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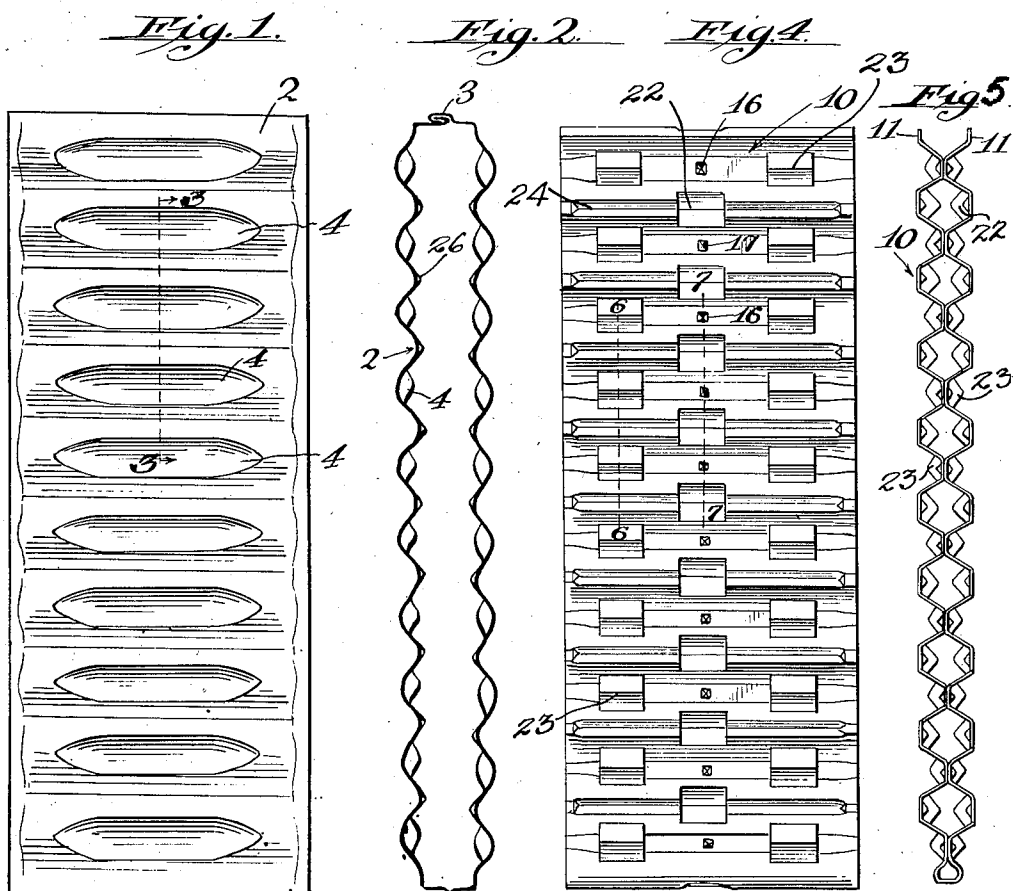
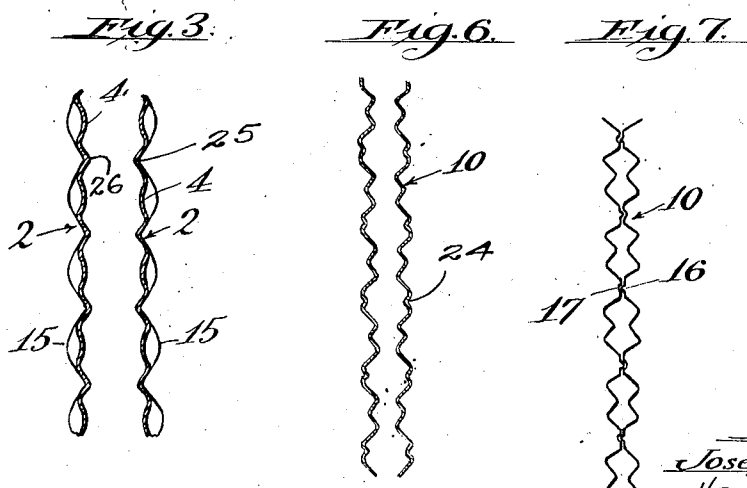
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RADIATOR CONSTRUCTION

