F. W. KEEGAN.

RADIATOR.

APPLICATION FILED OCT. 9, 1915.

1,239,491. Patented Sept. 11, 1917.

Fig. 1.

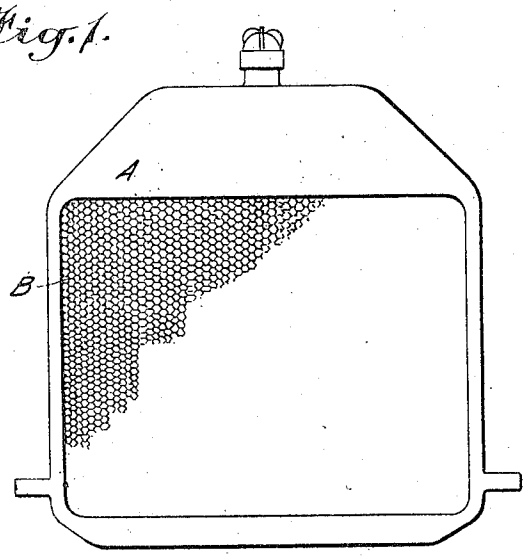


Fig. 2.

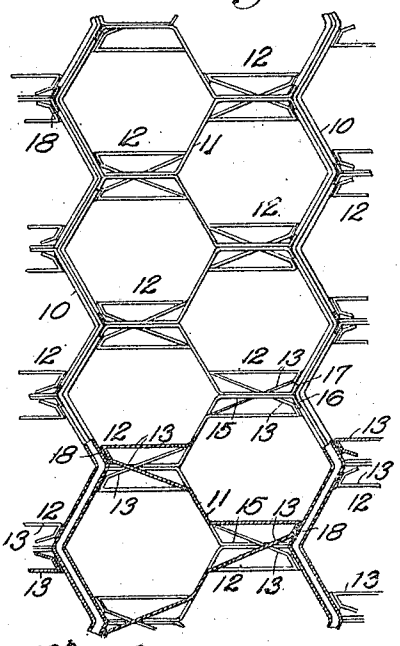


Fig. 3.

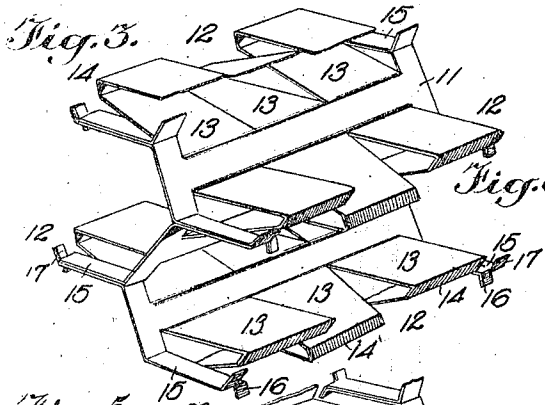


Fig. 8.

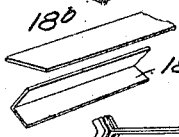


Fig. 4.

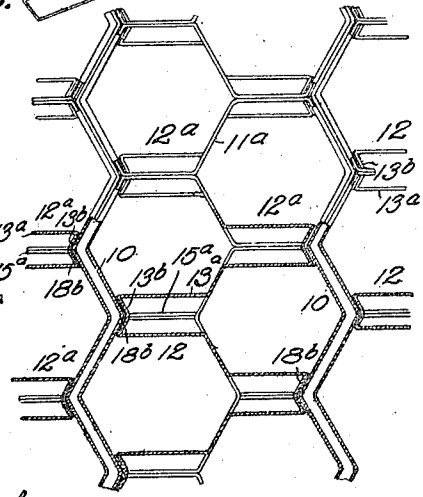


Fig. 5.

