Feb. 28, 1939. J. H. MIGUEL 2,149,065

RADIATOR CONSTRUCTION

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Fig. 1

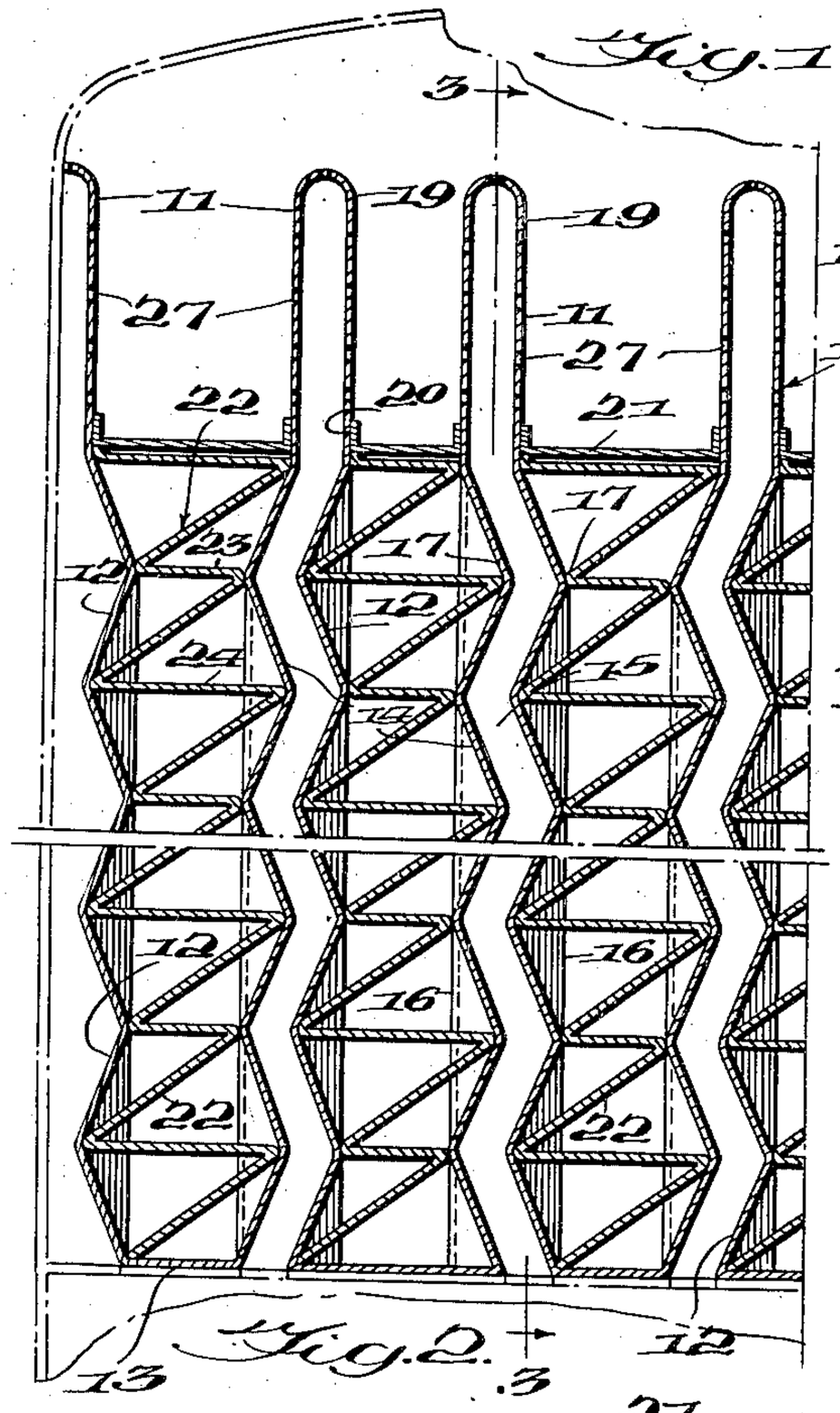


Fig. 2.

Fig. 3.