Filed Jan. 27, 1927

2 Sheets-Sheet 1



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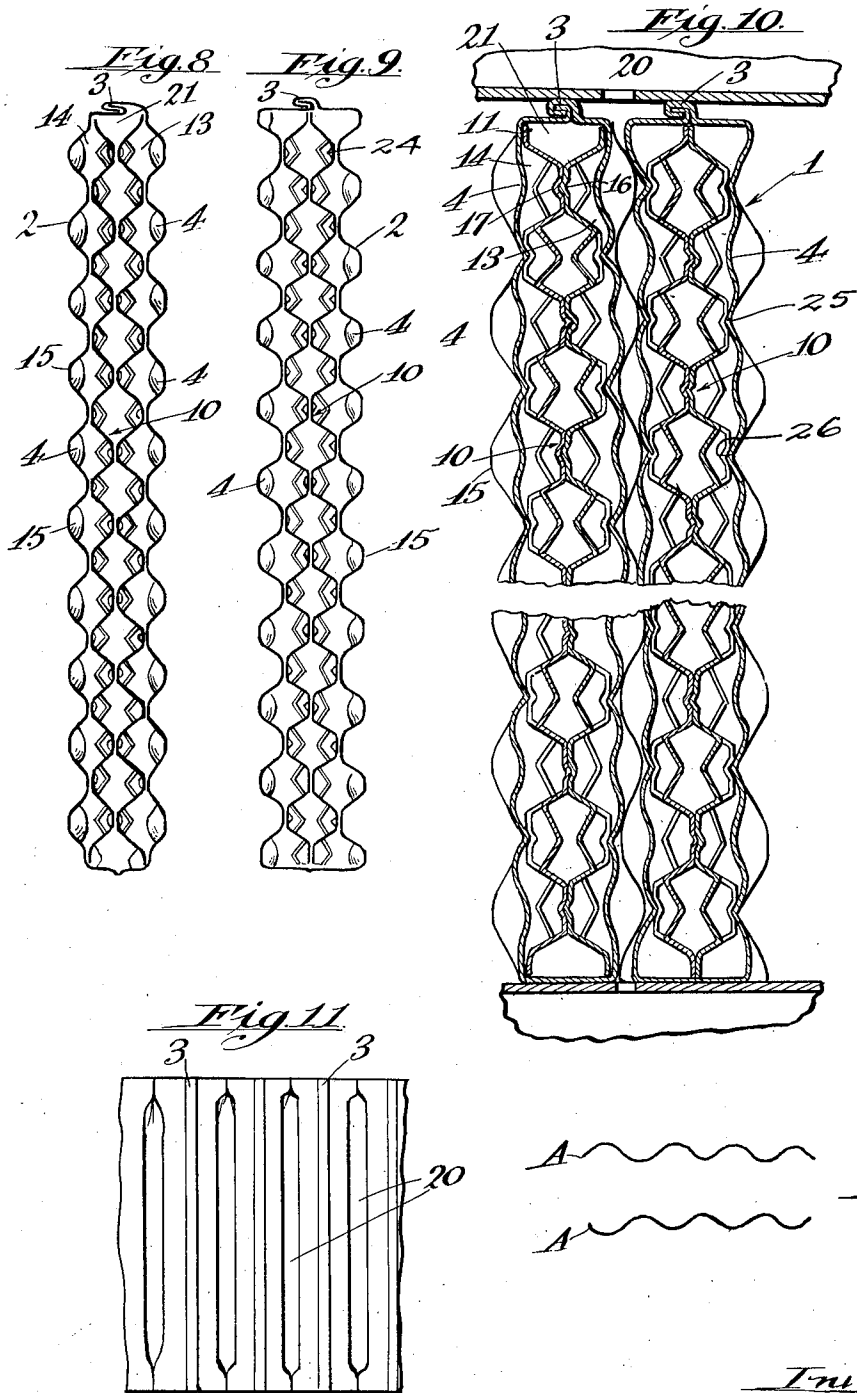
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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

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## RADIATOR CONSTRUCTION

Application filed January 27, 1927. Serial No. 164,006.

