Jan. 19, 1932. G. H. PHELPS ET AL 1,841,380

RADIATOR

Filed Feb. 18, 1930

Fig. 1.

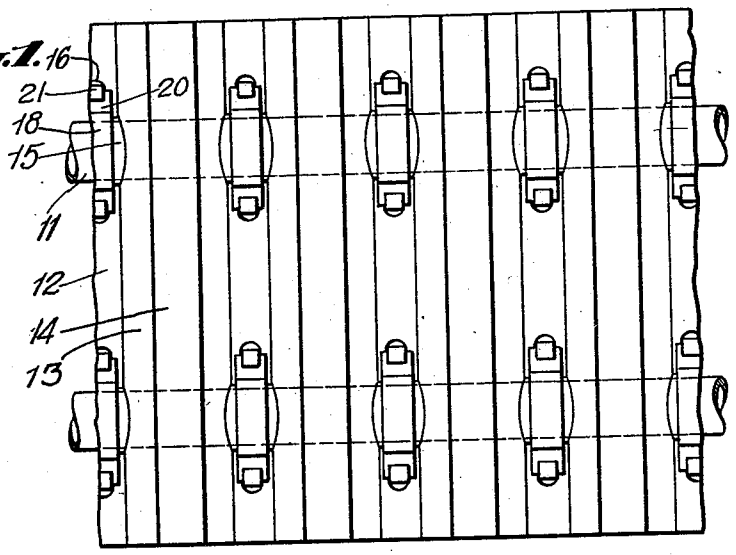


Fig. 2.

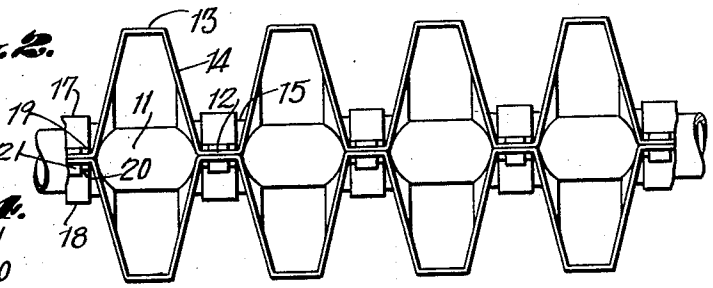


Fig. 4.

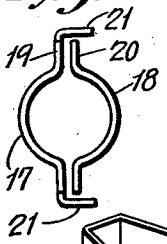


Fig. 3.

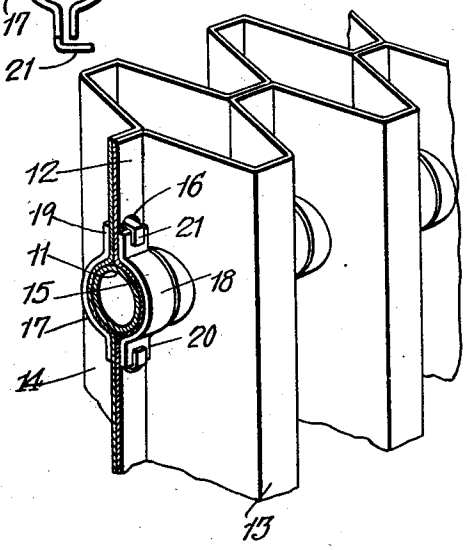
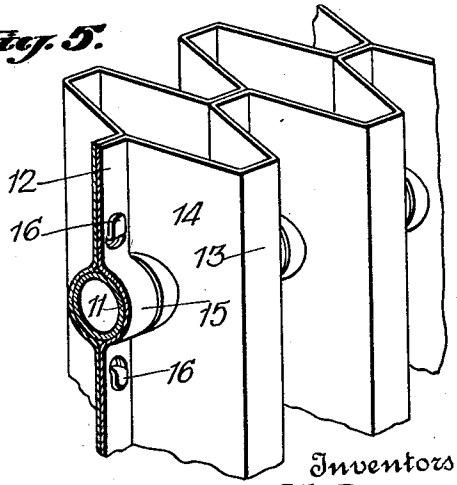


Fig. 5.



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UNITED STATES PATENT OFFICE

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RADIATOR

Application filed February 18, 1930. Serial No. 429,257.

In a previous Patent No. 1,744,078 and certain pending applications, there are described certain radiators of the convection type comprising horizontal tubes or similar narrow elongated heating elements to which are applied an extended area structure composed of corrugated sheets or the like forming transverse plates or fins between which are vertical passages for heating the air and inducing a strong upward draft and circulation of the heated air throughout the room to be warmed. In such radiators the manner of securing the extended area structure to the heating element is important. The contact should be intimate and of substantial extent to secure good conductivity and should be durable under the strains set up by alternate heating and cooling, and should be as economical as possible. The present invention aims to secure these advantages.

The accompanying drawings illustrate embodiments of the invention.

Fig. 1 is a front elevation and Fig. 2 a plan of the central part of a radiator.

Fig. 3 is a perspective in section through one of the joints.

Fig. 4 is an elevation of a pair of straps; Fig. 5 is a perspective illustrating another type of joint.

The heating element is a tube 11 for steam or other heating medium extending horizontally in two sections in vertical alignment with each other. It is preferably of copper.

The heating element may be a single section of tubing or may be more than the two sections illustrated. And although in the ordinary uses of heating the air of a room the sections should be in vertical alignment, yet this is not necessary in all cases and particularly not in cases where the radiator is used with a blower or other means for maintaining a draft through it. In that case the radiator may be set with air passages at various other angles than the vertical one shown.

