swells or bulges 6 between the flat portions 7 (Figs. 5 and 6), to which the radiating structure is united; the parts 7 being also vertically corrugated to fit the corrugations of the parts 4 of the radiating structure. These outward enlargements at the sides of the chamber give a greater area on the outer face exposed to the air circulating up the flues. In addition, these parts 6 may be bent to form transverse ribs 8 (Fig. 8) which will help to strengthen them as well as provide extra radiating surface. Also the outward bends 6 strengthen the side walls of the chamber and improve its ability to resist bending under pressure or vacuum within so that it will not be subject to the inward and outward bending and eventual fatigue which would occur with flat sides.

For further protection against the yielding of the walls when there is a vacuum within the chamber, we may provide an internal brace consisting of a flanged channel shaped member 9 (Figs. 5 and 6) holding the sides spaced apart. In this connection it will be noted that the outward bends provide spaces such as 10 (Fig. 6) at the sides of the inner braces to permit free circulation of steam. Shouldered rivets or other styles of internal bracing may be substituted for the single channel shown.

Direct engagement between the chamber

and the radiating structure is needed only for heat conductivity. The parts are firmly held together by other means described below.

The radiating structure extends not only laterally but also vertically beyond the top, and preferably the bottom, of the chamber. In this way, additional radiating surface is provided which is very useful, particularly where metal of such high conductivity is used. This feature at the same time provides a convenient method of holding the parts together. Against the outer face of each of the parts 4 there is arranged a copper channel 11. These channels extend above and below the chamber, where they are connected by spacers 12 and bolts 13 fastening them together at their ends and at the same time clamping them firmly against the parts 4 and clamping the latter against the sides of the chamber.

The radiating structure is further braced by means of copper angles 14 on the outer corners extending from end to end and by channels 15 extending from end to end between the inner sides of the radiating structure. For greater stiffness the laterally extending portions 2 of the radiating structure may be provided at intervals in their height with horizontal corrugations 16 as shown in Fig. 9.

Fig. 10 illustrates an alternative arrangement in which the radiating structure comprises the lateral portions 2 connected at their inner ends with horizontally arched portions 17 which engage the outward bends 6 on the sides of the chamber; the parts 17 being held in place by channels 18 similar to the channels 11 of Fig. 2. This arrangement offers some economy in the amount of metal used for the radiating structure. It has the disadvantage, compared with Fig. 2, that there is not so much metal of which both faces are exposed to the air to heat it.

The chamber 1 can be very economically produced by bending a single sheet of metal to form the sides, top and bottom, soldering or welding the lower edges together and crimping them as at 19, Fig. 5. This joint is not exposed to view. Also the end joints of the chamber are covered by the surrounding radiator structure so that the entire apparatus is of a pleasing unitary appearance.

We propose also to bend the ends of the fins or plates of the radiating structure so as to form inwardly extending flanges 20 along the top and bottom edges. This stiffens them laterally so as to prevent their being bent out of shape and thus facilitates the use of very thin metal; and also improves the appearance. The members 11 act as beams to resist deformation under the pressure within the chamber. They may be of other shapes than the channel shape shown and for greater stiffness they may be of other materials than copper; such, for example, as steel, in which case it is advisable to plate them with copper or other coating to prevent oxidation.

The greater the velocity of the air through the radiator, other things being equal, the greater will be the amount of heat transferred to a room. High velocities also give a quicker warming effect at points remote from the radiator, a better elimination of cold spots, hot spots and drafts in the room, a greater freedom of location of the radiators with reference to piping, furniture and so forth, and generally healthier because more uniformly distributed warmth. The velocity of the air is increased by increasing the height of the flues to the point where the transmission of heat from the radiating structure diminishes to such an extent as to be offset by the increased friction.

These advantages gained by the simple expedient of elongated air flues, may be obtained by the application of such flues to heating elements of various other designs than the steam chamber illustrated. And the invention may be applied not only to radiators of the type illustrated for heating rooms but also to similar structures for transferring heat or cold from the internal element to air or other fluids passing through the flues. For example cold brine or the like may be circulated through the chamber so that the latter becomes a heating element only in the negative sense; extracting heat from the radiating structure and inducing a flow of the cooled air downward through the flues similar to the upward circulation induced by the use of steam.