This invention relates to cell constructions for radiators and has for an object to provide an improvement over the construction disclosed in my prior Patent No. 1,554,708, issued September 22, 1925.

In the said allowed patent application I describe clearly a radiator construction formed of sheet material bended upon itself and having inserted between the folds of the bend a single strip of sheet material, said strip of sheet material and the sides of the fold forming when placed in parallel relation a honey-combed structure in which were formed two parallel rows of cells, each of which provided ventilation for the water channel. This application is for an improvement on such a structure and has for an object to provide a similar construction in which there are formed three parallel rows of cells, each row providing ventilation for the water passage through the radiator.

A still further object of my invention is to produce a radiator unit consisting of a plurality of rows of cells, in a manner less expensive and with greater facility than has heretofore been proposed.

Referring to the accompanying drawings forming a part of this specification, in which like numerals designate like parts in all views:

Figure 1 is a plan view of one of the strips of sheet material folded upon itself.

Figure 2 is a side elevation of the disclosure in Fig. 1 showing the bended strip on edge.

Figure 3 is a sectional view taken along the line 3—3 of Fig. 1.

Figure 4 is a plan view of another strip of material bended upon itself, which strip of material is adapted to be inserted in its bended form between the folds of the bent sheet material disclosed in Figs. 1, 2 and 5.

Figure 5 is a side elevation of the disclosure in Fig. 4 showing the strip of bended sheet material on edge.

Figure 6 is a sectional view taken along the line 6—6 of Fig. 4.

Figure 7 is a sectional view taken along the line 7—7 of Fig. 4.

Figure 8 is a view of the assembly of pieces shown in Figs. 1 and 4, said assembly being shown in a manner similar to Fig. 2 on edge.

Figure 9 is an assembly of a complementary pair of bended sheet metal forms, which forms are practically identical with the forms shown in Figs. 1 and 4 but have their outer surfaces arranged so as to fit closely against the outer surfaces of the assembly shown in Fig. 8.

Figure 10 is a sectional view, greatly enlarged, of the two unitary constructions shown in Figs. 8 and 9 when the same are disposed with sides in contiguous relationship showing the water passage-way extending therebetween. This figure discloses two complete assembly units of my radiator construction.

Figure 11 shows a plurality of these units assembled together, this view being an end view showing a plurality of water passages.

Figure 12 is a diagrammatic view of a pair of sine curves, which curves represent the curvature on the surface of a pair of bended sheet metal forms used in connection with my invention. This diagram is merely illustrative and is used to facilitate a thorough description of my invention.

In the drawings I have designated at 1 a pair of units, which are identical in construction with the exception that these units are complementary in design, that is, the outer surfaces of the same fit together in close relationship and define a water passage-way therebetween. Each of the units comprises an inner and an outer shell, and in forming the inner shell, I fold a metal plate 2 upon itself and join the outer edges of the same together as at 3. The structure of this metal plate is that of a sinuous curve, the central portion of the outer crest of each sine curve being depressed as at 4. This