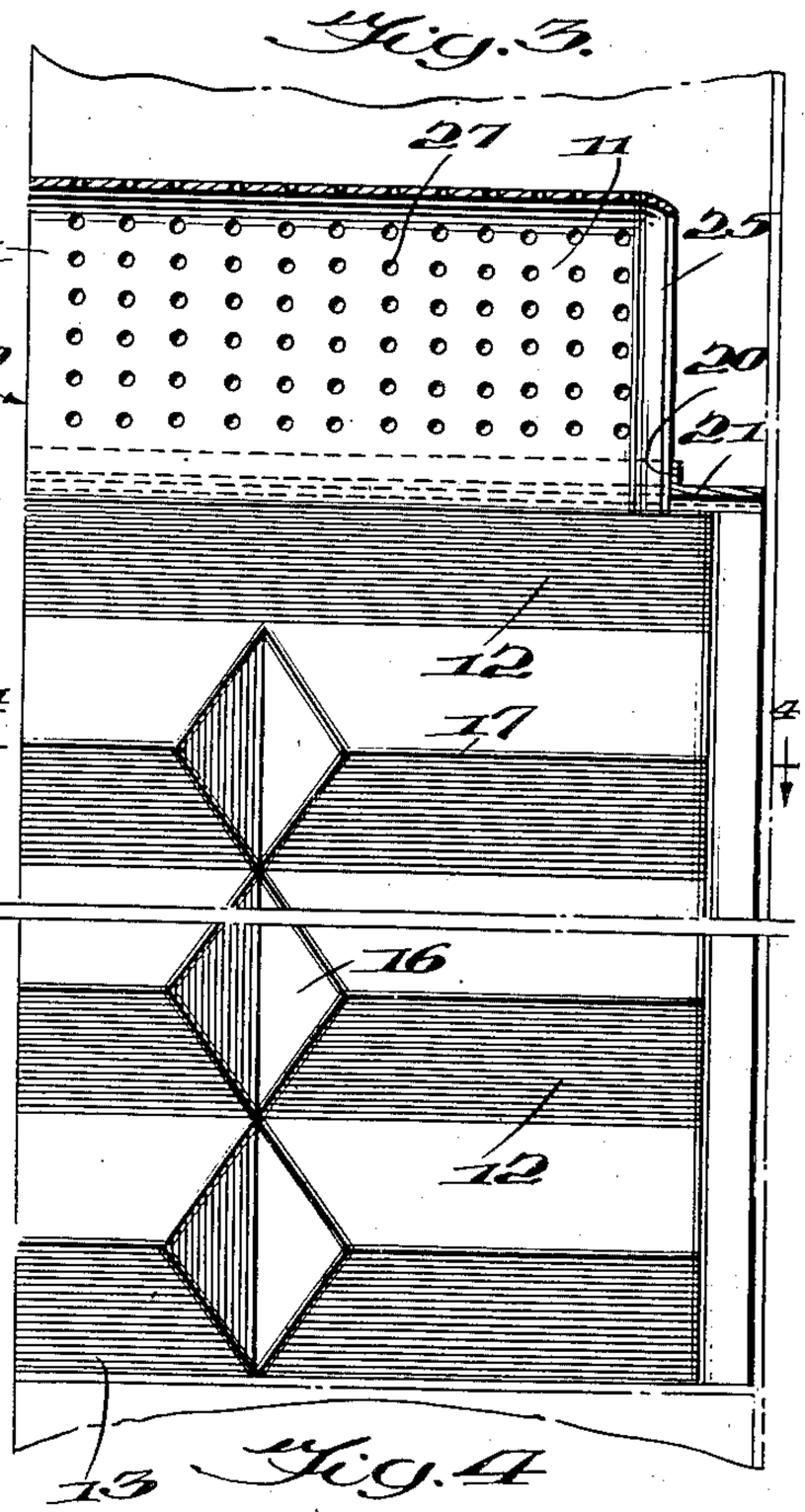
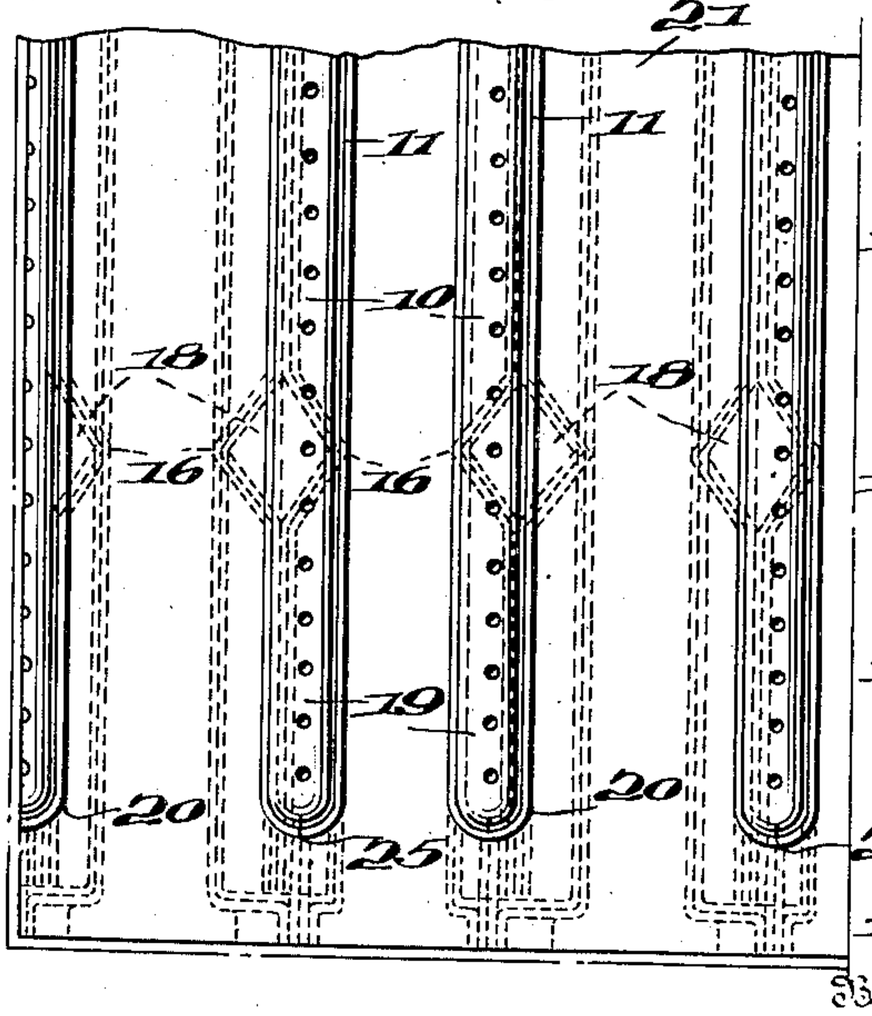