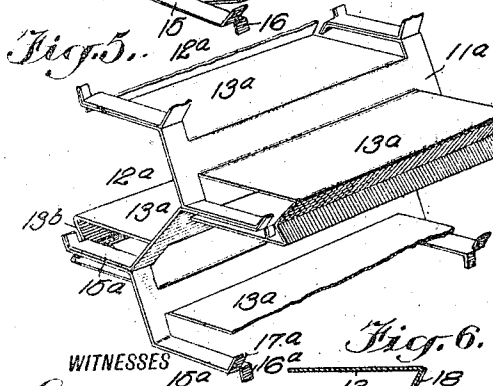


Fig. 6.

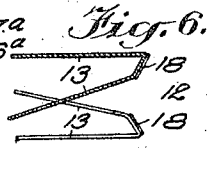
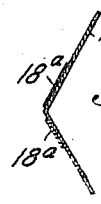


Fig. 7.



WITNESSES

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RADIATOR.

1,239,491. Specification of Letters Patent. Patented Sept. 11, 1917.

Application filed October 9, 1915. Serial No. 55,002.

To all whom it may concern:

Be it known that I, FRANCIS W. KEEGAN, a citizen of the United States, and a resident of New York city, borough of Manhattan, in the county and State of New York, have invented a new and Improved Radiator, of which the following is a full, clear, and exact description.

In cellular radiators employing radiating elements in the form of plates separate from the conduits and alternating therewith, said elements have been given a form in which the plate is bodily zig-zagged to produce radiating elements, there being, in radiators of this character, in some instances fins extending from the water tubes or conduits; in other instances, the corrugated or zig-zagged radiating element has been slitted across the corrugations to produce individual minor corrugated elements, the reverse of the main corrugations. These known radiators leave much to be desired on the score of strength, radiating efficiency, and the assembling of the parts without danger of crushing the water tubes.

My invention is more particularly designed for use in cellular radiators employing zig-zag water tubes and radiating elements presenting together a honeycomb pattern though the invention is not limited in all its phases to this type.

Prime objects of my invention are to provide a radiating element having a maximum efficiency by reason of presenting a materially increased total effective radiating surface; and to provide a radiating element that will effectively support and brace the water tubes or conduits and materially increase the strength and stability of the radiator structure.

The distinguishing features of the invention, and the advantages of the structural features characterizing the practical embodiment thereof, will more clearly appear from the specific description following.

Reference is to be had to the accompanying drawings forming a part of the specification in which similar reference characters indicate corresponding parts in all the views.

Figure 1 is a front elevation of a radiator frame and a portion of the grid or cellular structure presented by my improved radiating elements and water tubes;

Fig. 2 is a fragmentary front view on an enlarged scale showing a section of the radiator, parts being in section;

Fig. 3 is a perspective view of a portion of my improved radiating element;

Fig. 4 is a view similar to Fig. 2 but illustrating a slightly different form of the invention;

Fig. 5 is a perspective view of a portion of a radiating element employed in the form shown in Fig. 4;

Fig. 6 is a detail view showing a fragment of a radiating fin partly in section and partly in side elevation indicating tinning or solder thereon;

Fig. 7 is a fragmentary sectional view of a portion of the wall of one of the water conduits showing solder or tinning applied thereto as a substitute for the arrangement shown in Fig. 6; and

Fig. 8 is a perspective view of a strip of solder and a blank forming the same preferably employed in the form of the invention illustrated in Figs. 4 and 5.

The invention is adapted to be embodied in any suitable radiating frame A to produce a cellular structure B as indicated in Fig. 1.

In constructing the practical embodiment of the invention in the forms illustrated in Figs. 2 and 3, zig-zag water tubes 10, are provided, the same having V-shaped corrugations. Disposed between each pair of water tubes 10, and ranging in the same general direction thereof is a radiating element designated generally by the numeral 11; this element which I produce from a thin metal plate, I give in general a zig-zag form whereby to produce with the water tubes 10, a radiator of honeycomb pattern.