sheet metal plate is identical in construction with the plate described and shown in my prior application, above mentioned. The sheet metal plate in my prior application was similarly bent upon itself so that the parallel sides of the plate were arranged in complementary relation, having a trough contiguous with a trough and a crest contiguous with a crest. In this instance, however, I prefer to select the bending point of the metal plate so that corresponding parts on each side of the plate oppose each other, having a trough opposite a trough and a crest opposite a crest, so that the depressions 4 are also positioned opposite one another. This sheet metal plate when bent upon itself and the ends closed as at 3 forms a closed rectangular elongated shell into which shell is adapted to be inserted an inner shell shown in Fig. 4 and designated as an entirety as at 10. This second shell is also formed of a sheet of folded material and is likewise substantially identical with the inner piece of sheet material disclosed in my said prior patent application as far as configuration is concerned. The said piece of sheet material, however, was not folded upon itself as is the case in this improvement, and as may be seen in Fig. 5. The outer ends of this folded piece of sheet material diverge as at 11 and when this sheet of material is inserted in the elongated rectangular frame formed by the first piece of sheet material, these edges abut against the points of fold as shown in Fig. 8. It will be seen that when the two above described sections of folded sheet material are inserted, one within the other, the crests of the sine curves on the inner piece of sheet material are adapted to abut against the troughs of the sine curves on the outer piece of sheet material, thereby forming rows 13 and 14 of substantially hexagonal cells. These cells have been described as being formed between the troughs of sine curves placed in contiguous relationship. These curves are merely approximate sine curves as the troughs and crests of the same are flattened as shown at 15 and the use of the word sine curve in this application is merely descriptive of the zig-zag bends or corrugations formed in the bended sections of sheet material.

The inner strip of material 10 constituting the spacer for a unit, has alternate troughs formed with depressions designated at 16, 16, while the intermediate troughs are formed with a series of projections 17, 17. The bend in the strip of material 10 is so chosen that when the sides contact with one another, the projections and depressions interfit, presenting sliding movement of the sides on one another.

As clearly shown upon Figure 4, the crests are formed with struck-out portions 22 which are in alignment with the projections and

depressions 16 and 17. These struck-out portions are bent inwardly as shown upon Figure 5 so that they extend across the center row of hexagonal cells. They do not contact with each other, and as they have their ends connected to the body of the strip 10 they serve to strengthen this strip. In a converse manner, the troughs are formed with struck-out portions 23, these struck-out portions being arranged in two parallel rows which are on opposite sides of the row of struck-out portions 22. The struck-out portions 23 also have their ends connected to the body of the strip and are bent outwardly so that they extend across the cells forming the outside rows of cells 13 and 14. They do not however, contact with the outside strip which forms the exterior of the unit. The struck-out portions 22 and 23 thus present edges of metal which extend across the cells, and as the air passes over these struck-out portions there is a greater heat transfer from the radiator to the air than would be the case where the struck-out portions 22 and 23 were entirely omitted, or where they contacted with and fitted against other sides of the hexagonal cells. The crests on the strip 10 are also formed with longitudinal grooves 24 which extend nearly from side edge to side edge of the strip. The strip 2 which forms the outer walls of the unit has its troughs formed with grooves 25, which form beads or projections 26 on the inside surfaces of this strip which extend nearly from side edge to side edge of the outside strip 2. When the inside strip 10 is placed within the outside strip 2, the beads 26 fit within the grooves 24, serving to prevent relative movement between the sides of the strip 10 and the sides of the strip 2. In this manner, there is formed a bead and groove connection between the outside strip and the inside strip by means of the bead 26 and the grooves 24, and there is also formed a projection and depression connection between these strips, afforded by the projections 17 and the depressions 16.

Figure 8 shows the assembly of these two units, one within the other, and in constructing my radiator construction when one of these assemblies are formed the marginal edges of the same are immersed in liquid solder or the like so that a sealed passage-way 20 is formed through which water from the radiator reservoir is adapted to circulate. An intermediate row of cells 21 is formed between the rows 13 and 14 by virtue of the contacting crests of the sine curves.

My entire radiator construction consists of a plurality of units, as shown in Fig. 8, arranged in alternation with a plurality of similar units, shown in Fig. 9. As stated herebefore the construction of units shown in Fig. 8 and the construction of units shown in Fig. 9 is identical except that these two

sections are complementary. The difference in construction may be well described by the diagram shown in Fig. 12. This diagram represents the paths followed by a point in tracing the sine curve along a horizontal axis. The upper sine curve is generated by the equation  $X = \sin Y$ , while the lower curve is generated by the equation  $X = \sin (Y + 90^\circ)$ . The points A on each of these curves represent the points A in Figs. 8 and 9, that is, the beginning of one of the edges of sheet material. The point A on the upper curve begins to trace its path by mounting a crest, while the point A on the lower curve begins to trace its path by descending a trough, and it is in this manner that the troughs and crests are formed on the folded pieces of sheet material 2, 10, and on the inner folded pieces of sheet material 3, 10'. The arrangement of adjacent surfaces of these two units is therefore such that when they are brought together the water passage-way 20 extends between them and three rows of honey-combed cells separate each water passage-way to permit passage of air therebetween, each cell presenting a plurality of edges and cutting the air stream and breaking it up to produce a maximum heat transfer from the water to the air.