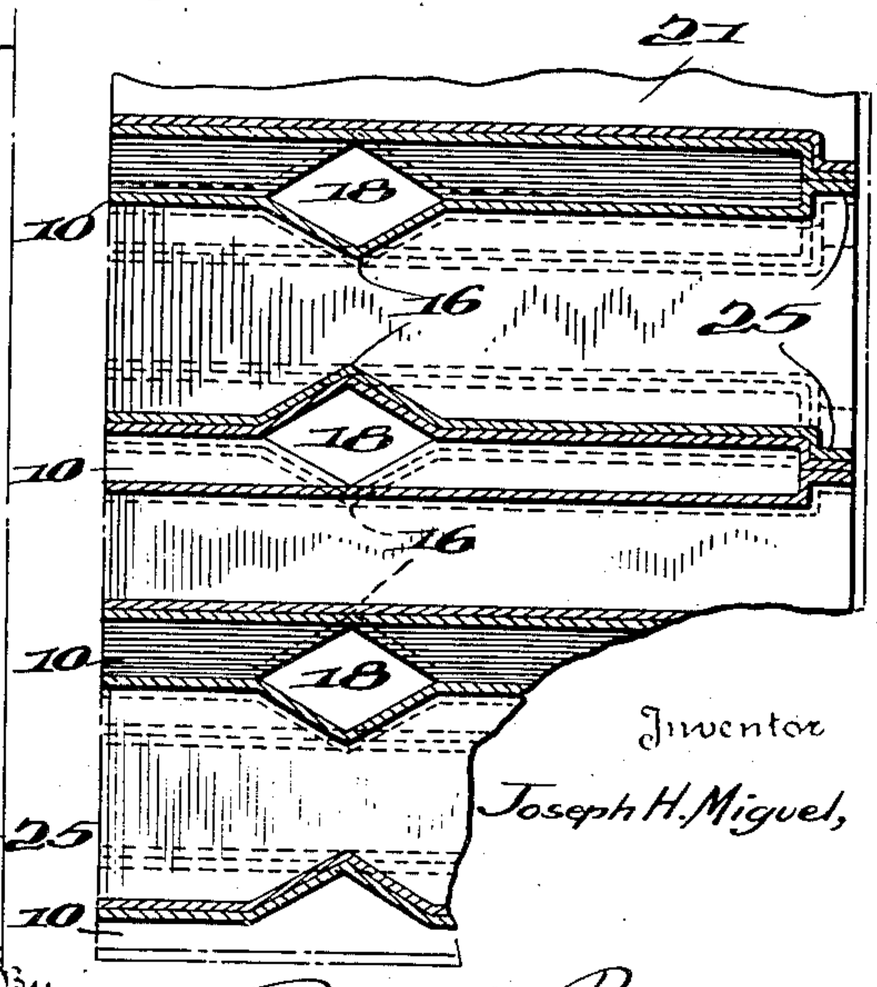