The water tubes 10, are plain, that is, they present no lateral projections in the way of fins or braces. On the other hand the radiating element 11, is given a form to present radiating fins designated generally by the numeral 12, these being positioned alternately at opposite sides of the plate 11, at the salients thereof so as to be disposed laterally in the direction of the salients presented by the water tubes 10. The form and arrangement, as well as the dimensions of the fins, are such that the same will extend to a contact with the opposed walls of the water tubes 10, whereby to brace the latter and result in a stable structure. Each fin is formed by bending the material of the

plate 11, laterally at the salient of the plate so that a return bend is produced presenting upper and lower spaced walls integral at their bases with the plate 11, and continuous with each other. Thus, both surfaces of both walls of the fin are open to the contact of air passing through the cells produced by the tubes and the said radiating element. In the preferred form of the invention each fin is slitted transversely, subdividing the same into fin sections 13, and these sections are bent alternately to be disposed in planes at an angle to each other so that the terminal of one fin section will contact with the adjacent wall of a conduit above the tip of the salient while the next fin section will engage the said wall of the conduit below the tip of the salient so that in effect, there is a depression presented by the alternate fin sections to receive the salient of the conduit. The end of each fin section 13, is preferably flattened as at 14, to give ample surface contact with the conduits. By the provision of the multiplicity of fin sections a greater number of radiating edges will be presented to the air current.

At the front and back vertical edges of the radiating plate 11, the lateral bends at the front and back ends of each fin 12, are flattened so as to produce lateral members 15, disposed at the median line of the fins 12, and directly in line with the tips of the salients of the conduits and radiating element, two thicknesses of the members 15 lying close together so as to constitute in effect a single lateral brace member which at the same time completes the honeycomb pattern of the cellular structure. The ends of the members 15, are preferably split to produce diverging members 16, 17, which receive the salient of the water tube.

The ends of the fins 12, as well as the member 16, are soldered to the walls of the respective conduits, the solder is indicated at 18 in Fig. 2. The solder can be applied in different ways; in Fig. 6 I have shown a coating of tin 18, on the flattened end 14, of each fin section 13, so that when the parts are assembled in close relation and subjected to heat, the solder will join the fins to the tubes. In Fig. 7, instead of applying the tin or solder 18, to the terminals of the radiating fins, I have shown the wall 10 of a conduit tinned as at 18^a, above and below the tip of the salient. In Fig. 8, is illustrated a fragment of a strip of solder which may be produced separately in the form of a flat blank and laid between the fins and the salients of the conduits so that when these parts are pressed together, the strip of solder will be bent into V-shape and held in position until subjected to heat. This manner of soldering may be employed in connection with the form of radiating element illustrated in Figs. 4 and 5. The radiating element illustrated in Figs. 4 and 5, is designated generally by the numeral 11^a. It is made in general of zig-zag form in accordance with the honeycomb pattern and has radiating fins 12^a, corresponding in general with the fins 12 in that they extend laterally from the plate forming the element 11^a, to the salients of the conduits or water tubes 10, which are the same as in Figs. 1 and 2. In this form of the invention, however, the fins present unbroken spaced upper and lower walls 13^a, that is, the fins extend continuously from end to end and are not formed into a plurality of fin sections as in the first described construction. At the outer ends the fins 12^a are formed with a V-shaped depression 13^b, to receive the salients of the conduits 10. The elements 15^a, 16^a, and 17^a, are the same as in the first described construction.

My improved radiating element permits of employing plain water tubes without fins or other special formation at the salients and it will be obvious that a very strong construction results by reason of the firm supporting and bracing of the water tubes by the radiating element and its fins. Moreover, these structural advantages are incident to such a disposition of the radiating members that the maximum effective radiating surface is presented to the cooling air current.