I am aware that other constructions have shown similar honey-combed devices but my particular construction is an improvement over these in that three rows of parallel cells, each of which communicate with each other, separate the water passage-ways.

Various changes may be made in the principles of my invention without departing from the spirit thereof, as set forth in the description, drawings and claims.

I claim:

1. A radiator construction comprising in combination units, certain of said units being formed of strips of corrugated sheet material folded to form a closed rectangle, other strips of corrugated sheet material folded upon themselves adapted to be inserted in said closed rectangular sheets of material, said folded sheets of material cooperating to form three parallel rows of honey-combed cells, other of said units being formed of sheet material folded to form a closed rectangle, strips of corrugated folded sheet material adapted to be inserted in said second mentioned rectangular strips, these strips also cooperating to form three parallel rows of honey-combed cells, said first mentioned units and said second mentioned units being disposed in contiguous relationship and defining a straight unobstructed water passage-way therebetween, the abutting surfaces of said units presenting configurations which are complementary.

2. A unit for a radiator core comprising means providing two corrugated outer walls for the unit, means providing two corrugated

inner walls for the unit, the inner walls being contiguous and co-operating to form a row of cells therebetween, said inner walls being positioned between the outer walls and co-operating therewith to form two rows of cells which are on opposite sides of the first row of cells, said inner walls having portions struck therefrom which are connected to the inner walls at their sides, and which extend across the cells of the outside rows to cut the air stream through the associated cell.

3. A unit for a radiator core comprising means providing two corrugated outer walls for the unit, means providing two corrugated inner walls for the unit, the inner walls being contiguous and co-operating to form a row of cells therebetween, said inner walls being positioned between the outer walls and co-operating therewith to form two rows of cells which are on opposite sides of the first row of cells, said inner walls having portions struck therefrom which are connected to the inner walls at their edges, and which extend across the cells of the inside row to cut the air stream through the associated cell.

4. A unit for a radiator core comprising means providing two corrugated outer walls for the unit, means providing two corrugated inner walls for the unit, the inner walls being contiguous and co-operating to form a row of cells therebetween, said inner walls being positioned between the outer walls and co-operating therewith to form two rows of cells which are on opposite sides of the first row of cells, said inner walls having portions struck therefrom which are connected to the inner walls at their edges, and which extend across portions of the cells to cut the air streams therethrough.

5. A unit for a radiator core comprising means providing two corrugated outer walls for the unit, means providing two corrugated inner walls for the unit, the inner walls being contiguous and co-operating to form a row of cells therebetween, said inner walls being positioned between the outer walls and co-operating therewith to form two rows of cells which are on opposite sides of the first row of cells, the inner walls having a rib and groove connection with the outer walls at the sides of the cells of the inner row, and portions struck from said inner walls, said portions being connected at both side edges to said strip and extending across portions of each of said cells to cut the air streams there-through.

6. A unit for a radiator core comprising means providing two corrugated outer walls for the unit, means providing two corrugated inner walls for the unit, the inner walls being contiguous and co-operating to form a row of cells therebetween, said inner walls being positioned between the outer walls and co-operating therewith to form two rows of cells which are on opposite sides of the first

row of cells, the inner walls having grooves  
formed upon them centrally of the sides of  
the central row of cells and there being beads  
formed upon the outer walls adapted to enter  
said grooves, and portions struck from said  
5 inner walls, said portions being connected at  
both side edges to said strip and extending  
across portions of each of said cells to cut the  
air streams therethrough.

10 In testimony whereof I have signed my  
name to this specification.

J. H. BRISKIN.

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