Fig. 4





Inventor

Joseph H. Miguel,

Paul C. Ross Attorney

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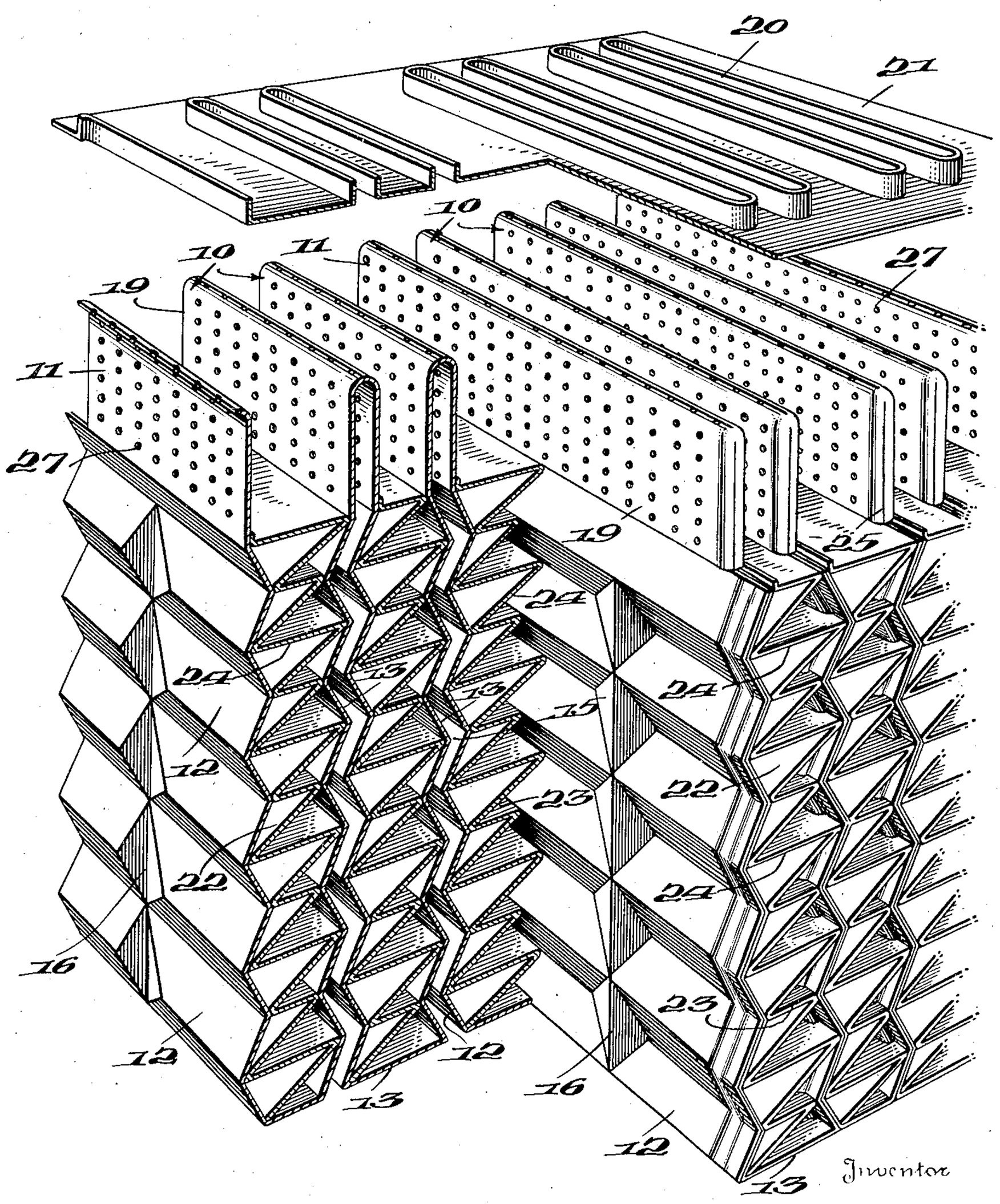
Fig. 5.