Having thus described my invention I claim as new, and desire to secure by Letters Patent:

1. A cellular radiator, including zig-zag conduits for a fluid, and an intermediate zig-zag radiating element having lateral radiating fins extending therefrom alternately at opposite sides toward the conduits, the fins being in contact with surfaces appurtenant to the conduits and presenting double walls spaced from each other, said double walls extending for the major portion of the width of said element, the said walls at the ends of the cells being in close relation and disposed at the transverse median lines of the fins to present unitary end members at the cells.

2. A cellular radiator, including zig-zag conduits for a fluid, and an intermediate zig-zag radiating element having lateral radiating fins extending therefrom alternately at opposite sides toward the conduits, the said fins contacting with surfaces appurtenant to the conduits and presenting double walls spaced from each other, and being slitted through both walls thereof presenting a plurality of fin sections, said sections being deflected alternately in planes at an angle to each other.

3. A cellular radiator, including zig-zag conduits for a fluid, and an intermediate zig-zag radiating element having lateral fins extending therefrom alternately at op-

posite sides toward the conduits, the fins presenting double walls spaced from each other, the said fins being slitted through both walls thereof presenting a plurality of fin sections, said sections being deflected alternately in planes at an angle to each other, said fin sections contacting with the conduits, the contact of alternate sections of each fin with a conduit being respectively at opposite sides of a conduit salient.

4. A cellular radiator, including zig-zag conduits for a fluid, and an intermediate zig-zag radiating element having lateral fins extending alternately at opposite sides of said element, said element and conduits forming respectively the opposite walls of open-ended cells alternating with the conduits and extending transverse to the general direction of the conduits, said fins all contacting with the said conduits adjacent to the salients of the latter at the ends of the cells and along substantially the whole length thereof between the ends and defining with the zig-zag body of the element and the zig-zag conduits, the walls of hexagonal cells.

5. A radiator, including zig-zag conduits for the flow of a liquid, and an intervening zig-zag radiating element having lateral radiating fins alternately at opposite sides at the salients of said element and extending to a contact with the conduits at the salients of the latter, forming opposite walls of hexagonal cells.

6. A cellular radiator, including zig-zag conduits for a fluid, and an intermediate zig-zag element having lateral fins extending therefrom alternately at opposite sides toward the conduits, the fins presenting double walls spaced from each other, the said fins being slitted through both walls thereof presenting a plurality of fin sections, said sections being deflected alternately in planes at an angle to each other, said fin sections contacting with the conduits, the contact of alternate sections of each fin with a conduit being respectively at opposite sides of a conduit salient, the walls of the fins at the front and back edges of the radiating element extending in close relation directly to and in line with the salients of the conduits and being secured to said conduits.

7. A radiator, including conduits, and an intermediate radiating element having lateral radiating fins extending therefrom alternately at opposite sides toward the conduits, the said fins being slitted through both walls thereof presenting a plurality of fin sections, said sections being deflected alternately in planes at an angle to each other.

8. A radiator, including conduits, and an intermediate radiating element having lateral radiating fins, extending therefrom alternately at opposite sides, said fins presenting double walls spaced from each other and being slitted through both walls thereof presenting a plurality of fin sections, said sections being deflected alternately in planes at an angle from each other and secured to the conduits.

9. In a radiator, a pair of conduits presenting opposite zig-zag walls, and an intermediate radiating element of zig-zag form and formed with fins at the salients thereof alternately at opposite sides extending laterally to an engagement with the walls of the conduits at the salients of adjacent conduits to form hexagonal cells, the said fins having spaced walls forming air passages, and the end edges of the said walls of the fins lying in contact to define a unitary wall member.

10. A cellular radiator comprising zig-zag water conduits, those salients of the conduits having a similar direction being in the same plane transversely to the general direction of the conduits, and a zig-zag radiating element having its salients alternating in the transverse planes of the salients of the respective conduits and formed with integral lateral fins at the salients of said element, the said fins extending directly to the salients of the conduits, said conduits and radiating elements thus forming hexagonal air cells.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANCIS W. KEEGAN.

Witnesses:

J. L. McAULIFFE,

PHILIP D. ROLLHAUS.