The radiator may be used for cooling the air by circulating cold brine, for example, through the tube, in which case the air circulation would be downward.

Applied to opposite sides of the tube are corrugated sheets forming inner longitudinal plates 12, outer longitudinal plates 13 and transverse plates or fins 14. The inner plates 12 are bent outward to form recessed portions 15 which embrace the tube so as to provide a considerable contact area.

The opposite plates 12 are brought close together to contact with each other above and below the tubes, the fastening operations being located on the outside of the corrugated sheets.

Above and below the tube, the plates 12 are punched to form apertures 16. Stiff steel straps 17 and 18 are shaped to fit the recessed portions 15 at opposite sides. At the ends, the straps have flat portions 19 and 20 bearing against the flat plates 12 and serving, when the straps are drawn together, to press the recessed portions 15 of the sheets into intimate contact with the tube around substantially its entire circumference. Extensions 21 are provided on the ends of one of the straps, which pass through the openings 16 and are clinched over the opposite strap while the parts are pressed together; thus holding the sheet metal in intimate and extensive contact with the tube.

Instead of the separate straps described, other devices may be used which pass through the sheet metal at one side and are bent over to clinch the parts together. In Fig. 5, for example, the plates 12 themselves are punched to form ears 16 which are first bent to the position in the upper part of the figure and then clinched over as shown in the lower part. It is the ear which extends from the left hand sheet which clinches the parts by being passed

through the opening in the right hand sheet and then bent over. But a single operation may punch out the ears 16 from both plates when the latter are close together and thus save the separate operation of punching holes in the right hand sheet. A single operation may in fact punch out the ears and clinch them over.

For some installations it is sufficient to have a corrugated sheet at only one side, using a straight flat sheet or a series of separate plates 12, or any other style of anchorage, at the other side. Or a single plate may be used, at one side of the tubing only, a strap similar to 17, Fig. 4, having its recessed portion bearing against the tube directly and its ends passing through the corrugated plate at the other side and clinched over. Or a single strap may be used in this way with the use of sheets on both sides of the tube, the strap bearing against the sheet at one side and having its ends pass through both sheets and clinched over.

Radators of generally similar design have been built also with separate transverse plates or fins like 14 but free at their outer edges and with flanges like the plates 12 engaging the heating element. The method of fastening above described may be applied to the flanges of such separate fins as well as to the plates 12 forming parts of the continuous corrugated sheets illustrated. In some cases it is not necessary to clamp the corrugated plates to the heating (or cooling) element so tightly as in the previous cases, because subsequent tinning, galvanizing or other such operations are required in order to comply with pure food regulations or for other reasons not connected with the heat transfer of the joint. In these cases the subsequent operation bonds the corrugated plates to the tube intimately and in fact makes the whole structure one continuous piece. It is obvious that when such subsequent treatment is intended it is only necessary to hold the plates in position and in contact with the tube until this treatment takes place.

This may be well accomplished by the use of fasteners at or near the top and bottom only, or of ears 16 like those of Fig. 5, one above the uppermost tube section and one below the lowermost tube section, or in fact they may be located in widely varying positions. The clips of Fig. 4, or the single clip 17, may be similarly used. In fact, in cases where the corrugated plates are of sufficiently heavy gauge or of a metal which is comparatievly stiff and rigid, and where tinning is not required for other reasons, the use of clips or clinch connections will produce contact sufficiently good for satisfactory use without any subsequent treatment.

Instead of using straps like those of Fig. 4 with both extensions 21 on one strap, each strap may have an extension at one end, to be clinched over the short end of the opposite strap. This simplifies the manufacture, making all the straps alike.

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

What we claim is:—

1. A radiator including a heating element, a sheet metal structure composed of two parts at opposite sides of the heating element and fastened together by devices passing through one of said parts and bent over at points closely above and below the heating element to hold such parts in contact with the heating element around substantially its entire circumference.

2. A radiator including a heating element, a sheet metal structure composed of two parts at opposite sides of the heating element, said parts embracing the heating element and substantially meeting each other at points above and below the heating element, straps bearing against the outer faces of said parts and means for mechanically fastening the opposite straps to each other to hold said parts in engagement with the heating element around substantially its entire circumference.

3. A radiator including a heating element in a plurality of tubular sections, a sheet metal structure composed of two parts at opposite sides of the heating element, straps bearing against the outer faces of said parts and devices extending from the straps at one side through the sheet metal parts at points between said tubular section and over the straps at the opposite side for holding said parts in engagement with the heating element.

4. A radiator including a heating element, a sheet metal structure composed of two parts at opposite sides of the heating element, straps bearing against the outer faces of said parts and an extension on the end of the strap at one side extending through said parts and over the strap at the opposite side for holding said parts in engagement with the heating element.

5. A radiator including a heating element, a sheet metal structure composed of two parts at opposite sides of the heating element and fastened together by devices passing through one of said parts, and bent over to hold such parts in contact with the heating element.

6. A radiator including a heating element, a sheet metal structure at one side of the heating element and a member at the other side passing through the sheet metal and bent over to hold the latter in contact with the heating element.

7. A radiator including a heating element, a sheet metal structure and straps at opposite sides, one of said straps having an end extension passing through the sheet metal

and bent over the strap at the opposite side.

8. A radiator including a heating element, a sheet metal structure composed of parts at opposite sides of the heating element and fastened by devices integral with one of said parts and passing through the other of said parts and bent over against it to hold the parts in contact with the heating element.

In witness whereof, we have hereunto signed our names.

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