Inventor

Joseph H. Miguel,

By Paul G. Rose

Attorney

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RADIATOR CONSTRUCTION

Joseph H. Miguel, St. Albans, N. Y., assignor to Louis E. Karcher, Middle Village, Long Island, N. Y., and himself, as copartners, trading under the name and style of Miguel Non-Clog Core Company

Application July 1, 1937, Serial No. 151,526

10 Claims. (Cl. 257—130)

This invention relates to radiators of the type employed in the cooling systems of internal combustion engines.

One of the principal causes of radiator failures is due to the stoppage of the water tubes or channels by an accumulation of rust or scale which over a period of time builds up in the tubes to such an extent that sufficient circulation for proper cooling is impossible. Experience has proven that this stoppage of the tubes of conventional radiators is due to the fact that relatively large pieces of rust and scale, which chip off of the walls of the cooling jacket and also from the upper tank or header usually found on radiators, become lodged in the tubes. These large pieces then act as baffles or dams upon which the finer particles of rust and scale, carried around by the circulating water or other cooling medium, gradually build up until the particular tube or channel is completely stopped up.

While some attempts have been made to filter or strain the water in cooling systems, these have heretofore proven unsatisfactory due to the fact that such devices soon get stopped up themselves and since they are not accessible for cleaning or replacement their use has been found to be impracticable.

It is a primary object of the invention to provide a radiator construction which will overcome the defects of prior radiators and which will be permanently clog-proof.

Another object of the invention is to provide a permanent filtering means built as a part of the radiator itself which will be self-cleaning and which will prevent large particles of solid matter from entering the water tubes or channels.

Another object is to provide a radiator in which the water tubes or channels are formed of a continuous single piece of sheet metal.

Another object is to provide a sheet metal radiator in which the water tubes or channels will be integrally braced against lateral strains.

A further object is to provide a radiator of increased circulating capacity and in which the flow of liquid therethrough will be so directed as to tend to wash out any solid matter which may tend to lodge in the water tubes.

Other objects and advantages of the invention not specifically enumerated will become apparent during the course of the following detailed description when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a vertical transverse section through a radiator embodying the invention,

Fig. 2 is a top plan view thereof,

Fig. 3 is a vertical partial sectional view on the line 3—3 of Fig. 1,

Fig. 4 is a horizontal sectional view taken on the line 4—4 of Fig. 3, and

Fig. 5 is a perspective view with parts in section of a unit in the process of assembly.