In a previous application of Thomas E. Murray, No. 709,080, filed April 26, 1924, there is described a radiator of construction basically similar to that of the present application; and in said Murray application claims are made to cover broadly the features common to the two cases, the claims in the present case being limited to points of distinction over claims in the earlier Murray application.

Though we have described with great particularity of detail certain embodiments of our invention, yet it is not to be understood therefrom that the invention is restricted to the particular embodiments disclosed. Various modifications thereof may be made by those skilled in the art without departure from the invention as defined in the following claims.

What we claim is:

1. A radiator including in combination a heating element comprising a chamber with thin flexible sides of substantial height, a separately formed radiating structure of sheet metal having portions bearing against the opposite sides of said chamber and fastening members engaging the outer faces of

said portions of the radiating structure and connected to each other to hold the radiating structure in close contact with the chamber.

2. A radiator including in combination a heating element comprising a chamber with thin flexible sides of substantial height, a separately formed radiating structure of corrugated sheet metal having the inner portions of the corrugations bearing against the opposite sides of said chamber and fastening members engaging the outer faces of said portions of the radiating structure and connected to each other to hold the radiating structure in close contact with the chamber.

3. A radiator including in combination a heating element comprising a chamber with thin flexible sides of substantial height and a radiating structure engaging the side thereof forming flues extending vertically beyond said chamber.

4. A radiator including in combination a heating element comprising a chamber with thin flexible sides of substantial height and a radiating structure engaging the side thereof forming flues extending vertically above and below said chamber.

5. A radiator including in combination a heating element comprising a chamber with thin flexible sides of substantial height and separately formed fins engaging and extending outward from the sides of said chamber and forming continuous flues extending vertically beyond the same, the fins at opposite sides being fastened to each other above and below the chamber.

6. A radiator including in combination a heating element and a radiating structure comprising laterally extending plates connected to each other at their outer edges to form closed air flues, and braces on the corners of said radiating structure.

7. A radiator including in combination a chamber for the heating medium with thin flexible side walls of substantial height and a radiating structure comprising laterally extending plates connected to each other and separate sections connected to the edges thereof and extending around the end of the chamber.

8. A radiator including in combination a thin-walled chamber for the heating medium and separately formed fins engaging and extending outward from the sides of said chamber so as to brace said sides, the chamber having its sides bent outward to stiffen them between such fins.

9. A radiator including in combination a thin-walled chamber for the heating medium and separately formed fins engaging and extending outward from the sides of said chamber so as to brace said sides, the chamber having its sides corrugated at points between such fins.

10. A radiator including in combination a thin-walled chamber for the heating medium and separately formed fins engaging and extending outward from the sides of said chamber so as to brace said sides externally, the chamber being reinforced internally.

11. A radiator including in combination a thin-walled chamber for the heating medium and separately formed fins engaging and extending outward from the sides of said chamber so as to brace said sides externally, the chamber having its sides bent outward to stiffen them between such fins and a longitudinal internal brace engaged by the sides of the chamber at its points of least width.

12. A radiator including in combination a chamber for the heating medium and fins engaging and extending outward from the sides of said chamber and vertically beyond the same and bracing means between the vertically extended portions of such fins.

13. A radiator including in combination a heating element and a radiating structure at the side thereof comprising fins of thin flexible metal extending vertically and stiffened by a transverse flange at the top.

14. A radiator including in combination a chamber for the heating medium and fins engaging and extending outward from the sides of said chamber and vertically beyond the same and transversely flanged on their upper edges.

15. A radiator including in combination a thin substantially flat chamber for the heating medium, fins engaging and extending outward from the sides of the chamber and outside beams extending across the sides of the chamber and serving to resist deformation under internal pressure.

16. A radiator including a thin substantially flat chamber having its sides bent outward at a plurality of points to resist deformation under internal vacuum and having a longitudinal internal reinforce in combination with beams on the outside arranged to resist deformation under internal pressure.

In witness whereof, we have hereunto signed our names.

GEORGE H. PHELPS.
THOMAS E. MURRAY, Jr.