In the drawings, those parts which are not necessary to an understanding of the invention have either been omitted or merely shown diagrammatically.

The core of the radiator constructed according to the invention comprises a plurality of sheet metal tubes or channels 10. These tubes 10 are formed from a single continuous strip of sheet metal which in its strip or blank form is provided in succession with a perforated portion 11, a corrugated portion 12, a plane portion 13, and a corrugated portion 14, the last corrugated portion being followed by another perforated portion and the succession repeated.

The blank formed as above described is folded upon itself so that the plane portions 13 between adjacent corrugated portions 12 and 14 become base members and the upper return bends are made midway of the length of the perforated portions 11. The corrugated portions 12 and 14 on either side of each perforated portion will lie opposite each other in matched relation to produce zig-zag open bottomed water channels 15. When this is done, the plane portions 13 between adjacent corrugated portions act as spacers between adjacent water tubes. Due to the fact that adjacent lower terminals of the zig-zag tubes are disposed in opposite directions, the adjacent base or plane portions 13 are necessarily of a different size so that the spacing between the tubes as a whole may be the same.

The corrugated sections are provided with two or more longitudinal vertical corrugations 16 in addition to the transverse or horizontal corrugations 17. These vertical corrugations intersect the horizontal corrugations and are substantially V-shaped and the same depth as the horizontal corrugations. The vertical corrugations extend the full length or height of the respective corrugated sections and are so formed that when the core is formed as shown, the vertical corrugations will be disposed with their channel faces in confronting relation to form straight water channels 18 the full length of the core, these straight drop channels merging at their sides with the zig-zag channels 15.

As stated above, in forming the core, the upper return bends are made midway of the length of the corrugated sections 11. This construction re-

sults in the formation of the upper ends of the water tubes as upstanding hollow ribs 19 having perforated side walls. These ribs 19 project through spaced elongated slots 20 in plate 21 and the plate is soldered to the ribs around the base thereof to make a watertight joint. The plate 21 preferably constitutes the bottom wall of the upper tank or header. It is to be noted that the perforated upper ends of the water tubes project an appreciable distance into the upper tank above the bottom wall thereof.

For the purpose of dissipating heat from the water passing through the tubes 10 in the most efficient manner, sheet metal fins or spacers are mounted between adjacent tubes. These fins are formed of a zig-zag sheet metal strip 22. The fins vary in size according to their position, that is, the fins 23 are shortest because they bridge the space between confronting rib portions of the corrugated tubes while fins 24 are longer because they bridge the wider space between confronting recessed portions of the tubes.

The vertical edges of the walls of the tubes 10, or the corresponding portions in the blank, are formed so as to be offset toward each other so that when the tube walls are formed as above described these edges will engage each other and properly space the walls of the water channels from each other. These edges are then soldered together.

After the tubes are formed, the fins or spacers are inserted into place in the air passages between the outside walls of adjacent tubes and the plate 21 is fitted over the upper ends of the tubes. The core is then dipped in solder to secure all these parts firmly together as a unit. The upper and lower header tanks are then soldered on and the radiator is ready for installation.

The vertical corrugations 16 in addition to providing the straight drop channels 18 afford integral bracing means which make the tubes more resistant to lateral strains.

The perforations 27 in the upper ends 19 of the tubes 10 are made of such a size as to prevent the passage into the water channels of any large particles of rust, scale or other foreign matter which may find its way into the upper tank. The perforated upper ends project into the upper tank a sufficient distance above the lower wall 21 thereof so that even the accumulation of years of use would not build up to the point at which it would effect the free circulation of cooling medium. Also since the sides of the perforated top of the tubes are vertical, any solid particles stopped thereby will immediately be washed off so that there is no danger of these members getting clogged up in use.

Since the water passing through the vertical channels 18 will flow faster than that passing through the adjacent zig-zag channel portions 15, it has a tendency to draw the water laterally from the corrugated sections of the tube into the vertical channels. The rate of flow and cooling efficiency is thus enhanced and if any particles of foreign matter should get into the tubes, this lateral flow would wash them into the vertical channels and they would deposit in the bottom tank where they would do no harm.

While a preferred embodiment of the invention has been shown and described for purposes of illustration, it is to be understood that various changes may be made in the details of the construction and that other modifications of the invention and the manner of constructing the same may be resorted to without departing from the spirit of the invention within the scope of the appended claims.

I claim:

1. A radiator comprising upper and lower headers and a sheet metal water tube formed of a single sheet of metal bent upon itself, the return bend being within said upper header and the portion of said tube within said header having perforations in the walls thereof.

2. A radiator comprising upper and lower headers, a plurality of sheet metal water tubes connecting said headers, said tubes formed of a continuous strip of sheet metal bent upon itself in a plurality of passes, the return bends forming the upper ends of said tubes being located within said upper header and having perforated walls.

3. A radiator core unit comprising a plurality of water tubes formed from a single strip of sheet metal having corrugated portions alternately spaced by plane portions and perforated portions, said strip being bent upon itself in a plurality of passes, one return bend being made midway of each of said perforated portions to dispose adjacent corrugated portions in confronting relation, the edges of said last mentioned portions being secured together.

4. A radiator comprising upper and lower header tanks, a plurality of water tubes extending between said tanks, said tubes formed from a single strip of sheet metal having corrugated portions alternately spaced by plane portions and perforated portions, said strip being bent upon itself in a plurality of passes, one return bend being made midway of each of said perforated portions to dispose adjacent corrugated portions in confronting relation, the edges of said last mentioned portion being secured together, the perforated ends of the tubes thus formed being disposed entirely within said upper tank, the other ends of said tubes being secured to and opening into said lower tank.

5. In a radiator, a water tube formed from a strip of sheet metal having corrugated portions spaced by a perforated portion, said strip being bent upon itself midway of said perforated portion to dispose said corrugated portions in confronting relation, the perforated portion forming an integral filter end on said tube.

6. In a radiator, a water tube formed from a strip of sheet metal having corrugated portions spaced by a perforated portion, said strip being bent upon itself midway of said perforated portion to dispose said corrugated portions in confronting relation, the perforated portion forming an integral filter end on said tube, said corrugated portions having transverse corrugations and a vertical corrugation intermediate the edges whereby the water channel formed by bending said strip upon itself will have tortuous paths spaced by straight paths.

7. A radiator core unit comprising a plurality of water tubes formed from a continuous strip of sheet metal having corrugated portions alternately spaced by perforated portions, said corrugated portions having transverse corrugations and aligned longitudinally extending corrugations intersecting said transverse corrugations, said strip being bent upon itself in a plurality of passes, one return bend being made midway of each of said perforated portions to dispose adjacent corrugated portions in confronting relation to define water channels having tortuous passages spaced by straight passages.

8. A radiator core unit comprising a plurality of water tubes formed from a single strip of sheet metal having corrugated portions alternately spaced by plane portions and perforated portions, said strip being bent upon itself in a plurality of passes, one return bend being made midway of each of said perforated portions to dispose adjacent corrugated portions in confronting relation, the edges of said last mentioned portions being secured together, and a zig-zag spacer strip supported between the adjacent tubes thus formed, said spacer strip having fins varying in width extending alternately between confronting bulged portions on said tubes and confronting recessed portions thereof.

9. An automobile radiator structure comprising upper and lower tanks, a plurality of sheet metal water tubes connecting said tanks, said tubes each having a reticulated end portion extending an appreciable distance into said upper tank and terminating short of the upper wall thereof, the ends of said reticulated end portions of said tubes being otherwise closed to the free endwise passage of liquid into said tubes.

10. A radiator structure comprising upper and lower tanks and a plurality of sheet metal water tubes connecting said tanks, the upper ends of said tubes extending an appreciable distance above the lower wall of said upper tank and terminating short of the upper wall thereof, said upper ends being closed to the free endwise passage of liquid into said tubes and the walls of said end portions within said upper tank having a plurality of perforations therein providing an integral filter end on said tubes.

JOSEPH H. MIGUEL.